Electricity Distribution and Supply Authority (EDSA)
Ministry of Energy (MOE)
Republic of Sierra Leone

PREPARATORY SURVEY REPORT
ON
THE PROJECT
FOR
EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR
IN
THE REPUBLIC OF SIERRA LEONE

AUGUST 2022

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

YACHIYO ENGINEERING CO., LTD.
WEST JAPAN ENGINEERING CONSULTANTS, INC.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Yachiyo Engineering Co., Ltd and West Japan Engineering Consultants, Inc.

The survey team held a series of discussions with the officials concerned of the Government of the Republic of Sierra Leone, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Sierra Leone for their close cooperation extended to the survey team.

August, 2022

Hiroo TANAKA

Director General,

Infrastructure Management Department

Japan International Cooperation Agency

SUMMARY

1. Overview of the Country

The Republic of Sierra Leone (hereinafter referred to as "Sierra Leone") is a country located in the western part of the African continent with an area of 71,740 km^2 (one-fifth of Japan). It faces the Atlantic Ocean to the west, boarders Guinea to the north, and Liberia to the south, and its fisheries industry accounts for 12% of its GDP. After independence from the United Kingdom in 1961, it became a republic country in 1971.

Freetown, the capital, is located in the northern part of the Freetown Peninsula in western Sierra Leone. Almost all of the Freetown Peninsula is composed of outcropped bedrock and there is little topsoil. The average temperature ranges from 25°C to 28°C, and the humidity ranges from 84% to 93%, making it a relatively pleasant climate with no major fluctuations throughout the year. 90% of the annual rainfall is recorded during the six months of the rainy season from May to October.

The total population is approximately 7.98 million (2020 World Bank), with 40% of the population aged 14 and under, and 57% of the working age population aged 15 to 64, and has been increasing at a rate of 2%/year since 2010. The population is concentrated in the capital, Freetown, which is the center of the economy, and in recent years, the concentration of population in the capital has been increasing. Therefore, people are avoiding the mountainous areas in the center of the peninsula and expanding their economic and living spheres to the southwest (sea side) and east (inland) areas that are not yet electrified.

The economy is in an unstable situation, repeating decline, stagnation, and recovery, and nominal GDP per capita is at a low level of US$509 (World Bank, 2020), 185th out of 191 countries in the world. Due to the domestic factors such as civil war (1991-2002), Ebola epidemic (2014-2015), global financial crisis (2007-2008), commodity price shock (2014-2015)), and the international factors such as the spread of the new coronavirus (2020-present), the construction of infrastructure facilities and social services that form the socio-economic foundation has been delayed.

2. Background of the Project

As of 2020, the power access rate in the capital Freetown is about 51.4%, the national average is about 26.2%, and the rural areas are still extremely low at about 4.86% (World Bank). Such an inadequate power supply system is a hindrance to the country's economic growth and a serious obstacle to the provision of basic social services. In the "New Direction" policy announced in 2018, the current government has positioned the improvement of the electricity access rate up to 44% as a priority issue.

Despite the fact that the southwestern part of the Freetown Peninsula is non-electrified, there are major fishing ports, fish processing plants and ice factories that contribute to the fisheries industry which accounts for 12% of GDP, and tourism resources such as beach resorts and quarries that are expected to earn foreign currency and create jobs. In addition, the area is the second largest economic and living area after Freetown, where population concentration is progressing, and there are many medical and educational facilities. However, as the power transmission and distribution network has not yet been developed, it is unable to receive power from the Sierra Leone Electricity Distribution Authority (hereinafter referred to as "EDSA"), and has no choice but to use its own power generation facilities.

In 2009, JICA implemented the Master Plan Study on Power Supply in Western Area and proposed electrification through the development of a power transmission and distribution network in the Freetown Peninsula. In 2008, the northern power grid was upgraded in Japan's Grant Aid, and from 2012 to 2017 (including interruptions due to the Ebola outbreak) the northwestern power grid in Japan's Grant Aid as well. In addition, by working on the development of basic infrastructure from the perspective of "poverty reduction," the Japanese government has set out a policy to support the promotion of sustainable growth in the country.

Against this background, President Bio (2018-present) requested Japan for grant aid in the electric power sector in the southwestern part of the Freetown Peninsula at the summit meeting held at Tokyo International Conference on African Development (TICAD7) in 2019. By providing EDSA, the executing agency on the Sierra Leone side, with power facilities for transformation and distribution that correspond to voltage classes of 33 kV and 11 kV, the aim is to expand and stabilize the power supply in the southwestern part of the Freetown Peninsula. It is also intended to contribute to strengthening the basic infrastructure of the country.

Initially, the Sierra Leone side requested that assistance be divided into two stages, but in the process of formulating the project after the spread of the new coronavirus, adjustments were made in the direction of providing assistance at once instead of dividing it into two stages from the perspective of urgency.

3. Outline of the study findings and Project contents

In response to the request, JICA dispatched the Survey Team to Sierra Leone from October 30 to December 2, 2021 (first field survey) in order to reconfirm the contents of the request and discuss the contents for implementation with related agencies on the Sierra Leone side (the line ministry of the Executing Agency: Ministry of Energy (MOE), the Executing Agency: EDSA), and survey the Project sites and gather related materials and data.

On returning to Japan, the Survey Team examined the necessity, social and economic impacts and validity of the Project based on the field survey materials and compiled the findings into the draft preparatory survey report. In addition, JICA dispatched the Survey Team to Sierra Leone from June 3 to 17, 2022 (second field survey) in order to explain and discuss the draft preparatory survey report (outline explanations) and reach a basic agreement with the Sierra Leone side.

Outline of the Project Components

Main components	Quantity
Procurement and Installation	
1. Construction of 33 kV transmission line	About 46 km
2. Construction of 11 kV distribution line	About 49 km
3. Construction of 33/11 kV substation	2 sets
4. Construction of 11/0.415 kV substation	23 sets
Supply	
1. Low voltage distribution materials	1
2. Maintenance tools	1
3. Spare parts	1
Civil	
1. 33/11kV substation building	2 buildings
2. Civil engineering work	1

4. Project implementation schedule and cost estimation

In the case where the Project is implemented under the Government of Japan's Grant Aid scheme, the project implementation duration will be 24 months after the conclusion of Grant Agreement (G/A). The total cost of the Project will be (*confidential*). The costs to be borne by the Sierra Leone side will be about 150 million yen. The main items to be borne by the Sierra Leone side are the tax exemption costs, construction of fences and gates for substations, installation of low-voltage materials and equipment, etc. It is necessary to budget for these costs before the start of construction.

5. Project Evaluation

5.1 Validity

As shown below, this project will contribute to the realization of Sierra Leone's development plan and energy policy, and will also benefit the general public, and is therefore considered to be a highly appropriate project for cooperation. In addition, the Sierra Leone side has sufficient personnel and budget plans, so there is no concerns with the implementation of this project and its operation and maintenance after implementation.

5.2 Effectiveness

In addition to the amount of power transmitted from the primary substation to be constructed, power supply to medical facilities and educational facilities in the project target area, cost reduction by switching from private generators to grids, etc. will be the outcome indicators.

(1) Quantitative indicators to measure the attainment of project objectives		
Indicators	Original [Yr 2021]	Target (Yr 2027) [After three years from Commissioning]
Annual Power Transmission (MWh / year) (York Substation)	0	22,624
Annual Power Transmission (MWh / year) (Tombo Substation)	0	35,231
Peak Power Transmission (kW) (York Substation)	0	3,614
Peak Power Transmission (kW) (Tombo Substation)	0	5,627
Healthcare Facilities connected to National Grid (Number)	0	7
Educational Facilities connected to National Grid (Number)	0	48
Reduced Energy Cost (Million US$)	0	20
(2) Qualitative indicators to measure the attainment of project objectives		
1. Industrial promotion: job creation, increase in sales and profit of business establishments 2. Appropriate medical services that can be provided by improving the operation of medical equipment; and increase in the number of patients 3. Improve education and training services 4. Increased entrepreneurial and employment opportunities for women 5. Improvement of women's living environment 6. Improvement of living conditions		

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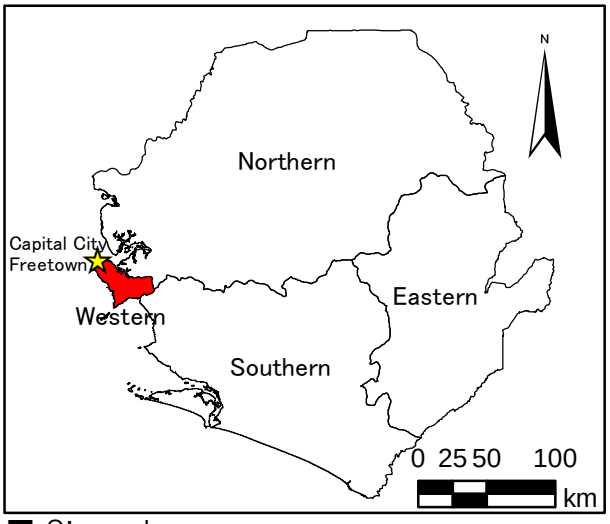
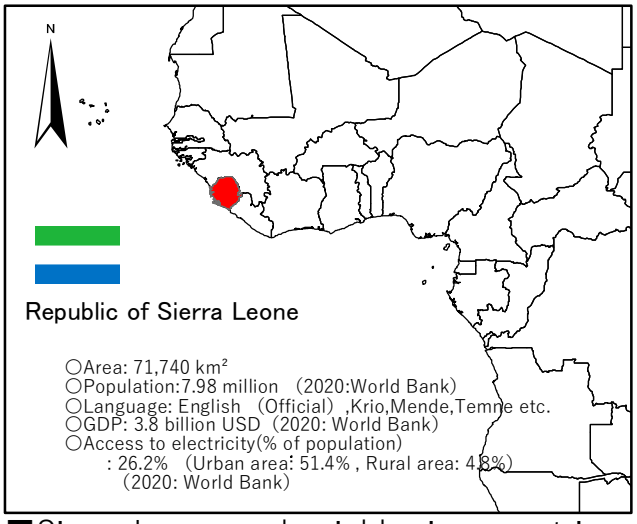
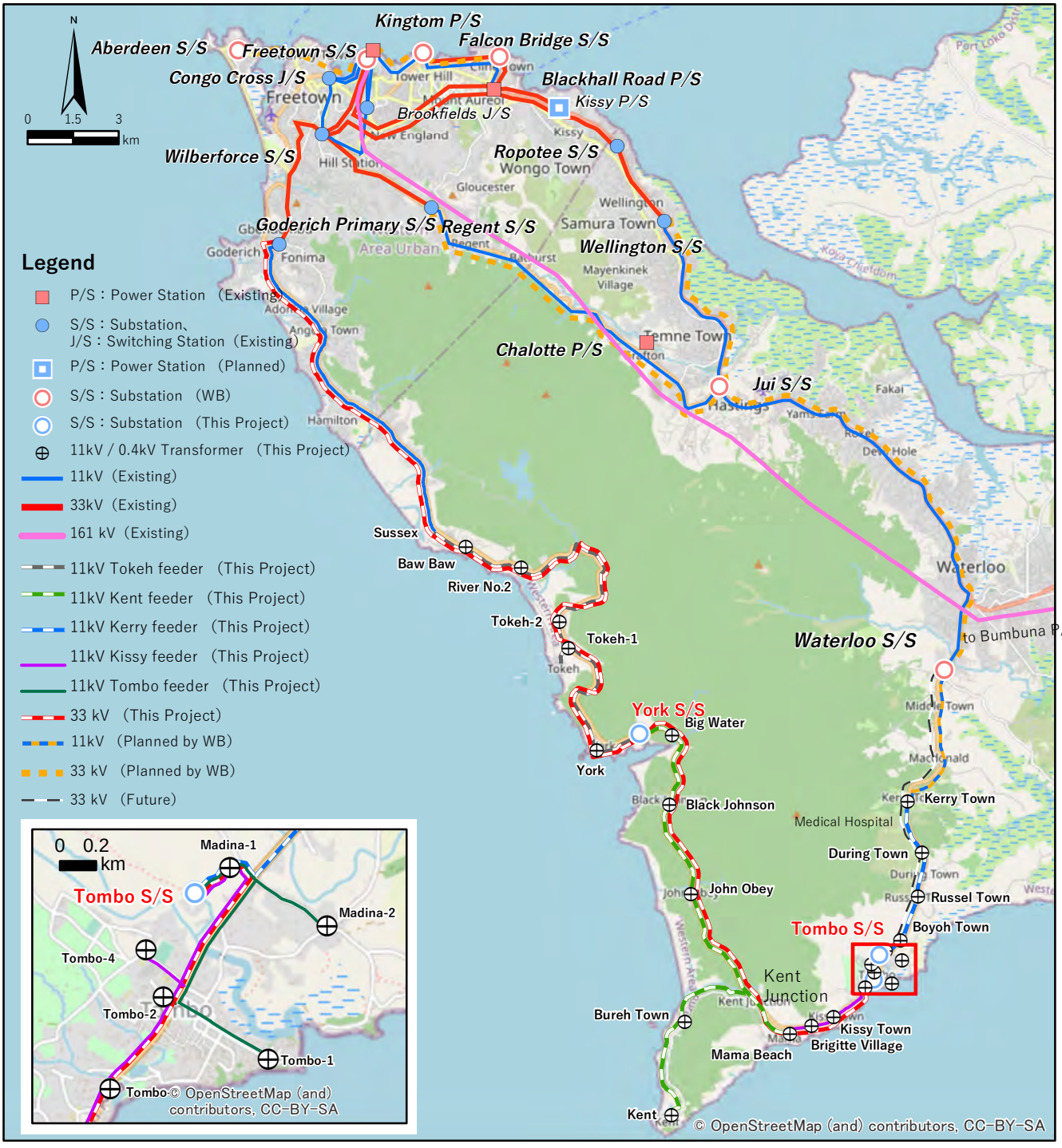


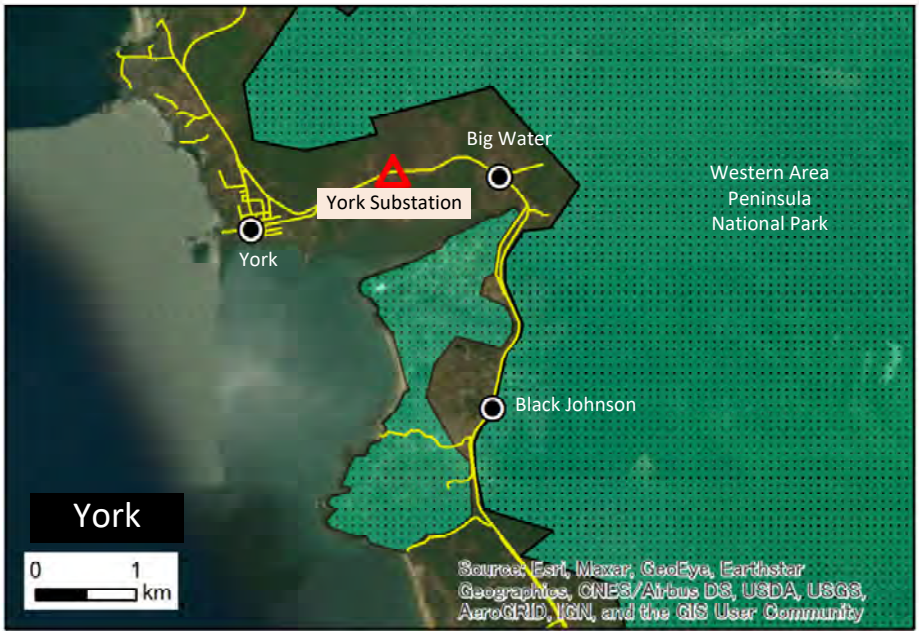
■ Sierra Leone

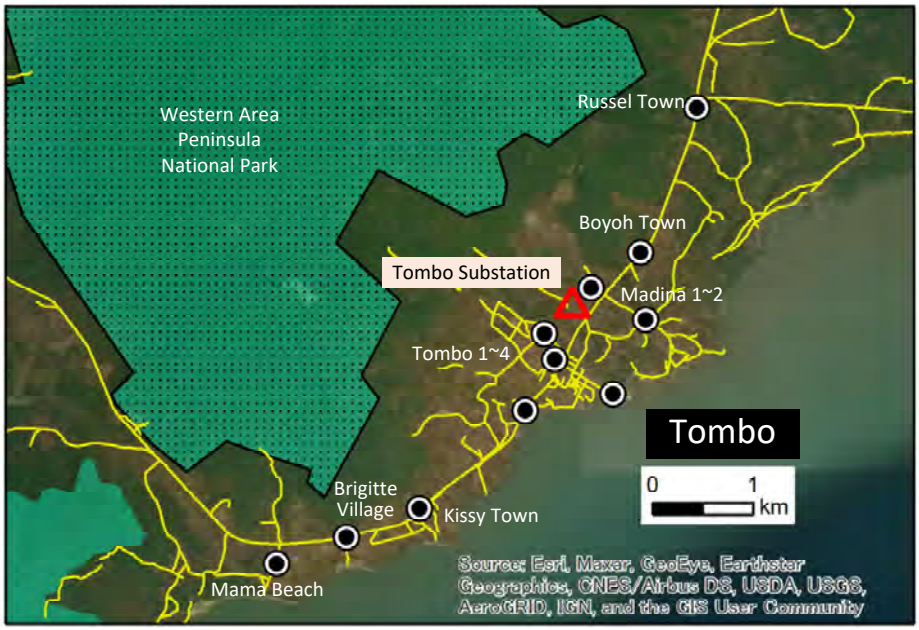


■Sierra Leone and neighboring countries



Location of the Project Site

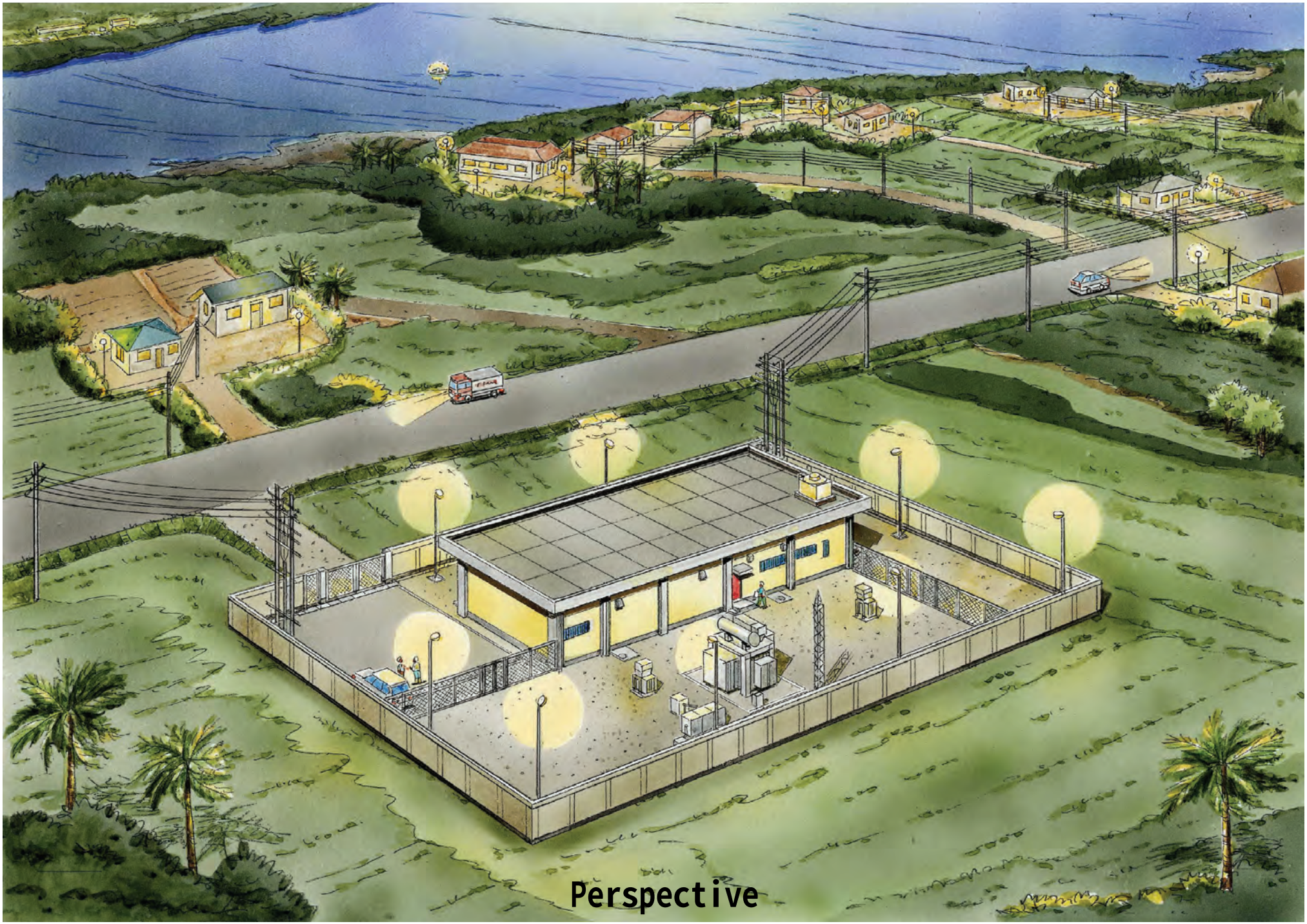




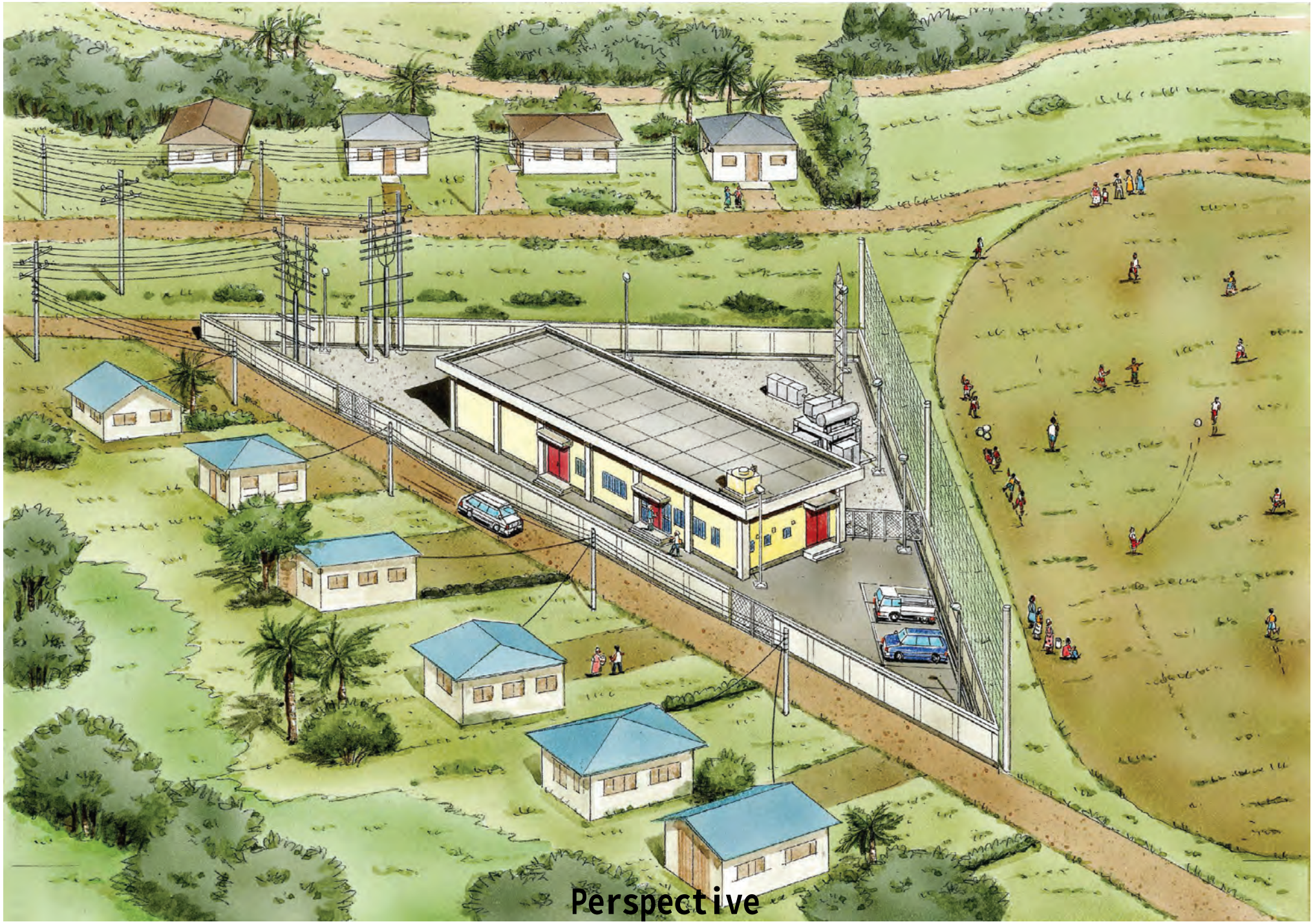
LEGEND;

- Substation
- 11kV/0.415kV Transformer
- Freetown Peninsula Peripheral Highway
- Western Area Peninsula National Park
- Tacugama Chimpanzee Sanctuary

Western Area Peninsula National Park



The Project for Extension of Power Distribution System along the Freetown Peninsular (York Substation)



Perspective

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Abbreviation

AAC	All Aluminum Conductor
AC	Alternating Current
ACSR	Aluminum Conductors Steel Reinforced
A/P	Authorization to Pay
ARAP	Abbreviated Resettlement Action Plan
ASEAN	Association of South East Asian Nations
AVR	Automatic Voltage Regulator
B/A	Banking Arrangement
BOD	Board of Directors
CB	Circuit Breaker
CHC	Community Health Center
CLSG	Côte d'Ivoire-Liberia-Sierra Leone-Guinea Interconnector
CT	Current Transformer
DC	Direct Current
DDG	Deputy Director General
DG	Director General
DTR	Distribution Transformer
ECOWAS	Economic Community of West African States
EDSA	Electricity Distribution and Supply Authority
EGTC	Electricity Generation and Transmission Company
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
E/N	Exchange of Notes
EPA-SL	Environmental Protection Agency-Sierra Leone
EPC	Engineering, Procurement and Construction
ESHIA	Environmental, Social, and Health Impact Assessment
ESMAP	Energy Sector Management Assistance Program
ESMP	Environmental and Social Management Plan
ESURP	Energy Sector Utility Reform Project
ETR	Earthing Transformer
EU	European Union
FQSE	Free Quality School Education
G/A	Grant Agreement
GCB	Gas Circuit Breaker
GDP	Gross Domestic Product
GRC	Grievance Redress Committee
GRM	Grievance Redress Management
IBA	Important Bird Area

IDP	Internally Displaced Persons
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IEE	Initial Environmental Examination
IFC	International Financial Corporation
IMF	International Monetary Fund
IPP	Independent Power Producer
ISC	Inter-Ministerial Sub-Committee
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JCS	Japanese Cable Makers' Association Standard
JEC	Japanese Electrotechnical Commission
JEM	Japan Electrical Manufacturers' Association
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
KBA	Key Biodiversity Area
LC	Least Concern
LIWV	Lightning Impulse Withstand Voltage
LTC	Load Tap Changer
LVDB	Low Voltage Distribution Board
MAB	Man and the Biosphere
MAF	Ministry of Agriculture and Forestry
MCCB	Molded Case Circuit Breaker
M/D	Minutes of Discussions
MLHCP	Ministry of Lands Housing and Country Planning
MOE	Ministry of Energy
MOF	Ministry of Finance
NDP	Medium-term National Development Plan
NEP	National Energy Policy
NGO	Non-Governmental Organization
NPA	National Power Authority
NRA	National Revenue Authority
O&M	Operation and Maintenance
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
OHL	Over Head Line
OJT	On-Job-Training
ONAN	Oil Natural Air Natural
PAPs	Project Affected Persons
PFWV	Power Frequency Withstand Voltage

PSRP	Poverty Reduction Strategy Papers
RAP	Resettlement Action Plan
RAP-IC	RAP Implementation Committee
RF	Resettlement Framework
ROW	Right of Way
SCADA	Supervisory Control And Data Acquisition
SLEWRC	Sierra Leone Electricity and Water Regulatory Commission
SLRA	Sierra Leone Road Authority
S/S	Substation
STR	Station Transformer
TICAD	Tokyo International Conference on African Development
TOR	Terms of Reference
TTB	Telegraphic Transfer Buying rate
TTS	Telegraphic Transfer Selling rate
UNESCO	
VAT	Value Added Tax
VCB	Vacuum Circuit Breaker
VT	Voltage Transformer
WAPFoR	Western Area Peninsula Forest Protection Project
WAPNP	Western Area Peninsula National Park
WAPP	West Africa Power Pool
WARDC	Western Area Rural District Council
WAPP	West Africa Power Pool
WB	World Bank
WHO	World Health Organization

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Current Status and Challenges

1-1-1 Overview

Access to electricity is still a major challenge for people in Sierra Leone against the situation that 40% of population is under 14 and the power demand is increasing rapidly. The national-averaged power access rate is only about 26.1%, and especially in the rural area, the rate is still extremely low at 4.8% (World Bank 2020). This environment stifles their potential and we miss out what they offer our society. In 2018, the President's New Direction National Strategic Plan (PRSV IV) on the energy sector clearly identified a road map to increase energy access and improve service delivery nationwide. This mandate is aligned with the Ministry of Energy's Electricity Sector Reform Roadmap (2017-2030) which now embarks on an urban electrification project to meet a growing population in Freetown Peninsular.

The Government of Japan through JICA have supported greatly the government of Sierra Leone for the improvement of power generation and distribution systems, and the capacity building in the energy sector.

Under the circumstances, the Government of Sierra Leone has requested the Government of Japan for the grant aid to extend the power distribution system to the non-electrified area in the south-west side of Freetown Peninsular.

1-1-2 Current Status and Challenges in the power sector

(1) Energy Policy

The Ministry of Energy (MOE) launched the National Energy Policy 2009 (hereinafter referred to as NEP2009) in 2009 and the Electricity Sector Reform Roadmap (2017-2030) in September 2017. The policy states that the low electricity access rate of Sierra Leone needs to be addressed for promoting long-term economic growth, and that all citizens will be given preferential access to inexpensive energy.

The NEP 2009 outlines sub-sector policies and measures in the electricity, oil, and renewable energy sectors. The following policies are listed for the electricity subsector.

- GOSL will explore all avenues to ensure reliable power supplies to all energy demand sub-sectors.
- GOSL will establish an adequate and transparent, legal and regulatory framework in a Reformed Power Sector structure that is conductive to private sector participation in the development of the energy sector.
- GOSL will encourage the entry of multiple players into the generation and distribution market. Generation and Distribution of electric power shall be fully open to private and public investors as Independent Power Producers.
- GOSL will develop a national grid that will extend the transmission line throughout the country, and to the sub-region.
- GOSL will undertake the development of mini/micro hydro sites and other renewable energy technologies, through public/private partnership arrangements.
- GOSL will set up effective system for tariff fixing, billing and collection of payments, to ensure sustainability of electricity supply.
- GOSL will establish feed-in tariffs to enable provision of electricity from extra generating capacity in mining companies and other industries, as well as from private individuals.
- GOSL will take legislative steps to criminalize electricity theft.
- GOSL will actively pursue regional co-operation and integration in investment matters.

(2) Electricity demand and supply

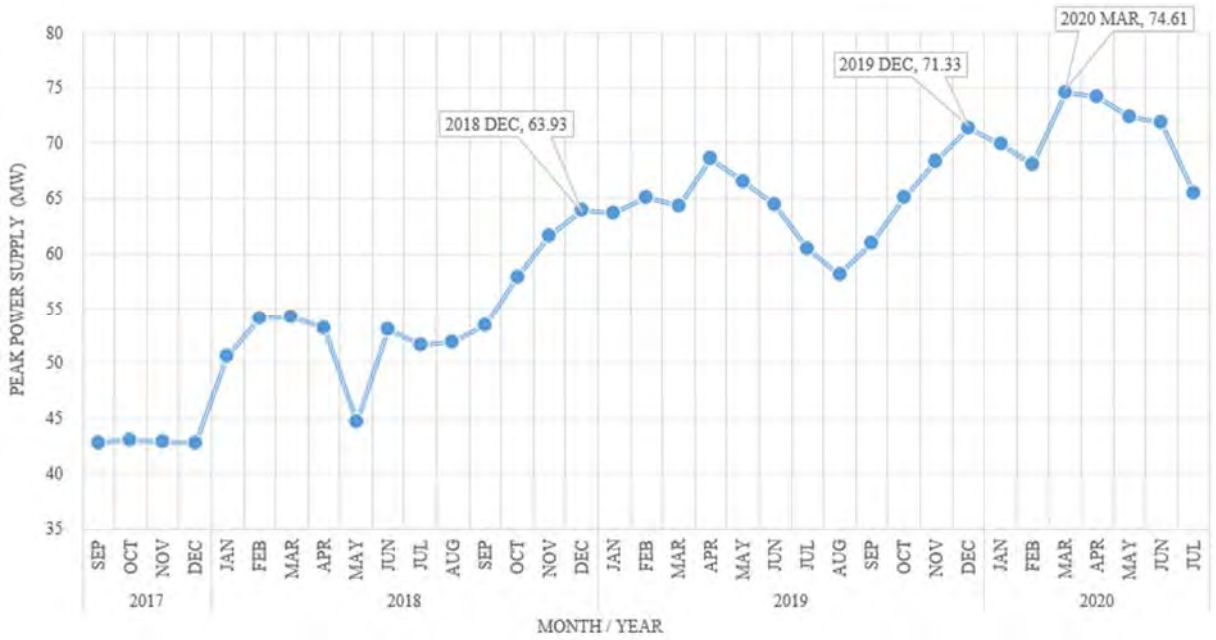
1) Peak demand

Table 1-1.1 shows the peak demand in Sierra Leone since 2017; the highest through July 2020 was 74.61 MW recorded in March 2020. The peak demand recorded a significant increase of about 1.5 times (48.9%) from 2017 to 2018 (11.6% from 2018 to 2019). Figure 1-1.1 also shows the monthly peak power from September 2017 to July 2020. As shown in this figure, annual peak power has occurred at the end of the year (December) for all three years since 2017, and the peak demand in 2020 is expected to be higher than 74.61 MW.

Table 1-1.1 Peak Demand in Sierra Leone

Item	2017 (from September)	2018	2019	2020 (up to July)
Peak Demand (MW)	42.94	63.93	71.33	74.61
Peak Demand growth (%)	-	48.9	11.6	-

Source: EGTC



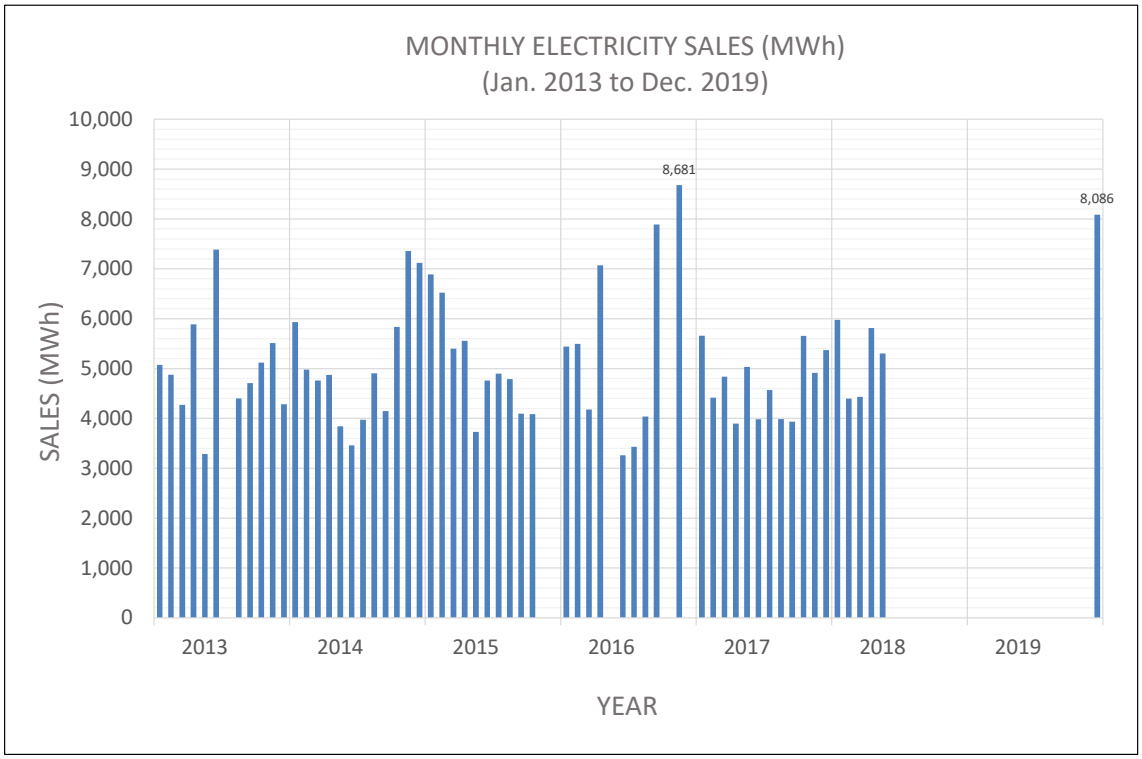
Source: EGTC

Figure 1-1.1 Monthly Peak Power (September 2017 - July 2020)

2) Electricity supply

Figure 1-1.2 shows the monthly electricity sales from 2013 to 2019. Although not all data is available and the graph is discontinuous, the data illustrates the maximum during this period was 8,681 MWh in November 2016.

Failures caused by aging and lack of maintenance of existing equipment have become the norm.



Source: EDSA

Figure 1-1.2 Monthly Electricity Supply (2013/1 to 2019/12)

(3) Challenge

The WORLD BANK (WB) reported that the national electrification rate in Sierra Leone in 2020 would be about 26.2%, and 51.4% in urban areas. The rate in rural areas was expected to be extremely low, ranging from 1 to 4.8%, making the implementation of measures to increase the electrification rate an urgent necessity.

In addition, the country has been suffering from power supply shortages for many years, and failures caused by insufficient capacity in all generation, transmission, and distribution facilities to meet potential demand, as well as the aging of existing facilities and lack of maintenance and management have become the norm.

1-1-3 Development Plan

(1) NEW DIRECTION

The NEW DIRECTION was published in 2018 when the current president was a presidential candidate, and is a manifesto that sets forth to the public the basic policies of the current president. The manifesto states that Sierra Leone will become a middle-income country (with a national income per capita of US$1,036-4,045 (World Bank, 2021)) during the 21st century through (1) economic reforms, (2) human development, (3) improved governance, and (4) infrastructure improvements.

In the chapter on infrastructure development in the New Direction, energy (electricity) supply is listed first among the numerous infrastructure areas. Within the power and energy sector, the NEW DIRECTION also places top priority on rural electrification, including electrification of District Capital, electrification of towns with populations of 20,000 or more, establishment of a rural electrification fund and a rural electrification agency, and electrification of at least five villages and two towns each year.

(2) Medium-term National Development Plan 2019-2023

The Medium-term National Development Plan 2019-2023 (NDP) is in the vein of the previous Poverty Reduction Strategy Papers (PSRP). The NDP sets out the following goals for achieving inclusive growth and poverty reduction: (1) strengthening governance and accountability, (2) building infrastructure, and (3) diversifying the economy and enhancing competitiveness. The third cluster is infrastructure and economic competitiveness.

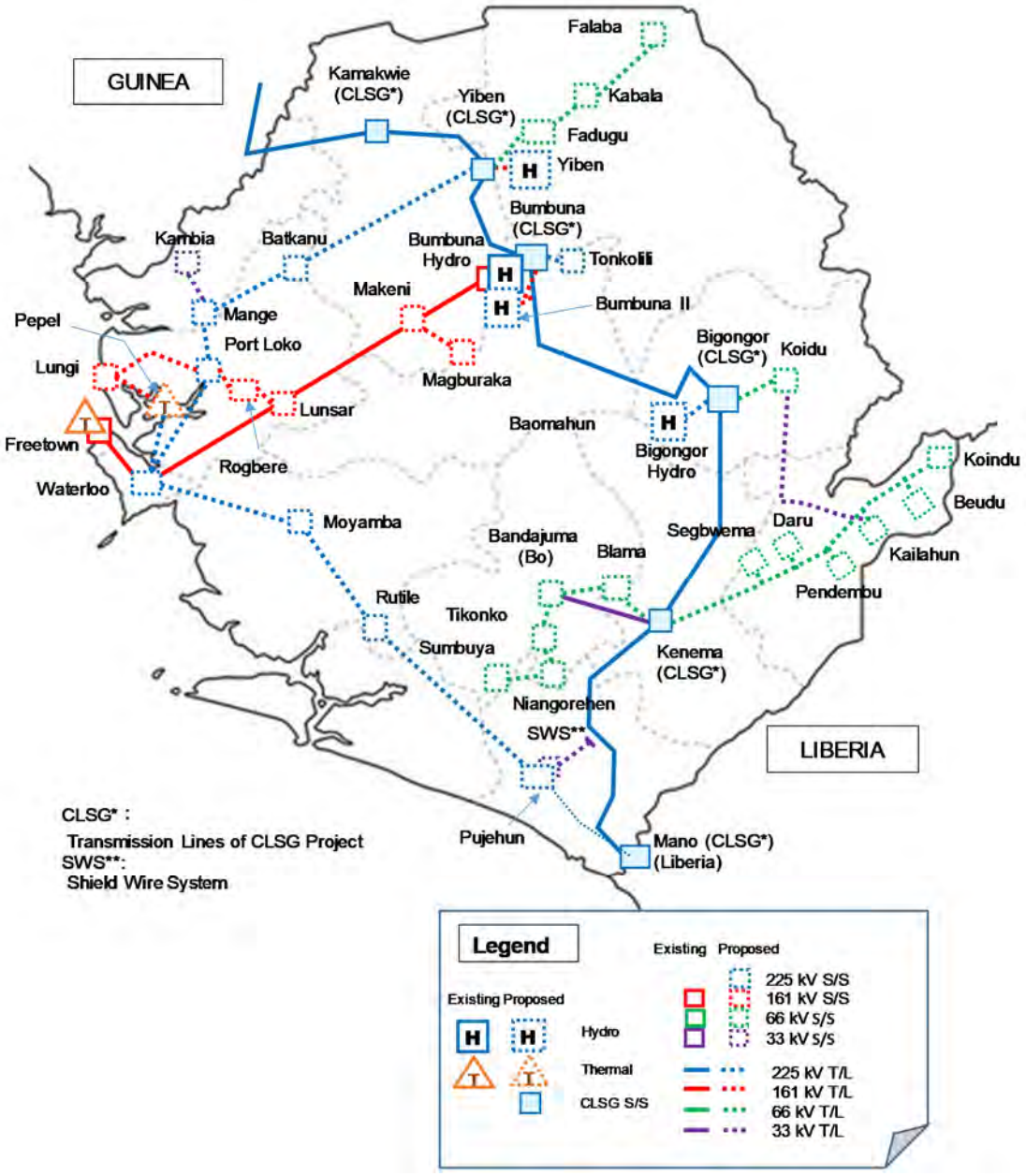
In the "Infrastructure/Economic Competitiveness" cluster, the strategic goals include restoring electricity supply in all District Headquarters and cities; and increasing access to electricity for a large number of citizens by increasing generation capacity (among other methods), given low access to electricity is the cause of weak economic growth and competitiveness. Regarding access to electricity, the goal is the electrification (on-grid and off-grid) of 20 villages and 8 towns (one in each District) by 2023.

(3) Sierra Leone's Development Plan and the Project

The power and energy sector is designated as the most important sector in "infrastructure development," which, as mentioned above, is positioned as a core element in the two development plans that form the basis of national development. In addition, the policy for power infrastructure development places the greatest emphasis on rural electrification. Given the above, this project is in line with the National Development Plan and can be positioned as one of the highest priority projects to be implemented by the Government of Sierra Leone.

(4) Power System Development Plan

Figure 1-1.3 shows Sierra Leone's national electricity system.



Source: JICA Survey Team

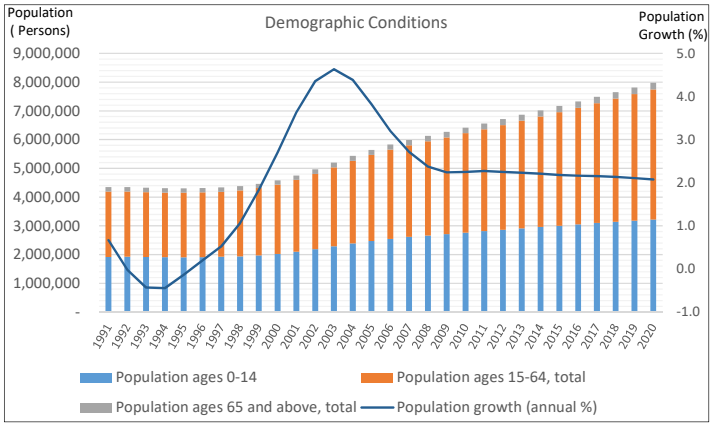
Figure 1-1.3 National Electric Power System Diagram (as of 2020)

The international interconnection in Sierra Leone is a CLSG project led by the West Africa Power Pool (WAPP) to interconnect four countries (Cote d'Ivoire, Liberia, Sierra Leone, and Guinea) with a 225 kV transmission line, which is currently underway. Five 225kV substations will be constructed in Sierra Leone, and power will be distributed from each substation via 66kV transmission lines and others. For now, the Freetown Peninsula will be served by the 161 kV line through the Bumbuna substation. However the current 161kV transmission line is limited in its capacity, so in the future the plan is to serve the peninsula with a 225 kV transmission line (referred to as the North Corridor Transmission Line) coming from the Yiben substation (225 kV north of Bumbuna substation), through Port Loko city, to the Waterloo substation.

1-1-4 Socioeconomic conditions

(1) Population

Sierra Leone's population composition by age group and population growth rate from 1991-2020 are shown in Figure 1-1.4. The population growth rate declined sharply with the beginning of the civil war (1991) from 1992 to 1995. The growth rate then became positive in 1996 in the second half of the civil war, continued to increase until 2003 (reaching its peak of 4.6% per year), then began to decline in 2004 and has remained in the 2% per year range since 2010. Young people account for a high percentage of Sierra Leone's population, and in 2020, 40% of the population will be under the age of 14. On the other hand, only 3% of the population is aged 65 years or older, and 57% of the population is of working age (15-64).



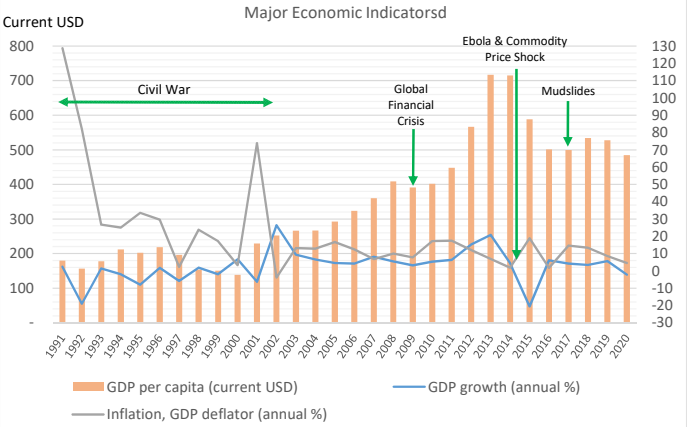
Source: World Development Indicators – World Bank

Figure 1-1.4 Population Structure and Population Growth in Sierra Leone

(2) Economy

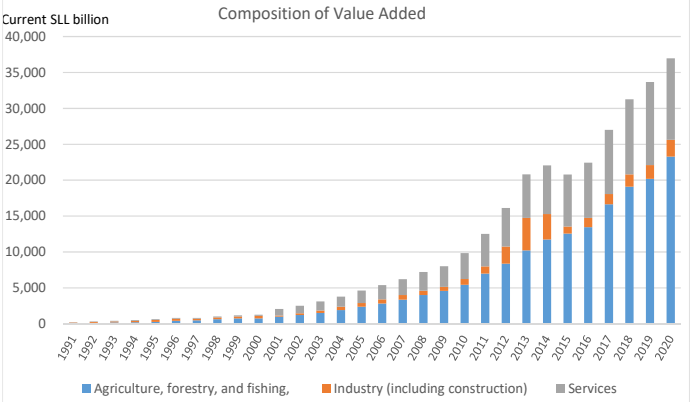
Sierra Leone's GDP per capita (in US dollars), economic growth rate, and inflation rate are shown in Figure 1-1.5. Sierra Leone's economy has been affected by domestic factors such as civil war (1991-2002), the Ebola epidemic (2014-2015); international factors such as the global financial crisis (2007-2008) and the commodity price shock (2014-2015). The country has experienced a series of economic declines and stagnation followed by recoveries. GDP per capita (in U.S. dollars) declined significantly from 2014 to 2016 and stagnated until 2020. Inflation rates have varied by around 10% since 2003 following the end of the civil war, then gradually declined since 2017, reaching 4.55% in 2020.

As shown in Figure 1-1.6, Sierra Leone's industrial structure is dominated by agriculture, forestry, and fisheries, which account for about 60% of total value added, while services account for about 30%. Manufacturing and other industries (including construction among others) accounted for 40% to 25% of total value added in the 1990s, but declined to less than 10% in the 2000s. Their value added recovered to about 15% to 22% for a period from 2012 to 2014, but has remained at 5% to 6% since 2015.



Source: World Development Indicators – World Bank

Figure 1-1.5 Sierra Leone Per Capita Gross Domestic Product, Economic Growth, and Inflation



Source: World Development Indicators – World Bank

Figure 1-1.6 Industrial Composition of Sierra Leone

1-2 Natural Conditions

1-2-1 Summary of the Survey Result

(1) Distribution Line Route

The JICA Survey Team conducted a site visit and studied the approximate route of the distribution line. Based on the results, a re-commissioning agreement was signed with the local contractor on November 12, 2021, to conduct a detailed route survey, including positioning of distribution poles and detailed survey, etc. The final report was received on January 11, 2022.

The accuracy of the schematic design will be at a level that allows for the estimation of the schematic construction cost, and the location of the new poles will be plotted on a map.

The main topographical and geological risks of the distribution line are loss due to mudslides, etc., soft ground near rivers, and damage due to collapse, etc. This is due to the geology of the mountainous area on the west side (400-600 m elevation), which consists of mixed rocks with many fractures (so-called mélange) formed during the Mesozoic Era, faults in the northwest-southeast and north-northeast-southwest directions, and areas with high rainfall (topographic conditions). Collapsed landforms are observed on the mountainsides, and flood plains that appear to be mudslide deposits are distributed downstream of the river, suggesting that frequent landslides occur in the area. For this reason, topographic interpretation (extraction of collapsed topography, etc.) and on-site confirmation (risk assessment) of the distribution line route will be conducted, and if geological risk

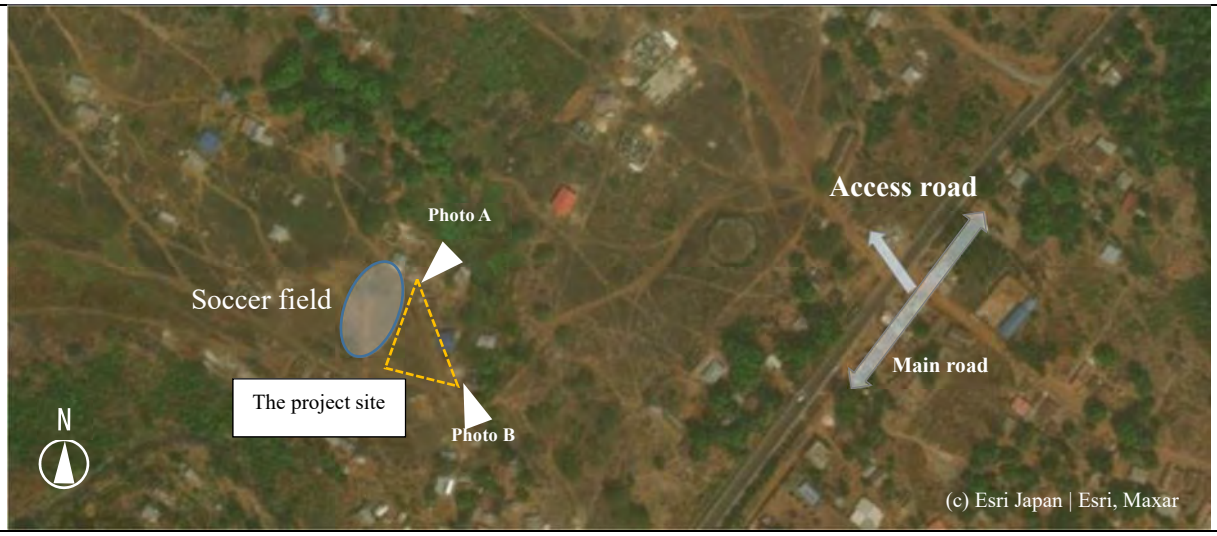
is judged to be unavoidable (or high), route adjustment and countermeasure construction methods, etc. will be proposed.

(2) Topographic Survey

Topography survey was conducted for the project sites in the Tombo Substation and York Substation.

1) The project site in Tombo

The project site of Tombo Substation is located in the southern part of the Freetown Peninsula, 300 m inland to the north from the Freetown Main Road, in a triangular shape. The site is a narrow site, sandwiched between two community roads (unpaved) and bordered on one side by an unimproved soccer field. The land is generally flat with some undulations.



The project site of the Tombo Substation and access road
Created from ArcGIS. The project site is located inland from the main road and is currently vacant.

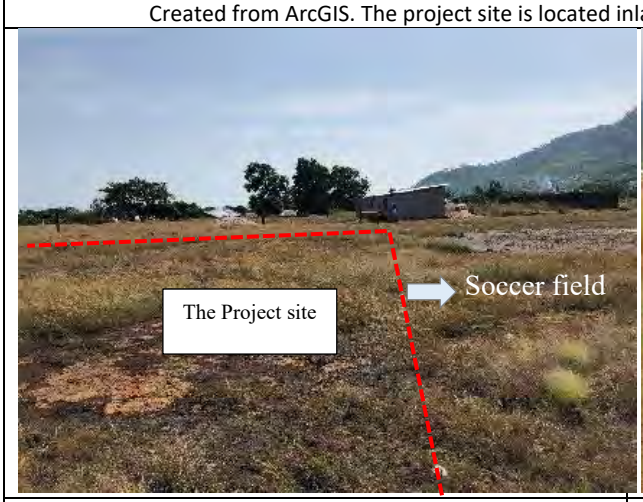


Photo A : From East boundary
The project site is triangular shaped. Since the site is adjacent to a soccer field, measures should be considered to prevent balls and other objects from entering the site.

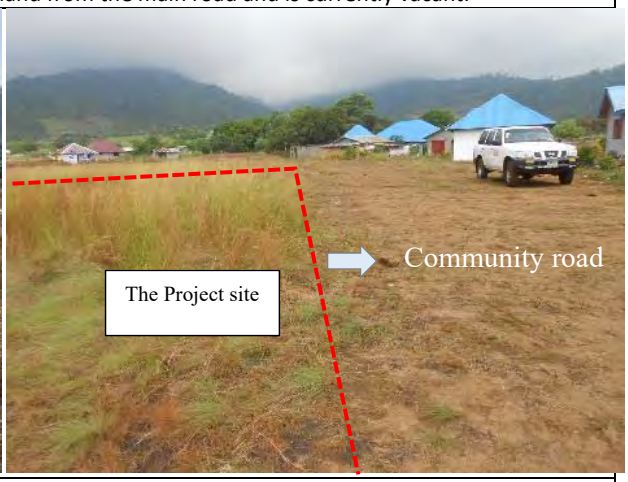


Photo B : From West boundary
The project site is sandwiched between two community roads

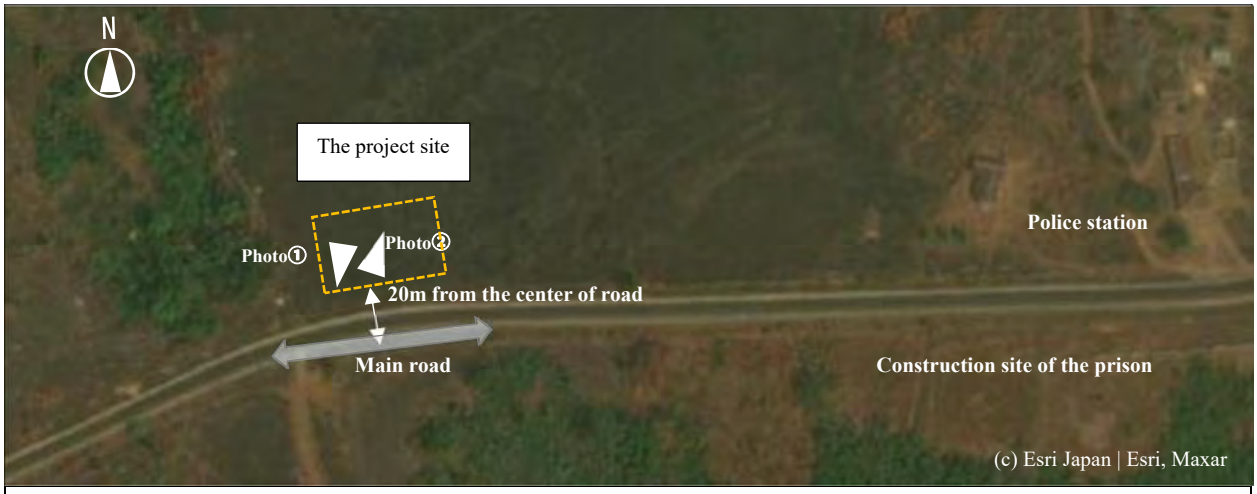
Source: JICA Survey Team

Figure 1-2.1 The project site of Tombo Substation

2) The project site in York

The project site of York Substation is a 2-acre (8,100 m^2) parcel of land that had been set aside for

the planned construction of a police station on the southwest Freetown Peninsula. The size of the site is sufficient for the construction of the York Substation (50m x 30m). The front road is a 6-meter road with one lane on each side, but there are plans to widen the road in the future, and it is confirmed that a 20-meter stretch parallel to the center line of the road will be used as a road right-of-way. The level difference between the front road and the site is approximately 1.0m. So it's necessary an access road for vehicles.



The project site of the York Substation

Created from ArcGIS. The project site is a portion of the approximately 8,100 m^2 land that had been reserved in the police station construction plan. The site boundary is 20 m from the center line of the road, taking into consideration the plan to widen the main road.

Photo A: The level difference between the front road and the site

View from the project site to the road side. Since there is a 1.0m difference in level from the road. It's neccesary an access road.

Photo B: View of the project site

The proposed construction site is relatively flat, but the surface is wet, so a 200 mm gravel bed will be considered.

Source: JICA Survey Team

Figure 1-2.2 The project site of York Substation

(3) Soil Investigation Result

Sierra Leone is located on the west coast of Africa at latitudes between 7 ° to 10 ° N and 14 ° 30 ′ to 10 ° 30 ′ W, bordered by Guinea to the north and east, Liberia to the southeast, and the Atlantic Ocean to the west and southwest, with a land area of 71,740 km2 , about 300 km east to west and 340 km north to south. With topographically, the country consists of coastal marshes, inland plains, and inland plateaus.

Coastal zone； It is up to 100 km wide and less than 50 m above sea level. Most of its lowlands are flooded during the rainy season, and mangroves thrive in the vast areas that are submerged by storm surges. Sierra Leone has more than 1.1 million square kilometers of swampy land, the majority of which is located in this region.

Inland lowlands； The elevation ranges from 50 to 200 m. In this area cause extensive flooding during the rainy season because rivers are shallow and wide. The terrain is generally flat, but there are isolated isolated peaks in places.

Inland highlands; The eastern part of the country forms the fringe of the Guinea Plateau and is the dividing line between the rivers flowing westward and the Nyjer Basin. Mount Pintimani (elevation l, 923 m) in the Loma Mountains is the highest peak in the region. The Freetown Peninsula is topographically separate and isolated at a height of 900 m in the coastal plain. Its stratigraphy is the Freetown igneous complex (layered complex layers of mottled rock, norite, trocholite, plagioclase, etc.).

Soil investigation

The Soil investigations shown in Table 1-2.1 were conducted during this survey. The additional investigations to be conducted in comparison with the original plan are the site survey of the York Substation and the indoor soil test.

Table 1-2.1 Soil Investigation

Site	Site survey		Indoor soil test
	SPT	testing	physics test
Tombo Substation（new）	2 points	2 points	10 samples
York Substation（new）	2 points	2 points	10 samples
Distribution line route	Risk assessment based on topographic interpretation and field survey. It's shown in 1-2-1-(1).		

The following is a summary of the Soil investigations at each site.

- For the Tombo Substation, the building and transformer locations were plotted on a drawing of Topographic Survey prepared based on the boundary locations confirmed in the presence of EDSA officials and local residents, and SPT and material sampling was conducted at one building location and one transformer foundation location. The test excavations were conducted at locations where the extent of the excavation did not interfere with the building and transformer locations.
- For the York Substation also, each survey was conducted after made of drawing of Topographic Survey.

1-2-2 Earthquake

The earthquake record in Sierra Leone was a magnitude 4.4 earthquake in 2001 near the Liberian border in the Eastern Province. But there has been no record of an earthquake of that magnitude or greater since then.

1-2-3 Air Temperature

Average temperatures in Freetown range from 25.0 °C to 28.0 °C, with no significant fluctuations throughout the year. The highest average maximum temperature is 31.0 °C in April, and the lowest average temperature is 23.0 °C in August and September. The average temperatures in Freetown are shown in Table 1-2.2 to Table 1-2.4 and Figure 1-2.3 to Figure 1-2.5.

Table 1-2.2 Average temperature in Freetown (usual)

UNIT： ℃

Month	Average temperature	Month	Average temperature
Jan.	26.0	Jul.	25.0
Feb.	27.0	Aug.	25.0
Mac.	27.0	Sep.	26.0
Apr.	28.0	Oct.	26.0
May.	27.0	Nov.	27.0
Jun.	26.0	Dec.	26.0
		Average	26.3

Source: Weatherbase

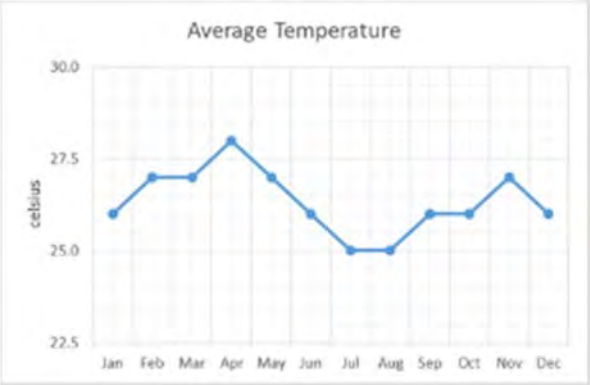


Figure 1-2.3 Average temperature in Freetown

Table 1-2.3 Average maximum temperature in Freetown (usual)

UNIT： ℃

Month	Average temperature	Month	Average temperature
Jan.	28.0	Jul.	27.0
Feb.	29.0	Aug.	26.0
Mac.	29.0	Sep.	27.0
Apr.	30.0	Oct.	27.0
May.	29.0	Nov.	28.0
Jun.	28.0	Dec.	28.0
		Average	28.0

Source: Weatherbase

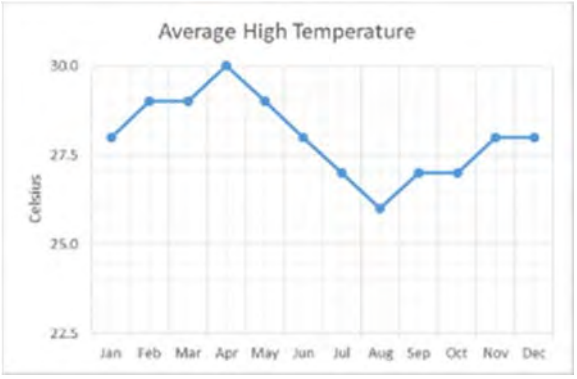


Figure 1-2.4 Average maximum temperature in Freetown

Table 1-2.4 Average minimum temperature in Freetown (usual)

UNIT： ℃

Month	Average temperature	Month	Average temperature
Jan.	24.0	Jul.	24.0
Feb.	25.0	Aug.	23.0
Mac.	26.0	Sep.	23.0
Apr.	26.0	Oct.	24.0
May.	26.0	Nov.	25.0
Jun.	25.0	Dec.	24.0
		Average	24.6

Source: Weatherbase

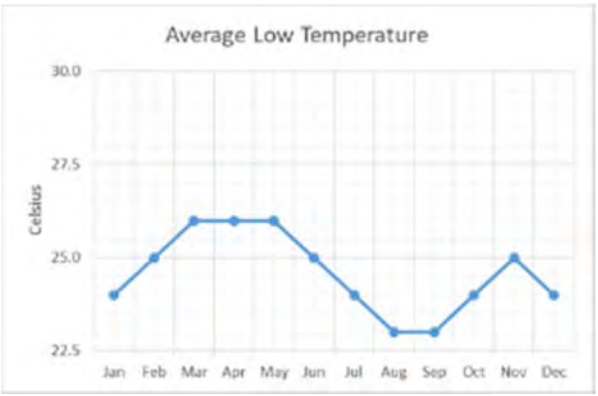


Figure 1-2.5 Average minimum temperature in Freetown

1-2-4 Rainfall and Lightning

The average annual rainfall is 2,910 mm. The climate is tropical monsoon, with approximately 2,600 mm of rainfall during the six-month rainy season (May to October) and very little rainfall during the dry season. Average rainfall is concentrated in July (590 mm/month), August (550 mm/month), and September (570

mm/month). During this period, flooding (flash floods) and cliff collapses on sloping land occur in Freetown. Outdoor construction work is difficult during this period. Lightning strikes occur on an average of 95 days per year. Table 1-2.5 to Table 1-2.6 show the variation in average monthly rainfall during a normal year, and Figure 1-2.6 to Figure 1-2.7 show the average number of lightning strike days during a normal month.

Table 1-2.5 Average rainfall in Freetown (usual)

Unit： mm

Month	amount of rainfall	Month	amount of rainfall
Jan.	0.0	Jul.	590.0
Feb.	0.0	Aug.	550.0
Mac.	20.0	Sep.	570.0
Apr.	70.0	Oct.	300.0
May.	230.0	Nov.	130.0
Jun.	420.0	Dec.	30.0
		total	2910.0

Source: Weatherbase

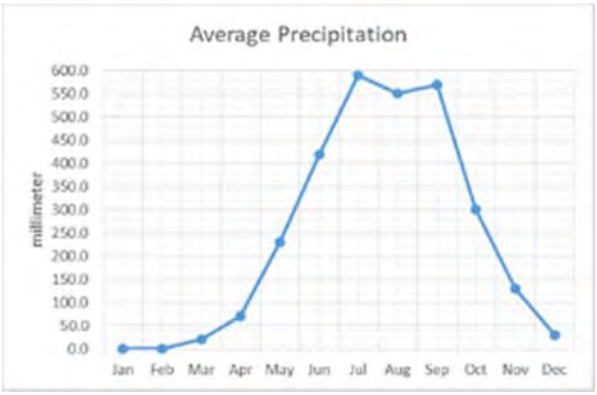


Figure 1-2.6 Average rainfall in Freetown

Table 1-2.6 Average number of thunderstorm days in Freetown

UNIT： day

Month	number of thunderstorm	Month	number of thunderstorm
Jan.	0.0	Jul.	11.0
Feb.	0.0	Aug.	9.0
Mac.	0.0	Sep.	14.0
Apr.	3.0	Oct.	18.0
May.	12.0	Nov.	10.0
Jun.	17.0	Dec.	1.0
		total	95.0

Source: Weatherbase

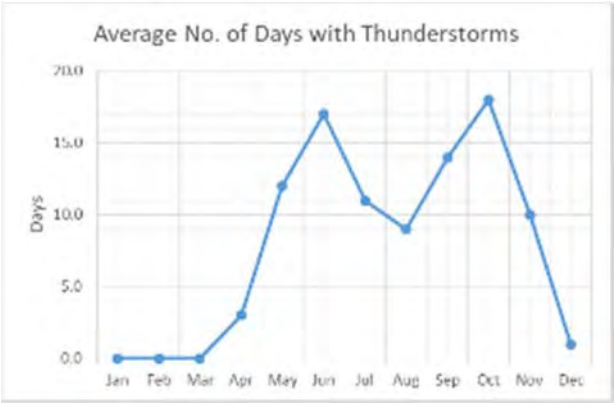


Figure 1-2.7 Average number of thunderstorm days in Freetown

1-2-5 Humidity

The average annual humidity is high at 90% and, like the temperature, is almost constant throughout the year. The highest average humidity is 94% in September and October, and the lowest average humidity is 57% in January. The average humidity in Freetown is shown in Table 1-2.7 to Table 1-2.8 and Figure 1-2.8 to Figure 1-2.9.

Table 1-2.7 Average morning humidity in Freetown (usual)

unit : %

Month	Average humidity	Month	Average humidity
Jan.	89.0	Jul.	93.0
Feb.	87.0	Aug.	93.0
Mac.	84.0	Sep.	94.0
Apr.	85.0	Oct.	94.0
May.	89.0	Nov.	92.0
Jun.	93.0	Dec.	91.0
		average	90.0

Source: Weatherbase

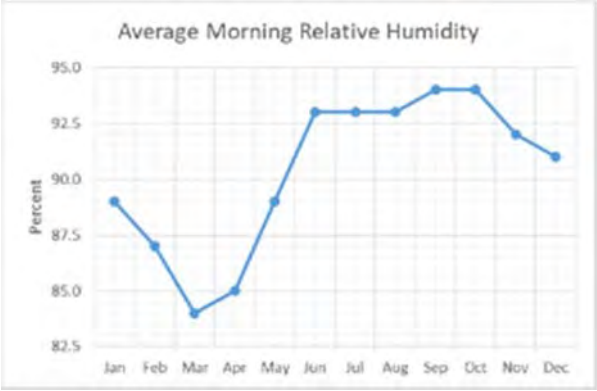


Figure 1-2.8 Average morning humidity in Freetown

Table 1-2.8 Average evening humidity in Freetown(usual)

unit : %

Month	Average humidity	Month	Average humidity
Jan.	57.0	Jul.	82.0
Feb.	61.0	Aug.	84.0
Mac.	61.0	Sep.	81.0
Apr.	64.0	Oct.	76.0
May.	71.0	Nov.	71.0
Jun.	79.0	Dec.	62.0
		average	71.0

Source: Weatherbase

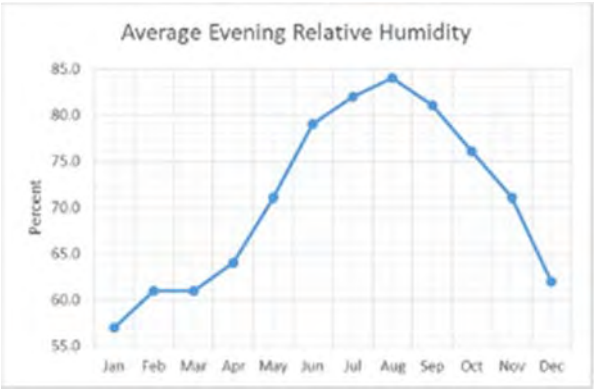


Figure 1-2.9 Average evening humidity in Freetown

1-2-6 Wind Speed

Average wind speeds in Freetown range from 9.0 to 14.0 km/h (2.5 to 3.9 m/s) and remain nearly constant throughout the year. The maximum wind speed is 90.0 km/h (25.0 m/s) in August. Average wind speeds in Freetown are shown in Table 1-2.9 and Figure 1-2.10.

Table 1-2.9 Average wind speed in Freetown (usual)

unit : m/s

Month	Average wind speed	Month	Average wind speed
Jan.	3.3	Jul.	3.3
Feb.	3.3	Aug.	3.3
Mac.	3.9	Sep.	3.3
Apr.	3.9	Oct.	3.3
May.	3.9	Nov.	2.5
Jun.	3.3	Dec.	2.5
		average	3.3

Source: Weatherbase

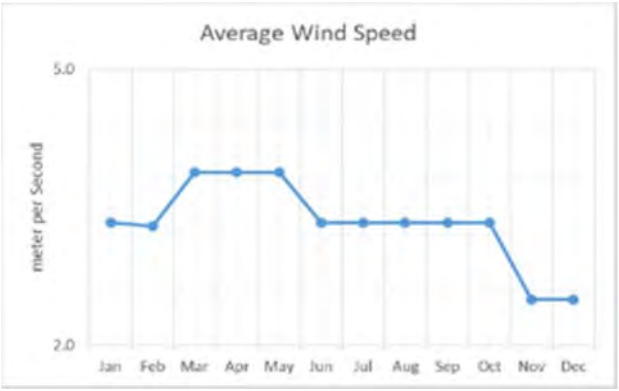


Figure 1-2.10 Average wind speed in Freetown

1-3 Environmental and Social Considerations

1-3-1 Outline

1-3-1-1 Schedule

Environmental and social considerations for this project consist of 1) Environmental Impact Assessment (EIA), 2) Preparation of Abbreviated Resettlement Action Plan (ARAP), 3) Implementation of ARAP. The schedule for EIA and ARAP, which was agreed upon between EDSA and JICA Survey Team, is shown in Table 1-3.1. The details of EIA and ARAP (land acquisition and resettlement) are described in 1-3-2 and 1-3-3 respectively.

Table 1-3.1 Schedule of Environmental Assessment and Preparation of ARAP

Items	Activities	Organizations in charge	2021		2022					
			Nov	Dec	Jan - Mar	Apr	May-Jul	Aug-Sep	Oct	Nov
EIA	Submission of screening form to EPA-SL for screening	EDSA/JICA								
	Issue of screening results	EPA-SL								
	Further environmental study	EDSA/Local consultant								
	Submission of EIA report to EPA-SL	EDSA/Local consultant								
	Issue of EIA License	EPA-SL								
Preparation of ARAP	ARAP study	EDSA/Local consultant								
	Submission of ARAP to JICA Survey Team	EDSA/Local consultant								
	Approval of ARAP by EDSA	EDSA								
Implementation of ARAP	Completion of land acquisition/ compensation	EDSA								
Others	Survey conducted by a local consultant	EDSA/Local consultant								

Note: Implementation of ARAP should be fully completed within about three months after the approval of the Project by the Japanese Government.
Source: JICA Survey Team

1-3-1-2 Directions of Land Acquisition and Resettlement

The project is not expected to result in any involuntary resettlement. For the project, a Resettlement Framework (FR) is required by the Environment Protection Agency Sierra Leone (EPA-SL), which has been prepared by the local consultant. EDSA will prepare a draft ARAP based on the Resettlement Framework. As shown in Table 1-3.1, for the smooth implementation of the project, EDSA agreed to complete all the land acquisition as well as compensation process within about three months after the approval of the project by the Japanese Government. After the approval by EDSA, the compensation procedure based on the ARAP will be proceeded as shown in Table 1-3.2.

Table 1-3.2 Schedule of Land Acquisition after ARAP Preparation

Stage	Responsible bodies	Actions	Timeframe
1. Submission of the Payment order to Ministry of Finance (MOF)	From EDSA Finance Department to MOF	From EDSA finance department, the Payment order and the original compensation forms are forwarded to MOF for Payment.	October 21-31, 2022
2. Payment process by MOF	From the MOF to the Central Bank of Sierra Leone	MOF submits the Payment Order to the Central Bank of Sierra Leone. The Payment by the Central Bank of Sierra Leone through Project Affected Persons' (PAPs)	November 1-10, 2022

Stage	Responsible bodies	Actions	Timeframe
		respective bank accounts.	
3. Land title request	EDSA/Western Area Rural District Council	EDSA will submit request for transfer of land title to Western Area Rural District Council	November 2022 (Within about 3 months after the approval of the project by Japanese Government)

Source: JICA Survey Team

1-3-2 Environmental Impact Assessment

1-3-2-1 Summary of the Project Components

The details of all project components are described in Chapter 2. Among these, the components that may have impacts on natural and social environments are shown in Table 1-3.3.

Table 1-3.3 Project Components and Land Required for Project

	Project Components	Land Required
1.	33kV Distribution Line	Approx. 46km ROW 4m (2m + 2m)
2.	11kV Distribution Line	Approx. 49km ROW 4m (2m + 2m)
3.	Tombo Substation	Approx. 1,440m^2
4.	York Substation	Approx. 1,500m^2
5.	11/0.4kV Secondary Substation	23 sets Land required: 368m^2 (4 x 4m/set x 23set)

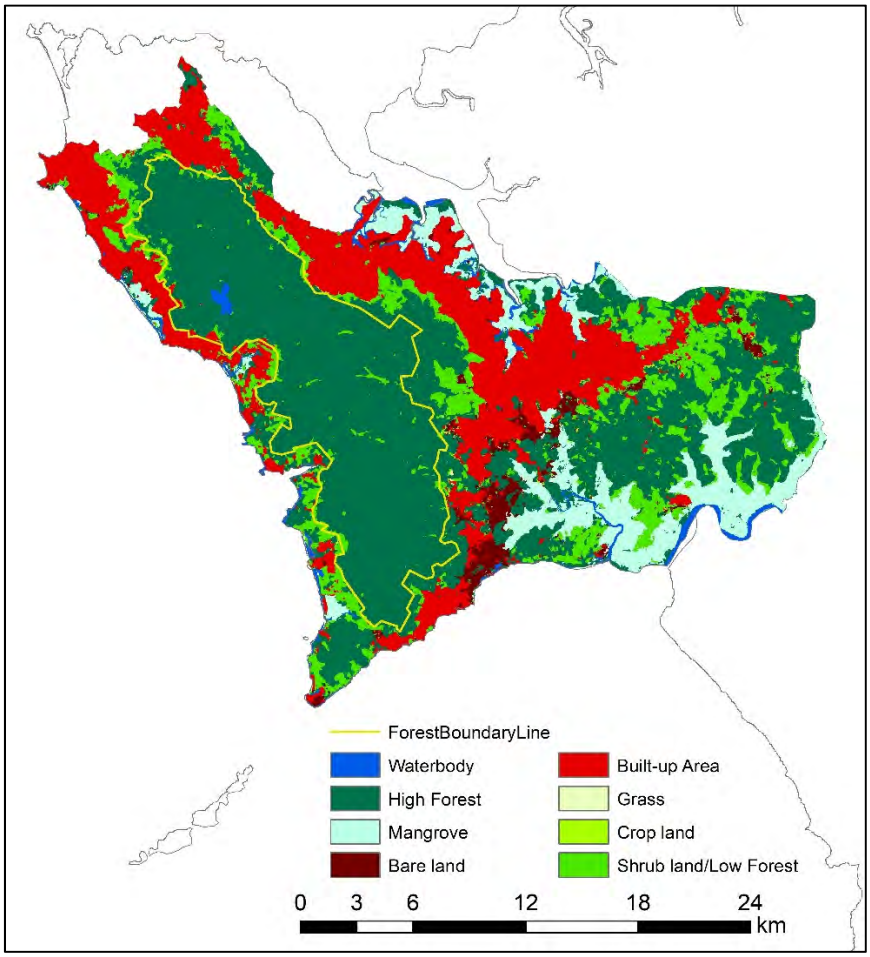
Note: ROW (Right-of-Way): Regarding the ROW, generally, the ROW of transmission and distribution lines includes land set aside for the transmission and distribution lines and associated facilities, land needed to facilitate maintenance, and to avoid risks of fires and other accidents. It provides a safety clearance between the high-voltage lines and surrounding structures. However, for 33kV and 11kV distribution lines in built-up areas such as roads (as is the case for this project), it is more economical to restrict the lines to the ROW of the roads so as to limit the social impact on the community. Since there are no guidelines or regulations for the ROW of transmission and distribution lines in Sierra Leone, the ROW values, i.e., 4m (2m+2m), used in similar World Bank projects implemented by EDSA were decided by EDSA for this project.

Source: JICA Survey Team

1-3-2-2 Baseline of Natural and Social Conditions

The proposed project site is adjacent to the Western Area Peninsula National Park (WAPNP, hereafter 'the National Park') in the Western Area Rural District (WARD) of Sierra Leone. The National Park was upgraded from Western Area Peninsula Forest in 2012 according to the "Statutory Instrument, Supplement to the Sierra Leone Gazette Vol. CXLIII, No.69 dated 29 November 2012, Proclamation For the Constitution of the Western Area Peninsula National Park", published by the Government of Sierra Leone. The National Park has an area of about 16,600 ha and forms the westernmost extent of the Upper Guinea forest in West Africa. It occupies a narrow chain of hills approximately 37km long and 14km wide, with the highest peak being Picket Hill (about 900 meters above sea level) in the south of the mountain range. A thin coastal strip lines the peninsula to the north, west, and south. However, there are no historically and culturally important sites designated by the laws within and around the project site.

Figure 1-3.1 shows a land cover map created by using a satellite imagery (satellite name: Sentinel, spatial resolution: 10m, observation date: January 21, 2021). Table 1-3.4 shows the areas of land covers of the Western Area Rural District and the National Park.



Source: JICA Survey Team

Figure 1-3.1 Land Cover of the Western Area Rural District

Table 1-3.4 Areas of Land Covers of Western Area Rural District and National Park

No.	Land Cover	Western Area Rural District		National Park	
		Area (ha)	Percentage	Area (ha)	Percentage
1	High Forest	30709.19	61.659	15868.56	95.575
2	Shrub Land/Low Forest	1237.42	2.485	519.95	3.132
3	Mangrove	1248.42	2.507	0	0
4	Grass	53.10	0.107	0.17	0.001
5	Built-up Area	13614.39	27.336	105.18	0.634
6	Bare land	1543.00	3.098	0.23	0.001
7	Crop Land	161.56	0.324	7.21	0.043
8	Waterbody	1237.42	2.484	101.95	0.614
	Total	**49804.50**	**100**	**16603.25**	**100**

Source: JICA Survey Team

By 2015, the WARD's population had risen to 444,270 people (221,351 men and 222,919 women), with an intercensal growth rate of 8.5 percent between 2004 and 2015 (Weeks and Bah, 2017). The increase in population has partly been attributed to post-conflict urbanization, which is underpinned by perceived opportunities available in Freetown, Sierra Leone's capital and largest city. During Sierra Leone civil conflict (1991-2002), WARD was a safe haven for Internally Displaced Persons (IDPs) from the provincial parts of the country, as it remained insulated from rebel invasion until 1997. Waterloo is the district capital

and largest city of the WARD. Before the decade-long civil war that engulfed the country between 1990 and 2002, agriculture was the main stay of people in the WARD. In addition to peri-urban agriculture, which included the cultivation of vegetables, poultry farming and fishing for supplying Freetown, the production of charcoal was a major economic activity for residents in the district (Thornton et al, 2012). After the civil conflict, although urban agriculture continues to be an important economic activity, a significant number of residents have resulted in petty trading. Waterloo for instance currently serves as the center for a greater majority of haulage trucks that transport vegetables from the provinces. In addition to these, tourism is another major economic activity. Apart from the established hotels and resorts in the WARD, another important and growing source of income is sand and stone mining, which is fueled by the high demand for building materials.

This section, describes (1) the result of confirmation of the National Park that is specifically designated for conservation of nature by the Government of Sierra Leone (GoSL), (2) the IUCN Red List status of fauna and flora in the National Park, (3) the natural conditions surveyed by the local consultant, (4) the social conditions surveyed by the local consultant, (5) the result of confirmation of the five conditions for exceptionally implementing a project in conservation area, and (6) the result of confirmation of the three conditions for implementing a project in an area with critical habitats.

1-3-2-2.1 Result of Confirmation of the National Park That is Specifically Designated for Conservation of Nature by GoSL

A literature review was conducted to confirm whether the National Park in the WARD, is designated for conservation of nature by the Government of Sierra Leone, The National Park, formerly the Western Area Peninsula Forest Reserve, has been protected since its gazettement in 1916 in which the name of 'Western Area' was used. The Western Area was designated as Forest Reserve in 1973 with a change in coverage and was placed under the jurisdiction of the Ministry of Agriculture, Forestry and Food Security. In 2011, the Government of Sierra Leone re-drafted the boundaries of the Forest Reserve and finalized the current protection regime. In 2012, the Government of Sierra Leone issued the "Statutory Instrument, Supplement to the Sierra Leone Gazette Vol. CXLIII, No. 69 dated 29 November 2012, Proclamation For the Constitution of the Western Area Peninsula National Park" and upgraded most areas of the Forest Reserve to the Western Area Peninsula National Park. The National Park, occupying the center of the peninsula, covers about 16,600 hectares of closed forest. rare animals are found such as Jentink's duikers and chimpanzees. It hosts approximately 80–90% of Sierra Leone's terrestrial biodiversity. Its environmental services – protection against floods, erosion and landslides; absorption of water in the rainy season and its release over the course of the dry season; considerable windbreak and micro-climate regulation, as well as its tourism potential are essential for the whole country.

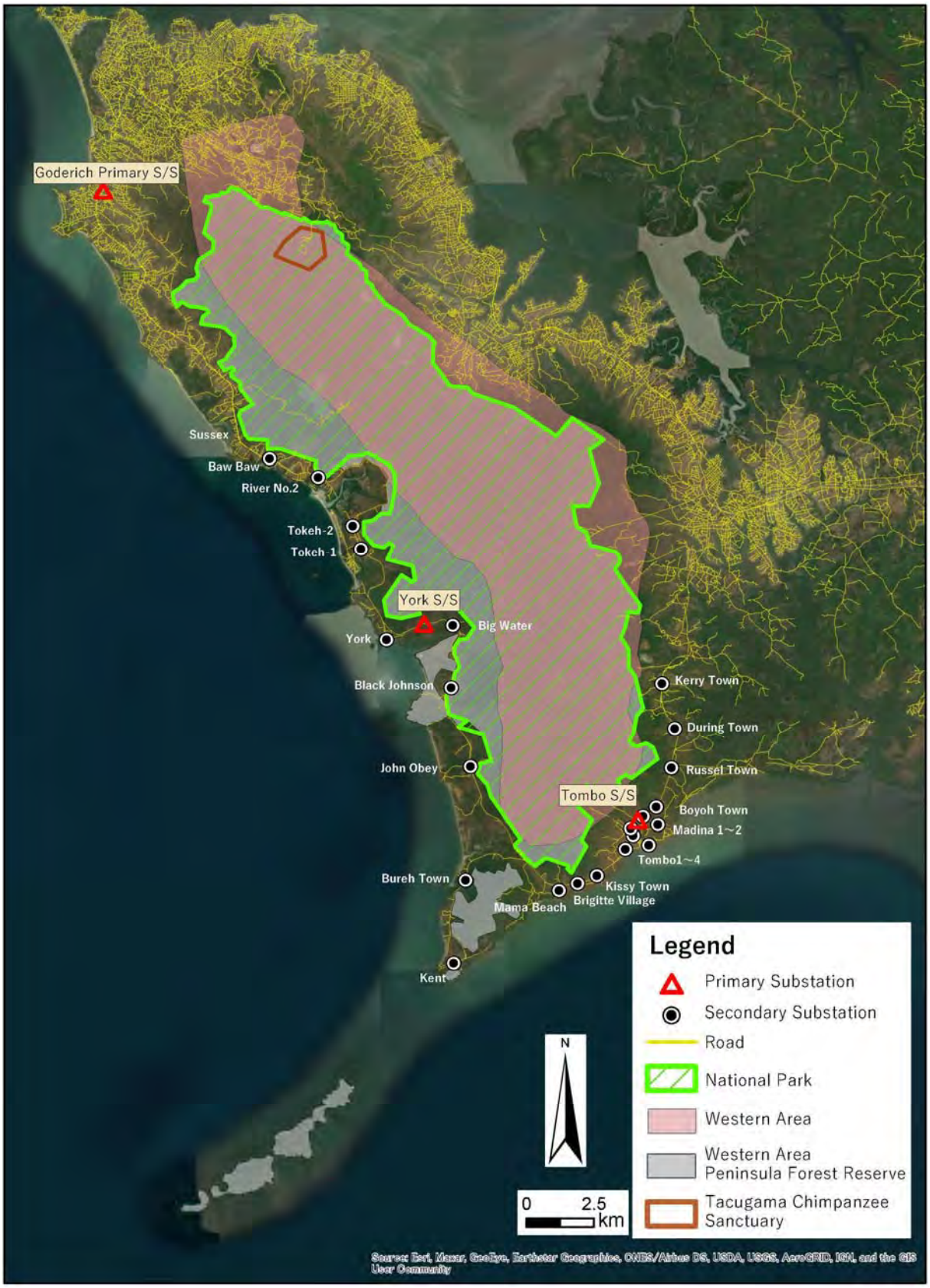
The National Park also falls within the areas specifically designated for conservation of nature by international organizations (Table 1-3.5). Figure 1-3.2 shows the National Park and IBA/KBA areas adjacent to the Project site. The IBA/KBA areas are represented by the Western Area and Western Area Peninsula Forest Reserve obtained from Protected Planet. The Western Area is no longer listed in the Sierra Leone's Protected Area Network.[1]

Table 1-3.5 Areas specifically designated for conservation of nature by international organizations

Area	Designated or Not (◯Yes、×No)	Organization
IBA (Important Bird Area)	◯	BirdLife International
KBA (Key Biodiversity Area)	◯	IUCN
UNESCO World Heritage Site	× (but on Tentative List)	UNESCO
MAB (Man and the Biosphere)	×	UNESCO
Wetlands of International Importance	×	The Ramsar Convention Secretariat

Source: JICA Survey Team

[1] GoSL, 2017. Sierra Leone's Second National Biodiversity Strategy and Action Plan 2017-2026.



Source: JICA Survey Team

Figure 1-3.2 National Park and Protected Areas adjacent to Project Site

1-3-2-2.2 IUCN Red List status of fauna and flora in the National Park

The IUCN Red List status of threatened species of fauna and flora in the National Park was reviewed based on the results of the IBA and KBA evaluations and summarized in Table 1-3.6. Note that the list excludes the Low Concern (LC) species.

Table 1-3.6 IUCN Red List Status of Threatened Species of Fauna and Flora in the National Park

Fauna/Flora	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
(1)Birds*	1. Hooded Vulture *Necrosyrtes monachus*	1. Timneh Parrot *Psittacus timneh*	1. Yellow-casqued Hornbill *Ceratogymna elata* 2. Brown-cheeked Hornbill *Bycanistes cylindricus* 3. White-necked Rockfowl *Picathartes gymnocephalus* 4. Grey-hooded Capuchin Babbler *Phyllanthus atripennis*	1. Bar-tailed Godwit *Limosa lapponica* 2. Curlew Sandpiper *Calidris ferruginea* 3. Woolly-necked Stork *Ciconia episcopus* 4. Green-tailed Bristlebill *Bleda eximius* 5. Rufous-winged Illadopsis *Illadopsis rufescens*
(2) Amphibians**	—	1. Freetown Long-fingered Frog *Cardioglossa aureoli*	—	1. *Arthroleptis aureoli*
(3)Mammals**	—	1. Jentink's Duiker *Cephalophus jentinki* 2. Chimpanzee *Pan troglodytes* 3. West African Red Colobus *Procolobus badius* 4. White-bellied Pangolin *Phataginus tricuspis*	1. Zebra Duiker *Cephalophus zebra* 2. Sooty Mangabey *Cercocebus atys* 3. Diana Monkey *Cercopithecus diana* 4. West African Manatee *Trichechus senegalensis*	—
(4)Vegetation**	1.*Triclisia macrophylla*	1. *Neolemonniera clitandrifolia* 2. *Tieghemella Africana*	1. Afzelia *Afzelia africana* 2. West African Cordia *Cordia platythyrsa* 3. *Cryptosepalum tetraphyllum* 4. *Garcinia kola* 5. Scented Guarea *Guarea cedrata* 6. *Heritiera utilis* 7. *Homalium smythei* 8. Azobe *Lophira alata* 9. *Mitragyna stipulosa* 10. *Nesogordonia papaverifera* 11. Black Afara *Terminalia ivorens*is 12. *Milicia regia*	—
(5) Reptiles**	1. Hawksbill Turtle *Eretmochelys imbricata*	1. Green Turtle *Chelonia mydas*	—	—

* Evaluated with BirdLife International IBA list (http://datazone.birdlife.org/site/factsheet/western-area-peninsula-forest-national-park-iba-sierra-leone/details) and Avibase list (https://avibase.bsc-eoc.org/checklist.jsp?lang=ZH&region=slwe01&list=clements&format=1)

** Evaluated with IUCN KBA list (http://www.keybiodiversityareas.org/site/factsheet/6836)

Source: JICA Survey Team

1-3-2-2.3 Natural Conditions

In order to understand the natural conditions around the project site, a survey was re-commissioned to a local consultant. Field surveys in dry season were conducted from December 2021 to February 2022. The results of the surveys in dry season are presented in Appendix 14 Environmental, Social, and Health Impact Assessment (ESHIA) Report. Field surveys in rainy season were additionally conducted from July to August 2022. The results of the surveys in rainy season were described in a separate report by the local consultant. The main results of the surveys are described below. Due to that there is no existing domestic standards on air quality, water quality as well as noise in Sierra Leone, here WHO or IFC standards are used for assessment.

(1) Birds

Field surveys at 70 locations and interviews with local residents and hunters were conducted in both of the dry season and rainy season.

In the dry season, 99 species of birds belonging to 44 avian families were recorded. Most of the species (97.4%) recorded were resident and ubiquitous. Here 'ubiquitous' means being found everywhere in Sierra Leone and around Africa. Five of these species that are designated as Critically Endangered (CR), Vulnerable (VU), and Near Threatened (NT) on the IUCN Red List of Threatened Species are listed in Table 1-3.7. A Hooded Vulture, which is listed as Critically Endangered (CR), was sighted once at one location.

In the rainy season, 110 species of birds belonging to 34 avian families were recorded. Most of the species recorded were resident and ubiquitous. Six of these species are designated as Critically Endangered (CR), Vulnerable (VU), and Near Threatened (NT), and 4 of them are the same species identified in the dry season (Table 1-3.7). One Hooded Vulture was sighted at one location and two at another location.

Table 1-3.7 Bird Species on IUCN Red List

No.	Species	Scientific Name	IUCN Status	Dry Season	Rainy Season
1	Hooded Vulture※	*Necrosyrtes monachus*	CR	YES	YES
2	Yellow-casqued Hornbill	*Ceratogymna elata*	VU	YES	YES
3	White-necked Rockfowl	*Picathartes gymnocephalus*	VU	YES	NO
4	Green-tailed Bristlebill	*Bleda eximius*	NT	YES	YES
5	Rufous-winged Illadopsis	*Illadopsis rufescens*	NT	YES	YES
6	Grey-hooded Capuchin Babbler	*Phyllanthus atripennis*	NT	NO	YES
7	Wolly-necked Stork	*Ciconia episcopus*	NT	NO	YES

Source: JICA Survey Team

(2) Amphibians and Reptiles

According to the literature, the National Park is home to 41 species of amphibians[2]. In the dry season, the number of amphibians recorded in the field surveys was five (5), all of which are Low Concern (LC) species, only representing 12.2% of the species known to the National Park, and the low diversity is associated with the dry nature of the environment at the time and season of the survey. In the rainy season, the number of amphibians recorded in the field surveys was twelve (12), all of which are Low Concern (LC) species, representing 26.8% of the species known to the National Park. In the rainy season, there was a significant increase in the abundance of amphibians in the sites surveyed, because this vertebrate thematic group naturally need aquatic environments to spawn.

According to the same literature mentioned above, the National Park is home to 48 species of reptiles.

[2] Karim, et al. (2013). Biodiversity Survey of the Western Area Peninsula Forest Reserve. Final Report submitted to Deutsche Welthungerhilfe, Sierra Leone. Department of Biological Science, FBC, USL.

In the dry season, the number of reptiles recorded in the field surveys was nine (9), all of which are Low Concern (LC) species, only representing 18.75% of the species known to the National Park. Ecologically, all five species of snakes recorded are associated with human settlements, farm bush and forest edges, and so their foraging activities take them into closed quarters with human dwellings. In the rainy season, in addition to the nine species recorded in the dry season, another species (Low Concern (LC)) was recorded.

Table 1-3.8 shows the species of amphibians and reptiles recorded in the field surveys in the dry season and rainy season.

Table 1-3.8 Species of amphibians and reptiles recorded

Fauna	No.	Species	Scientific Name	IUCN Status	Dry Season	Rainy Season
Amphibians	1	African Common Frog	*Sclerophrys regularis*	LC	YES	YES
	2	Broad-banded Grass Frog	*Ptychadena bibroni*	LC	YES	YES
	3	Sharp-nosed Frog	*Ptychadena oxyrhynchus*	LC	YES	YES
	4	African Grove-crowned Frog	*Hoplobatrachus occipitalis*	LC	YES	YES
	5	Ahl's River Frog	*Phrynobatrachus latifrons*	LC	YES	YES
	6	Medine Grassland Frog	*Ptychadena pumilio*	LC	NO	YES
	7	Ridged Frog	*Ptychadena mascariensis*	LC	NO	YES
	8	West African Puddle Frog	*Phrynobatratus maculatus*	LC	NO	YES
	9	Marsh Frog	*Amnirana galamensis*	LC	NO	YES
	10	Common toothed frog	*Petropedetes natator*	LC	NO	YES
	11	West African Brown Frog	*Aubria occidentalis*	LC	NO	YES
	12	Variable Reed Frog	*Hyperolius concolor*	LC	NO	YES
Reptiles	1	African Lizard	*Agama africana*	LC	YES	YES
	2	Rainbow Lizard	*Agama*	LC	YES	YES
	3	Greater Martinique Skink	*Mabuya mabouya*	LC	YES	YES
	4	Nile Monitor	*Varanus niloticus*	LC	YES	YES
	5	Green Mamba	*Dendroaspis viridis*	LC	YES	YES
	6	Black Mamba	*Dendroaspis polylepis*	LC	YES	YES
	7	African Forest Cobra	*Naja melanoleuca*	LC	YES	YES
	8	Stripped House Snake	*Lamprophis lineatus*	LC	YES	YES
	9	Gaboon Viper	*Bitis gabonica*	LC	YES	YES
	10	N/A	*Mabuya dorsivittata*	LC	NO	YES

Source: JICA Survey Team

(3) Mammals

Field surveys including visual surveys and interviews with local residents and hunters identified 9 species and 6 species of mammals in the dry season and rainy season, respectively (Table 1-3.9). A White-bellied Pangolin designated as Endangered (EN) on the IUCN Red List was caught around September 2021 at the edge of the forest at No. 2 River. Along the distribution line route of this project, no chimpanzee or signs of their presence or use of the forest edges was observed. Residents who relied on the forest for a daily living commented that chimpanzees could only be seen in a location deep into the forest.

Most of the mammal species recorded by visual evidence or interviews are presumed to be in decline in terms of their occurrence within the 500m range on either side of the Peninsula Highway. From observation and anecdotal information, the rarity of mammalian fauna could be attributed to the spate of deforestation of the forest buffers and the other side of the road, mainly for housing development.

Table 1-3.9 Mammal Species recorded by visual evidence or through interviews

No.	Species	Scientific Name	IUCN Status	Dry Season	Rainy Season
1	**White-bellied Pangolin**	***Phataginus tricuspis***	**EN**	YES	NO
2	Green Monkey	*Chlorocebus sabeus*	LC	YES	YES
3	Maxwell's Duiker	*Cephalophus maxwelli*	LC	YES	NO
4	Marsh Cane Rat	*Thryonomys swinderianus*	LC	YES	YES
5	Giant Pouch Rat	*Crecitomys emini*	LC	YES	YES
6	African Civet	*Civettictis civetta*	LC	YES	YES
7	Stripped Ground Squirrel	*Atlantoxerus getulus*	LC	YES	YES
8	Fire-footed Rope Squirrel	*Funisciurus pyrropus*	LC	YES	YES
9	Slender Mongoose	*Herpestess anguinea*	LC	YES	NO

Source: JICA Survey Team

(4) Vegetation

According to the results of survey conducted by Karim et al in the National Park in 2012, a total of 128 species of trees (dbh ≥ 5cm) belonging to 33 families were recorded[3].

In this preparatory survey, two survey methods were used for vegetation: line transect survey and plot survey.

1) Line Transect Survey

One survey site was selected every 5km along the distribution line route. In total, 28 sites were selected. A 500m line was drawn on both sides of each survey site, and plants were surveyed along the line. The geographic coordinates of each survey site were recorded by GPS.

In the dry season, the survey recorded a total of 119 species of plants belonging to 54 families. Four species of trees recorded are on the IUCN Red List as Vulnerable (VU). In the rainy season, the survey recorded a total of 131 species of plants belonging to 63 families. Four Vulnerable (VU) species of trees recorded are the same as those in the dry season (Table 1-3.10). However, only a few stands of these threatened species were recorded in locations that had some fragments of closed forest in almost all of the sites surveyed. All of these threatened tree species are valuable timber species, which are exploited for various commercial and building purposes within and along the buffer zone of the National Park.

Of the 119 species recorded in the dry season, 31 species are used as food (26.1%), 12 species as timber (10.1%), 55 used as medicinal herbs (46.2%), 6 species used as fuel wood (5.0%) and 15 used for various domestic and artisanal utility (12.6%). The distribution of plants into these use categories remained only slightly changed for the rainy season because almost all the additional species recorded were ferns and grasses and none of which could be placed in any of the use categories.

In the rainy season, three species of mangrove were recorded on the seaside end of the distribution route near the Kent Junction where a brackish water occurs, namely *Rhizophora mangle, Rhizophora racemosa and Avicennia germinans*. Generally, many of the sparse stands of Rhizophora species are found in the inner portions and the Avicennia towards the coastal end. The patch of mangroves identified is a narrow strip from the creek and is just a scrubby patch that covers an area of about 0.3ha. Because they are exploited all the time for fuel wood and are virtually unprotected, much of this mangrove patch has been cut and degraded. In addition, all three mangrove species identified are Least Concern (LC) ones on the IUCN Red List.

[3] Karim, et al., 2013. Biodiversity Survey of the Western Area Peninsula Forest Reserve. Final Report submitted to Deutsche Welthungerhilfe, Sierra Leone. Department of Biological Science, FBC, USL.

Table 1-3.10 Tree Species on IUCN Red List

No.	Species	Scientific Name	IUCN Status	Dry Season	Rainy Season
1	Afzelia	*Afzelia africana*	VU	YES	YES
2	-	*Heritiera utilis*	VU	YES	YES
3	Black Afara	*Terminalia ivorense*	VU	YES	YES
4	-	*Milicia regia*	VU	YES	YES

Source: JICA Survey Team

2) Plot Survey

In the dry season, three locations inside the core area of the National Park were selected for plot surveys. 20m x 20m plot was taken at each location to assess tree diversity and density. In the rainy season, plot surveys were conducted using the same methodology on the same locations in the dry season. All the three plots inside the National Park are located over 3km from the nearest proposed distribution line route. The geographic coordinates of 3 plots were recorded by GPS.

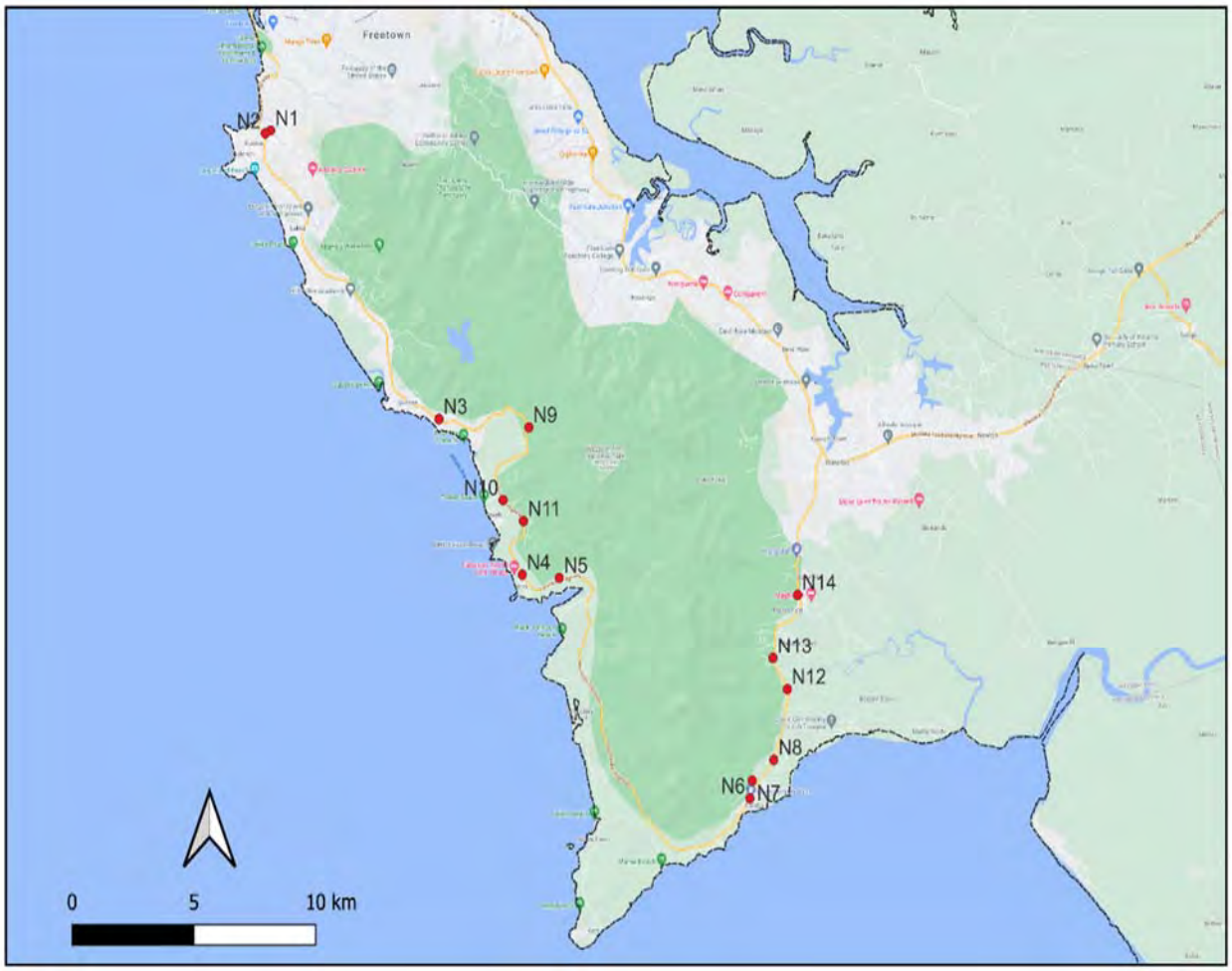
Trees with diameter at breast height (dbh) ≥ 10 cm in all plots were observed. As a result, a total of 53 species were recorded in the dry season and the same number of species were recorded in the rainy season. The most common species were *Xylopia quintassi, Daniella thurifera, Chlorophera excelsa* and *Terminalia ivorensis* in descending order. Other species of trees observed, which are targets for fuel wood and timber include *Musanga cercropoides, Albizia adianthifolia, Anthocleista nobilis, Erythrina senegalensis, Phyllanthrus discoidens, Fagara macrophylla, Chlorophora regia, Amphimas pterocarpoides, Lophira alata, Dialium guineensis, Uapaca guineensis* and *Anisophyllea laurina*.

The tree density was estimated as 410 trees per ha and the tree canopy estimated to be about 73%, which are good indicators that these core forest locations have experienced relatively low levels of disturbance, in the dry season. And the observation remained unchanged for the rainy season.

The Vulnerable (VU) trees shown in Table 1-3.10 were also identified in the plots.

(5) Air Quality

Fourteen (14) sample locations such as an existing primary substation, new primary substations, schools, hospitals, parks and locations along the main roads were selected to measure the concentrations of various air quality parameters (Figure 1-3.3; due to that the sample locations for air quality are the same for noise, AQ used here is considered to be N, e.g., AQ1=N1). The key parameters measured include Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), particulate matter (PM), air temperature, and percent relative humidity, wind speed and wind direction. Concentrations were measured every minute for 30 minutes in the morning, afternoon, and night respectively. These were computed into daily averages per site. Table 1-3.11 (a) and Table 1-3.11 (b) show the results of air quality measurements in the dry season and rainy season, respectively. The following sections summarize the results of SO_2, NO_2, O_3, and PM measurements and their comparison with WHO standards.

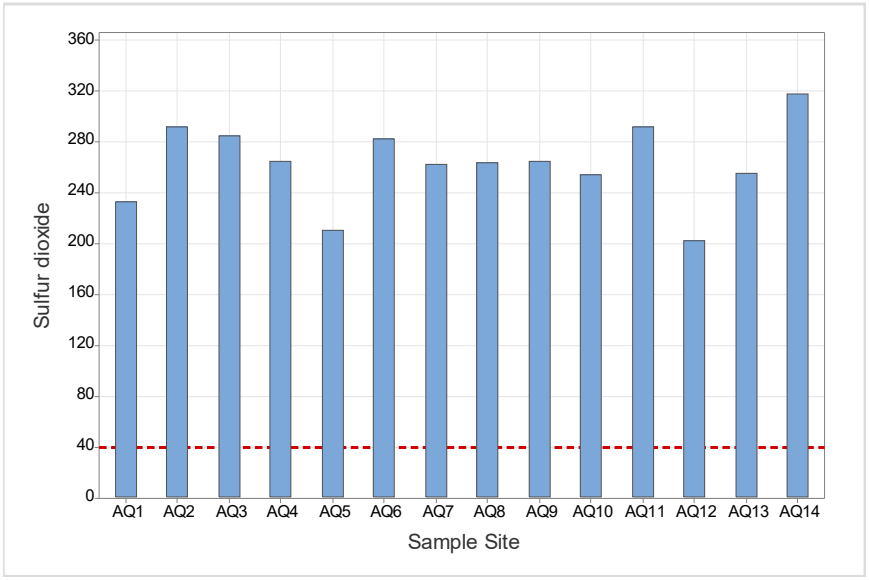


N1: Goderich Substation as background
Source: JICA Survey Team

Figure 1-3.3 Air quality and Noise Sampling Locations

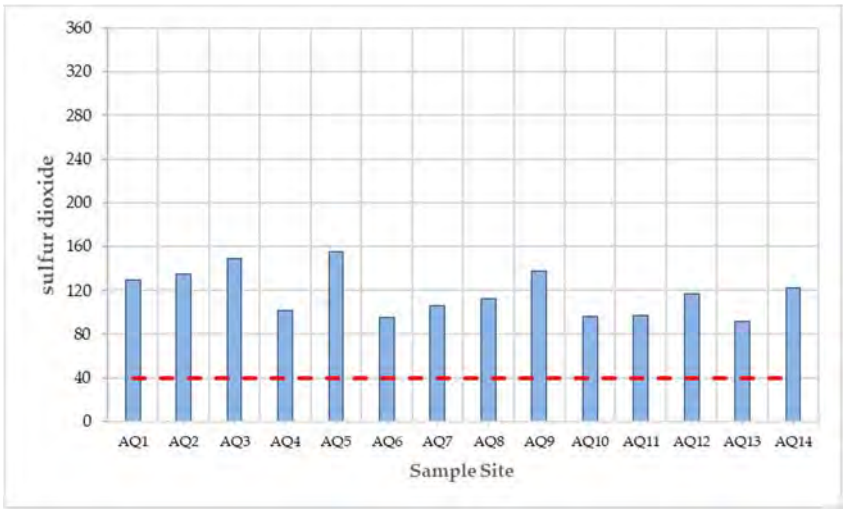
1) Sulfur dioxide (SO_2)

The WHO recommended standard for SO_2 is 40 µg/m^3 as a daily average. Figure 1-3.4 (a) and Figure 1-3.4 (b) show the daily average concentrations of SO_2 at the various sample locations in the dry season and rainy season, respectively. In both seasons, the concentrations at all locations including at Goderich Station as background are already far above the daily recommended average.



Source: JICA Survey Team

Figure 1-3.4 (a) Sulfur Dioxide Concentrations (Daily Averages) at Sample Locations in Dry Season (red line: WHO minimum contaminant threshold)

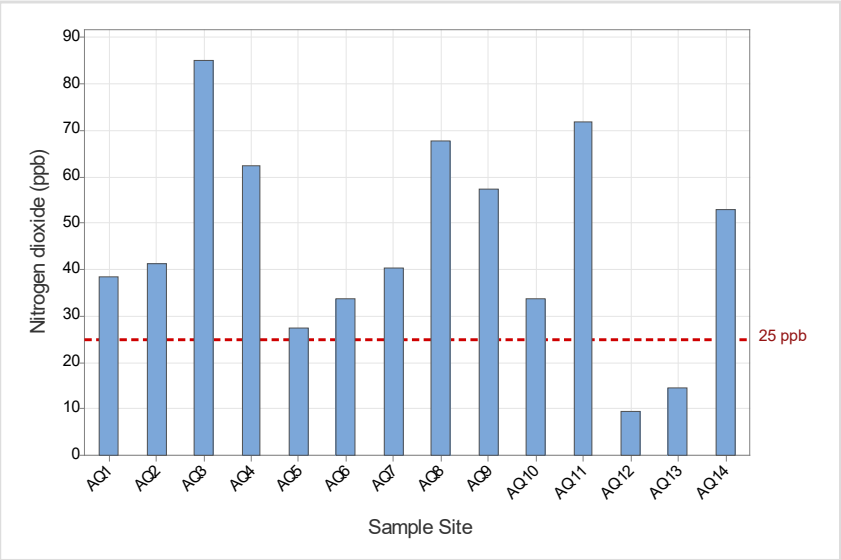


Source: JICA Survey Team

Figure 1-3.4 (b) Sulfur Dioxide Concentrations (Daily Averages) at Sample Locations in Rainy Season (red line: WHO minimum contaminant threshold)

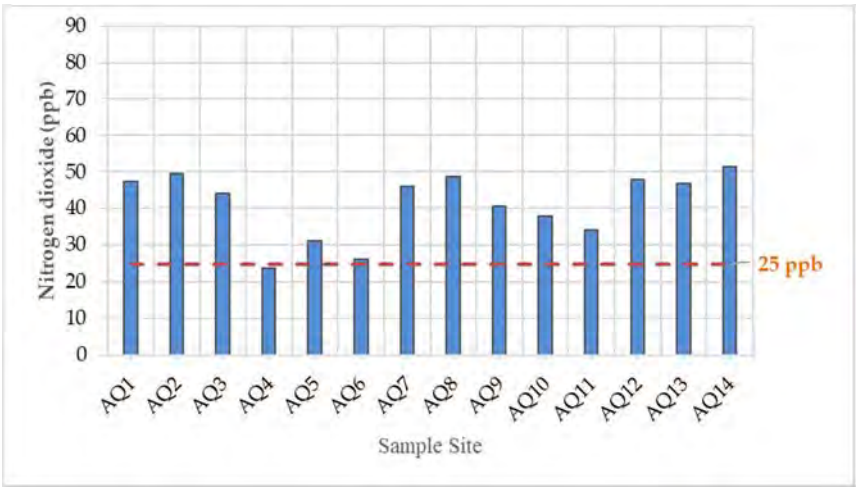
2) Nitrogen dioxide (NO_2)

The WHO recommended standards are 10 µg/m^3 as annual average and 25 µg/m^3 as daily average. Figure 1-3.5 (a) and Figure 1-3.5 (b) show the background daily average concentrations of NO_2 at the sample locations in the dry season and the rainy season, respectively. Only two sample locations among 14 ones in the dry season and one sample locations in the rainy season had concentrations lower than the minimum threshold recommended by the WHO.



Source: JICA Survey Team

Figure 1-3.5 (a) Nitrogen Dioxide Concentrations (Daily Averages) at Sample Locations in Dry Season (red line: WHO minimum contaminant threshold)

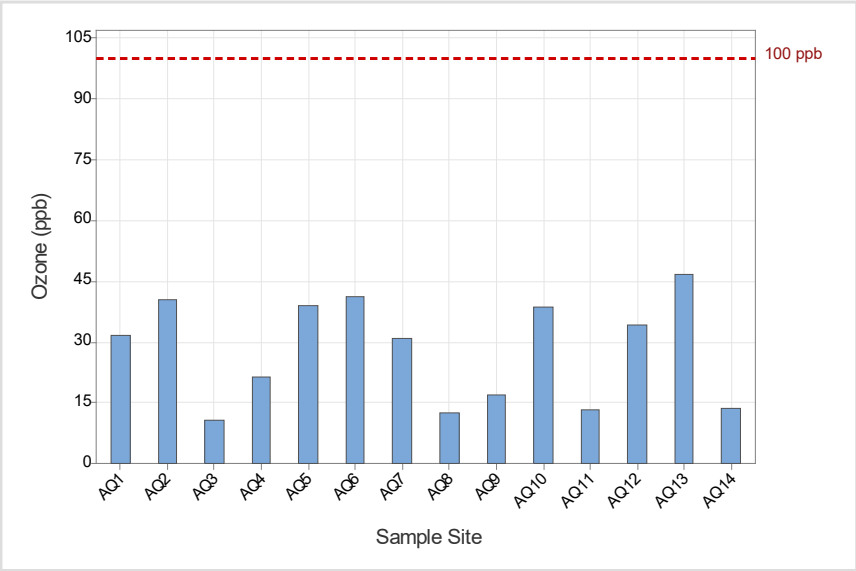


Source: JICA Survey Team

Figure 1-3.5 (b) Nitrogen Dioxide Concentrations (Daily Averages) at Sample Locations in Rainy Season (red line: WHO minimum contaminant threshold)

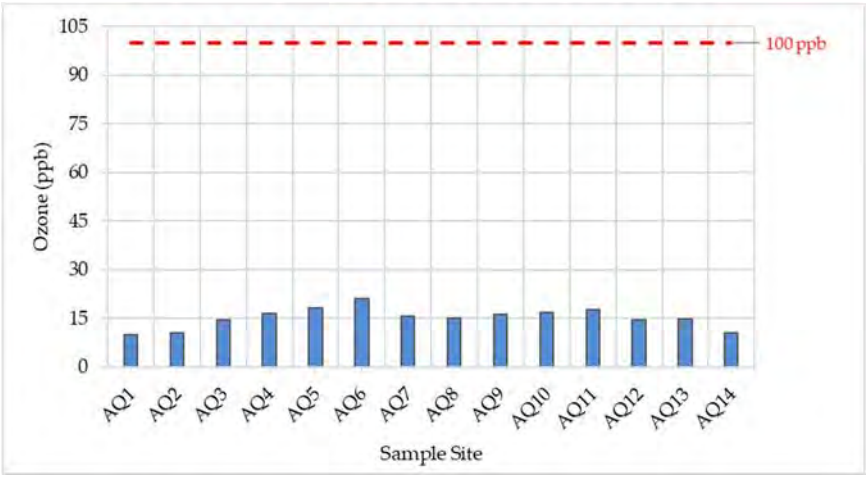
3) Ozone (O_3)

The WHO recommends a daily maximum O_3 emission of 100 µg/m^3 for 99% of 8-hour days in a year. Figure 1-3.6 (a) and Figure 1-3.6 (b) show the daily averages of O_3 at the sample locations in the dry season and rainy season, respectively. In both seasons, all of the readings were considerably below the specified maximum contamination.



Source: JICA Survey Team

Figure 1-3.6 (a) Ozone Concentrations (Daly Averages) at Sample Locations in Dry Season (red line: WHO minimum contaminant threshold)

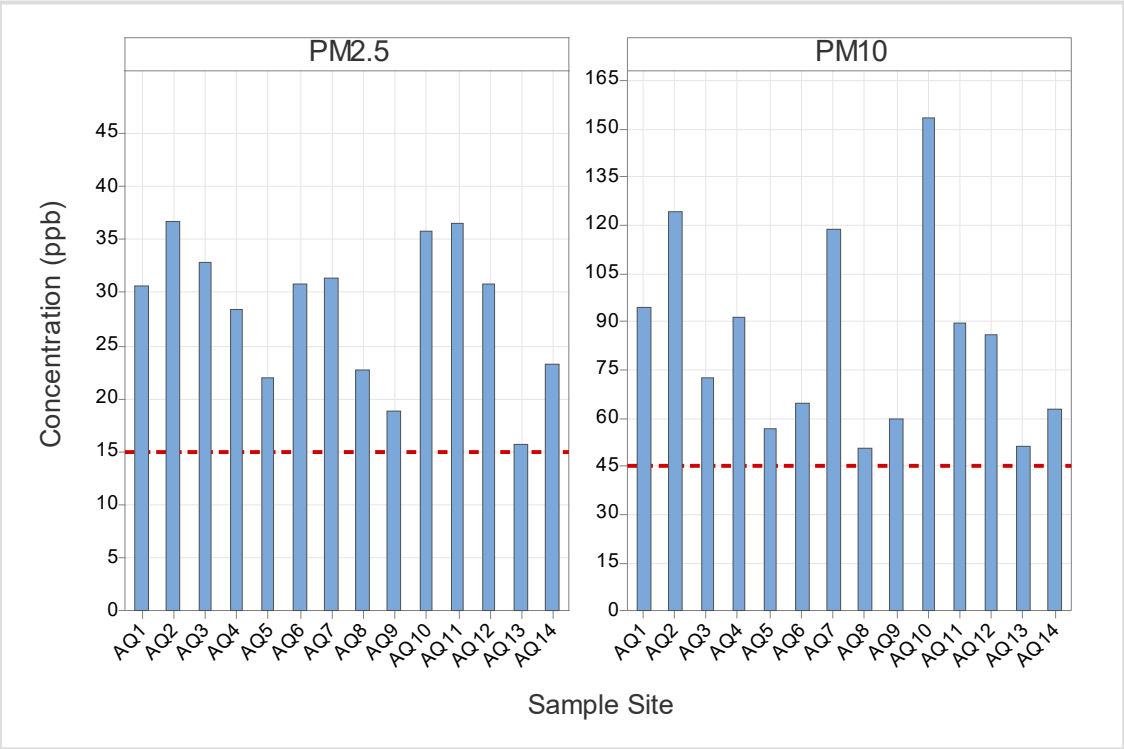


Source: JICA Survey Team

Figure 1-3.6 (b) Ozone Concentrations (Daly Averages) at Sample Locations in Rainy Season (red line: WHO minimum contaminant threshold)

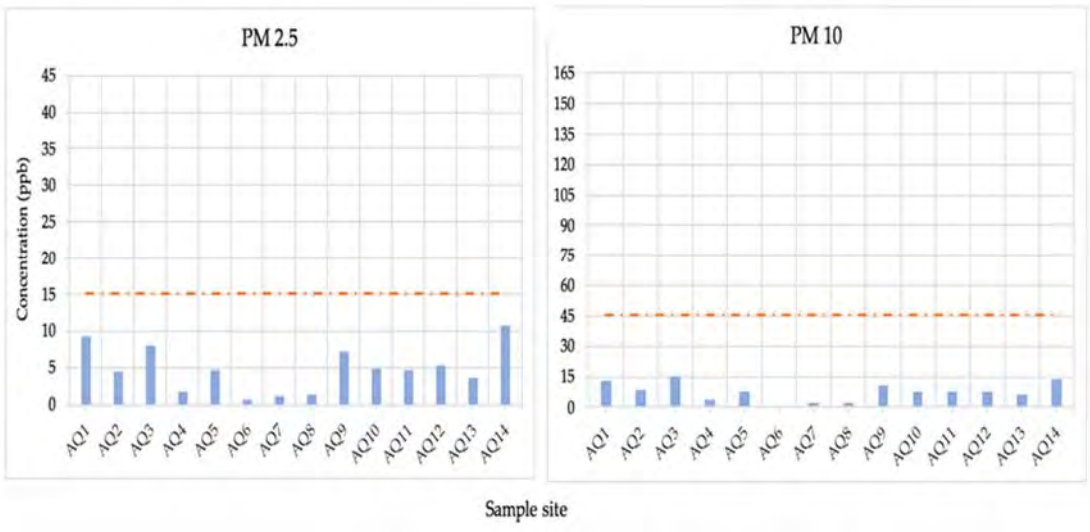
4) Particulate Matter (PM)

The WHO recommended standards for PM_{10} are 15 µg/m^3 for an annual average and 45 µg/m^3 for a daily average. The recommended standards for $PM_{2.5}$ are 5 µg/m^3 for an annual average and 15µg/m^3 for a daily average. Figure 1-3.7 (a) and Figure 1-3.7 (b) show the background concentrations of PM values at sample locations in the dry season and rainy season, respectively. These values are based on daily averages. For both the $PM_{2.5}$ and PM_{10}, the daily averages exceeded the WHO recommended standards for all the sites in the dry season, while the daily averages were considerably below the standards in the rainy season.



Source: JICA Survey Team

Figure 1-3.7 (a) $PM_{2.5}$ and PM_{10} Concentrations (Daily Averages) at sample locations in Dry Season (red line: WHO minimum contaminant threshold)



Source: JICA Survey Team

Figure 1-3.7 (b) $PM_{2.5}$ and PM_{10} Concentrations (Daily Averages) at sample locations in Rainy Season (red line: WHO minimum contaminant threshold)

Table 1-3.11 (a) Air Quality Baseline in Dry Season

Sample No.	Sample Site	SO_2 (ppb)	NO_2 (ppb)	O_3 (ppb)	CO (ppb)	$PM_{2.5}$ (ppb)	PM_{10} (ppb)	TSP (ppb)	Temp (^0C)	Humidity (%RH)	Wind Speed (m/s)	Wind Direction (^{o})
AQ1	Goderich Substation*	232.55	38.71	31.67	0.87	30.73	94.74	151.01	35.50	40.20	1.20	155.74
AQ2	Delcon Primary School	291.51	41.37	40.78	0.86	36.68	124.27	198.10	34.34	49.92	1.87	163.96
AQ3	Baw Baw Park	284.83	85.14	11.02	1.05	32.82	72.49	108.96	27.59	75.23	0.87	222.63
AQ4	School	264.38	62.48	21.50	0.69	28.41	91.67	131.89	30.99	63.06	1.55	178.83
AQ5	York PSS	210.81	27.44	39.34	0.29	21.97	56.58	88.96	34.29	52.04	2.20	228.76
AQ6	Tombo Park	282.12	33.81	41.47	0.64	30.77	64.63	94.58	33.81	54.24	1.70	131.70
AQ7	Tombo PSS	261.68	40.43	31.09	0.63	31.48	118.74	194.22	31.31	56.81	1.27	117.27
AQ8	Buyoh School	263.22	67.81	12.73	0.53	22.68	50.52	74.18	26.91	71.87	0.79	181.34
AQ9	No. 2 along main Road	264.15	57.61	17.05	0.67	18.91	59.70	96.58	31.83	59.93	1.15	132.59
AQ10	Tokeh junction	253.44	33.86	38.62	0.79	35.88	153.73	212.07	35.99	45.44	1.94	103.21
AQ11	Newly built hospital at Tokeh	291.02	72.03	13.30	0.86	36.60	89.90	137.06	28.62	73.22	0.42	200.91
AQ12	During Town along main Road	201.76	9.72	34.28	0.70	30.88	86.18	131.63	34.59	40.27	1.10	236.51
AQ13	Hospital at Kerry Town	255.15	14.62	46.85	0.43	15.72	51.19	85.69	36.05	39.19	1.75	256.94
AQ14	Macdonald along main Road	316.96	53.16	13.95	0.52	23.28	62.82	98.90	29.21	65.43	0.44	107.02

* Goderich Substation was constructed by a JICA project and was selected as background for this preparatory study.

Source: JICA Survey Team

Table 1-3.11 (b) Air Quality Baseline in Rainy Season

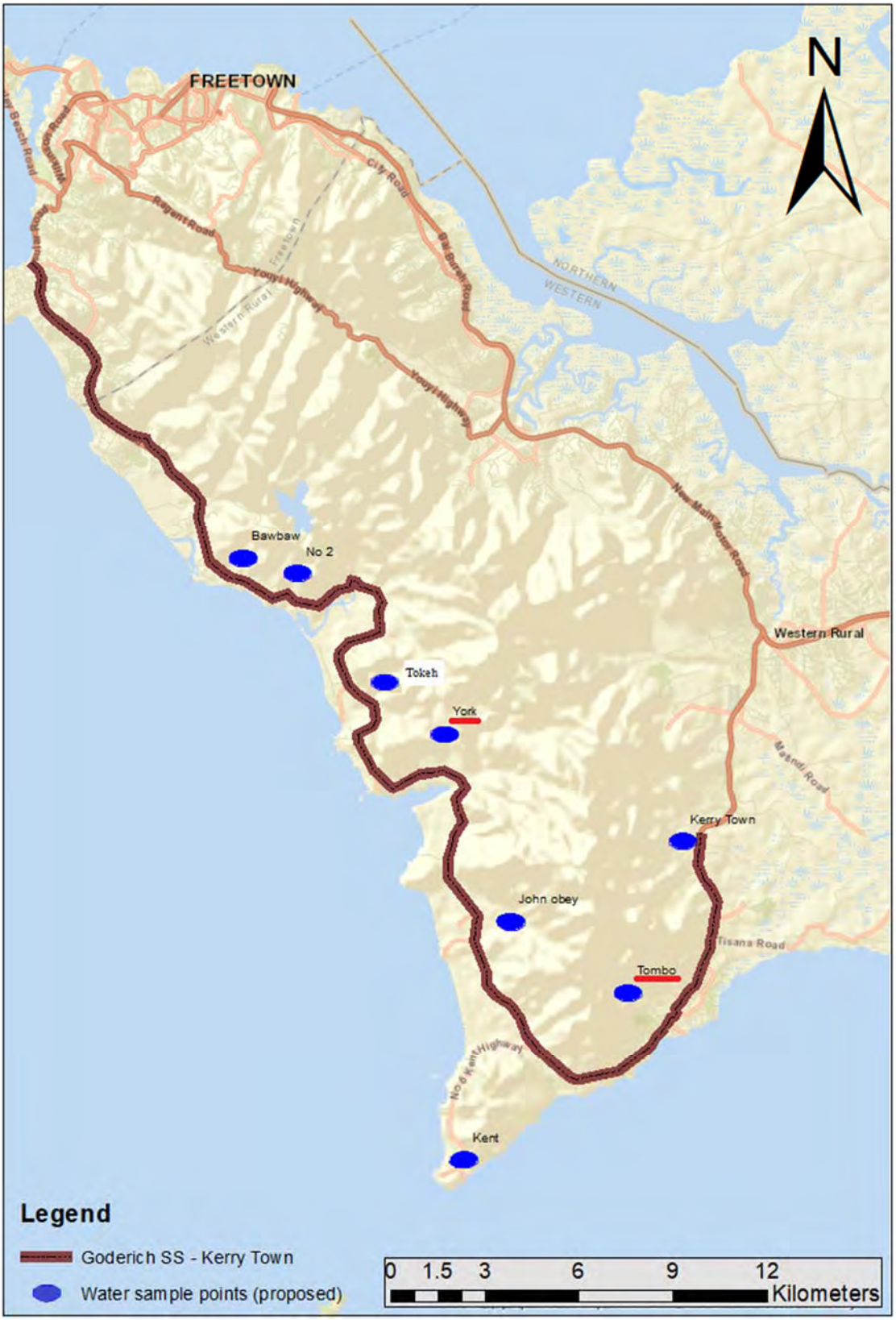
Sample No.	Sample Site	SO_2 (ppb)	NO_2 (ppb)	O_3 (ppb)	CO (ppb)	$PM_{2.5}$ (ppb)	PM_{10} (ppb)	TSP (ppb)	Temp (^0C)	Humidity (%RH)	Wind Speed (m/s)	Wind Direction (^{o})
AQ1	Goderich Substation*	129.55	47.39	9.98	0.61	9.32	12.49	15.36	28.29	81.49	1.47	200.14
AQ2	Delcon Primary School	135.17	49.55	10.58	0.79	4.36	8.32	12.30	28.66	81.69	0.88	163.57
AQ3	Baw Baw Park	148.43	44.11	14.43	0.70	8.022	15.22	21.53	28.67	80.53	1.28	215.02
AQ4	School	101.47	23.80	16.58	0.35	1.68	3.77	6.07	28.87	80.71	1.15	176.17
AQ5	York PSS	155.17	31.10	18.27	0.78	4.69	7.12	10.02	29.32	80.00	0.83	202.66
AQ6	Tombo Park	94.97	26.26	21.19	0.381	0.64	0.77	0.92	28.30	81.44	1.86	136.89
AQ7	Tombo PSS	106.32	45.91	15.58	0.33	0.97	1.99	2.87	27.69	84.35	0.97	161.82
AQ8	Buyoh School	112.06	48.61	15.20	0.37	1.33	2.39	3.23	28.30	81.79	1.63	78.00
AQ9	No. 2 along main Road	137.56	40.51	16.28	0.77	7.13	10.69	13.87	28.26	81.72	1.62	128.91
AQ10	Tokeh junction	96.06	37.78	16.76	0.42	4.93	7.30	9.078	29.37	80.44	2.072	188.66
AQ11	Newly built hospital at Tokeh	97.25	34.18	17.83	0.51	4.54	7.43	9.96	28.49	80.51	2.37	87.43
AQ12	During Town along main Road	117.16	48.02	14.61	0.43	5.26	7.71	9.62	26.63	87.70	3.43	87.48
AQ13	Hospital at Kerry Town	91.38	46.78	14.89	0.30	3.64	5.86	7.74	25.96	89.42	2.33	161.12
AQ14	Macdonald along main Road	122.08	51.49	10.53	0.50	10.68	13.64	16.32	25.93	91.70	0.59	151.36

* Goderich Substation was constructed by a JICA project and was selected as background for this preparatory study.

Source: JICA Survey Team

(6) Water Quality

The overall goal of a water quality assessment of community water supply sources is to evaluate their existing water quality state and ensure that the proposed Project development will not have an adverse effect on their water quality. Therefore, water samples were collected from water sources (surface water) that have the potential to receive run-off from the Project construction activities (Figure 1-3.8). These water bodies are only used for laundering and other domestic uses. In the dry season, water samples were collected at 8 locations. In the rainy season, 2 seasonal streams were identified near the Tombo and York Primary Substations. Therefore, samples were collected at 10 locations including at 2 seasonal streams. Table 1-3.12 (a) and Table 1-3.12 (b) show the water quality testing results in the dry season and rainy season, respectively. In the dry season, measurements of pH, turbidity, dissolved oxygen (DO), potassium, orthophosphate, and chromium exceeded the WHO standards at some locations. For example, turbidity readings at three locations (Kerry Town, York, and Baw Baw) exceeded the WHO standard. In the rainy season, measurements of pH, turbidity, orthophosphate, and chromium were above the WHO standards at some locations. For example, turbidity readings at two locations (Kerry Town and Tombo) were above the WHO standards.



Note: At York and Tombo (with red underlines), two locations were selected for measurement in the rainy season, respectively.
Source: JICA Survey Team

Figure 1-3.8 Water Quality Sampling Locations

Table 1-3.12 (a) Water Quality Testing Results in Dry Season

Parameters		Kerry Town	Tombo	Kent	John Obey	York	Tokeh	No 2 River	Baw Baw	WHO threshold
1	Water Temperature (°C)	30.4	30.5	33.9	27.9	29.0	29.4	28.4	30.6	No. Value
2	pH	6.63	6.50	5.81	5.20	4.95	6.10	6.38	6.99	6.5 – 8.5
3	Turbidity (NTU)	19	2	0	0	7	0	0	12	<5.0
4	Conductivity (µS/cm)	24	27	17	13	13	14	14	39	<500
5	Dissolved oxygen (mg/L)	2.69	5.15	8.87	6.73	5.44	6.58	6.82	6.68	>6
6	TDS (mg/l)	12	12.5	8.5	6.5	6.5	7	7	19.5	<248
7	Ammonia (mg/l)	0.52	0.21	0.07	0.03	0.12	0.20	0.24	0.04	No. Value
8	Copper (mg/l)	0.14	0.02	0.32	0.05	0.11	0.12	0.08	0.16	<1.0
9	Fluoride (mg/l)	0.92	0.025	0.13	0.03	0.09	0.025	0.04	0.34	<1.5
10	Iron (mg/l)	0.32	0.19	0.21	0.12	0.15	0.05	0.06	0.03	<0.3
11	Nitrite (mg/l)	0.01	0.03	0.01	0.01	0.01	0.005	0.05	0.02	3.0
12	Nitrate (mg/l) *HR*	0.94	0.34	0.05	0.15	0.33	0.23	0.16	0.12	<10
13	Potassium (mg/l)	16	4.3	0.9	2.2	0.13	2.3	1.2	1.2	<6.0
14	Orthophosphate (mg/l) *LR*	0.12	0.50	0.19	0.52	0.41	0.12	0.72	0.31	<0.035
15	Sulphate (mg/l)	23.1	2.3	2.5	6.4	9.1	12.6	13.2	7.4	<400
16	Chloride (mg/l)	11.1	4.2	3.0	3.2	1.9	4.8	10.8	10.4	<250
17	Chromium	0.51	0.10	0.32	0.21	0.12	0.10	0.15	0.25	<0.05
18	Zinc (mg/l)	0.01	0.15	0.91	0.13	0.17	0.05	0.41	0.51	<5.0
19	BOD (mg/ L O_2)	4.2	3.2	1.2	1.3	1.8	1.4	1.3	3.5	5.0 (U.S. EPA)

Note: Values in red are above the thresholds.
Source: JICA Survey Team

Table 1-3.12 (b) Water Quality Testing Results in Rainy Season

Parameters		Kerry Town	Tombo	Kent	John Obey	York	Tokeh	No 2 River	Baw Baw	Tombo S/S	York S/S	WHO threshold
1	Water Temperature (°C)	27.4	27.4	27.8	26.3	28.9	27.1	25.9	26.8	29.3	27.5	No. Value
2	pH	6.61	6.64	6.00	6.24	4.27	5.45	4.22	4.16	6.34	5.22	6.5 – 8.5
3	Turbidity (NTU)	24	54	0	0	0	0	0	0	0	0	<5.0
4	Conductivity (µS/cm)	16	21	19	14	19	14	14	32	30	14	<500
5	Dissolved oxygen (mg/L)	6.6	6.65	7.33	7.39	6.5	7.11	7.06	7.08	6.3	7.15	>6
6	TDS (mg/l)	8.0	10.5	9.5	7.0	9.5	7.0	7.0	16.0	15.0	7.0	<248
7	Ammonia (mg/l)	0.05	0.04	0.05	0.04	0.01	0.01	0.01	0.02	0.01	0.01	No. Value
8	Copper (mg/l)	0.27	0.25	0.23	0.32	0.29	0.32	0.23	0.23	0.13	0.4	<1.0
9	Fluoride (mg/l)	0.12	0.025	0.025	0.025	0.025	0.025	0.025	0.29	0.025	0.025	<1.5
10	Iron (mg/l)	0.05	0.03	0.03	0.015	0.015	0.04	0.015	0.07	0.09	0.2	<0.3
11	Nitrite (mg/l)	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.05	0.005	0.005	3.0
12	Nitrate (mg/l) *HR*	0.37	0.13	0.13	0.12	0.13	0.06	0.17	0.09	0.25	0.12	<10
13	Potassium (mg/l)	0.8	0.8	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.8	<6.0
14	Orthophosphate (mg/l) *LR*	0.57	0.59	0.93	0.77	0.77	0.66	0.84	0.35	0.72	0.4	<0.035
15	Sulphate (mg/l)	2.05	5.2	5.9	2.5	2.5	2.5	2.5	18.4	2.5	2.5	<400
16	Chloride (mg/l)	0.005	0.8	1.5	0.6	2.8	0.25	0.6	2.8	2.4	0.6	<250
17	Chromium	0.04	0.15	0.04	0.06	0.15	0.13	0.02	0.15	0.06	0.06	<0.05
18	Zinc (mg/l)	0.02	0.3	0.4	0.12	0.25	0.03	0.2	0.41	0.17	0.15	<5.0
19	BOD (mg/ L O_2)	1.4	3.2	1.2	1.5	1	1.5	1.3	1.4	4.2	3.1	5.0 (U.S. EPA)

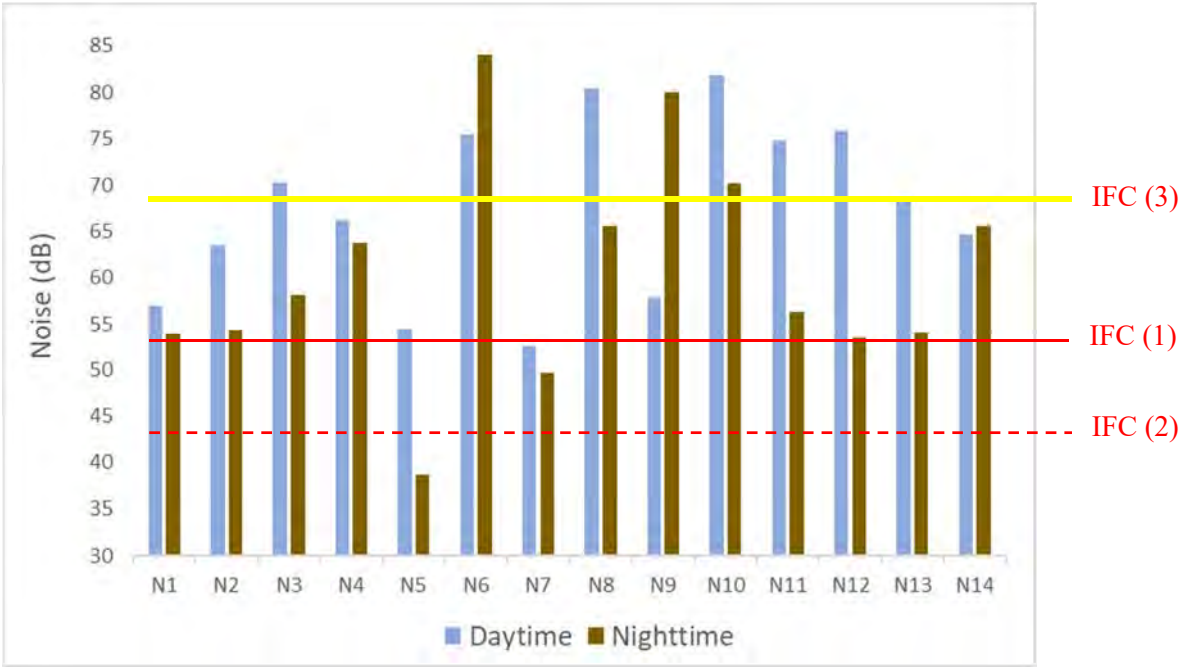
Note: Values in red are above the thresholds.
Source: JICA Survey Team

(7) Noise

Noise measurement was conducted in the dry season. The sample locations for the noise measurement are the same for the air quality measurement. Fourteen (14) sample locations such as an existing primary substation, new primary substations, schools, hospitals, parks and places along main roads were selected to measure the noise levels (Figure 1-3.3). Noise levels were measured every minute for 30 minutes in the morning, afternoon, and night respectively. These were computed into daytime and nighttime averages per site. Figure 1-3.9 shows results of daytime and nighttime averages of noise measured at the sample locations. Table 1-3.13 shows the noise level standard of IFC (International Finance Corporation). Because the physical conditions of some of the sample locations such as the substations, schools, and parks, are basically the same in the dry and rainy seasons, and the road conditions and traffic volumes on the main roads, which are some of the sample locations, are basically the same in the dry and rainy seasons, the noise levels are basically the same in the dry and rainy seasons. Therefore, noise measurement was not conducted in the rainy season.

Among all sample locations, N5, N6, N9, N10, N11, and N12 are located along main roads. Therefore, these locations fall under the Industrial and commercial receptors for the IFC noise standard. When the IFC noise standard is applied, N5 (daytime, nighttime) is below the standard, while N6 (daytime, nighttime), N9 (nighttime), N10 (daytime, nighttime), N11 (daytime) and N12 (daytime) are above the standard. The other eight locations (N1, N2, N3, N4, N7, N8, N13, N14) fall under the Residential, Institutional, and Educational receptors for the IFC noise standard. When the IFC noise standard is applied, all of these locations exceed the standard.

No baseline survey for vibration was conducted because the use of hydraulic hammers and vibrating type machinery and blasting operations are not expected during the construction phase.



IFC (1): Daytime standard for Residential, institutional, educational receptors.
IFC (2): Nighttime standard for Residential, institutional, educational receptors.
IFC (3): Daytime and nighttime standards for Industrial, commercial receptors.
Source: JICA Survey Team

Figure 1-3.9 Daytime and Nighttime Averages of Noise Levels at Sample Locations

Table 1-3.13 IFC Noise Level Standard

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational[1)]	55	45
Industrial; commercial[2)]	70	70

1) Tombo primary substation and all secondary substations of the Project fall in Residential.
2) York primary substation of the Project falls in Industrial (road).
Source: IFC General Environmental, Health, and Safety (EHS) Guidelines

1-3-2-2.4 Social Conditions

In order to understand the social conditions around the project site, a survey was re-commissioned to a local consultant. The survey was conducted only in the dry season. Table 1-3.14 shows the results of the survey conducted by the local consultant on the status of the main community infrastructure in the project site.

Table 1-3.14 Main Community Infrastructure in the Project Site

Community Name	Approx. no. of Houses	Main Source of Drinking Water	Other Sources of Water	No. of Pre & Pri. Sch	No. of Sec. Sch (JSS&SSS) & Tertiary Institutions	Type of Health Facility	No. of Churches & Mosques	Type(s) of Cultural site on Row	Other Community Infrastructure
Adonkia (including SLBC drive, Battalion, Metschem, Angola town, New Jersey, Emergency and Bango Farm)	500	Pipe Borne		7+	2+	CHC Hospital	15+		Market
Mile 13 Community	682	Pipe Borne	Stream	3	2	Hospital	7		Bar/Restaurant Hotel
Tombo Community	1705	Pipe borne/ Hand Pump	Well	2+	2+	CHC	4+		Market Radio station Community center Bar/Restaurant Hotel
Big Water	68	Stream		2	0	0	5		None
PWD Compound	341			2	0	CHC	4		None
Mammah Beach	682			4	1	CHC	6		Community centre Bar/Restaurant Hotel
Kosso Middle Town	91	Stream							None
Number 2 River Community	227	Pipe Borne		1	1		6		Bar/Restaurant Hotel
York Village	227	Pipe Borne		1	2	Hospital	4+		Community centre Bar/Restaurant Hotel
Kerry Town	100	Hand Pump							None
Mambo Community	795	Pipe Borne		5+	3+	CHC			Market Bar/Restaurant
Samuel Town	68	Hand Pump		6	4	Hospital	13		Community centre
During	91	Pipe Borne		2	0		5		Bar/Restaurant
John Obey	307	Hand Pump	Stream	1	1	CHC	6		Community centre
Macdonald	227	Stream	Well	2	2	CHC Hospital	6+		Market Community center Bar/Restaurants

Community Name	Approx. no. of Houses	Main Source of Drinking Water	Other Sources of Water	No. of Pre & Pri. Sch	No. of Sec. Sch (JSS&SSS) & Tertiary Institutions	Type of Health Facility	No. of Churches & Mosques	Type(s) of Cultural site on Row	Other Community Infrastructure
Black Johnson	68	Stream	Well	0	0	0	3		Community centre Hotels Bar/Restaurants
Ogoo Farm Community	1022	Hand Pump	Wells	4	1	CHC	11+		Market Bar/Restaurants
Russel	68	Stream	Well	2	1	0	3		Hotels Bar/Restaurants
Boyoh Village	68	Stream	Well	1	1	0	3		Bar/Restaurants
Madina	114	Stream	Well			None			None
Hamilton	1023	Pipe borne	Stream	7	3	Hospital	9+		Market Community center Bar/Restaurant
Kissy Town	80	Stream	Well	2	2	CHC	3		Bar/Restaurant Hotel
Baw Baw Community	170	Stream	Well	1	1	None	5		Community centre Bar/Restaurant Hotel
George Town	80	Stream	Well			None			None
Tokeh Community	386	Stream	Well	2	1	CHC Hospital	9		Community centre Bar/Restaurant Hotel
Lakka Community	795	Pipe Borne		7	3	CHC Hospital	15+		Community centre Bar/Restaurant Hotel
Sussex	341	Stream	Well	2	2	CHC	4+		Community centre Hotel Bar/Restaurant
Kent	150	Stream				None			None

Source: JICA Survey Team

The survey was adopted through multiple data collection approaches, including primary and secondary data. Secondary data was collected from the Freetown City Council, Western Area Rural District Council (WARD C), Statistics Sierra Leone, World Bank, WHO and other sources. Most importantly, primary data was collected from residents of 35 community resettlements shown in Table 1-3.14 using a structured questionnaire. Participants of 589 households in total were randomly selected from the total estimated number of households (1,873). Questionnaires were administered to 589 participants representing households within the communities surveyed. 562 households, representing 95.4% of all 589 households, took the interview. About half (49%) of the questionnaires were administered to household heads, 24% to spouses of household heads, and the remainder (27%) were to their parents, siblings or children. A questionnaire was designed, and later coded into Kobo Collect Toolbox. Kobo Collect Toolbox is an open-source tool for mobile data collection. It allows researchers to collect data in the field using android enabled mobile phones and tablets. Before participating in the survey, all participants gave their informed consent. The informed consent highlighted the purpose of the study and detailed observance of confidentiality of data collected.

The results of the survey are presented in Appendix 14 Environmental, Social, and Health Impact Assessment (ESHIA) Report. The main results of the survey results are described below.

(1) Gender of Household Head

78% of households are male-headed, with a significant proportion (22%) of households headed by females. The 22% of female-headed households could mean a little high vulnerability to economic shocks for this population within the rural population of Western Area.

(2) Age of Household Head

Table 1-3.15 shows that quite a significant proportion (90.3%) of household heads interviewed fall within the active working-age cohort (19–59yrs). The increased proportion of households with members above the age of 19 suggests that the surveyed communities have got potentially available labour.

Table 1-3.15 Age of Household Head

Age of Household Head	Household	Percentage
19 to 29 years	58	10.32
30 to 39 years	163	29.00
40 to 49 years	178	31.67
50 to 59 years	109	19.40
60 to 69 years	46	8.19
70 & above	8	1.42
Total	**562**	**100.0**

Source: JICA Survey Team

(3) Marital Status of Household Head

Table 1-3.16 shows that 65.3% of household heads are married.

Table 1-3.16 Marital Status of Household Head

Marital Status	Household	Percentage
Married	367	65.30
Single	94	16.73
Co-habiting	46	8.19
Widowed	32	5.69
Divorced/Separated	23	4.09
Total	**562**	**100.0**

Source: JICA Survey Team

(4) Households in a House

As shown in Table 1-3.17, the survey result indicates that about 66.7% of houses in the study population are occupied by one household, two households occupy 13.0%. Three or more households occupy 12.1%. According to the 2015 Census, Western Area has an average of 1.9 households per house as opposed to 1.6 national averages. The large number as houses with one household is a result of the fact that most of the communities in the study area are emerging communities.

Table 1-3.17 Households in a House

No. of Households in a House	Household	Percentage
One household	375	66.7
Two households	73	13.0
Three households	40	7.1
More than three households	68	12.1
No Response	6	1.1
Total	**562**	**100.0**

Source: JICA Survey Team

(5) Education and Labour Profile

Table 1-3.18 shows that only 15.3% have at least attained tertiary education or have been admitted to the tertiary education system. The low proportion of people with higher education in the communities surveyed could imply a scarcity of skilled technical labour and a high likelihood of a variety of active informal revenue and livelihood activities in the communities.

Table 1-3.18 Education Status of Household Head

Education Status	Household	Percentage
Arabic education	37	6.6
Primary school level	43	7.7
Junior secondary school level	85	15.1
Senior secondary school level	188	33.5
Tertiary level	86	15.3
Vocational school	19	3.4
Never went to school	102	18.1
No response	2	0.3
Total	**562**	**100.0**

Source: JICA Survey Team

Households (306 HH) with children of primary school-going age (6 to 12 years) were asked whether their children were enrolled in primary school. 97.4% reported that all their children were enrolled in primary school, while 2.6% or 8 respondents claimed that not all their children are in primary school. Those who reported that their children were not in school were asked to give reasons. The reasons were that either the cost of school materials (such as uniforms, shoes, bags, and books) is not affordable or there is no primary school in the community. The national dropout rate at the primary school level is 0.6%. The GoSL has in August 2018 launched the Free Quality School Education (FQSE) initiative that provides free admission and tuition to all children in government-approved schools.

Households (494 HH) with children of secondary school-going age (13 to 18 years) were asked whether all their children were enrolled in secondary school. Data show that a significant proportion (12.8%) of households has at least one child who has dropped out of school. Those who reported that their children were not in secondary school were asked to give reasons. The responses revealed that about 47.6% are not in school because parents could not afford other costs associated with secondary school education (books, uniform, bag, shoes and daily lunch). 15.9% assist households in trading and other income-generating activity and 9.5% are engaged in commercial bike riding. 6.3% blamed

it on the absence of secondary schools in the community.

(6) Religion of Household Head

The Muslim religion predominates the study area, accounting for 64%, with Christianity accounting for 35% of households surveyed.

(7) Ethnicity and Language

Table 1-3.19 shows the ethnicity of household. Eminent ethnic groups in the project area include Temne, Mende, Limba, and Krio. The Temnes are the dominant ethnic group in the project area, and this ethnic group makes up over one-third of the population (38.6%). The official language of Sierra Leone is English, although Krio is spoken by 90% of the country's population and by 10.5% as a mother tongue. However, within the project area, the most frequently spoken language is Krio. And over 98% of residents surveyed are nationals of Sierra Leone, with less than 2% foreign nationals

Table 1-3.19 Ethnicity of Household

Ethnicity of Household Head	Household	Percentage
Temne	217	38.6
Mende	92	16.4
Limba	65	11.6
Krio	47	8.4
Fula	36	6.4
Sherbro	25	4.4
Madingo	20	3.6
Loko	16	2.8
Kono	14	2.5
Susu	9	1.6
Koranko	8	1.4
Kroo	1	0.2
Foreign Nationals (Nigerian, Guinea & Lebanese)	9	1.6
No response	3	0.5
Total	**562**	**100.0**

Source: JICA Survey Team

(8) Household Head Community Tenancy

According to the field survey, a large proportion (73%) of households surveyed indicates that they were not born in the communities but had moved in from mostly the north and other parts of the western area. As shown inTable 1-3.20, the most eminent and evident reasons for households moving to the communities is for accommodation purposes (56.1%) followed by employment (20.1%) and trading (11.1%). Of these, 61.3% have stayed between 1 to 10 years, 22.6% have stayed between 11 to 20 years, and 11.3% have stayed between 21 to 30 years. A large percentage of residents to have stayed for 1 to 10 years which is in line with the reality that most of the Project area settlements are emerging.

Table 1-3.20 Non-indigenous Household Residence Period in Community

Years Stayed	Household	Percentage
1 to 10 years	250	61.3
11 to 20 years	92	22.5
21 to 30 years	46	11.3
31 to 40 years	15	3.7
41 to 50 years	5	1.2
Total	**408**	**100.0**

Source: JICA Survey Team

(9) Housing/Dwelling Type

As shown in Table 1-3.21**,** more significant proportion (42.3%) of the households surveyed live in standard concrete houses (one flat and story buildings), 6.0% live in houses built of mud and not plastered with cement. 23.7% live in mud houses plastered with cement. However, about 95% of these dwelling units have either concrete floors or tiles.

Table 1-3.21 Housing/Dwelling Type

Housing/Dwelling Type	Household	Percentage
Board house	1	0.2
Concrete house with cast iron (CI) roof	238	42.3
Container	3	0.5
Mud house not plastered with cement & CI roof	34	6.0
Mud house plastered with cement & CI roof	133	23.7
Pan body	122	21.7
Story building	25	4.5
Unfinished house	2	0.4
No response	4	0.7
Total	**562**	**100.0**

Source: JICA Survey Team

(10) Livelihood and Economic Profile

The dominant primary income-generating activity within the project area is trading (41.3%) followed by those who claimed to be self-employed (19.2%). Fishing activities account for 10.9%, and those that are not engaged in any for MOF income-generating activity (for the purpose of this survey, refers to as the unemployed) account for 6.4%. The high proportion of households' dependency on trading and other forms of informal income-generating activities could be attributed to the low proportion of households that have attained tertiary or post-secondary education (Table 1-3.22)

Table 1-3.22 Occupation of Household Head

Main Occupation	Household	Percentage
Administrator	8	1.4
Civil servant	17	3.0
Commercial Bike Rider	14	2.5
Dairy Labour	23	4.1
Farming	18	3.2
Fishing	61	10.8
Health worker	2	0.4
Imam	1	0.2
Local Government	3	0.5
NGO Worker	4	0.7
Quarry	11	2.0
Retired	2	0.4
Sand Mining	2	0.4
Self-employed	108	19.2
Teaching	17	3.0
Trading	232	41.3
Unemployed	36	6.4
No response	3	0.5
Total	**562**	**100.0**

Source: JICA Survey Team

As shown in Table 1-3.23, a greater proportion (22.2%) of the household heads surveyed on average earn between Le 401,000 to Le 800,000 monthly. 16.4% earn on average between Le801,000 - Le1

million and Le1100,000 - Le2 million on monthly basis. Only one respondent claimed to earn above 8 million Leones monthly. The low-income level (less than 1.5 million Leones (approx. USD1,360) monthly) of a household could be likely associated with the type of income-generating activities undertaken by the households.

Table 1-3.23 Average Income Distribution among Household Heads

Average Monthly Income from Main Occupation	Household	Percentage
Up to Le200,000	49	8.7
Le201,000 – Le400,000	56	10.0
Le401,000 – Le800,000	125	22.2
Le801,000 – Le1,000,000	92	16.4
Le1,100,000 – Le2,000,000	92	16.4
Le2,100,000 – Le3,000,000	71	12.6
Le3,100,000 – Le4,000,000	33	5.9
Le4,100,000 – Le8,000,000	11	1.9
Above Le8,000,000	1	0.2
No response	32	5.7
Total	**562**	**100.0**

Source: JICA Survey Team

(11) Health and Health Facility

As shown in Table 1-3.24, Malaria is reported as the most prevalent disease (about 48.8%), followed by Cold/cough/flu (26.3%), Eye irritation (8.2%), and typhoid (4.8%) in the study communities.

Table 1-3.24 Community/Household Disease Prevalence

Diseases	Household	Percentage
Malaria	274	48.8
Diarrhea/dysentery	24	4.3
Skin diseases/rash	13	2.3
Cold, cough and/or flu	148	26.3
Vomiting/stomach problems	6	1.1
Typhoid	27	4.8
Sucking blood (leach)	1	0.2
Worm infection	20	3.5
Eye irritation	46	8.2
Anemia	3	0.5
Total	**562**	**100.0**

Source: JICA Survey Team

Only a minimal number of the households interviewed (8.87%) reported having a health facility in their communities.

As indicated in Table 1-3.25, more than half (64.4%) of the households interviewed reported seeking medication from hospitals whenever they fell sick. Second to the hospital is the Community Health Center (CHC), which accounts for 23% of households. This, therefore, reveals that access to hospitals or community health centers in the study area is not a challenge. However, required facilities and staff capacity need to be given adequate attention, as the proposed project is likely to mount pressure on land and other current facilities as a result of a large influx of people from all around the city.

Table 1-3.25 Medication Preferences for Household

Medication Preferences	Household	Percentage
Community Health Center (CHC)	129	23.0
Drug peddler	50	9.0
Hospital	362	64.4
Pharmacy	7	1.2
Traditional doctor/healer	7	1.2
No response	7	1.2
Total	**562**	**100.0**

Source: JICA Survey Team

(12) Potable Water

As indicated in Table 1-3.26, about 42.7% of the households in the study area rely primarily on pipe-borne water for domestic and drinking purposes, and 25.5% mainly rely on open wells. About 30.6% rely on other water sources that include water from hand pump wells and streams/rivers.

Table 1-3.26 Main Source of Drinking Water for Household

Main Sources	Household	Percentage
Hand pump well	80	14.2
Open well	143	25.5
Pipe borne water	240	42.7
Stream/river	92	16.4
No response	7	1.2
Total	**562**	**100.0**

Source: JICA Survey Team

An overwhelming majority (89%) of household heads reported good water quality. Those who claim that the water quality is poor allege that it has a bad flavor or color, particularly during the dry season.

The average distance to a drinkable water source for families in the surveyed region is 90.5 m, according to survey data. It means that, regardless of supply frequency, most households in the surveyed area have improved access to drinkable water sources. Results from the analysis show that the majority (67%) of the households have their water source within their compound or neighboring compound.

(13) Waste Management

The survey data indicates that over one-third of households in the study communities dispose of their solid waste by burning (39.2%) and about one-fourth throw in the bush (Table 1-3.27). Only one-fifth (22.4%) dispose of their waste through commercial waste collectors. The data shows that households surveyed do not practice environmentally friendly and sustainable waste management. And there are no landfill facilities within the project area, but one landfill site in Waterloo is the closest to the project site.

Table 1-3.27 Waste Disposal Method by Household

Disposal Method	Household	Percentage
Burn	220	39.2
Throw in the bush	151	26.9
Throw in the sea/stream	30	5.3
Used to make compost	26	4.6
Waste disposal company (e.g., MASADA)	126	22.4
No response	9	1.6
Total	**562**	**100.0**

Source: JICA Survey Team

(14) Sanitation: Type of Toilet Facility used by Household

The traditional pit latrine is the most common toilet facility within the project area (Table 1-3.28). It is reportedly used by 34.9% of households, followed by the flush (30.8%) and the ventilated improved pit latrine (19.6%) available within their premises.

Table 1-3.28 Type of Toilet Facility used by Household

Type of Toilet	Household	Percentage
Bucket	9	1.6
Bush	46	8.2
Flush	173	30.8
Stream/river	21	3.7
Traditional pit latrine	196	34.9
Ventilated pit latrine	110	19.6
No response	7	1.2
Total	**562**	**100.0**

Source: JICA Survey Team

(15) Household's Energy Source for Cooking

As shown in Table 1-3.29, over half (56%) of households in the study area use charcoal, and over one-third (37%) use wood. The proposed project will likely impact these energy sources as residents will have access to safer energy sources for household use - cooking and warming homes.

Table 1-3.29 Household's Energy Source for Cooking

Sources for Cooking	Household	Percentage
Charcoal	315	56.0
Wood	208	37.0
Gas	28	5.0
No response	11	2.0
Total	**562**	**100.0**

Source: JICA Survey Team

(16) Energy Source for Lighting

Table 1-3.30 indicates that over one-third (39.5%) of households surveyed use a flashlight to light homes at night. Only about one-fourth (27.6%) use the EDSA light. Communities such as Adonkia, Emergency, New Jersey, Bango Farm, Ogoo Farm Lakka, Hamilton are connected to the national grid. The proposed project will improve these energy sources as every household along the project route that is able and willing to be connected will be connected to electricity.

Table 1-3.30 Energy Source for Lighting

Sources for Lighting	Household	Percentage
EDSA	155	27.6
Electricity from generator	61	10.8
Flashlight	222	39.5
Private solar light	120	21.4
No response	4	0.7
Total	**562**	**100.0**

Source: JICA Survey Team

(17) Historical Site

The only known historical site in the project area is a relic of an old bus station at York Village (Figure 1-3.10). The bus station was constructed by the Sierra Leone Road Transport Cooperation in the mid-1940s to shelter passengers who waited for the government bus during the raining season. The stone monument shown in the photo on the right of the figure was installed under the WAPFoR Project (Western Area Peninsula Forest Protection Project), which was implemented jointly by the Government of Sierra Leone and EU from March 2009 to February 2014. This site will host a secondary substation. However, construction shall not impact this asset.

Source: JICA Survey Team

Figure 1-3.10 Relics of Old Bus Stop site in York Village

1-3-2-2.5 Result of Confirmation of Five Conditions for Exceptionally Implementing a Project in Conservation Area

The project site is adjacent to the Western Area Peninsula National Park. Therefore, confirmation on the five conditions, which are described in the Answers to Frequently Asked Questions About JICA Guidelines for Environmental and Social Considerations, for exceptionally implementing the project in a conservation area were conducted. The results of the confirmation are shown in Table 1-3.31.

In the National Park, there is a chimpanzee sanctuary, Tacugama Chimpanzee Sanctuary, which is run by an NGO.

Table 1-3.31 Result of Confirmation of Five conditions for Exceptionally Implementing a Project in Conservation area

Five Conditions	Results of Confirmation
(1) No feasible alternative plans shall be available in areas other than the area designated as such by the country and/or local governments by laws and/or ordinances to protect nature and Cultural heritage ("the Designated Area" hereinafter).	The distribution lines of the project will be constructed within the ROW of the existing Peninsula Highway outside of the National Park. According to 2-2-41-3-21-3-2-4 Comparison of the Alternatives, no alternatives exist other than the without project alternative.
(2) Development in the Designated Area shall be legally Acceptable by the host country's domestic laws.	1. In the "Environment Protection Agency Act", "National Protected Areas Authority and Conservation Trust Fund Act", "Forestry Act", and "Wildlife Conservation Amendment Act", there are no articles regarding development activities in the National Park. 2. EDSA submitted a Screening Form to EPA-SL on December 1, 2021. On December 7, 2021, EPA-SL issued a letter to EDSA stating that the project is categorized as Category B project according to the World Bank's categorization shown in Table 1-3.38 and EDSA is required to carry out an ESHIA (Environmental, Social, and Health Impact Assessment) study for the project. Then, after EDSA submitted an ESHIA report, Environmental and Social Management Plan, and Resettlement Framework to EPA-SL on April 11, 2022, EPA-SL reviewed them. EPA-SL is expected to issue an EIA License in October 2022. Accordingly, the project development is expected to be accepted by the Environment Protection Agency Act of Sierra Leone.
(3) Project proponents, shall comply with the laws, ordinance concerning the Designated Area and management plan of the protected zones:	EDSA is committed to compliance with laws, regulations, management plans and the like.
(4) Project proponents, shall form a consensus about project implementation with stakeholders including organizations responsible for managing the Designated Area, local communities through consultations.	1. On January 24, 2022, the National Protected Area Authority (NPAA) issued a letter to EDSA approving the implementation of the project. Some excerpts from the letter are as follows: "Based on the ground-truthing / field assessment and map data you provided, it pleases the NPAA to realize that all your operational areas are located in built-up areas. However, as a result of national development through electricity generation and distribution in the aforementioned communities, the authority hereby approves your operations in the said areas as referenced above." 2. From December 17, 2021 to February 16, 2022, Stakeholder meetings were held for the leaders and residents in 18 communities, as well as the police and the officials in Western Area Rural District Council. Residents expressed no opposition to the project, but rather expressed their expectations for the project's benefits. For more details, see "1-3-2-10 Stakeholder Meeting".
(5) Project proponents, shall perform additional programmes, where necessary, to ensure that the Designated Area is effectively managed for its conservation.	IFC's Performance Standards note the following: "Implementing additional programs may not be necessary for projects that do not create a new footprint." Since the distribution lines of this project will be constructed within the ROW of SLRA, the project is not expected to create a new footprint, i.e., environmental impact of human activities, in the construction phase. EDSA has already developed an Environmental and Social Management Plan (ESMP). In the ESMP, EDSA plans to conduct environmental monitoring programs in the construction and operation phases. If performing additional programs becomes necessary, EDSA will be responsible for performing them.

Note: Regarding the Tacugama Chimpanzee Sanctuary, a chimpanzee sanctuary located within the National Park, on a meeting with the JICA Survey Team on November 17, 2021, the Deputy Director of the National Protected Area Authority (NPAA) commented that the project site was quite far from the chimpanzee sanctuary, and therefore the project would not affect the sanctuary.

Source: JICA Survey Team

1-3-2-2.6 Result of Confirmation of the Three Conditions for Implementing a Project in an Area with Critical Natural Habitats

The JICA Guidelines stipulates that "projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests." Therefore, in this section, we follow the International Finance Corporation's Guidance Notes: Performance Standards on Environmental and Social Sustainability to confirm the applicability of critical natural habitats and then the "Answers to Frequently Asked Questions about the JICA Guidelines for Environmental and Social Considerations" to confirm the three conditions for implementing a project in an area with critical natural habitats.

(6-1) Confirming the applicability of critical natural habitats

According to the World Bank OP 4.04 Annex A, natural habitats are defined as land and water areas where (i) the ecosystems' bio-logical communities are formed largely by native plant and animal species, and (ii) human activity has not essentially modified the area's primary ecological functions. In addition, "Critical natural habitats" in the natural habitants are defined as areas extremely important in preserving biodiversity and/or maintaining key functions of the ecosystems, including the following:

- Habitats of significant importance to Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Near Threatened (NT) species, as listed in the IUCN (International Union for Conservation of Nature) Red List of threatened species or equivalent national approaches;
- Habitats of significant importance to endemic or restricted-range species;
- Habitats supporting globally or nationally significant concentrations of migratory or non-migratory species;
- Highly threatened or unique ecosystems;
- Areas associated with important evolutionary processes.

Here, based on the results of literature review and field survey, we confirmed whether or not the National Park is a critical natural habitat that is extremely important in preserving biodiversity and/or maintaining key functions of the ecosystems. The results of the confirmation are shown in Table 1-3.32.

Table 1-3.32 Result of Confirmation of Applicability of Critical Natural Habitats

Items	Results of Confirmation
(1) Habitat of significant importance to Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Near Threatened (NT) species, as listed in the IUCN (International Union for Conservation of Nature) Red List of threatened species or equivalent national approaches;	1) According to the aforementioned "1-3-2-2.1 Result of Confirmation of the National Park That is Specifically Designated for Conservation of Nature by GoSL", the National Park has been designated for conservation of nature by GoSL, and that the areas have also been designated by international organizations as an Important Bird Area (IBA) and an Important Key Biodiversity Area (KBA) for conservation of biodiversity. 2) According to 'Table 1-3.7 IUCN Red List Status of Threatened Species of Fauna and Flora in the National Park' described above, several species of fauna and flora are designated as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) and Near Threatened (NT). 3) The field survey identified 1 CR species (Hooded Vulture: *Necrosyertes monochas*), 1 EN species (White-bellied Pangolin: *Phataginus tricuspis*), 2 UV species of birds (*Ceratogymna elata, Picathartes gymnocephalus*) and 4 UV species of trees (*Afzelia Africana, Heritiera utilis, Terminalia ivorense, Milicia regia*). Species designated as CR, EN, VU and NT are listed in Table 1-3.33.
(2) Habitat of significant importance to endemic or restricted-range species	1) According to 'Sierra Leone's Second National Biodiversity Strategy and Action Plan 2017-2026' (NBSAP)[4] published by the GoSL in 2017, Sierra Leone has over 2000 species of vascular plants including 74 endemic to the West African sub-region. However, there is no description that these endemic species are observed or recorded in the National Park. 2) According to the NBSAP, there are about 170 species of mammals in Sierra Leone, but

[4] GoSL, 2017. Sierra Leone's Second National Biodiversity Strategy and Action Plan 2017-2026

Items	Results of Confirmation
	they are not endemic to Sierra Leone. 3) According to the NBSAP, a total of 642 species of birds have been identified in Sierra Leone, of which 15 species are endemic to the Upper Guinea forest area. However, there is no description that these endemic birds are observed or recorded in the National Park. 4) According to the NBSAP, the herpeto-fauna (reptiles and amphibian) diversity indicates a total of 122 species: 67species of reptiles and 55 species of amphibians. Among these species, 2 frogs are endemic to West Africa. However, there is no description that these endemic species are observed or recorded in the National Park. 5) The geographic scopes of birds, mammals and vegetation that are designated as CR, EN, VU and NT species shown in Table 1-3.33 were examined through the IUCN and GBIF (Global biodiversity Information Facility) websites. This shows that these birds, mammals and plants are distributed on a wide range including West Africa (Table 1-3.34). However, information on the geographic scope of one bird (Ciconia episcopus) is not available on the IUCN homepage.
(3) Habitat supporting globally significant concentrations of migratory or congregatory species	1) According to the NBSAP, among the 642 species of birds identified in Sierra Leone, 143 species are migratory ones. The migratory species are categorized into 96 species of Palearctic migrants and 47 species of Intra-African migrants. 2) According to the Fifth National Report to the Convention on Biological Diversity[5], only 10 species of Palearctic migrants visit the country with 1% of their biogeographic population. Palearctic migrants mainly depend on mangroves, and intertidal mudflats and sandflats for their survival during their migratory activities. The sites that potentially support significant population of Palearctic migrants are Sierra Leone River Estuary (the only designated RAMSAR Site in Sierra Leone) in the west, Yawri Bay in the west, Scarcies River Estuary in the north and Sherbro River Estuary in the south. In terms of the Intra-African migrants, only 2 species visit the country with 1% of their biogeographic population. Most Intra-African migrants depend on a diversity of wetland types for their survival, thus they are found in both inland and coastal wetlands. Some of the most important inland wetland habitats for Intra-African migrants include Mamunta-Mayosso Wild Life Sanctuary, Lake Mape, Lake Mabesi and the Sewa-Wange River system. However, the National Park is neither the site that potentially supports significant population of Palearctic migrants nor the site that potentially supports significant population of Intra-African migrants.
(4) Highly threatened or unique ecosystems	1) According to UNESCO[6], the National Park is part of the rainforests of West Africa. These forests extend from Senegal to Togo, and are referred to as the Upper Guinean forest block. The National Park is similar to Mount Nimba Strict Nature Reserve in Guinea and Côte d.'Ivoire, and Taï National Park in Côte d.'Ivoire. As they are all in the same eco-region, the three parks have many species in common such as chimpanzees. Since the Upper Guinea Forest block itself is a vast expanse, the National Park is not considered to be an area with highly threatened or unique ecosystems.
(5) Areas associated with important evolutionary processes	1) As mentioned above, the National Park is a small part of the West African tropical rainforest (the Upper Guinea forest block) that stretches from Senegal to Togo. Although detailed survey data is not available, its geography, size, and other factors suggest that the National Park is unlikely to fall into the following categories: isolated areas, areas of high endemism, landscapes with high spatial heterogeneity, environmental gradients, landforms with juxtaposition of soil types, and biological corridors with connectivity between habitats, as defined by the IFC's Guidance Notes: Performance Standards on Environmental and Social Sustainability.

Source: JICA Survey Team

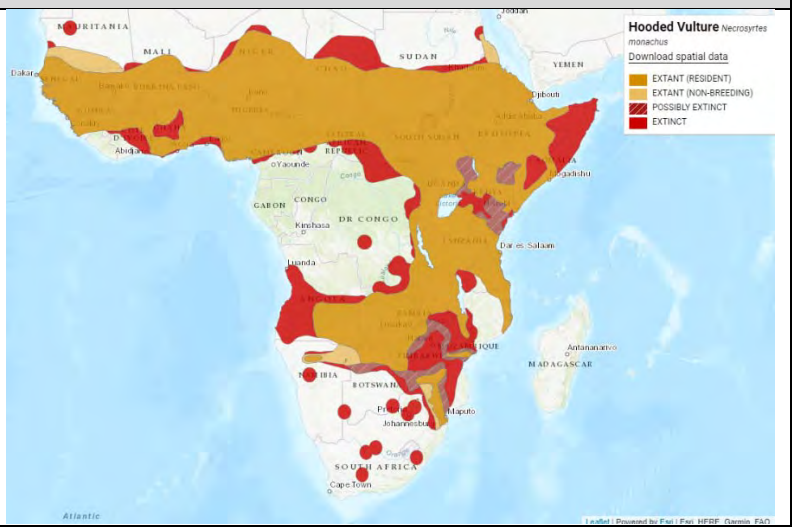
[5] GoSL, 2014. Fifth National Report to the Convention on Biological Diversity.
[6] https://whc.unesco.org/en/tentativelists/5741/

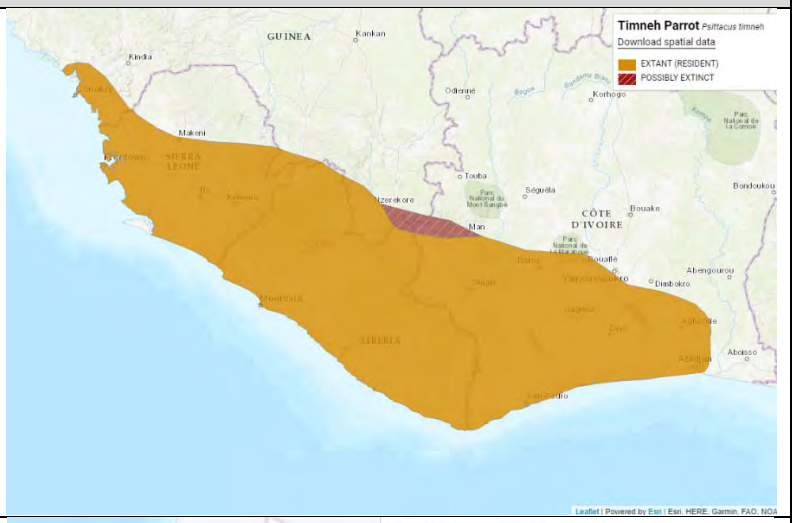
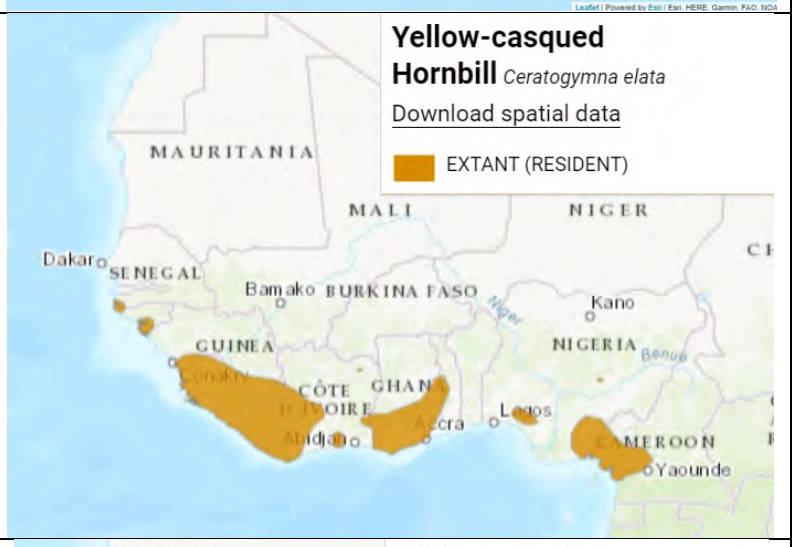
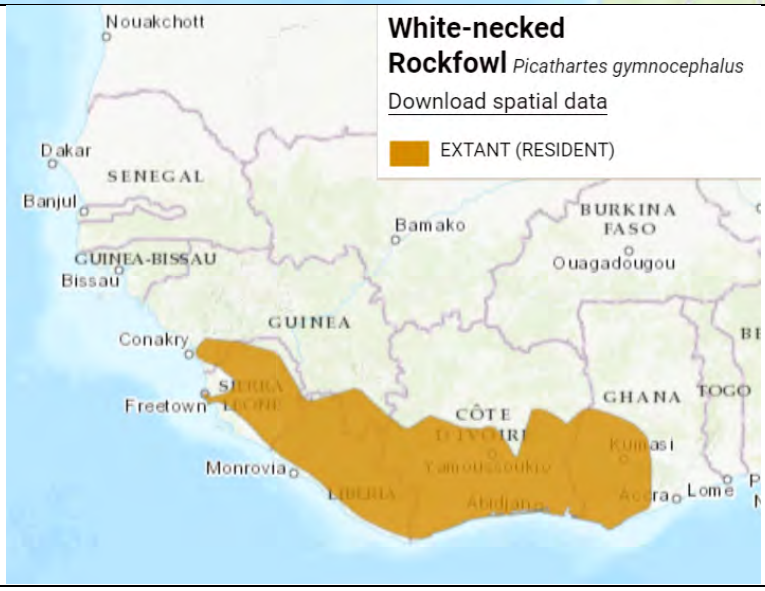
Table 1-3.33 Species designated as CR, EV, VU and NT in the National Park

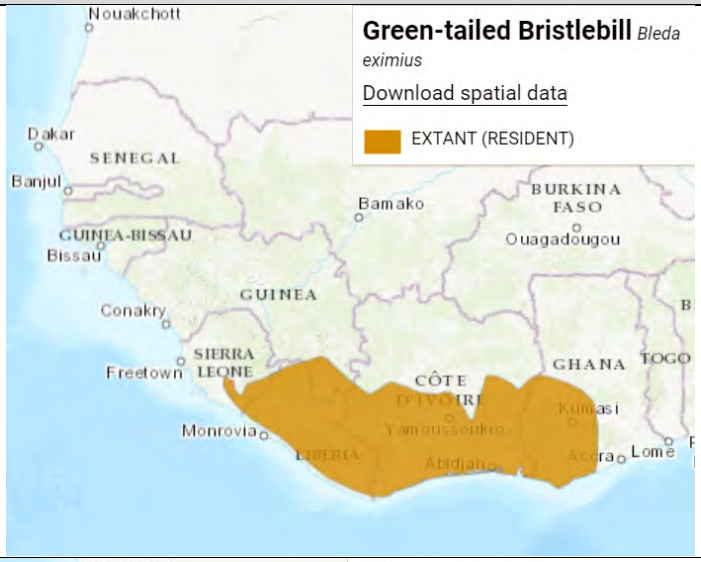
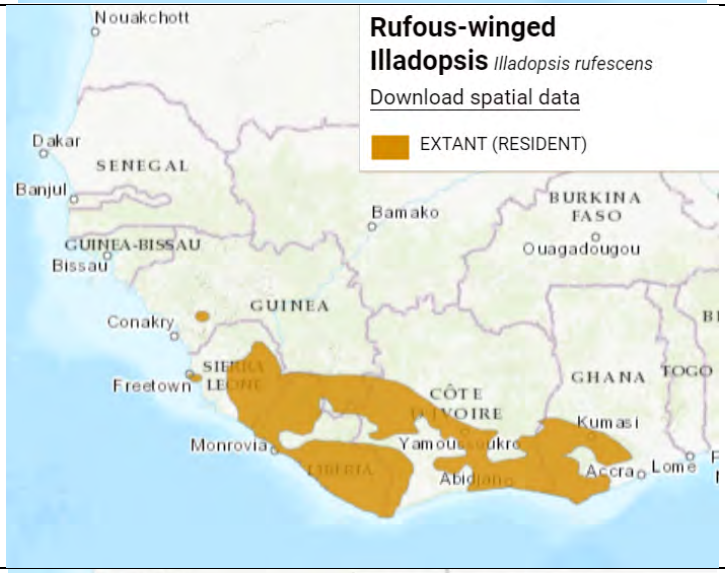
Fauna/Flora	Species	Name	IUCN Red List Status	Recorded in JICA Study
Birds	*Necrosyrtes monachus*	Hooded Vulture	CR	Yes
	Psittacus timneh	Timneh Parrot	EN	No
	Ceratogymna elata	Yellow-casqued Hornbill	VU	Yes
	Picathartes gymnocephalus	White-necked Rockfowl	VU	Yes
	Bleda eximius	Green-tailed Bristlebill	NT	Yes
	Illadopsis rufescens	Rufous-winged Illadopsis	NT	Yes
	Phyllanthus atripennis	Grey-hooded Capuchin Babbler	NT	Yes
	Ciconia episcopus	Wolly-necked Stork	NT	Yes
Mammals	*Phataginus tricuspis*	White-bellied Pangolin	EN	Yes
	Cephalophus jentinki	Jentink's Duiker	EN	No
	Pan troglodytes	Chimpanzee	EN	No
	Piliocolobus badius	Western Red Colobus	EN	No
Vegetation	*Triclisia macrophylla*	-	CR	No
	Tieghemella africana	Douka	EN	No
	Afzelia africana	Afzelia	VU	Yes
	Heritiera utilis	-	VU	Yes
	Terminalia ivorense	Black Afara	VU	Yes
	Milicia regia	-	VU	Yes

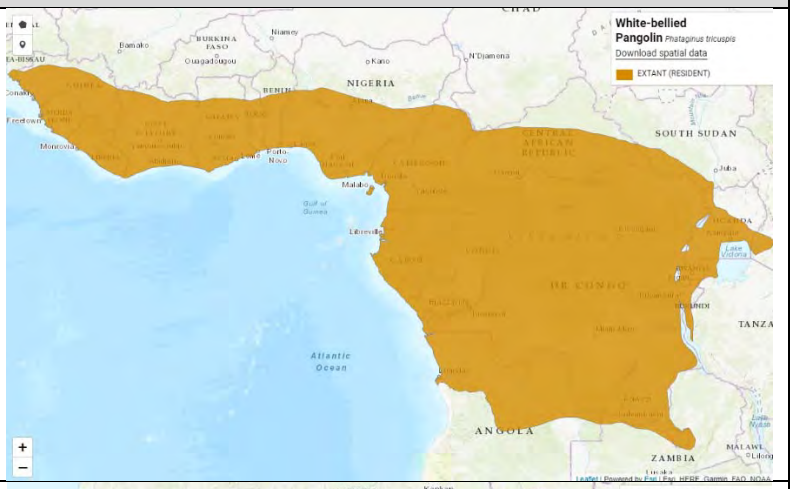
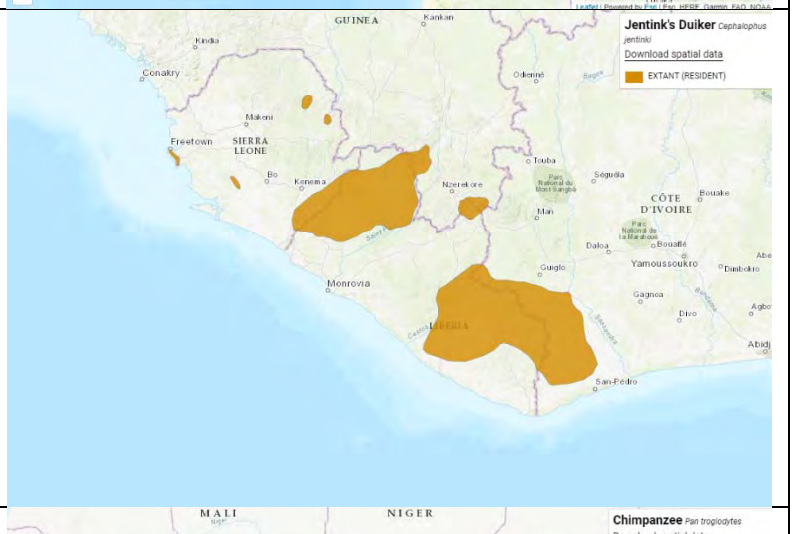
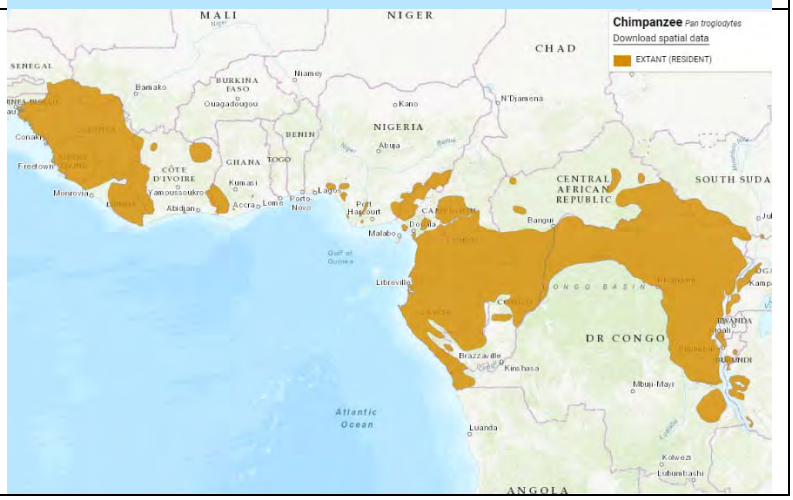
Source: JICA Survey Team

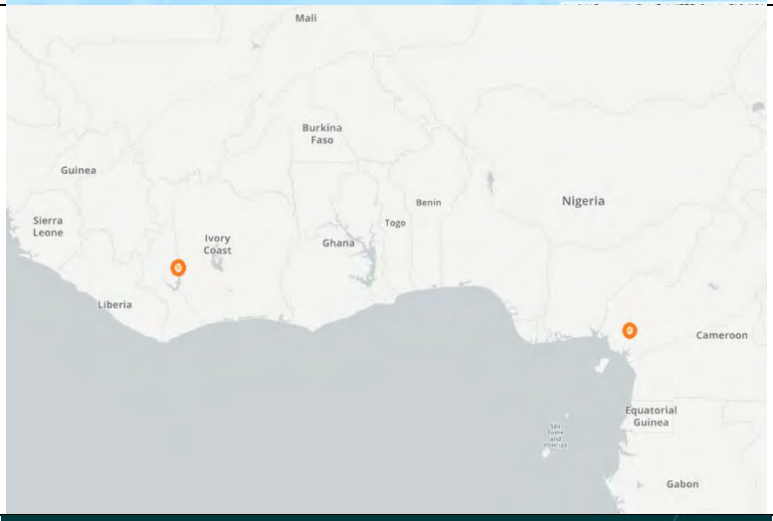
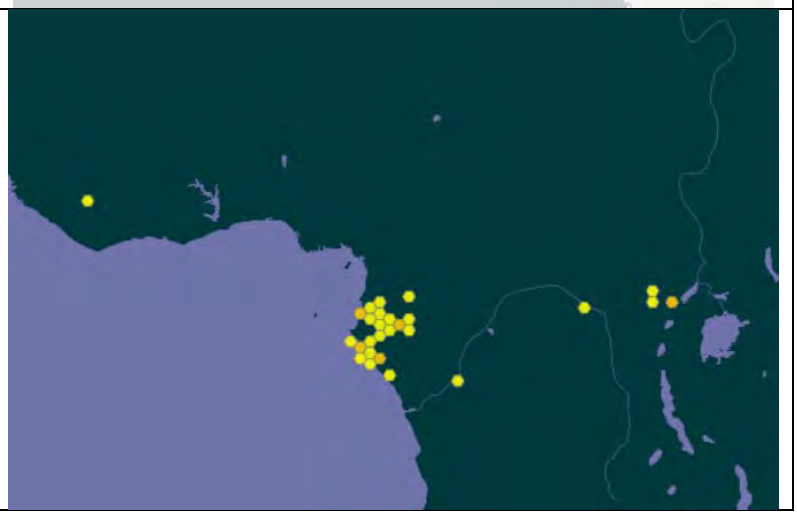
Table 1-3.34 Global Geographic Scopes of Birds, Mammals and Vegetation Designated as CR, EN, VU and NT Species

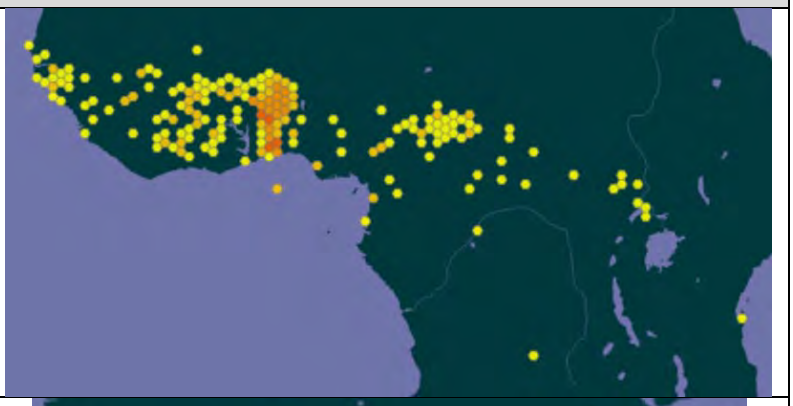
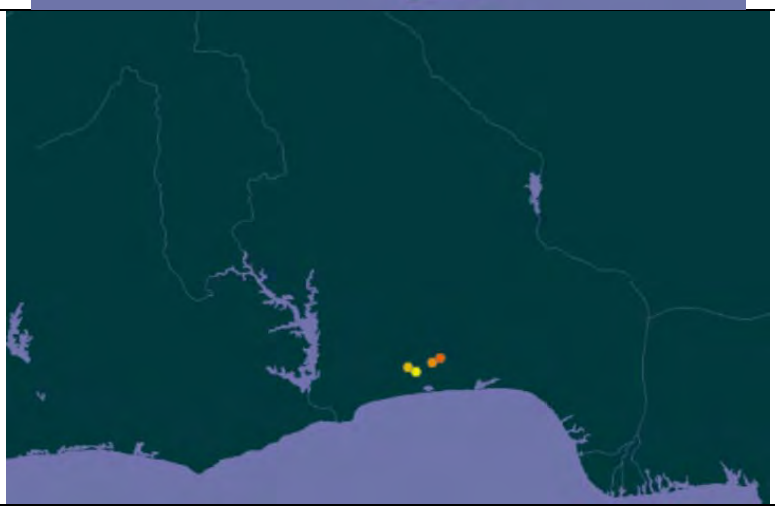
Species	IUCN Red List Status	Geographic Scope
Hooded Vulture	CR	

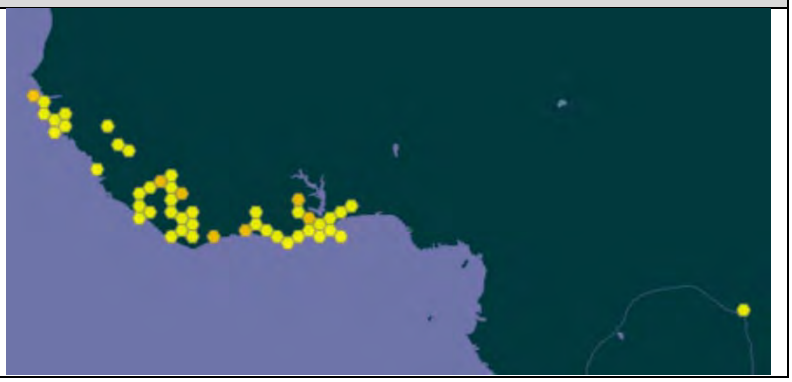
Species	IUCN Red List Status	Geographic Scope
Timneh Parrot	EN	
Yellow-casqued Hornbill	VU	
White-necked Rockfowl	VU	

Species	IUCN Red List Status	Geographic Scope
Green-tailed Bristlebill	NT	
Rufous-winged Illadopsis	NT	
Grey-hooded Capuchin Babbler	NT	

Species	IUCN Red List Status	Geographic Scope
White-bellied Pangolin	EN	
Jentink's Duiker	EN	
Chimpanzee	EN	

Species	IUCN Red List Status	Geographic Scope
Western Red Colobus	EN	
Triclisia macrophylla	CR	
Tieghemella africana	EN	

Species	IUCN Red List Status	Geographic Scope
Afzelia africana	VU	
Heritiera utilis	VU	
Terminalia ivorense	VU	

Species	IUCN Red List Status	Geographic Scope
Milicia regia	VU	

Note: Geographic information on the birds and mammals was obtained from the IUCN, and geographic information on the vegetation was obtained from the GBIF. For Triclisia macrophylla, specimens were collected at 14 sites, of which 3 (2 in Côte d'Ivoire (with same coordinates) and 1 in Cameron) had recorded coordinates. For Tieghemella africana, specimens were collected at 119 sites, of which 88 had recorded coordinates.
Source: JICA Survey Team

On the other hand, in the aforementioned definition of natural habitat, it is defined as land and water areas where "(ii) human activity has not essentially modified the area's primary ecological functions". According to the report by Catholic Relief Services & The Nature Conservancy[7], over the past several decades, there has been significant deforestation in the National Park and within the buffer zones of the National Park, causing severe damage to the ecosystem. Analysis of the Global Forest Cover Change (GFCC) Tree Cover dataset shows that from 2000 to 2015, 10,587 hectares of forest experienced some thinning or loss of canopy cover, equating to an overall loss of 2,103 hectares during the 15-year period. Urban expansion is the most serious driver of forest loss within the National Park (areas adjacent to the boundary). Additionally, illegal logging, fuelwood harvesting, and stone quarrying have been identified as causes of deforestation and degradation in the National Park. Although the areas adjacent to the project site are designated as a National Park and IBA/KBA, they have already been modified by human activities, and therefore, those areas are not considered as purely natural habitats.

Furthermore, from a social perspective, the National Park is not a place traditionally considered to be protected for the local communities.

(6-2) Confirming the three conditions for implementing a project in an area with critical natural habitats

According to the results of the confirmation described in (6-1), even though the National Park has been designated for conservation of nature by GoSL, and that the areas have also been designated by international organizations as an Important Bird Area (IBA) and an Important Key Biodiversity Area (KBA) for conservation of biodiversity, it is clear that the National Park does not definitely qualify as 'a habitat of significant importance to endemic or restricted-range species', 'a habitat supporting globally significant concentrations of migratory or non-migratory species', 'a highly threatened or unique ecosystem', and 'an area associated with important evolutionary processes'. In addition, the National Park is found that habitats in it do not qualify as critical natural habitats because they have already been converted by humans. But for clarification, the three conditions for implementing a project around the National Park with critical habitats were confirmed by interviewing two experts from 2 universities in Sierra Leone, who have knowledge of the ecosystem MOF the National Park, through an online method. Table 1-3.35 shows an outline of the interviews, and Table 1-3.36 shows the results of confirmation including the experts' comments.

[7] Catholic Relief Services & The Nature Conservancy, 2021, Western Area Peninsula Water Fund.

Table 1-3.35 Outline of Interviews to Experts

Date and Time (Tokyo Time)	Experts	Questions
Mar. 15, 2022 (Tue.) 17：00～17：45	Dr. Mohamed Lamin Sesay Chair of Biological Sciences Department School of Environmental Sciences Njala University	1. Are the critical habitats and key functions of the species of CR and EN in the National Park significantly different in dry seasons and rainy seasons? 2. Is it possible that the project shall exert significant adverse impacts on biodiversity values existing in "critical habitats" and key functions of the ecosystems? 3. Over a reasonable period of time, shall the project not cause net reduction in endangered species population? How to decide the reasonable period of time? 4. Are the mitigation measures to be conducted in the construction and operation phases feasible?
Mar. 28, 2022 (Mon.) 18：00～19：00	Dr. Arnold Okoni-Williams Senior Lecturer in Ecology and Conservation Biology Fourah Bay College University of Sierra Leone	

Source: JICA Survey Team

Table 1-3.36 Result of Confirmation of Three Conditions for Implementing a Project in Area with Critical Habitats

Three Conditions	Results of Confirmation
(1) Projects shall not exert significant adverse impacts on biodiversity values existing in "critical habitats" and key functions of the ecosystems (IFC's standards note: "Biodiversity values and their supporting ecological processes will be determined on an ecologically relevant scale.")	1) Currently, the species of fauna and flora in the National Park are very rich. Because the forests are generally stable, the habitats for fauna and flora are also stable. 2) Due to lack of data, the evaluation on whether the habitats and key functions of ecosysteMOF the species designated as CR and EN (e.g., Hooded Vulture) in the National Park differ significantly in the dry seasons and rainy seasons has not been conducted. Even though habitats change with the seasons and seasonal pattens are observed, because the habitats are stable in dry seasons and rainy seasons, respectively, it is unlikely that the Project which is implemented outside the National Park will cause a significant impact on the National Park. 3) At the end of the civil war, from 1998 to 1999, large numbers of people from all over the country migrated to Freetown. And the construction of the Peninsula Highway from Waterloo to Tombo started. Large amounts of forests in the buffer zone (within one mile outside the boundary of the National Park according to the National Protected Area Authority and Conservation Trust Fund Act) were fell down for housing development and road construction, resulting in degradation of the ecosystems not only in the buffer zone but also in the forested areas near the boundaries of the National Park. Since the project site falls in the buffer zone, it is unlikely that the Project will cause additional degradation of the ecosystems. 4) The distribution lines will be constructed on existing roads. Even though existing housing development, road construction, and traffic have already affected the habitats and the functions of ecosysteMOF fauna and flora, furthermore impacts of this project on biodiversity will not be expected.
(2) Over a reasonable period of time (based on experts' advice, etc., the period shall be determined for each project), projects shall not cause net reduction in endangered species population listed below: Species classified into "Critically Endangered (CR)" and "Endangered (EN)" out of	1) Currently, the species of fauna and flora in the National Park are very rich. Because the forests are generally stable, the habitats for fauna and flora are also stable. 2) As for the Chimpanzee, there is recorded data that proves that they are indeed living in the National Park. However, the chimpanzees would have fled deep into the forests to avoid human disturbance. Therefore, in recent years, they have not been witnessed outside the National Park at all. It is unlikely that this project in the buffer zone will cause net reduction in the chimpanzee population. 3) The Hooded Vulture is a high-flyer and a scavenger, so its home range of activity is very wide. Therefore, it is unlikely that this project will have an impact on the Hooded Vulture. 4) As for the Timneh Parrot, it is believed that no wild ones exist. On the other hand, they are traded as pets, and in a research conducted three years ago, they were witnessed in several pet stores in Aberdeen and York.

Three Conditions	Results of Confirmation
"Threatened" species listed on the IUCN Red List of Threatened Species, or those that fall under such classifications in accordance with the host country's rules and regulations.	5) As for the White-bellied Pangolin, the field survey reported that one was captured. It was said that this was the only time being captured in the last two years. Therefore, it is believed that the number of living White-bellied Pangolins is very small. If wide forested areas are lost due to construction works, it is concerned that the habitats of the White-bellied Pangolins may be fragmented. However, since the overhead line construction works for this project are conducted within the ROW of the existing roads, the habitats of the White-bellied Pangolins are not expected to be fragmented.
(3) Long-term and effective mitigation measures and monitoring shall be put in place be performed with regard to (1) and (2) above.	1) For the Project, based on the Environmental and Social Management Plan (ESMP), EDSA and the contractor will implement mitigation measures during construction and operation for environmental items (air pollution, water pollution, soil contamination, and noise) that are identified as having negative impacts. For details on mitigation measures, see Table 1-3.48 Mitigation Measures and Implementation Costs. In addition, based on the Environmental and Social Management Plan (ESMP), EDSA and the contractor will conduct monitoring during construction and operation for environmental items (air pollution, water pollution, soil contamination, and noise) that are identified as having negative impacts. For details on monitoring plan, see Table 1-3.49 Environmental Monitoring Plan. 2) The mitigation measures that will be taken in the construction and operation phases are highly feasible, regardless of the dry or rainy seasons. However, the long-term effects of the mitigation measures will need to be monitored over a long period. 3) The following mitigation measures to be implemented in the construction phase are important. • Educate construction equipment operators on potential noise issues and techniques for reducing noise emissions. • Restrict truck deliveries and construction works to daytime working hours for reducing light pollution in the night. • Prevent all solid and liquid wastes from entering waterways • Provide adequate knowledge to the workers regarding the protection of fauna and flora, and relevant government regulations and punishments for illegal poaching.

Source: JICA Survey Team

1-3-2-3 Legal and Institutional Frameworks for Environmental and Social Considerations

(1) Legal Framework for Environmental and Social Considerations in Sierra Leone

Legal framework relevant to environmental and social considerations in Sierra Leone is summarized in Table 1-3.37. According to the Constitution of Sierra Leone, every citizen is entitled to a healthy and safe environment and every person has the duty to protect, safeguard and promote the environment. Further, environmental laws and development policies and strategies promote proper environmental management system aimed at poverty reduction and sustainable development.

Table 1-3.37 Legal Framework Concerning Environmental and Social Considerations

Category	Name	Year
Constitution	The Constitution of Sierra Leone	1991
Environment	Environment Protection Agency Act	2008
	Environment Protection Agency Act Amendment	2010
EIA	Sierra Leone Electricity and Water Regulatory Commission Act	2011
	National Protected Area Authority and Conservation Trust Fund Act	2012
	Forestry Act	1988
	Wildlife Conservation Amendment Act	2021
	Factories Act	1974
Land Acquisition and	Public Lands Ordinance Law	1898
	National Lands Policy	2015

Category	Name	Year
Resettlement	Local Government Act	2004
	National Electricity Act	2011
	Sierra Leone Roads Authority Amendment Act	2010
	World Bank Operational Policy on Involuntary Resettlement	2001

Source: JICA Survey Team

(2) Institutional Framework for Environmental Impact Assessment

In terms of Environmental Impact Assessment (EIA), in Sierra Leone, the Environment Protection Agency (EPA-SL) is responsible for procedures concerning EIA. The Agency was established in December 2008 based on the Environment Protection Agency Act (2008) and under the jurisdiction of the Ministry of the Environment. The EIA implementation procedures are stipulated from Sections 23 to 39 in the Environment Protection Agency Act. Table 1-3.38 shows an outline of the Environmental Protection Agency Act.

EDSA uses World Bank safeguard policies as a benchmark to handle environmental and social aspects. The Environmental and Social Management Unit with only 2 staffs in EDSA is in charge of environmental and social considerations.

Table 1-3.38 Outline of the Environment Protection Agency Act

Establishment of the Environment Protection Agency (Sections 2-11)	Establishment and roles of committees; responsibilities and authority of the Director
Functions and management of the Environment Protection Agency (Sections 12-16)	Guidance to other government agencies, general coordination and liaison concerning the environment; authorization, cancellation, orders, procedures and warnings, etc. concerning environmental issues; issue of standards and guidelines, ensuring of compliance with EIA procedures; promotion of survey, research and development of environmental issues with secretariats of international conventions, other agencies and regional assemblies, etc.; monitoring, etc.
Organization of the Environment Protection Agency (Sections 17-22)	Establishment of the Chemical Control Department, Information, Education and Communications Department, Environmental Compliance Department, Interdepartmental and International Cooperation Department, Finance Department, and Administration Department
EIA (Sections 23-39)	EIA implementation procedure; First Schedule; Second Schedule; Third Schedule
Ozone layer depleting substances (Sections 40-52)	Management procedure
Miscellaneous (Sections 53-63)	Enforcement notice; financial security; legal proceedings; annual reports; regulations

Source: Prepared by JICA Survey Team from the Environment Protection Agency Act, 2008

(3) EIA Procedure in Sierra Leone

1) Legal Framework of EIA Procedure

The EIA implementation procedures are stipulated in Sections 23 to 39, in the Environment Protection Agency Act, as amended in 2010. EIA license registration is required in cases corresponding to projects prescribed under the First Schedule shown in Table 1-3.39. In such cases, it is necessary to apply for an EIA license to EPA-SL before the commencement of the project.

Table 1-3.39 First Schedule

(a)	Major change in use of renewable resources (for example, converting land for agricultural production, forests, pasture, rural development and timber production, etc.)
(b)	Major changes in agriculture and fisheries customs (for example, introduction of new species, large-scale mechanization and use of chemicals in agriculture)
(c)	Water resources development (for example, dam, drainage and irrigation projects, catchment basin development, water supply)
(d)	Infrastructure (for example, roads, bridges, airports, ports, transmission lines, pipelines, railways)
(e)	Industrial activities (for example, metallurgical plants, timber processing plants, chemical plants, power plants, cement plants, refining and petrochemical plants, agriculture)
(f)	Extraction industries (for example, mining, quarrying, extraction of sand, gravel, salt, peat, oil and gas)
(g)	Solid waste management and disposal (for example, sewerage systems and treatment plants, disposal sites, household and hazardous waste treatment plants)
(h)	Residential construction and development schemes
(i)	Establishment of entertainment facilities, car repair shops and welding plants
(j)	Importing of used cars

Source: Prepared by JICA Survey Team based on Environment Protection Agency Act (2008)

In cases where a project falls under one of the descriptions given under the First Schedule as shown in Table 1-3.39 the project proponent must make an application for an EIA license upon appending detailed information on the project. On receiving such an application, EPA-SL determines whether or not an EIA is required within 14 days. The factors for determining whether or not an EIA is required are prescribed under the Second Schedule shown in Table 1-3.40.

Table 1-3.40 Second Schedule

(a)	Environmental impact on the community
(b)	Project location
(c)	Will the project cause changes in the project area?
(d)	Will the project cause major changes to the ecosystem in the project area?
(e)	Will the project detract from the aesthetic, leisure, scientific, historical, cultural or environmental properties of the project area?
(f)	Will the project impart risk to the habitats and seeds of flora and fauna?
(g)	Project scale
(h)	Scope of environmental deterioration
(i)	Will the project lead to greater demand for natural resources in the project area?
(j)	Cumulative environmental impact of the project and other activities

Source: Prepared by JICA Survey Team based on Environment Protection Agency Act (2008)

In cases where an EIA is not required, the Director of the Environment Protection Agency notifies the applicant in writing. If an EIA is required, it is necessary to prepare and submit an EIA stating the information prescribed under the Third Schedule in Table 1-3.41.

Table 1-3.41 Third Schedule

(a)	Project location and surrounding area
(b)	Project principles, concept and purpose
(c)	Direct and indirect environmental impacts of the project
(d)	Potential social, economic and cultural impacts of the project affecting people and society
(e)	Communities, stakeholders and government agencies whose opinions have been heard
(f)	Countermeasures and means for averting, preventing, altering, mitigating or improving potential impacts on society and people
(g)	Alternatives to the proposed project
(h)	Natural resources in the target area used in the project
(i)	Project cancellation plan
(j)	Other information necessary for appropriately examining the latent environmental impacts of the project

Source: Prepared by JICA Survey Team based on Environment Protection Agency Act (2008)

The Environmental Protection Agency circulates the submitted EIA to corporate groups, associations, government agencies and NGOs, etc. in order to seek comments. Furthermore, it discloses the EIA to the general public via official gazettes and newspapers, etc. to invite further comment and examination. After receiving comments, it presents the EIA to the committee, which is composed of representatives from the following 10 agencies including the Ministry of the Environment:

1) Ministry of the Environment
2) Ministry of Local Government
3) Ministry of Mineral Resources
4) Ministry of Marine Resources
5) Ministry of Agriculture, Forestry and Food Security
6) Ministry of Tourism and Cultural Affairs
7) Ministry of Trade and Industry
8) Ministry of Transport
9) Ministry of Health
10) Petroleum Unit

This committee makes decisions on the following matters:

a) Issue of the EIA license
b) Request for additional information from the applicant within 21 days
c) Refusal of the EIA for imparting negative impacts on the environment, people and society

Following approval of the EIA, the committee instructs the Director to issue the license to the applicant. The Environment Protection Agency conducts monitoring in order to review the environmental impacts of all projects for which licenses are issued.

2) EIA Screening

Based on a Screening Form submitted to EPA-SL, EPA-SL will carry out screening and the project will be categorized. For projects requiring EIA, the fields of projects are broadly listed in the First Schedule as shown in Table 1-3.39; however, there are no quantitative criteria. Categorization is based on contents, location, characteristics and scope of impacts of each project. Because there is no clear laws and regulations on categorization in Sierra Leone, categorizing generally follows the categorization stated by the World Bank's OP 4.01-Environmental Assessment (1999) (Table 1-3.42).

Table 1-3.42 Categorization by Screening

Categorization	Definition
Category A	A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.
Category B	A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats - are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.
Category C	A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

Source: Prepared by JICA Survey Team based on WB OP 4.01-Environmental Assessment (1999)

3) Obtaining an EIA License for the Project

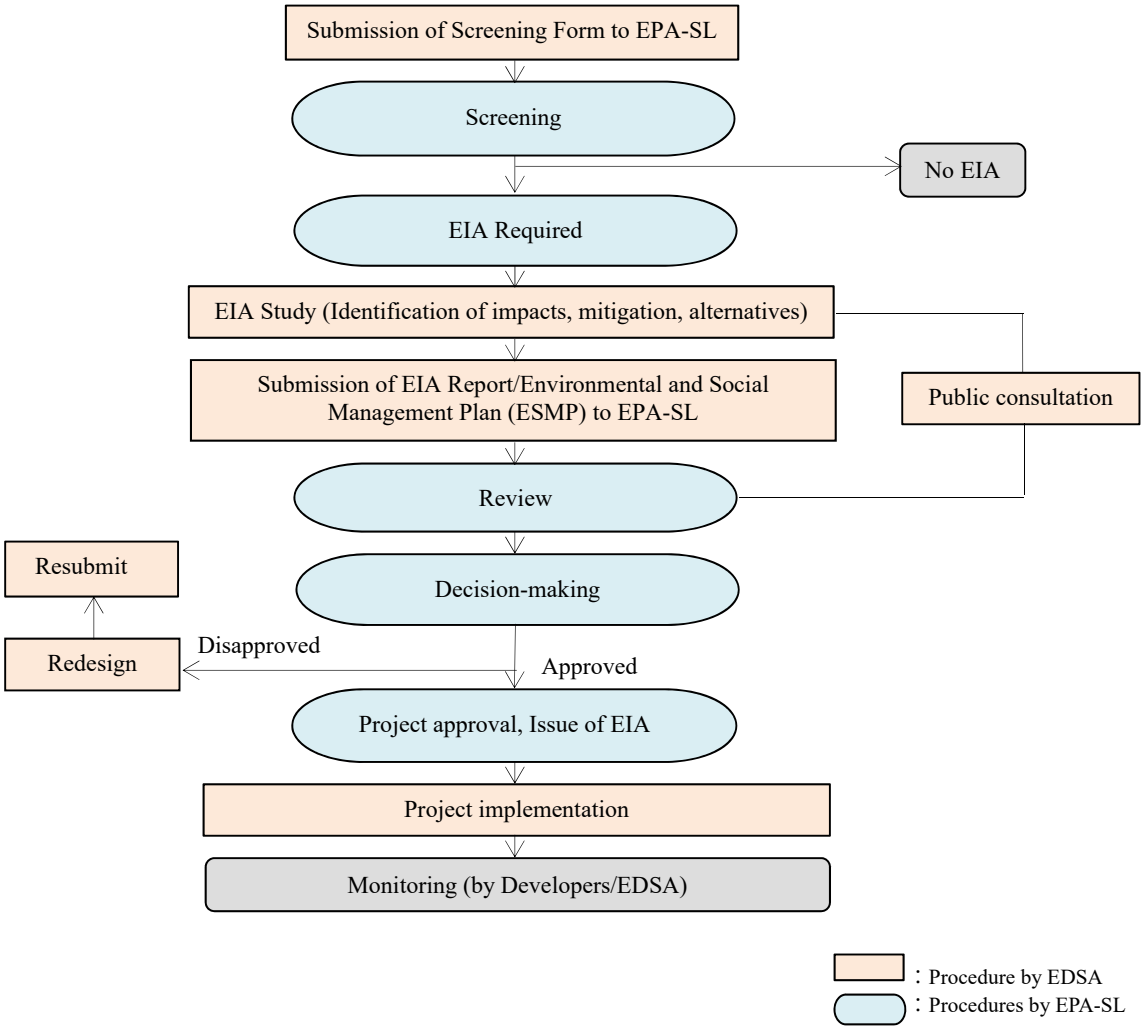
General EIA procedure in Sierra Leone is indicated in Figure 1-3.11. EDSA submitted a Screening Form to EPA-SL on December 1, 2021. On December 7, 2021, EPA-SL issued a letter to EDSA stating that the project is categorized as Category B project and EDSA is required to carry out an ESHIA (Environmental, Social, and Health Impact Assessment) study for the project. EDSA submitted an ESHIA report, an Environmental and Social Management Plan (ESMP), and a Resettlement Framework (RF) to EPA-SL on April 11, 2022. In terms of the EIA License, since EPA-SL requested EDSA to pay a license fee, according to an agreement reached by EDSA and EPA-SL, in late May 2022 EDSA applied for an integrated single license for two projects, this project and the World Bank's Enhancing Sierra Leone Energy Access Project (ESURP), both of which are to be implemented under the framework of the master plan for Western Area electrification of Sierra Leone. In early June 2022, EDSA applied to the Ministry of Finance through the Ministry of Energy for the license fee and a fund for the preparation and implementation of Abbreviated Resettlement Action Plan (ARAP). Furthermore, on July 29, 2022, EDSA issued a letter to JICA Sierra Leone Office, stating that "EDSA has substantially completed the confirmation of the contents of the environmental license with the EPA-SL, and the license is ready to be issued once the license fee is paid by the Ministry of Finance. EDSA will remind the Ministry of Finance to pay the license fee so that the license will be issued by the end of October 2022. JICA will be informed when it is obtained."

The processes to obtain an EIA License for the project are as follows:

- EDSA as the applicant begins the process by registering the project proposal through submitting an application with a filled screening form to EPA-SL. EPA-SL at this stage makes a decision whether an EIA is required or not and the project is categorized once an EIA is required.
- Upon approval of the screening form, EDSA is then informed that EDSA can proceed in conducting the EIA studies. At the end of the study, findings will be presented in an EIA report. This report is submitted to EPA-SL.
- EDSA prepares a detailed scoping report, which identifies the important issues, and a Terms of Reference (ToR) and summit them to EPA-SL.
- Once this report is approved, EDSA is requested to carry out a public disclosure meeting with concerned stakeholders to inform and consult with them. The outcome should be in-cooperated into the report. The completed report is finally submitted to the EPA-SL for a decision on the issuance of an EIA license.
- The project will proceed to the implementation stage if an EIA license is issued. Environmental Monitoring and Auditing of the project's activities, while it lasts, is undertaken to ensure that the terms and conditions of the EIA license issued are met in accordance with the EPA Act.

The table of contents of the Environmental, Social, Health Impact Assessment (ESHIA) report, as required by the Environment Protection Agency Act, is as follows:

1. Executive Summary
2. Introduction and Purpose
3. Policies, Legislative and Institutional Framework
4. Assessment of Alternative
5. Methodologies
6. Baseline Conditions
7. Impacts and Risk Assessment
8. Stakeholder Consultation and Public Disclosure
9. Environmental and Social Management Plan
10. Summary and Conclusions
11. References
12. Annexes- Full ESMP, questionnaire forms, consultation transcripts and more



Source: Prepared by JICA Survey Team based on ESDA report

Figure 1-3.11 Procedure for EIA in Sierra Leone

1-3-2-4 Comparison of the Alternatives

Analysis of the alternatives is shown in Table 1-3.43. Alternatives of the project components were examined from the viewpoints of natural and social environment and project cost. Accordingly, the proposed project, which can realize power supply through the construction of power distribution facilities, has the highest advantage, although this is a qualitative comparison.

With the 'without project' alternative, land acquisition and resettlement can be avoided. However, the power distribution facilities will not be installed to meet the increasing demand on the power in the Freetown City, and the stable power supply cannot be expected. This situation of unstable power supply will hinder economic development and improvement of living standards of people.

Table 1-3.43 Analysis of Alternatives (Primary substations and distribution lines)

Item	Alternative 1 (Proposed project)	Alternative 2	Alternative 3 （Without project）
Outline	• Primary substations will be constructed at the existing proposed construction sites. • All sections shall be overhead distribution lines.	• Primary substations will be constructed at the existing proposed construction sites. • All sections shall be underground distribution lines.	The proposed project will not be implemented.
Beneficiary effects on local residents	Stable power supply can be expected.	Stable power supply can be expected.	No beneficial effects on local residents are expected.
Consistency with urban development	Highly consistent.	Highly consistent.	It is not consistent with the urban development of Freetown City.
Impacts on natural environment	1) Air pollution. Due to the land leveling work at the primary substations in the planning phase and operation of heavy machineries during the construction works, temporary impacts on air pollution are expected. 2) Water pollution. In the construction phase, due to discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries, temporary impacts on water pollution are expected. 3) Soil pollution. In the construction phase, leakage of lubricants and other oils from construction equipment and vehicles may cause soil pollution. In the construction and operation phases, insulating oil will be used for transformers. It may cause soil pollution if leaked. 4) Noise. In the construction phase, temporary impacts are expected due to the operation of heavy machineries at primary substations. In the operation phase, transformers at Tombo substation may cause noise. However, these will be located away from the boundaries of the site. There are no sensitive receptors such as residential areas, hospitals or schools nearby. On the other hand, there is a possibility that low-flying birds may collide with the distribution lines in the operation phase.	1) Air pollution. Due to the land leveling work at the primary substations in the planning phase and operation of heavy machineries during the construction works, temporary impacts on air pollution are expected. 2) Water pollution. In the construction phase, due to discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries, temporary impacts on water pollution are expected. 3) Soil pollution. In the construction phase, leakage of lubricants and other oils from construction equipment and vehicles may cause soil pollution. In the construction and operation phases, insulating oil will be used for transformers. It may cause soil pollution if leaked. 4) Noise. In the construction phase, temporary impacts are expected due to the operation of heavy machineries at primary substations. In the operation phase, transformers at Tombo substation may cause noise. However, these will be located away from the boundaries of the site. There are no sensitive receptors such as residential areas, hospitals or schools nearby. On the other hand, no impact on the natural environment is expected in the operation phase.	No impact on the natural environment is expected.
Impacts on social environment	Since the overhead distribution lines are constructed within the ROW of the existing roads, resettlement and land acquisition are not expected. There will be impacts on traffic, etc. in the construction phase.	Since the overhead lines are constructed within the ROW of the existing roads, resettlement and land acquisition are not expected. There will be impacts on traffic, etc. in the construction phase. Converting overhead distribution lines to underground distribution lines is	No impact on the social environment is expected.

Item	Alternative 1 (Proposed project)	Alternative 2	Alternative 3 (Without project)
		expected to improve the landscapes on the roads and in some communities.	
Project cost	Compared with Alternative 2, the project cost is relatively low because there are no costs associated with the construction of underground distribution lines.	Compared with Alternative 1, the project cost is relatively very high due to the costs associated with the construction of underground distribution lines.	No project costs are incurred.
Beneficiary effects	◎	◎	×
Urban development	◎	◎	×
Natural environment	○	◎	◎
Social environment	○	◎	◎
Project cost	○	×	◎
Evaluation	◎ (Alternative 1 is recommended in terms of beneficiary effect, consistency with urban development, and project cost.)	× (Alternative 2 is not recommended in terms of project cost., even though there are advantages in terms of landscape, etc.,)	× (without project alternative is not recommended in terms of beneficiary effect and consistency with urban development.)

Source: JICA Survey Team

1-3-2-5 Scoping and TOR for Environmental and Social Considerations Study

(1) Scoping

The scoping was conducted as shown in Table 1-3.44, in consideration of the impacts caused by this project.

Table 1-3.44 Scoping

	No.	Item	Phase		Expected Impacts
			Planning Construction	Operation	
Pollution Control	1	Air Pollution	✓		Planning/Construction Phase: Due to the land leveling work at the Tombo and York substations and operation of heavy machineries during the construction works, temporary impacts on air pollution are expected.
	2	Water Pollution	✓		Construction Phase: Due to discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries, temporary impacts on water pollution are expected.
	3	Waste			Although the leveling is planned, large amount of waste soil will not be generated. The amount of domestic waste generated from worker's camp is small. Hence, no impact due to waste is expected.
	4	Soil Pollution	✓	✓	Construction Phase: Leakage of lubricants and other oils from construction equipment and vehicles may cause soil pollution. Construction/Operation Phase: Insulating oil will be used for transformers. It may cause soil pollution if leaked.

	No.	Item	Phase		Expected Impacts
			Planning Construction	Operation	
	5	Noise/Vibration	✓		Construction Phase: Temporary impacts of noises are expected due to the operation of heavy machineries at Tombo and York substations. Regarding vibration, the use of hydraulic hammers and vibrating type machinery and blasting operations are not expected. Operation Phase: Transformers at Tombo substation may cause noise. However, these will be located away from the boundaries of the site. There are no sensitive receptors such as residential areas, hospitals or schools nearby.
	6	Ground subsidence			No impact is expected.
	7	Odor			No impact is expected.
	8	Bottom sediment			There is no river or swamp near the project site, hence no impact is expected.
Natural Environment	9	Protected Areas	✓		Even though the project site is adjacent to the National Park, no new footprint, i.e., environmental impact of human activities, will be generated by the project.
	10	Ecosystem	✓		The project site is adjacent to the National Park and there are important fauna and flora in the National Park, which will be affected by the project.
	11	Hydrology			There is no major river or stream near the project site.
	12	Geological Features	✓		Planning Phase: Levelling of the lands is necessary for the Tombo and York substations, but it is limited to the sites and will not have any major impact.
Social Environment	13	Land acquisition /Involuntary resettlement	✓		Planning Phase: Small scale land acquisition for the construction of Tombo primary substation and secondary substations will occur, but no residents live on the lands. Hence, no resettlement occurs. Construction Phase: There may be potential impact on the structures that encroached within the ROW of the existing 33/11 kV distribution lines from Goderich to Sussex. Operation Phase: No impact is expected.
	14	Poverty	✓		Planning/Construction Phase: No resettlement will occur and therefore no impact is expected. Operation Phase: No impact is expected.
	15	Minorities /Indigenous			There are no indigenous people or minorities within the project site.
	16	Economic activities, living and livelihood	✓	✓	Planning/Construction Phase: Positive impacts such as employment for construction works and contribution to local economic activities due to the presence of construction workers may be expected during construction. Operation Phase: Positive impacts on socio-economic aspects of residences and industries due to the stable power supply are expected.
	17	Land Use and Utilization of local resources			Although land is acquired for the substations, development activities are limited and will not cause changes in land use and local resources.
	18	Water Use and Water Right			There is no major water body near the project site.

	No.	Item	Phase		Expected Impacts
			Planning Construction	Operation	
	19	Existing social infrastructure and services	✓	✓	Planning/Construction Phase: Traffic around the construction site of York substation may be affected due to delivery of materials, etc. Temporary power cuts are expected due to the works on the existing lines from Goderich to Sussex. Operation Phase: Positive impacts are expected due to the stable power supply.
	20	Social institutions such as social infrastructure and local decision-making institutions			No impacts are predicted as the project site is limited at the local level. The project will contribute to the improvement of public service in power sector; hence will not cause any impact on social infrastructure and local institutions.
	21	Misdistribution of benefits & damages			The project will contribute to the improvement of public service in power sector; hence will not cause any misdistribution
	22	Local conflicts of interest			The project will contribute to the improvement of public service in power sector; hence will not cause any conflict
	23	Heritage			There is no heritage or culturally important site near the project site.
	24	Landscape			There is no naturally or culturally important landscape near the project site.
	25	Gender			Since women are usually employed in civil engineering work, no adverse impact on gender issues is expected by the project.
	26	Children's right			Child labor is prohibited by law. No adverse impact on children's right is expected by the project.
	27	Infectious Disease (HIV/AIDS, etc.)			No impact on infectious diseases due to workers coming from outside is expected, because workers during the construction phase are planned to be hired from surrounding local communities.
	28	Occupational health hazards	✓		Construction Phase: It is necessary to protect workers from the hazards and risk of accidents.
Others	29	Accidents	✓	✓	Construction Phase: Constructing substations and rewiring may trigger general accidents caused by construction works such as falling accident of workers or parts. Operation Phase: Electrocution may occur by climbing the poles. Fire accidents may occur due to the broken conductors or lightening.
	30	Global warming			The project will not cover a large area; hence global warming or impacts across the boarders are not expected.

Source: JICA Survey Team

(2) TOR for Environmental and Social Considerations Study

Based on the scoping results above, the TOR for EIA study was determined as shown in Table 1-3.45.

Table 1-3.45 TOR for Environmental and Social Considerations Study

No.	Item	Study Item	Methods
1	Air Pollution	• Air quality standard • Air quality around the project site	• Review of existing literature and data • Sampling survey by local consultants
2	Water Pollution	• Water quality standard • Water quality around the project site	• Review of existing literature and data • Sampling survey by local consultants
4	Soil Pollution	• Setting of transformer and insulating oil management	• Review of existing literature and data (environmental and social guidelines for tendering, examples from other substations, etc.)
5	Noise/ Vibration	• Noise standard • Noise level around the project site	• Review of existing literature and data • Sampling survey by local consultants
9	Protected Areas	• Confirming the five conditions for exceptionally implementing a project in protected areas	• Review of existing literature and data • Coordination with relevant organizations. • Stakeholder meeting
10	Ecosystem	• Habitats of important fauna and flora around the National Park	• Review of existing literature and data • Field survey by local consultants • Interview with experts
12	Geological Features	• Land leveling for the Tombo and York substations	• Review of existing literature and data (design, methods, etc.)
13	Land acquisition /Involuntary resettlement	• Confirming necessity and scale of resettlement and land acquisition • Mitigation measures for resettlement	• Study on scale of resettlement and preparation of ARAP by local consultants • Site visit
14	Poverty	• The poverty among PAPs.	• Study on scale of resettlement and preparation of ARAP by local consultants
19	Existing social infrastructure and services	• Social infrastructures nearby	• Site visit
28	Occupational health hazards	• Labor Safety measures	• Review of existing literature and data (relevant labor regulations, environmental and social guidelines for tendering, etc.)
29	Accident	• Situation around the project site • Accident prevention measures during construction phase	• Review of existing literature and data (contract manual for construction, etc.) • Interview with EDSA etc.

Source: JICA Survey Team

1-3-2-6 Results of Environmental and Social Consideration Study

The results of the Study based on the TOR above are summarized in Table 1-3.46.

Table 1-3.46 Results of Environmental and Social Consideration Study

No.	Item	Results
1	Air Pollution	• The results of the sampling survey conducted at 14 survey locations around the project site are as follows: SO_2：In the dry season as well as the rainy season, all the concentrations are far above the minimum threshold recommended by WHO. NO_2：Only two sample locations in the dry season and one sample location in the rainy season among 14 ones had concentrations lower than the minimum threshold recommended by the WHO. O_3：In the dry season as well as the rainy season, all the concentrations are below the minimum threshold recommended by WHO. $PM_{2.5}$ and PM_{10}：In the dry season, all the daily averages are above the minimum thresholds recommended by WHO, while the daily averages were considerably below the thresholds in the rainy season. • Planning/Construction Phase: Due to the land leveling work at the new Tombo and York substations and operation of heavy machineries during the construction works, temporary impacts on air pollution are expected. However, these impacts may be mitigated largely by general measurements that are required for the contractor.
2	Water Pollution	• According to the results of the sampling survey conducted at the survey locations around the project site (8 locations in the dry season and 10 locations in the rainy season), in the dry season, measurements of pH, turbidity, dissolved oxygen (DO), potassium, orthophosphate, and chromium exceeded the WHO standards at some locations. For example, turbidity readings at three locations (Kerry Town, York, and Baw Baw) exceeded the WHO standards. In the rainy season, measurements of pH, turbidity, orthophosphate, and chromium were above the WHO standards at some locations. For example, turbidity readings at two locations (Kerry Town and Tombo) were above the WHO standards. • Construction Phase: Due to discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries, temporary impacts on water pollution are expected. However, these impacts may be mitigated largely by general measurements that are required for the contractor.
4	Soil Pollution	• Construction Phase. Leakage of lubricants and other oils from construction equipment and vehicles may cause soil pollution. • Construction/Operation Phase. Insulating oil will be used for transformers. It may cause soil pollution if it is leaked.
5	Noise/Vibration	• According to the results of the sampling survey conducted at 14 survey locations around the project site, all noise levels are below 80dB. • Construction Phase: Temporary impacts of noises are expected due to the operation of heavy machineries. Regarding vibration, the use of hydraulic hammers and vibrating type machinery and blasting operations are not expected. • Operation Phase: Transformers at Tombo substation may cause noise. However, these will be located away from the boundaries of the site. There are no sensitive receptors such as residential areas, hospitals or schools nearby.
9	Protected Areas	• The five conditions for exceptionally implementing a project in conservation area stated in the Answers to Frequently Asked Questions About JICA Guidelines for Environmental and Social Considerations have been confirmed and the results are shown in Table 1-3.31.
10	Ecosystem	• The results of the field survey and interviews conducted around the project site regarding the existing fauna and flora are as follows. Birds: In the dry season, 99 species of birds in 44 families were identified. Most of the birds recorded (97.4%) were resident birds that do not migrate seasonally and are ubiquitous species in Sierra Leone and around Africa. Of these, five bird species are designated as Critically Endangered (CR), Vulnerable (VU), and Near Threatened (NT) on the IUCN Red List. In addition, a Hooded Vulture, designated as CR, was sighted once in one location. In the rainy season, 110 species of birds in 34 families were recorded. Most of the species recorded were resident and ubiquitous. Six of these species are designated as Critically Endangered (CR), Vulnerable (VU), and Near Threatened (NT), and 4 of them are the same species identified in the dry season. One Hooded

No.	Item	Results
		Vulture was sighted at one location and two at another location. Amphibians and reptiles: Five Low Concern (LC) species of amphibians in the dry season were identified. Twelve Low Concern (LC) species were identified in the rainy season, of which 5 species were the same ones identified in the dry season. Regarding reptiles, in addition to the nine Low Concern (LC) species observed in the dry season, another one was observed in the rainy season. No endangered species were identified. Mammals: Nine species and six species were observed in the dry season and rainy season, respectively. A White-bellied Pangolin, designated as Endangered (EN), was captured by a resident on the edge of the forest near River No. 2 in September 2021. On the other hand, no evidence of presence of chimpanzees or using forest by chimpanzees were observed along the project distribution line route. Vegetation: In the line transect surveys along the distribution line route, 119 plant species in 54 families and 131 species in 63 families were identified in the dry season and rainy season, respectively. Among them, four tree species are designated as Vulnerable (VU). However, these plants were fragmented and only a few standing trees were recorded in nearly all survey sites. In addition, the patch of mangroves identified near the Kent Junction in the rainy season is a narrow strip from the creek and is just a scrubby patch that covers an area of about 0.3ha. Because they are exploited all the time for fuel wood and are virtually unprotected, much of this mangrove patch has been cut and degraded. The mangrove vegetation is quite distant from both primary substations. It is about 5km from the Tombo substation and about 17km from the York substation. This means that the construction of the substations as well as the distribution lines near Kent Junction) will not affect the conservation status of the mangrove. And a total of 53 tree species were recorded in plot surveys, in which plots were located more than 3 km away from the distribution line route in the National Park. It was estimated that the density of trees on the survey sites was estimated at 410 trees/ha and the tree canopy at about 73%, which are good indicators that these sites are relatively undisturbed core areas. • Currently, the species of fauna and flora in the National Park are very rich. Because the forests are generally stable, the habitats for fauna and flora are also stable. • Even though habitats change with the seasons and seasonal pattens are observed, because the habitats are stable in dry seasons and rainy seasons, respectively, it is unlikely that the Project which is implemented outside the National Park will cause a significant impact on the National Park. • The distribution lines will be constructed on existing roads. Even though existing housing development, road construction, and traffic have already affected the habitats and the functions of ecosysteMOF fauna and flora, furthermore impacts of this project on biodiversity will not be expected. • It is unlikely that this project in the buffer zone will cause net reduction in the populations of chimpanzees, Hooded Vultures, and White-bellied Pangolins. It is believed that no wild Timneh Parrots exist.
12	Geological Features	• Planning Phase: Levelling of the land is necessary for the Tombo and York substations, but it is limited to the sites and will not have any major impact.
13	Land acquisition /Involuntary resettlement	• Planning Phase: No involuntary resettlement occurs. No one is using the land informally. • The distribution lines will be constructed within the road ROW of SLRA, so land acquisition is not required. • No land acquisition is required for the York Substation because the land on which it will be constructed is owned by the Government. • The land for the Tombo Substation is owned by the community, but the community has agreed with EDSA to donate the land to EDSA. In addition, the eight criteria for voluntary land donation listed in the World Bank's Involuntary Resettlement Sourcebook have been confirmed. • Of the 23 secondary substations, the lands of 6 substations are owned by the Government, 12 the communities, and 5 the individuals, but all communities and individuals have agreed with EDSA to donate the lands to EDSA. In addition, the eight criteria for voluntary land donation listed in the World Bank's Involuntary Resettlement Sourcebook have been confirmed. No one is owing and using the lands informally. • The 66 structures under the existing overhead lines from Goderich to Sussex (66 houses) are very

No.	Item	Results
		unlikely to be damaged by the new overhead line construction and are not expected to be affected. • There is one board house (1 story, approx. 4x4 m) at Tombo-1, the location of the secondary substation, which serves as a meeting place, will need to be displaced to the back..
14	Poverty	• No resettlement will occur. Therefore, no impact is expected.
19	Existing social infrastructure and services	• Planning/Construction Phase: Traffic around the construction sites may be affected due to delivery of materials, etc. Temporary power cuts are expected due to the works on the existing lines from Goderich to Sussex. • Operation Phase: Positive impacts are expected due to the stable power supply.
28	Occupational health hazards	• Construction Phase: Without proper measure, accidents and poor labor environment may occur.
29	Accident	• Construction Phase: General accident related to construction activities such as erection of poles and rewiring of power lines may happen. • Operation Phase: Without proper measures, electrocution may occur by touching the lines, and there may be risks of fire caused by broken conductor and lightening.

Source: JICA Survey Team

1-3-2-7 Impact Evaluation

Based on the study results above, the impacts of the project are evaluated and compared to the evaluations at scoping as shown in Table 1-3.47.

Table 1-3.47 Impact Evaluation

	No.	Item	Evaluation at Scoping		Evaluation Based on Results		Reason for Evaluation
			Planning Phase Construction Phase	Operation Phase	Planning Phase Construction Phase	Operation Phase	
Pollution	1	Air Pollution	✓		B-	D	The impact is limited during construction phase. It is temporary and locally limited and can be mitigated by general measures.
	2	Water Pollution	✓		B-	D	The impact is limited during construction phase. It is temporary and locally limited and can be mitigated by general measures.
	3	Waste			N/A	N/A	
	4	Soil Pollution	✓	✓	B-	B-	The impact is expected during construction phases due to leakage of lubricants and other oils from construction equipment and vehicles. However, it is limited and can be mitigated by general measures. The impact is expected during construction and operation phases due to leakage of insulating oil from transformers. However, it is limited only to the inside of the substations and can be mitigated by general measures.
	5	Noise/Vibration	✓		B-	D	The impact is limited during construction phase. It is temporary and locally limited and can be mitigated by general measures.
	6	Ground subsidence			N/A	N/A	

	No.	Item	Evaluation at Scoping		Evaluation Based on Results		Reason for Evaluation
			Planning Phase Construction Phase	Operation Phase	Planning Phase Construction Phase	Operation Phase	
	7	Odor			N/A	N/A	
	8	Bottom sediment			N/A	N/A	
	9	Electromagnetic field		✓	D	D	The impact is limited, because considerations for the residents under the electrical lines are fully paid, such as securing enough clearance from the power lines.
Natural Environment	9	Protected Areas	✓		B-	D	The project's distribution lines will be constructed within the ROW of existing Peninsula Highway outside of the National Park. The five conditions for exceptionally implementing the project in a protected area have also been confirmed. 1) No alternatives exist other than the 'without project' alternative. 2) EPA-SL is expected to issue an EIA License in October 2022. Accordingly, the project development is accepted by the Environment Protection Agency Act of Sierra Leone. 3) EDSA is committed to compliance with laws, regulations, management plans and the like. 4) The National Protected Area Authority (NPAA) issued a letter to EDSA approving the implementation of the project. In addition, during stakeholder meetings, residents expressed no opposition to the project, but rather expressed their expectations for the project's benefits. 5) Since the distribution lines of this project will be constructed within the ROW of SLRA, the project is not expected to create a new footprint, i.e., environmental impact of human activities, in the construction phase. EDSA has already developed an Environmental and Social Management Plan (ESMP). In the ESMP, EDSA plans to conduct environmental monitoring program in the construction and operation phases. If performing additional programs becomes necessary, EDSA will be responsible for performing them.

	No.	Item	Evaluation at Scoping		Evaluation Based on Results		Reason for Evaluation
			Planning Phase Construction Phase	Operation Phase	Planning Phase Construction Phase	Operation Phase	
	10	Ecosystem	✓		B-	D	1) Currently, the species of fauna and flora in the National Park are very rich. Because the forests are generally stable, the habitats for fauna and flora are also stable. 2) Even though habitats change with the seasons and seasonal pattens are observed, because the habitats are stable in dry seasons and rainy seasons, respectively, it is unlikely that the Project which is implemented outside the National Park will cause a significant impact on the National Park.3) Large amounts of forests in the buffer zone were fell down for housing development and road construction, resulting in significant degradation of the ecosystems not only in the buffer zone but also in the forested areas near the boundaries of the National Park. It is unlikely that the Project in the buffer zone will cause new degradation of the ecosystems. 4) The distribution lines will be constructed on existing roads. Even though existing housing development, road construction, and traffic have already affected the habitats and the functions of ecosysteMOF fauna and flora, furthermore impacts of this project on biodiversity will not be expected. 5) It is unlikely that this project in the buffer zone will cause net reduction in the populations of chimpanzees, Hooded Vultures, and White-bellied Pangolins. It is believed that no wild Timneh Parrots exist.
	11	Hydrology			N/A	N/A	
	12	Geological Features	✓		D	D	Leveling will not cause any impact.
Social Environment	13	Land acquisition /Involuntary Resettlement	✓		B-	D	Small scale land acquisition for constructing Tombo primary substation and secondary substations will occur, but resettlement will not.
	14	Poverty	✓		D	D	No ressettlement will occur and therefore no impact is expected.
	15	Indigenous/Minorities			N/A	N/A	
	16	Economic activities,	✓	✓	N/A	N/A	

	No.	Item	Evaluation at Scoping		Evaluation Based on Results		Reason for Evaluation
			Planning Phase Construction Phase	Operation Phase	Planning Phase Construction Phase	Operation Phase	
		living and livelihood					
	17	Land Use and Utilization of local resources			N/A	N/A	
	18	Water Use and Water Right			N/A	N/A	
	19	Existing social infrastructure and services	✓	✓	B-	A+	The impact is limited during construction phase. It is temporary and locally limited and can be mitigated by general measures.
	20	Social institutions such as social infrastructure and local decision-making institutions			N/A	N/A	
	21	Misdistribution of benefits & damages			N/A	N/A	
	22	Local conflicts of interest			N/A	N/A	
	23	Heritage			N/A	N/A	
	24	Landscape			N/A	N/A	
	25	Gender			N/A	N/A	
	26	Children's right			N/A	N/A	
	27	Infectious Disease (HIV/AIDS, etc.)			N/A	N/A	
	28	Occupational health hazards	✓		B-	D	The impact is only during construction phase and can be mitigated by general measures.
Others	29	Accidents	✓	✓	B-	B-	The impacts such as accidents during construction phase and the impacts such as electrocution and fire during operation phase are temporary and locally limited and can be mitigated by general measures.
	30	Global warming			N/A	N/A	

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C: Extent of impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.
N/A：Impact assessment isn't conducted because the item was categorized into D in scoping phase.
Source: JICA Survey Team

1-3-2-8 Mitigation Measures and Implementation Costs

Mitigation measures towards the items with adverse impacts are summarized in Table 1-3.48.

Table 1-3.48 Mitigation Measures and Implementation Costs

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost (USD)
	Planning Phase				

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost (USD)
13	Land acquisition /Involuntary resettlement	Loss of assets, income and livelihood due to land acquisition	• In accordance with JICA guidelines and WB OP4.12, an ARAP will be prepared based on the consensus with project affected people, compensation and support will be provided.	EDSA	150,000
	Construction Phase				
1	Air Pollution	Air pollution by heavy machineries during leveling and construction works	• Minimizing the number of deliveries through timely scheduling. • Only contract automobiles with vehicle inspection certification, which are expected to have less exhaust emissions. • Installing the cover of trucks transporting soils or construction debris from the site. • Sprinkling water at the site to avoid dust.	Contractor	N/A
2	Water Pollution	Discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries	• Installing domestic wastewater treatment facilities. • Restricting washing trucks and heavy machineries to areas away from water bodies.	Contractor	Included in construction costs
4	Soil Pollution	Leakage of lubricants and other oils from construction equipment and vehicles and spillage of insulating oil from transformer	• Taking preventive measures against leakage of lubricants and other oils from construction equipment and vehicles by carrying adsorption mats, neutralizers, etc. while working. • Insulating oil as well as transformers will be set in the metal box. To prevent spillage, oil dike will be set under the transformers and filled with stone chips. • Protection of exposed ground with vegetation and rain drainage, etc.to prevent run-off	Contractor	Included in construction costs
5	Noise/ Vibration	Noise during leveling and construction	• In the primary substations, the transformer design should be such that soundproof walls, etc. are not necessary (however, a site boundary wall (made of concrete, equivalent to the existing Goderich primary substation) is required). • Controlling operation time (7a.m.-5p.m.) to reduce impact by noise as much as possible. • Use of proper automobile with inspection certificate	Contractor	N/A
9 / 10	Protected Areas/ Ecosystem	Loss of trees due to cutting	• Only clear vegetation that is required to be cleared in accordance with engineering plans and designs. Keep tree removal to a minimum during construction. • Regarding the mangrove identified near Kent Junction, avoid the left-hand-side of the road ROW for the installation of the poles where holds the patch of mangrove.	Contractor	N/A

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost (USD)
		Impact on animals and birds	• Before starting works, check whether animals exist on the site or not. If animals are found, use a qualified person to relocate the animals. • Avoid destroying active migratory bird nests or eggs. • Keep tree removal to a minimum.		
		Light pollution	• Control operation time (7a.m.-5p.m.) • Use lower wattage flat lens fixtures that direct light down and reduce glare, thus reducing light pollution, avoiding floodlights unless they are required. • Install light shades or plan the direction of lights to reduce light spilling outside the construction area.		
		Noise/vibration	• Install sound barriers when heavy equipment is used during the construction of the primary substations. • Educate construction equipment operators on noise issues and techniques for reducing noise emissions. • Avoid using hydraulic hammers and vibrating type machinery during the construction phase.		
		Animal roadkill	• Restrict truck deliveries, where practicable, to daytime working hours • Enforce on-site speed limit for avoiding road kills.		
		Wastes	• Prevent all solid and liquid wastes from entering waterways. • Collect all solid wastes and transport them to a disposal site for disposal. • Install domestic wastewater treatment facilities for wastewater from workers' camp. • Restrict washing trucks and heavy machineries to areas away from water bodies.		
		Loss of animals and plants due to poaching and illegal cutting	• Educate and raise awareness about animal and plant protection knowledge and protection-related laws and regulations to prevent poaching and illegal cutting by workers and to prevent them from purchasing meat from poached animals and birds. • Make available alternative fuels such as LP or kerosene on ration to the workforce to prevent them from using biomass for cooking.		

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost (USD)
19	Existing social infrastructure and services	Impacts on traffic during construction works Power cut during construction works	• By announcing construction plans to nearby residents and collaborating with local police, enforcement of traffic safety and mitigation of traffic congestion • Preparation of power cut plan and sharing the plan with affected communities	EDSA Contractor	N/A
28	Occupational health hazards	Health and safety of construction workers	• Based on laboring laws, the contractor must provide protective gear to workers, ensure them to wear them and provide safe working environment. • EDSA will confirm environmental and social safety management plan proposed by contractor at tendering. Based on this plan, the contractor will carry out safety and management tasks and avoid and mitigate risks of accidents. • Construction site (especially the storage site) will be fenced, lighted and guarded by security guards to prevent intruders and theft.	EDSA Contractor	Included in construction costs
29	Accidents	Accidents involving workers and residents	• Same as for occupational health hazards • When wiring or removing power lines, fall prevention net will be used.	Contractor	Included in construction costs
	Operation Phase				
4	Soil pollution	Spillage of insulating oil from transformers	• Insulating oil as well as transformers will be set in the metal box. To prevent spillage, oil dike will be set under the transformers and filled with stone chips.	EDSA	Included in construction costs
29	Accidents	Electrocution caused by contacting with wire or tower/ Fire risks caused by broken insulators	• Signboard indicating high voltage will be set. Residents nearby will be informed about prevention of electrocution. • EDSA will check house wiring carefully. • Ground wires with enough capacity will be set.	EDSA Contractor	Included in construction costs

Source: JICA Survey Team

1-3-2-9 Environmental Monitoring Plan

Environmental monitoring plan for each item is described in Table 1-3.49.

Table 1-3.49 Environmental Monitoring Plan

No		Item	Methods	Frequency	Responsible body
	Planning Phase				
14	Land acquisition /Involuntary resettlement	Compensation payment to bank accounts of PAPs	Counting the number of payment transaction to PAPs	Monthly until completion of land acquisition (planned to be completed around November 2022)	EDSA
	Construction Phase				
1	Air Pollution	Inspection of certification for vehicle and heavy machineries (schedule and cover to avoid dust) Water sprinkler of the site	Site inspection	Daily during construction phase	Contractor
		SO_2, NO_2, PM_{10}, $PM_{2.5}$, O_3	Air sampling at the Tombo and York substations and in the communities along the distribution lines	Quarterly	EDSA
2	Water Pollution	Management measures on domestic wastewater and discharges from washing trucks and heavy machineries	Site inspection	Daily during construction phase	Contractor
		Water temperature, pH, turbidity, DO, BOD, E. Coli.	Water sampling at the Tombo and York substations and in the communities along the distribution lines	Quarterly	EDSA
4	Soil Pollution	PAHs, BTEX	Soil sampling at the York and Tombo substations	3 times, before, during and after construction	Contractor
5	Noise/vibration	Inspection of certification and schedule for vehicle and heavy machineries Controlling operation time (7a.m.-5p.m.)	Site inspection	Daily during construction phase	Contractor
		Noise level	Noise measurement at the Tombo and York substations and in the communities along the distribution lines	Quarterly	EDSA
10 / 11	Protected Areas/ Ecosystem	Record of animals trapped in	Site inspection Confirming the reports	Daily during construction phase	Contractor
		Record of migratory bird nests			
		Restriction on daytime working hours			
		Lighting equipment			
		Noise			

No		Item	Methods	Frequency	Responsible body
		On-site speed limit Illegal dumping of wastes			
20	Existing social infrastructure and services	Power cut due to wiring distribution lines on the existing overhead lines from Goderich to Sussex	Confirming work plan Confirming power cut plan	During rewiring works During construction	Contractor EDSA
29	Occupational health hazards	Workers with protective gear Reports on accidents	Site inspection Confirming the reports	Daily during construction	Contractor EDSA
30	Accidents	Reports on accidents	Site inspection Confirming the reports	Daily during construction	Contractor EDSA
	Operation Phase				
4	Soil Pollution	PAHs, BTEX	Soil sampling at the Tombo and York substations	Annually	EDSA
30	Accidents	Fire prevention measures	Site inspection	At commission and regular maintenance	EDSA

Source: JICA Survey Team

1-3-2-10 Stakeholder Meeting

Stakeholder meetings are intended to establish a framework for full awareness and communication to all stakeholders involved in or affected by the project. Meetings were held primarily with community-level stakeholders to increase general understanding of ownership and processes.

During the stakeholder meetings, the local consultants on behalf of EDSA explained the project outlines, components and their locations, project schedule, adverse and positive impacts by the project, resettlement and land acquisition, compensation entitlement and process and grievance redress mechanism.

The opinions raised by stakeholders during meetings were supportive of project implementation. These were incorporated into the EIA study items and mitigation measures were reflected in the environmental management and monitoring plan. The summary of opinions raised during meetings is listed below.

- Benefits brought by this project (increase of electricity provision, creation of local employment during the construction stage)
- Positive/Negative impacts brought by this project (policy of compensation, beneficiaries to receive electricity, worries about electrocution)
- Mitigation measures (prioritization of local employment, fire prevention, installation of traffic signs)

The outline of stakeholder meetings is described in Table 1-3.50. The main comments raised and responses during stakeholder meetings are summarized in Table 1-3.51.

Table 1-3.50 Outline of Stakeholder Meetings

Date	Place	Participants	Number of participants (M: male, F: Female)	Contents
17th December 2021	Funkia	Community leaders and community residents	14 (M: 11, F: 3)	To inform and enlighten on; Project objectives, Project components, the scope of the Project, likely significant benefits of the Project, and the purpose and relevance of the consultation. To capture and comprehend; residents' perception of the Project, potential benefits and impacts of the Project, and suggestions
	Ogoo Farm	Community leaders	12 (M: 9, F: 3)	
	Lakka	Community leaders	7 (M: 4, F: 3)	
8th January 2022	Mile 13	Community leaders	8 (M: 7, F: 1)	
	Mambo	Community leaders	9 (M: 7, F: 2)	

Date	Place	Participants	Number of participants (M: male, F: Female)	Contents
		and community residents		on measures to lessen probable negative impacts.
	Baw Baw village	Community leaders	5 (M: 5, F: 0)	
15th January 2022	Tokeh village	Community leaders and community residents	15 (M: 11, F: 4)	
	York village	Community leaders	8 (M: 7, F: 1)	
	Black Johnson	Community leaders and community residents	12 (M: 11, F: 1)	
	Adonkia Police Division, Adonkia	Support Officer	1 (M: 1, F: 0)	To inform and enlighten on; Project objectives, Project components, the scope of the Project, likely significant benefits of the Project, and the purpose and relevance of the consultation as well as importance of stakeholders' institution to the Project. And concerns.
21st January 2022	Ogoo Farm	RoW occupants (Adonkia, New Jersey, Ogoo Farm)	32 (M: 18, F: 14)	To inform and enlighten on; Project objectives, Project components, the scope of the Project, likely significant benefits of the Project, and the purpose and relevance of the consultation. To capture and comprehend; participants' perception of the Project, potential benefits, and impacts of the Project, and suggestions on measures to lessen probable negative impacts. To understand from RoW occupants the extent to which they envisage the Project will affect them. And measures to cushion severe effects.
22nd January 2022	Mechkem Goderich	RoW occupants (battalion, Mechkem, college junction)	9 (M: 8, F: 1)	
	Tombo	Community leaders	16 (M: 15, F: 1)	To inform and enlighten on; Project objectives, Project Components, the scope of the Project, likely significant benefits of the Project, and the purpose and relevance of the consultation. To capture and comprehend; residents' perception of the Project, potential benefits and impacts of the Project, and suggestions on measures to lessen probable negative impacts.
30th January 2022	Kent	Community leaders	5 (M: 4, F: 1)	
6th February 2022	Mammah Beach	Community leaders	2 (M: 1, F: 1)	
	Bridget/PWD compound	Community leaders	5 (M: 5, F: 0)	
	Russel	Community leaders and community residents	11 (M: 10, F: 1)	
13th February 2022	During town	Community leaders	5 (M: 4, F: 1)	
	Kerry town	Community leaders	2 (M: 2, F: 0)	
16th February 2022	Western Area Rural District Council	Environmental Social Officer and Deputy Chief Administrator	2 (M: 1, F: 1)	To inform and enlighten on; Project objectives, Project components, the scope of the Project, likely significant benefits of the Project, and the purpose and relevance of the consultation as well as importance of stakeholders' institution to the Project. And concerns. Discuss council's role in the Project implementation

Source: JICA Survey Team

Table 1-3.51 Main Comments Raised and Responses during Stakeholder Meetings

Items	Comments from Stakeholders	Responses from EDSA
Benefits anticipated from improvement of the substation and distribution network	- The new electricity supply to the project area will improve the livelihood of the residents. In addition, nighttime security will be enhanced. - School and hospital facilities will be expanded. Students will be able to study at night. - Electricity supply in some areas will be increased, improving the electricity supply to individual households, stores, and facilities. In addition, electricity prices are expected to be lowered. - Increased electricity supply in the communities is expected to potentially stimulate local economic activities (commerce, fishing, quarrying, sand extraction). - It will be easier for outside development investment to enter the communities. Employment opportunities will be created. Increased income is expected.	- N/A
Common issues/ worries	- Land, structures, crops and trees will be lost due to the project, and local people wanted to know whether they would be fairly compensated.	- The asset survey has not yet been conducted. ARAP will be prepared and PAPs compensated for losses.
	- If one has legal documents for structure along the RoW, will he/she be compensated?	- The RoW belongs to Government. However, if one has a document for the structure, you will bring it forward for examination and onward submission to the appropriate authorities. However, all affected occupants of RoW will be compensated.
	- Will compensation be paid to those whose structures and/or businesses are affected?	- The impact of the construction is extremely small. At this stage, it cannot be guaranteed that compensation will be provided.
	- Will the contractor consider youth employment in the communities along the RoW?	- The policy emphasizes that operators or contractors give first consideration to Sierra Leoneans, especially those in the project area.
	- Will all the communities along the transmission line be connected to the transmission line?	- New electricity will be supplied to the communities in Sussex, Baw Baw, River No.2, Tokeh, York, Big Water, Black Johnson, John Obey, Bureh Town, Kent, Mammah Beach, Brigitte Village, Kissy Town, Tombo, Boyoh Town, Russel Town, During Town and Kerry Town. Electricity will be enhanced in the communities from Goderich to Sussex.
	- Will the project also provide meter for the communities?	- No, the distribution of meters is not part of this Project. Meters are bought at designated outlets in Freetown.
	- Who will sell electricity to consumers?	- Distribution and selling of the electricity generated will be done by EDSA to consumers through pre-paid meters.

Source: JICA Survey Team

1-3-3 Land Acquisition and Resettlement

1-3-3-1 Necessity of Land Acquisition and Resettlement

Since there are no guidelines or regulations for the ROW of transmission and distribution lines in Sierra Leone, the ROW values used in similar World Bank projects implemented by EDSA were tentatively decided by EDSA for this project.

Project components and the land required for each component are presented in Table 1-3.52.

Table 1-3.52 Project Components and Required Land

	Project Components	Land Required	Note
1.	33kV Distribution Line (from Goderich Substation to Tombo Substation)	Approx. 46km ROW 4m (2m + 2m)	No land acquisition is required, because distribution lines are constructed within ROW of roads. (After studying the photos of existing structures around 174 existing power poles from Goderich to Sussex, it is evaluated that there would be no damage or impact to all the existing structures due to overhead distribution line construction works.)
2.	11kV Distribution Line (from York Substation to Kerry Town)	Approx. 49km ROW 4m (2m + 2m)	No land acquisition is required, because distribution lines are constructed within ROW of roads.
3.	Tombo Substation	Approx. 1,440m^2	Land acquisition has not yet commenced. The land is owned by the community, but the community has agreed with EDSA to donate the land to EDSA. The current land cover is bare land (Figure 1-3.12)
4.	York Substation	Approx. 1,500m^2	No land acquisition is required, because the land is owned by the Government. The current land cover is grass land. (Figure 1-3.12Figure 1-3.1)
5.	11/0.4kV Secondary Substation	Approx. 23 sets Land required: 368m^2 (4 x 4m/set x 23set)	Land acquisition has not yet commenced. The lands of 6 sets are owned by the Government, 12 by communities, and 5 by individuals, but all communities and individuals have agreed with EDSA to donate the lands to EDSA. Involuntary resettlement is not required.

Source: JICA Survey Team

Figure 1-3.12 Sites of Tombo Substation (left) and York Substation (right)

1-3-3-2 Legal Framework on Land Acquisition and Resettlement

(1) Legal Framework in Sierra Leone

Legal framework for land acquisition and resettlement in Sierra Leone is shown in Table 1-3.37.

The Constitution of Sierra Leone (1991) guarantees the rights of individuals to own private property. The Constitution also sets up the principles under which citizens may be deprived of their properties through compulsory acquisition, where such properties become subjects of state expropriation for public interest.

Public Lands Ordinance Law (1898). Part 1 of CAP 116 of the Law deals with the acquisition of land. The provision of the ordinance may not apply to the provinces. Under the Law, the GoSL can acquire any land in the public interest as stated in Section 4. The declarations for the warrant of acquisition for such land are published in a gazette. Section 5 of the law outlines the processes.

National Lands Policy (2015) also provides for the compulsory acquisition of land in the public interest. The principles of the land policy include among others: the consideration of land as a common national or communal property resource held in trust for the people and which must be used in the long-term interest of the people of Sierra Leone.

Local Government Act (2004) focuses on having a meaningful decentralization and devolution of government functions through the establishment and operation of local councils around the country including the Western Area Urban and Rural Districts, the operational area of the Project.

National Electricity Act (2011) unbundled the former National Power Authority (NPA) to two separate entities: EGTC and EDSA. Part VI outlines EDSA's cardinal function as the supply, distribution and retailing of electricity for the entire country except in areas where a license has been issued to another qualified entity. Part X of the Act deals with land acquisition and related environmental practices. This Act gives the Minister powers to acquire land for EGTC or EDSA or both even if the land is private or some private interest in the land subject to payment of adequate compensation. Compensation of such land is paid by the GoSL firstly and the Authority or company will reimburse government at a later time.

Sierra Leone Roads Authority (Amendment) Act (2010) stipulates that the Authority has the legal mandate to set out the width of the Right-of-Way (ROW). The Authority is the institution responsible for managing roads in the country. Their mandate is to develop and maintain the national roads network, advise Government on general road policies and contribute to addressing transport concerns, among others. The Authority manages ROW issues in Sierra Leone, hence they have to give clearance for the use of the ROW with respect to this project.

(2) JICA Policies on Resettlement

The key principles of JICA policies on involuntary resettlement are summarized below.

I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.

II. When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.

III. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.

IV. Compensation must be based on the full "replacement cost" as much as possible.

V. Compensation and other kinds of assistance must be provided prior to displacement.

VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.

VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.

IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

The principles above are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that "JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies". Additional key principles based on World Bank OP 4.12 are as follows.

X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.

XI. Eligibility of Benefits include; the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.

XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

XIII. Provide support for the transition period (between displacement and livelihood restoration).

XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.

XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the core principles of the JICA policy stated above, emphasis is given to a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed financial Plan, etc.

(3) GAP Analysis between the JICA Guidelines and Laws of Sierra Leone

Table 1-3.53 below shows the gap analysis between the JICA Guidelines and laws of Sierra Leone, as well as the policies applied to fulfill the gaps.

Table 1-3.53 GAP Analysis between the JICA Guidelines (GL) and Laws of Sierra Leone

No.	JICA Guidelines	Laws of the Country	Gap between JICA Guidelines& Laws of the Country	Policies applied to the Project
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by	The Constitution of Sierra Leone makes provision for the protection of the rights of individuals to	Expropriation of land for public interest is regarded as inevitable and the affected persons shall be	Alternative analysis, including 'without project' alternative, is conducted to minimize

No.	JICA Guidelines	Laws of the Country	Gap between JICA Guidelines& Laws of the Country	Policies applied to the Project
	exploring all viable alternatives. (JICA GL)	private property, but it also makes provision for the compulsory acquisition of land where it is in the public interest.	given fair and just compensation.	impacts of involuntary resettlement and loss of means of livelihood. EDSA will obtain consensus with affected persons on land acquisition and resettlement based on the World Bank Safeguard Policies and JICA Guidelines, which are used as benchmarks by EDSA.
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Sierra Leonean law requires prompt, adequate, and fair compensation for PAPs.	No gap.	EDSA will obtain consensus with affected persons on land acquisition and resettlement based on the World Bank Safeguard Policies and JICA Guidelines, which are used as benchmarks by EDSA.
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	Under Sierra Leone law, compensation is usually made in cash for the actual value of the land and damages to property sustained because of the appropriation. Factors to be considered in determining just compensation are: a) the market value of the land at the date of the publication of the warrant; b) expenses involved if the person is forced to change his occupation or place of business; and c) damage suffered by people having other rights over the land.	No gap.	Compensation will be based on full replacement cots and provided before resettlement. Assistance and supports are provided to PAPs to restore their livelihood at least at its original level, if not better.
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	Under Sierra Leone law, compensation is usually made in cash for the actual value of the land and damages to property sustained because of the appropriation. The market value of the land at the date of the publication of the warrant is used for calculating the value of the land.	No gap.	Compensation will be based on the full replacement cost, including any fees and costs involved.
5.	Compensation and other kinds of assistance must	Sierra Leonean law requires prompt	No gap. Compensation will be provided prior to	Compensation and other kinds of assistance will be

No.	JICA Guidelines	Laws of the Country	Gap between JICA Guidelines& Laws of the Country	Policies applied to the Project
	be provided prior to displacement. (JICA GL)	compensation and support.	relocation.	provided prior to displacement.
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	Regarding RAP or ARAP, there is no descriptions in laws, but EDSA is required to prepare an ARAP for this project.	There are no specific regulations.	Since this project will not trigger a large scale resettlement, an ARAP will be prepared in accordance with JICA GL.
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	According to the Resettlement Framework (RF), the owner/occupier of the land must be formally notified at least a week in advance of the intent to enter, and be given at least 24 hours' notice before actual entry.	No gap.	Information about the project and ARAP will be shared with PAPs and their communities in advance. Consultations will be held at least twice, and continued if necessary.
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	The mediuMOF exchange in Sierra Leone is English. All Sierra Leoneans can hear and speak English.	No gap	English will be used in consultation and compensation payment agreements with PAPs are prepared in English.
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	The RF states public participation in planning and decision making for the project.	There are no specific guidelines for participation of affected people in planning, implementation, and monitoring of RAP.	Consultations during EIA and ARAP preparation will be used as opportunities for public participation in ARAP planning, implementation and monitoring.
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	The RF states grievance redress mechanism.	No gap.	An appropriate and accessible grievance mechanism will be established according to the RF.
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	According to the RF, the census of the PAPs is conducted as well as inventory of their properties at the beginning of the land survey. The PAPs eligibility will lose after the cut-off date is announced.	No gap.	An initial baseline survey (including socio-economic survey) will be conducted based on WB OP 4.12. A cut-off date for this project will be set after the initial baseline survey on assets promptly. It should be made public that persons who enter the project area and structures that are built after the cut-off date are not eligible for compensation or support.
12.	Eligibility of benefits	According to the RF,	No gap.	Follow the OP4.12

No.	JICA Guidelines	Laws of the Country	Gap between JICA Guidelines& Laws of the Country	Policies applied to the Project
	includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	various forms of evidence as proof of eligibility will be considered to cover: a) Affected persons with formal legal rights, documents in the forMOF land title registration certificates, leasehold indentures, and the like. and b) Affected persons with no formal or recognized legal rights		guidelines and principles. Eligibility to benefits includes both formal and informal owners of land and owners of other assets affected by the project.
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	According to the RF, compensation will be made in cash or land for land.	No gap.	Due to the fact that the PAPs' livelihoods are not land-based land owners, monetary based compensation will be generally applied.
14.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	According to the RF, the project will assist with the physical relocation and provide support to resettled individuals and households during the transition period.	The Sierra Leonean legislation is silent on this matter.	If necessary, the project will provide support for the transition period.
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	The RF states that particular attention must be paid to the needs of the vulnerable.	The Sierra Leonean legislation is silent on this matter.	If necessary, the project will provide support to the vulnerable PAPs.
16.	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	No indication in the Sierra Leonean law.	The Sierra Leonean legislation is silent on this matter.	PAPs are fewer than 200 people hence ARAP will be prepared for this project.

Source: JICA Survey Team

(4) Policies Applied to the Project

EDSA uses the World Bank safeguard policy as a benchmark. In the Field Report (dated on November 29, 2021, and signed by JICA Survey Team and EDSA), the Sierra Leone side agreed to abide by the JICA Guidelines under this project. Therefore, this project will be implemented on the basis of the World Bank safeguard policy and the JICA Guidelines. In case there are any gaps between these policy and guidelines, the gaps will be fulfilled by referring to the similar RAPs/ ARAPs prepared in Sierra Leone under the support of World Bank and JICA.

This section discusses the principles of the Project Policy based on the type and scale of resettlement, which will bridge the gaps between the policy and guideline. Where there are gaps between Sierra

Leone's legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with practices in Sierra Leone and JICA's Policy.

I. Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

II. Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.

III. Compensation and rehabilitation support will be provided to any PAPs, that is, any person or household or business which on account of project implementation would have his, her or their:

- Standard of living adversely affected;
- Right, title or interest in any house, interest in, or right to use, any land (including premises, agricultural and grazing land, commercial properties, tenancy, or right in annual or perennial crops and trees or any other fixed or moveable assets, acquired or possessed, temporarily or permanently;
- Income earning opportunities, business, occupation, work or place of residence or habitat adversely affected temporarily or permanently; or
- Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.

IV. All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost or adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAPs residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets(IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.

V. PAPs that lose only part of their physical assets will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land and structures will be agreed during the resettlement planning process.

VI. People temporarily affected are to be considered PAPs and resettlement plans address the issue of temporary acquisition.

VII. Where a host community is affected by the development of a resettlement site in that community, the host community shall be involved in any resettlement planning and decision-making. All attempts shall be made to minimize the adverse impacts of resettlement upon host communities.

VIII. The resettlement plans will be designed in accordance with Sierra Leone's expropriation law No. 18/2007 and JICA's Policy on Involuntary Resettlement.

IX. The Resettlement Plan will be translated into local languages and disclosed for the reference of PAPs as well as other interested groups.

X. Payment for land and/or non-land assets will be based on the replacement cost.

XI. Compensation for PAPs dependent on agricultural activities will be land-based wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal land titles. If replacement land is not available, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensation will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the project.

XII. Replacement lands, if the preferred option of PAPs, should be within the immediate vicinity of the affected lands wherever possible and be of comparable productive capacity and potential. As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.

XIII. Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihood and standards of living of PAPs. Such support could take the forMOF short-term jobs, subsistence support, salary maintenance, or similar arrangements.

XIV. The resettlement plan must consider the needs of those most vulnerable to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, and women, children, elderly and disabled) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.

XV. PAPs will be involved in the process of developing and implementing resettlement plans.

XVI. PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.

XVII. Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition (including compensation and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the Government.

XVIII. Displacement does not occur before provision of compensation and of other assistance required for relocation. Sufficient civic infrastructure must be provided in resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be ongoing activities.)

XIX. Organization and administrative arrangements for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.

XX. Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the resettlement management system. An external monitoring group will be hired by the project and will evaluate the resettlement process and final outcome. Such groups may include qualified NGOs, research institutions or universities.

Cut-off Date of Eligibility

The cut-off date for this project will be set promptly after the asset survey is completed. This date is discussed with the PAPs during preliminary meetings with PAPs and communities. The establishment of eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of project entitlement. The cut-off date is informed through community offices and radio.

Principle of Replacement Cost

All compensation for land and non-land assets owned by households/shop owners who meet the cut-off date will be based on the replacement cost. Replacement cost is the amount calculated before displacement which is needed to replace an affected asset without depreciation and without deduction for taxes and/or costs for transaction.

Based on the above policies, draft ARAP is (was) prepared (Appendix 17)

1-3-3-3 Scope of Land Acquisition and Resettlement

According to the results of the field survey conducted by the Survey Team in November 2021, there is no PAP for involuntary resettlement under the project.

The Project will construct 33kV distribution lines on the existing poles from the existing Goderich substation to Sussex. Many structures, including stores, have encroached into the road ROW along this route. From preliminary field assessments along the said route, it is estimated that around 66 persons might be affected by the project. Based on the photographs of these structures and the existing poles in the vicinity, it is evaluated that no structures will be damaged by the overhead line construction works. Therefore, this number will significantly be reduced or non will be affected if appropriate construction options are made.

(1) Asset Inventory

The implementation of this project will cause the loss of assets such as lands. In total, 1,632 m^2 of community lands and 80 m^2 of private lands will be acquired for the construction of secondary substations. Table 1-3.54 shows the affected land areas and PAPs not subject to resettlement.

Table 1-3.54 Lands Affected by the Project and PAPs Not Subject to Ressetlement

No.	Location	Land Use	Ownership	Affected Area (m^2)	Total (m^2)	PAPs (non-resettlement)
	Primary S/S					
1	Tombo	Bare land	Community	1,440	1,440	-
	Secondary S/S					
1	Mama Beach	Bare land	Community	16	16	-
2	Bureh Town	Bare land	Community	16	16	-
3	John Obey	Bare land	Community	16	16	-
4	Black Johnson	Bare land	Community	16	16	-
5	Big Water	Bare land	Community	16	16	-
6	York	Bare land	Community	16	16	-
7	Tokeh-1	Bare land	Community	16	16	-
8	River No. 2	Bare land	Community	16	16	-
9	Kerry Town	Bare land	Private	16	16	20
10	During Town	Bare land	Private	16	16	1
11	Boyoh Town	Bare land	Community	16	16	-
12	Madina-1	Bare land	Community	16	16	-
13	Madina-2	Bare land	Community	16	16	-
14	Tombo-1	Residential land	Private	16	16	10
15	Tombo-4	Bare land	Private	16	16	10
16	Kissy Town	Bare land	Private	16	16	9
17	Brigitte Village	Bare land	Community	16	16	-
				合計	**1,712**	**50**

Note: The lands for the York primary substation and the secondary substations at Kent, Tokeh-2, Baw Baw, Russel Town, Tombo-2, and Tombo-3 are owned by the Government of Sierra Leone (GoSL) and are not subject to land acquisition.
Source: JICA Survey Team

The only building affected by this project is shown in Table 1-3.55.

Table 1-3.55 Buildings Affected by the Project

No.	Location (Secondary S/S)	Type of Building	No. of Building	Photo
Meeting place				
1	Tombo-1	Single story, board house	1	

Source: JICA Survey Team

(2) Vulnerable Groups

In this project, the following vulnerable groups shall be given special considerations:

- The elderly, usually from 70 years and above
- Widows, Women and children
- Physically challenged persons
- Mentally challenged/highly depressed persons
- Affected Persons who are too ill, bedridden, hospitalized or stricken with HIV/AIDS
- Unemployed youth
- Female-headed households, and
- Migrants without proper land documents.

1-3-3-4 Compensation and Assistance Policy

In accordance with the above-mentioned Sierra Leone laws and regulations as well as the JICA Guidelines and World Bank Safeguard Policy, the Policy to be applied for this project is described as follows:

- Type: Loss of partially or fully displaced buildings and structures, Loss of crops, Loss of income sources or livelihood accompanied with resettlement
- Eligibility: All the PAPs
- Compensation methods: Cash compensation, Recovery of structure loss
- Calculation methods: Replacement cost based on market price

1) Compensation toward Loss

In terms the cut-off date for compensation and assistance, based on its past experience with similar projects of World Bank and African Development Bank, EDA will set it after EDSA has completed the asset survey.

Losses caused by the project and compensation toward them are as summarized below.

Loss of Land

A total of 1,712 m^2 will be lost by the project. Compensation is at full replacement cost based on the recent market price. However, no compensation will be made because the communities have agreed

with EDSA to donate the land for the construction of Tombo substation, the lands for the construction of 12 secondary substations to EDSA, and the individuals have agreed with EDSA to donate the lands owned by them for the construction of 5 secondary substations to EDSA. Since all PAPs prefer monetary compensation, there is no land for land compensation.

As to whether the donations were made with informed consent, the eight criteria for voluntary land donation as described in the World Bank's Involuntary Resettlement Sourcebook, which are listed below, were confirmed in the early August 2022.

1. The infrastructure must not be site specific.
2. The impacts must be minor, that is, involve no more than 10 percent of the area of any holding and require no physical relocation.
3. The land required to meet technical project criteria must be identified by the affected community, not by line agencies or project authorities (nonetheless, technical authorities can help ensure that the land is appropriate for project purposes and that the project will produce no health or environmental safety hazards).
4. The land in question must be free of squatters, encroachers, or other claims or encumbrances.
5. Verification (for example, notarized or witnessed statements) of the voluntary nature of land donations must be obtained from each person donating land.
6. If any loss of income or physical displacement is envisaged, verification of voluntary acceptance of community-devised mitigatory measures must be obtained from those expected to be adversely affected.
7. If community services are to be provided under the project, land title must be vested in the community, or appropriate guarantees of public access to services must be given by the private titleholder.
8. Grievance mechanisms must be available.

The local consultants hired by the Survey Team in coordination with the C/P in charge of environmental and social considerations at EDSA, visited all community leaders and landowners, briefed the outline of the project, explained that the legal procedures related to the lands would be carried out during the full-scale ARAP surveys, and the confirming work at this time was a preliminary ARAP survey. The World Bank's 8 criteria for voluntary land donations were also presented and explained in detail. As a result, all community leaders and landowners signed the confirmation documents with full understanding of the 8 criteria. Thus, it was confirmed that the land donations were made with informed consent (Table 1-3.56).

Table 1-3.56 Results of Confirmation of 8 Criteria for Voluntary Land Donation

Land Use		Land Ownership	Areas Donated	Community Leader/ Donor (Name, Address)	Informed Consent Engaged (YES or NO)	8 Criteria Confirmed (YES or NO)
Primary S/S						
1	Tombo	Community	1,440m^2	Michael K. BENGA Headman, Tombo	**YES**	**YES**
2	York	GoSL	1,500m^2	N/A	**N/A**	**N/A**
Secondary S/S						
1	Mama Beach	Community	4 x 4 m	Ibrahim DARAMY Deputy Headman, Mama Beach	**YES**	**YES**
2	Bureh Town	Community	4 x 4 m	Dainiella DOVE Deputy Headman, Bureh Town	**YES**	**YES**
3	Kent	GoSL	4 x 4 m	N/A	**N/A**	**N/A**
4	John Obey	Community	4 x 4 m	Hassan MARRAH Headman, John Obey	**YES**	**YES**
5	Black Johnson	Community	4 x 4 m	E. K. SAMEULS Headman, Black Johnson	**YES**	**YES**
6	Big Water	Community	4 x 4 m	Manso SESAY Headman, Big Water	**YES**	**YES**

Land Use		Land Ownership	Areas Donated	Community Leader/ Donor (Name, Address)	Informed Consent Engaged (YES or NO)	8 Criteria Confirmed (YES or NO)
7	York	Community	4 x 4 m	Julrick PRATT Headman, York Village	**YES**	**YES**
8	Tokeh-1	Community	4 x 4 m	Alhaji J. SLOWE Headman, Tokeh	**YES**	**YES**
9	Tokeh-3	GoSL	4 x 4 m	N/A	**N/A**	**N/A**
10	River No.2	Community	4 x 4 m	Joseph JALLOH Headman, River No. 2	**YES**	**YES**
11	Baw Baw	GoSL	4 x 4 m	N/A	**N/A**	**N/A**
12	Kerry Town	Private	4 x 4 m	Alusine KAMARA Main Motor Road, Kerry Town	**YES**	**YES**
13	During Town	Private	4 x 4 m	Obi A. MACFOY Community Development Committee Chairman, During Town	**YES**	**YES**
14	Russel Town	GoSL	4 x 4 m	N/A	**N/A**	**N/A**
15	Boyoh Town	Community	4 x 4 m	Kabia ALIE Headman, Boyoh Village	**YES**	**YES**
16	Madina-1	Community	4 x 4 m	Victor STEVENS Headman, Councilor Ward, Madina	**YES**	**YES**
17	Madina-2	Community	4 x 4 m	John S. KAMARA Headman, Madina	**YES**	**YES**
18	Tombo-1	Private	4 x 4 m	Augustine A. SMITH Fundley Street, Tombo	**YES**	**YES**
19	Tombo-2	GoSL	4 x 4 m	N/A	**N/A**	**N/A**
20	Tombo-3	GoSL	4 x 4 m	N/A	**N/A**	**N/A**
21	Tombo-4	Private	4 x 4 m	Mohamed KAMARA SHD Upper Creole Town, Tombo	**YES**	**YES**
22	Kissy Town	Private	4 x 4 m	John P. C. NICOL Main Motor Road, Kissy Town	**YES**	**YES**
23	Brigitte Village	Community	4 x 4 m	Ibrahim M. KAMARA Headman, Brigette Village	**YES**	**YES**

Source: JICA Survey Team

Loss of Houses

The project caused loss of 1 board house, located on the sie for Tombo-1 secondary substation. Compensation will be paid at full replacement cost toward construction materials, labor etc. The full replacement cost includes the cost required for moving the building (physical displacement). Since there is enough time for the construction of new building, there is no assistance for transitional period.

2) Livelihood Restoration

The Livelihood Restoration Plan is designed to have two stages, i.e. Short-term measures in the construction phase to support the PAHs, and Long-term measures to achieve a sustainable livelihood for PAHs.

As short-term measures to restore the loss of PAPs income sources, PAPs are given priority to be employed as unskilled and skilled labor during the construction period. As long-term measures, PAPs are given priority for paid temporary employment as skilled and unskilled labor to work during the maintenance of substations and clearing trees within the ROW and access roads.

3) Entitlement Matrix

In line with the Sierra Leone laws and regulations, JICA Guidelines and World Bank Safeguard Policy, the compensation and assistance policy for the project, such as eligibility and compensation valuation is shown in Table 1-3.57.

Table 1-3.57 Entitlement Matrix

Type of Loss	Eligible Groups	Impact	Entitlement	Responsible Bodies
Houses	Owner of the structure	- Loss of residential dwelling	・ Cash compensation at full replacement cost for entire structure and other fixed assets without depreciation and with additional 10% disturbance fee.	EDSA/MOF
Other structures (stores etc.)	Owner of the structure	- Loss of structure	・ Cash compensation at full replacement cost with additional 10% disturbance fee.	EDSA/MOF
Land	Land owner	- Displacement of people from land used for agriculture or housing	・ Cash compensation at current market value (including all transaction fees) for affected land plus additional 10% disturbance fee. ・ Priority for employment opportunities associated with construction. ・ Awareness training on saving and access to credit schemes so as to manage acquired cash compensation.	EDSA/MOF
Waged employment (Day laborers/ traders)	Employee	- Loss of livelihood	・ Employment opportunities during construction.	EDSA/Districts/Communities
Vulnerable Groups	Vulnerable Groups	- Loss of trees and loss of livelihood	・ Livelihood restoration measures (direct economic assistance, medical insurance).	EDSA/MOF

Source: JICA Survey Team

1-3-3-5 Grievance Redress Mechanism

Complaints and appeals on the ARAP are generally addressed in three tiers.

Tier 1: Ward councillors and other community influencers shall be the first level to resolve grievances. Councillors, chiefs or headmen, and other community stakeholders are known community structures for dispute resolution who reside in their local communities to be engaged by PAPs more easily. PAPs prefer this easy access and familiar means to settle disputes in their communities.

Tier 2: When grievances are not resolved at tier 1, PAPs can file a complaint to any person at tier 2. Also, PAPs can directly report a grievance to tier 2. A PAP shall file grievances using a complaint form. All complaints received in writing (or written when presented verbally) and processed through the stages identified in the GRM, will be recorded in a register or log sheet by the Environmentalist at EDSA and updated in a database. The register presents the date of the complaint, the name of the complainant, the community she/he is from, a description of the complaint, and the actions taken to address the grievance (which shall also note the status of the grievance).

Acknowledgment of receipt of grievance reports should be within seven working days. Outcomes from the decision should be provided within fourteen (14) working days of receiving the complaints, which should be communicated to the PAP. Once a grievance or complaint has been resolved or being escalated, the officer responsible shall complete a Grievance/Complaint Resolution/Escalation Form to close out the complaint or record the reason for escalation, and the officer and the complainant shall sign the form (if she/he so desires), with a witness.

However, where no amicable resolution is reached with the PAP or the PAP does not receive a response from the stakeholders in Tier 2, the PAP can appeal to the GRC, which should look at the complaints within fourteen (14) working days.

Tier 3: The court of law will serve as the last resort for all types of grievances. According to grievance redress procedures, PAPs should be exempted from all administrative and legal fees. However, the decision to use the court as a redress mechanism should be left to the discretion of a PAP.

Complaints and appeals on the ARAP for this project will be addressed through the dispute resolution procedures that were actually used in the past World Bank projects (ESURP and ESURP AF) implemented by EDSA in the Western Peninsula.

A Grievance Redress Committee (GRC) shall be established and composed of MoE, EDSA, ward councillors, traditional chiefs, and ward committees before the commencement of construction site works and the Engineering, Procurement and Construction (EPC) contractors shall be briefed of the GRM system. The GRC will be headed by a grievance redress officer at the EDSA and steps will be taken to ensure that all grievances are appropriately documented and updated in a database for tracking of resolution.

1-3-3-6 Institutional Framework

(1) Implementing Institutions

The main institutions involved in the implementation of the ARAP are shown in Table 1-3.58.

Table 1-3.58 Resettlement Related Institutions and Responsibilities

Institution	Responsibility
The Ministry of Energy	• Provides general Project oversight • Shall ensure that funds for the timely implementation of the RAP/ARAP are available • Minister can expropriate land for energy-related projects
The Ministry of Finance	• Relates with the central Bank to pay PAPs
EDSA	• Primary responsibility for ARAP implementation • Superintends the grievance redress process • Reviews and approve compensation rates • Present compensation rates to PAPs for signing off • Reviews reports on the completion of compensation payments • Responsible for ARAP Implementation • Assign safeguards personnel to contractors • Ensure that Project implementation complies with JICA Guidelines and World Bank's safeguards • Report to JICA on all aspects of environmental and social management and monitoring based on the results of ARAP monitoring and take corrective measures where necessary
The Ministry of Lands Housing and Country Planning	• Manages state land • Compulsory land acquisition for development projects • Prepare survey plans for EDSA in the event there is land acquisition • Verify survey/title claims • Participate in stakeholder consultations • Validation of property valuation
The Sierra Leone Roads Authority	• Manages RoW • Verify claims on RoW • Support demolition of structures on RoW
Western Area Rural District Council	• Valuation for land compensation • Involve in Project grievance redress process
Local authorities (Paramount Chiefs, Town Chiefs, opinion leaders, and councillors)	• Responsible for local policy matters; • Resolving local conflicts; • Provide orderly leadership at the local level
The Ministry of Agriculture and Forestry	• Determines rates for crop compensation
Law Officers' Department	• Draft compensation agreements • Guide grievance resolution • Participate in compensation sign-off meetings
Sierra Leone Police	• Provides security during the demolition of structures

(2) Implementing Framework

1) Inter-Ministerial Sub-Committee (ISC)

Land acquisition, resettlement, and compensation will be managed and supervised by an Inter-Ministerial Sub-Committee (ISC) consisting of the following members:

- Deputy Minister, Ministry of Energy
- Head, Road Infrastructure Monitoring and Protection Unit – SLRA
- WARDC
- Civil Engineer, Civil Engineering Department - Ministry of Works, Housing and Infrastructure
- Director, Disaster Management Unit - Office of National Security
- Director General – EDSA
- Senior Regional Officer – Environmental Protection Agency
- Sierra Leone Police
- Deputy Director, Surveys and Lands - Ministry of Lands, Housing and Country Planning
- Senior Information Officer - Ministry of Information and Communications
- Principal State Counsel, Law Officers' Department - Attorney General's Office
- Senior Director - Strategic and Policy Unit, State House
- Adviser to the President on Energy and Infrastructure - Strategic and Policy Unit, State House
- Chairman of Energy Committee – House of Parliament

2) RAP Implementation Committee (RAP-IC)

Land acquisition, resettlement, and compensation will be implemented by an RAP Implementation Committee (RAP-IC) consisting of the following members:

- EDSA (Facilitator/secretariat)
- EDSA Legal Representative
- MoE
- EDSA Planning Network Planning Department Representative
- EDSA Health and Safety Department Representative
- WARD C Chief Administrator, Community Councillors, council Engineer,
- Traditional Leaders/Chiefs of the respective Communities,
- Witness NGO
- A representative from the PAPs
- A representative from Disabled Organizations
- A representative from the Ministry of Lands, Housing and Country Planning
- A Representative from SLRA
- A Representative of Inter-religious Council (Pastor & Imam)
- A Representative of Traders Union

1-3-3-7 Implementation Schedule

The schedule of ARAP preparation is shown in Table Table 1-3.59.

Table 1-3.59 Schedule of ARAP Preparation

Stage	Responsible bodies	Actions	Time frame
1. Mapping	EDSA Social Safeguard Officers/EDSA-GIS Experts/ Local consultant	A land survey is carried out to identify exact locations and sizes of lands affected by the Project and their land use types and potential.	August - September, 2022
2. Consultation with Community Leaders	EDSA Social Safeguard Officers/ Local consultant	Consultation with community leaders. The consultations include the importance/advantages of the project to the people, the strategies to avoid, minimize and mitigate the adverse effects etc.	August - September, 2022
3. Consultation with PAPs	EDSA Social Safeguard Officers/ Local consultant	Consultation with the PAPs. The consultations include the importance/advantages of the project to the people, the strategies to avoid, minimize and mitigate the adverse effects etc.	August - September, 2022
4. Census	Local consultant /EDSA Social Safeguard Officers	The census of all PAPs ◆ Enumerating and collecting basic information on the affected population ◆ Registering the affected population by residence or locality. ◆ Establishing cut-off date and creating a list of legitimate beneficiaries	August - September, 2022
5. Inventory of Affected Assets	Certified valuers in collaboration with community leaders, District Land Bureau	A detailed survey of all losses caused by the project, including land acquisition and loss of physical assets as well as loss of income either temporary or permanent.	August - September, 2022
6. Socioeconomic Studies	Local consultant	Social economic data collection on all affected households.	August - September, 2022
7. Data Analysis/ Entitle Matrix	Local consultant	Analysis of data collected in the census, assets inventory and socioeconomic studies. Establishment of an entitlement matrix ◆ Designing appropriate livelihood restoration. ◆ Establishing baseline information for future monitoring and evaluation of ARAP implementation.	September, 2022
8. Consultation with PAPs	EDSA Social Safeguard Officers, Local consultant	With the information provided by the surveys and studies, resettlement planner engages in informed and constructive consultations with the affected communities regarding the RAP strategy for livelihood restoration.	September, 2022
9. Submission of 1st draft ARAP to JICA Survey Team and EDSA	EDSA Social Safeguard Officer, Local consultant	1st draft ARAP will be submitted to JICA Survey Team and EDSA for review.	October 1 – 15, 2022
10. Preparation and singing of compensation forms	EDSA Social Safeguard Officer, Local consultant, Community leaders, District Land Bureau	After valuation exercise conducted by the certified valuers, the compensation forms must be signed by PAPs and all relevant stakeholders.	October - November, 2022
11. Agreement with District and Community	EDSA Social Safeguard Officer, Local consultant, District, Communities	Local government such as District and communities will agree with the ARAP.	October - November, 2022
12. Submission of final ARAP to EDSA	EDSA Social Safeguard Officer, Local consultant	Final ARAP will be submitted to JICA Survey Team and EDSA for approval.	November, 2022
13. Checking and	EDSA Social Safeguard	The compensation forms must be approved	November, 2022

Stage	Responsible bodies	Actions	Time frame
Approval by Social Safeguard Officer/EDSA	Officer	and checked further by the Social Safeguard Officer at EDSA as well as correcting some mistakes if any.	
14. Process by EDSA Finance Department	From EDSA Social Safeguard Officer to EDSA Finance Department	After approval by social safeguard Officer, the compensation forms are forwarded to the EDSA Finance Department to process payment.	November, 2022

Source: JICA Survey Team

1-3-3-8 Cost and Finance

According to the estimates in the ARAP-related budgets covering ARAP preparation and implementation that EDSA formed, costs for land acquisition and resettlement and budget required for implementation, and their breakdowns are shown in Table 1-3.60, Table 1-3.61 and Table 1-3.62. EDSA is responsible for securing the fund for costs displayed in the ARAP.

Table 1-3.60 Cost and Budget for Compensation and ARAP Implementation

Item	Cost (USD)
Compensation costs	79,700
ARAP Implementation budget	70,300
Total	**150,000**

Source: JICA Survey Team

Table 1-3.61 Cost of Compensation

Items for Compensation	Cost (USD)
Land	14,230
Buildings etc.	75,470
Total	**79,700**

Source: JICA Survey Team

Table 1-3.62 Breakdowns for Implementation Budget

	Activities	Responsible Organizations	Unit	Quantity	Cost (USD)
1	Implementation Preparation				
(1)	Survey recommissioned to consultant	EDSA/Consultant	Set	1	50,000
(2)	Consultations with PAPs through community leaders	EDSA/Community Leaders	Set	1	7,000
2	Implementation				
(1)	Grievance Redress	EDSA/Community Leaders	Set	1	3,300
(2)	Monitoring by NGO	EDSA/NGO	Set	1	10,000
				Total	**70,300**

Source: JICA Survey Team

1-3-3-9 Monitoring System

Internal monitoring of land acquisition and resettlement will be led and implemented by EDSA. External monitoring will also be conducted by an organization composed of Western Area District Councilors (WARDC), community leaders, and civil society organizations. The monitoring plan will consist of the following three components and details are described in 1-3-4-1 Draft Monitoring Form.

(1) Performance monitoring

Performance monitoring will be conducted to monitor the progress of land acquisition and resettlement. The items to be monitored include the following:

- Stakeholder meetings
- Grievance redress procedures following the existing dispute resolution structure in place

- Institutional frameworks aligned with the relevant phase of the resettlement process
- Census, asset inventory, and socio-economic study
- Identification and calculation of assets affected by the project
- Disbursement of compensation payment
- Agreement on livelihood restoration plans with affected communities
- Monitoring and evaluation reports

(2) Impact monitoring

Compared with the baseline obtained by socio-economic study etc., the status of livelihood restoration will be monitored in order to analyze the effectiveness of ARAP and to evaluate qualitatively, ensuring the ARAP meets the needs of the PAPs The examples of items to be monitored are listed below.

- Ownership of household goods such as phones
- Changes in quality and quantity of agricultural production
- Changes in the number of working household members versus total number of household members
- Changes in household income levels and expenditure patterns
- Changes in access to social infrastructure and services
- Changes in asset ownership, quality and scale
- Proportion of children in each household attending primary school

(3) Completion audit

The completion audit will be undertaken about 2 years after all ARAP inputs have been completed. The audit will analyze whether the compensation has been completed according to the ARAP and the affected livelihood (socio-economic status) has been restored by mitigation measures as expected. EDSA will put in place corrective actions if necessary.

1-3-3-10 Stakeholder Consultation

The stakeholder consultations conducted for this project are described in "1-3-2-10 Stakeholder Meeting". Further stakeholder consultations will be conducted with the PAPs in the future. Individual consultations will be held as necessary.

1-3-4 Others

1-3-4-1 Draft Monitoring Form

Draft monitoring forms for environmental management as well as land acquisition and resettlement are shown below.

MONITORING FORM

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of comments from Governmental Authorities	Number: Contents: Actions to be taken:
Number and contents of comments from the Public	Number: Contents: Actions to be taken:

2. Mitigation Measures

- Air Quality（Emission Gas / Ambient Air Quality）(Construction Phase)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards(*1)	Remarks (Measurement Point, Frequency, Method, etc.)
SO_2, NO_2, PM10, $PM_{2.5}$, O_3				N/A		Point: Tombo and York Substations and communities along the route. Frequency: quarterly.

Note) Negative impact on air quality is expected to some extent during construction such as dust. Hence, EDSA and Contractor shall monitor the status of necessary mitigation measures, including daily site inspection for certification of vehicle and heavy machineries.

(*1) IFC EHS Guidelines, General EHS Guidelines Table 1.1.1

- Water Quality (Construction Phase)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards (*1)	Remarks (Measurement Point, Frequency, Method, etc.)
Management measures on domestic wastewater and discharges from washing trucks and heavy machineries				N/A		Point: worker's camps and sites for washing trucks and heavy machineries. Frequency: daily.
Water temperature, pH, turbidity, DO, BOD, E. Coli.				N/A		Point: Tombo and York Substations and communities along the route. Frequency: quarterly.

Note) Negative impact on water quality is expected to some extent during construction. Hence, EDSA and Contractor shall monitor the status of necessary mitigation measures, including daily site inspection for discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries.

(*1) WHO Guidelines.

- Noise / Vibration (Construction Phase)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards (*1)	Remarks (Measurement Point, Frequency, Method, etc.)
Inspection of certification				N/A	N/A	Point: construction sites Frequency: daily

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards (*1)	Remarks (Measurement Point, Frequency, Method, etc.)
and schedule for vehicle and heavy machineries. Controlling operation time (7a.m.-5p.m.)						
Noise level	dB			N/A	55	Point: Tombo and York Substations and communities along the route. Frequency: Quarterly.

Note) Noise and vibration standard for construction work is not stipulated in any national standards of Sierra Leone. However, EDSA and Contractor shall monitor the status of necessary mitigation measures, including time regulation of construction and daily site inspection for certification of vehicle and heavy machineries.

*1: IFC EHS Guidelines, General EHS Guidelines Table 1.7.1 Daytime (07:00-22:00)

- Soil (Construction/ Operation Phase)

Monitoring Item	Monitoring Results during Report Period
PAHs, BTEX	

Note) Insulation oil will be used for transformers, which may cause soil pollution if it is leaked. Hence, EDSA and Contractor shall conduct soil sampling at Tombo and York Substations before, mid-term and end of construction; EDSA shall conduct soil sampling on an annual basis at Tombo and York Substations in operation phase.

3. Natural Environment (Construction Phase)

- Protected Areas/Ecosystem

Monitoring Item	Monitoring Results during Report Period
Type and number of trees cut or trimmed	
Record of animals found on construction sites	
Record of migratory bird nests	
Record of working hours in terms of restriction on daytime working hours	
Lighting equipment of trucks	
Noise level	
Traffic management plan in terms of on-site speed limit	
Record of solid wastes collected and transported to disposal site for disposal	

Note) Since the project requires cutting or trimming trees, EDSA and Contractor shall conduct compensatory measures in accordance with relevant laws and regulations of Sierra Leone.

4. Social Environment

- Resettlement (Pre-Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Approval of ARAP by EDSA	Status/ Completion date:
Payment process by EDSA Finance Department	Status/ Completion date:
Submission of the Payment order to MOF	Status/ Completion date:
Payment process by MOF	Status/ Completion date:
Land title request	Status/ Completion date:

1) Progress of Compensation Payment and Land Acquisition

Components	Planned Total	Unit	Monthly Progress			Progress in %		Expected Date Completion	Responsible Organization.
			Jun. 2022	~	Nov. 2022	Till the last month	Up to the month		
Compensation Payment									
Secondary substations		HH							EDSA/ MOF
Total		HH							EDSA/ MOF
Land Acquisition									
Secondary substations		m^2							EDSA/Community Leader
Total		m^2							EDSA/Community Leader

Note: The figures in this table include the PAPs without consensus and absent

2) Progress of Consensus with PAPs absent and without consensus

Type of PAPs	Number	Unit	Monthly Progress			Expected Date Completion	Responsible Organization.
			Jun. 2022	~	Nov. 2022		
Absent		HH					EDSA
Without Consensus		HH					EDSA
Total		HH					EDSA

3) Remarks on Progress with PAPs absent and without consensus

No.	Name of PAP	Status/Progress in this month	Action Plan for the next month
1			
2			
3			
4			
5			

- Living / Livelihood (Pre-Construction, Construction and Operation Phase)

Monitoring Item	Monitoring Results during Report Period
Livelihood restoration programs	Status (during and after livelihood restoration program):

- Record of grievance management (Pre-Construction/Construction/Operation Phase)

Monitoring Item	Monitoring Results during Report Period
Number and contents of grievance	Number: Contents: Actions to be taken:

4) Remarks on Progress with PAPs absent and without consensus

No.	Name of PAP	Status/Progress in this month	Action Plan for the next month
1			
2			
3			
4			
5			
6			
7			
8			
9			

10			
11			
12			

- Existing social infrastructure and services (Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Traffic management plan	
Power cut plan	

- Occupational health hazards (Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Occupational health and safety Plan	
Record of workers wearing Personal Protective Equipment (PPE)	

- Accidents (Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Traffic management plan	
Record of road accidents	

1-3-4-2 Environmental Check List

Table 1-3.63 below is the Environmental Check List of the Project based on the JICA Guidelines for Environmental and Social Consideration.

Table 1-3.63 Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) Y (c) Y (d) Y	(a)-(c) The EIA report was submitted to EPA-SL and the EIA License is expected to be issued by EPA-SL in October 2022. Conditions are general issues concerning the construction works and they are already addressed in the EIA report with mitigation measures and monitoring plan. (d) On January 24, 2022, the National Protected Area Authority (NPAA) issued a letter to EDSA approving the implementation of the project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) In line with JICA Guidelines and Sierra Leone regulations, stakeholder meetings were conducted. (b) Main comments raised during meetings were reflected on the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Alternative plans including 'without project' alternative were studied. Different construction methods of distribution lines were studied. The proposed project is most preferable in terms of lower impacts on natural, social and economic aspects
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) There are no rivers or swamps around the project site.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The project site is adjacent to the National Park. Currently, the species of fauna and flora in the National Park are very rich. Because the forests are very stable, the habitats for fauna and flora are also very stable. The distribution lines of this project will be constructed on existing roads which are adjacent to the National Park. Since existing housing development, road construction, and traffic have already affected the habitats and the functions of ecosysteMOF fauna and flora in the National Park, the impacts of this project on biodiversity will be no greater than the existing ones.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N (b) N (c) Y (d) N (e) N (f) N	(a) There are no ecologically valuable habitats in the project site. (b) There are no protected habitat of endangered species in the project site. (c) Since the construction is geographically limited and completed within a short period, no significant ecological impact is anticipated. (d) No significant impacts are expected on habitat fragmentation and migration routes. (e) There is no such possibility as there is no important ecosystem near the project site. The project will not introduce non-native invasive species or pests. (f) The project site is within the ROW of Peninsula Highway, which have already been developed.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) There are no locations along the distribution lines which have risks of slope failure and land sliding. (b)-(c) The primary substation sites are flat lands. Since the soil is relatively hard, there are no risks of slope failure and landslides.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement?	(a) N (b) Y (c) Y (d) Y (e) Y (f) Y (g) N (h) Y (i) Y	(a) No resettlement occurs. In addition, the loss of one structure is predicted. The impacts were minimized by selecting routes of distribution lines along the ROW of existing roads. Especially, the 33kV distribution lines from the existing Goderich Substation and Sussex were supposed to pass a relatively dense residential area, so the construction methods with less impact on the existing structures were carefully studied. (b) Several stakeholder meetings were held prior to

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, and people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(j) Y	resettlement; explanation/clarification on compensation and livelihood restoration assistance was done toward the PAPs. The PAPs agreed upon it. (c) A census survey, socio-economic survey and asset inventory will be conducted for all the PAPs from August to September 2022, based on which ARAP will be developed. APAP includes compensation at full replacement cost and livelihood restoration programs. The full replacement cost includes the amount to move houses (physical displacement). (d) Compensation will be paid prior to the resettlement, which is also stipulated in Sierra Leone law. EDSA submits a payment order to MOF, and then MOF proceeds with the payment. After the payment, physical resettlement will be implemented. (e) Compensation policy was described in ARAP (including eligibility for compensation, entitlement matrix etc.). (f) Vulnerable groups shall be given special considerations. However, since it is not physically but economically displaced, livelihood restoration measures (direct economic assistance, medical insurance) will be conducted. (g) No resettlement occurs. (h) EDSA is responsible for ARAP implementation. EDSA has one social safeguard officer who deal with resettlement and land acquisition. It was agreed that all the implementation of ARAP would be completed within 3 months after the approval of this project by Japanese Government (Field Report (signed on November 29, 2021 by JICA Survey Team and EDSA). (i) Monitoring of resettlement and land acquisition will be conducted on a monthly basis. A monitoring plan was developed in ARAP. (j) A grievance redress system was developed, with the combination of existing conflict resolution methods at community level and arbitration by the Court.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to	(a) Y (b) Y	(a) An economic displacement such as the loss of one structure is expected. ARAP was developed and the loss

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(c) Y (d) Y	will be compensated at full replacement cost. (b) The project site is located within Freetown City, and no influx of population from outside of the project site is predicted. (c) The project will not cause radio interference. (d) Compensation under power lines will be paid according to the Sierra Leone laws/regulations and ARAP.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no such possibility as there is no heritage site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) The project will not affect the landscape. The areas around the project site have already been developed.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a)-(b) There are no ethnic minorities and indigenous people affected by the project.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a)- (d) EDSA observes all laws and ordinances associated with working conditions of the country, conducting necessary tangible and intangible safety measures.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	(a) Y (b) Y (c) Y	(a) Based on the Sierra Leone laws and regulations, mitigation measures will be conducted. The expected impacts are noise, dust, exhaust gas and soil. Mitigation measures to

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?		be taken will include water sprinkler, installation of cover to prevent dust and control of construction working hours. (b) Since the construction is geographically limited and completed within a short period, no impacts on surrounding environment are expected. (c) Construction activities may disturb the traffic around the site. EDSA requires the contractor to control traffic with collaboration with local police, securing the smooth traffic and safety around the project site. The power cuts will be informed to the surround communities and residents in advance.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) Y	(a)-(d) For the items with impacts, EDSA (planning and construction phases, operation phase) will be monitoring. Monitoring plan and responsible organizations were developed in the Environmental and Social Management Plan (ESMP).
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) N/A	(a) There is no additional Environmental Items that may be affected.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N/A	(a) Since the construction is geographically limited and completed within a short period, no impacts to transboundary or global issues are expected.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Project Overview

This project aims to expand and stabilize the electricity supply in the southwestern part of the Freetown Peninsula by constructing a new substation and improving the power distribution network, thereby strengthening the basic infrastructure and contributing to economic growth.

The outline of the basic plan of the Project based on the design policy described above is shown in Table 2-1.1.

Table 2-1.1 Project Summary

Main components	Quantity
Procurement and Installation	
1. Construction of 33 kV distribution line (Goderich Substation – Tombo Substation)	Approx. 46 km
(a.) 33 kV overhead line	
2. Construction of 11 kV distribution line	Approx. 49 km
(a.) 11 kV overhead line (Sussex – Kerry Town)	
3. Construction of Primary Substation	
(a.) Tombo Substation 15 MVA 33/11 kV transformer, etc.	1
(b.) York Substation 15 MVA 33/11 kV transformer, etc.	1
4. Construction of Secondary Substation	
(a.) 100 kVA 11/0.415 kV pole mounted transformer	6 set
(b.) 200 kVA 11/0.415 kV pole mounted transformer	3 set
(c.) 200 kVA x 2 11/0.415 kV pole mounted transformer	4 set
(d.) 250 kVA 11/0.415kV pole mounted transformer	3 set
(e.) 250 kVA x 2 11/0.415 kV pole mounted transformer	2 set
(f.) 630 kVA 11/0.415kV ground mounted transformer	5 set
Supply	
1. Low Voltage Distribution Materials (Power Pole, Conductor, Power Cable, Insulator, Power Meter)	1
2. Maintenance tools for procured materials and equipment	1
3. Replacement parts and consumables for procured materials and equipment	1
Construction	
1. New substation building	2 buildings
2. Civil engineering work	1

Source: JICA Survey Team

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policy

This project, a grant assistance project of Japan, aims to maximize cost-effectiveness based on the regional circumstances of the southwestern Freetown Peninsula, and aims to improve electricity supply capacity by developing a supply plan for the target area with an optimal combination of 33kV, 11kV, substation facilities, and low-voltage distribution lines.

The goal is to operate the 33kV, 11kV, and low-voltage distribution line voltages within the standard voltage range of ±6%. Detailed demand forecast will be made in developing the supply plan, and voltage studies will be conducted during peak and off-peak hours. At the time of supply planning, voltage drop and power loss will be evaluated, each planning proposal will be compared, and the most appropriate proposal will be made. In this project, protective relays and meters will be installed appropriately for the newly constructed facilities, and the design will be coordinated with the existing facilities to prevent unnecessary accidental

power outages.

At the same time, in consideration of the fact that the development plan is to be carried out in an area where socioeconomic activities are active, the policy is to ensure that environmental and social considerations are taken into account at the planning stage.

2-2-1-2 Plan for Natural Conditions

(1) Temperature and moisture conditions

It has a tropical monsoon climate, Köppen climate classification Am, with average temperatures ranging from 25.0 °C to 28.0 °C, with no significant change throughout the year in Sierra Leone. The average humidity is high, ranging from 84% to 93%, and like the temperature, does not vary significantly throughout the year. The substation and distribution facilities procured in this project shall take the above temperature and humidity into consideration. And they shall be designed to ensure that the equipment operates normally and does not interfere with operation and maintenance in the event of temporary temperature increases due to outdoor temperature and direct sunlight, as well as high humidity. Since the switchgear is installed inside the building, there is no need to take special measures against the outdoor temperature at the project sites. However, they should be considered to ensure that the equipment functions with a design temperature of 40°C (104°F) and 40°C (104°F) for outdoor equipment.

(2) Rainfall and Lightning

It is extremely high rainfall, with an annual rainfall of approximately 2,900 mm in Sierra Leone. There is a rainy season (May-October) and a dry season (November-April), with brief, heavy rains, often lasting from a few hours to half a day during the rainy season. During this time, flooding (flash floods) and sloping cliff collapses occur in Freetown. Although there is no such topography in the project sites Tombo and York substations, it is necessary to consider rainwater countermeasures for the foundations and buildings of the substation facilities, such as raising them approximately 30 to 60 cm above the ground level and installing gutters. In addition, safety considerations for rainfall during the construction period and process planning should be taken into account and planned. Lightning strikes occur on an average of 95 days per year, and the project will plan lightning rods and other appropriate measures in accordance with the laws and regulations applicable in Sierra Leone.

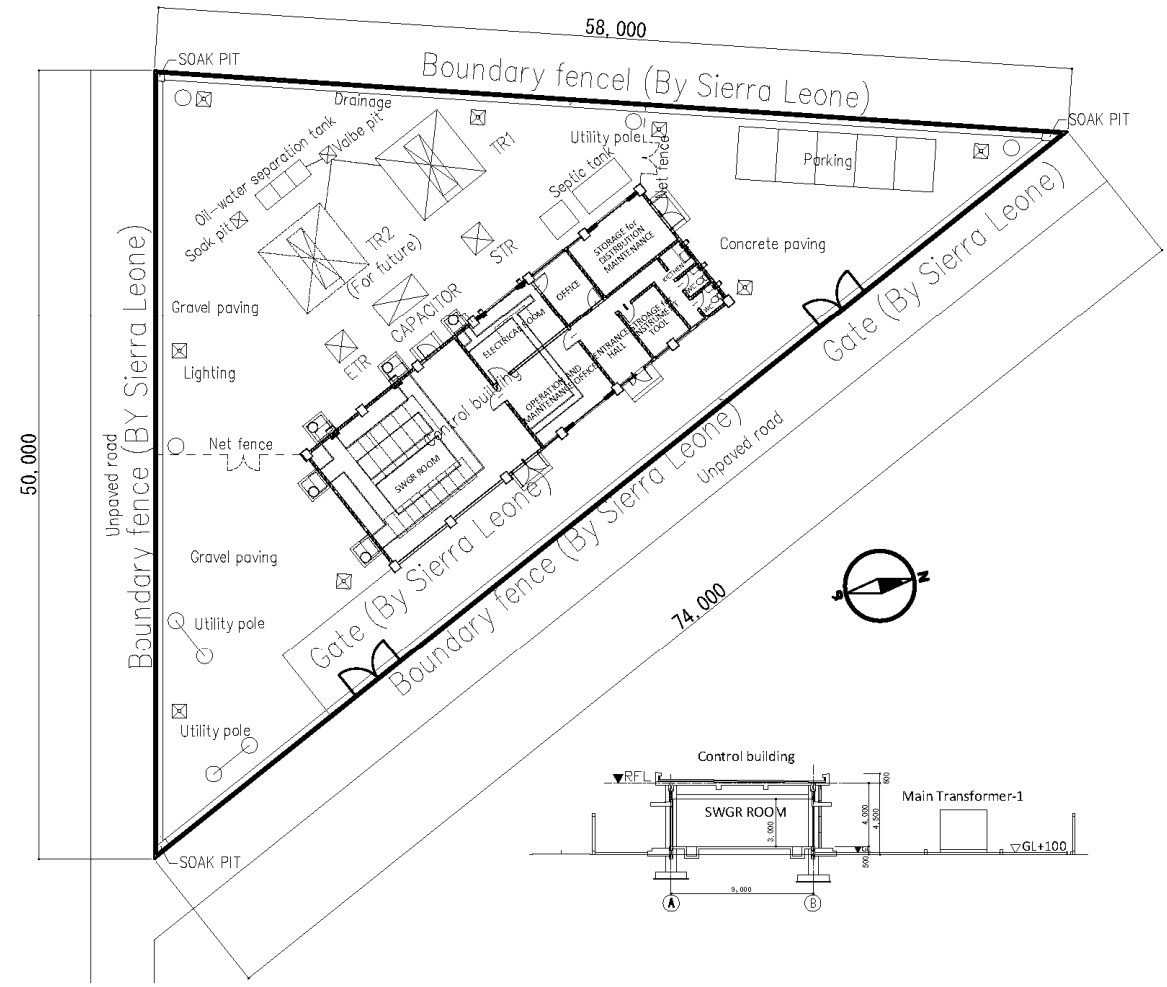
(3) Seismic Conditions

In Sierra Leone, an earthquake with a magnitude of 4.4 on the Richter scale was recorded near the Liberian border in the Eastern Province in 2001, but there have been no records since then. Although the occurrence of earthquakes is extremely rare, the horizontal seismic intensity of 0.1 G, which is generally adopted in Japan, is used as a design condition for the equipment, considering damage during transportation.

(4) Topographical and Geological Conditions

1) Topography and Geology for the project site in the Tombo Substation

The project site for Tombo Substation is a triangular-shaped site located in the southern part of the Freetown Peninsula, 300m inland to the north from the Freetown Peninsula Peripheral Highway. It is a narrow site (approximately 1,440 m^2), faced between two community roads (unpaved) and bordered on one side by an unimproved soccer field. The land is generally flat with some undulations. The ground surface is covered with laterite, and there are no particular problems as a construction site of a one-story RC control building foundation and transformer foundation.

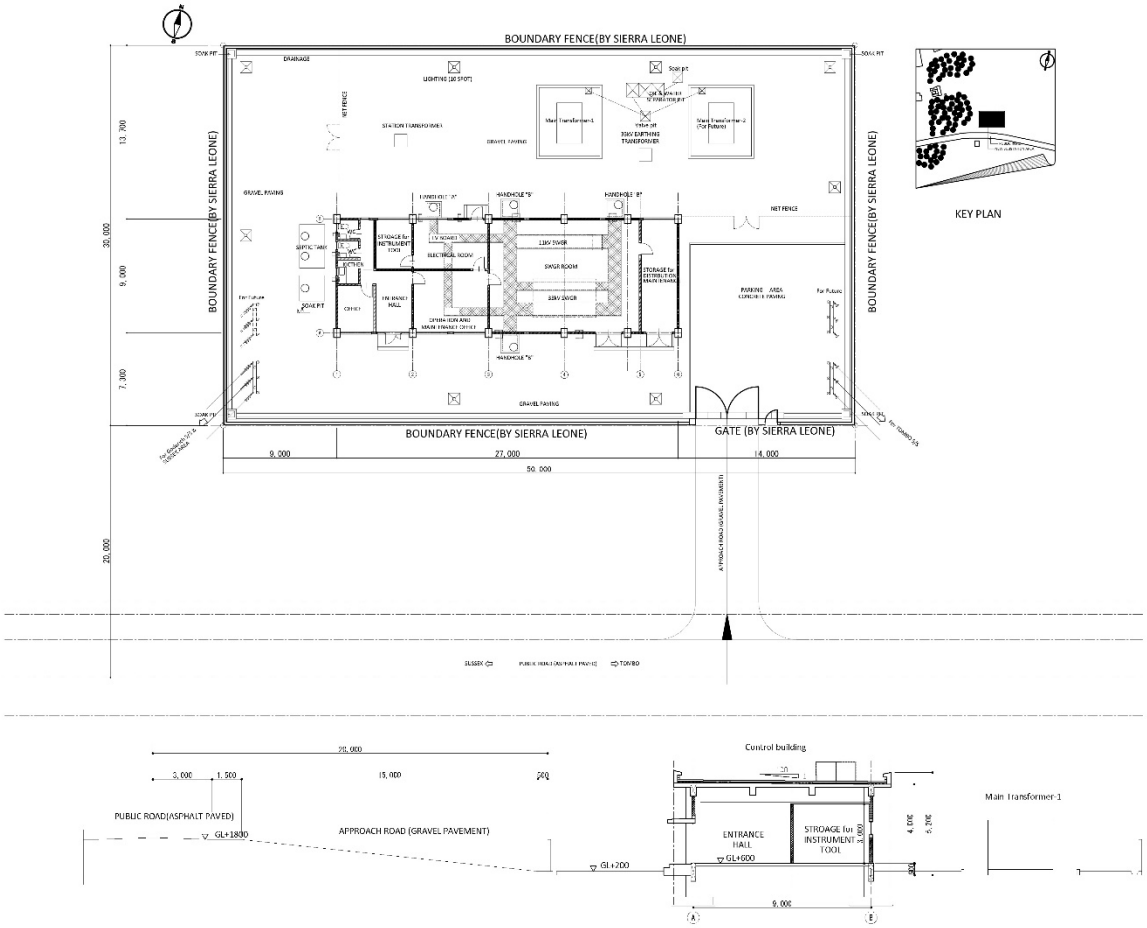


Source: JICA Survey Team

Figure 2-2.1 Site Plan for the Control Building in Tombo Substation

2) Topography and Geology for the project site in the York Substation

The project site for the York Substation is a 2-acre (8,100 m^2) parcel of land in the southwestern part of the Freetown Peninsula that had been set aside for the construction of a police station. The project site is sufficient for the construction of the York substation (50m x 30m). The front road is a 6-meter road with one lane on each side, but there are plans to widen the road in the future, and it is confirmed that a 20-meter stretch parallel to the center line of the road will be used as a road right-of-way. The difference in level between the front road and the site is approximately 1.0m, so an access road for vehicles is required. The area around the project site is a muddy stream with a waterway in the vicinity. The surface of the site is covered with hard laterite, and the entire surface may be flooded in rare cases during the rainy season. The surface of the site is covered with hard laterite, and the entire surface may be flooded in rare cases during the rainy season. After the project site is cleared, 20 cm of crushed stone will be placed on the entire surface, and drainage channels will be provided around the entire perimeter to prevent rainwater. The ground conditions are suitable for supporting the foundations of the single-story control building and the transformer foundations.



Source: JICA Survey Team

Figure 2-2.2 Site Plan for the Control Building in York Substation

2-2-1-3 Plan for Socioeconomic Conditions

(1) Current Status of Related Infrastructure Development

1) Health and Medical Facilities

There are eleven health and medical facilities in the Target Area according to the data provided buy EDSA. It seems that one health and medical facility is established in a town/village whose population is more than 500. Most of the health and medical facilities in the Target Area are so called "Health Posts", where no doctor is deployed and midwives and health workers provide mainly maternity heath care services.

2) Educational Facilities

The school system of Sierra Leone is shown in Table 2-2.1. In the Target Area, there are 42 schools. Though there is not educational facility of higher education at present, there is allegedly a plan for Public Administration University to be moved to Bureh Town.

Table 2-2.1 School System of Sierra Leone

School	Grade
Higher Education	13 -
Senior Secondary	10 - 12
Junior Secondary	7 - 9
Primary	1 - 6
Pre-primary	- 0

Source: JICA Survey Team

3) Transport Facilities

The trunk road in Freetown Peninsula along towns and villages of the Target Areal is well developed. Comfortable driving is possible except for sections where bridge replacement works or pavement works are underway. They say there is no plan to construct another main road. There are some sections or streets where road or street lights are installed with LED lamps, photo-voltaic panels and batteries. There seems to be no places where traffic signals are necessary to be installed in the Target Area.

4) Water Supply Facilities

Figure 2-2.3 depicts areas of water supply service shown the Project Appraisal Report of Greater Freetown Water Supply and Sanitation Master Plan and Investment Studies prepared in October 2017 with a support of African Development Bank. The appraisal report does not describe specific names of towns and villages of in the master plan projects and the priority projects. In the Target Area, a public water supply network is found in Tombo town. The water source of the water supply is a dam reservoir.

Source: Greater Freetown Water Supply and Sanitation Master Plan and Investment Studies

Figure 2-2.3 Development Status of Public Water Supply (2017)

Due to abundant rainfall and an adjacent national park, small scale agriculture is predominant and large-scale irrigation does not spread in the Target Area. According to a report provided by the Ministry of Agriculture and Forestry, there are large vegetable and poultry farms in the area between Tombo and Waterloo, and many women and the youth, especially in farms in Samuel Town, are employed. As large markets are near, potential for development the processing of the products seems to high. It is reported, however, that the challenge would be investment attraction.

(2) Social and Economic Conditions in the Target Area

1) Social Conditions of the Target Area

Social conditions of the Target Area are summarized in Table 2-2.2. “Village” or “Town” in the names of locations seem not related to their population scale.

Table 2-2.2 Social Conditions of the Target Area

Town/Place	Population	Number of Households	School	Health Center, etc.	Government Facility
KERRY TOWN	1,500	1,000	2	0	
DURING TOWN	500	200	0	0	
RUSSEL TOWN	300	200	0	0	
BOYOH TOWN MADINA	2,600	350	9	1	
TOMBO TOWN	30,000	3,000	14	4	Police Station
KISSY TOWN	1,500	1,000	0	0	
BRIGITTE VILLAGE	300	450	0	1	
MAMA BEACH	2,500	350	3	0	
BUREH TOWN	800	100	1	1	
KENT	2,000	300	1	1	Police Station
JOHN OBEY	3,000	300	3	0	
BLACK JOHNSON	400	250	0	0	
BIG WATER	400	100	1	0	
YORK	3,000	600	3	1	
TOKEH	8,000	2,000	3	1	
RIVER NO.2	1,500	500	2	1	

Source: EDSA

2) Results of Social and Economic Survey

a. Objective of the Survey

A social and economic survey is conducted to verify adequacy and effectiveness of the Project to be implemented as a grant-aid project.

b. Methodology

<Method applied>

An interview survey is conducted using prepared questionnaires by visiting households, business establishments, health/medical facilities and educational facilities.

<Number of samples>

Numbers of samples by type of visited places and area are shown in Table 2-2.3. Sample numbers are not determined for obtaining reliable results but by numbers of affordable surveyors and survey schedule within the budget limit, referring numbers of households and public facilities (health/medical and educational facilities) counted in the list provided by EDSA.

Table 2-2.3 Number of Samples for the Social and Survey

Visited places	Target Area	Adjacent Already Electrified Area	Total
1. Households	117	75	192
2. Business establishments	75	50	125
3. Health/medical facilities	9	16	25
4. Educational facilities	27	20	47
Total	228	161	389

Source: JICA Survey Team

<Target Villages/Towns>

Target villages and towns of the social and economic survey are listed in Table 2-2.4. All villages and towns in the Target Area are the target of the social and economic survey. Villages and towns in southern and northern peninsula in the adjacent already electrified areas also selected as the target.

Table 2-2.4 Target Villages and Towns

Target Area		Adjacent Already Electrified Area
1. Samuel Town	11. Mama Beach	<Southern peninsula>
2. MacDonald	12. Bureh Town	1. Goderich
3. Kerry Town	13. Kent	2. Hamilton
4. During Town	14. John Obey	3. Sussex
5. Russel Town	15. Black Johnson	4. < Northern peninsula >
6. Boyoh Town	16. Big Water	5. Wellington
7. Madina	17. York	6. Jui
8. Tombo	18. Tokeh	7. Regent
9. Kissy Town	19. No.2	8. Rokel
10. Brigitte Village		

Source: JICA Survey Team

<Questionnaires>

Questions asked in the social and economic survey are shown in Table 2-2.5 and the questionnaires for the social and economic survey are attached in Annex 7. Questions were prepared in Japan and modified based on information obtained before conducting the survey through analysis of existing statistical data, such as results of Sierra Leone Integrated Household Survey 2018 and interviews with related ministries and departments. For example, though questions about use of fuel woods or charcoal for cooking, such as those on volume of use, time/costs to obtain them, etc., were prepared in Japan, they are not finally included in the questionnaire since it was deemed that no household in the Target Area, which are located in rural areas of the Western Region, would change heat source for cooking from fuel woods or charcoal to electricity because the result of Sierra Leone Integrated Household Survey 2018 shows that 0% of households even in urban areas of the Western Region, including Freetown, use electricity for cooking.

Table 2-2.5 Questions Asked in the Social and Economic Survey

[Households]

Target Area	Adjacent Already Electrified Area
Q1: Name of village/town	Q1: Same as left
Q2: Confirmation of the respondent	Q2: Same as left
Q3: Name of the respondent	Q3: Same as left
Q4: Number of family members	Q4: Same as left
Q5: Number of house buildings and rooms	Q5: Same as left
Q6: Type of material for wall	Q6: Same as left
Q7: Main income sources	Q7: Same as left
Q8: Average monthly income (choice from alternatives)	Q8: Same as left
Q9: Average monthly expenditure (choice from alternatives)	Q9: Same as left
Q10: Willingness to connect to the EDSA distribution network	Q10: Connection to the EDSA network, year of connection, average monthly payment to EDSA, average hours of power supply by EDSA per day, frequency of power outage, quality of EDSA's services (choice from alternatives)
Q11: Number of lights to install after electrification	Q11: Number of installed lights
Q12: Types of electrical appliances to be used after electrification (choice from alternatives)	Q12: Types of electrical appliances used (choice from alternatives)
Q13: Self-power generator (ownership, capacity, year of purchase, price, operating hours per day, cost of operation per day, monthly payment in case of collective generator)	Q13: Same as left
Q14: Expected merits of electrification	Q14: Actual merits of electrification

[Business establishments]

Target Area	Adjacent Already Electrified Area
Q1: Name of village/town	Q1: Same as left
Q2: Confirmation of the respondent	Q2: Same as left
Q3: Name of the respondent	Q3: Same as left
Q4: Name of the business establishment	Q4: Same as left

Target Area	Adjacent Already Electrified Area
Q5: Type of business Q6: Number of employees Q7: Sales (choice from alternatives) Q8: Profits (percentage to the sales) Q9: Capital (choice from alternatives) Q10: Types of electrical equipment/machinery) Q11: Self-power generator (ownership, capacity, year of purchase, price, operating hours per day, cost of operation per day) Q12: Expected business expansion by electrification (Type of expanded business (choice from alternatives), increased percentage in sales, profits and employees) Q13: Expected additional use of electrical equipment/machinery after electrification Q14. Possible availability of capital, markets and quality employees for business expansion by electrification Q15: Expected merits of electrification	Q5: Same as left Q6: Same as left Q7: Same as left Q8: Same as left Q9: Same as left Q10: Connection to the EDSA network, year of connection, average monthly payment to EDSA, average hours of power supply by EDSA per day, frequency of power outage, quality of EDSA's services (choice from alternatives) Q11: Same as left Q.10 Q12: Same as left Q.11 Q13: Actual business expansion by electrification (Type of expanded business (choice from alternatives), increased percentage in sales, profits and number employees) Q14: Actual additional use of electrical equipment/machinery after electrification Q15: Actual availability of capital, markets and quality employees for business expansion by electrification Q16: Actual merits of electrification

[Health/medical facilities]

Target Area	Adjacent Already Electrified Area
Q1: Name of village/town Q2: Confirmation of the respondent Q3: Name of the respondent Q4: Name of the facility Q5: Number of doctors Q6: Number of nurses/health workers Q7: Number of beds Q8: Number of patients per day Q9: Type of laboratories in the facility Q10: Type of electric equipment/appliances used Q11: Self-power generator (ownership, capacity, year of purchase, price, operating hours per day, cost of operation per day) Q12: Expected additional use of electric equipment/appliances after electrification Q13: Expected improvement of services by electrification (types of expanded services, possible quality improvement, increased number of treated patients) Q14. Expected merits of electrification	Q1: Same as left Q2: Same as left Q3: Same as left Q4: Same as left Q5: Same as left Q6: Same as left Q7: Same as left Q8: Same as left Q9: Same as left Q10: Same as left Q11: Same as left Q12:Connection year to the EDSA distribution network Q13: Actual additional use of electric equipment/appliances after electrification Q14: Expected improvement of services by electrification (types of expanded services, possible quality improvement, increased number of treated patients) Q15: Actual merits of electrification

[Educational Facilities]

Target Area	Adjacent Already Electrified Area
Q1: Name of village/town Q2: Confirmation of the respondent Q3: Name of the respondent Q4: Name of the facility Q5: Number of teachers Q6: Number of students Q7: Number of classes/night classes Q8: Uses of the facility by communities, purposes of community uses Q9: Uses electrical equipment/appliances	Q1: Same as left Q2: Same as left Q3: Same as left Q4: Same as left Q5: Same as left Q6: Same as left Q7: Same as left Q8: Same as left Q9: Same as left Q10: Same as left

Target Area	Adjacent Already Electrified Area
Q10: Self power generator (ownership, capacity, year of purchase, price, operating hours per day, cost of operation) Q11: Expected additional use of electric equipment/appliances after electrification Q12: Expected increase in use of the facility by communities, purposes of increased uses Q13: Expected merits of electrification	Q11: Actual additional use of electric equipment/appliances after electrification Q12: Actual increase in use of the facility by communities, purposes of increased uses Q13: Actual merits of electrification

Source: JICA Survey Team

c. Survey Results [Households]

<Basic Information>

Table 2-2.6 shows survey results regarding number of family members, house buildings and rooms, materials of house buildings (walls), main income sources, monthly income and expenditure. Major characteristics of households of the Target Areas and the adjacent already electrified areas are as follows:

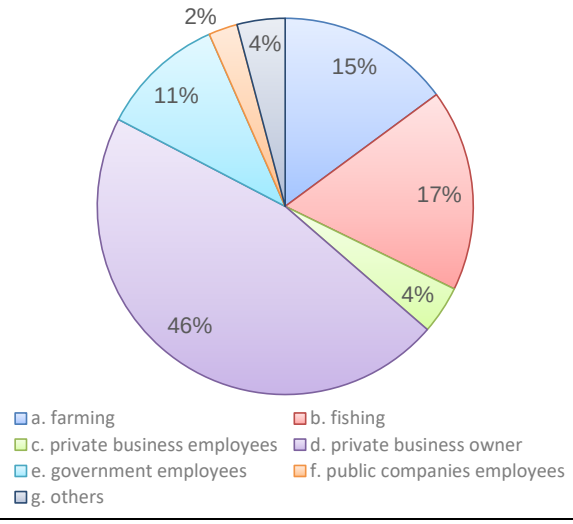
* Numbers of family members, house buildings of the Target Area are larger than those of the adjacent already electrified areas. The difference in number of rooms is small. As for materials of house buildings (wall), portion of buildings made of mud in the Target Area is larger than the portion in the adjacent already electrified areas.
* Since electrification, i.e., expansion of the National Grid in the Freetown Peninsula, has been carried out from Freetown City extending to rural areas, already electrified areas generally belong to urban areas, while the Target Area, which is not electrified area, belongs to rural areas. Reason of the above-mentioned difference would be explained by this fact.
* Own businesses are the major main income sources in the Target Area as well as in the adjacent already electrified areas, whose shares are more than 40%. In the Target Area, the share is followed by that of agriculture (15%) and fishery (17%), and by the government employment (32%) in the adjacent already electrified areas. At this viewpoint as well, the Target Area has characteristics of rural areas, while the adjacent already electrified areas have those of urban areas.
* In the Target Area, larger portion of households belongs to low income/expenditure group (less than Le. 1.5 million/month or around USD 1,360/month, converted at USD 1=Le. 1,100) compared to the adjacent electrified areas. In the adjacent electrified areas, a large portion of the households falls into middle income/expenditure group. Portions of high income/expenditure group (Le. 2.5 million/month or more, or around USD 1,360/month or more) in the Target Area and the adjacent already electrified areas are not much different.

Table 2-2.6 Basic Information of Visited Households

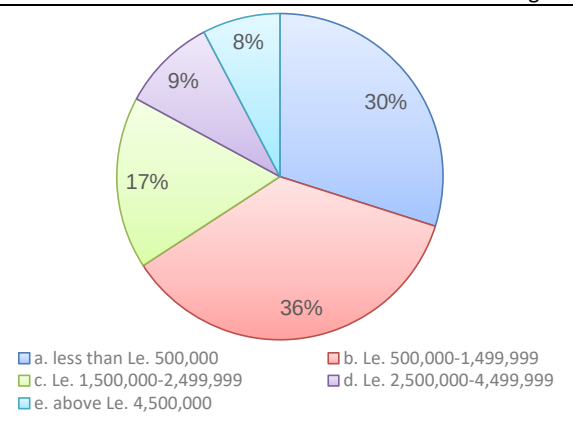
Questions	Target Area	Adjacent Already Electrified Area
Average family members	9.0 persons	7.6 persons
Average house buildings [rooms]	1.9 buildings [7.2 rooms]	1.5 buildings [7.1 rooms]
Material of house walls (answered up to three house buildings)	concrete: 69%, mud: 30%, galvanized iron: 1%	concrete: 79%, mud: 18%, galvanized iron: 3%

Target Area

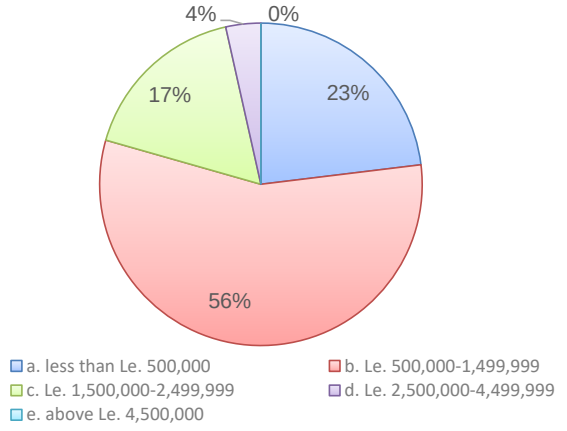
Main income sources [portion of households] (answered up to two, most respondents answered only one.)



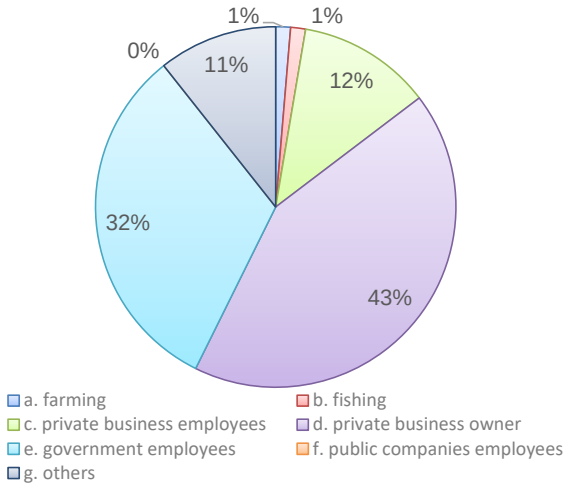
Average monthly income

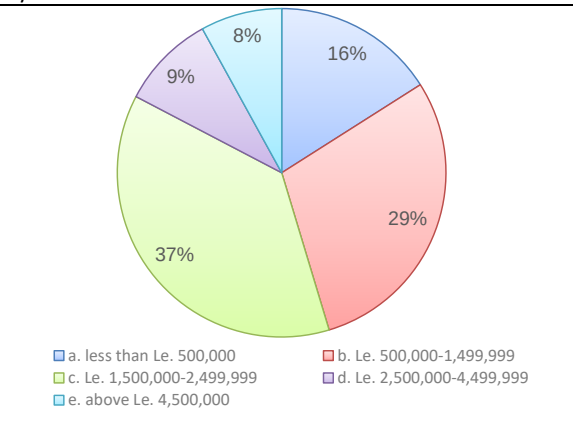


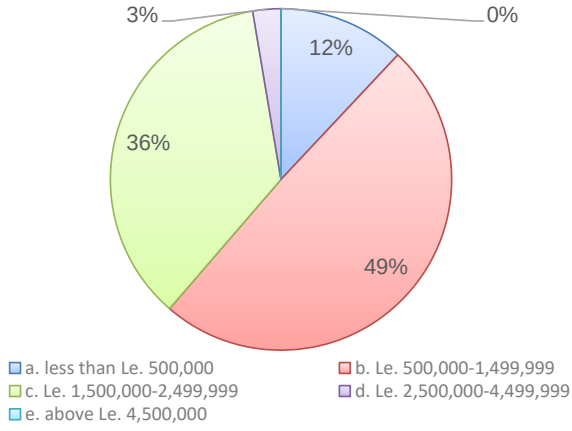
Average monthly expenditure



Adjacent Already Electrified Area







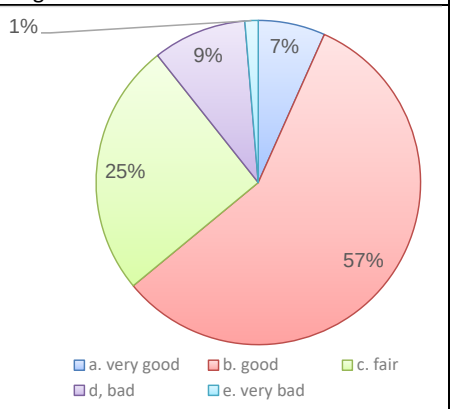
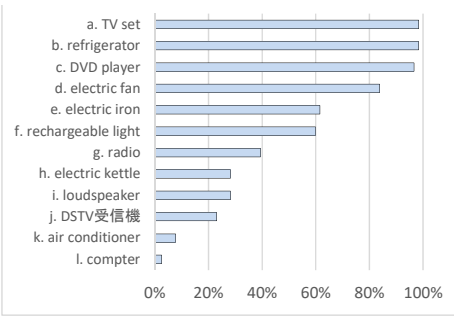
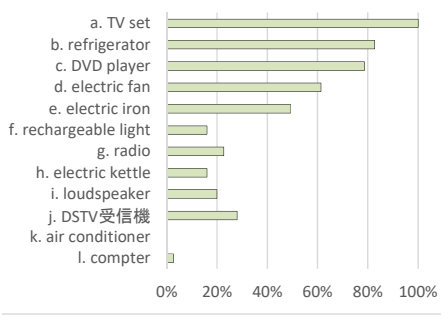
Source: JICA Survey Team

<Changes by Electrification (Target Area: expected, Adjacent already electrified＜areas: actual)>

Survey results regarding expected changes in the Target Area and actual changes in the adjacent already electrified areas by electrification are given in Table 2-2.7.

* All households in the Target Area wish to connect to the EDSA network and all households in the already electrified areas actually connected to the network. Connection years range from 1980 to 2021.
* Average monthly payment to EDSA by households in the adjacent already electrified areas amounts to Le. 182,560, or USD 166 (converted at USD 1=Le. 1,100, same hereafter)
* Since average monthly payment to EDSA reaches Le. 182,560, or USD 166 and the payments range from Le. 12,000 or USD 11 to Le. 1,500,000 or USD 1,364, it is conjectured that many of private small business owners pay for electricity for their household use and business use altogether.
* Average daily power supply hours in the adjacent already electrified areas is 13.6 hours, the least is 3 hours/day and the most is 24 hours/day.
* Average power outages per day is 2.6 times. There is a household that answered 10 times power outages for a day.
* Evaluation of EDSA's services in the adjacent already electrified areas is high. More than 80% households evaluate the EDSA's services as "good" or "fair", and only 10% said that the services are "bad" or "very bad".
* Average number of electric lights that a household in the Target Area wishes to install in the house after electrification is 12.7, while an average number of lights actually installed by a household in the adjacent already electrified is 7.7. The difference could be explained by the wider land area and the larger number of house buildings for a household in the Target Area compared to those in the adjacent already electrified area. The difference might also be explicated by high exception for use of electric lights of the household in the Target Area.
* Types of electrical appliances that households in the Target Area wish to use are quite similar to those actually used by households in the adjacent already electrified areas. The portion of households that wish to use a type of electrical appliances in the Target Area is generally more than the portion of households that actually use the same type of electrical appliance in the adjacent already electrified area. The larger figures might also show strong wishes of the households in the Target Area to use electrical appliances.
* In the Target Area, 30% of the households own self-power generators, 6% of them use community generators and 4% of them use solar panels. Besides, 23% of the households own self-power generators and no households use community generators or solar panels. Capacity as well as operation hours per day of a self-power generator for a household in the adjacent already electrified areas are slightly larger than those of the Target Area. It is estimated that some households in the adjacent already electrified areas continue to use self-power generators for domestic and business purposes.
* Merits of electrification raised by households in the Target Area and the adjacent already electrified areas are listed also in Table 2-2.7. Largest number of households raised merits of 'safety/security', 'night study by children' or 'more income/expenditure saving' in the Target Area, while many households mentioned merits of 'more comfortable lives' or "diverse amusement/cultural knowledge' in addition to the merits raised by the largest number of households in the Target Area. Portions of households that raised specific merits in the Target Area and in the adjacent already electrified areas are similar to each other.

Table 2-2.7 Changes by Electrification to Households (Expectation/Actual)

Questions	Target Area	Adjacent Already Electrified Area
1. Connection to the EDSA network	All households wish to connect.	All households actually connected.
2. Year of connection	---	1980-2021 (average 2015)
3. Monthly payment to EDSA	---	average: Le. 182,560, median: Le. 150,000 range: Le. 12,000～Le. 1,500,000 average: USD 166, median: USD 136 range: USD 11-USD1,364
4. Hours of power supply per day	---	average: 13.6 hours, median: 15 hours range: 3 hours-24 hours
5. Number of power outages per day	---	average: 2.6 times, median: 2 times range: 1-10 times
6. Evaluation of EDSA's services	---	
7. Number of lights (wish/actual)	average: 12.7 lights, median: 11 lights range: 3 – 35 lights	average: 7.7 lights, median: 7 lights range: 2-18 lights
8. Used electric appliances after electrification (wish/actual)		
9. Ownership of a self-power generator	Owing: 30% Using community generators: 6% Using solar panels: 4% No power generator: 60%	Owing: 23% No power generator: 77%
10. Capacity of self-power generators	average: 3.1KVA, median: 2.5KVA range: 1KVA-6.5KVA	average: 3.1KVA, median: 3KVA range: 2KVA-6.5KVA
11. Purchase year of self-power generators	average: 2013, median: 2017 range: 2005-2020	average: 2014, median: 2016 range: 2000-2021
12. Operation hours of a self-power generators per day	average: 5.4 hours, median: 5 hours range: 2 hours-10 hours	average: 4.6 hours, median: 4 hours range: 2 hours-10 hours
13. Operation cost of a self-power generators per day	average: Le. 49,500, median: Le. 40,000 range: Le. 20,000-Le. 100,000 average: USD 45, median: USD 36 range: USD 18-USD 91	average: Le. 55,294, median: Le. 50,000 range: Le. 30,000-Le. 120,000 average: USD 50, median: USD 45 range: USD 27-UDS 109

14. Merits of electrification (expectation/actual) (three answers per household)	Merit	Target Area	Adjacent already electrified area
	(1) Improvement in safety/security	90 answers	52 answers
	(2) Possible night study by children	72 answers	52 answers
	(3) More income/expenditure saving	61 answers	13 answers
	(4) More comfortable lives	42 answers	43 answers
	(5) Diverse amusement/cultural knowledge	31 answers	24 answers
	(6) Improvement in communication/social life	28 answers	13 answers
	(7) Better food sanitation (by use of refrigerators)	15 answers	19 answers
	(8) Possible night study by adults	12 answers	9 answers
	Total	351 answers	225 answers

Source: JICA Survey Team

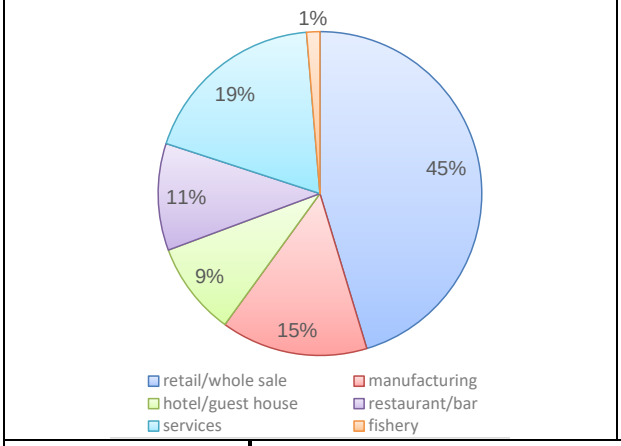
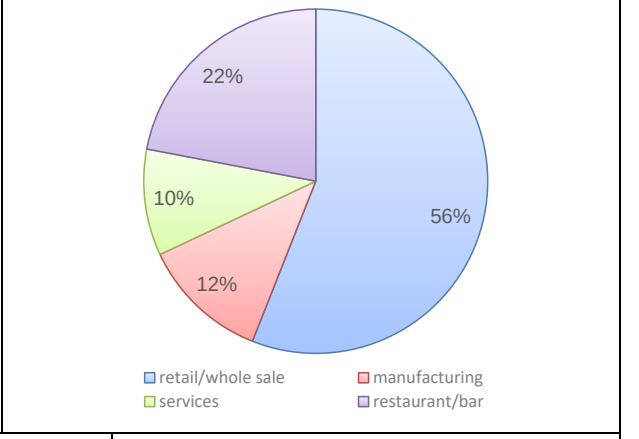
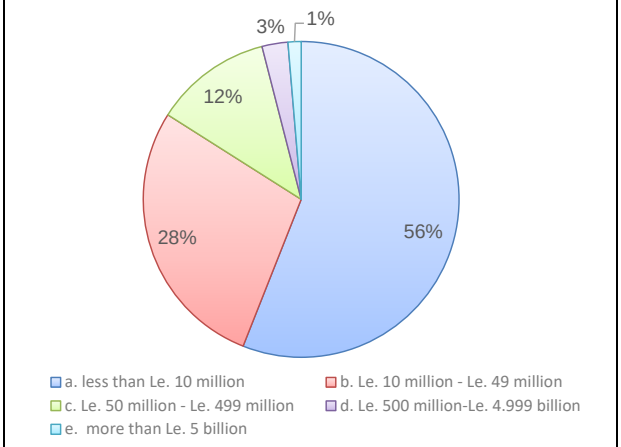
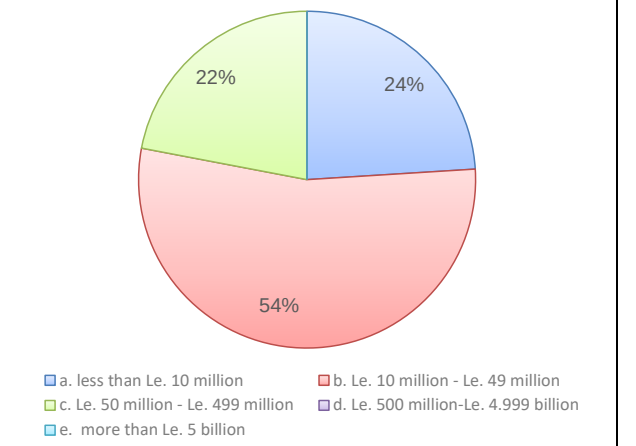
d. Survey Results [Business Establishments]

<Basic Information>

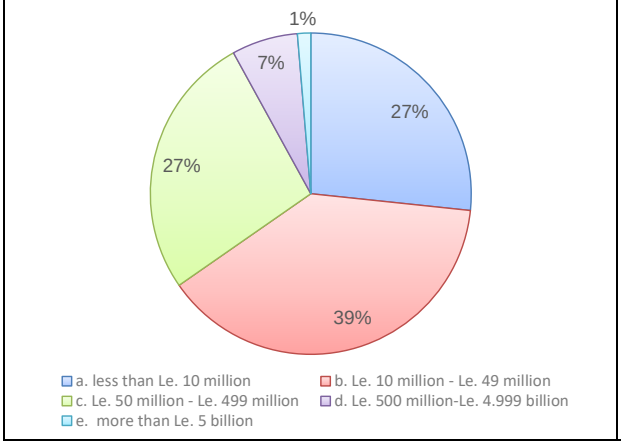
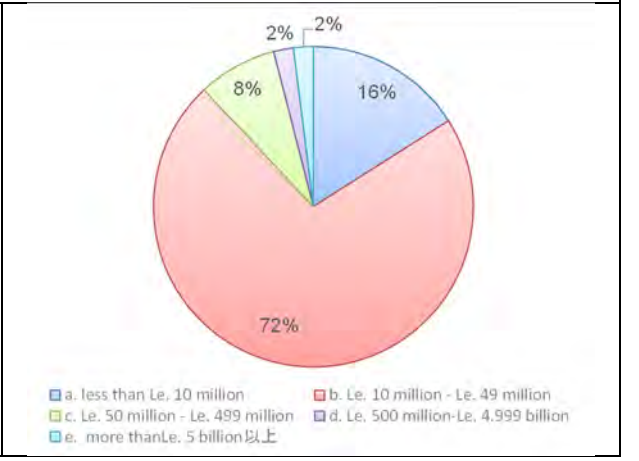
Table 2-2.8 shows numbers of employees, sales, profits and capitals of business establishments in the Target Area and in the adjacent already electrified areas. Features of business establishments of the Target Areas and the adjacent already electrified areas are described below.

* Business type of the largest number in the Target Area as well as in the adjacent already electrified areas is 'retail/whole sale', followed by 'various services' and 'restaurant/bar'. Though 'hotel/gust house' account for a large portion in the Target Area, that portion does not mean the actual large share but is derived from an instruction to the surveyors that they should visit many hotels and gust houses.
* Average numbers of employees in the Target Area and the adjacent already electrified area are 7.6 persons and 5.8 persons, respectively. This does not mean that average number of employees of all business establishments in the Target Area is larger than that of the adjacent already electrified area. The reasons of these figures are approximate numbers and sample ratios of large and small scale business establishments to be surveyed in each village and town.
* Business establishments of the largest portion (56% of the samples) in the Target Area have annual sales of less than Le. 10 million (USD 9,091) and business establishments of the largest portion (54% of the samples) in the adjacent already electrified area have annual sales of more than Le. 10 million (USD 9,091) and less than Le. 50 million (USD 45,455).
* In the Target Area, capitals of around 30% of sample business establishments are less than Le. 10 million (USD 9,091), capitals of around 40% of sample business establishments are Le. 10 million (USD 9,091)–Le. 50 million (USD 45,455) and capitals of around 30% of sample business establishments are Le. 50 million (USD 45,455)–Le. 500 million (USD 454,545). In the adjacent already electrified areas, capitals of around 70% are Le. 10 million (USD 9,091)–Le. 50 million (USD 45,455).

Table 2-2.8 Basic Information of Visited Business Establishments

Questions	Target Area	Adjacent Already Electrified Area
1. Business type		
		
2. Number of employees	average: 7.6 persons, median: 3 persons range: 1-100 persons	average: 5.8 persons, median: 3 persons range: 1-70 persons
3. Annual sales		
		

Questions	Target Area	Adjacent Already Electrified Area
4. Profits (percentage to sales)	average: 7.7%, median: 5% range: 1-30%	average: 6.6%, median: 6% range: 1%-30%

Target Area	Adjacent Already Electrified Area
5. Capital	
	

Source: JICA Survey Team

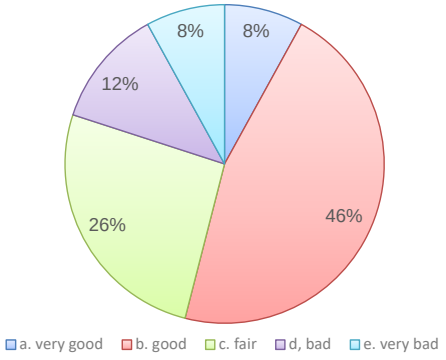
<Changes by Electrification (Target Area: expected, Adjacent already electrified areas: actual)>

Table 2-2.9 shows the survey results regarding expected changes in the Target Area and actual changes in the adjacent already electrified areas caused by electrification. Major findings are as follows;

* All business establishments in the adjacent already electrified areas actually connected to the EDSA network and all business establishments in the Target Area wish to connect to the EDSA network.
* Average monthly payment to EDSA in the adjacent already electrified areas amount to Le. 577,800, or USD 525. The amounts vary widely and range from Le. 50,000 (USD 45) to Le. 10,000,000 (USD 9,091).
* According to the interview results, average power supply hours per day in the adjacent already electrified areas are 14 hours and range from 3 hours to 24 hours per day.
* Business establishments in the adjacent already electrified areas say that average power outage for a day is 2.6 times and the frequency varied from one time a day to five times a day depending on the location.
* Evaluation of EDSA's services by business establishments in the adjacent already electrified areas are also high. Around 80% of the business establishments in the adjacent already electrified areas evaluated as 'very good', 'good' or 'fair'.
* In the Target Area, 72% of the business establishments own self-power generator (53%), use community generator (12%) or have solar panels (7%), while 64% of the business establishment in the adjacent already electrified areas own self-power generators. Business establishments in the Target Area operate their self-power generators 10.2 hours a day, and business establishments in the adjacent already electrified areas their self-power generator 5.7 hour a day.
* Average operation cost of self-power generators for a day in the Target Area is far higher than that in the adjacent already electrified areas as large-scale sample business establishments raise the average a lot.
* Business establishments in the Target Area expect increases after electrification in sales, profits and number of employees by 34%, 32% and 22% respectively. Besides, business establishments in the adjacent already electrified areas mentioned that actual increases in sales, profits and number of employees were 22%, 13% and 11% respectively.
* The greatest number of the business establishments in the Target Area as expected important merits, as well as business establishments in the adjacent already electrified areas as actual important merits, raise 'expansion of business' and 'improvement in safety/security'.

Table 2-2.9 Changes by Electrification to Business Establishments (Expectation/Actual)

Questions	Target Area	Adjacent Already Electrified Area
1. Connection to EDSA network	All business establishments wish to connect to the network.	All business establishments have connected to the network.
2. Connection year	---	2000-2021 (average 2016)
3. Payment of EDSA	---	average: Le. 577,800, median: Le. 200,000 range: Le. 50,000-Le. 10,000,000 average: USD 525, median: USD 182 range: USD 45-USD9,091
4. Power supply hours per day		average: 14 hours, median: 15 hours range: 3 hours-24 hours
5. Number of Power outage per day	---	average: 2.6 times, median: 3 tines range: 1 times-5 times

Questions	Target Area	Adjacent Already Electrified Area
6. Evaluation of EDSA's	---	
7. Ownership of a self-power generator	Owning: 53% Using community generators: 12% Using solar panels: 7% No power generator: 28%	Owing: 64% No power generator: 36%
8. Capacity of self-power generators	average: 28.0KVA, median: 2.5KVA range: 1 KVA-6.5KVA	average: 4.7KVA, median: 5KVA range: 1.5KVA-14KVA
9. Purchase year of self-power generators	average: 2019, median: 2019 range: 2007-2021	average: 2018, median: 2019 range: 2010-2021
10. Operation hours of a self-power generators per day	average: 10.2 hours, median: 10 hours range: 2 hours-24 hours	average: 5.7 hours, median: 5 hours range: 2 hours-14 hours
11. Operation cost of a self-power generator per day	average: Le. 1,713,293 median: Le. 90,000 range: Le. 20,000-Le. 60,000,000 average: USD 1,558, median: 82 range: USD 18-USD 54,545	average: Le. 85,781, median: Le. 60,000 range: Le. 30,000-Le. 300,000 average: USD 78, median: USD 55 range: USD 27-USD 273

Questions		Target Area	Adjacent Already Electrified Area
12. Possible business expansion (expectation/actual)	Expansion	75 establish. (100%)	36 establish. (72%)
	No expansion	0 establish. (0%)	14 establish. (28%)
13. Field of business expansion (expectation/actual)	Conventional field	68 establish. (91%)	28 establish. (56%)
	New field	7 establish. (9%)	8 establish. (16%)
	Both fields	0 establish. (0%)	0 establish. (0%)

Note: Establish. Business Establishment(s)

Questions	Target Area	Adjacent Already Electrified Area
14. Increase in sales (expectation/actual) (0% for no increase)	average: 34%, median: 25% range: 1%-80%	average: 22%, median: 30% range: 0%-40%
15. Increase in profits (expectation/actual) (0% for no increase)	average: 32%, median: 25% range: 1%-75%	average: 13%, median: 20% range: 0%-0%
16. Increase in Nos. of employees (expectation/ actual) (0% for no increase)	average: 22%, median: 10% range: 1%-65%	average: 11%, median: 0% range: 0%-0%

17. Merits of electrification (expectation/actual) (three answers per business establishment)	Merit	Target Area	Adjacent already electrified area
	(1) Business expansion	82 answers	40 answers
	(2) Improvement in safety/security	50 answers	36 answers
	(3) Better environment in shop/working place	38 answers	23 answers
	(4) Less expenditure	37 answers	17 answers
	(5) Better store of merchandise	10 answers	24 answers
	(6) More working hours	7 answers	4 answers
	(7) Stable operation	1 answers	2 answers
	Total	225 answers	150 answers

Source: JICA Survey Team

e. Survey Results [Health/Medical Facilities]

<Basic Information>

Table 2-2.10 shows numbers of doctors, nurses/health workers, beds and patients of health/medical facilities in the Target Area and in the adjacent already electrified areas. Summary of the results are as follows:

* Most of the health/medical facilities in the Target Area are small and no doctors are deployed, while health/medical facilities in the adjacent already electrified areas visited in the survey include large ones as an instruction to surveyors to visit many large scale facilities as well to understand merits of the electrification.
* In the Target Area, there are three health/medical facilities that have laboratories capable of simple inspection, such as urinalysis and blood test. Besides, health/medical facilities visited by the surveyors in the adjacent already electrified areas have laboratories except for a facility. One facility in the adjacent already electrified areas has advanced medical equipment.

Table 2-2.10 Basic Information of Visited Health/Medical Facilities

Questions	Target Area	Adjacent Already Electrified Area
1. Number of doctors	average: 1.0 persons median: 0 persons range: 0-5 persons	average: 1.3 persons, median: 0.5 persons range: 0-9 persons
2. Number of nurses/health workers	average: 9.4 persons median: 8 persons range: 3-31 persons	average: 33.8 persons, median: 19.5 persons range: 3-186 persons
3. Number of beds	average: 6.4 beds, median: 7 beds range: 1-5 beds	average: 13.3 beds, median: 7 beds range: 6-67 beds
4. Number of patient per day	average: 14.2 persons, median: 10 persons range: 3-50 persons	average: 52.3 persons median: 35 persons range: : 10-287 persons
5. Annexed laboratory	There are three facilities that have small laboratories capable of basic tests, such as urinalysis, blood, HIV, tuberculosis, or malaria tests.	One facility has advanced medical equipment, and 14 facilities has annexed laboratories capable of ordinary tests.

Source: JICA Survey Team

<Changes by Electrification (Target Area: expected, Adjacent already electrified areas: actual)>

Expected changes in the Target Area and actual changes in the adjacent already electrified areas to health/medical facilities caused by electrification are shown in Table 2-2.11. Major findings in this regard are described below.

* As for electric equipment/appliances used in health/medical facilities in the Target Area, almost all the facilities constitute a part of the cold chain for vaccination and freezers and/or refrigerators are installed.
* Except for one health/medical facility in the adjacent already electrified areas, basic laboratory equipment is installed according the scale of laboratories. One of the facilities has advanced equipment.
* Three health/medical facilities, which correspond one third of the total health/medical in the Target Area, have self-power generator and three of them use solar panels. In the adjacent already electrified areas, three health/medical facilities, i.e., 16% of the total sample, have self-power generators and six of them use solar panels.
* Average capacities of the self-generators in the Target Area and the adjacent already electrified areas are 15.8KVA and 230.4KVA, respectively. The average for the adjacent already electrified are is high due to a large hospital that has three generators, one unit of 280KVA and two units of 400KVA. Self-generators for other facilities are two units of 150KVA and one

unit of 2.5KVA.

* In the Target Area, average operation hours of self-power generators are 9.7 hours/day, and average operation costs is Le. 50,000 (USD 145)/day. Total operation hours of the self-power generators of the large hospital are 15 hours/day and operation cost is Le. 2,700,000 (USD 2,455)/day. For the rest two facility, the operation hours and the operation cost are 6 hours/day and Le. 40,000 (USD 36)/day, and 10 hours/day and Le. 800,000 (USD 727)/day, respectively.
* As the most important merits of electrification expected by health/medical facilities in the Target Area, and actually enjoyed by health/medical facilities in the adjacent already electrified areas, 'diverse, improved and rapid laboratory tests', 'midwifery at night', 'better storage of drugs and vaccines' and 'improvement in safety/security' are pointed out.

Table 2-2.11 Changes by Electrification to Health/Medical Facilities (Expectation/Actual)

Questions	Target Area	Adjacent Already Electrified Area
1. Used electrical equipment/ appliances (at present)	• Almost all health/medical facilities have a refrigerator/freezer. • There are three laboratories and are generally equipped with necessary equipment.	• Basic laboratory equipment is installed except for a facility. • Advanced equipment, such as an ultrasonic diagnostic apparatus is installed in a hospital.
2. Ownership of a self-power generator	• Three facilities own self-power generators. • Three facilities use solar panels. • As electric appliances, such as refrigerators, freezers, fans, or TV sets are widely used, some power source would be available in other facilities.	• Three facilities own self-power generators. • Six facilities use solar panels.
3. Capacity of self-power generators	Capacity of the three self-generators are 3.5KVA、38KVA、6KVA, and the average is 15.8KVA.	average: 230.4KVA, median: 215KVA range: 2.5KVA-400KVA
4. Operation hours of a self-power generators per day	Operation hours of the three self-generators are 5 hours, 12 hours, and 12 hours, and the average is 9.7 hours.	average: 10.3 hours, median: 10 hours range: 6-15 hours (per facility)
5. Operation cost a of self-power generators per day	Operation cost of the three self-generators is Le. 50,000 (USD 145)/day for each,	average: Le.1,180,000 median: Le.800,000 range: Le.40,000～Le.2,700,000 average: USD 1,073, median: USD 727 range: USD 36～USD 2,455 (per facility)
6. Additional used electric appliances after electrification (wish/actual)	• Many facilities wish to enhance laboratory equipment. • Many facilities wish to introduce auto claves and/or X-ray machines. • Many facilities wish to introduce electric fans or air conditions to improve environment for patients and workers.	• Many facilities introduced freezers. • Many facilities introduced incubators. • Many facilities added equipment for laboratories. • Many facilities introduced computers. • Some facilities introduced autoclaves. • Some facilities introduced X-ray machines.
7. Improvement in medical treatment	• Enhancement of laboratory tests • Possible maternity cares at night • Enabling more sophisticated medical treatments • Possible medical treatment at night • More stable equipment operation • Possible sterilization of tools and equipment • More diverse treatment	• Improvement in storage of medicines and vaccines • More various and speedy laboratory tests • Increase in maternity cares at night • Improvement of quality of medical treatments • Improvement with oxygen generators • Better environment by introducing air conditions
8. Increase in patients by electrification (expectation/ actual)	average: 26%, median: 20% range: 10-80%	average: 31%, median: 25% range: 0-90%
9. Merits of electrification (expectation/actual) (three answers per health/medical facility)	• Enhancing laboratory equipment/ medical equipment (9 answers) • Improvement in safety/security (5 answers) • Introduction of autoclaves (3 answers)	• Possible maternal care services at night (6 answers) • Improvement in safety/security (6 answers) • Saving in expense (4 answers)

Questions	Target Area	Adjacent Already Electrified Area
	• Improvement in communication (3 answers) • Saving in expense (2 answers) • Possible maternity care services at night (2 answers) • Introduction of refrigerators for preservation of vaccine • Increase in patient cares • Less noise	• Improvement in communication (3 answers) • Better storage of medicines, samples and vaccine (3 answers) • Possible night treatment (2 answers) • Grade up of medical treatment (2 answers) • Increase in patient cares • Less noise • Pump up for water supply • Earlier test results • Stable operation of equipment • Use or drink of cold water

Source: JICA Survey Team

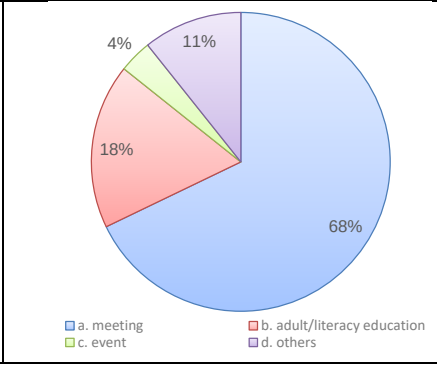
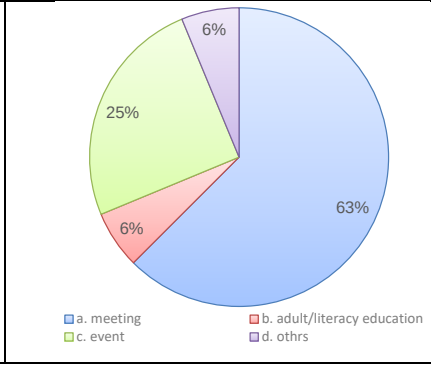
f. Survey Results [Educational Facilities]

<Basic Information>

Table 2-2.12 shows numbers of teachers, students, classrooms, etc. of educational facilities in the Target Area and in the adjacent already electrified areas. Major findings are summarized below.

* There are many schools whose numbers of students per classroom exceed100 in the Target Area as well as in the adjacent already electrified areas. It seems that these schools take a two-shift system.
* Portion of educational facilities that neighboring communities use is 81% for the Target Areas and 70% for the adjacent already electrified areas. In the Target Area, nearly 70% of the communities use for the purpose of 'meeting' and around 20% of the communities for the purpose of 'adult and literacy education'. In the adjacent already electrified area, 60% of the communities use for 'meeting' purpose, 25% for 'event' purpose, and only 6% for 'adult and literacy education' purpose.

Table 2-2.12 Basic Information of Visited Educational Facilities

Questions	Target Area	Adjacent Already Electrified Area
1. Number of teachers	average: 13.0 persons median: 10 persons range: 5-42 persons	average: 33.5 persons median: 14 persons range: 6-215 persons
2. Number of students	average: 493.6 persons median: 328 persons range: 17-2,200	average: 835.0 persons median: 475 persons range: 50-2,600 persons
3. Number of classrooms	average: 8.1 classrooms median: 8 classrooms range: 3-16 classrooms	average: 11.4 classrooms median: 11 classrooms range: 4-24 classrooms
4. Use by communities	Potion of educational facilities used by communities: 81%	Potion of educational facilities used by communities: 70%
5. Purpose of community use (at present)		

Source: JICA Survey Team

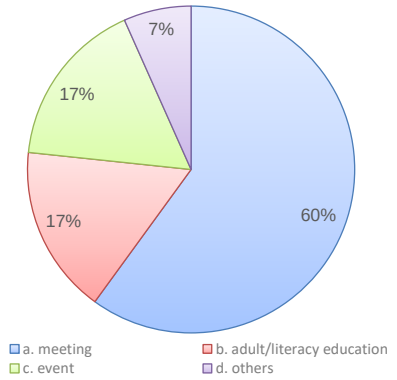
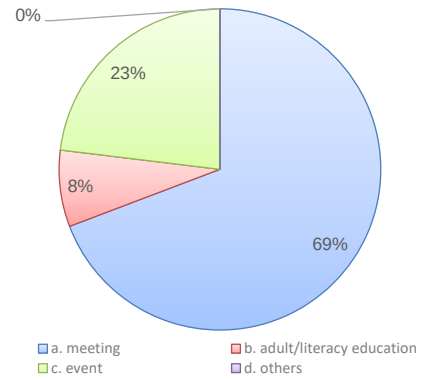
<Changes by Electrification (Target Area: expected, Adjacent already electrified areas: actual)>

Table 2-2.13 shows expected changes in the Target Area and actual change in the already electrified areas brought to educational facility by electrification. Summary of the results is described below.

* Educational facilities in the Target Area use limited types of electric appliances at present. Types of electric appliances that educational facilities in the Target Area wish to use after the electrifications are quite similar to those used by educational facilities in the adjacent already electrified areas.
* In the adjacent already electrified areas, substantial portion of educational facilities continued to use self-power generators. Reasons for their continuous use might be that necessity for use of self-power generators has been increased with development of use of electric appliances, such as computers, copy machines, educational AV equipment, PA equipment, for the preparation of unexpected power outages, and that due to the large scale of the facilities in the adjacent already electrified areas, the losses caused by power outages are large and preventive measures are important, etc.
* Expected incremental rate of community use of educational facilities after electrification in the Target Area is substantially larger than the actual incremental rate of community use after electrification in the adjacent already electrified areas. The larger rate might show excessive expectation of educational facilities. Or, the reason of the larger figure might be explained with the difference in geographic conditions in which the adjacent already electrified areas are located in more urbanized areas.
* Merits of electrification expected in the Target Area by educational facilities are very similar than those actually enjoyed by educational facilities in the adjacent already electrified areas.

Table 2-2.13 Changes by Electrification to Educational Facilities (Expectation/Actual)

Questions	Target Area	Adjacent Already Electrified Area
1. Used electric appliances	• There are facilities that use electric lights and TV sets. • Small number of facilities use computers, printers, tablets, projectors, etc. Out of these, some do not have own generators or solar panels.	• Many facilities use electric fans, lights, TV sets, computers, copy machines, etc. • Some facilities use refrigerators, kettles, microwaves, air conditions, etc.
2. Ownership of a self-power generator	• Seven facilities (26%) own self-power generators, and two (7%) use their own solar panels.	• Six facilities (30%) have self-power generators and no facility uses its own solar panels.
3. Capacity of self-power generators	average: 2.9KVA, median: 3KVA range: 2KVA～5KVA	average: 16KVA, median: 3KVA range: 2.5KVA～80KVA
4. Operation hours of a self-power generator per day	average: 3.8 hours, median: 2 hours range: 2-6 hours	average: 4.7 hours, median: 4 hours range: 3-8 hours
5. Operation cost of a self-power generator per day	average: Le.75,000, median: Le.55,000 range: Le.30,000～Le.200,000 average: USD 68, median: USD 50 range: USD 27- 182projec	average: Le.182,000, median: Le.56,000 range: Le.40,000～Le.800,000 average: USD 165, median: USD 51 range: USD 36-727
6. Used electric appliances after electrification (wish/actual)	• Many facilities wish to use computers, projectors, DSTV receiver, to prepare and use supplemental teaching materials, etc. • Many facilities also wish to introduce electric fans, refrigerators, etc., to improve environment for students/ teachers and staff. • Some facilities wish to introduce printers, copy machines, etc.	• Many facilities introduced computers. • Many facilities use printers, copy machines, etc. • Many facilities also introduced electric fans, refrigerators, microwaves, electric kettles, etc. • Some facility installed PA systems.

Questions	Target Area	Adjacent Already Electrified Area
	♦ Some facilities also wish to install PA systems.	
7. Increase in community use (expectation/actual)	Portion of educational facilities that expect increase of community use by electrification: 89%	Portion of educational facilities that experienced increase of community use by electrification: 50%
8. Purpose of increased community use (expectation/actual)		

9. Merits of electrification (expectation/actual) (three answers per educational facility)	Merit	Target Area	Adjacent already electrified area
	(1) Improvement in safety/security	21 answers	13 answers
	(2) Better educational environment	19 answers	13 answers
	(3) Possible night class/learning	17 answers	7 answers
	(4) Enhancement of teaching support equipment	7 answers	4 answers
	(5) Promotion of computer use	5 answers	3 answers
	(6) Promotion of computer learning	4 answers	5 answers
	(7) Possible printing teaching materials, examinations, etc.	4 answers	7 answers
	(8) Improvement in communication	2 answers	4 answers
	(9) More efficient use of spaces	2 answers	0 answers
	(10) More efficient administrative works	0 answers	2 answers
	(11) Saving in expense	0 answers	2 answers
	Total	81 answers	60 answers

Source: JICA Survey Team

2-2-1-4 Plan for Procurement/Construction Conditions

Since this project will be implemented under Japan's grant assistance scheme, the installation must be completed by the deadline. In addition, in order to complete the construction within the specified construction period and to realize the expected effects of the new substation and distribution line, it is necessary for the Japanese and Sierra Leone side to coordinate construction process between the Japanese side and the Sierra Leonean side, and to establish a process plan that takes into consideration the inland transportation route, transportation method, period, and so forth.

Since this project involves the simultaneous construction of a new 33/11 kV primary substation, an 11/0.415 kV secondary substation, a 33 kV distribution line, and an 11 kV distribution line, a process plan should be established to ensure efficient construction through appropriate team organization, the use of construction methods familiar to the local contractors and engineers, and the safe The construction management system needs to be set up to ensure that the work progresses quickly and efficiently.

The project sites are located in the suburbs of Freetown, the capital of Sierra Leone. In Freetown, various public facilities, commercial facilities, and residences are being constructed. And there are many contractors, including electrical contractors that handle construction work for these facilities, so the general construction conditions are good. There are several contractors that can perform the construction of the substation and

distribution facilities for this project. It can be to procure from contractors in the suburbs of Freetown.

Since Sierra Leone does not produce steel so steel frame construction is expensive. And there are no examples of steel frames being used for general building construction in them. On the other hand, there is a ready-mixed concrete plant in Freetown, and reinforced concrete construction is widespread. So the control building, TR foundation, equipment foundation trestle, wiring pit, and steel structure foundation, which are the subject facilities of this project, are to be designed using reinforced concrete construction. However, the distance from the ready-mixed concrete plant to the construction site of the Tombo Substation and York Substation is 25 to 42 km, and it is expected to be difficult to place the concrete within the specified time after it is manufactured because of possible traffic jam in the city of Freetown. Therefore, a process plan and construction plan should be developed that takes into account the use of on-site concrete casting.

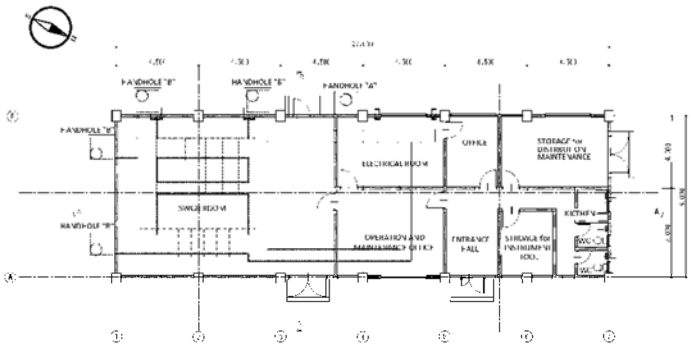
In addition, some sections of the west side perimeter road were undergoing repair work, but the east side perimeter road was asphalt paved, so there were no problems for the construction conditions.

(1) Basic Plan for the Control Building in Each Substation

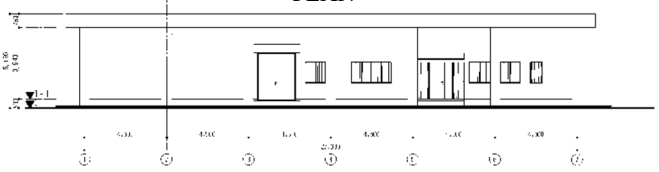
Since the Freetown Peninsula faces the Atlantic Ocean and the project sites are located 0.5 to 1.0 km from the coastline. it is necessary to protect the switchgear from salt and wind damage and ensure its long-term operation. Therefore, one control building is constructed for each substation. The size of the building is planned to be appropriate considering the quantity and size of the switchgear to be installed, the maintenance space, the ease of carrying in and out, and future plans. The building itself is to be constructed of reinforced concrete to protect it from salt and wind damage, and the dimensions of the columns and beams are to be planned so that the thickness of the reinforcing steel cover can be slightly increased. As building facilities, water supply and drainage facilities are to be provided for toilets and kitchens, and air conditioning and lighting facilities are to be installed to keep the open/close facilities in proper condition. For the building finishing materials, a type of paiting that is resistant to salt damage will be selected. The foundations will be direct foundations, as the results of the Soil investigation indicate that both sites have sufficient bearing capacity.

(2) Control Building in the Tombo Substation

The control building whici be constructed in the Tombo substation will be a single-story reinforced concrete structure measuring 9.0 m x 27.0 m, taking into account the dimensions of the switchgear to be stored and the maintanance space around it. Because the project site is located in a residential area, it is sandwiched between residential roads, and the land immediately adjacent to it is a soccer field. The wall for boundary and the entrance gates are to be constructed by Sierra Leone. The site will be paved with crushed stone except for the parking area. Facilities include water supply, drainage, air conditioning, ventilation, and lighting. Soak pit, lighting equipments. Septic tanks, and Oil-water separation tanks will be installed on the exterior.



PLAN



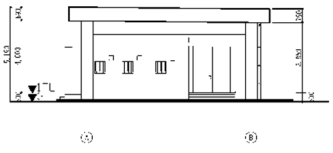
EAST ELEVATION

Finishing schedule

Floor	Porcelain tile,Mortar trawel,Dustproof・Non-srip tile
Exterior wall	CB + AEP paint, Mortar finish
Interior wall	CB + AEP paint, Mortar finish
Roof	Asphalt waterproofing
Fitting	Steel and wood door,Alminium window
Equipment	Air condition and Ventilation, Plumbing and Sanitary, Electrical work

AEP: Acrylic Emulsion Paint

CB:Concrete Block



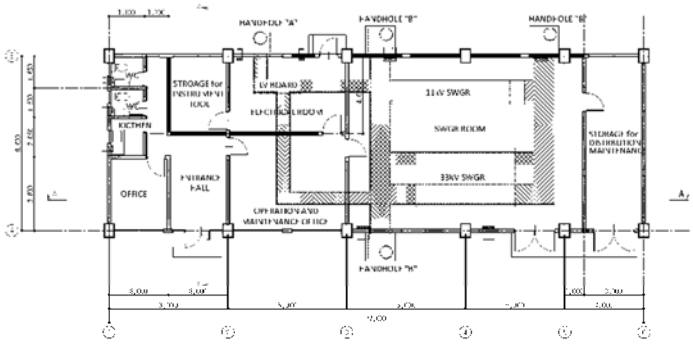
NORTH ELEVATION

Source: JICA Survey Team

Figure 2-2.4 Plan and Elevation for the Control Building in Tombo Substation

(3) Control Building in York Substation

The control building which be constructed in the York Substation will be a single-story reinforced concrete structure of 9.0m x 27.0m, considering the dimensions of the switchgear to be stored as well as the control building in the Tombo substation, and the maintenace space around it. Since the same site area and shape as the Godrich substation could be secured. So it is planed same plan as them one. Since the front road is approximately 1.0m higher than the site, a temporary gravel paved road was planed on the Japanese side as an entry. The wall for boundary and entrance gates will be constructed by the Sierra Leonean side. The site will be paved with crushed stone except for the parking area. Facilities include water supply, drainage, air conditioning, ventilation, and lighting equipments. Soak pit, Lighting, Septic tanks, and Oil-water separation tanks will be installed on the exterior.



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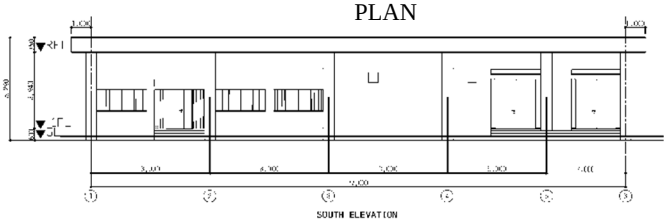


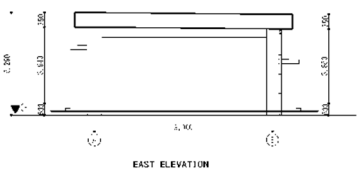
SOUTH ELEVATION

Finishing schedule

Floor	Porcelain tile,Mortar trawel,Dustproof・Non-srip tile
Exterior wall	CB + AEP paint, Mortar finish
Interior wall	CB + AEP paint, Mortar finish
Roof	Asphalt waterproofing
Fitting	Steel and wood door,Alminium window
Equipment	Air condition and Ventilation, Plumbing and Sanitary, Electrical work

AEP: Acrylic Emulsion Paint

CB:Concrete Block



EAST ELEVATION

Source: JICA Survey Team

Figure 2-2.5 Plan and elevation of the Control Building in York Substation

2-2-1-5 Setting Grades for the Facilities and Equipment

Considering the above-mentioned conditions, materials and equipment to be procured for this project, the scope of their installation, and the design criteria will be planed based on the following plans.

2-2-2 Basic Plan

2-2-2-1 Condition of the plan

(1) Purpose of the demand forecast

The main components of this project are the York substation (33 / 11kV 15MVA x 1), Tombo substation (33 / 11kV 15MVA x 1), 33kV and 11kV distribution line, which are constructed to strengthening power network in the Freetown Peninsula. The power demand forecast in this preparatory survey are intended to clarify the preconditions of the plan as basic data related to verification of the validity and benefit of this project, such as power flow analysis and evaluation of cooperation with other development plans.

(2) Target year for the project

Relevance and effectiveness of the project as a grant aid project, including urgency and benefit will be confirmed through the preparatory survey. This project primarily targets higher level power distribution facilities in Freetown peninsular.Still, in the absence of medium to long term development plans, there are concerns that operation of lower level power facilities and even supply stability may also impacted as the project targets Freetown area experiencing significant growth. The target year for facility planning will be five (5) years after service starts. This project must avoid equipment being replaced before the facilities reach their service life once in service, and the five year figure is consistent with recent projects for enhancing upper level system power transmission/distribution in metropolitan areas and cities, as well as other similar grant aid projects. Meanwhile, as this project is a grant aid project of urgent need, the target year for evaluating the project and its benefits will be three years after service start.

Start of service: 2024
Target year for project evaluations: 2027 (Three years from start of services)
Target year for facility plan: 2029 (Five years from start of services)

2-2-2-2 Power demand forecast

The result of demand forecast are described as below. The range of demand forecast can be broadly divided into two contents.

① Demand forecast for the entire Freetown Peninsula which is in accordance with result of masterplan

② Demand forecast for the southwestern part of the Freetown peninsula, which is currently a non-electrified area and is the target area for this survey.

Regarding ① above, the result of forecast is accumulated for the purpose of power flow analysis for the entire Freetown peninsula. In addition, item ② is to be implemented to consider where stable power supply is possible after construction of facilities through grant aid project.

(1) Existing Report of demand forecast

In the JICA Master Plan(2009), the power demand forecast calculated by the regression analysis method which based on the data from 1965 to 1984 and potential maximum power of 41 MW of the free town power system as of 2008. And the real GDP based on 2000 was utilized for demand forecast.The potential maximum power is calculated based on the sample survey results for each tariff category in the Western area as of the end of 2008. The annual power consumption and

maximum power up to 2025 are calculated by considering the correction coefficient for the potential maximum power. The basic conditions at the time of formulating the master plan are as follows.

1) GDP growth rate

Table 2-2.14 The GDP growth rate used for Master Plan(2009)

Case	2009	2010	2011	2012	Note
High case	7.0%	8.0%	9.0%	9.5%	Remained at 7-9% after 2012
Base case	5.5%	5.8%	6.0%	6.5%	Remained at 4-5% after 2012
Low Case	4.0%	3.5%	4.0%	4.5%	Remained at 3-5% after 2012

Source: JICA Survey Team

2) Number of household customer

It has been increasing by 10% annually since 2009. This growth rate needed to achieve the government's goal of 75% electrification by 2025

3) Load Factor

65% (Common value for all tariff class)

(2) Methodology of demand forecast

1) Period and Scenario

- ✓ Forecasted period is 2024 to 2034
- ✓ Forecast shall be calculated by 3 scenario which changed future GDP growth rate(Base, High and Low)

2) The Review of the real GDP growth rate

It reflects the actual GDP growth rate up to 2020. In the master plan, power consumption is calculated based on real GDP (2000 base). The power consumption was recalculated in consideration of the growth rate in the actual GDP (2010 base)

For the GDP growth rate after 2021, the values of the IMF staff report were adopted. Since 2026, the annual rate has been 4.2%. (Base case)

Table 2-2.15 Reviewed GDP growth rate

	2021	2022	2023	2024	2025	2026 to 2034
Base case	3.2%	5.9%	4.4%	4.9%	4.8%	4.2%
High case	6.2%	8.9%	7.9%	7.9%	7.8%	7.2%
Low Case	2.2%	4.9%	3.4%	3.9%	3.8%	3.2%

Source: JICA Survey Team

3) Percentage of real GDP by sector

In the master plan, real GDP is accumulated by agriculture, industry, and service sector, and the GDP and power consumption forecast has been calculated by the ratio of 2007. This time, we took the average value for the five years from 2016 to 2020 described in Statistics Sierra Leone.

Agriculture: 52.9%, Industry 9.3%, Service 37.9% will keep until 2034.

4) Number of household customer

Based on the actual number of customer from EDSA (2018-2020). In order to achieve the electrification rate 50% targeted by 2030 described in the NRECA report, it is necessary to make a new contract with an annual rate of 15% after 2021. Therefore, the increase rate of household customer is set at 15%. The population growth is based on the “population assumption of Statistics

Sierra Leone."

5) Current potential demand

For the current domestic potential demand, we used the actual value as of 2015 which described in the Preparation of the Electricity Network Investment Plan prepared by NRECA. Since this value was for the whole country of Sierra Leone, the value of the Western area was calculated after assuming the demand by 2034. The ratio of the Western Area to national demand is also referred from the NRECA report.

(3) Result of the demand forecast

The result of demand forecast by base case is shown as follows

Table 2-2.16 Result of demand forecast

	2017	2018	2019	2020	2021	2022	2023	2024
(1)Result	**111.9**	**113.9**	**122.4**	**118.1**	**128.3**	**135.9**	**144.5**	**154.5**
(2)MP(2009)	78.2	84.1	90.4	97.0	104.0	111.5	119.3	127.6
(3)NRECA	―	69.0	―	103.0	―	―	―	―
(4)MOE	―	―	―	85.0	96.1	108.5	119.4	131.3

	2025	2026	2030	2031	2032	2033	2034
(1)Result	162.3	174.8	240.3	263.1	288.9	318.1	351.1
(2)MP(2009)	136.3	―	―	―	―	―	―
(3)NRECA	166.0	―	248.0	―	―	―	―
(4)MOE	143.0	155.8	―	―	―	―	―

Source: JICA Survey Team

(4) Demand forecast for southern part of Freetown peninsula

Estimated demand calculated from 2024 to 2034 which is expected commissioning year of the substation for 10 year operation. Since there is no electricity access in southern part of Freetown peninsula, the demand for each field was calculated as follows.

1) Household customer

The present population of the planned area covered by electricity was obtained by EDSA. Based on this present population, the population forecast was calculated using the population growth rate described in Population and housing census (Statistics Sierra Leone Oct. 2017) published in 2015.The power consumption of each customer set at 1.2 kW/household.

The detailed methodology for calculation of demand described as follows.

a. Calculation of energy consumption by household customer

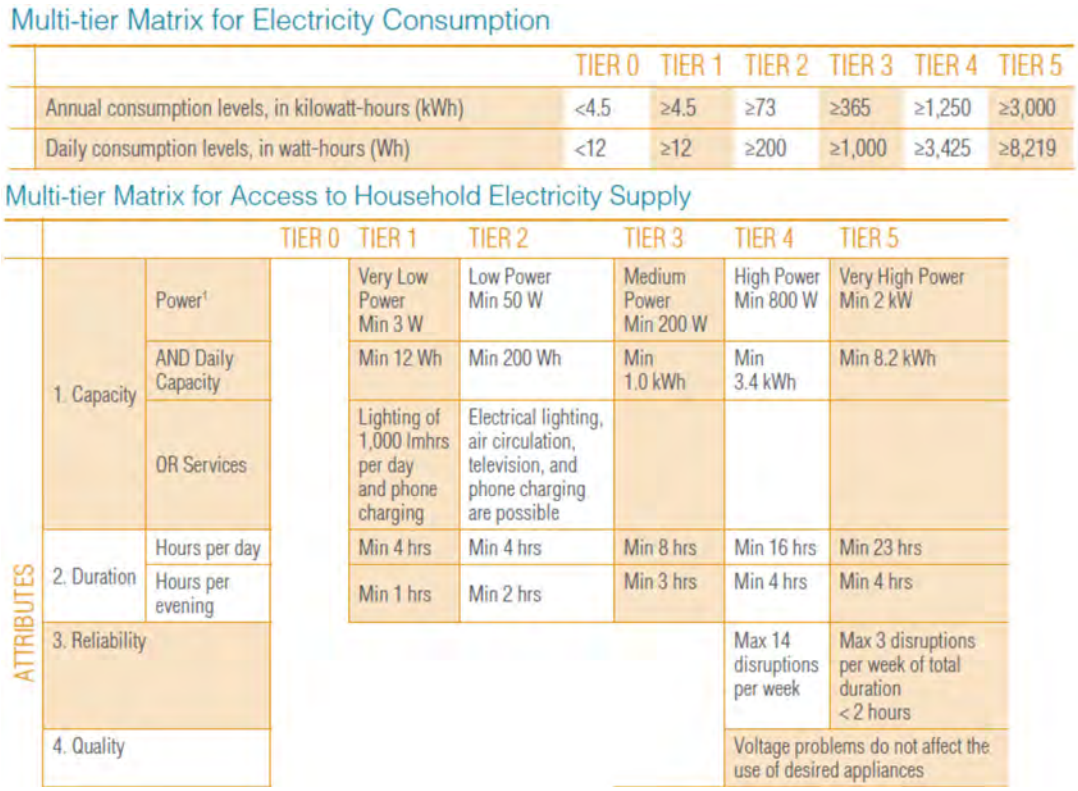
The following materials were referred to formulating the forecasted demand in the electrification target area.

Table 2-2.17 Materials for household demand

Materials	Detailed	Key data
Result of demand forecast(EDSA)	Material that describes the population and household demand of each town in targeted area for development in the southern part of Freetown. The data as of 2020 is shown and is not forecasted value.	Demand:**1.5kW** / household
JICA Masterplan(2009)	Master Plan forecasting electricity demand by 2025. Addition, in order to estimate demand, the power capacity and average usage per household are calculated in a sample survey.	In 2008 Energy capacity: 1.81kW/ household Average consumption: 0.543kW/household

Materials	Detailed	Key data
		*Peak demand was calculated by average consumption
Beyond Connections Energy Access Redefined (ESMAP)	A management program supported by the World Bank to promote sustainable energy solutions that contribute to poverty reduction and economic growth for low- and middle-income countries. To promote electrification, the power consumption was categorized by each household. The program is one of the indicators for formulating a development plan.	Refer to Figure 2-2.6 Tier-4 (Matrix for electricity consumption) Average consumption : **0.8kW**/household Power consumption **3.4kWh** / day **1,250kWh** / year

Source: JICA Survey Team



Multi-tier Matrix for Electricity Consumption

	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Annual consumption levels, in kilowatt-hours (kWh)	<4.5	≥4.5	≥73	≥365	≥1,250	≥3,000
Daily consumption levels, in watt-hours (Wh)	<12	≥12	≥200	≥1,000	≥3,425	≥8,219

Multi-tier Matrix for Access to Household Electricity Supply

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
1. Capacity	Power[1]		Very Low Power Min 3 W	Low Power Min 50 W	Medium Power Min 200 W	High Power Min 800 W	Very High Power Min 2 kW
	AND Daily Capacity		Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh
	OR Services		Lighting of 1,000 lmhrs per day and phone charging	Electrical lighting, air circulation, television, and phone charging are possible			
2. Duration	Hours per day		Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs
	Hours per evening		Min 1 hrs	Min 2 hrs	Min 3 hrs	Min 4 hrs	Min 4 hrs
3. Reliability						Max 14 disruptions per week	Max 3 disruptions per week of total duration < 2 hours
4. Quality						Voltage problems do not affect the use of desired appliances	

*Note: The report described power supply methods for consumers in each category. There is a decryption that Tier 1to 2 is by household solar kit, Tier is by Mini-grid, and tier 4 to 5 is by grid interconnection. For the same Western African republic of Togo, the above ESMAP index is used to formulate the electrification policy. (Togo electrification strategy 2018)

Figure 2-2.6 Categorized consumption

b. Detailed methodology

In order to qualify the validity of the power consumption per household of 1.5kW / household obtained from EDSA, The master plan (2009) and ESMAP program are referred.

- Forecasted power consumption in Master plan(2009)
  In the Master Plan, the number of general consumers and the annual number of general consumers in the Freetown Peninsula by 2025 are based on the average usage per household of 0.543kW / household (as of 2008) calculated from the household survey. The following table shows the results from 2023 to 2025, which are the newest expected years.

Table 2-2.18 Result of consumption in masterplan

No	Contents	Unit	2023	2024	2025
A	Power consumption	GWh/year	350.464	377.175	405.839
B	No of customer	―	202,294	222,523	244,775
C	Conversion No A (KWh)	kWh/year	350,464,000	377,175,000	405,839,000
D	Conversion No C (day)	kWh/day	960,178	1,033,358	1,111,888
E	Consumption per household (D/B) and (C/B)	kWh/day	4.75	4.64	4.54
		kWh/year	1,732	1,695	1,658

Source: JICA Survey Team

The results of the power demand review of the power master plan based on the actual GDP growth rate in this survey, the results of the examination in the 2029 and 2034 sections are shown below. At the time of the examination, the real GDP growth rate, the latest number of household consumer contracts as of 2020, and the amount of electricity sold are also reflected as materials for demand estimation.

Table 2-2.19 Result of consumption in this survey

No	Items	Unit	2029	2034
A	Power consumption	GWh/year	872.48	1541.49
B	No of customer	―	434,052	873,034
C	Conversion No A (KWh)	kWh/year	872,480,000	1,541,490,000
D	Conversion No C (day)	kWh/day	2,390,356	4,223,260
E	Consumption per household (D/B) and (C/B)	kWh/day	5.5	4.8
		kWh/year	2,010	1,766

Source: JICA Survey Team

From the above results, it is estimated that the daily power consumption of households will be changed in range of 4.64kWh to 5.5kWh from 2024 to 2034.

c. Conclusion : Power consumption per household

Based on the power consumption per household calculated above, the forecasted consumption classified into which category in EMAP index. The demand on the Freetown Peninsula corresponds to TIER4, as shown below.

Table 2-2.20 Classified consumption

Contents	TIER3	TIER4	Freetown	TIER5
Yearly Power Consumption (kWh)	≧365	≧1,250	1,658～2,010	≧3,000
Daily Power Consumption (Wh)	≧1,000	≧3,425	4,640～5,500	≧8,219

Source: JICA Survey Team

In the case of TIER4, the ESMAP index is set with a minimum power consumption is 800W and a daily power supply time is at least 16 hours. In this case, assuming that 3,425 (Wh) / 800 (W) x16 (h) = 0.268 is the load factor, the power consumption is calculated from 4,640Wh to 5,500Wh, which is 1,082W to 1,283W.

Based on this result, 1.2kW per household was adopted, taking into consideration the upside of demand. Therefore, it is slightly lower than the assumed demand of EDSA of 1.5kW / household.

2) Education facilities

The JICA Survey Team obtained the number of schools scattered in the target area. The power consumption of each school was calculated as 5kW / school, based on the information by EDSA. Most of the schools in the target area were one-story buildings, and consisting of 4 to 7 classrooms.

Source: JICA Survey Team

Figure 2-2.7 Primary school in Tombo

3) Health center and hospital

The JICA Survey Team Obtain the number of hospitals scattered in the target area. Since most of facilities are health center class, it was calculated as 200 kVA / center, which is the average capacity of a distribution transformer for existing facilities in Freetown. The Kerry town medical hospital is planned at the side of Ebola treatment facilities. The scale and specification has not known. Considering that it has 150 bed general hospital, the estimated power consumption would be 1000kVA.

Photo left: Kerry town medical hospital (construction sigh)

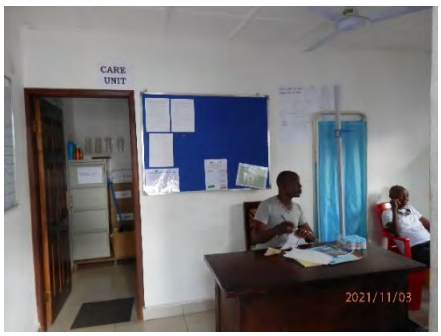


Photo Right: General Clinic in Tombo town. Electricity is supplied by Solar and nearby diesel generator/Electric lights, fans, vaccine freezer etc. are the main power consuming devices.

Source: JICA Survey Team

Figure 2-2.8 Medical facilities around development area

4) Other load

Estimated demand was calculated based on the installed generator capacity owned by the fishery processing company, quarry and hotel etc, in the target area.The generation equipment owned by the individual owner is assumed to be 100% x 2 (1 backup), and the power used is assumed to be 60%. Therefore, the rated capacity x 50% x 60% is expected demand.

Table 2-2.21 List of industrial load

No	Town	Customer	Gen CAP (kVA)①	Consumption (kVA) ①x0.5x0.6
1	SAMUEL TOWN			0
2	MACDONALD	CRSG Quarry Stone Crushing Plant	1200	360
3	KERRY TOWN			0
4	DURING TOWN			0
5	RUSSEL TOWN			0
6	BOYOH TOWN+MADINA	Gento Quarry Stone Crushing Plant	900	270
7	TOMBO	Two Brothers Fishing Co	850	255
		Korea Group Fishing Co	750	225
		Amtaishpat Fish Drying Facility	165	49.5
		EVSUMO Pure Water	200	60
8	KISSY TOWN	White Pole Fishing Co. Ice Making Plant, Cold Rooms,	900	270
9	BRIGITTE VILLAGE			0
10	Mama Beach	Mama Beach Wharf (IPP)	8	2.4
		Rickma Fishing Co Ice Making Plant, Cold Rooms,	1000	300
11	BUREH TOWN	Settu's Villa	8	2.4
		Gem Beach Resort	7.5	2.25
		White Water Guest Hse	5	1.5
		Maroon View Guest Hse	4	1.2
		Austra Leone Guest Hse	3	0.9
		Lunthubul Gardens	6	1.8
		Robbinson Guest Hse	3.5	1.05
		Zen Village Resort	12	3.6
		Rakish Resort	14	4.2
		Osu Bai Koroma Resort	17.5	5.25
		Saful Resort	84	25.2
		Bureh Beach Surf Club	4	1.2
12	KENT	Kent Beach Resort Guest Hse	14	4.2
		Sengbeh Pieh Village Resort	12	3.6
		Appimays Beach Bar & Restaurant	3.5	1.05
		Golden Sand Resort	7	2.1
		Nova Africa Resort	19	5.7
13	JOHN OBEY	Lagoon Bungaloows	18	5.4
		Nation Lodge Resort	4	1.2
		Estuary Beach Resort	50	15
14	BLACK JOHNSON			0
15	BIG WATER	Tito's Paradise Eco Beach Lodge	5	1.5
		Sahara Spring Water Processing Plant	70	21
16	YORK	Fabulous Resort	150	45
		York Guest House	13	3.9
17	TOKEH	2 Seasons Resort	100	30
		The Place Hotel & Tokeh Beach	355	106.5
		Tokeh Beach Resort	190	57
		Africa Point Guest Hse	15	4.5
		Baracuda Island Ltd	13.5	4.05
		Eden Park Resort	75	22.5
		Nimi Resort	90	27
18	No.2	Cockle Point Guest House	120	36
		Beach No 2 Resort, Sankofa	5	1.5
		Island View Resort	10	3

Source: JICA Survey Team

5) Design of secondary substation

The capacity of secondary should be considered for loads of A and B above. Since items C and D above (clinic, hospital and other loads) are loads related for businesses, the loads for C and D are not included in capacity of distribution transformers in the secondary substations. However the capacity of these loads shall be considered as the transformer capacity of Tombo and York primary S/S. In Sierra Leone, customers have a responsibility of paying grid connection charge such as installation of LV service line, tariff meter and/or transformer (if necessary)

6) Result of the demand forecast for southern part of Freetown peninsula

Table 2-2.22 Result of the demand forecast for southern part of Freetown peninsula

Supply	No	Household (kVA) ①	School (kVA) ②	Hospital (kVA) ③	Specific load factory,hotel (kVA) ④	Total ①+②+③+④
Tombo S/S	KERRY TOWN	164.4	10.8	600.0	0.0	775.2
	DURING TOWN	54.8	0.0	0.0	0.0	54.8
	RUSSEL TOWN	32.9	0.0	0.0	0.0	32.9
	BOYOH TOWN+MADINA	285.0	48.4	200.0	270.0	803.4
	TOMBO	3288.4	75.3	800.0	589.5	4753.1
	KISSY TOWN	164.4	0.0	0.0	270.0	434.4
	BRIGITTE VILLAGE	32.9	0.0	200.0	0.0	232.9
York S/S	Mama Beach	274.0	16.1	0.0	302.4	592.6
	BUREH TOWN	87.7	5.4	200.0	50.6	343.6
	KENT	219.2	5.4	200.0	16.7	441.3
	JOHN OBEY	328.8	16.1	0.0	21.6	366.6
	BLACK JOHNSON	43.8	0.0	0.0	0.0	43.8
	BIG WATER	43.8	5.4	0.0	22.5	71.7
	YORK	328.8	16.1	200.0	48.9	593.9
	TOKEH	876.9	16.1	200.0	251.6	1344.6
	River No.2	164.4	10.8	200.0	40.5	415.7
	Baw	434.8	0.0	0.0	0.0	434.8

Source: JICA Survey Team

Remarks: Power factor: 0.93 (refer to Average record of Goderich S/S)
Load factor: 0.6
Assumed year: 2029

(5) Determination for capacity of transformer

Based on the result of demand forecast, the transformer capacity for York and Tombo will be examined. The total demand for the target areas supplied by two substations in the 2029 peak section is as follows

Table 2-2.23 10 Supplied load in Normal operation

Unit：MVA

Supply	House hold	School	Hospital	Specific load	Sussex load	Total
Tombo S/S	4.0	0.1	1.8	1.1	—	7.09
York S/S	2.8	0.1	1.0	0.8	3.4	8.1

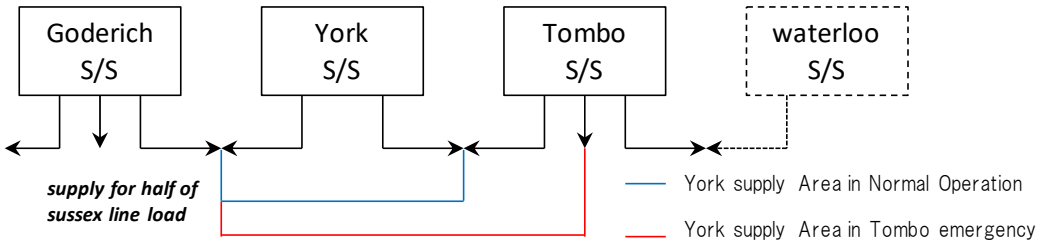
Source: JICA Survey Team

After construction of York substation, new 11kV feeder will be connected to the Sussex line of the existing Godrich substation, and it will be possible to supply a part of the load of the existing Sussex line in operation. After checking the operation record of the Godrich substation, the Sussex feeder is supplying about 4.6 MW at the peak in the 2020, and when calculated based on the demand estimation of Tombo Town, the estimated value asuumed about 6.2 MW in the 2029. Therefore, assuming that about 50% of this power is supplied from the York, [6.2 MW ÷ 2 ÷ 0.93 (power factor) = 3.4 MVA] shall be included in the York load. Regarding the transformer capacity, it is desirable to consider a certain margin even in the meet to peak demand after 10 years. Plan to make it about 60% of the peak rated capacity. In this case,

- ✓ Tombo S/S：7.54/0.6=12.6MVA
- ✓ York S/S ：8.2/0.6=13.7MVA

Therefore, the transformer capacity shall be larger than the above capacity.

On the other hand, consideration will be given to substation backup in the event of a transformer accident. Both the Tombo and the York substation are arranged with one transformer for each transformer, following the configuration of the existing distribution substation, but the N-1 configuration is not satisfied. However, consider emergency accommodation between each substation connected by distribution lines. As shown in the figure below, York and Tombo, and the Waterloo substation planned by the World Bank will be interconnected to the Godrich substation, which was the end of the existing grid.



Source JICA Survey Team

Figure 2-2.9 Grid configuration in southern part of Freetown peninsula

In the event of a substation emergency, it is desirable to consider the transformer capacity that can backup 50% of the load of each substation for both the Tombo and the York. Considering the above, the table below is obtained.

Table 2-2.24 Supplied load in Emergency operation

Supply	House hold	School	Hospital	Specific load	Sussex load	Subtotal on normal	Backup capacity	Capacity After backup
Tombo	4.5	0.1	1.8	1.1	—	7.54	4.1 (Half of York load)	11.64
York	3.1	0.1	0.8	0.8	3.4	8.2	3.8 (Half of Tombo load)	12.00

Source JICA Survey Team

Therefore, the transformer capacity of **Tombo and York determined to 15MVA.**

2-2-2-3 Power Flow Analysis

The power flow analysis in this survey conducted to the following two steps.

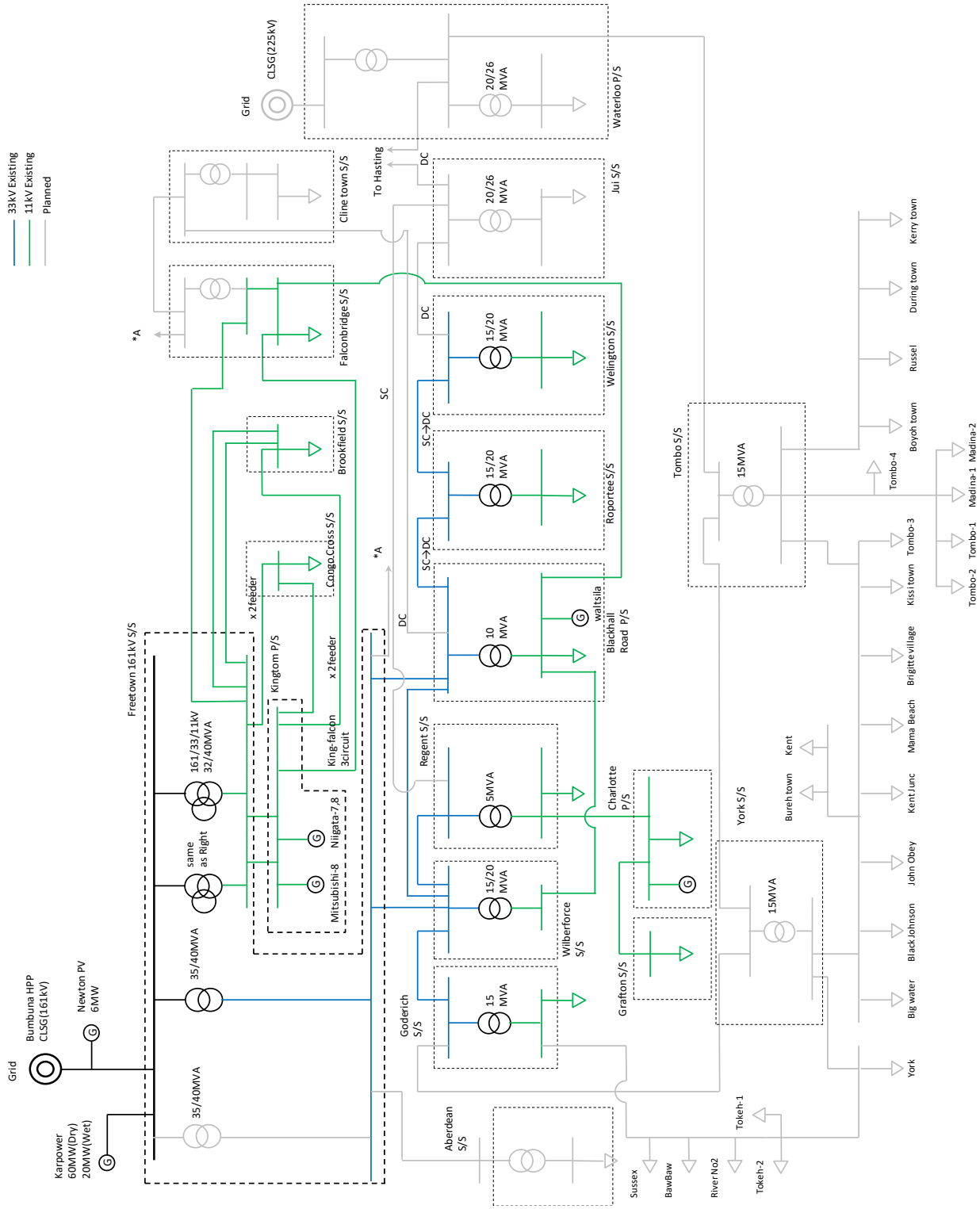
Table 2-2.25 Steps for the power flow analysis

STEP	Range of Analysis	Purpose of analysis
1	The analysis for the southern part of Freetown peninsula	To validity examination for selected specification for new primary and secondary and distribution line.
2	The analysis for the entire Freetown peninsula	To validity examination for grid operation in Freetown peninsula

Source JICA Survey Team

For the detailed evaluation of selected specification is mentioned on next section. Basic policy of the implementation of power flow analysis is described as follows.

- ✓ The analysis range is from 2024 to 2029, and to be confirmed that the components in Grant Aid project can be effective without any operational restrictions during this period.
- ✓ To consider grid expansion and development including support from other donors that occur during the analysis period.
- ✓ To consider the electricity gap between demand and supply.
- ✓ During the above period, to propose the reinforced plan that will be bottlenecks in grid operation.
- ✓ The range of the power flow analysis showed next page.



Source: JICA Survey Team

Figure 2-2.10 Range of the power flow analysis

(1) Precondition of power flow analysis

a. Consideration of electricity Gap

Although the Freetown Peninsula consumes about 70% of the electricity in Sierra Leone, an appropriate power development plan that meets the demand has not been advanced, and the electricity gap is in normal. The Electricity gap based on the potential demand estimates in the Freetown Peninsula and the power development plan described in the Economic Justification for karpower contract extension described in "2-2-2-2 Demand Forecast" Is shown in the following table.

Table 2-2.26 Trend of electricity Gap

		Projected													
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Potential demand	High Growth	129.51	138.86	149.67	162.33	172.88	188.85	206.95	227.39	250.45	272.46	301.27	333.70	370.19	411.28
	Base	128.29	135.99	144.50	154.57	162.32	174.88	189.10	205.17	223.32	240.32	263.14	288.92	318.07	351.06
	Low Growth	127.89	135.05	142.91	152.21	159.16	170.75	183.91	198.81	215.68	231.41	252.75	276.93	304.36	335.51
Electricity Gap	Deviation (high)	-33.21	-15.56	-11.37	-24.03	31.42	-49.55	-63.15	-83.59	-106.65	-128.66	-157.47	-189.90	-226.39	-267.48
	Deviation (Base)	-31.99	-12.69	-6.20	-16.27	41.98	-35.58	-45.30	-61.37	-79.52	-96.52	-119.34	-145.12	-174.27	-207.26
	Deviation (Low)	-31.59	-11.75	-4.61	-13.91	45.14	-31.45	-40.11	-55.01	-71.88	-87.61	-108.95	-133.13	-160.56	-191.71
Production	KarPower	60	60	65	65	65									
	Bumbuna HPP(Existing)	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	Bumbuna HPP-2(Future)														
	Makeni	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
	Freetown solar+batt							4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
	CLSGImport(via 161kV)		27	27	27	27	27	27	27	27	27	27	27	27	27
	CLSGImport(via 225kV)					66	66	66	66	66	66	66	66	66	66
	Kingtom(Nigata 5MW x 2)			10	10	10	10	10	10	10	10	10	10	10	10
	Blackhall road(8.75MW x 2)	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
	Sunbird bioenergy														
	Charlotte														
	Subtotal	96.3	123.3	138.3	138.3	204.3	139.3	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8

Source: JICA Survey Team

In 2020, the government of Sierra leone decided to 5 years extend the contract with Karpowership. Regarding CLSG 225kV, since there was no comment from EGTC about the commission date during the survey period, it is set to be in operation in 2025 announced by the government. However, as a increasing of demand, the electricity gap is expanding except for some years. Therefore, in the power flow analysis, the analysis is not based on the potential demand, but on the basis of the power development plan, the amount of power that can be supplied.

b. Load allocation of each substation

Based on the result of peak demand which is shared from EDSA, Peak load is allocated to each substation. The detail value are shown as Table 2-2.27.

Table 2-2.27 Load allocation of each substation

(Unit:MW)

【Based on power development plan : for power flow analysis】

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Available production	138.3	204.3	139.3	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
Congo Cross	6.77	9.96	6.78	6.99	6.98	7.00	7.02	7.04	7.07	7.09	7.11
Brookfields	4.91	7.23	4.92	5.07	5.06	5.08	5.09	5.11	5.13	5.14	5.16
Falcon Bridge S/S	20.45	30.09	20.47	21.09	21.07	21.14	21.20	21.27	21.34	21.40	21.46
Goderich S/S	15.01	22.08	15.02	15.48	15.46	15.51	15.56	15.61	15.66	15.70	15.75
Wilberforce S/S	18.06	26.57	18.07	18.63	18.61	18.67	18.72	18.78	18.84	18.90	18.95
Regent S/S	6.24	9.18	6.25	6.44	6.43	6.45	6.47	6.49	6.51	6.53	6.55
Blackhall Road S/S	19.79	29.11	19.80	20.41	20.39	20.46	20.51	20.58	20.64	20.71	20.76
Roportee S/S	6.24	9.18	6.25	6.44	6.43	6.45	6.47	6.49	6.51	6.53	6.55
Welington S/S	6.11	8.99	6.11	6.30	6.29	6.32	6.33	6.35	6.37	6.39	6.41
Charlotte S/S	1.33	1.95	1.33	1.37	1.37	1.37	1.38	1.38	1.39	1.39	1.39
Waterloo S/S	6.64	9.77	6.64	6.85	6.84	6.86	6.88	6.91	6.93	6.95	6.97
Jui S/S	6.64	9.77	6.64	6.85	6.84	6.86	6.88	6.91	6.93	6.95	6.97
Cline Town S/S	9.30	13.68	9.30	9.59	9.58	9.61	9.64	9.67	9.70	9.73	9.75
Aberdean S/S	5.31	7.82	5.32	5.48	5.47	5.49	5.51	5.52	5.54	5.56	5.57
North West East area total	-	-	-	-	-	-	-	-	-	-	-
York S/S	3.26	5.33	3.84	4.12	4.21	3.93	3.70	3.43	3.17	2.92	2.68
Tombo S/S	2.23	3.59	2.56	2.72	2.76	2.57	2.43	2.25	2.08	1.92	1.77

【Based of High case potential demand : Just reference】

HIGH Case	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Congo Cross	8.54	9.06	9.88	10.81	11.88	13.14	14.34	15.91	17.68	19.67	21.92
Brookfields	6.20	6.57	7.17	7.85	8.62	9.53	10.40	11.54	12.83	14.27	15.90
Falcon Bridge S/S	25.78	27.36	29.83	32.66	35.87	39.67	43.29	48.03	53.38	59.40	66.18
Goderich S/S	18.92	20.08	21.89	23.96	26.32	29.11	31.76	35.25	39.17	43.59	48.56
Wilberforce S/S	22.77	24.16	26.35	28.84	31.68	35.03	38.23	42.42	47.14	52.46	58.44
Regent S/S	7.87	8.35	9.10	9.97	10.95	12.11	13.21	14.66	16.29	18.13	20.20
Blackhall Road S/S	24.95	26.47	28.86	31.60	34.71	38.38	41.88	46.48	51.65	57.47	64.03
Roportee S/S	7.87	8.35	9.10	9.97	10.95	12.11	13.21	14.66	16.29	18.13	20.20
Welington S/S	7.70	8.17	8.91	9.75	10.71	11.85	12.93	14.35	15.94	17.74	19.77
Charlotte S/S	1.67	1.78	1.94	2.12	2.33	2.58	2.81	3.12	3.47	3.86	4.30
Waterloo S/S	8.37	8.88	9.69	10.60	11.65	12.88	14.05	15.60	17.33	19.29	21.49
Jui S/S	8.37	8.88	9.69	10.60	11.65	12.88	14.05	15.60	17.33	19.29	21.49
Cline Town S/S	11.72	12.44	13.56	14.84	16.30	18.03	19.68	21.83	24.26	27.00	30.08
Aberdean S/S	6.70	7.11	7.75	8.48	9.32	10.30	11.24	12.48	13.87	15.43	17.19
North West East area total	167.43	177.67	193.72	212.06	232.92	257.57	281.08	311.92	346.63	385.71	429.73
York S/S	4.01	4.67	5.33	5.99	6.65	6.73	6.82	6.90	6.99	7.08	7.17
Tombo S/S	2.74	3.14	3.55	3.95	4.36	4.42	4.47	4.53	4.59	4.66	4.72

【Based on Base case potential demand : Just reference】

Medium Case	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Congo Cross	8.33	8.73	9.40	10.16	11.02	12.01	12.94	14.19	15.60	17.19	19.00
Brookfields	6.04	6.34	6.82	7.37	7.99	8.71	9.39	10.29	11.32	12.47	13.78
Falcon Bridge S/S	25.15	26.37	28.38	30.67	33.27	36.26	39.07	42.84	47.10	51.92	57.37
Goderich S/S	18.45	19.35	20.83	22.51	24.41	26.61	28.67	31.43	34.56	38.09	42.09
Wilberforce S/S	22.21	23.29	25.07	27.09	29.38	32.03	34.50	37.83	41.59	45.85	50.66
Regent S/S	7.68	8.05	8.66	9.36	10.15	11.07	11.92	13.07	14.37	15.84	17.51
Blackhall Road S/S	24.33	25.51	27.46	29.68	32.19	35.09	37.80	41.45	45.57	50.23	55.51
Roportee S/S	7.68	8.05	8.66	9.36	10.15	11.07	11.92	13.07	14.37	15.84	17.51
Welington S/S	7.51	7.88	8.48	9.16	9.94	10.83	11.67	12.80	14.07	15.51	17.14
Charlotte S/S	1.63	1.71	1.84	1.99	2.16	2.35	2.54	2.78	3.06	3.37	3.73
Waterloo S/S	8.17	8.56	9.22	9.96	10.80	11.77	12.69	13.91	15.29	16.86	18.63
Jui S/S	8.17	8.56	9.22	9.96	10.80	11.77	12.69	13.91	15.29	16.86	18.63
Cline Town S/S	11.43	11.99	12.90	13.94	15.12	16.48	17.76	19.47	21.41	23.60	26.08
Aberdean S/S	6.53	6.85	7.37	7.97	8.64	9.42	10.15	11.13	12.23	13.48	14.90
North West East area total	163.31	171.22	184.31	199.17	216.02	235.48	253.70	278.17	305.83	337.12	372.52
York S/S	4.01	4.67	5.33	5.99	6.65	6.73	6.82	6.90	6.99	7.08	7.17
Tombo S/S	2.74	3.14	3.55	3.95	4.36	4.42	4.47	4.53	4.59	4.66	4.72

【Based on Low case potential demand : Just reference】

Low Case	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Congo Cross	8.35	8.73	9.36	10.09	10.90	11.83	12.69	13.86	15.19	16.69	18.40
Brookfields	6.06	6.33	6.79	7.32	7.91	8.58	9.21	10.06	11.02	12.11	13.35
Falcon Bridge S/S	25.21	26.35	28.28	30.45	32.92	35.71	38.32	41.85	45.86	50.40	55.56
Goderich S/S	18.49	19.34	20.75	22.35	24.16	26.21	28.12	30.71	33.65	36.98	40.77
Wilberforce S/S	22.26	23.27	24.97	26.89	29.07	31.54	33.84	36.96	40.50	44.51	49.06
Regent S/S	7.69	8.04	8.63	9.29	10.05	10.90	11.70	12.77	14.00	15.38	16.96
Blackhall Road S/S	24.39	25.50	27.36	29.46	31.85	34.55	37.08	40.49	44.37	48.76	53.75
Roportee S/S	7.69	8.04	8.63	9.29	10.05	10.90	11.70	12.77	14.00	15.38	16.96
Welington S/S	7.53	7.87	8.45	9.10	9.83	10.67	11.45	12.50	13.70	15.05	16.59
Charlotte S/S	1.64	1.71	1.84	1.98	2.14	2.32	2.49	2.72	2.98	3.27	3.61
Waterloo S/S	8.18	8.56	9.18	9.89	10.69	11.60	12.44	13.59	14.89	16.36	18.04
Jui S/S	8.18	8.56	9.18	9.89	10.69	11.60	12.44	13.59	14.89	16.36	18.04
Cline Town S/S	11.46	11.98	12.85	13.84	14.96	16.23	17.42	19.02	20.84	22.91	25.25
Aberdean S/S	6.55	6.85	7.34	7.91	8.55	9.28	9.95	10.87	11.91	13.09	14.43
North West East area total	163.67	171.13	183.61	197.75	213.77	231.91	248.83	271.77	297.77	327.27	360.76
York S/S	4.01	4.67	5.33	5.99	6.65	6.73	6.82	6.90	6.99	7.08	7.17
Tombo S/S	2.74	3.14	3.55	3.95	4.36	4.42	4.47	4.53	4.59	4.66	4.72

Source: JICA Survey Team

c. Among the electric power facilities on the Freetown Peninsula, the future development plans implement by other donors considered in the analysis are summarized in the Table 2-2.28.

Table 2-2.28 Future development plan by other donor

Planned facilities	Donor	Commission date	Note
Waterloo S/S	World bank	2022.12	Construction of 33/11kV substation
Jui S/S	World bank	2022.12	Construction of 33/11kV substation
Aberdeen/S	World bank	2022.12	Construction of 33/11kV substation
Cline town S/S	World bank	2022.12	Construction of 33/11kV substation
Falcon bridge S/S	World bank	2022.12	Upgrade to 33/11kV Substation
Freetown/S	World bank	2022.12	Installation of additional 161/33kV transformer
CLSG 225kV T/L	Indian Exim	2025	Construction of 225kV transmission line Construction of 225/66kV Waterloo Substation

Source: JICA Survey Team

d. Precondition of electrical facilities for power flow analysis

Based on the existing and newly designed facilities information obtained from EDSA and EGTC, the parameters were input along with the power flow analysis. The input parameters are shown in Table 2-2.29. For devices whose details are unknown, analysis is performed using the typical data of the grid analysis software ETAP.

Table 2-2.29 Parameters for power flow analysis

【Power station】

Power plant	Unit	Capacity		Pf	Voltage (kV)	Rotation (rpm)	GD^2(kg·m^2)		Inertia constant (s)	Reactance					Time Constatnt		Reactance	
							Turbine	Gen		Synchronous		Transient	Sub-transient		Transient	Sub-transient	Zero	Negative
		MW	MVA							Xd	Xq	Xd'	Xd"	Xq"				
Kingtom	Nigata-7	5	6	0.8	11.00	750	NA	6,544	3.6	1.4	0.81	0.32	0.23	0.27	0.98	0.029	0.13	0.25
	Nigata-8	5	6	0.8	11.00	750	NA	6,544	3.6	1.4	0.81	0.32	0.23	0.27	0.98	0.029	0.13	0.25
Blackhall road	Waltsila-1	8.75	10.90	0.8	11.00	750	NA	NA	3.6	1.4	0.81	0.32	0.23	0.27	0.98	0.029	0.13	0.25
	Waltsila-2	8.75	10.90	0.8	11.00	750	NA	NA	3.6	1.4	0.81	0.32	0.23	0.27	0.98	0.029	0.13	0.25
Bumbuna	No1	30.33	33.70	0.90	13.80	333.33	NA	700,000	6.32	0.94	0.57	0.21	0.17	0.18	1.16	0.03	0.10	0.175
	No2	30.33	33.70	0.90	13.80	333.33	NA	700,000	6.32	0.94	0.57	0.21	0.17	0.18	1.16	0.03	0.10	0.175
Karpower	No1	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No2	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No3	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No4	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No5	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No6	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No7	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No8	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No9	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No10	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No11	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No12	10	13	0.8	11.00	600	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
Charlotte	No1	1.1	1.375	0.8	11.00	750	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA
	No2	1.1	1.375	0.8	11.00	750	NA	NA	6.5	1.55	NA	0.28	0.19	0.19	NA	NA	0.07	NA

【Substation】

Substation	Unit	Voltage(kV)			cooling type	Capacity (MVA)		impedance (%)	Vector group	Tap			Note
		Pri	Sec	thi		ONAN	ONAF			voltage (kV)	Tap No	Step (%)	
Bumbuna	No1	13.8	165	—	ONAN	33.7	—	15	YNd11	13.8±7.5%	5	3.75	
	No2	13.8	165	—	ONAN	33.7	—	15	YNd11	13.8±7.5%	5	3.75	
Freetown	No1	161	11.5	34.5	ONAN/ONAF	32/28/12	40/35/15	13.85(H-L) 10.02(H-M)	YNynd11	161±12.5%	21	1.25	
	No1	161	11.5	34.5	ONAN/ONAF	32/28/12	40/35/15	13.85(H-L) 10.02(H-M)	YNynd11	161±12.5%	21	1.25	
	No3	161	33	—	ONAN/ONAF	35	40	9.61	YNyn0	161±10%	19	1.25	
	No4	161	33	—	ONAN/ONAF	35	40	9.61	YNyn0	161±10%	19	1.25	Planned
Blackhall road	No1	33	11	—	ONAN	10	—	9.49	Dyn11	33±10%	9	2.5	
Wilberforce	No1	33	11	—	ONAN/ONAF	15	20	12.98	Dyn11	33+10%,-15%	21	1.25	
Goderich	No1	33	11	—	ONAN	15	—	7.13	Dyn11	33+5%,-15%	17	1.25	
Regent	No1	33	11	—	ONAN	5	—	8.04	Dyn11	33+5%,-15%	17	1.25	
Welington	No1	33	11	—	ONAN/ONAF	15	20	13.01	Dyn11	33+5%,-15%	17	1.25	
Ropotee	No1	33	11	—	ONAN/ONAF	15	20	12.99	Dyn11	33+5%,-15%	17	1.25	
Falcon bridge	No1	33	11	—	ONAN/ONAF	20	26	NA	Dyn11	33+5%,-15%	17	1.25	Planned
Aberdean	No1	33	11	—	ONAN/ONAF	20	26	NA	Dyn11	33+5%,-15%	17	1.25	Planned
Jui	No1	33	11	—	ONAN/ONAF	20	26	NA	Dyn11	33+5%,-15%	17	1.25	Planned
Cline town	No1	33	11	—	ONAN/ONAF	20	26	NA	Dyn11	33+5%,-15%	17	1.25	Planned
Waterloo	No1	33	11	—	ONAN/ONAF	20	26	NA	Dyn11	33+5%,-15%	17	1.25	Planned
Tombo	No1	33	11		ONAN	15	—	7	Dyn11	33+5%,-20%	21	1.25	
York	No1	33	11		ONAN	15	—	7	Dyn11	33+5%,-20%	21	1.25	

【Transmission line and distribution line】

Voltage (kV)	From	To	Length (m)	Material	Type	Core	Size (mm^2)	Status
161	Bumbuna	Freetown	204,000	Al	ACSR	3*1	400	Operational
161	Karpower	Freetown	500	Al	ACSR	3*1	400	Operational
11	Kingtom	Falconbridge	2,000	Cu	XLPE	3*2	240	Operational
11	Kingtom	Falconbridge	2,000	Cu	XLPE	3*2	240	Operational
11	Kingtom	Falconbridge	2,000	Cu	XLPE	3*2	240	Operational
11	Kingtom	Freetown	504	Cu	XLPE	1*3*2	500	Operational
11	Kingtom	Freetown	504	Cu	XLPE	1*3*2	500	Operational
11	Kingtom	Congo cross	2,900	Cu	XLPE	3*1	185	Operational
11	Freetown	Congo cross	2,172	Cu	ABC	3*1	150	Operational
11	Kingtom	Brook field	2,184	Cu	XLPE	3*1	265	Operational
11	Kingtom	Brook field	2,184	Cu	XLPE	3*1	265	Operational
11	Freetown	Brook field	2,360	Cu	XLPE	3*2	240	Operational
11	Freetown	Brook field	2,360	Cu	XLPE	3*2	240	Operational
33	Freetown	Blackhallroad	13,112	Al	AAAC	1*3	150	Operational

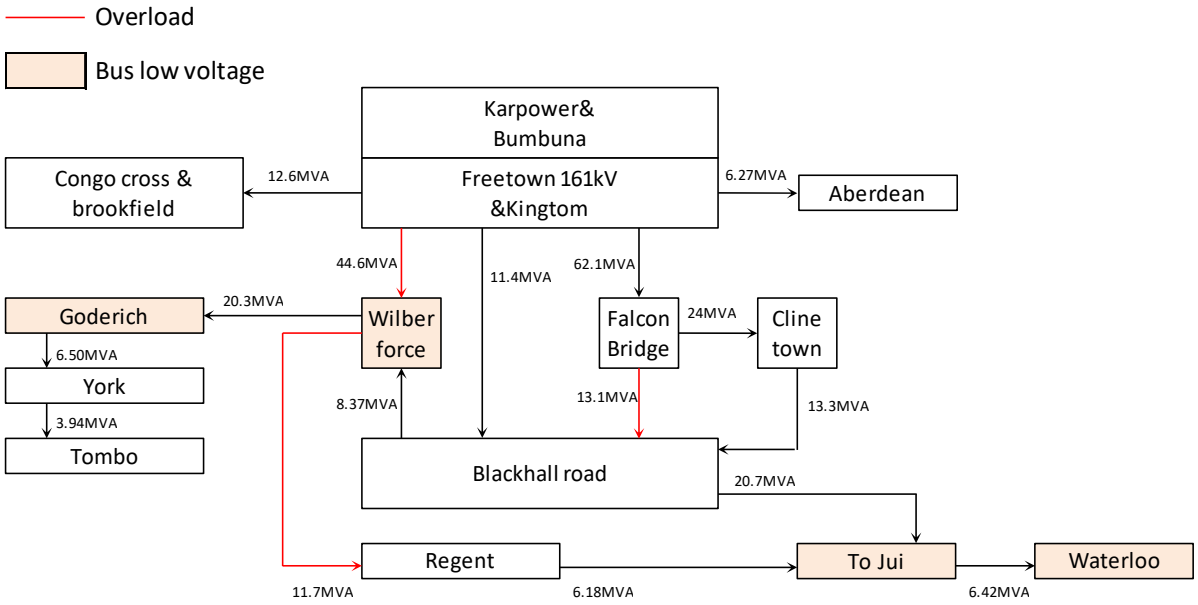
Voltage (kV)	From	To	Length (m)	Material	Type	Core	Size (mm^2)	Status
33	Wilberforce	Blackhallroad	11,600	Al	AAAC	1*3	150	Operational
33	Roportee	Blackhallroad	4,593	Al	AAAC	1*3	265	Operational
11	Wellington	Blackhallroad	N/A	Al	ACSR	N/A	N/A	
11	Falconbridge	Blackhallroad	3,948	Cu	XLPE	1*3	185	Operational
33	Roportee	Wellington	2,900	Al	AAAC	1*3	265	Operational
33	Wilberforce	Regent	4,500	Al	ACSR	1*3	120	Operational
33	Wilberforce	Goderich	7,000	Al	ACSR	1*3	240	Operational
33	Wilberforce	Freetown	5,700	Al	AAAC	1*3	150	Operational
11	Regent	Charlotte PS	5,378	Al	AAC	1*3	120	Operational
11	Charlotte PS	Grafton	6,234	Al	AAC	1*3	120	Operational
33	Wellington	Jui	13,200	Al	ACSR	1*3	265	Planned
33	Regen6t	Jui	12,300	Al	ACSR	1*3	265	Planned
33	Jui	Waterloo	6,600	Al	ACSR	1*3	265	Planned
33	Freetown	Aberdeen	6,800	Al	ACSR	1*3	265	Planned
33	Freetown	Falconbridge	2,500	Al	ACSR	1*3	265	Planned
33	Cline town	Falconbridge	3,000	Al	ACSR	1*3	265	Planned
33	Cline town	Blackhallroad	1,100	Al	ACSR	1*3	265	Planned
33	Jui	Regent	12,300	Al	ACSR	1*3	265	Planned

Source: JICA Survey Team

(2) Result of the power flow analysis

As a result of the power flow analysis, The components which are provided by G/A will be utilized for new Tombo, York S/S and distribution line without no problem for 5 years from 2024. (From the point of view lack of capacity and relaiable grid operation at the end of secondary substation) However, as described in the previous section, it is difficult to supply power to meet the potential demand of the entire Freetown Peninsula because the development plan for power sources in response to the growth in demand is stagnant, therefore early development of incluiding international linkage lines CLSG Reand the development of new power sources are expected.

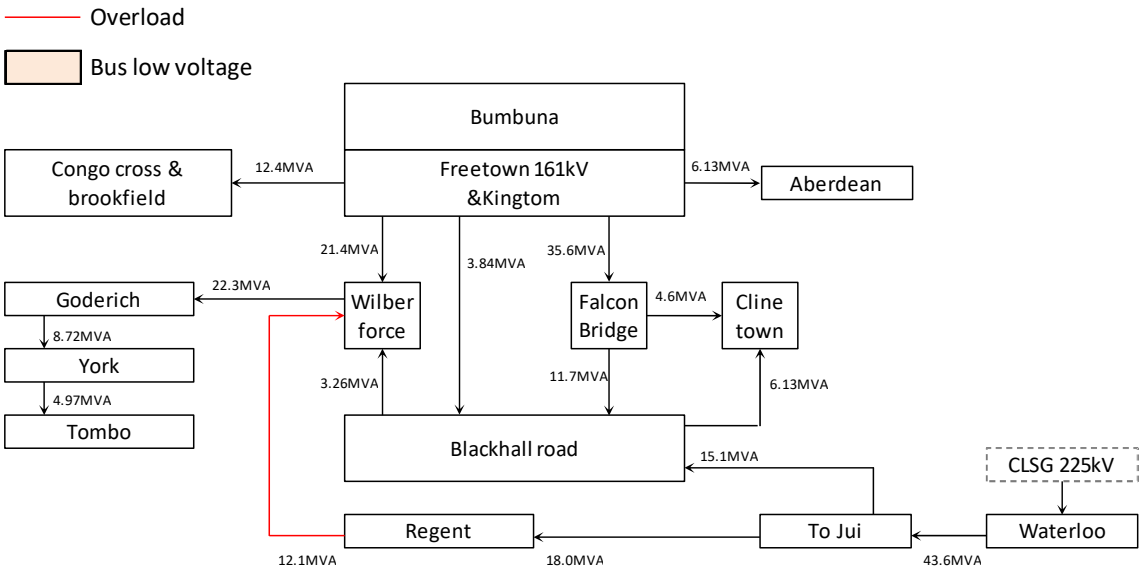
As a result of the interview with Ministry of Fisheries and Marine resources, some development plan such as integration of Fishery processing factory, construction of new port equipment around Black Johnson are scheduled.Therefore the reinforcement of power generation and transmission are required. The following describes the part that assumed to be bottlenecks in the system, which are revealed by the analysis.



Source: JICA Survey Team

Figure 2-2.11 Result of the analysis (2024)

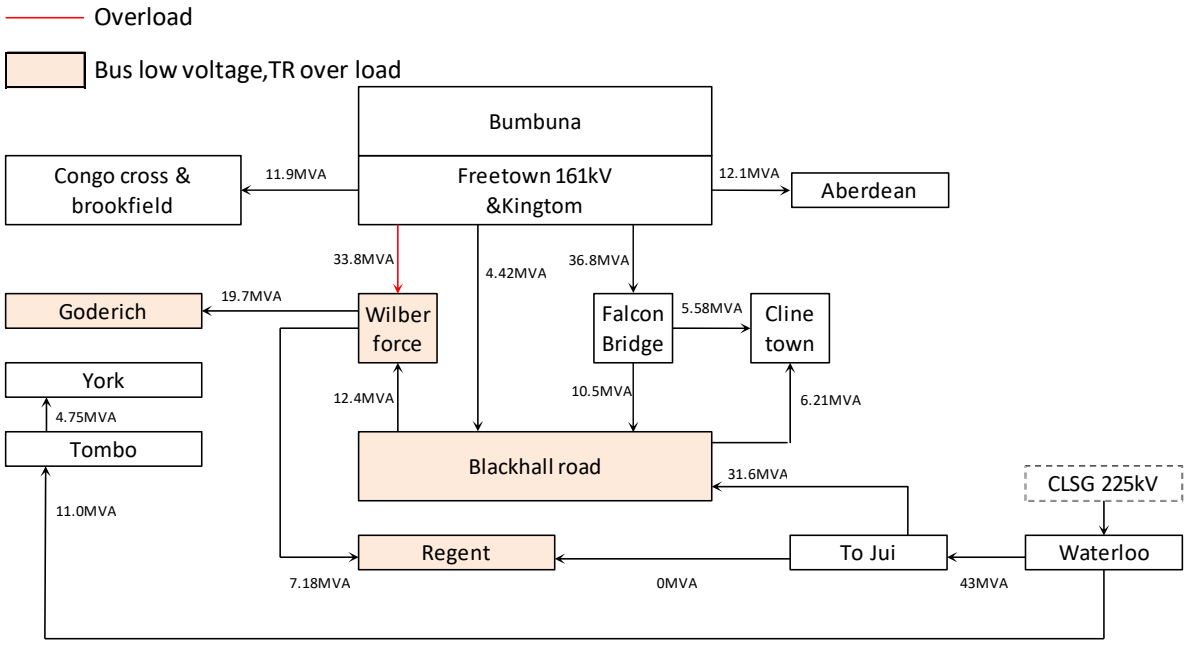
In 2024, the 33kV distribution line and substation (waterloo, etc.) of the eastern Freetown system developed by the World Bank have been already completed. The nain power source is only be Freetown 161kV substation, and mainly distribution to the east, west and south of the peninsula via Wilberforce, Falcon bridge and blackhall road substations.



Source: JICA Survey Team

Figure 2-2.12 Result of the analysis (2026)

The power supply contract with Karpower will terminated in 2025, and the main power source for Freetown Peninsula will be supplied from Bumbuna Hydropower and CLSG 225kV, a new international interconnection line. Due to the additional power supply from Waterloo in the eastern part of the peninsula, the power flow direction will be reversed for some distribution lines.



Source: JICA Survey Team

Figure 2-2.13 Result of the analysis (2029)

Assuming 2029, a new 33kV distribution line between Tombo and Waterloo will be installed, and the ring configuration of the 33kV system will be completed. Due to the system configuration, the power flow analysis was performed under the condition of loop break operation between York and Goderich substation.

Table 2-2.30 Assumed bottleneck part of Freetown peninsula

Year	Part	Problem	Countermeasure
2024	Wilberforce S/S	11kV Bus low voltage (89.6%)	Installation of reactive power compensator at 33kV Bus in Freetown 161kV substation. To regulate the reactive power whole Freetown peninsula, and to keep a reliability of 11kV feeder.
2024	Goderich S/S	11kV Bus low voltage (90.2%)	
2024	Jui S/S	11kV Bus low voltage (93.7%)	
2024	Waterloo S/S	11kV Bus low voltage (92.3%)	
2024	Freetown – Wilberforce 33kV Distribution line	Distribution line Overload (132%)	The World bank has planning for reinforcement of distribution line. But commission date is not clear.
2024	Wilberforce-Regent 33kV Distribution line	Distribution line Overload (135%)	Reinforcement of distribution line
2024	Falcon bridge-Blackhallroad 11kVcable	Distribution line Overload (105%)	Reinforcement of distribution cable
2024	11kV Sussex feeder (Goderich S/S)	Line voltage low (77.6%)	To allocate a part of load from Goderich S/S to York S/S, and to install pole-mount type capacitor bank.
2029	Blackhallroad S/S	11kV Bus low voltage (92.6%)	After termination of contract of Karpower ship, there are no power source which can regulate voltage around Freetown. Therefore it is difficult to keep reliable voltage on 161kV, 33kV, 11kV bus in Freetown 161kV substation. In order to well supply the power from additional CLSG and Bumbuna-2, existing 161kV transmission line shall be double circuit or conductor reinforcement.
2029	Regent S/S	11kV Bus low voltage (86.2%)	
2029	Wilberforce S/S	11kV Bus low voltage (84.7%)	
2029	Goderich S/S	11kV Bus low voltage (79.7%)	
2029	Goderich S/S	Transformer over load (122%)	To install additional transformer
2029	Regent S/S	Transformer over load (141%)	To install additional transformer

Source: JICA Survey Team

The detail result of the analysis shown Appendix.9

(3) Calculation result of fault current

The three phase short circuit current was calculated at each substation bus in the model used for the load flow analysis. The calculation was made with the required reinforcements listed in Table 2-2.30 for respective year. The calculation results of three phase short circuit current at buses of new Tombo and York substation and of major substations are shown in Table 2-2.31 below.

Table 2-2.31 Three phase short circuit current

		2029	Rated breaking current
Tombo S/S	33kV Bus	3.54kA	25kA
	11kV Bus	5.57kA	25kA
York S/S	33kV Bus	2.21kA	25kA
	11kV Bus	4.35kA	25kA
Wilberforce S/S (For reference)	33kV Bus	4.94kA	25kA
	11kV Bus	7.67kA	25kA
Goderich S/S (For reference)	33kV Bus	4.27kA	25kA
	11kV Bus	6.52kA	25kA

Source: JICA Survey Team

(4) Decision of specification

To examine the required items to decide specification.

1) Necessity of the York Substation

a. Purpose of the examination

Since the distance between existing Goderich and Tombo is very long about 50km.Although the master plan (2009) did not mention the construction of York Substation. In view of the reliable grid operational, necessity of York substation which is located at the midpoint between the two S/S is examined.

b. Result of necessity of York S/S

Based on the expected power demand in the Tombo and York area, the power flow analysis has been done by following cases.

Case 1: Construction of York and Tombo S/S
Case 2: Construction of Tombo S/S only
Case 3: Construction of York S/S only

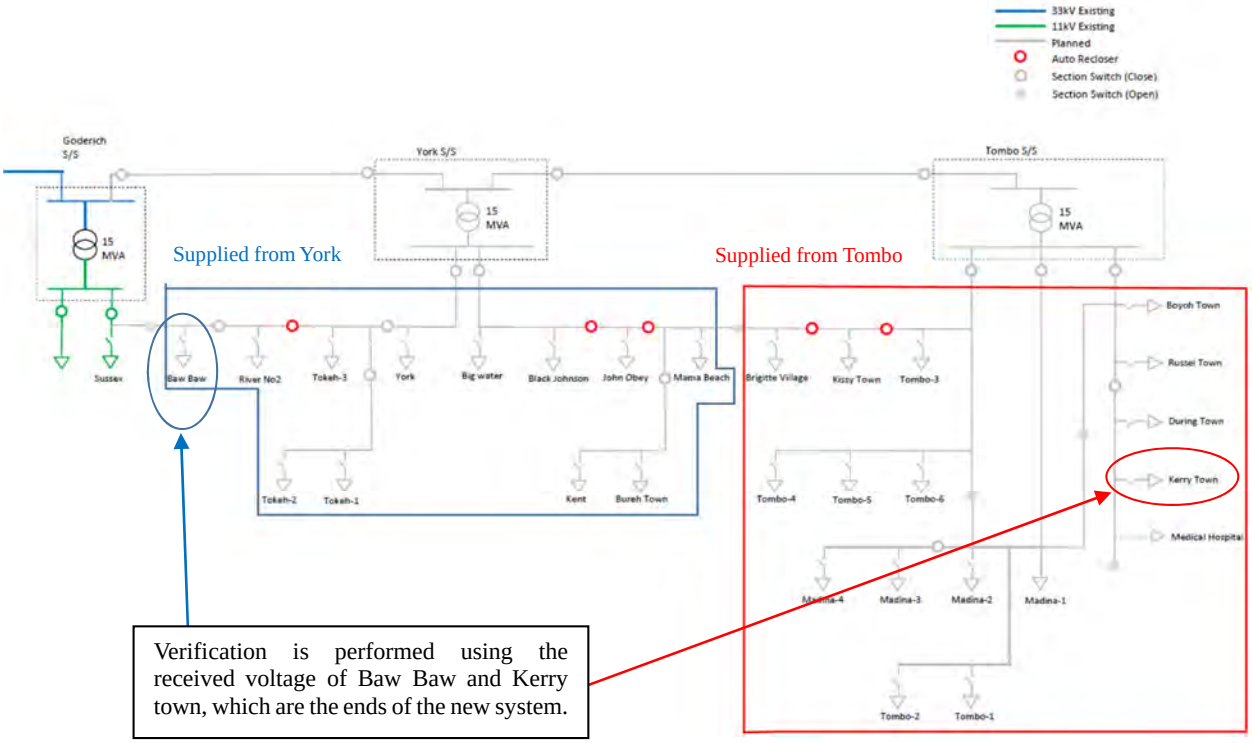
Condition of the power flow analysis are as follows.

- ✓ Normal operation voltage: ±6%(10.34kV～11kV～11.66kV)
- ✓ Based power demand: 2029 (5 years after completion of construction)
- ✓ On the analysis, the bus voltage of the Goodrich S/S which is power supply source was set at 30kV. This is based on actual Goderich operation data
- ✓ Transformer specification

	Tombo S/S	York S/S
Rated capacity	15MVA	15MVA
Voltage	33/11kV	33/11kV
% impedance	7～8%	7～8%
Cooling method	ONAN	ONAN
Tap	+5% (4 x 1.25%) -20%(16 x 1.25%) 21tap	+5% (4 x 1.25%) -20%(16 x 1.25%) 21tap
Vector Group	Dyn11	Dyn11

Source: JICA Survey Team

✓ The power supplied area from primary substation shown as following figure.



Source: JICA Survey Team

Figure 2-2.14 Electricity power supply area in southern part of Freetown

Based on above three cases, the summary of analysis result is shown as below. The table mentionsresult of voltage at Tombo and York S/S. The table also include result of voltage at Baw Baw andKerry town which are grid end of newly installed facilities.

Table 2-2.32 Result of necessity of York S/S

case	For reference				Result(Voltage)		Result (loss)*1	Result
	Bus voltage at Tombo S/S		Bus voltage at York S/S		Baw Baw	Kerry Town		
Voltage	33kV	11kV	33kV	11kV	11kV	11kV	—	
Case1	26.7	10.9	27.4	10.9	10.6	10.8	4.45%	Good
Case2	24.8	10.1	—	—	8.38	10.01	7.19%	NG
Case3	—	—	26.5	10.7	10.3	8.2	8.53%	NG

Source: JICA Survey Team

"*1" were calculated from the ratio of the system loss of the entire southern system to the power flow from the Goderich substation

As shown in the above results, if either York or Tombo S/S is missing, proper voltage operation at the end of the grid would not be possible. In both cases 2 and 3, it is difficult to properly operate the voltage not only at the end of the system but also in areas other than the demand area near the substation. Therefore, both York and Tombo S/S are required for stable power supply in the southern part of the Freetown peninsula.

2) Consideration of introduction of reactive power compensator

As a result of interview with EGTC, the current situation of power supply in Freetown are as shown following table.

Table 2-2.33 Current situation of power supply in Freetown

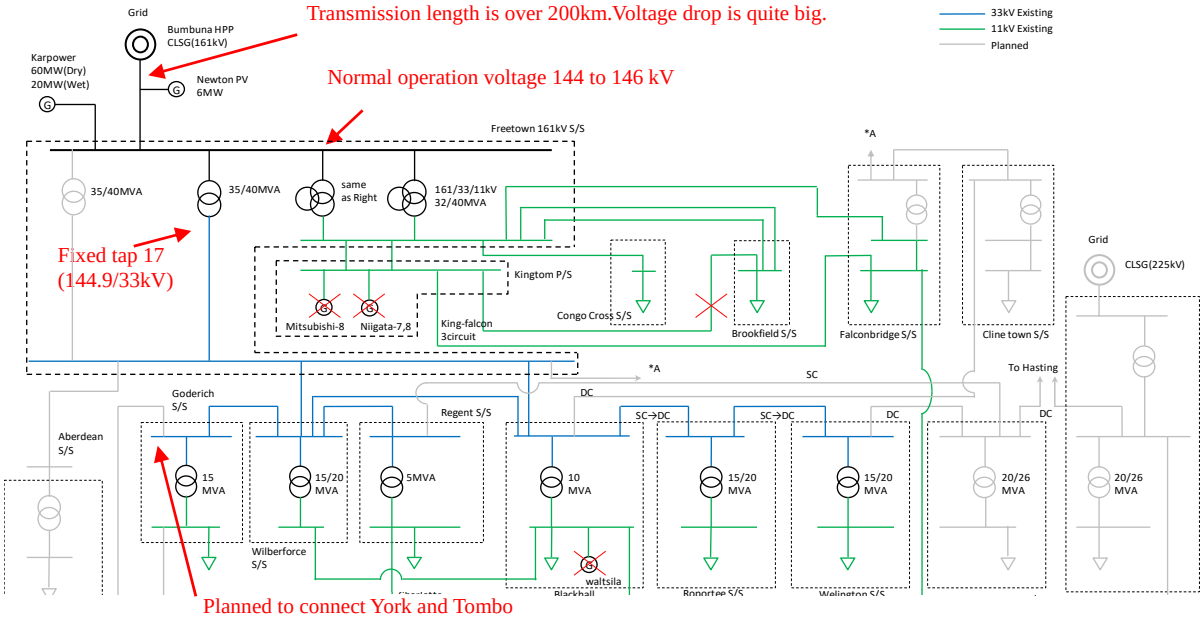
No.	Name	Rated Capacity	Condition
1	Bumbuna Hydro Power Plant	50MW(rain) 10-15MW(dry)	The supplied power received at Freetown S/S Via existing 161kV T/L. When the site survey, 42 MW power receiving was confirmed
2	Karpowership Thermal Power Plant	20MW(rain) 60MW(dry)	The supplied power transmitted via individual line between Karpower and Freetown. When the site survey, 23MW power receiving was confirmed
3	Kingtom Thermal Power Plant	5MW x2	Currently waiting for maintenance after 24,000 hours of operation, and plans to restart operation in early 2023.
4	Blackhall road Thermal Power Plant	8MW x 2	Operated as a backup in case of karpower failure
5	Newton PV Power plant	6MW x1	Under commissioning test
6	Charlotte Hydro Power Plant	2.2MW x1	Operate only for about 3-4 months during the rainy season. Other than that, the amount of water required for power generation could not be secured and it was stopped.
7	CLSG225kV	Max66MW	It is necessary to expand the CLSG northern system, but there is no noticeable movement such as funds or donor

Source: JICA Survey Team

In the supply of electricity to the Freetown Peninsula, the supply to meet the required demand has not met, and the Electricity gap has become normal.As mentioned above, the main power supply facilities are only Bumbuna and KarPower, and both power are supplied from the 161kV Freetown substation in the northern part of Freetown. Through the survey, the following problems were revealed in terms of voltage operation.

- The transmission line specification between the Bumbuna and the Freetown substation is ACSR 400mm^2 1 circuit with a total length of 204km. Due to the long length, the voltage drop was remarkable, and the drop was 144 kV (-11%) at the time of the survey, compared to the rated value of 161 kV.
- When the site survey of Freetown substation, the specifications of the Karpower side step-up transformer are found 132 / 11kV. Therefore, the generator voltage rated at 11kV is adjusted to about 144 to 146kV (tap 12 at the time of survey) with a rated tap 132kV transformer, and power is supplied to the 161kV Freetown substation several hundred meters away.
- Currently, the Freetown 161 kV substation is configured by 161/33/11 kV 32/40 MVA transformer 2 and 161/33 kV 35/40MVA x1 transformer. In the 161/33kV transformer, the bus voltage on the 161kV side was limited to 144 to 146 kV as described above, and the minimum tap was 17 for fixed tap operation (tap17 144.9/33kV). Therefore, there is almost no compensation for the 33kV system in Freetown in terms of operation.

Electricity for the southernpart of Freetown will be connected via 161 kV Freetown substation-wilberforce substation Goderich substation. Due to the problem of existing voltage regulation, the Godrich substation 33kV bus, which is the end of the 33kV system is normally operated at about 30kV.



Source: JICA Survey Team

Figure 2-2.15 Freetown Grid configuration

Based on the current situation of Goderich substation, and specification of new tombo, York substation and distribution line, to consider a necessity of reactive power regulator and capacity of the regulator. In order to conduct analysis, forecasted demand data and software Etap were utilized. For reference, the analysis up to the 2034 was implemented.

Precondition of analysis shown as follows.

- Planned to be installed on the 11kV bus of either the Tombo or York substation in consideration of the benefit of introducing the reactive power regulator.
- Allowable range of grid operating voltage:
  Operation voltage ±6%（10.34kV～11kV～11.66kV）
- Since the connection year of large-scale consumers such as industrial and hotels is unknown at this time during the analysis period of 10 years, it is assumed that all loads will be connected within 5 years after completion of commission date. Therefore, it is calculated that the assumed 100% load will be applied by 20% in the five years from 2024 to 2029. The Medical Hospital, which is scheduled to be built in Kelly Town, will start to operate in 2026.
- In grid terminated point Goodrich substation, bus voltage set by fixed value 30kV.
- The analysis is considered by peak demand for each year.

The result of the analysis shown as following tables

Table 2-2.34 Effect of the reactive power compensator

(%)

Condenser Capacity （2024）	Tombo		York		Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	82.15	100.1	85.15	99.53	97.54	99.78	96.95
1000kVar(T)	—	—	—	—	—	—	—
2000kVar(T)	—	—	—	—	—	—	—
3000kVar(T)	—	—	—	—	—	—	—
1000kVar(Y)	—	—	—	—	—	—	—
2000kVar(Y)	—	—	—	—	—	—	—
3000kVar(Y)	—	—	—	—	—	—	—

(%)

Condenser Capacity （2026）	Tombo		York		Baw Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	78.1	96.15	82.49	99.15	96.57	95.16	92.41
1000kVar(T)	80.62	99.82	83.81	99.22	96.64	98.81	96
2000kVar(T)	—	—	—	—	—	—	—
3000kVar(T)	—	—	—	—	—	—	—
1000kVar(Y)	79.44	97.8	83.87	99.85	97.26	96.8	94.03
2000kVar(Y)	—	—	—	—	—	—	—
3000kVar(Y)	—	—	—	—	—	—	—

(%)

Condenser Capacity （2028）	Tombo		York		Baw Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	74.31	91.04	79.86	98.73	95.62	94.91	91.16
1000kVar(T)	—	—	—	—	—	—	—
2000kVar(T)	79	97.92	82.25	100.1	96.98	96.87	93.08
3000kVar(T)	82.01	99.13	83.9	99.08	95.96	98.07	94.26
1000kVar(Y)	75.67	92.71	81.27	99.48	96.35	91.7	88.01
2000kVar(Y)	—	—	—	—	—	—	—
3000kVar(Y)	78.28	95.95	83.98	99.37	96.24	94.91	91.16

(%)

Condenser Capacity （2029）	Tombo		York		Baw Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	74.46	91.09	79.82	98.6	94.74	90.06	86.69
1000kVar(T)	—	—	—	—	—	—	—
2000kVar(T)	79.18	98.13	82.21	100	96.11	97.06	93.56
3000kVar(T)	82.18	99.4	83.87	98.97	95.11	98.32	94.8
1000kVar(Y)	—	—	—	—	—	—	—
2000kVar(Y)	77.16	94.42	82.61	100.1	96.17	93.37	89.94
3000kVar(Y)	78.46	96.02	83.95	99.25	95.38	94.97	91.51

(%)

Condenser Capacity （2030）	Tombo		York		Baw Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	74.58	91.42	79.97	98.83	95.63	90.41	86.95
1000kVar(T)	76.92	94.84	81.18	98.79	95.6	93.8	90.29
2000kVar(T)	79.39	98.46	82.46	98.83	95.63	97.39	93.82
3000kVar(T)	82.32	99.56	84.03	99.2	96	98.49	94.89
1000kVar(Y)	—	—	—	—	—	—	—
2000kVar(Y)	—	—	—	—	—	—	—
3000kVar(Y)	78.56	96.35	84.09	99.47	96.26	95.3	91.76

(%)

Condenser Capacity （2032）	Tombo		York		Baw Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	—	—	—	—	—	—	—
1000kVar(T)	—	—	—	—	—	—	—
2000kVar(T)	—	—	—	—	—	—	—
3000kVar(T)	81.81	98.89	83.69	98.77	95.48	97.81	94.08
1000kVar(Y)	—	—	—	—	—	—	—
2000kVar(Y)	—	—	—	—	—	—	—
3000kVar(Y)	78.09	95.71	83.77	99.06	95.76	94.65	90.99

(%)

Condenser Capacity （2034）	Tombo		York		Baw Baw	Kerry town	Tombo
	33 kV	11 kV	33 kV	11 kV	11 kV	11 kV	11 kV
Without condensor	73.65	90.17	79.34	97.99	94.63	89.13	85.44
1000kVar(T)	75.83	93.38	80.42	99.33	95.93	92.33	88.57
2000kVar(T)	78.27	96.96	81.68	99.34	95.94	95.87	92.05
3000kVar(T)	81.02	99.39	83.13	99.56	96.16	98.29	94.42
1000kVar(Y)	74.92	91.74	80.66	100.2	96.77	90.69	86.97
2000kVar(Y)	76.31	93.46	82.1	99.43	96.03	92.4	88.65
3000kVar(Y)	77.5	95.06	83.44	100.1	96.7	93.99	90.2

Note：In above table, “1000kVar(T) means the case of installation of 1000kVar reactive power compensator in Tombo S/S. ”(Y)” means it is installed in the York S/S. and the red letters means the case that deviate from the operating voltage range.

Source: JICA Survey Team

【Summary】

In Consideration of the stable power supply in the development target area, the result was that the operating voltage range could be regulated by installing a 3,000kVar reactive power compensator (capacitor bank) on the 11kV bus of the Tombo substation. Since the Tombo substation, which is the end of the 33kV system, has a remarkable voltage drop and is near the large-scale demand area Tombo town.Therefore the benefit of voltage drop countermeasures by reactive power compensator is remarkable.

As a described in precondition, the analysis conducted by peak demand. The demand value influenced by season and daily curve. Regulating by only the rated capacity will lead to overcompensation (voltage rise), so we would like to select a specification that can be adjusted at 500kVar x 6 steps.

(5) Consideration of protection relay in planned substation

Considering the existing substation facilities and new substation configuration, the protection device configuration of the York and Tombo substation examined below.

Table 2-2.35 Configuration of protection relay in planned substation

Facilities	Protection relay	Note
33kV Distribution line	Short Circuit Relay 50/51	—
	Earth Fault Relay 50N/51N	—
	Distance Relay 21	Result of the interview with world bank, Planned new Waterloo, Jui, Aberdeen substation will be installed distance relay for 33kV distribution line. In case of the consideration of future 33kV ring configuration. Since the direction of the power flow is not fixed, there is a risk that the coordinate the protection between the substations will not be impossible

Facilities	Protection relay	Note
		by existing overcurrent relay. Therefore, new distance relay plan to prepare for new distribution line between Goderich and York and Tombo.
	Frequency Relay 81L	The world bank is reviewing existing relay configuration and they plan to add frequency relay against load shedding. The relay setting should be coordinated by each substation.
11kV Distribution line	Short Circuit Relay 50/51	―
	Earth Fault Relay 50N/51N	―
	Frequency Relay 81L	same as above 33kV distribution line
	Auto recloser 79	In order to install future auto reclosed section switch for distribution line, to consider auto recloser at substation side.
33/11kV main transformer	Differential Relay 87T	―
	Short Circuit Relay 50/51	―
	Earth Fault Relay 50N/51N	―
	Frequency Relay 81L	―
Earthing transformer	Short Circuit Relay 50/51	―
	Earth Fault Relay 50N/51N	―
Bus	Over voltage 59	―

Source: JICA Survey Team

2-2-2-4 Overall Plan

The design conditions for the Project are as shown below.

(1) Basic Conditions

The basic conditions applicable to the design of substation equipment, buildings, and foundations are shown in Table 2-2.36.

Table 2-2.36 Basic Conditions

Item		Data
Altitude		Less than 1,000m
Ambient Temperature	Maximum	40 Degrees Centigrade
	Minimum	17 Degrees Centigrade
	Average	27 Degrees Centigrade
Maximum wind speed		25 m/s
Annual Rain Fall		2,910 mm/year
Seismic Force		Horizontal 0.10 G
Geotechnical Endurance		1,000kN/m^2 (at approximately GL=1.5m)

Source: JICA Survey Team

(2) Design Conditions for Electrical System

1) System voltage

- Normal
  33 kV : 33 kV ± 6% (31.02 - 33 - 34.98 kV)
  11 kV : 11 kV ± 6% (10.34 - 11 – 11.66 kV)
-Single contingency
  33 kV : 33 kV ± 10% (29.7 - 33 – 36.3 kV)
  11 kV : 11 kV ± 10% (9.9 - 12 - 12.1 kV)

2) Frequency

- Normal
  50 Hz ± 0.2 Hz (49.8 - 50 - 50.2 Hz)
-Single contingency
  50 Hz ± 1.5 Hz (48.5 - 50 - 51.5 Hz)
- Multiple contingency (event on grid emergency)
  50 Hz ± 3.0 Hz (47.0 - 50 – 53.0 Hz)

3) Short circuit current

- 33 kV : 25 kA - 1 sec.
- 11 kV : 25 kA - 1 sec.

4) Grounding system

- 33 kV : Grounding through Earthing transformer (300 A, 10 sec.)
- 11 kV : Solid grounding

5) Pollution level for Insulator

Heavy (Class d of IEC-60815-2008)

(3) Applicable Standards and Usage Units

Distribution and substation equipment shall be designed based on the latest version of IEC standards, or equivalent to IES standards (JEC and so on). In principle, the International System of Units (SI units) shall be used.

a	Japanese Industrial Standards (JIS)	:	Applicable to all industrial products
b	Japanese Electrotechnical Standards (JEC)	:	Applicable to electrical products in general
c	Standards of the Japan Electrical Manufacturers' Association (JEM)	:	Ditto
d	Japanese Cable Makers' Association Standard (JCS)	:	Applicable to electric wires and cables
e	Japanese Technical standards for electrical equipment	:	Applicable to general electrical work
f	International Electrotechnical Standards (JEC)	:	Applicable to electrical products in general
g	International Organization for Standardization (ISO)	:	Applicable to all electrical and mechanical products
h	Relevant standards and specifications for Sierra Leone	:	Mainly applicable to construction and its related matters

(4) Basic Plan for Primary Substations

The primary substations should be planned based on the following basic policies.

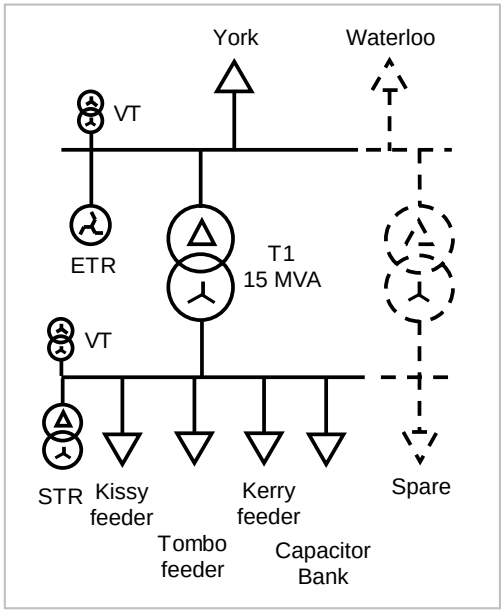
- 33/11kV transformer
  - Capacity and number of transformers
    As described in " 3-2-2-2 Demand forecast (5) Study of Transformer capacity based on the Results of Freetown Peninsula Demand forecast" above, the 33/11kV transformers at both Tombo and York substations should have a capacity of 15MVA and a quantity of one transformer. However, the layout plan should take into account the installation of a second transformer to prepare for future increases in demand.
  - Cooling system
    The capacity of the transformer should be sufficient to meet the expected demand in 2029, which is the target year of the project, and the "self-cooling system (ONAN)" without fans or other accessories will be applied, taking maintenance aspects into consideration.

- 33/11kV switchgear
  Considering the uniformity of maintenance of both 33kV and 11kV switchgear with the existing facilities, an air insulated metal-enlosed switchgear similar to that of the existing switchgear shall be selected.

- Substation monitoring panel
  The two substations planned for this project are located far from the city of Freetown, and it is anticipated that there will be prolonged interruptions to the power supply in the event of equipment malfunctions. In order to cope with this situation, it is desirable for the operators to be able to properly recognize the alarms, etc. in the event of equipment failure, thus substation monitoring panel is to be installed in the control room of both substations. In addition, an 11kV capacitor bank is installed at the Tombo substation for the purpose of voltage regulation of the distribution system. Since timely opening and closing operations of the capacitor bank are required, it is necessary to check the power flow status of the distribution system, thus requiring the installation of this monitoring panel.

A list of major equipment for both substations is provided below, and Table 2-2.37 lists the major specifications.

■ Tombo Substation

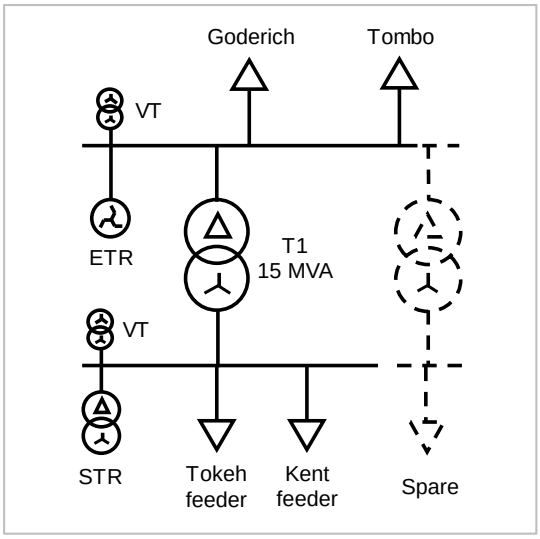


The main equipment in Tombo substation is as follows;-

- 33/11 kV, 15 MVA main tansformer (T1)
- 33 kV earthing transformer (ETR)
- 11/0.415 kV house transformer (STR)
- 11 kV, 6 x 500 kvar capacitor bank
- Indoor use, 33 kV air-insulated switchgears (Single busbar system)
  - One (1) panel for 33 kV feeder (for York substation)
  - One (1) panel for T1
  - One (1) panel for ETR
  - One (1) panel for 33 kV Busbar voltage transformers
  - Space of one (1) panel for 33 kV feeder (for Waterloo substation)
  - Space of one (1) panel for 33/11 kV, 15 MVA transformer (T2)
- Indoor use, 33 kV air-insulated switchgears (Single busbar system)
  - Three (3) panels for 11 kV feeder (for Kissy, Tombo and Kerry lines)
  - One (1) panel for 11 kV capacitor bank
  - One (1) panel for T1
  - One (1) panel for STR
  - One (1) panel for 11 kV Busbar voltage transformers
  - Space of one (1) panel for 33/11 kV, 15 MVA transformer (T2)
  - Space of one (1) panel for 11 kV feeder
- LTC control panel (for T1)
- Substation monitoring panel
- AC/DC power supply panel
- 33 kV and 11 kV lightning arresters (for T1)
- 33 kV and 11 kV cables
- Substation grounding system

■ York substation

- 33/11 kV, 15 MVA main tansformer (T1)
- 33 kV earthing transformer (ETR)
- 11/0.415 kV house transformer (STR)
- Indoor use, 33 kV air-insulated switchgears (Single busbar system)
  - Two (2) panels for 33 kV feeder (for Goderich and Tombo substation)
  - One (1) panel for T1
  - One (1) panel for ETR
  - One (1) panel for 33 kV Busbar voltage transformers
  - Space of one (1) panel for 33/11 kV, 15 MVA transformer (T2)
- Indoor use, 33 kV air-insulated switchgears (Single busbar system)
  - Two (2) panels for 11 kV feeder (for Tokeh and Kent lines)
  - One (1) panel for T1
  - One (1) panel for STR
  - One (1) panel for 11 kV Busbar voltage transformers
  - Space of one (1) panel for 33/11 kV, 15 MVA transformer (T2)
  - Space of one (1) panel for 11 kV feeder
- LTC control panel (for T1)
- Substation monitoring panel
- AC/DC power supply panel
- 33 kV and 11 kV lightning arresters (for T1)
- 33 kV and 11 kV cables
- Substation grounding system



➢ Major specification of Primary substations

Planned equipment of the primary substations are shown in Table 2-2.37.

Table 2-2.37 Technical requirement for the equipment in the Substations

No.	Equipment	Major Specifications
1.	Transformer	
(1)	15 MVA, 33/11 kV Transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Rated capacity	15 MVA
	➢ Primary voltage	33 kV
	➢ Tap changer	
	- Type	On-load tap changer
	- Voltage regulating range	33 kV +5%/- 20%
	- Steps (taps)	21 taps
	- Step voltage (%)	1.25%
	➢ Secondary voltage	11 kV
	➢ Cooling	ONAN
	➢ Vector group	Dyn11
	➢ Standard % impedance	Approximately 7 - 8%
	➢ Rated lightning impulse withstand voltage (LIWV)	33 kV : 170 kV 11 kV : 75 kV
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	33 kV : 70 kV 11 kV : 28 kV
	➢ Neutral grounding	33 kV : Non grounding system (Earthing transformer: 300 A, 10 sec.)

No.	Equipment	Major Specifications
		11 kV : Solidly grounding system (Bushing CT should be installed at neutral line for earth fault)
	➢ Color	RAL7033
	➢ Parallel operation	No (Provision should be made for future second transformer installation)
	➢ Noise level	Less than 68 dB
	➢ Others	Oil-water separator should be installed.
(2)	33 kV Earthing transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Rated capacity	300 A - 10 sec
	➢ Primary voltage	33/√3 kV
	➢ Cooling	ONAN
	➢ Vector group	ZN
	➢ Rated lightning impulse withstand voltage (LIWV)	170 kV
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	70 kV
	➢ CT	300/1, 5P20
	➢ Color	RAL7033
(3)	11/0.415 kV Station transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Rated capacity	100 kVA (Tentative) Note; The capacity shall be calculated at the implementation stage.
	➢ Primary voltage	11 kV +/- 2.5%, +/- 5% (No voltage tap changer)
	➢ Secondary voltage	415/240 V AC (3 phases, 4 wires)
	➢ Cooling	ONAN
	➢ Vector group	Dyn11
	➢ Rated lightning impulse withstand voltage (LIWV)	75 kV
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	28 kV
	➢ Color	RAL7033
2.	11 kV Capacitor bank	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Type	Outdoor use, self-standing metal enclosed type
	➢ Rated capacity	6 x 500 kVar (3 phase)
	➢ Primary voltage	11/√3 kV
	➢ Cooling	Self-cooling
	➢ Connection	Star
	➢ Rated lightning impulse withstand voltage (LIWV)	75 kV
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	28 kV
	➢ Rated short-time withstand current	25 kA -1 sec.
	➢ Accessories	Reactor for inrush current limiting CT for unbalance current detection
	➢ Color	RAL7032
3.	33 kV Switchgear	
(1)	Common specifications	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Type	Indoor use, self-standing metal enclosed type, air-insulated switchgear
	➢ Busbar configuration	Single busbar system
	➢ Rated voltage	36 kV

No.	Equipment	Major Specifications
	➢ Rated current	
	- Busbar	1,250 A
	- Feeder panel	800 A or more
	- Transformer panel	630 A
	- Earthing transformer panel	630 A
	➢ Rated short-time withstand current	25 kA (1 sec.)
	➢ Rated lightning impulse withstand voltage (LIWV)	170 kV
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	70 kV
	➢ Creepage distance (for insulator)	Heavy (class d) in accordance with IEC 60815 (2008)
	➢ Painting color	RAL 7032
(2)	Equipment specifications	
	(a.) Circuit Breaker (CB)	
	➢ Type	GCB or VCB
	➢ Rated voltage	36 kV
	➢ Rated interrupting current	25 kA
	➢ Operating duty	O-0.3 sec.-CO-3 min.-CO
	➢ Control voltage	110 V DC
	➢ Auto-reclosing	Yes
	(b.) Current transformer (CT)	
	- Feeder bay	600-300/1 A, Class 0.5 for metering 600-300/1 A, Class 5P20 for protection
	- Transformer bay	300-150/1 A, Class 0.5 for metering (spare) 300-150/1 A, Class 5P20 for main protection 300-150/1 A, Class 5P20 for back-up protection
	- Earthing transformer bay	300/1 A, Class 0.5 for metering (spare) 300/1 A, Class 5P20 for protection
	(c.) Voltage transformer (VT)	
	- Feeder bay	33/√3 kV / 110/√3 V / 110/3 V, Class 0.5/3G
	- Busbar	Ditto
	(d.) Lightning arrester (LA) @ Transformer HV side	
	➢ Type	Single phase, zinc metal oxide type, to be installed in the switchgear panel
	➢ Rated voltage	36 kV
	➢ Rated discharge current	10 kA
	➢ Surge counter	Yes (1 counter per phase)
4.	11 kV Switchgear	
(1)	Common specifications	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Type	Indoor use, self-standing metal enclosed type, air-insulated switchgear
	➢ Busbar configuration	Single busbar system
	➢ Rated voltage	12 kV
	➢ Rated current	
	- Busbar	1,250 A
	- Feeder panel	630 A
	- Transformer panel	1,250 A
	- Station transformer panel	630 A
	- Capacitor bank panel (for Tombo substation only)	630 A
	➢ Rated short-time withstand current	25 A (1 sec.)
	➢ Rated lightning impulse withstand voltage (LIWV)	75 kV

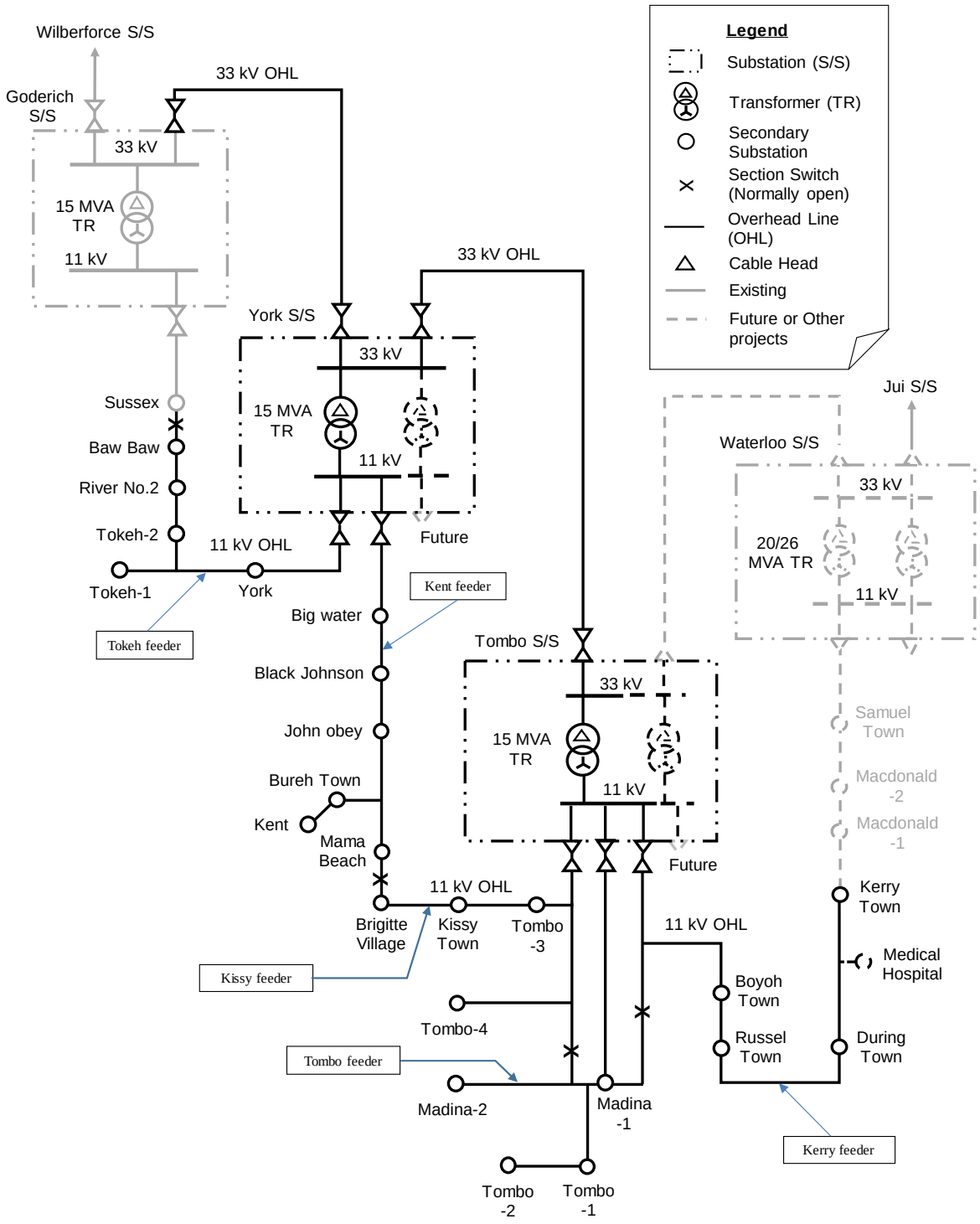
No.	Equipment	Major Specifications
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	28 kV
	➢ Creepage distance (for insulator)	Heavy (class d) in accordance with IEC 60815 (2008)
	➢ Painting color	RAL 7032
(2)	Equipment specifications	
	(a.) Circuit Breaker (CB)	
	➢ Type	VCB or GCB
	➢ Rated voltage	12 kV
	➢ Rated Interrupting Current	25 kA
	➢ Operating duty	O-0.3 sec.-CO-3 min.-CO
	➢ Control Voltage	110 V DC
	➢ Auto-reclosing (AR)	Yes The system of the combination of AR and section switches should be applied on some 11 kV feeders.
	(b.) Current transformer (CT)	
	➢ Feeder panel	400-200/1 A, Class 0.5 for metering 400-200/1 A, Class 5P20 for protection
	➢ Transformer panel	1,200-600/1 A, Class 0.5 for metering 1,200-600/1 A, Class 5P20 for main protection 1,200-600/1 A, Class 5P20 for back-up protection
	➢ Station transformer panel	50/1 A, Class 0.5 for metering 50/1 A, Class 5P20 for protection
	(c.) Voltage transformer (VT)	
	- Feeder bay	11/√3 kV/110/√3 V, Class 0.5
	- Busbar	Ditto
	(d.) Lightning arrester @ Transformer LV side and Feeder bays	
	➢ Type	Outdoor, single phase, zinc metal oxide type
	➢ Rated voltage	12 kV
	➢ Rated discharge current	10 kA
	➢ Surge counter	Yes (1 counter per phase)
5.	Control and protection system	
	(a.) Standards	IEC or equivalent (JEC etc.)
	(b.) Control system	Direct control (Remote control from future SCADA)
	(c.) Protection system	(SEPAM or equivalent)
	➢ 33 kV feeder	50/51; Instantaneous/Inverse time overcurrent protection 50N/51N; Instantaneous/Inverse time overcurrent earth fault protection 81L; Under frequency protection 59; Overvoltage protection (59) 27; Under voltage protection (detection only) 21; Distance protection (Separate relay can be installed) Note) A distance relay shall be installed at the 33 kV feeder panel (for York substation) in Goderich substation by the Supplier.
	➢ 33/11 kV Transformer	87T; Transformer differential protection 50/51, 50N/51N
	➢ 11 kV feeder	50/51, 50N/51N, 81L 79; Auto Recosing
	(d.) 33 and 11 kV metering system	Multi-type digital meter (SEPAM or equivalent)
	(e.) LTC control panel	
	33/11 kV Transformer control	AVR for On-load tap changer (OLTC) is installed in the control panel. Note) Provision should be made for future parallel operation.

No.	Equipment	Major Specifications
	(f.) Substation monitoring panel	See attached drawing SS-07.
	Power flow monitoring	The panel should be with mimic indication type, as shown in the drawing "SS-07". Mustimeters should be installed for the following feeders on the panel to monitor the power flow of the substation. 33 kV feeders 11 kV side of T1 transformer 11 kV feeders 11 kV Capacitor Bank (Tombo only)
	Alarms	Collective alarms are indicated on the panel with audible alarm, such as;- 33 kV switchgear failure 11 kV switchgear failure 11 kV Capacitor Bank failure (Tombo only) 33/11 kV transformer failure AVR control failure AC/DC power supply failure Other necessary alarms The following push button switches are installed on the panel. Acknowledge Reset Lamp test
	(g.) Interface with future SCADA system	Terminals shall be prepared for future SCADA system. See attached drawing SS-08-1 for conceptual diagram and SS-08-2 & 3 for Signal list.
6.	Power Supply System	
1)	AC system	
	(a.) AC Distribution panel	415/240 V AC (3 phases, 4 wires)
2)	DC system	
	(a.) 110 V DC	
	➢ Charger	
	- System	Single charger system
	- Voltage	Input: 415/240 V AC Output: 110 V DC
	- Distribution circuits	MCCBs for DC distribution circuits are included in the Charger panel.
	➢ Battery	
	- Type	Valve regulated lead acid (VRLA) type or equivalent
	- Capacity	150 Ah/10hr. (tentative) Note; The capacity shall be calculated at the implementation stage.
7.	33/11 kV Cable	
	(a.) Standard	IEC or equivalent (JEC etc.)
	(b.) Type	XLPE insulated, PVC sheathed cable, steel armored wire for direct burial case
	(c.) Size	
	➢ 33 kV feeder	185 mm^2 x 2 cables/phase (Single core cable)
	➢ 33 kV side of 15 MVA Transformer	185 mm^2 x 1 cables/phase (Single core cable)
	➢ 33 kV Earthing transformer	185 mm^2 x 1 cable/phase (Single core cable)
	➢ 11 kV feeder	240 mm^2 x 1 cable/phase (Single core cable)
	➢ 11 kV side of 15 MVA Transformer	240 mm^2 x 2 cable/phase (Single core cable)
	➢ Station transformer	50 mm^2 x 1 cable/phase (3 core cable)

(5) Secondary Substations

➢ Locations of Secondary Substations

A field survey was conducted together with EDSA, and 23 secondary substation locations were determined as shown in Figure 2-2.16“Network Diagram of Primary and Secondary substations" below.



Source: JICA Survey Team

Figure 2-2.16 Network Diagram of Primary and Secondary substations

Table 2-2.38 shows “List of Secondary Substations” indicating the capacity of Transformers of each region and the type of substation. There are 2 feeders from York S/S, such as “Tokeh feeder” and “Kent feeder”, and 3 feeders from Tombo S/S, such as “Kissy feeder”, “Tombo feeder” and “Kerry feeder”. It should be noted that Distribution transformers (DTR) are basically for household loads, not for Industrial loads, commercial loads, etc.

Table 2-2.38 List of Secondary Substations

Substation	No.	Region	Transformer (kVA)	Type	Feeder
YORK	1	Mama Beach	2 x 200	Pole mounted	Kent feeder 1,350 kVA
	2	Bureh Town	100	Pole mounted	
	3	Kent	250	Pole mounted	
	4	John Obey	2 x 200	Pole mounted	
	5	Black Johnson	100	Pole mounted	
	6	Big Water	100	Pole mounted	
	7	York	2 x 200	Pole mounted	Tokeh feeder 1,980 kVA
	8	Tokeh-1	630	Ground mounted	
	9	Tokeh-2	250	Pole mounted	
	10	River No.2	200	Pole mounted	
	11	Baw Baw	2 x 250	Pole mounted	
TOMBO	12	Kerry Town	200	Pole mounted	Kerry feeder 800 kVA + Medical Hospital
	13	During Town	100	Pole mounted	
	14	Russel Town	100	Pole mounted	
	15	Boyoh Town	2 x 200	Pole mounted	
	16	Madina-1	250	Pole mounted	Tombo feeder 2,140 kVA
	17	Madina-2	630	Ground mounted	
	18	Tombo-1	630	Ground mounted	
	19	Tombo-2	630	Ground mounted	
	20	Tombo-3	2 x 250	Pole mounted	Kissy feeder 1,430 kVA
	21	Tombo-4	630	Ground mounted	
	22	Kissy Town	200	Pole mounted	
	23	Brigitte Village	100	Pole mounted	

Source: JICA Survey Team

- Equipment in Secondary Substations

The equipment in Secondary substations is consisting of Distribution Transformers (DTR) and Low Voltage Distribution Board (LVDB). As listed in Table 2-2.39, four types of DTR (100 kVA, 200 kVA, 250 kVA and 630 kVA) and six types of LVDB should be prepared, including 2 x 200 kVA transformers and 2 x 250 kVA transformers.

- For 100 kVA, 200 kVA, 250 kVA, 2 x 200 kVA and 2 x 250 kVA transformers
  The three types of transformers are mounted on the top of the distribution poles, and their LVDB is installed at the bottom of the poles. This is shown in Figures SS-09-1 (one transformer) and SS-09-2 (two transformers). By adopting this method, the installation area can be minimized.
- For 630 kVA transformers
  Both DTR and LVDB should be installed at the ground level in the cases. The typical arrangement of 630 kVA transformers is shown in SS-10. The fences and gates for these secondary substations should be installed by EDSA.
- LVDB
  LVDBs are installed in each of the six transformer patterns, and the single line diagram for LVDBs is shown in Figure SS-11 (100 to 700).

- Technical requirement for the equipment in the Secondary Substations

The main specifications of the equipment in Secondary substations are as follows;-

Table 2-2.39 Main Specifications of Equipment in Secondary Substations

No.	Equipment	Major Specifications
1.	11/0.415 kV Distribution transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Rated capacity	100 kVA, 200 kVA, 250 kVA, 630 kVA
	➢ Primary voltage	11 kV +/- 2.5%, +/- 5% (No voltage tap changer)
	➢ Secondary voltage	415/240 V AC (3 phases, 4 wires)
	➢ Cooling	ONAN
	➢ Vector group	Dyn11
	➢ Rated Lightning Impulse Withstand Voltage (LIWV)	75 kV
	➢ Rated Power Frequency Withstand Voltage (PFWV) (1 min.)	28 kV
	➢ Color	RAL7033
2.	LV Distribution Board	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Type	Outdoor, Metal enclosed, self-standing type The panel shall be pad-locked.
	➢ Protection degree	IP54
	➢ Insulation	Air insulation
	➢ Measurement	1. Instantaneous rms values Current, voltage, frequency, active, reactive, apparent power, power factor 2. Energy values Active, reactive, apparent energy, configurable, Accumulation mode 3. Hour counter The meter shall be installed inside the panel.
	➢ Circuit	See attached drawings "SS-11-100 to 700".
	➢ Color	➢ RAL 7032

Source: JICA Survey Team

(6) Basic Plan for 33kV and 11kV Distribution Line

The scope of work for 33kV and 11kV distribution lines are shown in the Project Site Location Map in this report and in drawing DL-01. In order to supply power reliably, the distribution feeder shall be divided by some section switches properly. The distribution diagram plan is formulated to energize power for the normal section when a line fault occurs.

33kV and 11kV distribution line pole types are shown in Table 2-2.40. Each drawing of the pole type are shown in Appendix 6. Also, the details of the planned distribution route maps are shown in Appendix 6.

Table 2-2.40 33kV and 11kV distribution line pole type

Pole Type	Drawing Title
C	11&33kV Combination Type
CA	11&33kV Combined Intermediate Pole (Line Angle 0-5deg)
CB	11&33kV Combined Light Angle Pole (Line Angle 5-20deg)
CC	11&33kV Combined Middle Angle Pole (Line Angle 20-60deg)
CE	11&33kV Combined Section Pole
CF	11&33kV Combined Sharp Angle Pole (Line Angle 90deg)
CG	11&33kV Combined Cable Connection Pole
CH	11&33kV Combined Branch Pole(11kV Line Angle 45deg)

Pole Type	Drawing Title
CS	11&33kV Combined Intermediate Pole(Line Angle 0-5deg –Special Arm）
S	11kV+33kV(only space) Combination Type
SA	11kV Combined Intermediate Pole （Line Angle 0-5deg）
SB	11kV Combined Light Angle Pole （Line Angle 5-20deg）
SC	11kV Combined idle Angle Pole (Line Angle 20-60deg）
SF	11kV Combined Sharp Angle Pole （Line Angle 90deg）
SH	11kV Combined Branch Pole
D	11kV Double Layer Type
DB	11kV Double Light Angle Pole （Line Angle 5-20deg）
DC	11kV Double Middle Angle Pole （Line Angle 20-60deg）
DF	11kV Double Sharp Angle Pole （Line Angle 90deg）
DG	11kV Double Cable Pole
DH	11kV Double Branch Pole (Line Angle 90deg）
3	33kV+11kV(only space) Pole Type
3A	33kV Intermediate Pole （Line Angle 0-5deg）
3C	33kV Middle Angle Pole （Line Angle 20-60deg）
3F	33kV Sharp Angle Pole （Line Angle 90deg）
3G	33kV Cable Connection Pole
1	11kV Pole Type
1A	11kV Intermediate Pole （Line Angle 0-5deg）
1B	11kV Light Angle Pole （Line Angle 5-20deg）
1C	11kV Middle Angle Pole （Line Angle 20-60deg）
1F	11kV Sharp Angle Pole （Line Angle 90deg）
1H	11kV Light Branch Pole
1L	11kV Transformer Connection Pole
1M	11kV Transformer Connection Pole （Ground mounted）

Source: JICA Survey Team

1) Contents of the Plan

a. 33kV Distribution Line between Goderich substation and New Tombo substation

The York and Tombo substations will be energized by constructing a new 33kV distribution line using a conductor AAC-265mm^2 overhead line. The overhead line length is about 43.9km. Support structure for the 33kV overhead distribution line shall be steel poles.

Since the maximum number of high-voltage lines that can be installed on the same pole is two, the existing 11kV distribution line from the Goderich substation is a two-circuit pole, and the 33kV distribution line cannot be attached to the same pole. Therefore, a new 33kV distribution line route will be built up to the point where the existing 11kV distribution line becomes a single line (approximately 400m from the Goderich substation). The poles will be designed to provide space for the 11kV distribution line so that the 11kV distribution line can be attached to the poles in the future. (refer to the 33kV single-circuit pole drawings) After that, the section to Sussex has only one existing 11kV distribution line, and space is available on the existing poles to attach a 33kV distribution line, so the 33kV distribution line will basically be attached to the existing poles. The route from Sussex to the Tombo substation is basically a combination pole arrangement where the 33kV and 11kV distribution lines are installed on the same pole (refer to the drawings of the 33 & 11 kV combination poles).

b. 11kV Distribution Line from York substation

11 Secondary substations will be energized by constructing a new 11kV distribution line using a conductor AAC-150mm^2 overhead line. The overhead line length is about 35.3km. Support structure for the 11kV overhead distribution line shall be steel poles.

The same route with the 33 kV distribution line will attached on the same pole (refer to the drawings

of the 33 & 11 kV combination poles), but the route to the Kent secondary substation shall be pole attached on one 11 kV distribution line (refer to the 11kV single-circuit pole drawings). Refer to the pole drawings 1L and 1M for the transformer pole at the secondary substation.

c. 11kV Distribution line from Tombo substation

12 Secondary substations will be energized by constructing a new 11kV distribution line using a conductor AAC-150mm^2 overhead line. The overhead line length is about 13.2km. Support structure for the 11kV overhead distribution line shall be steel poles.

The route between the Tombo Substation and the Kerry Town Secondary Substation shall be reserved for the future installation of a 33 kV distribution line (refer to the 11kV+33kV(only space) pole drawings), but the route to the secondary substations at Madina-1,2 and Tombo-1-4 shall be pole attached with two 11kV distribution lines or one 11kV line (refer to the 11kV double-circuit pole and 11kV single-circuit pole drawings). Refer to the pole drawings 1L and 1M for the transformer pole at the secondary substation.

2) 33kV Distribution Line

The details of the planned 33kVdistribution line are shown in the table below.

Table 2-2.41 Specification for 33kV Distribution Line

No.	Items	Specifications	
1)	Power Pole	Type	Steel Pole 15m-850kg
		Type of pole	Suspension pole Tension pole
		Safety factor	1.0 for main body 1.2 for arms
		Accessories	All of needed pole arrangement accessories
2)	Overhead Line (Conductor)	Type Size	Aluminum Conductor （AAC） 265mm^2
3)	Section Switch	Type	Pole mount, Water proof
4)	Lightning Arrester	Type Rated voltage Nominal discharge current	Outdoor, single phase, metal oxide gapless 36kV 10kA
5)	Insulator	Standards Type Material Creepage distance	IEC60383-1 or equivalent Line post insulator Suspension insulator (3pcs/phase) Porcelain or Polymer Heavy (class d)
6)	Ground Wire	Type Size Shield angle	Aluminum Clad Steel Wire （AC） 45mm^2 45 degrees

Source: JICA Survey Team

3) 11kV Distribution Line

The details of the planned 11kVdistribution line are shown in the table below.

Table 2-2.42 Specification for 11kV Distribution Line

No.	Items	Specifications	
1)	Power Pole	Type	Steel Pole 15m-850kg、12m-850kg
		Type of pole	Suspension pole Tension pole

No.	Items	Specifications	
		Safety factor Accessories	1.0 for main body 1.2 for arms All of needed pole arrangement accessories
2)	Overhead Line (Conductor)	Type Size	Aluminum Conductor （AAC） 150mm^2
3)	Section Switch	Type	Pole mount, Water proof
4)	Lightning Arrester	Type Rated voltage Nominal discharge current	Outdoor, single phase, metal oxide gapless 12kV 10kA
5)	Insulator	Standards Type Material Creepage distance	IEC60383-1 or equivalent Line post insulator Suspension insulator (2pcs/phase) Porcelain or Polymer Heavy (class d)
6)	Ground Wire	Type Size Shield angle	Aluminum Clad Steel Wire （AC） 45mm^2 45 degrees

Source: JICA Survey Team

4) Supply of Low Voltage Distribution Materials

In the previous project, the Japanese side provided poles, wires, and pole materials for low-voltage distribution lines (trunk lines) from each secondary substation, and achieved a certain level of success in improving the electrification rate. In the current project, in addition to poles, wires, and pole materials for low-voltage distribution lines (trunk lines) from 23 secondary substations, power meters to be installed at the expense of customers will be provided to improve the electrification rate in areas without electrification. The quantity of equipment to be provided may be adjusted in the process of estimating the total project cost.

Table 2-2.43 shows the details of the planned provision of materials for low-voltage distribution lines. Table 2-2.44 also shows a list of the poles for low-voltage distribution lines. Refer to Reference Drawing DL-04 "Low-voltage pole drawings" for each pole type.

Table 2-2.43 Specifications for Low Voltage Distribution Line

No.	Items	Specifications		Quantity
1)	Power Pole	Type	Steel Pole 10m-500kg	600
2)	Trunk Overhead Line (Conductor)	Type Size	Aluminum Conductor （AAC） 70mm^2 95mm^2	 38km 91km
3)	Insulator	Type Material Color	Low Voltage Shackle Porcelain Brown	4pcs/pole
4)	Power Cable	Type Size	XLPE, 600V Aluminum 60mm^2 x 4c 100mm^2 x 4c	 360m 440m
5)	Power Meter	Type	400V, three phase four-wires	100

Source: JICA Survey Team

Table 2-2.44 Low Voltage Distribution Line Pole Type

Pole Type	Drawing Title	Quantity
L	LV Pole Type	
LA	LV Intermediate Pole	361
LB	LV Angle Pole	178
LC	LV Terminal Pole	61

Source: JICA Survey Team

2-2-3 Outline Design Drawing

The schematic design of the Project is shown in Appendix 6.

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

Since this project will be implemented under the framework of Japan's grant assistance, the project will be implemented only after the Japanese government approves the implementation of the project and the Exchange of Notes (E/N) and the Gift Agreement (G/A) between JICA (Japan International Cooperation Agency) and Sierra Leone are signed by the two governments. The following is a summary of the basic requirements for the implementation of this project and points that require special consideration.

(1) Project Implementing Entity

EDSA will be responsible for operation and maintenance of the procured facilities after completion of the facilities. In order to ensure the smooth implementation of the Project, the Ministry of Energy and EDSA should appoint a person to be in charge of the Project and should closely communicate and consult with the Japanese consultants and contractors.

The appointed EDSA project manager should ensure that the Ministry of Energy, EDSA, and the residents of the project area involved in the project fully explain and understand the details of the project and educate them to cooperate in the implementation of the project.

(2) Consultant

In order to implement the procurement and installation of equipment for this project, a Japanese consultant recommended by JICA will engage in a design and supervision contract with EDSA to implement the design and construction supervision services related to this project. The consultant will also prepare the bidding documents and execute the bidding process on behalf of EDSA, the project executing entity.

(3) Contractor

In accordance with the framework of Japan's grant assistance, the Japanese contractor selected by the Sierra Leonean side through an open bidding process will carry out the construction, procurement and installation of materials and equipment for the project.

Since the contractor is expected to continue to provide after-sales services, such as the supply of replacement parts and response to malfunctions after the completion of this project, the contractor must give sufficient consideration to communication and coordination for such materials, equipment and facilities after delivery of the project.

(4) Necessity of Engineer Dispatch

The project consists of civil and building works for the construction of a new 33/11 kV primary substation in the Tombo and York areas, the installation of substation equipment, construction of approximately 46 km of 33 kV distribution lines and approximately 52 km of 11 kV distribution lines (11/0.415 kV secondary substation). The construction work consists of two separate projects, which

need to be coordinated with each other. Since most of these various works will be carried out in parallel, it is essential to dispatch a site supervisor from Japan who understands the scheme of Japan's grant aid and can consistently manage and guide the entire construction work in order to control the process, quality, workmanship, and safety.

2-2-4-2 Implementation Conditions

(1) Construction Situation and Technology Transfer in Sierra Leone

There are several general contractors and electrical contractors in Freetown, so it is possible to procure local labor, transport vehicles, and construction equipment in Sierra Leone, as well as civil works for the construction of facilities and transmission/distribution lines for the Project from these local contractors. However, in order to ensure that the delivery date of the project is met, and considering the construction conditions of the 33kV and 11kV distribution lines, it is essential to dispatch Japanese engineers to the site for process control, quality control, and safety control.

(2) Use of local materials and equipment

In Sierra Leone, cement, rebar, and other materials used in foundation construction need to be controlled for quality and delivery, but local procurement is possible, and there are many examples of the use of locally procured materials. Therefore, in formulating the construction plan, materials that can be procured locally should be used as much as possible, taking into consideration the development of local industry. On the other hand, the substation and power distribution equipment required for this project not manufactured in Sierra Leone (and are therefore imported), will be procured from Japan or a third country.

(3) Safety measures

Although there are relatively few security problems in Sierra Leone, the majority of the project area is off-grid and located far from Freetown, so construction work should be avoided after sunset. Security measures shall be taken into consideration. In the previous project, some of the low-voltage equipment and materials provided to EDSA were stolen, and a security guard also disappeared when the theft occurred. Based on this lesson learned, we will deliver a portion of the equipment and materials to EDSA during the construction phase so that EDSA can finish the low-voltage line as much as possible before the completion of the project, and even if the work is not completed before the completion of the project, we will take the measures to ensure that the work is completed before the completion of the project.

2-2-4-3 Scope of Work

Japan will be responsible for procurement of equipment, installation, testing and adjustment, and necessary civil works for the newly constructed primary substation, secondary substation, 33 kV distribution line, and 11 kV distribution line. The Sierra Leonean side will be responsible for the installation of new low-voltage distribution lines after the secondary substation. The detailed construction burden classification between Japan and Sierra Leone is shown in 2-4 Obligation of Recipient Country.

2-2-4-4 Consultant Supervision

Based on Japan's grant aid system, the consultant will organize an integrated project team for design implementation work and construction supervision based on the basic project design to ensure smooth implementation. The project will require coordination with substation construction and distribution line construction, which require coordination with existing substation facilities. Therefore, the consultant will have at least one engineer on site during the construction supervision phase to ensure comprehensive process management, quality control, and construction supervision. These management measures shall be implemented. In addition, other specialized engineers will be dispatched as the work progresses, including equipment installation, commissioning/adjustment, and handover testing, to supervise the work performed

by the contractor. Furthermore, if necessary, domestic experts will participate in factory inspections and pre-shipment inspections of materials and equipment manufactured in Japan, and supervise to prevent any problems from occurring after the materials and equipment are delivered to the site.

The Consultant's construction supervision staff shall monitor and verify whether the quality of materials and equipment procured for the Project and the workmanship of their installation are in accordance with the Contract Documents (Technical Specifications, Execution Design Drawings, etc.), based on the following items. If there is any doubt about the quality or workmanship, we will request the contractor to make corrections, changes, or revisions.

(1) Basic policy for construction supervision

The basic policy of the Consultant shall be to supervise the progress of the Work to ensure the Work is completed within the specified construction period, ensuring the quality, workmanship, and delivery of materials and equipment is done as indicated in the Contract Documents, and to supervise and guide the Contractor to ensure the safe execution of the Work at the site. The following is a list of major construction supervision considerations.

(2) Process Management

In order to ensure that the contractor meets the delivery deadline date indicated in the contract, a progress assessment is made each month or each week. If a process delay is anticipated, the contractor is alerted and asked to submit and implement a countermeasure plan, and the contractor is then provided with guidance to ensure work is completed within the contracted construction period. Comparison of the progress with the planned process is mainly based on the following items:

a) Confirmation of materials and equipment delivery results (materials and equipment for substation and power distribution, and materials and equipment for civil engineering and construction work.)
b) Confirmation of temporary construction and construction equipment readiness
c) Confirmation of walk in rates and actual number of engineers, technicians, laborers, etc.

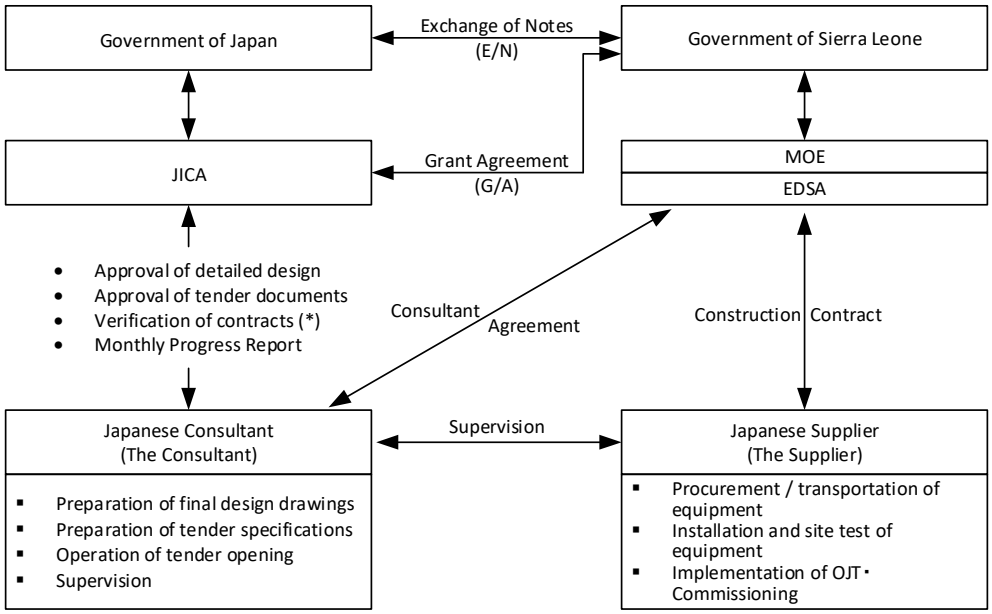
(3) Safety Management

In consultation and cooperation with the responsible person of the contractor, safety management shall be carried out to prevent occupational accidents on site during the construction period as well as accidents to third parties. Points to be considered regarding safety management on site are as follows:

a) Establishment of safety management regulations and appointment of managers
b) Preventing accidents by conducting periodic inspections of construction machinery
c) Formulate operating routes for construction vehicles, transport equipment and so forth; and ensure safe driving.
d) Encourage workers to take advantage of welfare measures and holidays.

(4) Overall relationship regarding plan implementation

Figure 2-2.17 shows the interrelationships among the persons in charge of implementing this project, including during construction supervision



Remarks: *JICA's concurrence is required for Consultant Agreement and Contract
Source: JICA Survey Team

Figure 2-2.17 Project Implementation Relationship Diagram

(5) Construction supervisor

The contractor will procure materials and equipment for the construction of the new substation and 33kV and 11kV distribution lines, as well as civil and construction work related to the project. In addition, the contractor will employ local Sierra Leonean contractors under subcontracts for the implementation of the works. Therefore, the contractor must ensure that the subcontractors are aware of the construction process, quality, workmanship, and safety measures stipulated in the contract, and the contractor shall dispatch engineers with experience in similar work overseas to the site to provide guidance and advice to the local contractors.

In addition, since the adjustment and testing of substation equipment, distribution line materials and equipment after installation requires specialized engineers from manufacturers with the prescribed technical level, it is difficult to use local contractors.

2-2-4-5 Quality Control Plan

The Consultant's construction supervision staff shall monitor and verify whether the quality of materials and equipment procured for the Project and the workmanship of their installation are in accordance with the Contract Documents (Technical Specifications, Execution Design Drawings, etc.), based on the following items. If there is any doubt about the quality or workmanship, we will request the contractor to make corrections, changes, or revisions.

a) Verification of production drawings and specifications of materials and equipment
b) Witnessing factory inspections of materials and equipment, or verifying the results of factory inspections
c) Verification of packaging, transportation and on-site temporary storage methods
d) Verification of construction drawings and installation manuals for materials and equipment
e) Verification of trial operation, adjustment, testing, and inspection procedures for materials and equipment

f) Supervision of on-site installation of materials and equipment and witnessing of trial operation, adjustment, testing, and inspection
g) Verification of equipment installation and fabrication drawings and site workmanship
h) Verification of construction drawings, fabrication drawings, and field workmanship

2-2-4-6 Procurement Plan

The equipment and materials for the substation facilities to be procured and installed in this project are not manufactured in Sierra Leone. For this reason, all equipment and materials for substation facilities in Sierra Leone, including transformers and switchboards, are procured from European countries such as France, Italy, and Germany, along with Japan. In recent years, Chinese and Indian products have begun to be introduced into the substation facilities of the Energy Management Corporation, but trust in Japanese, European, and U.S. products is high. Few manufacturers have the necessary after-sales service systems in place to handle accidents, repairs, and procurement of replacement parts for high-voltage substation equipment. Therefore, in selecting suppliers of equipment and materials for the substation facilities of this project, it is necessary to take into account local conditions, the ease of operation and maintenance of the facilities by Sierra Leonean engineers, and the availability of after-sales service systems for procurement of replacement parts and response to malfunctions and other matters.

The Energy Operation and Maintenance Corporation, which will be in charge of operation and maintenance of facilities and equipment after the completion of the project, states that the Japanese transformers and power distribution equipment procured through past Japanese grant projects are still in sound operation at each site, and that the high-level performance of the main substation equipment and the after-sales service system of Japanese manufacturers can be relied upon. Therefore, the company hopes as much as possible for the substation equipment and materials for this project be made in Japan. As for construction equipment for equipment installation and transportation, 25-ton class cranes and trailers can be leased locally, and there will be no particular obstacles to the implementation of this project.

Based on the above, the following suppliers of materials and equipment to be used in this project shall be;

(1) Locally Procured Materials and Equipment

Construction materials and equipment: cement, sand, concrete aggregate, concrete blocks, rebar, lumber, gasoline, diesel oil, construction vehicles, cranes, trailers, and other temporary construction materials and equipment.

(2) Materials and equipment procured form Japan/Third Countries

1) Materials and equipment for primary substation

33/11kV transformer, 33kV grounding transformer, 11/0.415kV in-substation transformer, 33kV distribution panel, 11kV distribution panel, 11kV capacitor bank (only for Tombo substation), LTC control panel, substation monitoring panel (including alarm), in-substation power supply equipment, surge arresters, high voltage cables, substation grounding materials, and other materials.

2) Materials and equipment for Secondary substation

11/0.415kVA distribution transformer, low voltage distribution panel

3) Materials and equipment for distribution lines

33kV distribution line materials and equipment, 11kV distribution line materials and equipment, low-voltage line materials and equipment (steel materials, insulators, etc.)

2-2-4-7 Operational Guidance Plan

The initial operation and maintenance instructions for the equipment procured for this project shall be provided by the manufacturer's instructors through on-the-job training in accordance with the operation and

maintenance manual before construction is completed.

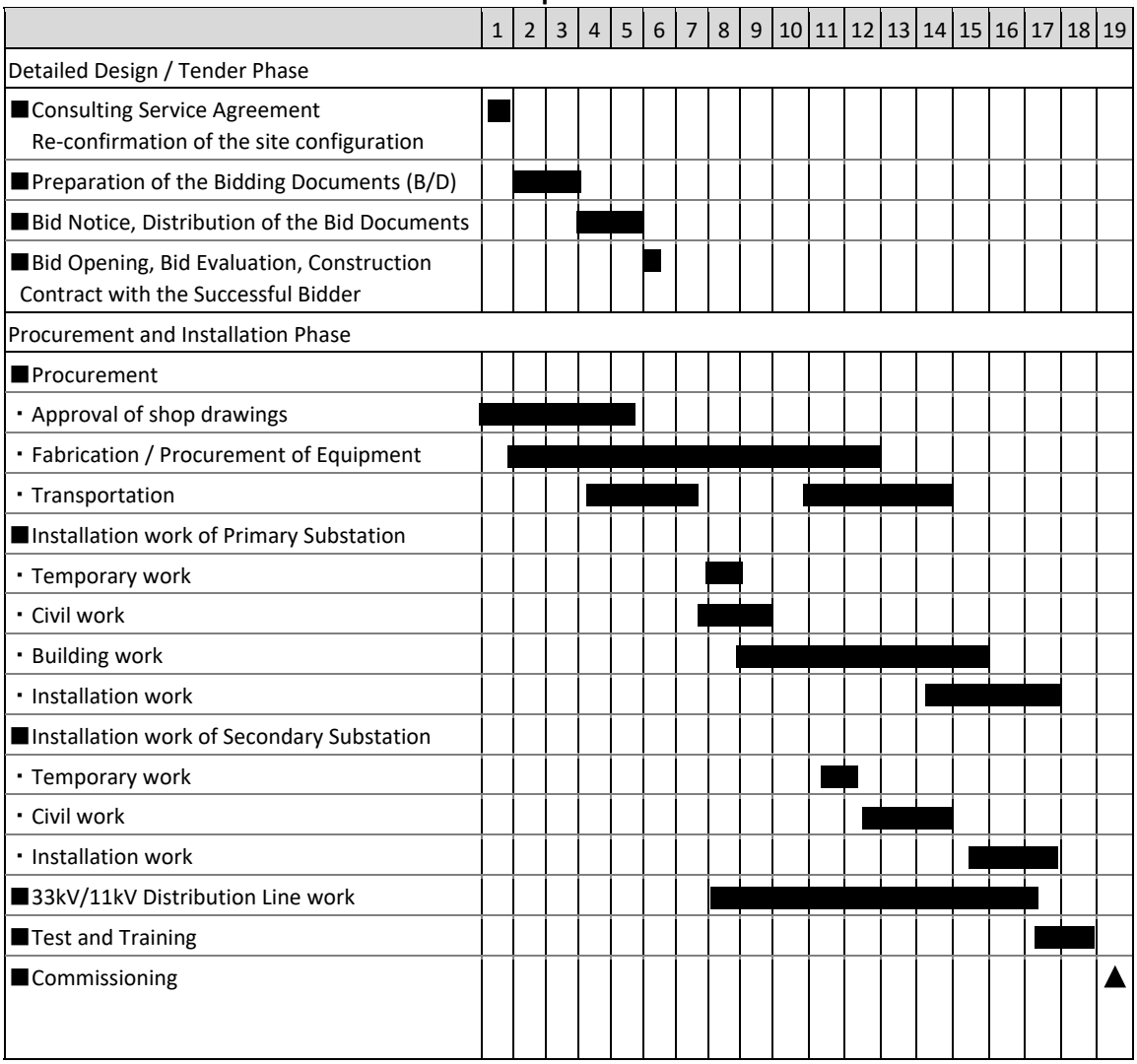
In order to facilitate this guidance plan, EDSA should closely communicate and consult with the consultant and contractor and appoint a full-time engineer to participate in the on-the-job training. The appointed EDSA engineer should horizontally deploy his/her skills to other staff members who were not able to participate in the guidance plan and help improve EDSA's maintenance and management capacity.

In addition, since the operation of substation facilities and the adjustment and testing of distribution line materials and equipment during and after installation require specialized engineers from manufacturers with the prescribed technical level, it is difficult to use local contractors. It is therefore necessary to dispatch engineers from Japan to perform quality control, technical guidance and process control.

2-2-4-8 Implementation Schedule

After the implementation design and bidding, and after concluding the contract with the contractor, the equipment procurement and installation will be started. The required construction period is about 24 months for the entire process from the conclusion of Grant Agreement (G/A) to the completion of construction, of which about 18.5 months is expected to be the equipment procurement and installation process. Table 2-2.45 shows the project implementation process chart.

Table 2-2.45 Implementation Process



Source: JICA Survey Team

2-3 Security Plan

The target area of this project is required to be an area with few security problems, but it is necessary to pay sufficient attention to prevent theft of materials and equipment and ensure the safety of construction personnel. For this reason, it is essential for the Sierra Leone side to take necessary measures for safety measures, but the Japanese side also takes safety measures such as installing a fence as part of the temporary construction work at the equipment storage site and assigning security guards. I will consider it.

2-4 Obligations of Recipient Country

In addition to the "Major Undertakings to be taken by the Government of Sierra Leone" attached in the Minutes of Discussions signed between Sierra Leone side (Ministry of Energy, EDSA) and the JICA Survey Team, JICA Survey Team has explained the basic obligations to be borne by either Japanese side or Sierra Leone side as indicated in the following table.

JICA Survey Team and EDSA have agreed with the following undertakings and understood that some parts of the works might become additional obligations of Sierra Leone side in the process of Project scoping.

(1) Before the Tender

No.	Items	Deadline	Japan	Sierra Leone (In charge)
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A	-	●(Bank of Sierra Leone)
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)	-	●(MOE)
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A 1) Advising commission of A/P 2) Payment commission for A/P	1) within 1 month after the signing of the contract(s) 2) every payment	-	●(MOE)
4	To approve IEE/EIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation for EMP and EMoP (and fulfilling conditions of approval, if any).	within 1 month after the signing of the G/A	-	●(EDSA)
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before notice of the bidding documents	-	●(MOE)
6	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	until land acquisition and resettlement complete	-	●(EDSA)
7	To secure and clear the following lands 1) right of way for the construction of the project 2) project sites for new substation 3) temporary construction yard and stock yard near the Project area 4) borrow pit and disposal site near the Project area	before notice of the bidding documents	-	●(EDSA)
8	To obtain the planning, zoning, building permit	before notice of the bidding documents	-	●(EDSA)
9	To clear, level and reclaim the following sites 1) remove utilities 2) existing facilities 3) leveling and reclaiming the sites for new substation and distribution lines	before notice of the bidding documents	-	●(EDSA)

No.	Items	Deadline	Japan	Sierra Leone (In charge)
10	To submit Project Monitoring Report (with the result of Detailed Design)	before preparation of the bidding documents	-	●(EDSA)
11	To obtain Certificate/Title of Land acquisition for substation construction (land ownership, register, etc.)	before preparation of the bidding documents	-	●(EDSA)
12	To issue a letter with project brief to the SLRA to elect power poles and to construct distribution lines on the Right of Way of the Road Authority for coordination.	before preparation of the bidding documents	-	●(EDSA)
13	To hold stakeholder meetings/consultations to explain the project outline to the neighbors in the project area.	before preparation of the bidding documents	-	●(EDSA)
14	To implement a RAP	before preparation of the bidding documents	-	●(EDSA)

(2) Before the commencement of the construction work

No	Items	Deadline	Japan	Sierra Leone (In charge)
1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)	-	●(MOE)
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission for A/P	within 1 month after the signing of the contract(s) every payment	-	●(MOE)
3	Construction of access road to Tombo substation (about 200m from main road to Tombo substation)	within 1 month after the signing of the contract(s)	-	●(EDSA)

(3) During the Project Implementation

No	Items	Deadline	Japan	Sierra Leone (In charge)
1	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project	-	●(EDSA)
2	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	-	●(EDSA)
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	-	●(MOE)
4	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	-	●(EDSA)
5	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	during the construction	-	●(EDSA)
6	To submit Project Monitoring Report	every month	-	●(EDSA)

No	Items	Deadline	Japan	Sierra Leone (In charge)
7	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within 1 month after issuance of Certificate of Completion for the works under the contract(s)	-	●(EDSA)
8	To submit a report concerning completion of the Project	within 6 months after completion of the Project	-	●(EDSA)
9	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)	during the construction	-	●(EDSA)
	Water Supply The city water distribution main to the site	before start of the construction	-	●(EDSA)
	Drainage The city drainage main (for storm, sewer and others) to the site	6 months before completion of the construction	-	●(EDSA)
10	To cut or trim the tree on the way of distribution line.	before start of the construction	-	●(EDSA)
11	To provide equipment, furniture, facilities necessary for the implementation of the Project in the site(s)	before start of the construction	-	●(EDSA)
12	To ensure the safety of persons engaged in the implementation of the Project	during the Project	-	●(EDSA)
13	To take necessary measures for security and safety of the Project site	during the construction	-	●(EDSA)
14	To implement EMP and EMoP	during the construction	-	●(EDSA)
15	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	-	●(EDSA)
16	To implement RAP (livelihood restoration program)	for a period based on livelihood restoration program	-	●(EDSA)
17	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between EDSA and JICA.	until the end of livelihood restoration program	-	●(EDSA)
18	Construction of Buildings and Civil Works	based on the Master Work Schedule to be approved before start of the construction	●	-
19	Procurement, Installation and Commissioning of Equipment and Materials other than the ones mentioned in the special notes	based on the Master Work Schedule to be approved before start of the construction	●	-
20	Procurement of Spare parts Consumables and Tools	based on the Master Work Schedule to be approved before start of the construction	●	-
21	Operation Training Work	based on the Master Work Schedule to be approved before start of the construction	●	-
22	Power outage plan during the construction period including notification in public.	during the Project	-	●(EDSA)
	Construction of Substation			
23	Land leveling work for substations	based on the Master Work Schedule to be approved before start of the construction	●	―

No	Items	Deadline	Japan	Sierra Leone (In charge)
24	Apply for a transportation permit for heavy equipment and improve the road from the port of unloading to the project site (if necessary)	during the Project	-	●(EDSA)
25	Construction of access road from the main road to York substation	based on the Master Work Schedule to be approved before start of the construction	●	-
26	Functional tests of York feeder circuit breaker, at Goderich substation	6 months before completion of the construction	-	●(EDSA)
27	Settings of protection relays	before completion of the construction(for York feeder at Goderich substation)	-	●(EDSA)
28	Construction of Fence and Gates at Primary substations	before completion of the construction	-	●(EDSA)
	Construction of Distribution Line and Secondary Substation			
29	Connection work of the existing distribution lines to the section switch to be installed by the Japanese side	during the Project	-	●(EDSA)
30	Installation and connection of LV Trunk lines, Branch lines and Service lines.	6 months after the completion of the construction work.	-	●(EDSA)
31	Construction of Fence and Gates at Secondary substations	before completion of the construction	-	●(EDSA)
32	Submission of the inventory list of prepaid meters to be connected to the customers Report for installation of prepaid meters and connection to the customers	for one year after completion of the construction	-	●(EDSA)

(4) After the Project

No	Items	Deadline	Japan	Sierra Leone (In charge)
1	To implement EMP and EMoP	for a period based on EMP and EMoP	-	●(EDSA)
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between EDSA and JICA.	for 3 years after the Project	-	●(EDSA)
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	-	●(EDSA)

Remarks:

Other than the Items in the thick-bordered box ☐ are the same items attached in the Minutes of Discussions signed between Sierra Leone side (Ministry of Energy, EDSA) and the JICA Survey Team

Abbreviations:

B/A：Banking Arrangement
G/A：Grant Agreement
A/P：Authorization to Pay
IEE：Initial Environmental Examination
EIA：Environmental Impact Assessment
EMP：Environmental Management Plan
EMoP：Environmental Monitoring Plan
SLRA：Sierra Leone Road Authority
RAP：Resettlement Action Plan
JICA：Japan International Cooperation Agency
MOF：Ministry of Finance
EDS：Electricity Distribution Supply Authority

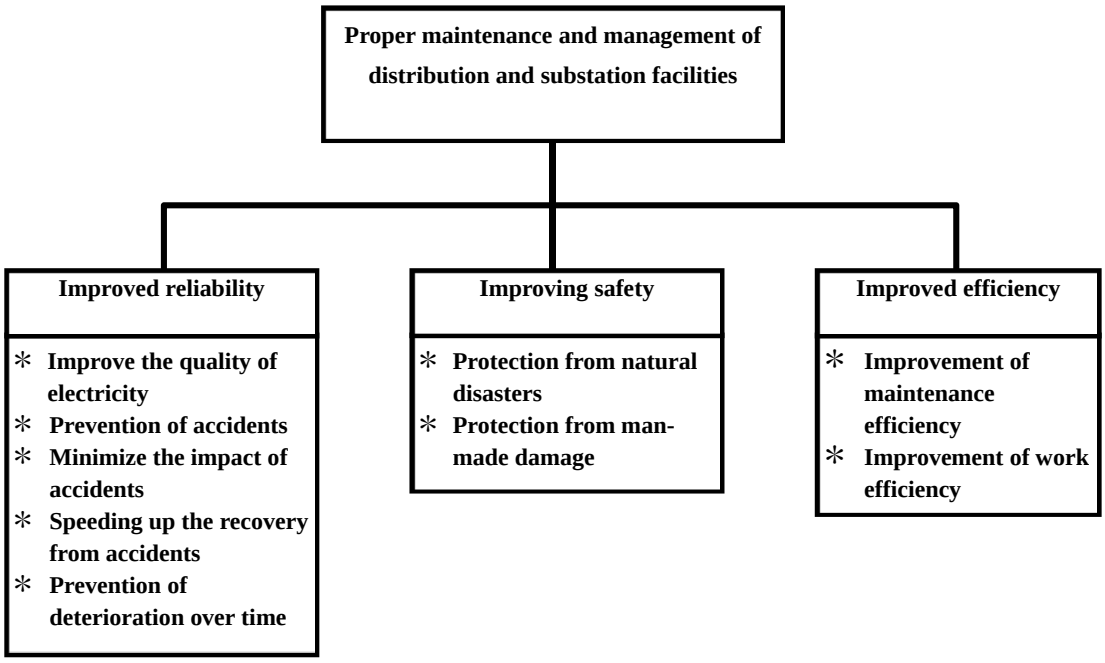
2-5 Tax Exemption

The Government of Sierra Leone shall ensure that customs duties, international taxes and other fiscal levies which may be imposed in the Sierra Leone with respect to the purchase of the products and/or the services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

2-6 Project Operation Plan

2-6-1 Basic Plan

Proper operation and maintenance (O&M) of transmission and substation facilities and preservation of their surrounding environment are essential to improve the reliability of power supply to consumers in the Project area and to ensure stable power supply operation. Therefore, it is desirable to implement appropriate preventive maintenance, and O&M aims at reducing the accident rate of each facility and improving reliability, safety, and efficiency. Figure 2-6.1 shows the basic approach to the maintenance and management of transmission and substation facilities. As a result, the maintenance and management of the equipment to be procured and installed in the Project and the facilities to be constructed should be carried out with a focus on preventive maintenance.



Source: JICA Survey Team

Figure 2-6.1 Basic Approach to the Maintenance and Management of Transmission and Substation Facilities

In the Project, OJT (on-the-job training) for operation and maintenance of the substation and distribution facilities will be provided by the engineers dispatched by the Supplier during the period of installation, testing and adjustment. At the same time, Japan will provide the necessary replacement parts, test equipment, maintenance tools, and operation and maintenance manuals, and will propose an operation and maintenance management system after the start of service, which will be fully effective.

2-6-2 Regular Inspection and Periodical Inspection Items

2-6-2-1 Regular Inspection and Periodical Inspection for Substation Equipment

The standard periodical inspection items for the substation equipment to be procured and installed in this project are shown in Table 2-6.1. As shown in the table, the inspection of substation equipment is

classified into three types as follows.

(1) "Daily patrol inspection": daily inspection of equipment for abnormal heat generation, abnormal noise, etc. using the five human senses
(2) " Regular inspection": Inspection of live parts that cannot be done by daily patrol inspection, such as the tightening conditions of bolts, etc., of each device, and the conditions of surface contamination of insulators.
(3) " Detailed inspection": Inspection of the function of the interlock mechanism between each device, inspection to maintain the accuracy of instruments, etc.

Normally, regular inspections are conducted once every one to two years, and detailed inspections are conducted once every four years. Fuses, gauges, relays, and other parts with deteriorated performance, deteriorated insulation, worn contacts, or changing characteristics that are built into switchgear panels, etc., should be replaced as necessary after confirming the characteristics and frequency of use of the parts during regular and detailed inspections.

Table 2-6.1 Inspection Items for Standard Substation Equipment

Inspection Items	Details of Inspection (Method)	Daily	Regular	Detailed
Visual Appearance	Conditions of indication lamps, alarm indicators etc.	○	○	
	Abnormal noise and/or smells	○	○	
	Overheat and discoloration of terminals	○	○	
	Cracks and damage of bushings and insulators, and their conditions of contamination	○	○	
	Rusting conditions of cubicles, supporting structures, etc.	○	○	
	Abnormal heat (temperature meter/gauge)	○	○	
	Tightening conditions of the bushing terminals (mechanical check)	○	○	
Switchgear cubicles and Control panels	Display conditions on measuring instruments	○	○	○
	Indication on operation counters		○	○
	Wetting condition and rusting condition inside operation boxes and panels, and their contamination conditions		○	○
	Conditions of oil filling and cleaning		○	○
	Conditions of terminals inside cubicles, and panels	○	○	○
	Position indications of switching equipment		○	○
	Gas leaks and/or oil leaks		○	○
	Pressures before/after operation、if any		○	○
	Operating times of Circuit breakers (counters)		○	○
	Rust, deformation and/or damage on springs (maintenance)	○	○	○
	Abnormalities of tightening pins		○	○
	Inspection of auxiliary switches and relays (maintenance)		○	○
	Inspection of DC power supply	○		
Measurement and testing	Measurement of insulation resistance		○	○
	Measurement of contact resistance			○
	Conditions of space heaters		○	○
	Operation tests of main relays		○	○

Source: JICA Survey team

2-6-2-2 Regular Inspection and Periodical Inspection for Distribution Equipment

The maintenance and management of the 33 kV and 11 kV distribution lines is the most important service to be provided to customers. In addition, when ground fault accidents due to contact with trees on distribution line are expected, it is necessary to take preventive measures such as cutting down trees in advance. The following are the main items to be inspected during daily patrols.

Table 2-6.2 Inspection Items for Distribution Line

Equipment		Inspection Items
Support	Concrete pole	No cracks, breaks, bends, or tilts
	Guy wire	No corrosion, breakage, looseness
Armature		No curvature, inclination, rusting, or corrosion
Insulator		No cracks, damage, or staining Bindings not detached or broken
electric wire		Whether or not the coating is damaged Proximity between dissimilar wires, arms, etc. Disconnection of lead wire Contact with trees, etc.
Switch		No rusting or corrosion of the case Whether the bushing is cracked, damaged, or stained
Cable	Cable	Whether the cable exterior is damaged or deteriorated
	Pipeline	Whether the protection pipe is damaged, deformed, rusted, or corroded Disconnect the cap of the rising protection pipe.
	Cable Head	Discoloration or deformation of terminal cover due to heating Deterioration or damage to triggers Damage or staining of bushings
Manhole		Check for shifting or rattling of the iron cover Presence of cracks or damage to the iron cover Whether there is a gap between the cover and the road surface

Source: JICA Survey Team

2-6-3 Spare Parts Procurement Plan

2-6-3-1 Spare Parts Procurement Plan

Spare parts should be selected on the basis of parts which deteriorate with daily operations and must be replaced regularly. The following spare parts, fulfilling quantities needed for one year, will be procured for the Project.

- Transformers
- 33/11 kV switchgear
- 11 kV switchgear
- Station power supply
- LTC control panel
- Cable sealing ends
- Lightning arresters
- 11kV section switch
- Cutout switch (each type)
- Cutout fuse (each type)

2-6-3-2 Procurement Plan for Testing Equipment and Maintenance Tools

For one year, the Japanese side plans to procure the minimum required standard spare parts for the Project. These items are listed in Table 2-6.3 and Table 2-6.4. Sierra Leone side will be responsible for preparing a budget for purchasing necessary replacement parts one year after the completion of the Project.

Table 2-6.3 Lists of Spare Parts for Primary Substation

Spare parts (including consumables)	Quantity (for each York and Tombo substations)
1. Transformers	
1.1 33/11 kV transformer	
(1) Gasket for a transformer	1 set
(2) Buchholz relay	1 set

Spare parts (including consumables)	Quantity (for each York and Tombo substations)
(3) Oil thermometer (for main tank and OLTC)	1 set
(4) Oil level gauge (for main tank and OLTC)	1 set
(5) Silica gel (consumables)	200%
1.2 33 kV earthing transformer	
(1) Oil level gauge	1 set
1.3 11/0.415 kV station transformer	
(2) Oil level gauge	1 set
2. Switchgear	
2.1 33 kV switchgear	
(1) Closing coil for Circuit breakers (CB) (1 set for three phases)	Each 1 set
(2) Tripping coil for Circuit breakers (CB) (1 set for three phases)	Each 1 set
(3) Vacuum bulbs complete with necessary accessories for replacement (each type, for three phase)	Each 1 set
(4) Isolating main terminals (each type, completed for three phases)	Each 1 set
(5) Fuse (each type)	
(6) Protective relay (each type)	
(7) Meter (each type) Note) Not required if the meter is an all-in-one type with a protection relay	
(8) Auxiliary relay (each type)	Each 1 set
(9) Control switch, Selector switch (if used, each type)	Each 1 set
2.2 11 kV switchgear	
(1) Closing coil for Circuit breakers (CB) (1 set for three phases)	Each 1 set
(2) Tripping coil for Circuit breakers (CB) (1 set for three phases)	Each 1 set
(3) Vacuum bulbs complete with necessary accessories for replacement (each type, for three phase)	Each 1 set
(4) Isolating main terminals (each type, completed for three phases)	Each 1 set
(5) Fuse (each type)	Each 1 set
(6) Protective relay (each type)	Each 1 set
(7) Meter (each type) Note) Not required if the meter is an all-in-one type with a protection relay	Each 1 set
(8) Auxiliary relay (each type)	Each 1 set
(9) Control switch, Selector switch (if used, each type)	Each 1 set
3. Power supply system	
3.1 AC distribution panel	
(1) MCCB (each type)	Each 1 set
(2) Indication lamp (each type)	Each 1 set
(3) Fuse (each type)	Each 1 set
(4) Meter (each type)	Each 1 set
3.2 Charger	
(1) Control Card and diode module	Each 1 set
(2) Indicating lamp, if any (each type)	100%
(3) Fuse (each type)	100%
(4) Meter (each type)	Each 1 set
(5) MCCB (each type)	Each 1 set
4. LTC control panel	
(1) Printed circuit (each type)	Each 1 set
5. HV cables	
5.1 33 kV cable	
(1) Indoor use cable sealing end (for switchgear side)	Each 1 set
(2) Outdoor use cable sealing end (for pole side)	Each 1 set
5.2 11 kV cable	
(1) Indoor use cable sealing end (for switchgear side)	Each 1 set
(2) Outdoor use cable sealing end (for pole side)	Each 1 set
6. Lightning arrester	
6.1 33 kV lightning arrester	3 phases
6.2 11 kV lightning arrester	3 phases

Source: JICA Survey team

Table 2-6.4 Lists of Spare Parts for Secondary Substation

No.	Consumables	Unit	Quantity
1	11kV Section Switch	Set	1
2	Cutout Switch		
(1)	Cutout Switch (each type)	Set	1
(2)	Cutout Fuse (each type)	Set	1

Source: JICA Survey Team

2-7 Project Cost Estimation

2-7-1 Initial Cost Estimation

(1) Condition of the Estimation

a) Time of Estimation: December 2021

b) Exchange rate:

1 USD = 113.48 JPY (TTS average from September 2021 to November 2021)

c) Construction/Procurement period: Periods for detailed design, equipment procurement and installation are as shown in the construction schedule

d) Other: The Project is implemented in a line with the Japan's Grant Aid Scheme.

(2) Cost Borne by Sierra Leone

1,183,700 USD (Approximately 150 million YEN)

The cost borne by Sierra Leone by work item is given in Table 2-7.1.

Table 2-7.1 Breakdown of Costs Borne by Sierra Leone side

No.	Work Items	Responsibility	Cost (USD)
A. Before the Bidding			
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	Bank of Sierra Leone	-
2	To issue the authorization to pay (A/P) to the Agent Bank for the payment to the Consultant	MOE	-
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A 1) Advising commission of A/P 2) Payment commission for A/P	MOE	
4	To approve IEE/EIA (conditions of approval should be fulfilled, if any) and secure the necessary budget for the implementation of EMP and EMoP (and fulfilling conditions of approval, if any)	EDSA	40,500
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	MOE	150,000
6	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	EDSA	Cost included in A 5 above
7	To secure and clear the following lands 1) right of way for the construction of the project 2) project sites for new substation 3) temporary construction yard and stock yard near the Project area 4) borrow pit and disposal site near the Project area	EDSA	165,000

No.	Work Items	Responsibility	Cost (USD)
8	To obtain the planning, zoning, building permit	EDSA	5,000
9	To clear, level and reclaim the following sites 1) remove utilities 2) existing facilities 3) leveling and reclaiming the sites for new substation and distribution lines	EDSA	95,000
10	To submit Project Monitoring Report (with the result of Detailed Design)	EDSA	3,000
11	To obtain Certificate/Title of Land acquisition for substation construction (land ownership, register, etc.)	EDSA	5,000
12	To issue a letter with project brief to the SLRA to elect power poles and to construct distribution lines on the Right of Way oh the neighbors in the project area.	EDSA	-
13	To hold stakeholder meetings/consultations to explain the project outline to the neighbors in the project area.	EDSA	Cost included in A5 above
14	To implement a RAP	EDSA	Cost included in A5 above
	SUB TOTAL (A)		**463,500**
B. During the Project Implementation			
1	To issue the authorization to pay (A/P) to the Agent Bank for the payment to the supplier	MOE	--
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission for A/P	MOE	
3	Construction of access road to Tombo substation (about 200m from main road to Tombo substation)	EDSA	150,000
4	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	EDSA	-
5	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	EDSA	-
6	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted and/or be borne by its designated authority without using the Grant	MOE	-
7	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	EDSA	30,000
8	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers	EDSA	-
9	To submit Project Monitoring Report	EDSA	Cost included in A10 above
10	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	EDSA	-
11	To submit a report concerning completion of the Project	EDSA	-

No.	Work Items	Responsibility	Cost (USD)
12	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)	EDSA	15,000
	1) Water Supply: The city water distribution main to the site	EDSA	6,000
	2) Drainage: The city drainage main (for storm, sewer and others) to the site	EDSA	7,000
13	To cut or trim the tree on the way of distribution line	EDSA	2,000
14	To provide equipment, furniture, facilities necessary for the implementation of the Project in the site(s)	EDSA	6,000
15	To ensure the safety of persons engaged in the implementation of the Project	EDSA	10,000
16	To take necessary measures for security and safety of the Project site	EDSA	28,800
17	To implement EMP and EMoP	EDSA	Cost included in A4 above
18	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	EDSA	3,000
19	To implement RAP (livelihood restoration program)	EDSA	Cost included in A5 above
20	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between EDSA and JICA.	EDSA	3,000
21	Power outage plan during the construction period including notification in public	EDSA	5,000
	[Construction of Substation]		
22	Apply for a transportation permit for heavy equipment and improve the road from the port of unloading to the project site (if necessary)	EDSA	-
23	Functional tests of York feeder circuit breaker, at Goderich Substation	EDSA	2,000
24	Setting of protection relays	EDSA	1,500
25	Construction of Fence and Gates at Primary substations	EDSA	Cost included in C25 below
	[Construction of Distribution Line and Secondary Substation]		
26	Connection work of the existing distribution lines to the section switch to be installed by the Japanese side	EDSA	1,900
27	Installation and connection of LV Trunk lines, Branch lines and Service lines.	EDSA	130,000
28	Construction of Fence and Gates at Secondary substation	EDSA	255,000
29	Submission of the inventory list of prepaid meters to be connected to the customers report for installation of prepaid meters and connection to the customers	EDSA	-
	SUB TOTAL (B)		**656,200**
C. After the Project			
1	To implement EMP and EMoP	EDSA	3,000
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are	EDSA	1,000

No.	Work Items	Responsibility	Cost (USD)
	found. The extension of environmental monitoring will be decided based on the agreement between EDSA and JICA		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	EDSA	60,000
	SUB TOTAL (C)		**64,000**
	GRAND TOTAL (A+B+C)		**1,183,700**

2-7-2 Operation and Maintenance Cost

After the commencement of service, EDSA shall be responsible for the operation and maintenance of the equipment procured and installed by the project. For two primary substations, EDSA have to hire new employee for the operation and maintenance. For secondary substations and distribution line, no additional operator is required. As for the spare parts and consumables given in 2-6-3, EDSA shall stock them at all times in order to operate the new substation properly.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

Although EDSA has experience with Japan's grant aid for similar power facilities in the past, it is necessary to continuously check the progress of procedures, budgetary measures and so forth, and monitor them to ensure that no repeat of procedures are required at the implementation stage of the project.

1) Approve the EIA (if conditions of approval are met) and secure the necessary budget for the implementation of the EMP and EMoP (and meet any conditions of approval).
2) Provide the necessary budgetary measures to implement the items to be borne by the counterparties.
3) Implement site acquisition and relocation plan (Resettlement Action Plan: RAP).
4) The following land shall be secured.
   (land acquisition and compensation, tree trimming, removal of obstructions)
   a. Project site
      - Proposed site for primary substation
      - Proposed site for secondary substation
      - 33kV and 11 kV distribution lines
   b. Temporary storage yard for equipment
5) Hold stakeholder meetings to explain the project to the project target communities.
6) Explain the project to the Highway Department regarding the ROW use of the road and obtain their approval for the implementation of the work.
7) Guarantee that any customs duties, internal taxes and other fiscal levies that may be imposed in the recipient's country in respect of the purchase of products and/or services will be waived and borne by the designated Sierra Leonean authorities without the use of our country's grant.

3-2 Necessary Inputs by Recipient Country

The following inputs (burdens) on the Sierra Leone side are required to achieve the overall plan of this project. Of the items listed in "Table 3-3.1 Classification of items to be borne by the project sponsor (draft)", the major items are listed below.

(1) Before public notice of bidding

1) Approve the IEE/EIA (if conditions of approval are met) and secure the necessary budget to implement the EMP and the EMoP (and meet any conditions of approval). Secure the necessary budget to implement site acquisition and third country settlement (including the development of third country settlements) and compensate at full replacement cost in accordance with the RAP.
2) Secure the necessary budget, carry out site acquisition and relocation, and pay compensation costs in compliance with the RAP.
   【Major Site Acquisition Details】
   - Right-of-Way required for construction of distribution lines
   - Land required for construction of primary and secondary substations (Land)
   - Temporary equipment and materials storage area near the project site
   - Waste treatment plant
3) Obtain planning, zoning and building permits from the relevant authorities.

4) Obtain a land acquisition certificate for substation construction (land ownership, registration, etc.)

5) Obtain permission to implement the project from the relevant authorities (road administrator, etc.).

6) Implement a RAP (relocation plan).

(2) During construction

1) Guarantee that any exemptions or subsidies from customs duties, national taxes and other fiscal levies that may be imposed in the recipient's country with respect to the purchase of products and services will be borne by the designated authorities without the use of subsidies.

2) Temporary outage plans for substations under construction, including notification to residents

［Substation construction］

3) Functional Testing of Yoke Feeder Circuit Breakers and other devices at Goderich Substation

4) Setting of protective relay for Goderich substation yoke feeder

5) Construction of fences and gates at primary substations

［Distribution line and secondary substation construction］

6) Connection with the existing side of the compartment switchgear to be installed on the Japanese side

7) Construction of low-voltage trunk lines, branch lines, and connection lines to customers (due within 6 months of completion on the Japan side)

8) Construction of fences and gates for secondary substations

9) Prepare a list of watt-hour meters to be installed, and implement and report on the installation and connection.

(3) After completion of construction and start of service provision

1) Implement EMP and EMoP.

2) Submit the results of environmental monitoring to JICA every six months using the monitoring form.
(The period of environmental monitoring may be extended if significant adverse environmental impacts are found. Extension of environmental monitoring will be determined by agreement between the PPUC and JICA.)

3) Appropriately and effectively maintain and use the facilities and equipment constructed through grant aid.

- Budget allocation for maintenance and management costs
- Operation and maintenance management system
- Daily and periodic inspections

3-3 Important Assumptions

The external conditions that are prerequisites for the development and sustaining of the project's effects are as follows:

(1) Overall goals

・ The policy regarding the electricity distribution development plan in Sierra Leone remains

unchanged.
- Political and economic stability.

(2) Project goals

- Operation and maintenance will be sustained.
- Fees and financial support will continue to be collected and provided.
- Security of facilities and equipment will be ensured.

(3) Expected results

- The power generation facilities are fully operational.
- Residents (government) can bear the connection costs and electricity charges.

3-4 Project Evaluation

3-4-1 Relevance

As shown below, the relevance for this cooperation project is judged to be high since this project contributes to the realization of Sierra Leone's development plans and policies, and also benefits the socio-economic activities of the general public on the Freetown Peninsula.

(1) Benefits

Electric power is an indispensable energy for the self-sustaining socio-economic development of the nation. In particular, the project target area is the economic and living area next to Freetown City, where the population is concentrated, so housing and basic social service facilities and Construction of commercial facilities is remarkable.

However, in the non-electrified area, there is an urgent need to connect to a grid where cheaper electricity can be used because of the situation where there is no choice but to rely on private power generation facilities, which require high fuel costs.

A development project that contributes to the probability of a reliable and efficient power distribution network is one of the important issues in economic infrastructure development, and the benefits of implementing this project that contributes to the promotion of electrification in the target area are extremely high.

(2) Urgency

This project was proposed in the "Metropolitan Electricity Supply Master Plan Study of the Republic of Sierra Leone" and, coupled with the implementation of the "Freetown City Distribution Network Emergency Rehabilitation Plan" and support from the World Bank, the implementation of this project will result in EDSA's distribution lines running around the Freetown Peninsula, the hinterland of the city of Freetown. Given this premise, the urgency of the Project is judged to be high.

(3) Contribution to the development plan

In both of Sierra Leone's major development plans (NEW DIRECTION and the Medium-term National Development Plan 2019-2023 (PRSP4)), infrastructure development is listed as one of the most important issues, and the power and energy sector is listed as one of the most important areas of infrastructure development. In addition, the strategy for the electricity and energy sector sets improving access to electricity as the most important strategic goal. Given these factors, the implementation of this project is expected to make a significant contribution to the realization of the National Development Plan.

3-4-2 Effectiveness

The expected effects of the implementation of this project are as follows.

(1) Quantitative effects

In addition to the amount of power transmitted from the primary substation to be constructed, power supply to medical facilities and educational facilities in the project target area, cost reduction by switching from private generators to grids, etc. will be the outcome indicators.

Table 3-4.1 Quantitative Indicators

Indicators	Original [Yr 2021]	Target (Year 2027) [After three years from Commissioning]
Annual Power Transmission (MWh / year) (York Substation)	0	22,624
Annual Power Transmission (MWh / year) (Tombo Substation)	0	35,231
Peak Power Transmission (kW) (York Substation)	0	3,614
Peak Power Transmission (kW) (Tombo Substation)	0	5,627
Healthcare Facilities connected to National Grid (Number)	0	7
Educational Facilities connected to National Grid (Number)	0	48
Reduced Energy Cost (Million US$)	0	20

(2) Qualitative effects (project-wide)

Table 3-4.2 shows the projected occurrence of qualitative effects based on the results of the socioeconomic survey. Although these are projections of qualitative effects, we have tried to analyze them as quantitatively as possible based on the aggregate results of the questionnaire survey visits in the socioeconomic survey described in Section 2-2-1-3.

Table 3-4.2 Predicted occurrence of qualitative effects

Expected Effects of this Project	Predicting the occurrence of qualitative effects based on field survey results
1) Industrial promotion: Job creation [Number of new employees] Increase in sales and profit of business establishments [amount]	* In the on-site questionnaire survey conducted in the socioeconomic survey, 100% of the establishments in the target area (75 sample size) estimated that electrification would expand their business, with an average increase of 34% in sales, 32% in profits, and 22% in employment, on average. * On the other hand, 72% of the establishments located in previously electrified areas near the project target area (sample size of 50) reported that electrification has expanded their business, with an average increase of 22% in sales, 13% in profits, and 11% in employment for the total sample of establishments. * Even conservatively looking at the above, it is estimated that electrification will increase sales by about 20% and profits and the number of employees by about 10% for establishments in the subject area. * Data on the total number of current establishments and employees was not available. * However, it is estimated that there are 10,700 households in the target area, of which 32% are farming and fishing families, 11% are civil service families, and the remaining 57% (6,099) of the families either own a business (self-employed) or work in a business, with an economic

Expected Effects of this Project	Predicting the occurrence of qualitative effects based on field survey results
	population per household (aged 15-64) of 4 persons, of which about 80 % (19,500) are estimated to own or work at a business establishment. * Assuming that electrification will increase the number of employees by about 10%, we can estimate that the number of new employees will be about 1,950.
2) Appropriate medical services that can be provided by improving the operation of medical equipment; and increase in the number of patients	* The most frequently cited benefit of electrification (answered by all facilities) is the installation, enhancement, and stable use of laboratory equipment. * Other important benefits cited by respondents were improved safety, the introduction of sterilization equipment, the ability to provide nighttime care, improved or expanded quality and speed of care (expanded scope, increased number of patients), and the ability to store or improve vaccines, drugs, and reagents. * Some facilities cited the benefits of installing or expanding the use of fans and air conditioners to increase administrative efficiency and improve the environment for inpatients. * All of the above benefits were also cited as examples of actual improvements due to electrification in neighboring already-electrified areas, so it can be fully expected that they will be realized as benefits of electrification in healthcare facilities in the target areas.
3) Improve education and training services	* The largest number of respondents in the education and training facilities in the target area pointed to improved safety as a benefit of electrification, while many respondents cited improved environment for students and teachers, the ability to conduct evening studies and evening classes (e.g. adult literacy education), and computer learning and computer promotion as educational improvements. Some respondents also pointed to the enhancement of educational aids and materials (projectors, audio-visual equipment, etc.), printing of teaching materials and tests, and streamlining of administrative work. These benefits were also answered in the same way as the results after electrification in neighboring already-electrified areas (see Table 2-2.13 for the remainder). * 89% of facilities in the target area anticipate increased community use of their facilities as a result of electrification (50% in nearby electrified areas). As for increased community use, event purposes are expected to increase significantly (17%), and community use is expected to diversify due to electrification. * One vocational training center was identified in Tombo in the target area, although the number is small. It currently has several foot-pedal sewing machines and a sewing course for young women. Once electrified, there is a possibility of reviving the course using the equipment and tools (previously, with donor support, a generator was also installed and there was a welding course) (however, the equipment and tools are no longer in use). * There is a plan to relocate the University of Public Administration to Bureh, and electrification would promote this relocation plan and contribute to maintaining and improving the educational level of the University after its relocation.
4) Increased entrepreneurial and employment opportunities for women	* In fish houses, it is common for men to catch fish and women to sell them, and since electrification will enable ice making, it is expected to expand sales channels, which in turn will stimulate women's activities and increase their income. * Electrification is expected to expand the processing of marine and agricultural products, as these industries employ a high percentage of women.
5) Improvement of women's living environment	* A very large number of households (98%) would like to use refrigerators after electrification, which is expected to reduce the amount of time women spend obtaining food. It is also expected that the food sanitation environment will improve from the use of refrigerators.

6) Improvement of living conditions	* The most important, second most important, and third most important benefits of electrification are shown in the table below for the target area (expected) and neighboring areas already electrified (actual). What households in the target area expect as important benefits of electrification, and what they actually expect after electrification in the neighboring areas already electrified are confirmed below.

Merit	Percentage of households that listed it as important	
	Target Area	Electrified neighboring areas
(1) Security improvements	77%	69%
(2) Evening study for children	62%	69%
(3) Increased income and reduced expenses	52%	17%
(4) More convenient life	36%	57%
(5) Diversification of recreation and education	26%	32%
(6) Improved social life and communication	24%	17%
(7) Improved food hygiene (by purchasing refrigerators)	13%	25%
(8) Evening study for adults	10%	12%
Total	300%	300%

Source: JICA Survey Team

(3) Electricity supply to expected basic social service facilities

During the first round of field survey, we confirmed with EDSA the facilities that will be newly supplied with electricity from the power distribution facilities to be developed under the project. The target area for power distribution is the second largest economic and living area after Freetown, which has a large population concentration, and is home to many educational and medical facilities, as well as lodging facilities, an ice factory, a fish processing plant, a quarry, and other facilities. However, the city still does not receive electricity from EDSA and is forced to use expensive private power generation facilities. This project is expected to supply electricity to these basic social service facilities.

Figure 3-1.1 summarizes the basic social service facilities that are expected to be supplied with electricity. The project plans to supply electricity to these diverse and dispersed users by building secondary substations in each community, and also plans to provide low-voltage equipment and materials to deliver electricity to end-users to ensure that the project will contribute to improving electricity access rates.

Appendices

1. Member List of the Survey Team

1. Member List of the Survey Team

First Field Survey (October 30th to December 2nd 2021)

Name	Assignment	Organization
Katsuya KUGE	Team Leader	Japan International Corporation Agency
Aiko KATO	Operation Officer	Japan International Corporation Agency
Makoto ABE	Chief Consultant / Distribution Facilities Planning 1	Yachiyo Engineering Co., Ltd.
Kazuhiko KOEDA	Deputy Chief Consultant / Distribution Facilities Planning 2	Yachiyo Engineering Co., Ltd.
Kenji SAKEMURA	Substation Facilities Planning	West Japan Engineering Consultants, INC.
Shinichi TAKAO	Environmental and Social Consideration	IDEA Consultants, Inc.
Naoki HARA	Social and Economic Analysis	Yachiyo Engineering Co., Ltd.
Mikiko IWAGO	Procurement Planning / Cost Estimation (Equipment) / GIS	Yachiyo Engineering Co., Ltd.
Teruo KURUMADA	Facility Planning / Natural Condition Study	Yachiyo Engineering Co., Ltd.
Shohei TERUI	Procurement Planning / Cost Estimation (Facilities)	Yachiyo Engineering Co., Ltd.
Taro NAKAMURA	Power Demand Forecast / Power Flow Analysis / Protection Coordinates	West Japan Engineering Consultants, INC.

Second Field Survey (June 3rd to June 17th 2022)

Name	Assignment	Organization
Hideaki KONISHI	Team Leader	Japan International Corporation Agency
Aiko KATO	Operation Officer	Japan International Corporation Agency
Makoto ABE	Chief Consultant / Distribution Facilities Planning 1	Yachiyo Engineering Co., Ltd.
Mikiko IWAGO	Procurement Planning / Cost Estimation (Equipment) / GIS	Yachiyo Engineering Co., Ltd.

2. Study Schedule

2. Survey Schedule

(1) First Field Survey (October to November in 2021)

No.	Date		JICA HQ	Chief Consultant / Distribution Facilities Planning 1	Deputy Chief Consultant / Distribution Facilities Planning 2	Substation Facilities Planning	Environmental and Social Consideration	Social and Economic Analysis	Procurement Planning / Cost Estimation (Equipment) / GIS	Facility Planning / Natural Condition Study	Procurement Planning / Cost Estimation (Facilities)	Power Demand Forecast / Power Flow Analysis / Protection Coordinates
1	2021/10/29	Fri.		NRT→CDG	NRT→CDG	FUK→ITM KIX→CDG		NRT→CDG	NRT→CDG			FUK→ITM KIX→CDG
2	2021/10/30	Sat.	NRT→	CDG→FNA	CDG→FNA	CDG→FNA		CDG→FNA	CDG→FNA			CDG→FNA
3	2021/10/31	Sun.	→FNA	Self-quarantine	←	←		←	←			←
4	2021/11/1	Mon.	Self-quarantine Courtesy call to JICA Sierra Leone Office Courtesy call to MOE Courtesy call to EDSA *ONLINE	←	←	←		←	←			←
5	2021/11/2	Tue.	EDSA meeting Site Survey Goderich SS Substation site Distribution Line Route Houses, Factories	←	←	←		←	←			←
6	2021/11/3	Wed.	PCR test Documentation	Courtesy call to the Minister of MoE Site survey Substation Site Hospital, Factory Meeting with EDSA	←	←		Meeting with local consultant Site Survey	Courtesy call to Minister of MoE Site survey Substation site Hospital, Factory Meeting with EDSA			←
7	2021/11/4	Thu.	Meeting with MoE PS Meeting with EGTC DG Visit to Kingtom PP	←	Line route survey	Meeting with EGTC DG Site survey Existing power facilities Falcon Bridge Switching Station、Kingtom PP		Site Survey Meeting with EDSA CFO	Meeting with EGTC DG Site survey Existing power facilities Kingtom PP			Meeting with EGTC DG Site survey Existing power facilities Falcon Bridge Switching Station Kingtom PP
8	2021/11/5	Fri.	Discussion of the draft M/D	Social and Economic Survey	Line route survey	Meeting with EDSA	NRT→CDG	Preparation of questionnaire	Interview of local consultant	NRT→CDG	NRT→CDG	Meeting with EDSA
9	2021/11/6	Sat.	FNA→	Documentation	←	←	CDG→FNA	Documentation	←	CDG→FNA	CDG→FNA	Documentation
10	2021/11/7	Sun.	Transfer	Documentation	←	←	Self-quarantine	←	←	Self-quarantine	Self-quarantine	←
11	2021/11/8	Mon.	→NRT	Contract with local consultant of social and economic survey	Site survey Primary substation site	Meeting with EDSA(WB project plan) Site survey Primary substation site	Meeting with EDSA Site survey Primary substation site	Survey to related organizations Preparation of questionnaire	Contract with local consultant of social and economic survey	Site survey Primary substation site	Site survey Primary substation site	←
12	2021/11/9	Tue.		Site survey Secondary Substation site	←	←	←	Survey to related organizations (Ministries)	Site survey Secondary Substation site	Drawings preparation	Construction condition survey	Site survey Secondary Substation site
13	2021/11/10	Wed.		Site survey Secondary Substation site	←	←	←	Survey to related organizations (Ministries)	Site survey Secondary Substation site	Drawings preparation	Procurement condition survey	Site survey Secondary Substation site
14	2021/11/11	Thu.		Interview with Tax exemption survey consultant Meeting with EDSA	Meeting with EDSA	Existing substation survey Discussion on noise from substation Meeting with EDSA	EIA system survey Discussion on noise from substation Meeting with EDSA	Survey to related organizations (Ministries)	Interview with Tax exemption survey consultant Meeting with EDSA	Construction and Procurement condition survey	←	Existing substation survey Discussion on noise from substation Meeting with EDSA
15	2021/11/12	Fri.		Site survey Secondary Substation site	Site survey Secondary Substation site Contract with local consultant of line route survey	←	←	Survey to related organizations (Ministries)	Site survey Secondary Substation site	Construction and Procurement condition survey	←	←
16	2021/11/13	Sat.		Documentation	←	←	←	←	←	←	←	←
17	2021/11/14	Sun.		Documentation	←	←	←	←	←	←	←	←
18	2021/11/15	Mon.		Site survey Existing secondary substation	Site survey Tombo substaion	Site survey Existing secondary substaion Single line diagram preparation	Drafting site survey report	Survey to related organizations (Ministries)	Site survey Existing secondary substation	Site survey Primary substation site	←	Site survey Existing secondary substation
19	2021/11/16	Tue.		Contract with local consultant of Tax survey	Meeting with EDSA	Single line diagram preparation Site survey Kingtom PP Freetown SS	Land acquisition and compensation system survey Meeting with EDSA	Survey to houses Preparation of questionnaire Follow up of the survey to related organization	Contract with local consultant of Tax survey Cost Estimation Implementation schedule preparation	Construction condition survey Drawings preparation	←	Survey of Kingtom PP Survey of Freetown Substation

20	2021/11/17	Wed.		Drafting Field Report Meeting with EDSA Interview with local consultant of environmental and social consideration	Site survey (Goderich SS) Meeting with EDSA	SCADA List preparation Single line diagram preparation Drafting Field Report Meeting with EDSA	Interview with local consultant of environmental and social consideration Meeting with EPA	Survey to houses Preparation of questionnaire Follow up of the survey to related organization	Drafting Field report	Weather condition survey	←	Meeting with EDSA
21	2021/11/18	Thu.		Drafting Field Report Meeting with EDSA Interview with local consultant of environmental and social consideration	Drafting Field Report	Drafting Field Report Courtesy call to the Minister of MoFMR	Interview with local consultant of environmental and social consideration	Trial survey of Social and Economic survey to the communities	Drafting Field Report Implementation schedule preparation	Site survey Primary substation site Topographic survey arrangement	←	Field Report Preparation Courtesy call to the Minister of MoFMR
22	2021/11/19	Fri.		Drafting Field Report Meeting with EDSA	Drafting Field Report PCR test	Meeting with EDSA Power demand forecast Meeting with WB	TOR preparation of Environmental and social consideration survey by local consultant Meeting with EDSA	Trial survey of Social and Economic survey to the communities	Meeting with EDSA Implementation schedule preparation	Drawings preparation	Documentation	Meeting with EDSA Power demand forecast Meeting with WB
23	2021/11/20	Sat.		Documentation	←	←	←	←	Pick up the quotation for cost estimation Distribution line route survey (Goderich-Sussex)	Documentation	←	←
24	2021/11/21	Sun.		Documentation	FNA→LLW	Documentation	←	← PCR test	←	← PCR test	← PCR test	←
25	2021/11/22	Mon.		Visit to Road Authority		Drafting Field Report	Drafting Field Report	Revision of Questionnaire Detailed planning of the survey	Documentation Drafting Field Report	Drawings preparation	Drawings preparation	Drafting Field Report
26	2021/11/23	Tue.		Drafting Field Report Meeting with EDSA		Drafting Filed Report	Drafting Field Report	Meeting with EDSA FNA→CDG	Meeting with EDSA on tax exemption Drafting Field Report	FNA→CDG	FNA→CDG	Drafting Field Report
27	2021/11/24	Wed.		Drafting Field Report Discussion of Field Report with EDSA		←	←	transfer	Drafting Field Report Discussion of Field Report	transfer	transfer	Drafting Field Report Discussion of Field Report with EDSA
28	2021/11/25	Thu.		Drafting Field Report		Drafting Field Report	Drafting Field Report Interview with local consultant	CDG→HND	Drafting Field Report	CDG→HND	CDG→HND	Drafting Field Report
29	2021/11/26	Fri.		Safety reporting meeting at JICA Distribution line route survey Interview with local consultant of Environmental and social consideration survey		Site survey Goderich SS Substation site	Site Survey with local consultant		Drafting Field Report Arrangement of social and economic survey			既設 Goderich 変電所、一次変電所調査
30	2021/11/27	Sat.							Transportation condition survey			
31	2021/11/28	Sun.		PCR test		PCR test	PCR test		PCR test			PCR 検査
32	2021/11/29	Mon.		Explanation of field report to MoE Report to JICA office Signing on Field Report Contract with local consultant of Environmental and social consideration survey Contract with local consultant of Topographic survey		Explanation of Field report to MOE Report to JICA office	Visit to EPA Report to JICA office Contract with local consultant Environmental and social consideration		Explanation of Field report to MoE Visit to EPA Report to JICA office Contract with local consultant of Environmental and social consideration survey Pick up the quotation for cost estimation			Explanation of Field report to MoE Report to JICA office
33	2021/11/30	Tue.		FNA→CDG		←	←		←			←
34	2021/12/1	Wed.		Transfer		←	←		←			←
35	2021/12/2	Thu.		CDG→HND		←	←		←			←

(2) Second Field Survey (June in 2022)

No.	Date		JICA HQ	Chief Consultant / Distribution Facilities Planning 1	Procurement Planning / Cost Estimation (Equipment) / GIS
1	2022/6/3	Fri.		NRT→DXB	←
2	2022/6/4	Sat.		DXB→ACC ACC→FNA	←
3	2022/6/5	Sun.		Documentation	←
4	2022/6/6	Mon.		Meeting with EDSA	←
5	2022/6/7	Tue.		Meeting with MoF Explanation to MoE, EDSA	←
6	2022/6/8	Wed.		Site Survey	←
7	2022/6/9	Thu.	NRT→	Site Survey with SLRA Meeting with World Bank	←
8	2022/6/10	Fri/	FNA	Meeting with EDSA Meeting with MCC	←
9	2022/6/11	Sat.	Site Survey, Meeting with EDSA	←	←
10	2022/6/12	Sun.	Documentation	←	←
11	2022/6/13	Mon.	M/D Explanation to MoE	←	←
12	2022/6/14	Tue.	M/D Explanation to MoE M/D Explanation to MoF	← FNA→CDG	Meeting
13	2022/6/15	Wed.	M/D Conclusion		M/D Conclusion
14	2022/6/16	Thu.		CDG→NRT	Existing Power Facilities Survey
15	2022/6/17	Fri.			FNA→ROB
16	2022/6/18	Sat.			

<Abbreviation>

DG	: Director General	MoF	: Ministry of Finance
EDSA	: Electricity Distribution and Supply Authority	MoFMR	: Ministry of Fisheries and Marine Resources
EGTC	: Electricity Generation and Transmission Company	SLRA	: Sierra Leone Roads Authority
JICA	: Japan International Cooperation Agency	TOR	: Terms of Reference
MoE	: Ministry of Energy	WB	: World Bank

3. List of Parties Concerned in the Recipient Country

3. List of Parties Concerned in the Recipient Country

1) Ministry of Energy (MoE)	
Mr. Alhaji Kanja Sesay	Minister
Mr. Eldred Taylor	Deputy Minister
Mr. Tamba Gbetuwa	Permanent Secretary
Dr. Donald Caulker	Head of Planning Unit
Mr. Abu Kamara	Director, Public Private Partnership
Mr. Austine Luseni	Communication Specialist
Mr. Emmanuel Junisa	Deputy Secretary
Ms. Zainab Sesay	Assistant Secretary
Mr. Abdulai M. Kamara	Assistant Secretary
Mr. Cherrnoh S. Tallor	Director Technical Services
Dr. Patrick Tarawalie	Technical Advisor
Dr. Edmund Wuseni	General Project Coordinator

2) Electricity Distribution and Supply Authority (EDSA)	
Ing. James Rogers	Acting Director General
Mr. Fofi S. Baimba Jr.	Acting Deputy Director General
Mr. Mustapha Sannoh	Chief Finance Officer
Ing. Chernoh S. Jalloh	Director, T.S.D
Ing. Steven S. Sesay	Head, Network Planning
Ing. Abdul Conteh	Manager, Network Planning
Ing. Peter Vandy	O & M
Mr. Mohamed Sow	Protection
Mr. Edward Lavaly	Substation Planning
Mr. Senesie Fullah	Environmental and Social Considerations
Mr. George Bella Kamara	Civil Engineer
Mr. James Macfoy	Power System Analysis
Mr. Suresh Kumar Musala	Advisor to O&M Manager
Mr. Boston Bamba	Station Supervisor (Goderich)
Mr. Aleksandar Nikolic	ESURP/ESLEAP Project Coordinator
Mr. Sahr Nepor	CCRM
Mr. Lamin Muhammed Gassama	Accountant
Ms. Rose Marie Sam	Finance

3) Electricity Generation ＆Transmission Authority (EGTC)	
Mr. Milton Gerbai	Director General

Mr. Munda Lewis	Deputy Director General
Mr. Sinneh Kamara	Acting Hydro Manager
Mr. Mohamed Marrah	Generation
Mr. Ahmed Fomba	Planning Department

4) National Protected Area Authority (NPAA)	
Mr. Joseph Ranto Musa	Executive Director

5) Sierra Leone Meteorological Agency (SLMET)	
Mr. Gabriel Mannah Kpaka	Deputy Director General / Head of Operations

6) Sierra Leone Road Authority (SLRA)	
Ing. Peter S. Kome	Director, Department of Road Asset Management
Ing. Melvin Scott	Deputy Director, Department of Road Asset Management

7) Statistics Sierra Leone (SSL)	
Dr. Sonnia Magba Jabbi	-
Hassan Sankoh	-

8) Ministry of Agriculture, Forestry and Food Security (MAFFS)	
Mr. Mustapha Nyallay	Acting Director, Planning, Evaluation, Monitoring and Statistics Division
Mr. Umaru M. Sankoh	-

9) Ministry of Basic and Senior Secondary Education (MBSSE)	
Mrs. Adama J Momoh	Director of Planning and Policy

10) Ministry of Finance (MOF)	
Mr. Joseph Fatoma	Assistant Director, Risk Management
Mrs. Catherine Kangbai	Senior Economist Risk Management
Mr. Ibrahim Bangura	Head, Cash Management Unit, A. G. D
Mr. Morlai S. Kamara	Economist Risk Management

11) Ministry of Fisheries and Marine Resources (MFMR)	
Ms. Han Emma Kowa	Minister
Dr. Elizabeth H. Ellie	Permanent Secretary
Mr. Abibatu Conteh	Assistant Directors of Fisheries
Mr. Mahmood Mansaray	

12) Ministry of Gender and Children Affairs (MGCA)	
Mr. Joseph Sunday Sinnah	Chief Director , Gender and Children Affairs
Ms. Charles Vandy	Director of Gender

13) Ministry of Health and Sanitation (MHS)	
Mr. Morie Momoh	Permanent Secretary
Dr. Sulaiman Phoray-Musa	Director Donor/NGO Coordination Office

14) Ministry of Information and Communication (MIC)	
Mr. Emmanuel A.B. Turay	Acting Director of Information

15) Ministry of Technical and Higher Education (MTHE)	
Dr. Jpsephus J Brima	Chief Technical and Higher Education Officer

16) Ministry of Tourism and Cultural Affairs (MTCA)	
Mr. Philip Morsay	Deputy Permanent Secretary of Tourism

17) Ministry of Trade and Industry (MTI)	
Mr. Augustine S. Sheku	Permanent Secretary

18) Ministry of Transport and Aviation (MTA)	
Mr. Haroun Conteh	Director of Transport
Mr. Aiah J.P. Lebbie	

19) Ministry of Water Resources (MWR)	
Mr. Augustine Tucker	Director of Water Resources

20) JICA Sierra Leone Field Office	
Hitoshi Sato	Chief Representative
Koji Ohashi	Officer
Kana Endo	Officer

4. Minutes of Discussions

Minutes of Discussions
on the Preparatory Survey for the Project for
EXTENSION OF POWER DISTRIBUTION SYSTEM
ALONG THE FREETOWN PENINSULAR
IN THE REPUBLIC OF SIERRA LEONE

In response to the request from the Government of Sierra Leone (hereinafter referred to as "Sierra Leone"), Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") of the Project for extension of power distribution system along the Freetown peninsular in the Republic of Sierra Leone (hereinafter referred to as "the Project") to Sierra Leone. The Team held a series of discussions with the officials of the Government of Sierra Leone and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Freetown, November 30, 2021

KUGE Katsuya
Leader
Preparatory Survey Team

Japan International Cooperation Agency
Japan

Ing. James A.S. ROGERS
Director General
Electricity Distribution and Supply Authority (EDSA)
The Republic of Sierra Leone

For:
Tamba R. GBETUWA
Permanent Secretary
Ministry of Energy
The Republic of Sierra Leone

ATTACHMENT

1. Objective of the Project
The objective of the Project is to expand and stabilize the power supply in the southwest part of the Freetown Peninsular by constructing a new substation and distribution network, thereby contributing to the reduction of poverty, the stability of society and the establishment of peace.

2. Title of the Preparatory Survey
Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for extension of power distribution system along the Freetown peninsular in the Republic of Sierra Leone".

3. Project site
Both sides confirmed that the sites of the Project are in the southwest part of the Freetown Peninsular, which is shown in Annex 1.

4. Responsible authority for the Project
Both sides confirmed the authorities responsible for the Project are as follows:

4-1. The Electricity Distribution and Supply Authority will be the executing agency for the Project (hereinafter referred to as "the Executing Agency"). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

4-2. The line ministry of the Executing Agency is the Ministry of Energy. The Ministry of Energy shall be responsible for supervising the Executing Agency on behalf of the Government of Sierra Leone. The organization charts are shown in Annex 2.

5. Items requested by the Government of Sierra Leone

5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Sierra Leone are as follows:

- Construction of new primary substation in Tombo area in Annex 1. (Construction of new substation in York area is needed further discussion based on the result of power demand forecast and analysis).

- Construction of 33kV distribution line between Goderich substation and Tombo substation
- Construction of 11kV distribution line between Sussex and Samuel town
- Construction of new secondary substations in the area of the project
- Procurement of low voltage distribution materials to connect to the consumers in the area of the project
- Implementation of majors for supplying power for social infrastructure such as hospital and school in the area of the project
- Implementation of technical cooperation for sustainable operation and maintenance of new substation and distribution line

5-2. JICA will assess the feasibility of the above requested items through the survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan.

6. Procedures and Basic Principles of Japanese Grant

6-1. The Sierra Leone side agreed that the procedures and basic principles of Japanese Grant (hereinafter referred to as "the Grant") as described in Annex 3 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Sierra Leone side to submit the Project Monitoring Report, the form of which is attached as Annex 4.

6-2. The Sierra Leone side agreed to take the necessary measures, as described in Annex 5, for smooth implementation of the Project. The contents of the Annex 5 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 5 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Sierra Leone until November 23rd, 2021.

7-2. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Sierra Leone in order to explain its contents around April, 2022.

7-3. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Sierra Leone side, JICA will finalize the Preparatory Survey Report and send it to Sierra Leone around August, 2022.

7-4. The above schedule is tentative and subject to change.

8. Environmental and Social Considerations

8-1. The Sierra Leone side confirmed to give due environmental and social considerations before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

8-2. The Project is categorized as "B" from the following considerations:

The project is not likely to have significant adverse impact on the environment under the JICA guidelines for environmental and social considerations (April 2010) in terms of its sectors, characteristic and areas.

The Sierra Leone side confirmed to conduct the necessary procedures concerning the environmental assessment (including stakeholder meetings, Environmental Impact Assessment(EIA) /Initial Environmental Examination (IEE) and information disclosure, etc.) and make EIA/IEE report of the Project. The EIA/IEE approval shall be received from the responsible authorities and submitted to JICA by the end of July 2022.

8-3. For the Project that will result in involuntary resettlement, the Sierra Leone side confirmed to prepare a Resettlement Action Plan (RAP)/Abbreviated Resettlement Action Plan (ARAP) and make it available to the public. In addition, the Sierra Leone side confirmed to provide the affected people with sufficient compensation and/or support in accordance with RAP/ARAP, which is consistent with JICA Guidelines for Environmental and Social Considerations (April, 2010), in a timely manner.

9. Other Relevant Issues

9-1. Prioritizing contents of the project

The Japanese side explained that items that requested from Sierra Leone, mentioned in 5-1, will be studied and made prioritizing from the viewpoints of its urgency and effectiveness contribution to expand and stabilize power supply in Freetown peninsular.

9-2. Planning of technical cooperation

Both sides confirmed that it is necessary to arrange the contents of technical cooperation referring the outcome of the past JICA grant aid named "The project for the urgent improvement of power distribution system in Freetown in the Republic of Sierra Leone."

9-3. Procedure regarding environmental regulation

Both sides confirmed that in case that any special permission is needed for the construction implemented near the Western Area Peninsular National Park under the regulation in Sierra Leone, the Executing Agency shall take the responsibility for its domestic procedure.

9-4. Majors to be taken for effective power supply

Both sides confirmed that in order to supply electricity to the demand area effectively through the project, various majors for reducing the cost on demand side should be discussed.

9-5. Gender Mainstreaming

Both sides confirmed that following gender elements shall be duly reflected in the scope of Preparatory Survey.

(a) Collection of information and gender disaggregated data for assessment of gender needs.

(b) Examination of gender-responsive measures based on the assessment.

9-6. Coordination among relevant donors and agencies

The Team requested the Sierra Leone side to ensure coordination among relevant donors and agencies for smooth implementation of the Project. The team explained to the Sierra Leone side that information related to on-going and future power development plans should be provided to make a coordinated power system plan for entire power system development to be consistent and for operation and maintenance by EDSA.

9-7. Submission of the Questionnaire

The Sierra Leone side shall submit answers to the Questionnaire given by the Team by 10th of November, 2021.

Annex 1 Project Site

Annex 2 Organization Chart

Annex 3 Japanese Grant

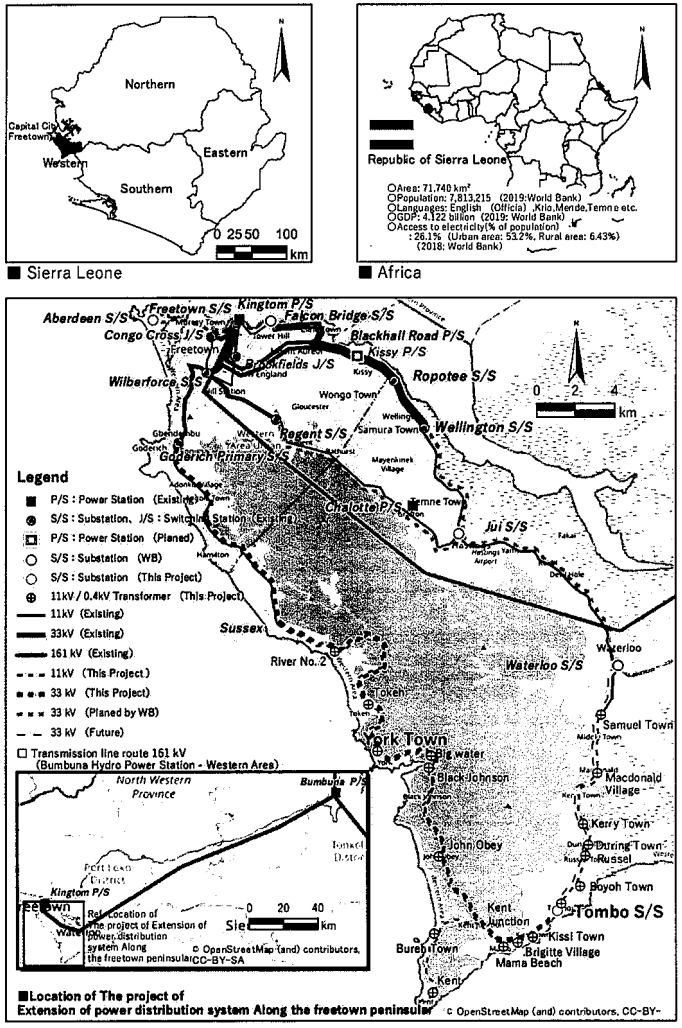
Annex 4 Project Monitoring Report (template)

Annex 5 Major Undertakings to be taken by the Government of Sierra Leone

A4-3

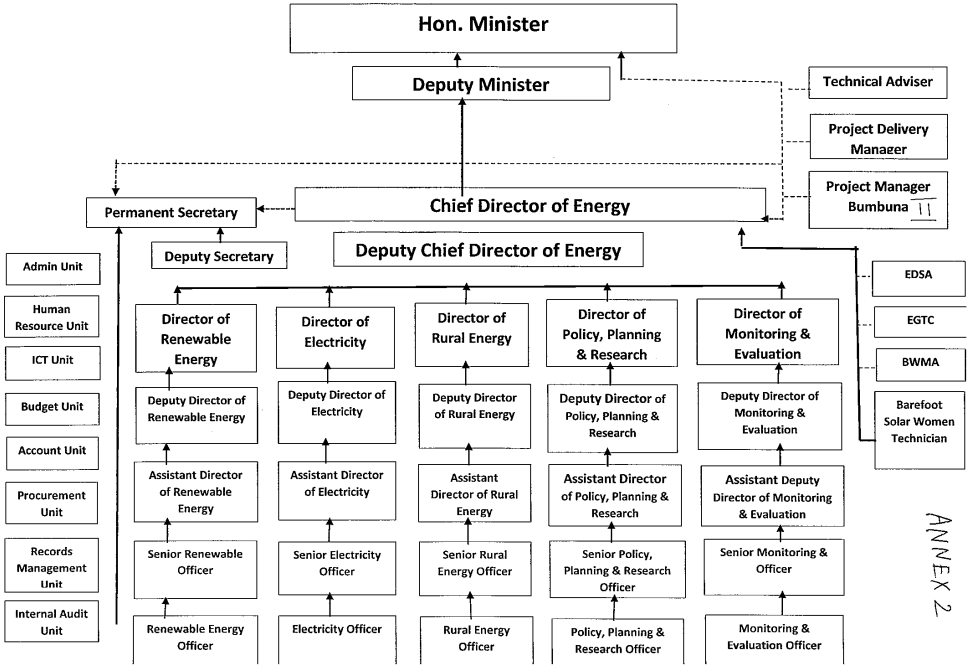
Annex 1

Project Site



Location of the Project Site

MINISTRY OF ENERGY ORGANOGRAM



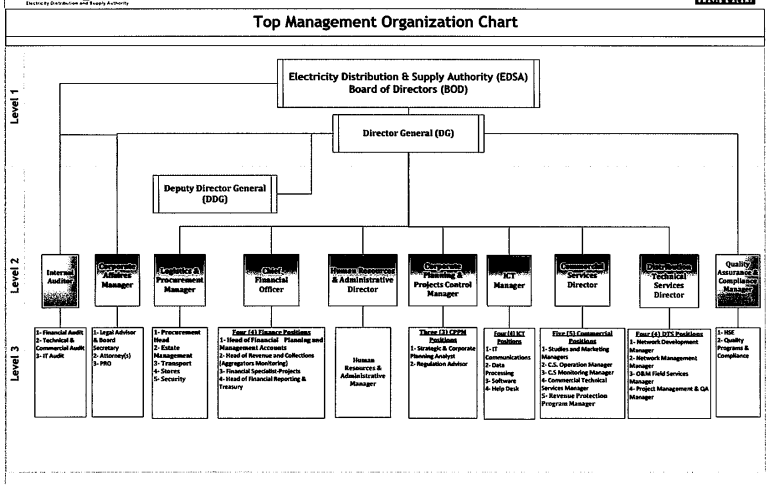
A4-4

ANNEX 2

EDSA

Electricity Distribution and Supply Authority

Top Management Organization Chart



ANNEX 2

Annex 3

JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation
- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal
-Appraisal by the government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes
-The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")
-Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")
-Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement
-Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation
-Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the Recipient necessary for the implementation of the Project.
- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

PROCEDURES OF JAPANESE GRANT

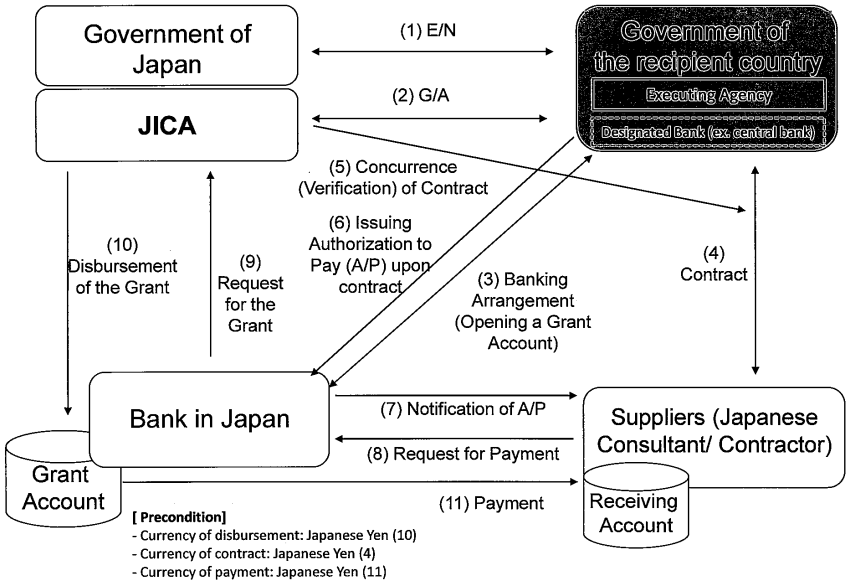
Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Financial Flow of Japanese Grant (A/P Type)



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Major Undertakings to be taken by the Government of Sierra Leone

1. Specific obligations of the Government of Sierra Leone which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A	Bank of Sierra Leone		
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)	MOE		
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A 1) Advising commission of A/P 2) Payment commission for A/P	1) within 1 month after the signing of the contract(s) 2) every payment	MOE		
4	To approve IEE/EIA(Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation for EMP and EMoP (and fulfilling conditions of approval, if any).	within 1 month after the signing of the G/A	EDSA		
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before notice of the bidding documents	MOE		
6	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	until land acquisition and resettlement complete	EDSA		
7	To secure and clear the following lands 1) right of way for the construction of the project 2) project sites for new substation 3) temporary construction yard and stock yard near the Project area 4) borrow pit and disposal site near the Project area	before notice of the bidding documents	EDSA		
8	To obtain the planning, zoning, building permit	before notice of the bidding documents	EDSA		
9	To clear, level and reclaim the following sites 1) remove utilities 2) existing facilities 3) leveling and reclaiming the sites for new substation and distribution lines	before notice of the bidding documents	EDSA		
10	To submit Project Monitoring Report (with the result of Detailed Design)	before preparation of the bidding documents	EDSA		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.

1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)	MOE		
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission for A/P	1) within 1 month after the signing of the contract(s) 2) every payment	MOE		
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project	EDSA		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	EDSA		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	MOE		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	EDSA		
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	during the construction	EDSA		
8	To submit Project Monitoring Report	every month	EDSA		
	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within 1 month after issuance of Certificate of Completion for the works under the contract(s)	EDSA		
10	To submit a report concerning completion of the Project	within 6 months after completion of the Project	EDSA		
11	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)	during the construction	EDSA		
	1) Water Supply The city water distribution main to the site	before start of the construction	EDSA		
	2) Drainage The city drainage main (for storm, sewer and others) to the site	6 months before completion of the construction	EDSA		
12	To cut or trim the tree on the way of distribution line.	before start of the construction	EDSA		
13	To provide equipment, furniture, facilities necessary for the implementation of the Project in the site(s)	by the end of construction	EDSA		
14	To ensure the safety of persons engaged in the implementation of the Project	during the Project	EDSA		
15	To take necessary measures for security and safety of the Project site	during the construction	EDSA		
16	To implement EMP and EMoP	during the construction	EDSA		
17	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	EDSA		
18	To implement RAP (livelihood restoration program)	for a period based on livelihood restoration program	EDSA		
19	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between EDSA and JICA.	until the end of livelihood restoration program	EDSA		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	EDSA		
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between EDSA and JICA.	for 3 years after the Project	EDSA		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	EDSA		

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Line Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations
See Attachment 2.

2-4-2 Activities
See Attachment 3.

2-4-3 Report on RD
See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

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Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial Total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Increased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials
(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ○month, 2015	2nd ○month, 2015	3rd ○month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)
-
-
-

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

		Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost		(A/D%)	(B/D%)	(C/D%)	
	Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
	others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost		(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost		(A/D%)	(B/D%)	(C/D%)	
Total		(A/D%)	(B/D%)	(C/D%)	

Minutes of Discussions
on the Preparatory Survey for the Project for
EXTENSION OF POWER DISTRIBUTION SYSTEM
ALONG THE FREETOWN PENINSULAR
IN THE REPUBLIC OF SIERRA LEONE
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between the Ministry of Energy, Electricity Distribution and Supply Authority (EDSA) and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 30th November, 2021, and in response to the request from the Government of Sierra Leone (hereinafter referred to as "Sierra Leone") dated 24th September, 2020, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Extention of Power Distribution System along the Freetown Peninsular in the Republic of Sierra Leone (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Freetown, June 15 2022

小西英明

Mr. KONISHI Hideaki
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ATTACHEMENT

1. Objective of the Project
The objective of the Project is to to expand and stabilize the power supply in the southwest part of the Freetown Peninsular by/through constructing a new substation and distribution network, thereby contributing to the reduction of poverty, the stability of society and the establishment of peace.

2. Title of the Preparatory Survey
Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for extension of power distribution system along the Freetown peninsular in the Republic of Sierra Leone".

3. Project site
Both sides confirmed that the site of the Project is the southwest part of the Freetown Peninsular, which is shown in Annex 1.

4. Responsible authority for the Project
Both sides confirmed the authorities responsible for the Project are as follows:

4-1. The Electricity Distribution and Supply Authority will be the executing agency for the Project (hereinafter referred to as "the Executing Agency"). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be taken care by relevant authorities properly and on time. The organization charts are shown in Annex 2.

4-2. The line ministry of the Executing Agency is the Ministry of Energy. The Ministry of Energy shall be responsible for supervising the Executing Agency on behalf of the Government of Sierra Leone.

5. Contents of the Draft Report
After the explanation of the contents of the Draft Report by the Team, the Sierra Leone side agreed to its contents. JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Sierra Leone side around August, 2022.

6. Cost estimate
Both sides confirmed that the cost estimate explained by the Team is provisional and will be examined further by the Government of Japan for its approval.

Both sides confirmed that the cost estimate including the contingency explained by the Team is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

7. Confidentiality of the cost estimate and technical specifications
Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded.

8. Procedures and Basic Principles of Japanese Grant
The Sierra Leone side agreed that the procedures and basic principles of Japanese Grant (hereinafter referred to as "the Grant") as described in Annex 3 shall be applied to the Project. In addition, the Sierra Leone side agreed to take necessary measures according to the procedures

9. Timeline for the project implementation
The Team explained to the Sierra Leone side that the expected timeline for the project implementation is as attached in Annex 4.

10. Expected outcomes and indicators
Both sides agreed that key indicators for expected outcomes are as follows. The Sierra Leone side will be responsible for the achievement of agreed key indicators targeted in year 2027 and shall monitor the progress for Ex-Post Evaluation based on those indicators.

[Quantitative indicators]

Outcome Indicator	Reference Value (2021)	Target Value (2027) 3 years after Project Completion
Annual Electric Energy Transmission (MWh/year) (York Substation)	0	22,624

Annual Electric Energy Transmission (MWh/year) (Tombo Substation)	0	35,231
Peak Transmission Power (kW) (York Substation)	0	3,614
Peak Transmission Power (kW) (Tombo Substation)	0	5,627
Number of Medial Facilities to be connected to the National Grid (place)	0	7
Number of Educational Facilities to be connected to the National Grid (place)	0	48
Reduction of Energy Cost (Million US Dollar)	0	20

[Qualitative indicators]

- Job creation and Increase in sales and profit of business stablishments
- Appropriate medical services that can be provided by improving the operation of medical equipment; and increase in the number of patients
- Improve education and training services
- Increased entrepreneurial and employment opportunities for women
- Improvement of women's living environment
- Improvement of living conditions
- Survey results on the expected benefits of electrification before the survey was conducted.

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Sierra Leone side is required to provide necessary support for the data collection.

12. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 5. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in (2) No. 6 of Annex 5, both sides confirmed that such customs duties, internal taxes and other fiscal levies, which shall be clarified in the bid documents by EDSA during the implementation stage of the Project.

The Sierra Leone side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 5 will be used as an attachment of G/A.
As shown in Annex 5, Both sides confirmed that EDSA shall take necessary measures to ensure and maintain the security of the Project site and the persons related to the implementation of the Project, in cooperation with relevant authorities such as police.

Both sides confirmed that the butget necesarry for the operation and maintenance of equipment granted in this project will be assured by the Sierra Leone side.
In order to assure the budget, EDSA explained their plan to increase their profit by increasing the price of electricity.

13. Monitoring during the implementation

The Project will be monitored by EDSA and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 6. The timing of submission of the PMR is described in Annex 5.

14. Project completion

Both sides confirmed that the project completes when all the facilities constructed and equipment procured by the Grant are in operation. The completion of the Project will be reported to JICA promptly by the Executing Agency, but in any event not later than six months after completion of the Project.

15. Environmental and Social Considerations

Both sides confirmed that the environmental and social considerations are as follows:

15-1. Both sides confirmed information on environmental and social considerations including major impacts and relevant mitigation measures are summarized in the Environmental Checklist attached as Annex7. The Executing Agency confirmed they will inform JICA of any major changes which may affect environmental and social considerations made for the Project by revising the Checklist in a timely manner.

15-2. Both sides confirmeds that environmental monitoring will be conducted by the

Executing Agency in accordance with the Environmental Monitoring Plan described in the Preparatory Study Report.

15-3. The Executing Agency and JICA confirmed internal monitoring proposed in the Abbreviated Resettlement Action Plan (ARAP) will be conducted by the Executing Agency. The Executing Agency agreed that progress of land acquisition and implementation of ARAP will be monitored until land acquisition and resettlement activities including livelihood restoration program are completed. The Executing Agency will report the monitoring results to JICA on a quarterly basis as a part of Monthly Progress Report by filling in the Attachment 6. In case there is a remaining issue that needs to be addressed (e.g. insufficient restoration of livelihood of displaced PAPs), JICA may request to extend the period of monitoring and reporting until JICA confirms the issues have been properly addressed and solved in accordance with the agreement between the Executing Agency and JICA.

15-4. The Executing Agency confirmed it will take stipulated procedures for information disclosure in accordance with regulations of Environmental Protection Agency Sierra Leone (EPA) / EDSA. In addition, the JICA Mission requested the Executing Agency to disclose the monitoring results to local project stakeholders, and the Executing Agency agreed to disclose monitoring results on MoE website and EDSA website.

The Executing Agency agreed JICA's disclosure of provided monitoring results in the monitoring form (Attachment 6) on its website.

16-1 General Issues

16-1-1 Environmental Guidelines and Environmental Category

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as B because the project is not likely to have significant adverse impact on the environment under the JICA guidelines for environmental and social considerations (April 2010) in terms of its sectors, characteristic and areas.

16-1-2 Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as Annex 7. Both sides confirmed that in case of major modification of the content of the Environmental Checklist, the Sierra Leone side shall submit the modified version

to JICA in a timely manner.

16-2 Environmental Issues

16-2-1 Environmental Impact Assessment (EIA)

Both sides confirmed the EIA report will be approved by Environmental Protection Agency of Sierra Leone in July, 2022.

16-2-2 Environmental Management Plan and Environmental Monitoring Plan

Both sides confirmed Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) of the Project is as Annex 8 respectively. Both side agreed that environmental mitigation measures and monitoring shall be conducted based on the EMP and EMoP, which may be updated during the detailed design stage.

16-2-3 Other specific environmental issues which need to be confirmed/agreed between the parties.

Both sides confirmed that there are proteceted areas and Important Bird Area(IBA)/ Key Biodiversity Area (KBA) in the vicinity of the project area. However, impacts are expected to be minimum due to the characteristics of the project and the implementation of appropriate mitigation measures and monitoring. Although this project is in the vicinity of protected areas and IBA/KBA, it has also been confirmed that the requirements for exceptions in protected areas and critical natural habitats shall be met as following;

(1) Protected Areas

The Team explained that according to the Guidelines, projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage. The project is outside the protected areas however, it will be implemented in the vicinity of the protected areas. Projects in/near the protected areas will be acceptable only when there are no technically and financially feasible alternatives and the Executing Agency will;

(a) Demonstrate that the proposed development in such areas is legally permitted.
(b) Act in a manner consistent with any government recognized management plans for such areas.
(c) Consult protected area sponsors and managers, Affected Communities, Indigenous Peoples and other stakeholders on the proposed project, as appropriate.
(d) Implement additional programs, as appropriate, to promote and enhance the

conservation aims and effective management of the area.

Both sides confirmed the above matters in June 2022.

(2) Critical Natural Habitat

Both sides confirmed that "Western Area Peninsula Forest National Park" are IBA/KBA and might be considered as the critical natural habitat in which projects must not involve significant conversion or significant degradation according to the Guidelines. Any project activities that have potential adverse impacts shall not be implemented unless all of the following conditions are met;

(a) The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values.

(b) The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time.

(c) A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.

Both sides confirmed the above matters in June 2022.

A4-19

16-3 Social Issues

16-3-1 Land Acquisition and Resettlement

Both sides confirmed the 0.33 ha of land would be aquired due to the implemenation of the Project. However, relocation and resettlement are not expected in the project. Such land acquisition shall be implemented based on ARAP as Annex 9 which was prepared in line with the Guidelines and authorized by the Sierra Leone side in September, 2022.

16-4 Environmental and Social Monitoring

16-4-1 Environmental Monitoring

Both sides agreed that the Sierra Leone side will submit results of environmental monitoring to JICA with PMR by using the monitoring form attached as Annex 10. The timing of submission of the monitoring form is described in Annex 5.

16-4-2 Social Monitoring

Both sides confirmed that the Sierra Leone side will implement social monitoring about land acquisition plan proposed in ARAP. The Sierra Leone side and the Team agreed that the Executing Agency will submit results of social monitoring to JICA with PMR by using the monitoring form attached as Annex 10.

16-4-3 Information Disclosure of Monitoring Results

Both sides confirmed that the Sierra Leone side will disclose results of environmental and social monitoring to local stakeholders through the website of EDSA.

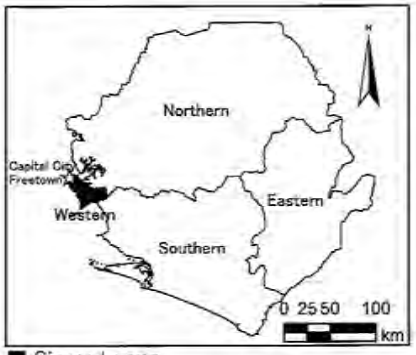
The Sierra Leone side agreed that JICA will disclose results of environmental and social monitoring submitted by the Sierra Leone side as the monitoring forms attached as Annex 10 on its website.

17. Other Relevant Issues

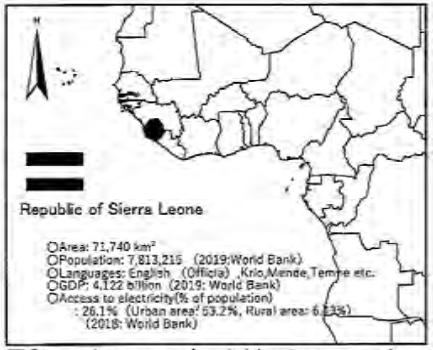
17-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

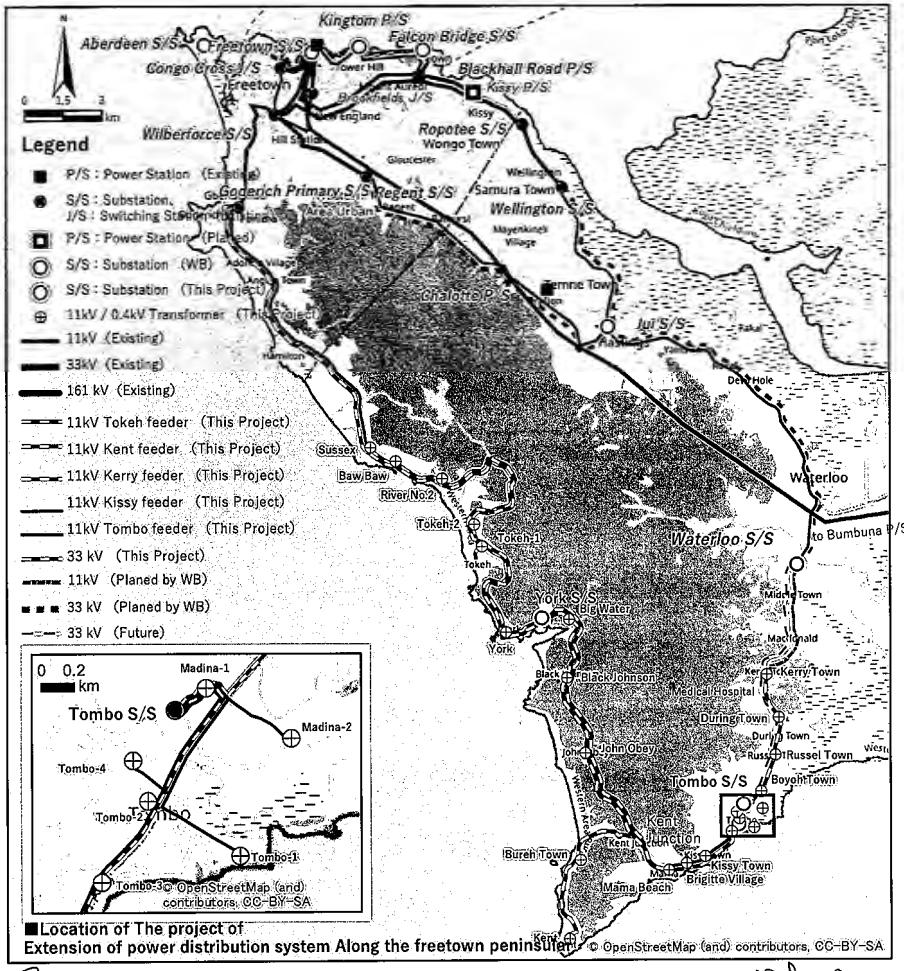
Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Japanese Grant
Annex 4 Project Implementation Schedule
Annex 5 Major Undertakings to be taken by the Government of Sierra Leone
Annex 6 Project Monitoring Report (template)
Annex 7 Environmental Check List
Annex 8 Environmental Management Plan/Environmental Monitoring Plan
Annex 9 Abbreviated Resettlement Action Plan
Annex 10 Environmental and Social Monitoring Form



■ Sierra Leone



■ Sierra Leone and neighboring countries

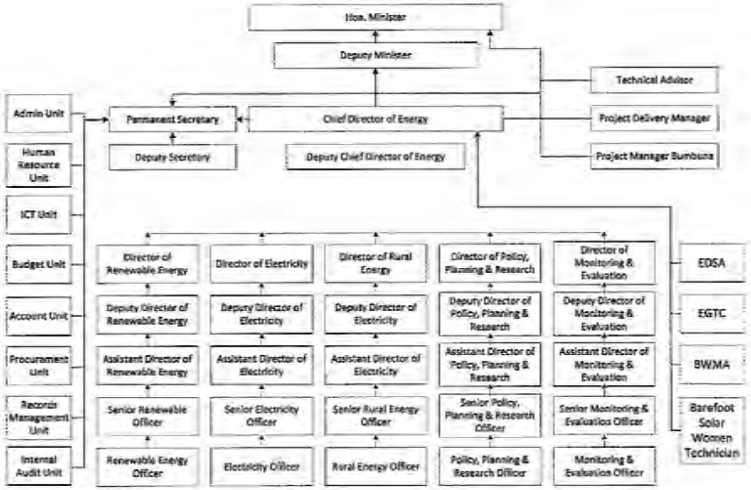


■Location of The project of
Extension of power distribution system Along the freetown peninsular

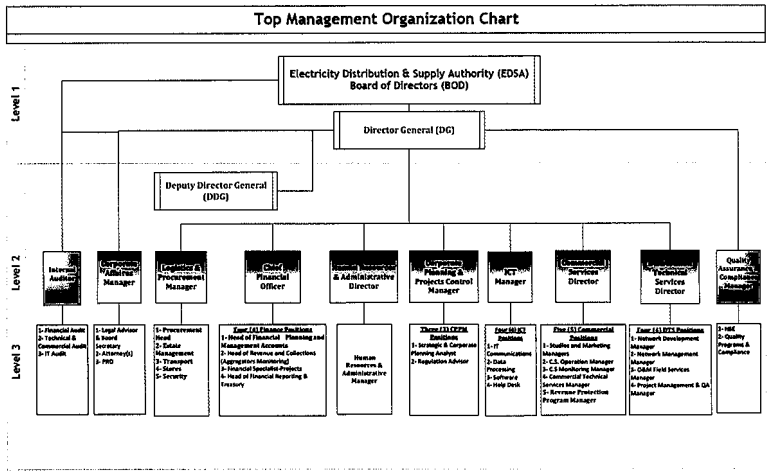
Location of the Project Site

Annex 2

Organization Chart



Organization chart of Ministry of Energy



Organization chart of EDSA

PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Annex 3

JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation
- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal
- Appraisal by the government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation
Exchange of Notes
- The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")
- Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")
- Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement
- Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation
- Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the Recipient necessary for the implementation of the Project.

Financial Flow of Japanese Grant (A/P Type)

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as

followings:

a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Measures to ensure more efficient implementation of the Grant

i) In the event that the E/N and the G/A concerning a project cannot be signed by the end of the following Japanese fiscal year of the cabinet decision concerned by the GOJ, the authorities concerned of the two Governments will discuss the cancellation of the project.

ii) In the event that the period, specified in the G/A, during which the grant is available expires before the completion of the disbursement, the authorities concerned of the GOJ will thoroughly review the status, situation and perspective of the implementation of the project concerned before extending the said period. The authorities concerned of the two Governments will discuss the termination of the project including a refund, unless there are concrete prospects for its completion.

iii) Regardless of the period mentioned in ii) above, the authorities concerned of the two Governments will, in the event that five years have passed since the cabinet decision concerned by the GOJ before the completion of the disbursement, except as otherwise confirmed between them, discuss the termination of a project including a refund, unless there are concrete prospects for its completion.

4) Proper Use

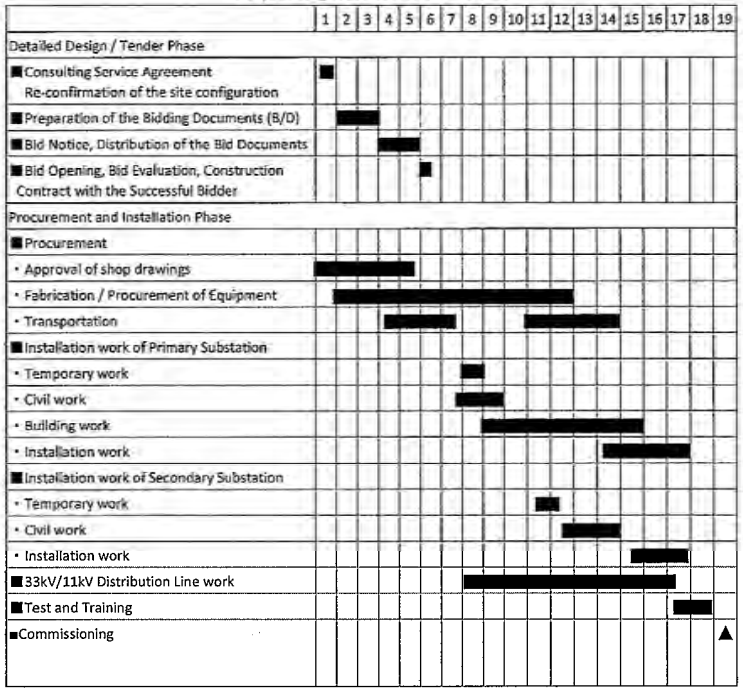
The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

5) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

Annex 4

Project Implementation Schedule



Annex 5

Major Undertakings to be taken by the Government of Sierra Leone

(1) Before the Bidding

NO	Items	Deadline	In charge	Estimated Cost(USD)	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	Within 1 month after the signing of the G/A	Bank of Sierra Leone	-	
2	To issue the authorization to pay (A/P) to the Agent Bank for the payment to the Consultant	Within 1 month after the signing of the contract(s)	MOE	-	
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A		MOE	-	
	1) Advising commission of A/P	Within 1 month after the signing of the contract(s)		250	*1
	2) Payment commission for A/P	Every payment		20,700	*2
4	To approve IEE/EIA (conditions of approval should be fulfilled, if any) and secure the necessary budget for the implementation of EMP and EMoP (and fulfilling conditions of approval, if any)	Within 1 month after the signing of the G/A	EDSA	40,500	
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	Before notice of the bidding documents	MOE	150,000	
6	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	Until land acquisition and resettlement complete	EDSA	Cost included in (1) No.5	
7	To secure and clear the following lands 1) right of way for the construction of the project 2) project sites for new substation 3) temporary construction yard and stock yard near the Project area 4) borrow pit and disposal site near the Project area	Before notice of the bidding documents	EDSA	165,000	
8	To obtain the planning, zoning, building permit	Before notice of the bidding documents	EDSA	5,000	
9	To clear, level and reclaim the following sites 1) remove utilities 2) existing facilities 3) leveling and reclaiming the sites for new substation and distribution lines	Before notice of the bidding documents	EDSA	95,000	
10	To submit Project Monitoring Report (with the result of Detailed Design)	Before preparation of the bidding documents	EDSA	3,000	
11	To obtain Certificate/Title of Land acquisition for substation construction (land ownership, register, etc.)	Before preparation of the bidding documents	EDSA	5,000	
12	To issue a letter with project brief to the SLRA to elect power poles and to construct distribution lines on the Right of Way oh the neighbors in the project area.	Before preparation of the bidding documents	EDSA	-	
13	To hold stakeholder meetings/consultations to explain the project outline to the neighbors in the project area.	Before preparation of the bidding documents	EDSA	Cost included in (1) No.5	
14	To implement a RAP	Before preparation of the bidding documents	EDSA	Cost included in (1) No.5	

*1 and *2 are rough referencial costs and more accurate costs will be identified at the implementation stage.

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost(USD)	Ref.
1	To issue the authorization to pay (A/P) to the Agent Bank for the payment to the supplier	Within 1 month after the signing of the contract(s)	MOE	-	
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A		MOE	-	
	1) Advising commission of A/P	Within 1 month after the signing of the contract(s)		Cost included in (1) No.3	
	2) Payment commission for A/P	Every payment		Cost included in (1) No.3	
3	Construction of access road to Tombo substation (about 200m from main road to Tombo substation)	Within 1 month after the signing of the contract(s)	EDSA	150,000	
4	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	During the Project	EDSA	-	
5	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	During the Project	EDSA	-	
6	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted in advance or partially reimbursed and/or be borne by its designated authority without using the Grant	During the Project	MOE	-	
7	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	During the Project	EDSA	30,000	
8	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers	During the construction	EDSA	-	
9	To submit Project Monitoring Report	Every month	EDSA	Cost included in (1) No.10	
10	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	Within 1 month after issuarance of Certificate of Completion for the works under the contract(s)	EDSA	-	
11	To submit a report concerning completion of the Project	Within 6 months after completion of the project	EDSA	-	
12	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)	During the construction	EDSA	15,000	
	1) Water Supply: The city water distribution main to the site	Before start of the construction	EDSA	6,000	
	2) Drainage: The city drainage main (for storm, sewer and others) to the site	6 months before completion of the construction	EDSA	7,000	

NO	Items	Deadline	In charge	Estimated Cost(USD)	Ref.
13	To cut or trim the tree on the way of distribution line	Before start of the construction	EDSA	2,000	
14	To provide equipment, furniture, facilities necessary for the implementation of the Project in the site(s)	Before start of the construction	EDSA	6,000	
15	To ensure the safety of persons engaged in the implementation of the Project	During the project	EDSA	10,000	
16	To take necessary measures for security and safety of the Project site	During the construction	EDSA	28,800	
17	To implement EMP and EMoP	During the construction	EDSA	Cost included in (1) No.4	
18	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	During the construction	EDSA	3,000	
19	To implement RAP (livelihood restoration program)	For a period based on livelihood restoration program	EDSA	Cost included in (1) No.5	
20	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between EDSA and JICA.	Until the end of livelihood restoration program	EDSA	3,000	
21	Implementation of power outage plan during the construction period including notification in public	During the project	EDSA	5,000	
22	Apply for a transportation permit for heavy equipment and improve the road from the port of unloading to the project site (if necessary)	During the project	EDSA	-	
23	Functional tests of York feeder circuit breaker, at Goderich Substation	6 months before completion of the construction	EDSA	2,000	
24	Setting of protection relays	Before compeletion of the construction (for York feeder at Goderich substation)	EDSA	1,500	
25	Construction of Fence and Gates at Primary substations	Before compeletion of the construction	EDSA	Cost included in (2) No.28	
26	Connection work of the existing distribution lines to the section switch to be installed by the Japanese side	During the project	EDSA	1,900	
27	Installation and connection of LV Trunk lines, Branch lines and Service lines.	6 months after the completion of the construction work	EDSA	130,000	
28	Construction of Fence and Gates at Secondary substation	Before compeletion of the construction	EDSA	255,000	
29	Submission of the inventory list of prepaid meters to be connected to the customers report for installation of prepaid meters and connection to the customers	For one year after compeletion of the construction	EDSA	-	

*1 and *2 are rough referencial costs and more accurate costs will be identified at the implementation stage.

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost(USD)	Ref.
1	To implement EMP and EMoP	For a period based on EMP and EMoP	EDSA	3,000	
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between EDSA and JICA	For 3 years after the Project	EDSA	1,000	
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	EDSA	60,000	

(4) Other obligations of the Government of Sierra Leone funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct substations and distribution lines, and to provide equipment 1) To conduct the following transportation a) Marin and air transportation of the products from Japan to the country of the Recipient b) Internal transportation from the port of disembarkation to the project site	-	
	2) To provide equipment with installation and commissioning		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		
3	Contingencies	-	
	Total		XXX

Annex 6 Project Monitoring Report (template)

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX
20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:
Executing Agency	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:
Line Ministry	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original *(proposed in the outline design)*	Original *(at the time of signing the Grant Agreement)*	Actual

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations
See Attachment 2.

2-4-2 Activities
See Attachment 3.

2-4-3 Report on RD
See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-
-
-

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)

(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Annex 7 Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) Y (c) Y (d) Y	(a)-(c) The EIA report was approved and EIA License was issued by EPA-SL on June x, 2022. Conditions are general issues concerning the construction works and they are already addressed in the EIA report with mitigation measures and monitoring plan. (d) On January 24, 2022, the National Protected Area Authority (NPAA) issued a letter to EDSA approving the implementation of the project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) In line with JICA Guidelines and Sierra Leone regulations, stakeholder meetings were conducted. (b) Main comments raised during meetings were reflected on the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Alternative plans including 'without project' alternative were studied. Different construction methods of distribution lines were studied. The proposed project is most preferable in terms of lower impacts on natural, social and economic aspects
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) There are no rivers or swamps around the project site.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The project site is adjacent to the National Park. Currently, the species of fauna and flora in the National Park are very rich. Because the forests are very stable, the habitats for fauna and flora are also very stable. The distribution lines of this project will be constructed on existing roads which are adjacent to the National Park. Since existing housing development, road construction, and traffic have already affected the habitats and the functions of ecosystem of fauna and flora in the National Park, the impacts of this project on biodiversity will be no

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				greater than the existing ones.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) Y (b) Y (c) Y (d) N (e) N (f) N	(a) There are ecologically valuable habitats in the National Park that is adjacent to the project site. (b) There are protected habitat of endangered species in the National Park that is adjacent to the project site. (c) No significant ecological impact is anticipated, even though some trees within ROW of distribution lines are removed. (d) No significant impacts are expected on habitat fragmentation and migration routes. (e) There is no such possibility as there is no important ecosystem near the project site. The project will not introduce non-native invasive species or pests. (f) The project site is within the ROW of Peninsula Highway, which have already been developed.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) There are no locations along the distribution lines which have risks of slope failure and land sliding. (b)-(c) The primary substation sites are flat lands. Since the soil is relatively hard, there are no risks of slope failure and landslides.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full	(a) N (b) Y (c) Y (d) Y (e) Y (f) Y	(a) No resettlement occurs. In addition, the loss of one structure and a lot of trees is predicted. The impacts were minimized by selecting routes of distribution lines along the ROW of existing roads. Especially, the 33kV distribution lines from the existing Goderich Substation and Sussex were supposed to pass a relatively dense residential area, so the construction

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, and people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(g) N (h) Y (i) Y (j) Y	methods with less impact on the existing structures were carefully studied. (b) Several stakeholder meetings were held prior to resettlement; explanation/clarification on compensation and livelihood restoration assistance was done toward the PAPs. The PAPs agreed upon it. (c) A census survey, socio-economic survey and asset inventory were conducted for all the PAPs, based on which ARAP was developed. APAP includes compensation at full replacement cost and livelihood restoration programs. The full replacement cost includes the amount to move houses (physical displacement). (d) Compensation will be paid prior to the resettlement, which is also stipulated in Sierra Leone law. EDSA submits a payment order to MoF, and then MoF proceeds with the payment. After the payment, physical resettlement will be implemented. (e) Compensation policy was described in ARAP (including eligibility for compensation, entitlement matrix etc.). (f) According to the results of the census survey and socio-economic survey, x PAHs is headed by an elderly (over 70 years old). However, since it is not physically but economically displaced, livelihood restoration measures (direct economic assistance, medical insurance) will be conducted. (g) No resettlement occurs. (h) EDSA is responsible for ARAP implementation. EDSA has one social safeguard officer who deal with resettlement and land acquisition. It was agreed that all the implementation of ARAP would be completed within 3 months after the approval of this project by Japanese Government (Field Report (signed on November 29, 2021 by JICA Study Team and EDSA). (i) Monitoring of resettlement and land acquisition will be conducted on a monthly basis. A monitoring plan was

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				developed in ARAP. (j) A grievance redress system was developed, with the combination of existing conflict resolution methods at community level and arbitration by the Court.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) Y (b) Y (c) Y (d) Y	(a) An economic displacement such as the loss of one structure and some trees is expected. ARAP was developed and the loss will be compensated at full replacement cost. (b) The project site is located within Freetown City, and no influx of population from outside of the project site is predicted. (c) The project will not cause radio interference. (d) Compensation under power lines will be paid according to the Sierra Leone laws/regulations and ARAP.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no such possibility as there is no heritage site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) The project will not affect the landscape. The areas around the project site have already been developed.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a)-(b) There are no ethnic minorities and indigenous people affected by the project.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a	(a) Y (b) Y (c) Y (d) Y	(a)- (d) EDSA observes all laws and ordinances associated with working conditions of the country, conducting necessary tangible and intangible safety measures.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?		
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Based on the Sierra Leone laws and regulations, mitigation measures will be conducted. The expected impacts are noise, dust, exhaust gas and soil. Mitigation measures to be taken will include water sprinkler, installation of cover to prevent dust and control of construction working hours. (b) The project site is adjacent to the National Park in which there are ecologically valuable habitats. Since the construction is geographically limited and completed within a short period, no impacts on surrounding environment are expected. (c) Construction activities may disturb the traffic around the site. EDSA requires the contractor to control traffic with collaboration with local police, securing the smooth traffic and safety around the project site. The power cuts will be informed to the surround communities and residents in advance.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) Y	(a)-(d) For the items with impacts, EDSA (planning and construction phases, operation phase) will be monitoring. Monitoring plan and responsible organizations were developed in the Environmental and Social Management Plan (ESMP).
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) N/A	(a) There is no additional Environmental Items that may be affected.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N/A	(a) Since the construction is geographically limited and completed within a short period, no impacts to transboundary or global issues are expected.

Annex 8 Environmental Management Plan/Environmental Monitoring Plan

Environmental Management Plan

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost
	Planning Phase				
14	Land acquisition /Involuntary resettlement	Loss of assets, income and livelihood due to land acquisition	• In accordance with JICA guidelines and WB OP4.12, an ARAP will be prepared based on the consensus with project affected people, compensation and support will be provided.	EDSA	Budget by EDSA
	Construction Phase				
1	Air Pollution	Air pollution by heavy machineries during leveling and construction works	• Minimizing the number of deliveries through timely scheduling. • Only contract automobiles with vehicle inspection certification, which are expected to have less exhaust emissions. • Installing the cover of trucks transporting soils or construction debris from the site. • Sprinkling water at the site to avoid dust.	Contractor	Included in construction costs
2	Water Pollution	Discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries	• Installing domestic wastewater treatment facilities. • Restricting washing trucks and heavy machineries to areas away from water bodies.	Contractor	Included in construction costs
4	Soil Pollution	Leakage of lubricants and other oils from construction equipment and vehicles and spillage of insulating oil from transformer	• Taking preventive measures against leakage of lubricants and other oils from construction equipment and vehicles by carrying adsorption mats, neutralizers, etc. while working. • Insulating oil as well as transformers will be set in the metal box. To prevent spillage, oil dike will be set under the transformers and filled with stone chips. • Protection of exposed ground with vegetation and rain drainage, etc.to prevent run-off	Contractor	Included in construction costs
5	Noise/ Vibration	Noise during leveling and construction	• In the primary substations, the transformer design should be such that soundproof walls, etc. are not necessary (however, a site boundary wall (made of concrete, equivalent to the existing Goderich primary substation) is required). • Controlling operation time (7a.m.-5p.m.) to reduce impact by noise as much as possible. • Use of proper automobile with inspection certificate	Contractor	Included in construction costs
11	Protected Areas/Ecosyst em	Loss of trees due to cutting	• Only clear vegetation that is required to be cleared in accordance with engineering plans and designs.	Contractor	Included in construction costs

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost
		Harm to animals and birds due to construction works	• Check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animals. • Avoid destroying active migratory bird nests or eggs. • During the bird breeding season, keep tree removal to a minimum.		
		Light pollution	• Control operation time (7a.m.-5p.m.) • Use lower wattage flat lens fixtures that direct light down and reduce glare, thus reducing light pollution, avoiding floodlights unless they are required. • Install light shades or plan the direction of lights to reduce light spilling outside the construction area.		
		Noise	• Educate construction equipment operators on potential noise issues and techniques for reducing noise emissions.		
		Animal roadkill	• Restrict truck deliveries, where practicable, to daytime working hours • Enforce on-site speed limit for avoiding road kills.		
		Illegal dumping of solid and liquid wastes	• Prevent all solid and liquid wastes from entering waterways;		
		Loss of animals and plants due to illegal poaching and cutting	• Provide adequate knowledge to the workers regarding the protection of flora and fauna, and relevant government regulations and punishments for illegal poaching and cutting. • Prohibit illegal poaching and cutting.		
20	Existing social infrastructure and services	Impacts on traffic during construction works Power cut during construction works	• By announcing construction plans to nearby residents and collaborating with local police, enforcement of traffic safety and mitigation of traffic congestion • Preparation of power cut plan and sharing the plan with affected communities	EDSA Contractor	Included in construction costs
29	Occupational health hazards	Health and safety of construction workers	• Based on laboring laws, the contractor must provide protective gear to workers, ensure them to wear them and provide safe working environment. • EDSA will confirm environmental and social safety management plan proposed by contractor at tendering. Based on this plan, the contractor will carry out safety and management tasks and avoid and mitigate risks of accidents. • Construction site (especially the storage site) will be fenced, lighted and guarded by security guards to prevent intruders and theft.	EDSA Contractor	Included in construction costs

No.	Item	Impact	Mitigation Measures	Implementation /Responsible Body	Cost
30	Accidents	Accidents involving workers and residents	• Same as for occupational health hazards • When wiring or removing power lines, fall prevention net will be used.	Contractor	Included in construction costs
	Operation Phase				
4	Soil pollution	Spillage of insulating oil from transformers	• Insulating oil as well as transformers will be set in the metal box. To prevent spillage, oil dike will be set under the transformers and filled with stone chips.	EDSA	Included in construction costs
30	Accidents	Electrocution caused by contacting with wire or tower/ Fire risks caused by broken insulators	• Signboard indicating high voltage will be set. Residents nearby will be informed about prevention of electrocution. • EDSA will check house wiring carefully. • Ground wires with enough capacity will be set.	EDSA Contractor	Included in construction costs

Environmental Monitoring Plan

No		Item	Methods	Frequency	Responsible body
	Planning Phase				
14	Land acquisition /Involuntary resettlement	Compensation payment to bank accounts of PAPs	Counting the number of payment transaction to PAPs	Monthly until completion of land acquisition (planned to be completed by November 2022)	EDSA
	Construction Phase				
1	Air Pollution	Inspection of certification for vehicle and heavy machineries (schedule and cover to avoid dust) Water sprinkler of the site	Site inspection	Daily during construction phase	Contractor
		SO_2, NO_2, PM_{10}, $PM_{2.5}$, O_3	Air sampling at the Tombo and York substations and in the communities along the distribution lines	Quarterly	EDSA
2	Water Pollution	Management measures on domestic wastewater and discharges from washing trucks and heavy machineries	Site inspection	Daily during construction phase	Contractor
		Water temperature, pH, turbidity, DO, BOD, E. Coli.	Water sampling at the Tombo and York substations and in the communities along the distribution lines	Quarterly	EDSA
4	Soil Pollution	PAHs, BTEX	Soil sampling at the York and Tombo substations	3 times, before, during and after construction	Contractor

No		Item	Methods	Frequency	Responsible body
5	Noise/vibration	Inspection of certification and schedule for vehicle and heavy machineries Controlling operation time (7a.m.-5p.m.)	Site inspection	Daily during construction phase	Contractor
		Noise level	Noise measurement at the Tombo and York substations and in the communities along the distribution lines	Quarterly	EDSA
11	Protected Areas/Ecosystem	Record of animals trapped in	Site inspection Confirming the reports	Daily during construction phase	Contractor
		Record of migratory bird nests			
		Restriction on daytime working hours			
		Lighting equipment			
		Noise			
		On-site speed limit			
		Illegal dumping of wastes			
20	Existing social infrastructure and services	Power cut due to wiring distribution lines on the existing overhead lines from Goderich to Sussex	Confirming work plan Confirming power cut plan	During rewiring works During construction	Contractor EDSA
29	Occupational health hazards	Workers with protective gear Reports on accidents	Site inspection Confirming the reports	Daily during construction	Contractor EDSA
30	Accidents	Reports on accidents	Site inspection Confirming the reports	Daily during construction	Contractor EDSA
	Operation Phase				
4	Soil Pollution	PAHs, BTEX	Soil sampling at the Tombo and York substations	Annually	EDSA
30	Accidents	Fire prevention measures	Site inspection	At commission and regular maintenance	EDSA

Abbreviated Resettlement Action Plan

DRAFT

For the Project of

Extension of Power Distribution System along the Freetown Peninsula in the Republic of Sierra Leone

JICA

EDSA

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Acronyms and Abbreviation

AIDS	Acquired Immune Deficiency Syndrom
ARAP	Abbreviated Resettlement Action Plan
EDSA	Electricity Distribution and Supply Authority
EIA	Environment Impact Assessment
EPA-SL	Environmental Protection Agency of Sierra Leone
ESS	Environmental Social Standard
ESURP	Energy Sector Utility Reform Project
ESURP-AF	ESURP Additional Finance
GoSL	Government of Sierra Leone
GRC	Grievance Redress Committee
GRM	Grieviance Redress Mechanism
GST	Government Sales Tax
HIV	Human Immunodeficiency Virus
ISC	Inter-Ministerial Sub-Committee
JICA	Japan International Cooperation Agency
MoE	Ministry of Energy
NGOs	Non-Governmental Organizations
NPA	National Power Authority
PAPs	Project Affected Persons
PRSP	President's New Direction National Strategic Plan
RAP	Resettlement Action Plan
RF	Resettlement Framework
RAP IC	RAP Implementation Committee
RoW	Right-of-Way
SLRA	Sierra Leone Roads Authority
WARD	Western Area Rural District
WB	World Bank

EXECUTIVE SUMMARY

1. Introduction

1.1 Background

Concerned about the worsening electricity/energy situation in the city, in 2018, His Excellency the President's New Direction National Strategic Plan (PRSP IV) on the energy sector identified a road map to increase energy access and improve service delivery nationwide. This mandate is aligned with the Ministry of Energy's Sector Strategic Plan (2018-2030), which now embarks on an urban electrification project to extend the distribution network from Goderich to Waterloo via Sussex, Tokeh, York, Kent, and Tombo communities. The Republic of Sierra Leone Government (GoSL) requested Grand Aid for the Project for Extension of Power Distribution System Along the Freetown Peninsula in the Republic of Sierra Leone to the Government of Japan. The Government of Japan is expected to grant the Government of Sierra Leone aid to develop the distribution network along the Freetown Peninsula. On behalf of the Government of Japan, Japan International Cooperation Agency (JICA) is financing the proposed project development, and it is undertaken jointly with the Electricity Distribution and Supply Authority (EDSA) as the proponent of the Project.

This Project aims to expand and stabilize the power supply in the southwest part of the Freetown Peninsula by constructing a new substation and distribution network for poverty reduction, the stability of society, and the establishment of peace in the Freetown Peninsula. As part of the Project development procedures, risks associated with this Project's development are placed under"**Category B**" by the Environmental Protection Agency of Sierra Leone (EPA-SL) based on the assessment undertaken for the Project.

The investments under this operation, mainly the construction of distribution lines and substations, can create some displacement and land acquisition issues. Therefore, for this purpose, a Resettlement Framework (RF) following the laws of Sierra Leone, the JICA Guidelines for Environmental Social Considerations (JICA Guidelines) (2010), and the World Bank Environmental Social Standard (ESS) has been developed. This Abbreviated Resettlement Action Plan (ARAP) was prepared based on the RF and the results of asset inventory on the Project Affected Persons (PAPs) within the Project area.

1.2 The Resettlement Action Plan

In compliance with the World Bank Environmental Social Standard (ESS), an ARAP is prepared when people are physically or economically displaced from their land or other assets as a result of development projects. When displacement impacts are not substantial, i.e., when displacement impacts affect 200 PAPs or less, an ARAP is considered. The ARAP is prepared to guide the land acquisition process for this project and outlines key procedures and measures for compensating all PAPs for project impacts. The ARAP records baseline conditions of the PAPs within the project area, details potential impacts of project and consultations with PAPs. It also indicates the strategies that have been utilized to avoid or minimize impacts and compensate for losses where displacement is found to be unavoidable. When implemented properly, the ARAP should improve the standards of living and livelihoods of PAPs over and above their pre-displacement levels. The ARAP, as well as and the project's Environmental and Social Management Plan (ESMP) will be disclosed publicly and it is the responsibility of the project proponent (EDSA) to roll out disclosure plans with the support of consultants.

As some of the construction works of the Project are expected to trigger moderate adverse social impacts, JICA has requested the preparation and implementation of an ARAP prior to implementation of the Project. Accordingly, this ARAP was commissioned by the Project and is linked to the preparation of the project's RF and ESMP.

The ARAP will establish agreed procedures to value and compensate affected people for project impacts on assets and livelihoods. When impacts are not mitigated, there are risks of community opposition and conflicts which can result in project delays or stoppages and increase the project's budget.

The objectives of this resettlement plan will establish procedures and processes to:

- avoid, and where avoidance was not possible, minimize displacement through design alternatives;
- minimize social and economic impacts from displacement and restrictions access to land and business activities;
- ensure extensive consultation, information disclosure and participation of affected persons;
- restore or improve the standards of living and livelihoods of affected persons;
- extend special considerations for vulnerable PAPs and improve their livelihoods, where necessary.

EDSA will provide compensation for lost assets and temporary disruption of livelihood activities. This will be monitored over a minimum of 3 months following project implementation.

1.3 The Project

The proposed Project is located along the Freetown Peninsula. It runs from the Goderich substation through Sussex, Tokeh, York, Tombo to Kerry Town. The Project comprises the following main components (*see Table 1*).

Table 1: Project Components

No	Main Components	Quantities
1	Construction of 33kV line (Goderich SS to Tombo SS) (a) 33kV overhead line	Approx. 46km
2	Construction of 11kV line (Sussex to Medical Hospital at Kerry Town) (a) 11kV overhead line	Approx. 52km
3	Construction of 33/11kV Primary substation (a) 1x 15MVA 33/11kV Tombo substation (b) 1x 15MVA 33/11kV York substation	 1 lot 1 lot
4	Construction of 11/0.4kV Secondary substation (a) 100kVA Pole-mount type (b) 200kVA Pole-mount type (c) 200kVA x 2 Pole-mount type (d) 250kVA Pole-mount type (e) 250kVA x 2 Pole-mount type (f) 630kVA Ground-mount type	23 locations 6 set 3 set 4 set 3 set 2 set 5 set

NOTE:
Macdonald and Samuel town will be supplied power from Waterloo substation Note that contents and quantities are subject to change.

2. Project Description and Potential Impacts

This chapter contains a detailed description of key project activities and the potential risks and impacts that may be caused by the the activities. Maps showing project locations are also presented in this chapter

2.1 Imapct Identification

The Project shall use the Right-of-Way (RoW) for the most part. The RoW is the parcel of land reserve between the edge of our road to the approved offset varying with the road class. This parcel of land is mainly reserved for future development, provides access for other utility companies like EDSA, and provides road users the required safety and level of service. The RoW is state-owned land, and the GoSL has vested it in the Sierra Leone Roads Authority (SLRA). Over time, the RoW has faced encroachment in the country.

The construction of 33kV and 11kV distribution lines shall be mainly constructed along existing public roads and the existing RoW. Many traders and small businesses have occupied the RoW between Goderich substation and Sussex. Options are employed so that the construction works will not affect assets during stringing along the existing line from Goderich to Sussex. There is a likelihood that the construction of new lines and secondary substations from Sussex to Kerry will affect trees along the RoW.

The land parcels for the proposed primary substation sites at York and Tombo are owned by the Sierra Leone Police and Tombo community, respectively. EDSA is in the process of acquiring those parcels of land for the Project. The land acquisition process is expected to be voluntary transactions and no displacements of persons will be involved. Therefore, the World Bank Environmental and Social Standard 5 (ESS5) may not apply to this component. However, the land acquisition process shall be screened following ESS5 requirements and probably subject to an audit. In addition, in addition, the eight criteria for voluntary land donation listed in the World Bank Involuntary Resettlement Sourcebook shall be confirmed.

Since the Project will induce displacement involving one makeshift structure at Tombo for a sencondary substation construction, EDSA shall pay compensation regardless of land ownership status as per the national laws and ESS5.

2.2 Detailded Project Activities

2.3 Minimizing Displacement and Resettlement

3. Policy, Legal and Institutional Framework

This chapter discusses the policies, the legal and institutional framework relating to land acquisition and involuntary resettlement in Sierra Leone, and the World Bank ESS5 (Environmental and Social Standard 5) and the JICA Guidelines requirements.

3.1 Policy Framework

National Land Policy, 2015

The 2015 National Land Policy also provides for compulsory land acquisition in the public interest. The principles of the land policy include the principle of land as a common national or communal property resource held in trust for the people and which must be used in the long-term interest of the people of Sierra Leone. Such a principle only holds where it does not violate existing private ownership rights. Compensation to be paid for lands acquired through compulsory government acquisition will be fair and adequate and will be determined, among other things, through negotiations that consider government investment in the area. Local Authorities (City and District Councils) may negotiate for land for project development purposes, but all such grants should be properly documented and processed.

No interest in or right over any land belonging to an individual or family can be disposed of without consultation with the owner or occupier of the land. No interest in or right over any land belonging to an individual or family can be compulsorily acquired without payment, in a reasonable time, of fair and adequate compensation.

This Policy highlights Land distribution (acquisition and allocation), access to land by all Sierra Leoneans and investors, land tenure systems, land use planning and regulations, land management and administration systems, and land adjudication systems.

World Bank Environmental and Social Standard 5 (ESS5)

The World Bank Environmental and Social Standard 5 (ESS5) replaces the World Bank safeguard policy, OP 4.12, which forms part of the 2016 World Bank Environmental and Social Framework. The ESS5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. Project-related land acquisition may cause physical displacement (relocation, loss of

residential land, or loss of shelter), economic displacement (loss of land, assets, or access to assets leading to loss of income sources or other means of livelihood) or both.

ESS5 applies to a bank-funded project when the displacement is caused or any loss of land or other assets resulting in:

- relocation or loss of shelter;
- loss of assets or access to assets; or
- loss of income sources or means of livelihood, whether or not the affected people must move to another location.

ESS5 applies to all components of a bank-funded project that result in involuntary resettlement, regardless of the source of financing. It also applies to other activities resulting in involuntary resettlement that in the judgement of the Bank are:

i. directly and significantly related to the Bank-assisted Project;
ii. necessary to achieve its objectives as outlined in the project documents; and
iii. carried out, or planned to be carried out, contemporaneously with the Project.

ESS5 provides guidelines to project proponents on land acquisition, restrictions on land use, and involuntary resettlement. ESS5 will apply where involuntary resettlement, impacts on livelihoods and assets, acquisition of land, or restrictions to natural resources may occur due to the Project. The requirements of ESS5 includes:

- Involuntary resettlement is avoided or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives;
- The Project avoids forced eviction;
- To mitigate unavoidable adverse social and economic impacts from the land acquisition or restrictions on land use by:
- Providing timely compensation for loss of assets at replacement cost, and
- Assisting displaced persons in their efforts to improve, or at least restore their livelihoods and living standards in real terms, to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher.
- To improve living conditions of poor vulnerable persons who are physically displaced by providing adequate housing access to services and facilities, and security of tenure.
- To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the Project, as the nature of the Project may warrant.

- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.

Also, ESS5 provides eligibility criteria and it states that affected persons may be classified as persons:

- Who have formal legal rights to land or assets;
- Who do not have formal legal rights to land or assets, but have a claim to land or assets that is recognized or recognizable under national law; or
- Who have no recognizable legal right or claim to the land or assets they occupy or use.

ESS5 also addresses issues of grievances that may emerge as a result of the implementation of certain project activities. Firstly, the proponent must ensure that a grievance mechanism is in place as early as possible in the project development phase to address specific concerns about compensation, relocation, or livelihood restoration measures raised by displaced persons (or others) in a timely fashion. Where possible, such a grievance mechanism will utilize existing formal or informal grievance mechanisms suitable for project purposes, supplemented as needed with project-specific arrangements designed to resolve disputes impartially.

JICA Guidelines

According to the JICA Guidelines for Environmental and Social Considerations 2010, projects should not deviate significantly from the World Bank's Safeguard Policies which the document referred to as the benchmark standards for international financial organizations. Therefore, the World Bank safeguard policy, which has now been changed or updated to World Bank Environmental Social Standards, will be considered to be substituted for the World Bank's Operational Policies.

For the JICA Guidelines, projects that result in large-scale involuntary resettlement required a Resettlement Action Plan (RAP) to be submitted. The following are outlines for involuntary resettlement in the JICA Guidelines:

- Involuntary resettlement and loss of livelihood are to be avoided when feasible by exploring all viable alternatives. After such an examination, avoidance is proved unfeasible, effective measures to minimize impact and compensate for losses must be agreed upon with the people who will be affected.
- People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. on time. Prior compensation must be provided as much as possible at full replacement cost. Project proponents must

enable people affected by projects to improve their standard of living, income opportunities, and production levels, or at least restore these to pre-project levels. Measures to achieve this may include: Providing land and monetary compensation for losses (to cover land and property losses), Supporting means for an alternative sustainable livelihood, and Providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.

- Appropriate participation by affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.
- For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. In preparing a RAP, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When talks are held, explanations must be given in a form, manner, and language that are understandable to the affected people. The RAP should include elements laid out in the ESS5.

3.2 Legal Framework

There are a number of legislative and regulatory instruments in Sierra Leone that are pertinent to the Project's land acquisition and resettlement activities. These are outlined below:

- National Constitution of Sierra Leone (1991): Section 21 provides guidance on protection of the fundamental rights of citizens with respect to the deprivation of private property;
- Public Lands Ordinance Law (1998): GoSL can acquire land for development purposes and provides for payment of compensation to those affected;
- Compulsory Acquisition of Property Act (1961): Section 15-20 provide guidance on appropriate mechanisms for compensation in relation to compulsory acquisition of property;
- Environmental and Social Regulations for the Mineral Sector (2013): Part IV, Sector 21 makes regulations for projects involving resettlement. It prescribes that where a project involves the potential for resettlement, the Executive Chairman of the Environmental Protection Agency (EPA) or Authorized Officer shall refer the Social Impact Assessment (SIA), the Social Management Plan (SMP) and the Resettlement Management Plan (RMP) to the appropriate authority responsible for resettlement for its consideration.

3.3 Gap Analysis: National Laws, World Bank ESS5 and JICA Guidelines

This section assesses the gaps and discrepancies between Sierra Leonean laws, the the World Bank ESS5 and JICA Guidelines. Where there is a discrepancy between national policy and the World Bank policies, under this Project, the JICA Guidelines and the World Bank's requirement will take precedence as part of the gap-filling measures in the implementation summarized in Table2.

Common Principles

Generally, both the donors and the policy of GoSL support the following basic principles:

- Involuntary resettlement shall be avoided or minimized to the extent possible by incorporating social consideration into design options and alignment selections.
- Where displacement is unavoidable, i.e. people losing assets, livelihood, and other resources, shall be assisted in improving or at a minimum regaining their former status of living at no cost to themselves.

Table 2: Comparison of the Laws of Sierra Leone, World Bank ESS5 and JICA Guidelines concerning land acquisition, restriction on land use, and involuntary resettlement.

Category	The Laws of Sierra Leone	World Bank ESS5	JICA Guidelines	Gap filling measures under the Project
Landowners	Cash compensation based upon market value under the statute. Land for land under Customary Law	Recommends land for-land compensation of equal productive use or potential, located in the vicinity of the affected land or new sites of similar or better value plus transaction costs such as registration, transfer taxes or customary fees. Or compensation is the Market value of the equivalent area and use, with similar or improved infrastructure and services, located in the vicinity of the affected land plus all transaction costs.	Land and monetary compensation for losses (to cover land and property losses)	JICA Guidelines and ESS5 will be followed
Land Tenants	Entitled to compensation based upon land under the statute	PAPs are entitled to resettlement assistance in lieu of compensation for land, to help improve or at least restore their livelihoods.	Supporting means for an alternative sustainable livelihood and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.	JICA Guidelines and ESS5 will be followed - Land tenants receive compensation irrespective of the legal recognition of their occupancy and any other livelihood restoration measure that will be agreed upon.
Land Users, Farmers, Gardeners	Entitled to compensation for crops and all other forms of improvements made to the land. Land for land under customary.	Entitled to compensation for crops, may be entitled to replacement land and livelihood must be restored to pre-project levels at least.	Provide the expenses necessary	provisions are almost the same. - other livelihood restoration arrangements to pre-project levels that will be agreed upon.
Owners of Non-Permanent Buildings	Cash compensation based on market value under the statute.	Entitled to in-kind compensation or cash compensation at full replacement cost including movement allowance, livelihood assistance for income loss, etc.	Land and monetary compensation for losses (to cover land and property losses)	JICA Guidelines and ESS5 will be followed
Owners of Permanent Buildings	Cash compensation based on market value.	Entitled to in-kind compensation or cash compensation at full replacement cost including labour and relocation expenses, before displacement.	Land and monetary compensation for losses (to cover land and property losses)	JICA Guidelines and ESS5 will be followed

Crops	Cash compensation based upon rates established as the one-year net agricultural income.	Market value for lost crops.	Provide the expense necessary	JICA Guidelines and ESS5 will be followed - the RAP Implementation Committee (RIC) set up to handle crop compensation matters shall mediate between the parties for the farmer to accept cash compensation as per market value.
Timing of compensation payment	Prompt	Prior to displacement	At resettlement sites.	Compensation payments must be paid prior to displacement.
Calculation of compensation	Fair and adequate.	Full replacement cost	Full replacement cost	The Full Replacement Cost Approach will be adopted for the calculation of compensation. No depreciation will be considered. Full replacement cost will include labour, relocation expenses and administration costs of the relocation.
Squatters	No provision for PAPs with no claim whatsoever to land. Are deemed not to be eligible and therefore not entitled to any compensation.	Are to be provided resettlement assistance and compensation for lost or damaged structures, and trees or crops they planted (but no compensation for land itself)	Expense necessary for relocation	Squatters are to be provided resettlement assistance and compensation for crops, trees and structures (but no compensation for land)
Grievances	Formal and informal mechanisms and formal access to court of law.	Functional, effective, transparent and accessible grievance redress mechanisms to be established	Appropriate and accessible grievance redress mechanisms must be established for the affected people and their communities	Functional, effective, transparent and accessible grievance redress mechanisms to be established
Consultation and information disclosure	The owner/occupier of the land must be formally notified at least a week in advance of the intent to enter, and be given at least 24 hours' notice before actual entry	Displaced persons and their communities are provided timely and relevant information, consulted on resettlement options, and offered opportunities to participate in planning, implementing, and monitoring resettlement.	Consultations must be held with the affected people and their communities based on sufficient information made available in them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people	JICA Guidelines and ESS5 will be followed.

3.4 Institutional Framework of Land Acquisition and Resettlement

The institutional responsibilities related to land acquisition and resettlement in Sierra Leone as applicable under the Project are summarized in ***Table 3*** below.

Table 3: Institutional responsibilities related to land acquisition and resettlement

Institution	Responsibility
The Ministry of Energy	• Provides general Project oversight • Shall ensure that funds for the timely implementation of the RAP/ARAP are available • Minister can expropriate land for energy-related projects
The Ministry of Finance	• Relates with the central Bank to pay PAPs
EDSA	• Primary responsibility for ARAP implementation • Superintends the grievance redress process • Reviews and approve compensation rates • Present compensation rates to PAPs for signing off • Reviews reports on the completion of compensation payments • Responsible for ARAP Implementation • Assign safeguards personnel to contractors • Ensure that Project implementation complies with JICA Guidelines and World Bank's safeguards • Report to JICA on all aspects of environmental and social management and monitoring based on the results of ARAP monitoring and take corrective measures where necessary
The Ministry of Lands Housing and Country Planning	• Manages state land • Compulsory land acquisition for development projects • Prepare survey plans for EDSA in the event there is land acquisition • Verify survey/title claims • Participate in stakeholder consultations • Validation of property valuation
The Sierra Leone Roads Authority	• Manages RoW • Verify claims on RoW • Support demolition of structures on RoW
Western Area Rural District Council	• Valuation for land compensation • Involve in Project grievance redress process
Local authorities (Paramount Chiefs, Town Chiefs, opinion leaders, and councillors)	• Responsible for local policy matters; • Resolving local conflicts; • Provide orderly leadership at the local level
The Ministry of Agriculture and Forestry	• Determines rates for crop compensation
Law Officers' Department	• Draft compensation agreements • Guide grievance resolution • Participate in compensation sign-off meetings
Sierra Leone Police	• Provides security during the demolition of structures

4. Summary of Census and Socio-economic Surveys

Baseline census and socio-economic data was collected to help identify and evaluate the social impact, risks and opportunities of the Project that would help in developing mitigation measures for such impacts. Through these surveys, ownership status of all assets and earnings that will be impacted by the project will also be identified for mitigation.

4.1 Methodology

A census was conducted first to identify the number of people affected by the project and recorded up to x PAPs along the distribution line route and on the secondary substations. The census was then followed by a socio-economic study and obtained information regarding their socioeconomic conditions which will be used by EDSA to design compensation and resettlement assistance package.

4.1.1 Overview of the Questionnaire

The survey instrument used comprised 8 sections which captured information on the following themes:

- population and demographic;
- income from primary and secondary sources;
- tenure status of PAPs;
- health conditions;
- housing;
- inventory of land and structure losses;
- agriculture;
- business.

4.1.2 Data Collection and Analysis

Data collection was carried out by enumerators and supervised by senior staff after a brief explanation of the objective and importance of the survey exercise. After consent was granted by the identified PAPs, the questionnaire administration was initiated. The questionnaire which comprised 8 sections was administered to each

household head of all PAPs covering the themes mentioned above. Out of the x PAPs interviewed, y are females and z males.

The answered questionnaires were cross examined by the supervisors to make sure they are correctly filled and then were analyzed.

4.2 Ethical Consideration

The survey team observed the following ethical principles to protect and promote human rights and dignities of people affected by the project:

· voluntary participation;

· informed consent;

· maintaining anonymity and confidentiality.

All the PAPs participated voluntarily with no coercion or embellishment. Information supplied was of their volition. PAPs were informed about the data collection exercise using the questionnaire developed. Those PAPs who consented were granted the interview. Those who declined were neither forced nor threatened but were politely talked to before leaving their premises. Table 3 below is a summary of the survey results by major indicator themes.

Table 3. Summary of survey results

5. Eligibility and Entitlements

5.1 Eligibility Criteria

According to the JICA Guidelines and the World Bank ESS5, the criteria for determining PAPs eligibility are as follows:

- Those who have formal legal rights to the land or assets they occupy or use;
- Those who do not have formal legal rights to the land or assets but have a claim to land that is recognized or recognizable under national law. Communal lands usually fall in this category;
- Those who have no recognizable legal right or claim to the land or assets they occupy or use. The squatters and encroachers will fall into this category.

However, all these categories should be or have their assets or interest in the Project area before the cut-off date is announced.

Any person who suffers a loss of, or damage to an asset or loss of access to productive resources or restricted access (temporarily), as a result of the carrying out of the Project for the extension of power distribution system, will be considered eligible for compensation and/or resettlement assistance provided the damage or loss is induced by the Project and satisfies the conditions of eligibility including the cut-off date.

The eligibility will be based on the category of losses at the cut-off date identified through the various interest and rights derived from common law and international conventions and in specific cases as agreed with the affected community. Eligible persons would include, but not be limited to, those listed in ***Table 4***.

Table 4: Type of Loss and Eligible Persons

Type of Loss	Eligible persons
Loss of Land	Various interest and rights – allodial titleholder, usufruct, freeholder, leaseholder, tenant, licensees
Loss of Structure	Various interests and rights – freeholder, leaseholder, etc.
Business Losses	
Loss of business income	Business owner/operator
Loss of business goodwill	Business owner/operator
Loss of rent income	Landlord/Lessor
Loss of wage income	Business employees/attendants
Loss of fees from trainees or apprentices	Trainer/Person offering apprenticeship job training

Loss of Business, Residential or Industrial Accommodation or Room	Residential/Commercial/Industrial Tenant Owner of a building during the reinstatement period
Loss of location for a temporary structure	Owner of a temporary structure
Loss of training or apprenticeship	Apprentice/Trainee
Loss of economic or perennial trees Loss of food crops Loss of grazing land	Various rights and interest holders – farm owner, Sharecroppers, Licensees, Lessees

5.2 Cut-off Dates/Moratorium

A cut-off date is designed to serve as cut-off period for a project's obligation to compensate affected, eligible assets, and is based on proper disclosure. In another sense, it is the closing of the database of identified PAPs to establish a limit to eligibility. EDSA will gazette the cut-off date in parliament.

People who would occupy the ROW after a cut-off date is established are not eligible for compensation and/or resettlement assistance, but it should be noted that there is a limit to which a cut-off date can prevent people from developing their properties. When a project is significantly delayed the survey results will become outdated.

The following steps were taken to declare a cut-off date for the project:

The cut-off date was established by the RAP team as xrd July 2022 for all the communities. This was done in conjunction with EDSA, making anyone who makes a claim for loss of land or any assets after such a date ineligible for expropriation/compensation. This was in addition to the process of valuation that established a cut-off date directly for PAPs at an individual level during asset registration.

The cut-off date strategy included the following measures:

- cut-off date handout bearing grievance redress procedure given to PAPs during meetings;
- A0-A1-A4 sized posters on the cut-off date, the GRM, and Engineering design were displayed at the community meetings and were later given to Councilors to paste at the community centers of affected communities. While the A0 and A1 poster were pasted at the community centers, the A4 illustrations were given to PAPs as hand outs and take away;
- consultation with local leaders, Chiefs and Headmen, WARD Counsellor and relevant organizations (XX Organization) within the project area.

5.3 Eligibility and Entitlement

Table 5 presents the eligibility criteria and entitlement matrix for the general categories of impacts. The resettlement/livelihood plan for this Project will only consider impacts applicable to the Project.

Table 5: Eligibility criteria and entitlements

Affected Assets	Type of impact	Entitled units	Eligibility criteria	Entitlement
Land	Permanent acquisition of land, i.e., leasing of land	Landowner (individual, family, community/stool)	Owns the affected plot of land under Sierra Leone laws, including customary	1. Land for land (of equivalent productivity, location advantages, and acceptable to PAPs) including transaction cost, transfer taxes, etc. or 2. Cash compensation as agreed among the parties via negotiation or prevailing market rates.
	Temporary occupation of land	Landowner (individual, family, community)	Owns the affected plot of land under Sierra Leone laws, including customary	1. Compensation (in cash or kind) for the period of occupation as agreed among the parties via negotiation.
	Renters	Renter (Individual, family)	Rent land for farming, business or any livelihood activities etc	Are entitled to resettlement assistance in lieu of compensation for any improvement or undertaking on land, to help improve or at least restore their livelihoods
Crops (food/cash crops and economic trees inclusive)	Destruction of/ damage to standing crops	Owner or Farmer	Have grown the affected crop (regardless of related plot ownership)	1. Cash compensation for standing crops counted at the valuation date and based upon updated market rates, and 2. Disturbance allowance of 10% of (1)
Structures	Destruction of immovable structures	Owner - permanent	Owns affected structure	1. Compensation at full replacement cost (no depreciation) of structure, including the cost of registration, transfer taxes 2. right to salvage

Affected Assets	Type of impact	Entitled units	Eligibility criteria	Entitlement
				3. Cost of moving (e.g. personal goods in the structure and/or belonging to the owner) 4. Disturbance allowance of 10% of (1)
		Occupant - permanent	Live in or use the affected structure on a rental basis (Occupant different from owner)	1. Cost of renting a similar structure (e.g. for 6 months duration) 2. compensation for any non-movable asset at full replacement cost 3. Cost of moving out to a new place 4. Disturbance allowance of 10% of (1)
	Structure - temporal	Owner and occupant	Lives or use structure but may be restricted access due to Project operations though the structure itself may not be affected	1. Alternative route for ease of access 2. Disturbance allowance as negotiated with the PAP
	Relocation of movable structures	Owner	Owns the affected structure	1. Cost of moving affected structure to a new site 2. Disturbance allowance of 10% of (1)
		Occupant	Use or occupies the affected structure	1. Cost of moving occupants to a new site 2. Disturbance allowance of 10% of (1) (NB: if the owner is the same as the occupant, he/she will not be entitled to this disturbance allowance).
Livelihoods	Agriculture - the destruction of economic or cash crops	Farmer	Use affected land for farming as livelihood sources (emphasis on perennial crops. Annual crops can be harvested	1. Cash compensation for any temporary loss of income or livelihood incurred as a result of the project during the transition period (period required to reestablish farm at a new location agreed upon).

Affected Assets	Type of impact	Entitled units	Eligibility criteria	Entitlement
			prior to land entry or destruction)	
	Businesses	Business person (may be distinct from owner of a structure where business takes place)- permanent loss	Operate a business on Project affected land, regardless of the land ownership situation (includes squatters)	1. Compensation of structures at full replacement value. 2. right to salvage materials 3. cost of moving to a new location 4. Disturbance allowance of 10% of (1)
		Business person (may be distinct from owner of a structure where business takes place)- temporal loss	Operate a business on Project affected land, regardless of the land ownership situation (includes squatters)	1. Cash compensation of temporary loss of income and livelihood based on daily income and duration works before re-establishment of the business to pre-Project conditions.
	Use of communal resources	The user of such resources (can be individuals or communities)	Use communal resources as an element of livelihood	1. Assistance in identifying and accessing similar resources elsewhere 2. Cash compensation of temporary loss of income incurred because of the Project during the period required to access similar resources elsewhere/period required to provide alternative livelihood assistance

6. Approach and Procedure for Valuating Assests

6.1 The Process of Valuation Inspection/Referencing

Key points that the valuation will cover are as follows:

i. Collection of all relevant primary and secondary data on the affected property during final detailed valuation inspection and referencing to serve as the basis for assessment of loss; and
ii. A comprehensive primary database for monitoring, evaluation and audit.

Some relevant data to be captured by the valuer will be:

1. For Land
   - Capture location details of the land
   - Identify the boundaries of the area/section of the land to be affected.
   - Take detailed measurements of the land area to be affected along the affected boundaries.
2. For Buildings (Immovable Structures)
   - Photograph all affected immovable properties
   - Precise internal measurement of buildings should be done
   - Collate property details which will include noting affected accommodation details, constructional details of affected parts and external works (fence walls, gates, pavements), affected owner's details, etc.
3. For Temporary Structures (Movable Properties)
   - Collate data on temporary structures by categorizing temporary structures based on constructional details (wall materials, affixed to concrete slabs or not), size of the structure and use of structure (business/residential) and type of business.
4. Intangible Assets (loss/impact arising from disturbance)
   - Obtain relevant data on households affected (tenants, owners, relatives), apprentices/trainees and determine intangible loss on households, businesses and livelihoods.
5. For Crops
   - During the inspection and enumeration exercise, details such as type, age, stage of growth, size of farm (or the number of crops for isolated economic/perennial trees), nature of the farm, etc. should be captured.

6.2 Identification and Categorization of Loss and Impact

PAPs should be identified by the types of losses they suffer or the project's impact on them. PAPs should not be limited to renters, tenants, farmers, and others who don't own their housing/field/etc. but will be displaced. The resettlement consultant will:

1. Ensure that identification and categorization of the likely loss or impact is undertaken during the planning and design stages of the project;
2. Establish the magnitude and coverage of impacts early in the project planning to justify adopting the resettlement instrument. A general categorization of losses will be done to reflect the extent of loss in terms of the following:-
   - Permanent or Temporary Loss;
   - Full or Partial Loss;
   - Minimal or Significant Loss.
3. Determine specific losses or impacts to reflect the exact nature of loss, whether visible and tangible or intangible and categorize into the following losses: -
   - Physical loss of assets which will be determined by assessing the interest or right to ownership, occupation and possession;
   - Loss of income, loss of livelihood and opportunities to employment; and
   - Impacts arising from disturbance/disruptions.

6.3 The Basis and Method of Valuation

The valuation basis would comply with the JICA Guidelines and the World Bank ESS5. Compensation will be assessed and granted at Full Replacement Cost. The methods for valuation for the various losses are presented in ***Table 6***.

Table 6: Method of Valuation

Type of Loss	Method of Valuation	Basis
Loss of land	Land for land of equal productive use or potential, located in the vicinity of the affected land or new housing site plus the cost of preparation to levels similar to or better than those of the affected land, and transaction costs such as registration and transfer	Based on the market value of comparable recent land transactions

	taxes. orcomparative sales method	
Loss of buildings (any type of structure, e.g., mud houses, wooden structures, sandcrete block houses, public buildings etc)	Replacement cost method or comparative sales method (whichever gives a commensurate value)	Full replacement cost value as if new – recent construction cost rates. No depreciation will apply.
Loss of trees, perennial crops, food/ cash crops	Comparative sales method/ replacement cost method	Based on ongoing market rates. Crop rates will consider the stage of the crop and the number of years to maturity before such trees will begin to generate income, including the cost of labour and equipment invested in crop cultivation.
Loss of business income and loss of business goodwill	Comparative method	Based on the average monthly net profit
Loss of income from rent and expenditure incurred for alternative accommodation during the reinstatement period	Comparative sales method	Based on the comparable rent passing, rent advance paid
Expenditure incurred for transfer of chattels, movable properties and temporary structures	Comparative method	Based on truck/ transport hiring charges
Loss of wages Loss of fees from apprentice Loss of Job training	Comparative method	Estimated income of the business or daily sales of the business; and Estimated period of construction which will disrupt business or commercial activity. Losses of income for businesses will be estimated from net monthly/annual profit of the business verified by an assessment of visible stocks and activities.

Loss of access to natural resources	Access to similar resource elsewhere taking into consideration impacts at the alternative location. Cash compensation at replacement cost when it is demonstrated that there is no feasible alternative measures available.	Full replacement cost

6.4 Consideration for Vulnerable Groups

6.4.1 Identification of vulnerable groups

Vulnerable groups are those at risk due to the displacement, compensation, and resettlement process. There may also be some PAPs who are already vulnerable based on their existing conditions such as poor health, disability, old age, etc., project impact could worsen their condition. During the census, the project should identify such persons for the resettlement/livelihood plan. In preparing the resettlement/livelihood plan, the following categories of PAPs shall be given special considerations:

- The elderly, usually from 70 years and above;
- Widows, Women and children;
- Physically challenged persons;
- Mentally challenged/highly depressed persons;
- Affected Persons who are too ill, bedridden, hospitalized or stricken with HIV/AIDS;
- Unemployed youth;
- Female-headed households; and
- Migrant without proper land documents.

6.4.2 Assistance to vulnerable persons

Assistance to vulnerable persons will be outlined in the resettlement/livelihood plan following the census and may take various forms depending on the circumstance of their vulnerability and needs. Assistance to vulnerable people may include but not limited to the following:

Similar to all PAPs, assistance in financial literacy training, especially for women and assistance in compensation payment procedures (e.g. going to the bank with them to cash the compensation cheque);

- Assistance in the post-payment period to secure the compensation money and reduce risks of misuse/robbery;
- Assistance in moving: providing vehicle, driver and assistance at the moving stage;
- Where compensation is determined in-kind payment, vulnerable persons should be paid in cash if they so desire;
- Access to Health insurance and assistance to medical facilities for critically ill PAPs.
- Moving and rent subsidy for the transition period.

7. Community Participation

7.1 Objectives of Stakeholder Engagement and Information Disclosure

The World Bank ESS10 provides the following objectives of the Stakeholder Engagement and Information Disclosure process:

- To establish a systematic approach to stakeholder engagement that will help borrowers identify stakeholders, build and maintain a constructive relationship with them, in particular, Project-affected parties;
- To assess the level of stakeholder interest and support for the Project and to enable stakeholders' views to be taken into account in Project design and environmental and social performance;
- To promote and provide means for effective and inclusive engagement with Project-affected parties throughout the Project life cycle on issues that could potentially affect them;
- To ensure that appropriate Project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and fair manner and format;
- To provide Project-affected parties with accessible and inclusive means to raise issues and grievances and allow borrowers to respond to and manage such grievances.

7.2 Stakeholder Engagement and Participation Strategy

The key elements of the stakeholder engagement and information disclosure strategy for the Project will include the following:

i. disclosure of important Project related information by the implementing agencies on its website and at the appropriate local level and other disclosure procedures agreed with JICA;
ii. a framework for consultation with the key stakeholders including the affected communities, important local leaders and energy user groups (e.g., local business associations) during planning, design and implementation of the Project;
iii. ensuring free, prior, informed consultation with the affected communities and key energy user groups and their representatives for obtaining broad community support;

iv. the establishment of a GRM at the national and Project site levels (to be managed by EDSA in concert with WARD Council) to meet specific grievance redress requirements of operations/Project. 7.4 Stakeholder Engagement during Preparation of Resettlement Framework

8. Monitoring and Evaluation

The monitoring arrangements are intended to track the resettlement/livelihood implementation performance and will consist of both internal and external monitoring. The MoE will have the overall responsibility for Project coordination, monitoring, and reporting on results achieved in the Project.

8.1 Internal Monitoring and Reporting

Internal monitoring of the resettlement/rehabilitation operations will be undertaken by EDSA following the schedules (including identification of PAPs, land acquisition, compensation of PAPs, and how these PAPs have participated in the Project resettlement preparation and implementation) to be outlined in the resettlement/livelihood plan. The Environmental and Social Management Unit of EDSA is primarily responsible for monitoring resettlement activities. However, the Supervising Engineers will conduct the day-to-day field supervision and capture in the monthly and quarterly progress reports subject to review by EDSA. EDSA will produce quarterly reports for the MoE and JICA.

8.2 External Monitoring and Reporting

The Project shall incorporate external monitors. Independent monitoring shall be commissioned for the Project. Civil Society Organizations (CSOs) are often suitable for such task. The independent monitor shall monitor engagements with the PAPs until compensation payments are made and the demolition of affected properties is concluded. This task will be carried out in parallel with implementing the resettlement/livelihood activity.

As part of promoting greater community participation and involvement in the Project and encouraging a sense of ownership, the local council (WARD Council) and Project communities should be involved in monitoring resettlement implementation. For this purpose, they need to be adequately sensitized on land issues and transfer procedures and conditions governing such transfers. This will create a better understanding of the land issues related to the Project.

The monitoring system will:

- Inform the Environmental and Social Management Unit of EDSA on the progress and performance of the land acquisition;

- Number of households enrolled for the livelihood restoration program
- Document timely completion of the Project resettlement obligations for all permanent and temporary losses, as well as unanticipated, additional construction damages;
- Status of ongoing income restoration activities;
- Number of vulnerable households supported during the transition period; and
- Records on grievances received, number of grievances resolved, number of grievances pending resolution, number of Project grievances escalated and forwarded to the Law Court;

8.3 Monitoring Indicators

While taking lead responsibility, MoE and the Environmental and Social Management Unit of EDSA shall track the preparation and implementation of the Resettlement/livelihood plan. They shall closely monitor the following indicators as shown in *Table 7*.

Table 7: Sample Resettlement/Livelihood Monitoring Indicators

No.	Monitoring	Specific Indicator	Frequency
1.	Social and Economic Monitoring	Provide the number of PAPS: i) Whose livelihoods have been restored to pre-Project level, ii) whose livelihoods have improved beyond the pre-Project level, iii) whose livelihoods are worse than the pre-Project level	Monthly until the end of Resettlement/Livelihood implementation
2.	Private Structures	Provide the number of PAPs: i) whose livelihood has been restored to pre-Project level, ii) whose livelihoods improved beyond the pre-Project level, iii) whose livelihood are worse than the pre-Project level	Monthly until the end of Resettlement/Livelihood implementation
3.	Public Structures	Provide the number of PAPs: i) whose livelihoods have been restored to pre-Project level, ii) whose livelihoods have improved beyond the pre-Project level, iii) whose livelihoods are worse than the pre-Project level	Monthly until the end of Resettlement/Livelihood implementation

No.	Monitoring	Specific Indicator	Frequency
4.	Economic Crops	Track progress on: i) number and type of economic crops planted by affected farmers, ii) number of farmers who have restored their income to pre-Project level, iii) the number of farmers who have not restored their income to pre-Project level, iv) the number of farmers whose income has been restored beyond the pre-Project level, v) the number of affected farmers who have changed their livelihoods from farming to other livelihood activities.	Monthly until the end of Resettlement/Livelihood implementation
5.	Assistance to Businesses	Track progress on: i) number of affected businesses that have resumed business operations, ii) number of businesses that have restored net income to pre-Project levels, iii) number of businesses that have restored their net income beyond the pre-Project level, iv) number of affected businesses that have not resumed operations	Monthly until the end of Resettlement/Livelihood implementation
6.	Vulnerable Groups	Provide the number of vulnerable PAPs: i) whose livelihoods have been restored to pre-Project level, ii) whose livelihoods have improved beyond the pre-Project level, iii) whose livelihoods are worse than pre-Project level, iv) who have received assistance from the special package, v) who are sick and who benefitted from health service in the Project area, vi) the number of disabled-friendly facilities constructed by the Project such as access ramps from the main road to their living quarters or neighbourhood.	Monthly until the end of Resettlement/Livelihood implementation
7.	Tenants	Provide the number of affected tenants: i) who have found new rental places, ii) who reported that the rental allowance is inadequate, iii) who showed satisfaction	Monthly until the end of Resettlement/Livelihood implementation

No.	Monitoring	Specific Indicator	Frequency
		over their new rental places compared to the ones they occupied before the Project, iv) the number of tenants who have not yet found rental places.	
8.	Grievances and grievance management system	Track grievances and report: i) number of cases at each impact location, ii) the number of cases resolved, iii) number of cases pending, iv) reasons for pending cases, v) frequency of GRM meetings, vi) description of compliance to GRM procedures	Monthly until the end of Resettlement/Livelihood implementation

8.4 Evaluation (Completion Audit)

An audit will be done to determine whether the efforts to restore the living standards of the affected population have been adequately designed and executed. This completion audit will verify that all physical inputs earmarked in the Resettlement/Livelihood have been delivered and all services provided. The audit will also evaluate if the mitigation actions prescribed in the Resettlement/Livelihood plan have had the desired effect. The baseline conditions of the affected parties before the relocation will be used as a measure against their socio-economic status after the resettlement.

The exercise shall provide the feedback needed to adjust the resettlement/livelihood plan and take corrective action. The evaluation shall have the following specific objectives:

- General assessment of the implementation of resettlement activities;
- Examine compliance of the implementation of resettlement activities with national laws, regulations, JICA Guidelines and World Bank ESS5;
- Assessment of resettlement and compensation procedures as outlined in the RF and ESS5;
- Evaluation of the impact of the resettlement and compensation programs on PAP incomes and standards of living, with focus on the "no worse-off if not better-off" requirement;
- Identify actions to be taken as part of the ongoing monitoring exercises to improve resettlement/livelihood implementation.

9. Grievance Redress Mechanism

9.1 Introduction

A systematic and functional Grievance Redress Mechanism (GRM) should be adopted to address the concerns of PAPs and other residents. Such a mechanism should detail the processes involved in registering grievances at no cost to the PAPs. In the context of this RF, a grievance could mean a simple query or inquiry, concern, issue, or formal complaint that bothers or disturbs the lives of PAPs. The levels of the GRM should be well publicised as a way of educating PAPs and other residents on the process. However, alternative means of access will be the public information centres that will be established at various Project communities. At the same time, information about where complaints can be lodged shall be incorporated into all compensation and/or livelihood restoration agreements. There is a wider public understanding and acceptance of the mechanisms proposed for grievance redress. Similar information will be published on public notice boards communicated verbally at all public meetings and outreach sessions.

9.2 Rationale for GRM

The primary purpose of the GRM is to hear the complaints or address the concerns of PAPs and related communities to a fair extent and on time. Dissatisfaction can cause an aggrieved PAP or resident to act beyond expectations, culminating in some unforeseen repercussions that would negatively affect Project implementation and stall Project progress. Consequently, the GRM proposed for this Project seeks to achieve the following objectives:

- Encourage registration, acknowledgement, and recording of all concerns or issues raised by the PAPs or stakeholders;
- Identify the frequencies of issues raised: for instance, unpaid compensation, inadequate compensation, disregard for local ritual ceremonies, land acquisition and many more;
- Ensure that complaints are appropriately registered, tracked and documented, with due regard for confidentiality;
- Address the composition of a committee that would handle all grievances;
- Inform people of the public information centre establishment and access;
- Establish procedures for the GRM to enhance easy access, transparency and accountability, and tackle escalation of grievances beyond expectations;

- Manage the concerns raised by PAPs to achieve a win-win situation within a reasonable timeframe that would comply with national and international best practices; and
- Record all resolutions agreed upon by all parties involved and ensure that aggrieved persons are satisfied with every outcome of remedial resolution to foster harmony in the Project's implementation.

9.3 GRM Institutional Framework

A functional Grievance Redress Mechanism (GRM) exists within EDSA for the ESURP and ESURP-AF Projects. Residents within the Project area (Western Area) are very convenient with its procedures. Therefore, it is advisable to adopt the same structure for this Project.

This GRM is very systematic and functional to address the concerns of PAPs. Such a mechanism details the processes involved in registering grievances at no cost to the PAPs. The levels/tiers of the GRM shall be well publicised to educate PAPs and other residents on the process. However, alternative means of access will be the public information centres that will be established at the councillor's office. At the same time, information about where complaints can be lodged shall be incorporated into all compensation and or livelihood restoration agreements so that there is a wider public understanding and acceptance of the mechanisms proposed for grievance redress. Similar information should be published on public notice boards communicated verbally at all public meetings and outreach sessions.

The grievance redress process shall follow the following principles:

- Simplicity: procedures in filing complaints are understandable to users and easy to recall;
- Accessibility: filing complaints is easy through means that are commonly used by stakeholders, especially by the PAPs;
- Transparency: information about the system is made widely available to all stakeholders and the general public;
- Timeliness: grievances are attended to and resolved on time;
- Fairness: feedback or complaints are validated thoroughly and subjects of complaints are given due process and opportunities for appeal;
- Confidentiality: the identity of complainants remains confidential;
- Provide multiple uptake points to build trust and confidence in the GRM. Complainants will be provided with multiple channels to submit their complaints;

- Develop a simple system (possibly electronic-based) for receiving, sorting, verifying, and tracking complaints about more effective management of grievances; and
- Publicly disclose the complaints/grievance redress arrangements so that people are aware of where and how complaints will be managed.

9.3.1 Grievance Procedure

A Grievance Redress Committee (GRC) shall be established and composed of MoE, EDSA, WARD councillors, traditional chiefs, and WARD committees before the commencement of construction site works and the Engineering, Procurement and Construction (EPC) contractors shall be briefed of the GRM system. The GRC will be headed by a grievance redress officer at the EDSA and steps will be taken to ensure that all grievances are appropriately documented and updated in a database for tracking of resolution.

The GRC members may require some capacity in managing grievances. Therefore, a budget will be allocated for training and sitting allowances for the GRC members.

Overall, the grievances management steps will include the following:

- Lodge complaints through a phone call, text message, WhatsApp, in-person directly to community influencers, the grievance redress officer at the EDSA or the appeals committee all at the Project level.
- Acknowledgement and registration of complaints within 2 days
- The investigation, verification, and determination of resolution options. Complaints shall be acted upon within fourteen (14) working days;
- Provision of feedback to the stakeholder regarding resolution and progress towards resolution and complainant satisfaction within 2 days of receipt of resolution outcome
- Final resolution -tracking and documenting actions and outcomes in the database and with the stakeholder;
- Where a PAP is fully satisfied with the resolution process, the matter will be formally closed.

If the complainant is not satisfied with the mediation at the community and EDSA levels, a referral to an appeals committee is required at all the Project levels. While the Project will undertake reasonable efforts to resolve all grievances within the Project structures, complainants will still have the right to resort to the court of law to get a final settlement where the resolution offered by the Project is not accepted.

EDSA should maintain all records of grievances in a database. The scope of reporting should include:

- Quarterly reporting of grievance mechanism data
- The types of complaints received, response times, offers of the resolution, and acceptance and complaints resolved vs. appealed
- Whether the Project worked to improve processes to eliminate the issue causing a repeated concern
- Track any unresolved or illegitimate complaints where a resolution was offered but not accepted.
- Timeframe to analyze the effectiveness of the GRM and make changes as appropriate

9.3.2 Levels of Grievance Resolution

Tier 1: Ward councillors and other community influencers shall be the first level to resolve grievances. Councillors, chiefs, headmen, and other community stakeholders are known community structures for dispute resolution who reside in their local communities to be engaged by PAPs more easily. PAPs prefer this easy access and familiar means to settle disputes in their communities. However, to ensure effective grievance management at this level, the councillors should be trained on the resettlement/livelihood processes (***Figure*** 2).

Tier 2: When grievances are not resolved at tier 1, PAPs can file a complaint to any person at tier 2. Also, PAPs can directly report a grievance to tier 2. A PAP shall file grievances using a complaint form (***Annex iii***) for sample form). All complaints received in writing (or written when presented verbally) and processed through the stages identified in the GRM, will be recorded in a register or log sheet by the Environmentalist at EDSA and updated in a database. The register presents the date of the complaint, the name of the complainant, the community she/he is from, a description of the complaint, and the actions taken to address the grievance (which shall also note the status of the grievance).

Acknowledgment of receipt of grievance reports should be within seven working days. Outcomes from the decision should be provided within fourteen (14) working days of receiving the complaints, which should be communicated to the PAP. Once a grievance or complaint has been resolved or being escalated, the officer responsible shall complete a Grievance/Complaint Resolution/Escalation Form (see ***Annex iii*** for sample form) to close out the complaint or record the reason for escalation, and the officer and the complainant shall sign the form (if she/he so desires), with a witness.

However, where no amicable resolution is reached with the PAP or the PAP does not receive a response from the stakeholders in tier 2, the PAP can appeal to the GRC, which should look at the complaint within fourteen (14) working days.

Tier 3: The court of law will serve as the last resort for all types of grievances. According to grievance redress procedures, PAPs should be exempted from all administrative and legal fees. However, the decision to use the court as a redress mechanism should be left to the discretion of a PAP.

Figure 7: GRM Structure

10. RAP Implementation

10.1 RAP Implementation Arrangement

EDSA has a functional implementation arrangement for RAP/ARAP implementations. The implementation arrangement mentioned below has been used for the Bo-Kenema project, the Energy Sector Utility Reform Project (ESURP), and the ESURP Additional Finance (ESURP-AF) implemented in Sierra Leone.

This arrangement can be adopted for the extension of power distribution system along the Freetown Peninsula.

10.1.1 Roles and Responsibilities

The Ministry of Energy will provide general Project oversight. Planning, management, and implementation of the resettlement/livelihood are the responsibility of the Environmental and Social safeguards Specialists at EDSA. For successful implementation of the Project, a RAP Implementation Committee (RAP IC) will be established to support all activities of the implementation of the ARAP. The RAP-IC oversees the implementation of the resettlement/livelihood and shall work with the resettlement/livelihood implementation schedule. The implementation process will require that MoE and EDSA coordinate with several stakeholders. An Inter-Ministerial Sub-Committee (ISC) will be established to provide the necessary support to the Project's implementation.

(1) The Inter-Ministerial Sub-Committee (ISC)

The ISC shall support the RAP IC access to necessary legal documentation such as building permits, house plans, etc. on properties within the RoW.
This committee is comprised of officials from Statehouse, Ministries of Energy and Lands, Roads Authority, the Sierra Leone Police, EPA-SL, Ministry of Lands, Ministry of Works and Infrastructure, the Law Office Department, Ministry of Information and Communication, Office of National Security and a representative from the RAP-IC.

Structure of the Committee

The committee is structured as follows:

- A Chairperson - Director of SPU responsible for convening meetings; chairing and moderating meetings and also giving responsibilities to committee members

- A Coordination Committee – where other Ministries Departments and Agencies (MDAs) can be co-opted on a needs basis
- A Secretariat - the MoE will coordinate activities before, during and after committee meetings

Composition of the Committee

- Deputy Minister, Ministry of Energy
- Head, Road Infrastructure Monitoring and Protection Unit – SLRA
- WARD Council
- Civil Engineer, Civil Engineering Department - Ministry of Works, Housing and Infrastructure
- Director, Disaster Management Unit - Office of National Security
- Director General – EDSA
- Senior Regional Officer – Environmental Protection Agency
- Sierra Leone Police
- Deputy Director, Surveys and Lands - Ministry of Lands, Housing and Country Planning
- Senior Information Officer - Ministry of Information and Communications
- Principal State Counsel, Law Officers' Department - Attorney General's Office
- Senior Director - Strategic and Policy Unit, State House
- Adviser to the President on Energy and Infrastructure - Strategic and Policy Unit, State House
- Chairman of Energy Committee – House of Parliament

Major Responsibilities

The Inter-Ministerial Sub-Committee (ISC)

- supports monitoring activities and enforce regulations to protect the RoW, with particular emphasis on congested communities
- facilitates the demolition of all affected structures as per defined Project guidelines for demolition
- ensures timely implementation of the RAP and related issues to the RoW

Expected Outputs

Specifically, the expanded inter-ministerial will have the following outputs:

- Access to necessary legal documentation such as building permits, house plans, etc. on properties within the RoW facilitated;
- All structures violating RoW clearances will be demolished, including:

  those identified as ineligible for compensation

  - PAPs that had received compensation and yet in occupancy in the RoW;
  - structures in the RoW that have been built after cut-off date;
  - temporary structures during rehabilitation works of the Contractor
- safeguards monitoring enhanced
- community sensitization as well as door-to-door sensitization on electric hazards associated with living under the RoW supported

Frequency of Meetings

Quarterly meetings will be held and where necessary extraordinary meetings will be organized. For resettlement/livelihood implementation, monthly meetings will be held.

(2) The RAP IC

The committee will assist in the validation of the PAPs, and in identifying affected persons for compensation. The contractor shall submit a construction work plan to the committee, which the supervising engineer of EDSA must endorse. This committee will meet regularly to review the work plan and discuss other matters. An adequately constituted structure for administration and implementation of the resettlement/livelihood plan is imperative and agreement must be reached from the onset with the committee members. The RAP-IC will need capacity building to successfully implement the resettlement/livelihood plan. This should be budgeted for.

Composition of the RAP-IC

The composition of the committee shall include the main stakeholders in the Project.

- EDSA (Facilitator/secretariat)
- EDSA Legal Representative
- MoE
- EDSA Planning Network Planning Department Representative
- EDSA Health and Safety Department Representative
- WARD Council Chief Administrator, Community Councillors, council Engineer,
- Traditional Leaders/Chiefs of the respective Communities,
- Witness NGO
- A representative from the PAPs
- A representative from Disabled Organizations
- A representative from the Ministry of Lands, Housing and Country Planning
- A Representative from SLRA
- A Representative of Inter-religious Council (Pastor & Imam)
- A Representative of Traders Union

Structure

i) Chairperson: responsible for convening meetings; chairing and moderating meetings and also give responsibilities to committee members
ii) A Coordination Committee - where other stakeholders can be co-opted on a needs basis
iii) Secretariat: The Facilitator/ Secretariat, the EDSA, will be responsible for the following:
  - Coordinate, organise, and facilitate committee and PAP meetings, including preparation of an agreed standing agenda, presentations, and sending minutes to stakeholders;
  - Act as a key contact person for the ISC;
  - Co-ordination and liaison, including tracking and reviewing Project progress through regular meetings with respective committee members and committees;
  - Ongoing reporting and communication to the RAP-IC, and ISC, through a communication strategy, on the progress of committee related matters;

iv) Other responsibilities include but are not limited to:
  - Providing upfront planning, scheduling, and resourcing for the Project;
  - Reviewing the resettlement/livelihood preparation process, including the scope, budget, and schedule;

Frequency of Meetings

- Monthly meetings for the duration of the resettlement/livelihood planning and development phase will be held.
- All meetings will be accompanied by an agenda, minutes of the meeting, and action plan;
- Meeting invites will go out 2 weeks before the meeting to secure a suitable timeslot and a telephonic reminder will be done 2 days before the meeting;
- Meetings will take place at the most convenient and practical location for all members

10.2 Procedures for Delivery of Entitlements

The procedure for delivering of entitlements will be detailed in the resettlement/livelihood plan. EDSA shall follow approved procedures, ensuring that full payment of compensation is made before possession of acquired sites.

A database of PAPs prepared by the resettlement/livelihood plan consultant forms the basis for compensation. The database should include the name, telephone number, photo, description of the affected property, total compensation, etc. of PAPs. EDSA shall then hold consultations with PAPs to negotiate with PAPs to agree on the compensation package, highlight the time allowed to salvage properties, establish payment methods.

10.2.1 Payment of Compensation

The following shall be followed:

i. The compensation rates and total budget should be verified and approved by EDSA
i. Once EDSA approves the compensation rates and total budget, EDSA shall proceed to sign individual compensation agreements with PAPs
ii. Payment of cash will be made via direct bank transfer to the PAPs bank account. EDSA shall open bank accounts for PAPs if they do not have one to pay in cash instead of giving them cheques.
iii. Payments to PAPs should be made in the presence of the RAP-IC.
iv. A local NGO should be hired to monitor the payment process.
v. Every stage of the process will be photographed, and all PAPs will be thumb printed
vi. Compensation shall be paid before displacement

10.3 Preparation of ARAP and Setting Up of Resettlement Management Teams

Table 8 shows typical steps to prepare ARAPs and set up resettlement teams.

Table 8: ARAP Preparation Steps and Setting up Resettlement Management Committees

Step	Detail	Responsibility	KPIs
Conduct census and socio-economic survey	Identification of PAPs including those who were not available during the course of the survey and resistant PAPs as well as the vulnerable. Survey of affected assets	EDSA/Consultant	Survey data (including pictures and full details of PAPs) stored in a database

Establish cut-off date	Determine the cut-off date and develop the cut-off date communication strategy and budget. Communicate the cut-off date as determined	EDSA/Consultant	Cut-off date implementation plan signed off
Preparation, review and publishing of the ARAP	Local publication at the MoE/EDSA website and local tabloids and also at JICA website	JICA/MOE / EDSA	ARAP published
Establish the RAP IC	Send out invitation letters and launch committee; ToRs for RAP IC	EDSA	Meeting minutes of RAP IC meetings
Validate ARAP	Approve eligibility criteria including the LRP for each PAP	EDSA/ RAP IC	PAP entitlements signed off
Develop Monitoring Plan	Recruit the services of an Independent Monitor; develop internal monitoring plan	JICA/EDSA	Monitoring plan signed off and completed
Recruit firm or provide for Livelihood Restoration Program	Draft ToRs; Evaluate CVs; Negotiations; Contract signing; develop and implement plan	JICA/EDSA	List of PAPs eligible for LRP
Notification of eligibility	Prepare notification letters of eligibility. Letter should request proof of ownership/tenancy where applicable	JICA/EDSA	Proof of delivery of notification letters to every PAP on eligibility matrix
PAP initial consultations	Informing community leadership; Preparing invitation letters; Developing meeting agenda (Project background, ARAP process, GRM, Cut-off date, title claims, ID cards); print posters, Selection of meeting	JICA/EDSA	Initial meetings with PAPs undertaken

	locations, media and other arrangements and secure budget funds; Documentation (minutes, pics, recording)		
PAP negotiations	Invitation letters to negotiations meetings; Prepare negotiations sign- off sheets; Draft negotiations points (compensation amount, in- kind/cash compensation, time required to salvage, preferred option for demolition etc.); Negotiations meeting; Identify alternatives and include in compensation agreements	JICA/EDSA	Signed PAP negotiations form
PAP compensation	Draft compensation agreement forms; Confirm Powers of Attorney (PoAs) and claims; Outsource service of fund manager; Selection of meeting locations, media and other arrangements and secure budget funds; Sign final agreements	JICA/EDSA	Signed compensation agreements; signed cheques
Demolition of affected structures	Source service provider; Prepare MoU or Contract as the case may be; Budget; Establish mutual expectations around workers health and safety procedures and community health and safety; demolish as per	JICA/EDSA	Demolition report

	agreed timeline with PAPs		
Hand over site to contractor		JICA/EDSA	Handing over notes/ photos
Supervision of construction works		JICA/EDSA	Onsite checklist or forms
Grievance management	develop grievance registers; set up WhatsApp group;	JICA/EDSA	Number of grievances received

10.4 Public Disclosure Process of ARAP

An ARAP should be made public where stakeholders and PAPs can access it. EDSA would publicly disclose this ARAP, in English and a summarized version in Krio, where need be in the newspapers, on radio and TV. Copies of the ARAP would be made available and distributed at the offices of EDSA and the Ministry of Energy and ensure that the public will be notified both through administrative structures and informal structures about the availability of the ARAP documents and be requested to make their suggestions and comments. A public workshop would be organized to disclose the contents of the ARAP and seek feedback from the public on the contents.

10.5 ARAP Implementation Budget

10.5.1 Implementation Budget

The estimated budget for the implementation of this ARAP is USD 10,500. The budget components include disclosure of ARAP, establishing a Grievance Redress Mechanism (GRM), training and capacity for all relevant entities, etc.

Table 9: Estimated Budget for RP

Activity	Description	Item	Unit cost (US$)	No.	Total Cost US$
Disclosure	Disclosure of ARAP	Media advertisement, the	NA	NA	5,000

		printing of documents, Local travel, community/ stakeholder engagements etc.			
GRM sensitization and Implementing	popularize the GRM among PAPs and the general public	Local travel, allowances, community engagements, stakeholder meetings, etc.	NA	NA	3,000
Capacity building of key stakeholders in Project implementation.	Training of Project and Project-related staff, Resettlement Committee etc.	Technical assistance/Resource persons (for training), training materials, hall rental, food and refreshment	NA	NA	2,500
Total Cost			NA	NA	**$10,500**

10.5.2 Resettlement/Livelihood Plan Preparation Budget Estimation

An outline of the indicative costs for the preparation of resettlement/livelihood plan and implementation is indicated below and will be derived from expenditure relating to:

(1) the preparation of the resettlement instrument,

(2) relocation and transfer,

(3) income losses and livelihood restoration plan, and

(4) administrative costs.

Table 10: Indicative Outline of Resettlement/Livelihood Plan Budget

No.	ITEM Description	Q'TY	Unit Cost (US$)	Total Cost (US$)
1.0	PREPARATORY PHASE COST			
1.1	Preparation of resettlement plans or compensation reports			
1.2	*Subtotal 1 (Preparatory phase cost)*			
2.0	COMPENSATION COST			
2.1	Compensation for temporary occupation of land			
2.2	Compensation for the destruction of standing trees			
2.3	Compensation for the destruction of permanent immovable structures			
2.4	Compensation for temporary displacement of moveable structures			
2.5	*Subtotal 2 (Compensation cost)*			
3.0	LIVELIHOOD RESTORATION /MITIGATION MEASURES COST			
3.1	Compensation for PAPs loss of income			
3.2	Compensation for business person loss of income			
3.3	Cost of special assistance to vulnerable groups			
3.4	*Subtotal 3 (Livelihood restoration/mitigation cost)*			
4.0	CAPACITY BUILDING & IMPLEMENTATION COST			
4.1	Capacity building for key stakeholders			
4.2	Disclosure of resettlement instrument			

4.3	Logistical support and engagement of Safeguard Officer (s)			
4.4	Cost for grievance redress/monitoring & evaluation activities			
4.5	Cost for compensation disbursement			
4.6	Legal fees (in case of court dispute)			
4.7	Cost for Resettlement/livelihood Completion Audit			
4.8	*Subtotal 4 (Capacity building & implementation cost)*			
5.0	**TOTAL COST (addition of all subtotals 1-4)**			
6.0	**CONTINGENCY (5%-10% OF TOTAL COST)**			
7.0	**GRAND TOTAL COST (Total Cost + Contingency)**			

10.6 ARAP Implementation Schedule

No.	Activity	Description	2022 Sep	Oct	Nov
1	Presentation of ARAP to EDSA	Presentation of findings of ARAP, document and response to feedback, sharing expectation during ARAP implementation			
2	Presentation of ARAP to EDSA board	Presentation of findings of ARAP, document and response to feedback, sharing expectation during ARAP implementation			
3	Presentation of ARAP to RAP IC	Feedback and support, negotiation of survey plans (for private land acquisition), verification of valuation, verification of title deeds			
4	ARAP Disclosure	Public relations of ARAP			
5	Preparation of PAP eligibility	Draft house including name of PAPs, address, affected asset right, request for submission of relevant documentation			
6	Initial PAP sensitization	Presentation of eligibility letters, discussions around project design, cut-off date, ESMP, environmental, health and safety measures, ARAP timelines, evidence feedback from PAPs. Town meetings will be organized			
7	Continuing any required follow-ups from feedback from meetings	Grievances could be registered during initial PAP sensitizations that will need to be further investigated and documented			
8	Preparation of PAP sign-off (negotiations) forms	This will include listing of compensation entitlements, photos of PAPs and signed from PAP with the understanding that this is not the compensation agreement form			
9	PAP negotiations and sign-off	This will be done at the community. PAPs will be informed of resettlement strategy including payment method, paying bank, required documentation, etc.			
10	Resolving any existing issues	Assess any alternative compensation options that may arise			
11	Verification of title deeds	For those whose private land is affected, verify ownership and determine whether land for land will be included in compensation package			
12	Agree on final compensation matrix and sign off	ARAP budget will be reviewed after determination of whom is to be compensated and will to be compensated			
13	Preparation of compensation agreement including review periods	Draft agreement with support of RAP IC and EDSA lawyers for review			
14	Identifying and evaluating any Assets of Attorney (POA)	Confirmation from PAP on who POA is, PAP and POA to sign an agreement, submission and inspection of ID cards			
15	Compensation and sign off	This will be done at the the communities with participation of EDSA, RAP IC, Community Leaders and PAPs. Ministry of Energy will sign the agreements with the PAPs and will be witnessed by the Community Leaders (Ward Councilor)			
16	Monitoring salvaging of assets or harvesting, as the case may be	Conduct regular site visits to monitor process and respond to any issues			
17	Demolition	EDSA will prepare written guidelines for the Contractor on this process			

10.7 Resettlement Risk Assessment and Mitigation Strategy

The risks from resettlement and social impacts on projects can threaten the project's license to operate and could result in delays, budget increase and serious reputational damage. It is important to understand that the success of the project depends on how well risks are identified and how efficiently they are managed. Table x below identifies risks to the success of the project and suggest ways in which the risks can be mitigated. During implementation, risks can be further identified, and the table can be updated by EDSA.

Table x Risk matrix

No.	Description of Risk	Rating (1-10)*	Risk Mitigation Strategy
1	Distribution line design not available by the start of ARAP-related work.	8	The exact locations of poles, particulary the first new 12 poles from Goderich substations to Sussex, shall be marked to determine the PAPs during detailed design.
2	Money for compensation not available in time to implement ARAP as soon as ARAP has been developed	5	EDSA to facilitate timely allocation funds for compensation.
3	ARAP not endorsed by EDSA	5	EDSA endorses the ARAP.
4	Contractors are unaware fo ARAP and ESMP and may implement their work without compliance to environment and social safeguards	4	• inform Contractors and have them endorse Environment and Safeguards objectives; • monitor their works.
5	Contractors change design after ARAP is finalized and disclosed	4	Verify ARAP as far as possible with Contractors before compensation is paid

* 1: Lowest, 10: Highest

11. Conclusion and Recommendations

12.1 Project impacts

EDSA

12.2 Recommendations

EDSA

References

- Gerry Reddy, Eddie Smyth and Michael Steyn (2015). Land Access and Resettlement. A guide to best practice.
- Njoh, A. J., & Akiwumi, F. (2012). Colonial legacies, land policies and the millennium development goal: Lessons from Cameroon and Sierra Leone. Habitat International, 36(2), 210-218.
- Renner-Thomas, A. (2010). Land tenure in Sierra Leone: The law, dualism and the making of a land policy. Author House.
- Taylor, B.K., 2014. Sierra Leone: The land, its people and history. New Africa Press.
- Turay, H. (2006). Land tenure and the legal aspects of land use in Sierra Leone: a background status report. prepared for the FAO, July, Freetown.
- Smyth, E., & Vanclay, F. (2017). The Social Framework for Projects: a conceptual but practical model to assist in assessing, planning and managing the social impacts of projects.
- SRK Consulting (2015). Sierra Leone Energy Access Project Final Full Report for the Social Review and Audit and Support to the Implementation of the Resettlement Action Plan.
- Statistics Sierra Leone (2016). 2015 Population and housing census survey of final results. Freetown.

Annexes

Annex i: Asset Valuation Method: Housing Property Valuation

Annex ii: Asset Valuation Method: Plantation Valuation

Annex iii: PAP List

Annex iv: Contacts of Participants in the Focus Group Discussion (FGD)

Annex v: Summary of Focus Group Discussion (FGD)

Annex vii: Recommandations on Environmental Impact Mitigation

Annex viiii: Initial PAP Consultation Participant List

Annex viiiii: Summary of Focus Group Discussion (FGD)

Annex 10 Environmental Monitoring Form

MONITORING FORM

1. Responses/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of comments from Governmental Authorities	Number: Contents: Actions to be taken:
Number and contents of comments from the Public	Number: Contents: Actions to be taken:

2. Mitigation Measures

- Air Quality (Emission Gas / Ambient Air Quality) (Construction Phase)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards(*1)	Remarks (Measurement Point, Frequency, Method, etc.)
SO_2, NO_2, PM10, $PM_{2.5}$, O_3				N/A		Point: Tombo and York Substations and communities along the route. Frequency: quarterly

Note) Negative impact on air quality is expected to some extent during construction such as dust. Hence, EDSA and Contractor shall monitor the status of necessary mitigation measures, including daily site inspection for certification of vehicle and heavy machineries.

(*1) IFC EHS Guidelines, General EHS Guidelines Table 1.1.1

- Water Quality (Construction Phase)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards (*1)	Remarks (Measurement Point, Frequency, Method, etc.)
Water temperature, pH, turbidity, DO, BOD, E. Coli.				N/A		Point: Tombo and York Substations and communities along the route. Frequency: quarterly.

Note) Negative impact on water quality is expected to some extent during construction. Hence, EDSA and Contractor shall monitor the status of necessary mitigation measures, including daily site inspection for discharges of domestic wastewater from workers' camp, and from washing trucks and heavy machineries.

(*1) WHO Guidelines.

- Noise / Vibration (Construction Phase)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Referred International Standards (*1)	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level	dB			N/A	55	Point: Tombo and York Substations and communities along the route. Frequency: Quarterly.

Note) Noise and vibration standard for construction work is not stipulated in any national standards of Sierra Leone. However, EDSA and Contractor shall monitor the status of necessary mitigation measures, including time regulation of construction and daily site inspection for certification of vehicle and heavy machineries.

*1: IFC EHS Guidelines, General EHS Guidelines Table 1.7.1 Daytime (07:00-22:00)

- Soil (Construction/ Operation Phase)

Monitoring Item	Monitoring Results during Report Period
PAHs, BTEX	

Note) Insulating oil will be used for transformers, which may cause soil pollution if it is leaked. Hence, EDSA and Contractor shall conduct soil sampling at Tombo and York Substations before, mid-term and end of construction; EDSA shall conduct soil sampling on an annual basis at Tombo and York Substations in operation phase.

3. Natural Environment (Construction Phase)

- Protected Areas/Ecosystem

Monitoring Item	Monitoring Results during Report Period
Type and number of trees cut or trimmed	
Record of animals trapped in	
Record of migratory bird nests	
Restriction on daytime working hours	
Lighting equipment	
Noise	
On-site speed limit	
Illegal dumping of wastes	

Note) Since the project requires cutting or trimming trees, EDSA and Contractor shall conduct compensatory measures in accordance with relevant laws and regulations of Sierra Leone.

4. Social Environment

- Resettlement (Pre-Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Approval of ARAP by EDSA	Status/ Completion date:
Payment process by EDSA Finance Department	Status/ Completion date:
Submission of the Payment order to MOF	Status/ Completion date:
Payment process by MOF	Status/ Completion date:
Land title request	Status/ Completion date:

1) Progress of Compensation Payment and Land Acquisition

Components	Planned Total	Unit	Monthly Progress			Progress in %		Expected Date Completion	Responsible Organization.
			Jun. 2022	~	Nov. 2022	Till the last month	Up to the month		
Compensation Payment									
Secondary substations		HH							EDSA/ MOF
Total		HH							EDSA/ MOF
Land Acquisition									
Secondary substations		m^2							EDSA/Community Leader
Total		m^2							EDSA/Community Leader

Note: The figures in this table include the PAPs without consensus and absent

2) Progress of Consensus with PAPs absent and without consensus

Type of PAPs	Number	Unit	Monthly Progress			Expected Date Completion	Responsible Organization.
			Jun. 2022	~	Nov. 2022		
Absent		HH					EDSA
Without Consensus		HH					EDSA

Total		HH					EDSA

3) Remarks on Progress with PAPs absent and without consensus

No.	Name of PAP	Status/Progress in this month	Action Plan for the next month
1			
2			
3			
4			
5			

- Living / Livelihood (Pre-Construction, Construction and Operation Phase)

Monitoring Item	Monitoring Results during Report Period
Livelihood restoration programs	Status (during and after livelihood restoration program):

- Record of grievance management (Pre-Construction/Construction/Operation Phase)

Monitoring Item	Monitoring Results during Report Period
Number and contents of grievance	Number: Contents: Actions to be taken:

4) Remarks on Progress with PAPs absent and without consensus

No.	Name of PAP	Status/Progress in this month	Action Plan for the next month
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

- Existing social infrastructure and services (Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Traffic management plan	
Power cut plan	

- Occupational health hazards (Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Occupational health and safety Plan	

- Accidents (Construction Phase)

Monitoring Item	Monitoring Results during Report Period
Traffic management plan	
Records of road accidents	

5. Field Report

PREPARATORY SURVEY
FOR
THE PROJECT
FOR
EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR
IN
THE REPUBLIC OF SIERRA LEONE

FIELD REPORT

29th November, 2021

Prepared and Submitted by

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Executing Agency for the Project

JICA PREPARATORY SURVEY TEAM

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West Japan Engineering Consultants, INC.

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Table of Contents

Location of the Project Site

Chapter 1 Outline of the Project

1.1 Background of the Project

In 2018, His Excellency the President's New Direction National Strategic Plan (PRSP I V) on the energy sector clearly identified a road map to increase energy access and improve service delivery nationwide. This mandate is aligned with the Ministry of Energy's Sector Strategic Plan (2018-2030) which now embarks on an urban electrification project to extend the distribution network from Goderich to Waterloo via Sussex, Tokeh, York, Kent and Tombo communities.

In Sierra Leone, access to electricity is a major challenge which account for less than 16% penetration nationwide with 14% in urban Freetown and 2% in rural areas. This is compounded with the lack of investment in the Transmission and Distribution System of the country.

This project aims to expand and stabilize the power supply in the southwest part of the Freetown Peninsular by constructing a new substation and distribution network to contribute to the reduction of poverty, the stability of society and the establishment of peace.

1.2 Framework for the Project

The framework for the Project are shown as follows;

- Responsible Ministry: Ministry of Energy
- Executing Agency: Electricity Distribution and Supply Authority (EDSA)
- Operation and Maintenance Agency: Electricity Distribution and Supply Authority (EDSA)

1.3 The Proposed Scope of the Project (Tentative)

The Scope of the Japanese side and the Outline of the proposed project components are shown in Table 1.3-1. The final scope of the Project will be decided by the Government of Japan.

Table 1.3-1 Outline of the Proposed Project Components

Components	Quantities
Procurement and Installation Work	
1. Construction of 33kV line (Goderich SS to Tombo SS)	
(a) 33kV overhead line	Approx. 46km
2. Construction of 11kV line (Sussex to Medical Hospital at Kerry Town)	
(a) 11kV overhead line	Approx. 52km
3. Construction of 33/11kV Primary substation	
(a) 1x 15MVA 33/11kV Tombo substation	1 lot
(b) 1x 15MVA 33/11kV York substation	1 lot
4. Construction of 11/0.4kV Secondary substation	28 ocations
(a) 100kVA Pole-mount type	6 lot
(b) 250kVA Pole-mount type	11 lot
(c) 2x250kVA Pole-mount type	5 lot
(d) 315kVA Ground-mount type	4 lot
(e) 630kVA Ground-mount type	2 lot

Components	Quantities
Procurement Work	
5. Low voltage facilities (poles, conductors, cables, insulators, power meters)	1 lot
6. Maintenance Tools	1 lot
7. Spare Parts and Consumables	1 lot
8. Rock-breaker	1 set
Construction Work	
9. Construction of buildings for substation	2 buildings
10. Civil works	1 lot

Remarks
Macdonald and Samuel town will be supplied power from Waterloo substation
Note that contents and quantities are subject to change.

Chapter 2 Technical requirements confirmed in the first field survey

2.1 General Technical requirements

2.1.1 General requirement

General Design Condition

Table 2.1-1 Basic Conditions for the Facility Design of the Project

Items		Values
Altitude		Less than 1,000 m
Ambient Temperature	Maximum	40 Degrees Centigrade
	Minimum	17 Degrees Centigrade
	Mean	27 Degrees Centigrade
Maximum Wind Velocity in 2020		25 m/s
Annual Rain Fall		2,910 mm/year
Seismic Force		Horizontal 0.10 G
Soil Bearing Capacity		Depends on the soil survey result

2.1.2 Electrical System

(1) System voltage

- ✓ Normal
  33 kV : 33 kV ± 6% (31.02 - 33 - 34.98 kV)
  11 kV : 11 kV ± 6% (10.34 - 11 – 11.66 kV)
- ✓ Single contingency
  33 kV : 33 kV ± 10% (29.7 – 33 – 36.3 kV)
  11 kV : 11 kV ± 10% (9.9 - 12 – 12.1 kV)

(2) Frequency

- ✓ Normal
  50 Hz ± 0.2 Hz (49.8 - 50 - 50.2 Hz)
- ✓ Single contingency
  50 Hz ± 1.5 Hz (48.5 - 50 - 51.5 Hz)
- ✓ Multiple contingency (event on grid emergency)

50 Hz ± 3.0 Hz (47.0 - 50 – 53.0 Hz)

(3) Short circuit current

- 33 kV : 25 kA - 1 sec
- 11 kV : 25 kA - 1 sec

(4) Grounding system

- 33 kV : Grounding through Earthing transformer (300 A, 10 sec.)
- 11 kV : Solid grounding

(5) Pollution level for Insulator

Heavy (Class d of IEC-60815-2008)

2.1.3 Applicable Standards

Distribution and substation equipment shall be designed based on latest version of IEC standards or equivalent to IEC standards (JEC and so on).

2.1.4 Power Demand Forecast

(1) Nationwide demand forecast

1) Methodology of demand forecast

In this preparatory survey, the following items were reviewed based on the analysis result of the master plan conducted 2009 by JICA. And also the result of "Preparation of the Electricity Network Investment Plan (NRECA)" was referred.

- Period and scenario
  - ✓ Forecasted period 2024 (expected commission year of Tombo and York S/S) to 2034
  - ✓ Demand forecast shall be calculated as 3 scenario which changed future GDP growth rate (Base, high and low)
- The review of the real GDP growth rate
  In the master plan, the power consumption was calculated based on real GDP (2000 base), in this survey it was recalculated in consideration of the growth rate in the actual GDP (2010 base).
- The review of the future demand forecast
  For the GDP growth rate after 2021, the values of IMF staff report were applied. After 2026, the annual rate has set as 4.2% (base case)

Table 2.1-2 Scenarios

Case	2021	2022	2023	2024	2025	1026 to 2034
Base case	3.2%	5.9%	4.4%	4.9%	4.8%	4.2%
High case	6.2%	8.9%	7.9%	7.9%	7.8%	7.2%
Low Case	2.2%	4.9%	3.4%	3.9%	3.8%	3.2%

- Percentage of real GDP by sector

  In the master plan, real GDP is accumulated by agriculture, industry and service sector, and the GDP forecast has been calculated by the ratio at 2007. This time, survey team took the average value for the five years from 2016 to 2020 described in Statistics Sierra Leone, i.e.,

  Agriculture: 52.9%, Industry 9.3%, Service 37.9% will be kept until 2034.

- Number of household customer

  Actual number of customer was indicated by EDSA document, in order to achieve the electrification rate 50% targeted by 2030 described in the NRECA report, it is necessary to make a new contract with an annual rate of 15% after 2021. Therefore, the increase rate of household customer is set at 15% per year. The population growth is based on the "population assumption of Statistics Sierra Leone."

- Current potential demand

  For the current domestic potential demand, we used the actual value as of 2015 which described in the Preparation of the Electricity Network Investment Plan prepared by NRECA. Since this value was for the whole country of Sierra Leone, the value of the Western area should be calculated after assuming nationwide demand until 2034. The ratio of the Western Area to national demand is also referred as the NRECA report. The result of nationwide demand forecast until 2034 is shown as in the table below.

2) Result of the nationwide demand forecast

Table 2.1-3 Result of the nationwide demand forecast

Study	2021	2022	2023	2024	2025	2026	2030	2031	2032	2033	2034
(1)Result	128.3	135.9	144.5	154.5	162.3	174.8	240.3	263.1	288.9	318.1	351.1
(2)MP(2009)	104.0	111.5	119.3	127.6	136.3	—	—	—	—	—	—
(2)NRECA	—	—	—	—	166.0	—	248.0	—	—	—	—
(3)MOE	96.1	108.5	119.4	131.3	143.0	155.8	—	—	—	—	—

(2) Demand forecast for southern part of Freetown peninsula

JICA survey team calculated the estimated demand from 2024 to 2034 which is expected commissioning year of the substation for 10 year operation. Since there is no electricity access in southern part of Freetown peninsula, the demand for each field was calculated as follows.

1) Household customer

The present population of the planned area covered by electricity was obtained by EDSA. Based on this present population, the population forecast was calculated using the population growth rate described in Population and housing census (Statistics Sierra Leone Oct. 2017) published in 2015.The power consumption of each customer set at 1.2 kW/household. This is referred by the guideline for household power consumption mentioned in ESMAP SE for ALL Energy Access

Redefined. Around 1.2kW / household is the timing of graduation from the power supply by mini solar, micro grid and start the power supply from the grid. Since there is a description in the guideline that the minimum value is set as 0.8kW / household, the calculation was made at 1.2kW / household in consideration of a margin of about 50%. For reference, according to the result of EDSA interview, the average value of contracted consumers on the Freetown Peninsula is 1 to 5 kW / household.

2) Education facilities

Survey team obtained the number of schools scattered in the target area. The power consumption of each school was calculated as 5kW / school, based on the information by EDSA. Most of the schools in the target area were one-story buildings, and consisting of 4 to 7 classrooms.

3) Health center and hospital

Survey team Obtain the number of hospitals scattered in the target area. Since most of facilities are health center class, it was calculated as 200 kVA / center, which is the average capacity of a distribution transformer for existing facilities in Freetown. The Kerry town medical hospital is planned at the side of Ebola treatment facilities.

The scale and specification has not known. Considering that it has 150 bed general hospital, the estimated power consumption would be 1000kVA.

4) Other load

Estimated demand was calculated based on the installed generator capacity owned by the fishery processing company, quarry and hotel etc, in the target area.

The generation equipment owned by the individual owner is assumed to be 100% x 2 (1 backup), and the power used is assumed to be 60%. Therefore, the rated capacity x 50% x 60% is expected demand.

Table 2.1-4 List of industrial load

No	Town	Customer	Gen CAP (kVA)①	Consumption (kVA) ①x0.5x0.6
1	SAMUEL TOWN			0
2	MACDONALD	CRSG Quarry Stone Crushing Plant	1200	360
3	KERRY TOWN			0
4	DURING TOWN			0
5	RUSSEL TOWN			0
6	BOYOH TOWN+MADINA	Gento Quarry Stone Crushing Plant	900	270
7	TOMBO	Two Brothers Fishing Co	850	255
		Korea Group Fishing Co	750	225
		Amtaishpat Fish Drying Facility	165	49.5
		EVSUMO Pure Water	200	60
8	KISSY TOWN	White Pole Fishing Co. Ice Making Plant, Cold Rooms.	900	270
9	BRIGITTE VILLAGE			0

No	Town	Customer	Gen CAP (kVA) ①	Consumption (kVA) ①x0.5x0.6
10	Mama Beach	Mama Beach Wharf (IPP)	8	2.4
		Rickma Fishing Co Ice Making Plant, Cold Rooms,	1000	300
11	BUREH TOWN	Settu's Villa	8	2.4
		Gem Beach Resort	7.5	2.25
		White Water Guest Hse	5	1.5
		Maroon View Guest Hse	4	1.2
		Austra Leone Guest Hse	3	0.9
		Lunthubul Gardens	6	1.8
		Robbinson Guest Hse	3.5	1.05
		Zen Village Resort	12	3.6
		Ratish Resort	14	4.2
		Osu Bai Koroma Resort	17.5	5.25
		Saful Resort	84	25.2
		Bureh Beach Surf Club	4	1.2
12	KENT	Kent Beach Resort Guest Hse	14	4.2
		Sengbeh Pieh Village Resort	12	3.6
		Applmays Beach Bar & Restaurant	3.5	1.05
		Golden Sand Resort	7	2.1
		Nova Africa Resort	19	5.7
13	JOHN OBEY	Lagoon Bungaloows	18	5.4
		Nation Lodge Resort	4	1.2
		Estuary Beach Resort	50	15
14	BLACK JOHNSON			0
15	BIG WATER	Tito's Paradise Eco Beach Lodge	5	1.5
		Sahara Spring Water Processing Plant	70	21
16	YORK	Fabulous Resort	150	45
		York Guest House	13	3.9
17	TOKEH	2 Seasons Resort	100	30
		The Place Hotel & Tokeh Beach	355	106.5
		Tokeh Beach Resort	190	57
		Africa Point Guest Hse	15	4.5
		Baracuda Island Ltd	13.5	4.05
		Eden Park Resort	75	22.5
		Nimi Resort	90	27
18	No.2	Cockle Point Guest House	120	36
		Beach No 2 Resort, Sankofa	5	1.5
		Island View Resort	10	3

5) Design of secondary substation

The capacity of secondary should be considered for loads of a and b above. Since items c and d above (clinic, hospital and other loads) are loads related for businesses, the loads for c and d are not included in capacity of distribution transformers in the secondary substations. However the capacity of these loads shall be considered as the transformer capacity of Tombo and York primary S/S. In Sierra Leone, customers have a responsibility of paying grid connection charge such as installation of LV service line, tariff meter and/or transformer (if necessary)

(3) Result of the demand forecast for southern part of Freetown peninsula

The summary of the demand forecast of Freetown southern area is mentioned as follows.

Table 2.1-5 Result of the demand forecast for southern part of Freetown peninsula

Supply	No	Town	Household (kVA) ①	School (kVA) ②	Hospital (kVA) ③	Specific load factory,hotel (kVA) ④	total(kVA) 2035 ①+②+③+④
Tombo S/S	1	KERRY TOWN	183.2	10.8	600.0	0.0	794.0
	2	DURING TOWN	61.3	0.0	0.0	0.0	61.3
	3	RUSSEL TOWN	16.8	0.0	0.0	0.0	16.8
	4	BOYOH TOWN+MADINA	317.4	48.4	200.0	270.0	835.8
	5	TOMBO	3661.9	75.3	800.0	589.5	5126.7
	6	KISSY TOWN	183.2	0.0	0.0	270.0	453.2
	7	BRIGITTE VILLAGE	16.8	0.0	200.0	0.0	236.8
York S/S	8	Mama Beach	305.2	16.1	0.0	302.4	623.7
	9	BUREH TOWN	97.4	5.4	200.0	50.6	353.3
	10	KENT	243.9	5.4	200.0	16.7	465.9
	11	JOHN OBEY	366.5	16.1	0.0	21.6	404.2
	12	BLACK JOHNSON	49.0	0.0	0.0	0.0	49.0
	13	BIG WATER	49.0	5.4	0.0	22.5	76.9
	14	YORK	366.5	16.1	200.0	48.9	631.5
	15	TOKEH	976.1	16.1	200.0	251.6	1443.8
	16	No.2	183.2	10.8	200.0	40.5	434.5
	17	Baw Baw	484.5	0.0	0.0	0.0	484.5

Remarks:
Power factor: 0.93 (refer to Average record of Goderich S/S)
Load factor : 0.6
Assumed year: 2034

(4) The capacity of main transformer for Tombo and York Substation

The capacity of main transformer is to be determined, based on the result of demand forecast.

Expected total demand value supplied by two substations in 2034 is as follows.

Tombo S/S: 7.5MVA

York S/S: 4.7MVA (+3.4MVA)

After completion of York S/S construction, York 11kV feeder will be connected to Sussex feeder of existing Goderich S/S. Operationally, it will be possible to supply power for the part of load from York S/S. According to the operation record of Goderich S/S, Sussex feeder has been supplied around 4.6MW power. Calculated based on the demand forecast of Tombo town, the power consumption will be about 5.2 MW in 2034. Therefore, assuming that about 50% of this power is supplied from York,

6.2MW x 50% / 0.93 (Power factor) = 3.4MVA, The York S/S should have "3.4MVA" capacity.

For the determination of transformer capacity, it is desirable to consider a certain margin even in the peak demand at 2034. On the other hand, consideration should be taken to back up in the event

of substation accident. Both Tombo and York S/S are arranged with one transformer (future additional transformer is considered), which is same configuration as existing S/S. Thus the capacity for emergency backup of each S/S should be considered.

As shown in the figure below, York and Tombo, and also Waterloo S/S (WB funds) will be linked to the existing Goderich S/S which has been the end of the grid.

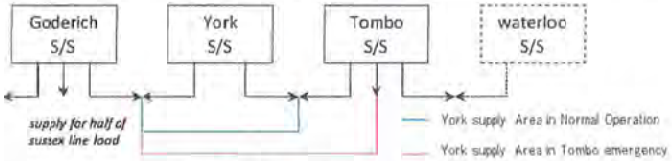


Figure 2.1-1 Expected Power Supply

In the event of Tombo S/S emergency, the transformer design capacity of York transformer should have approximately 50% capacity of Tombo S/S, and vice versa. The summary of the transformer capacity is shown in the following table.

Table 2.1-6 Summary of transformer load

(MVA)	House hold	School	hospital	Specific load factory,hotel	Subtotal	Backup	Load after backup	Transformer capacity
Tombo	4.5	0.1	1.8	1.1	7.54	2.4 (50% of York Load)	9.89	15
York	2.8	0.1	1.0	0.8	4.68	4.7 (50% of Tombo Load)	11.9	15
2034 Half load of Sussex lord	-	-	-	-	3.4*	-		

The operating capacity should be about 60% of the peak load. Therefore, both York and Tombo will be examined with a transformer capacity of 15 MVA.

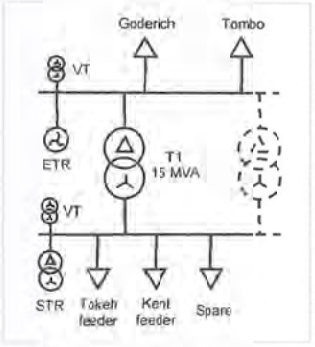
2.2 Equipment and Technical requirements for the Substation of the Project

2.2.1 Primary Substations

(1) York Substation

The following equipment should be installed for York Substation.

- One (1) set of 33/11 kV, 15 MVA Transformer (T1)
- One (1) set of 33 kV Earthing transformer (ETR)
- One (1) set of 11/0.415 kV Station transformer (STR)
- Indoor type 33 kV air insulated switchgear with single busbar system shall be installed in the control building, as indicated below;-
  - Two (2) panels for distribution lines for Goderich and Tombo substations
  - One (1) panel for T1
  - One (1) panel for ETR
  - One (1) panel for Bus VT (Metering)
  - One (1) panel space for future 33/11 kV Transformer (T2)
- Indoor type, 11 kV air insulated switchgear with single busbar system should be installed in the control building, as indicated below;-
  - Two (2) panels for distribution lines for Tokeh and Kent feeders
  - One (1) panel for a future distribution line
  - One (1) panel for T1
  - One (1) panel for STR
  - One (1) panel for Bus VT (Metering)
  - One (1) panel space for future 33/11 kV Transformer (T2)
- AVR control panel for T1
- Substation monitoring panel for the substation
- AC/DC power supply equipment
- 33 kV and 11 kV Arresters for T1
- 33 kV and 11 kV power cables
- Entire earthing system in the substation

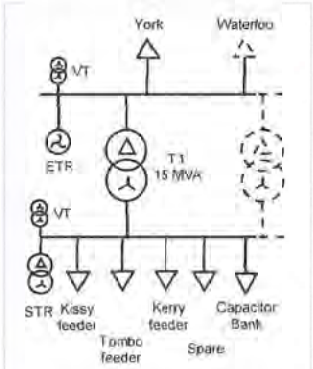


(2) Tombo Substation

The following equipment should be installed for Tombo Substation. One (1) set of 33/11 kV, 15 MVA Transformer (T1)

- One (1) set of 33 kV Earthing transformer (ETR)
- One (1) set of 11/0.415 kV Station transformer (STR)
- One (1) set of 11 kV, 3 Mvar Capacitor Bank
- Indoor type 33 kV air insulated switchgear with single busbar system shall be installed in the control building, as indicated below;-
  - Two (2) panels for distribution lines for York and future Waterloo substations

- One (1) panel for T1
- One (1) panel for ETR
- One (1) panel for Bus VT (Metering)
- One (1) panel space for future 33/11 kV Transformer (T2)



- Indoor type, 11 kV air insulated switchgear with single busbar system shall be installed in the control building, as indicated below;-
  - Three (3) panels for distribution lines for Kissy, Tombo and Kerry feeders
  - One (1) panel for a future distribution line
  - One (1) panel for 11 kV Capacitor bank
  - One (1) panel for T1
  - One (1) panel for STR
  - One (1) panel for Bus VT (Metering)
  - One (1) panel space for future 33/11 kV Transformer (T2)
- AVR control panel for T1
- Substation monitoring panel for the substation
- AC/DC power supply equipment
- 33 kV and 11 kV Arresters for T1
- 33 kV and 11 kV power cables
- Entire earthing system in the substation

Reference drawings (Preliminary):-

SS-01 Single Line Diagram (York S/S)
SS-02 Overall layout plan (York S/S)
SS-03 Control Room Layout Plan (York S/S)
SS-04 Single Line Diagram (Tombo S/S)
SS-05 Overall layout plan (Tombo S/S)
SS-06 Control Room Layout Plan (Tombo S/S)
SS-07 Substation Monitoring Panel
SS-08-1 Conceptual Diagram for Future SCADA System
SS-08-2 SCADA Signal List for York S/S
SS-08-3 SCADA Signal List for Tombo S/S

(3) Technical requirement for the equipment in the Primary Substations

Major specifications of proposed substation equipment are summarized in Table 2.2-1 below

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Table 2.2-1 Technical requirement for the equipment in the Substations

No.	Equipment	Major Specifications
1.	Transformer	
(1)	15 MVA, 33/11 kV Transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Capacity	15 MVA
	➢ Primary voltage	33 kV
	➢ Voltage regulating range	33 kV +5%/- 20%
	➢ Steps (taps)	21 taps@1.25%
	➢ Secondary voltage	11 kV
	➢ Cooling	ONAN
	➢ Vector group	Dyn11
	➢ Standard % impedance	Approximately 7 - 8%
	➢ Rated Lightning Impulse Withstand Voltage (LIWV)	33 kV : 170 kV 11 kV : 70 kV
	➢ Rated Power Frequency Withstand Voltage (PFWV) (1 min.)	33 kV : 75 kV 11 kV : 28 kV
	➢ Neutral grounding	33 kV : Grounding through Earthing transformer (300 A, 10 sec.) 11 kV : Solidly grounding (Bushing CT should be installed at neutral line for earth fault)
	➢ Color	RAL7033
	➢ Parallel operation	No (Provision should be made for future second transformer installation)
	➢ 33 kV and 11 kV Lightning Arresters (LA)	Yes (LA should be installed in each cable boxes) 36 kV, 10 kA
	➢ Others	Oil-water separator should be installed.
(2)	33 kV Earthing transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Capacity	300 A - 10 sec
	➢ Primary voltage	33/√3 kV
	➢ Cooling	ONAN
	➢ Vector group	ZN
	➢ Rated Lightning Impulse Withstand Voltage (LIWV)	170 kV
	➢ Rated Power Frequency Withstand Voltage (PFWV) (1 min.)	70 kV
	➢ CT	300/1, 5P20
	➢ Color	RAL7033
(3)	11/0.415 kV Station transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Capacity	50 to 100 kVA (Tentative) Note: The capacity shall be calculated at the implementation stage.
	➢ Primary voltage	11 kV +/- 2.5%, +/- 5% (No voltage tap changer)
	➢ Secondary voltage	415/240 V AC (3 phases, 4 wires)
	➢ Cooling	ONAN
	➢ Vector group	Dyn11
	➢ Rated Lightning Impulse Withstand Voltage (LIWV)	75 kV
	➢ Rated Power Frequency Withstand Voltage	28 kV

No.	Equipment	Major Specifications
	(PFWV) (1 min.)	
	➢ Color	RAL7033
2.	11 kV Capacitor bank	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Capacity	6 x 500 kVar (3 phase)
	➢ Primary voltage	11/√3 kV
	➢ Cooling	Self-cooling
	➢ Connection	Star
	➢ Rated Lightning Impulse Withstand Voltage (LIWV)	75 kV
	➢ Rated Power Frequency Withstand Voltage (PFWV) (1 min.)	28 kV
	➢ Short-time withstand current	25 kA -1 sec.
	➢ Accessories	- Reactor for inrush current limiting - CT for unbalance current detection
	➢ Color	RAL7032
3.	33 kV Switchgear	
(1)	Common specifications	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Busbar configuration	Single busbar system
	➢ Rated voltage	36 kV
	➢ Rated current	
	- Busbar	1,250 A
	- Feeder panel	800 A or more
	- Transformer panel	630 A
	- Earthing transformer panel	630 A
	➢ Rated short-time withstand current	25 kA (1 sec.)
	➢ Rated lightning impulse withstand voltage (LIWV)	170 kV
	➢ Rated power frecuency withstand voltage (PFWV) (1 min.)	70 kV
	➢ Creepage distance (for insulator)	Heavy (class d) in accordance with IEC 60815 (2008)
	➢ Painting color	RAL 7032
(2)	Equipment specifications	
	a) Circuit Breaker (CB)	
	➢ Type	GCB or VCB
	➢ Rated Interrupting Current	25 kA
	➢ Operating Duty	O-0.3 sec.-CO-3 min.-CO
	➢ Control Voltage	110 V DC
	➢ Auto-reclosing	None
	b) Current transformer (CT)	
	➢ Ratings	
	- Feeder bay	600-300/1 A, Class 0.5 for metering 600-300/1 A, Class 5P20 for protection
	- Transformer bay	300-150/1 A, Class 0.5 for metering (spare) 300-150/1 A, Class 5P20 for main protection 300-150/1 A, Class 5P20 for back-up protection
	- Earthing transformer bay	200-100/1 A, Class 0.5 for metering (spare) 200-100/1 A, Class 5P20 for protection

No.	Equipment	Major Specifications
	c) Voltage transformer (VT)	
	➢ Ratings	
	- Feeder bay	33/√3 kV / 110/√3 V / 110/3 V, Class 0.5/3G
	- Busbar	Ditto
	d) Lightning arrester (LA) @ Transformer HV side and Feeder bays	
	➢ Type	Outdoor, single phase, zinc metal oxide type
	➢ Ratings	36 kV, 10 kA
	➢ Surge counter	Yes
4.	11 kV Switchgear	
(1)	Common specifications	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Busbar configuration	Single busbar system
	➢ Rated voltage	12 kV
	➢ Rated current	
	- Busbar	1,250 A
	- Feeder panel	630 A
	- Transformer panel	1,250 A
	- Station transformer panel	630 A
	➢ Rated short-time withstand current	25 A (1 sec.)
	➢ Rated lightning impulse withstand voltage (LIWV)	75 kV
	➢ Rated power frequency withstand voltage (PFWV) (1 min.)	28 kV
	➢ Creepage distance (for insulator)	Heavy (class d) in accordance with IEC 60815 (2008)
	➢ Painting color	RAL 7032
(2)	Equipment specifications	
	a) Circuit Breaker (CB)	
	➢ Type	VCB
	➢ Rated Interrupting Current	25 kA
	➢ Operating duty	O-0.3 sec.-CO-3 min.-CO
	➢ Control Voltage	110 V DC
	➢ Auto-reclosing (AR)	Yes The system of the combination of AR and section switches should be applied on some 11 kV feeders. (See attached sheet "Effect of Auto Recloser")
	b) Current transformer (CT)	
	Feeder panel	400-200/1 A, Class 0.5 for metering 400-200/1 A, Class 5P20 for protection
	Transformer panel	1,200-600/1 A, Class 0.5 for metering 1,200-600/1 A, Class 5P20 for main protection 1,200-600/1 A, Class 5P20 for back-up protection
	Station transformer panel	100/1 A, Class 0.5 for metering 100/1 A, Class 5P20 for protection
	c) Voltage transformer (VT)	
	➢ Ratings	
	- Feeder bay	11/√3 kV/110/√3 V, Class 0.5
	- Busbar	Ditto
	d) Lightning arrester @ Transformer LV side and Feeder bays	

No.	Equipment	Major Specification
	➢ Type	Outdoor, single phase, zinc metal oxide type
	➢ Ratings	12 kV, 10 kA
	➢ Surge counter	Yes
5.	Control and protection system	
	a) Standards	IEC or equivalent (JEC etc.)
	b) Control system	Direct control
	c) Protection system	(SEPAM or equivalent)
	➢ 33 kV feeder	50/51; Instantaneous/inverse time overcurrent protection
		50N/51N; Instantaneous/inverse time overcurrent earth fault protection
		81L; Under frequency protection
		59; Overvoltage protection (59)
		27; Undervoltage protection (detection only)
	➢ 33/11 kV Transformer	87T; Transformer differential protection
		50/51, 50N/51N
	➢ 11 kV feeder	50/51, 50N/51N, 81L
		79; Auto Recosing
	d) 33 and 11 kV metering system	Multi-type digital meter (SEPAM or equivalent)
	e) AVR control panel	
	33/11 kV Transformer control	AVR for On-load tap changer (OLTC) is installed in the control panel.
		Note) Provision should be made for future parallel operation.
	f) Substation monitoring panel	See attached drawing SS-07.
	Power flow monitoring	Necessary meters will be installed on the panel. Details will be described in Final draft report.
		- 33 kV feeders
		- 11 kV side of T1 transformer
		- 11 kV feeders
		11 kV Capacitor Bank (Tombo only)
	Alarms	Collective alarms are indicated on the panel with audible alarm, such as;-
		- 33 kV switchgear failure
		- 11 kV switchgear failure
		- 11 kV Capacitor Bank failure (Tombo only)
		- 33/11 kV transformer failure
		- AVR control failure
		- AC/DC power supply failure
		- Other necessary alarms
		The following push button switches are installed on the panel.
		- Acknowledge
		- Reset
		- Lamp test
	g) Interface with future SCADA system	Terminals are prepared for future SCADA system. See attached drawing SS-08-1 for conceptual diagram and SS-08-2 & 3 for signal list.
6.	Power Supply System	
1)	AC system	
	a) AC Distribution panel	415/240 V AC (3 phases, 4 wires)
2)	DC system	

No.	Equipment	Major Specification
	a) 110 V DC	
	➢ Charger	
	- System	Single charger system
	- Voltage	Input: 415/240 V AC
		Output: 110 V DC
	- Distribution circuits	MCCBs for DC distribution circuits are included in the Charger panel.
	➢ Battery	
	- Type	Valve regulated lead acid (VRLA) type or equivalent
	- Capacity	150 Ah/10hr. (tentative)
		Note; The capacity shall be calculated at the implementation stage.
7.	33/11 kV Cable	
	a) Standard	IEC or equivalent (JEC etc.)
	b) Type	XLPE insulated, PVC sheathed cable, steel armored wire for direct burial case
	c) Size	
	➢ 33 kV feeder	185 mm² x 2 cables/phase (Single core cable)
	➢ 33 kV side of 15 MVA Transformer	185 mm² x 2 cables/phase (Single core cable)
	➢ 33 kV Earthing transformer	185 mm² x 1 cable/phase (Single core cable)
	➢ 11 kV feeder	240 mm² x 1 cable/phase (Single core cable)
	➢ 11 kV side of 15 MVA Transformer	240 mm² x 2 cable/phase (Single core cable)
	➢ Station transformer	50 mm² x 1 cable/phase (3 core cable)

2.2.2 Secondary Substations

(1) Locations of Secondary Substations

Secondary substations should be installed at 28 locations as indicated in Fig. 2.2-1 "Network Diagram of York and Tombo Substations" below.

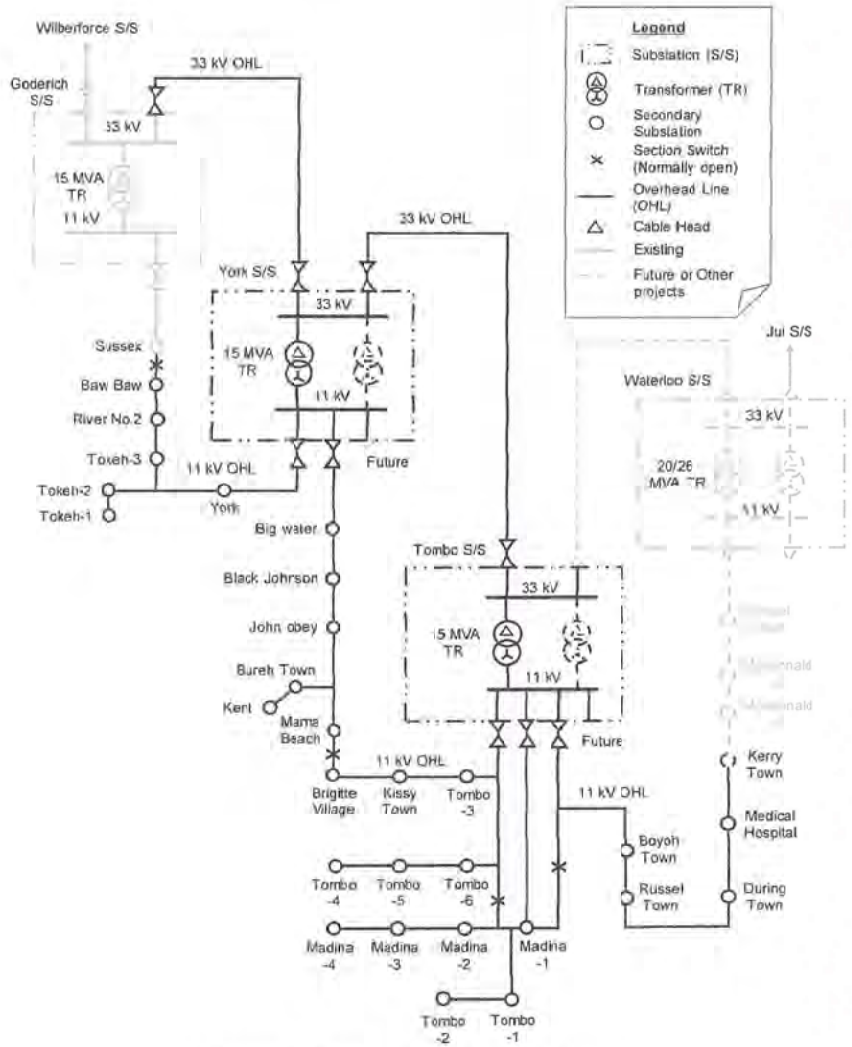


Figure 2.2-1 Network Diagram of York and Tombo Substations

There are 2 feeders from York S/S, such as "Tokeh feeder" and "Kent feeder", and 3 feeders from Tombo S/S, such as "Kissy feeder", "Tombo feeder" and "Kerry feeder". The following table shows

the capacity of Transformers of each region and the type of substation. (Distribution transformers (DTR) are basically for household loads, not for Industrial loads, commercial loads, etc.)

Table 2.2-2 Summary of Secondary Substations

Substation	No.	Region	Transformer (kVA)	Type or Required Size (m x m)	Feeder
YORK	1	Mama Beach	315	4 x 4	Kent feeder 1,365 kVA
	2	Bureh Town	100	Pole mounted	
	3	Kent	250	Pole mounted	
	4	John Obey	2 x 250	Pole mounted	
	5	Black Johnson	100	Pole mounted	
	6	Big Water	100	Pole mounted	
	7	York	2 x 250	Pole mounted	Tokeh feeder 2,195 kVA
	8	Tokeh-1	315	4 x 4	
	9	Tokeh-2	315	4 x 4	
	10	Tokeh-3	315	4 x 4	
	11	River No.2	250	Pole mounted	
	12	Baw Baw	2 x 250	Pole mounted	
TOMBO	13	Kerry Town	250	Pole mounted	Kerry Feeder 950 kVA + Medical Hospital
	14	During Town	100	Pole mounted	
	15	Russel Town	100	Pole mounted	
	16	Boyoh Town	2 x 250	Pole mounted	
	17	Madina-1	630	4 x 4	Tombo feeder 2,510 kVA
	18	Madina-2	630	4 x 4	
	19	Madina-3	2 x 250	Pole mounted	
	20	Madina-4	250	Pole mounted	
	21	Tombo-1	250	Pole mounted	
	22	Tombo-2	250	Pole mounted	
	23	Tombo-3	250	Pole mounted	Kissy feeder 1,350 kVA
	24	Tombo-4	250	Pole mounted	
	25	Tombo-5	250	Pole mounted	
	26	Tombo-6	250	Pole mounted	
	27	Kissy Town	250	Pole mounted	
	28	Brigitte Village	100	Pole mounted	

(2) Equipment for Secondary Substations

The equipment in Secondary substations is consisting of DTR and LV Distribution Board (LVDB).

As shown in the table, there are 4 kinds of DTR, such as 100, 250, 315 and 630 kVA transformers.

- For 100 and 250 kVA transformers
  The transformer should be mounted on the poles and its LVDB should also be installed at the bottom of the poles, as shown in SS-09.
- For 315 and 630 kVA transformers
  Both DTR and LVDB should be installed at the ground level. The typical arrangement of 315 and 630 kVA transformers is shown in SS-10.

It is noted that the fence and the gate for Secondary substations should be installed by EDSA.

(3) Technical requirement for the equipment in the Secondary Substations

The main specifications of the equipment in Secondary substations are as follows;-

Table 2.2-3 Major Specifications of Secondary Substations

No.	Equipment	Major Specifications
1.	11/0.415 kV Distribution transformer	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Capacity	100 kVA, 250 kVA, 315 kVA, 630 kVA
	➢ Primary voltage	11 kV +/- 2.5%, +/- 5% (No voltage tap change)
	➢ Secondary voltage	415/240 V AC (3 phases, 4 wires)
	➢ Cooling	ONAN
	➢ Vector group	Dyn11
	➢ Rated Lightning Impulse Withstand Voltage (LIWV)	75 kV
	➢ Rated Power Frequency Withstand Voltage (PFWV) (1 min.)	28 kV
	➢ Color	RAL7033
2.	LV Distribution Board	
	➢ Standards	IEC or equivalent (JEC etc.)
	➢ Type	Outdoor, Metal enclosed, self-standing type The Board shall be pad-ocked.
	➢ Insulation	Air insulation
	➢ Measurement	1. Instantaneous rms values Current, voltage, frequency, active, reactive, apparent power, power factor 2. Energy values Active, reactive, apparent energy, configurable Accumulation mode 3. Demand Values Current active, reactive, apparent power, Predicted active, reactive, apparent power Synchronization of the measurement window Demand calculation mode 4. Hour counter The meter shall be installed inside the Board
	➢ Circuit	➢ 100 and 250 kVA - 1 x Incoming circuit - 3 x Feeder circuits - 1 x Feeder circuit (spare) ➢ 315 and 630 kVA - 1 x Incoming circuit - 4 x Feeder circuits - 2 x Feeder circuits (spare)
	➢ Color	➢ RAL 7032

Reference drawings (Preliminary):-

SS-09 Pole Mounted Transformer with LV Distribution Board
SS-10 Typical Arrangement of Distribution Transformer above 315 kVA Capacity

2.3 Technical requirements for Distribution Line

2.3.1 Medium Voltage Distribution Lines

(1) Scope of Work

Scope of the work for distribution lines is shown in the Site Location Map in this report.

a) 33 kV Distribution Line between Goderich substation and New Tombo substation
New York and Tombo substations will be energized by constructing new 33kV distribution line using conductor AAC-265mm^2 overhead line, refer to attached drawing DL-1. The overhead line length is approx. 45.7km. Support structure of the 33kV overhead distribution line shall be steel pole types, refer to the drawing DL-2.

b) 11kV Distribution Line from York substation

12 Secondary substations will be energized by constructing new 11kV distribution line using conductor AAC-150mm^2 overhead line, refer to attached drawing DL-1. The overhead line length is approx. 36.4km. Support structure of the 11kV overhead distribution line shall be steel pole types, refer to the drawing DL-1.

c) 11kV Distribution Line from Tombo substation

16 Secondary substations will be energized by constructing new 11kV distribution line using conductor AAC-150mm^2 overhead line, refer to attached drawing DL-1. The overhead line length is approx. 15.6km. Support structure of the 11kV overhead distribution line shall be steel pole types, refer to the drawing DL-2.

(2) Design Conditions for 33 kV and 11 kV Distribution Lines (D/L)

Natural Conditions and Electrical Conditions are shown in Table 2.3-1 and Table 2.3-2, Table 2.3-3 respectively.

Table 2.3-1 Natural Conditions (Draft)

Items	Design Values
Altitude	up to 100m
Conductor temperature	-
Minimum temperature	17 degree Centigrade
Everyday temperature	27 degree Centigrade
Maximum temperature	41 degree Centigrade
Sag calculation to determine steel tower height	40 degree Centigrade
Wind speed	Maximum:25 m/sec (Gust) Average: about 11.7 m/sec
Soil bearing capacity	Depends on the soil survey result

Table 2.3-2 Specifications for 33 kV Distribution Line (Draft)

No.	Items	Specifications	
1)	Power Pole	Type:	Steel Pole 15m-850kg
		Type of pole:	Suspension pole Tension pole
		Safety factor:	1.0 for main body 1.2 for arms
2)	Overhead Line (Conductor)	Type: Size:	Aluminum Conductor (AAC) 265mm²
3)	Section Switch	Type:	Pole mount, Water proof
4)	Lightning Arrester	Type: Rated voltage: Nominal Discharge Current:	Outdoor, single phase, metal oxide gapless 36kV 10kA
5)	Insulator	Standards: Type: Material: Color: Creepage distance:	IEC60383-1 or equivalent Line post insulator Suspension insulator (3 pcs/phase) Porcelain Brown Heavy (class d)
6)	Ground Wire	Type: Size: Shield Angle:	Aluminum Clad Steel Wire (AC) 50mm² 45 degrees

Table 2.3-3 Specifications for 11 kV Distribution Line (Draft)

No.	Items	Specifications	
1)	Overhead Line (Conductor)	Type:	Steel Pole 15m-850kg, 12m-850kg
		Type of pole:	Suspension pole Tension pole
		Safety factor:	1.0 for main body 1.2 for arms
2)	Overhead Line (Conductor)	Type: Size:	Aluminum Conductor (AAC) 150mm²
3)	Section Switch	Type:	Pole mount, Water proof
4)	Lightning Arrester	Type: Rated voltage: Nominal Discharge Current:	Outdoor, single phase, metal oxide gapless 12kV 10kA
5)	Insulator	Standards: Type: Material: Color: Creepage distance:	IEC60383-1 or equivalent Line post insulator Suspension insulator (2 pcs/phase) Porcelain Brown Heavy (class d)
6)	Ground Wire	Type: Size: Shield Angle:	Aluminum Clad Steel Wire (AC) 50mm² 45 degrees
7)	Auto Recloser	Type:	Pole mount, Water proof 3 phase, 15kV, 630A, 12.5kA Control Box

A5-12

(3) Detail procedure of the work

Work shall be performed with maximum care to avoid collapse of existing power poles during construction. To apply adequate work procedure is essential.

Some of the preparatory work has to be done with energized condition. Maximum care is deemed to be necessary in order not to make electrical accident.

To minimize the shutdown duration, it is essential to plan and apply parallel works as much as possible.

2.3.2 Low Voltage Distribution materials

Low Voltage Distribution materials shall be provided for 28 Secondary substations area shown in Table 2.3-4.

Table 2.3-4 Specifications for Low Voltage Distribution Line (Draft)

No.	Items	Specifications	
1)	Power Pole	Type:	Steel Pole 10m-850kg
2)	Trunk Overhead Line (Conductor)	Type: Size:	Aluminum Conductor (AAC) 70mm², 95 mm²
3)	Insulator	Type: Material: Color:	Low Voltage Shackle Porcelain Brown
4)	Power Cable	Type:	XLPE, 600V Aluminum
5)	Power Meter	Type:	415 V, three phase four-wires

2.4 Procurement Plan of Spare Parts and Maintenance Tools

Capability of sustainable operation and maintenance for the equipment of the Project by the Recipient is one of conditions for the Japan's Grant Aid. The Sierra Leone side shall keep operation and maintenance for the equipment of the Project properly by himself, including procurement of spare parts. On the other hand, the warranty period for the Project is 1 year after insurance of the completion certificate in case of the Japan's Grant Aid. To secure operation and maintenance for the equipment of the Project for the warranty period, the Spare parts required for the period shall be provided as the scope of the Japanese.

Possession of maintenance tools for proper operation and maintenance for the equipment of the Project by the Recipient is one of conditions for the Japan's Grant Aid. However, the special tools required for operation and maintenance of the equipment of the Project shall be provided as the scope of the Japan.

Spare parts are listed in Table 2.4-1 are recommended to be procured. More detailed parts, tools, test equipment and their quantity will be explained in the Draft Final Report. The details of the special tools and the quantity will be described in the Draft Final Report.

Table 2.4-1 Recommended Spare Part List

Name of Spare Parts	Quantity	
	Lmk	Tombo
1. Transformer		
1.1 33/11 kV Transformer		
(1) Gasket (complete set)	1 set	1 set
(2) Buchholz relay set	1 set	1 set
(3) Oil temperature indicators (main tank and conservator)	1 set	1 set
(4) Oil level indicators (main tank and conservator)	1 set	1 set
(5) Silica gel for Breathers	200%	200%
1.2 33 kV Earthing transformer		
(1) Oil level indicator	1 set	1 set
1.3 11/0.4 kV Station transformer		
(1) Oil level indicator	1 set	1 set
2. Switchgear equipment		
2.1 33 kV Switchgear		
(1) Closing coil (1 set: 3 phases)	1 set each	1 set each
(2) Tripping coil (1 set: 3 phases)	1 set each	1 set each
(3) Vacuum bulbs (each type) complete with necessary accessories for replacement (for 3 phases)	1 set each	1 set each
(4) Isolating main terminals (completed one pole)	1 set each	1 set each
(5) Fuse (each type)	1 set each	1 set each
(6) Protection relay (each type)	1 set each	1 set each
(7) Meter (each type) Note) It is not necessary if the integrated type of protection and metering unit is applied.	1 set each	1 set each
(8) Auxiliary relay (each type)	1 set each	1 set each
(9) Control and selector switch, if any (each type)	1 set each	1 set each
2.2 11 kV Switchgear		
(1) Closing coil (1 set: 3 phases)	1 set each	1 set each
(2) Tripping coil (1 set: 3 phases)	1 set each	1 set each
(3) Vacuum bulbs (each type) complete with necessary accessories for replacement (for 3 phases)	1 set each	1 set each
(4) Isolating main terminals (completed one pole)	1 set each	1 set each
(5) Fuse (each type)	1 set each	1 set each
(6) Protection relay (each type)	1 set each	1 set each
(7) Meter (each type) Note) It is not necessary if the integrated type of protection and metering unit is applied.	1 set each	1 set each
(8) Auxiliary relay (each type)	1 set each	1 set each
(9) Control and selector switch, if any (each type)	1 set each	1 set each
3. Station IV Power Supply Equipment		
3.1 AC Distribution Board		
(1) MCCB (each type)	1 set each	1 set each
(2) Indicating lamp, if any (each type)	1 set each	1 set each
(3) Fuse (each type)	1 set each	1 set each
(4) Meter (each type)	1 set each	1 set each
3.2 Charger		
(1) Control Card and diode module	1 set each	1 set each
(2) Indicating lamp, if any (each type)	100%	100%
(3) Fuse (each type)	100%	100%
(4) Meter (each type)	1 set each	1 set each
(5) MCCB (each type)	1 set each	1 set each

Name of Spare Parts	Quantity	
	Lmk	Tombo
4. AVR Control		
(1) Control card	1 set each	1 set each
5. Cable		
5.1 33 kV Cable		
(1) Indoor type cable sealing end (for switchgear side)	1 set each	1 set each
(2) Outdoor type cable sealing end (for overhead line side)	1 set each	1 set each
5.2 11 kV Cable		
(1) Indoor type cable sealing end (for switchgear side)	1 set each	1 set each
(2) Outdoor type cable sealing end (for overhead line side)	1 set each	1 set each
6. Arrester		
6.1 33 kV Arrester	3 phases	3 phases
6.2 11 kV Arrester	3 phases	3 phases

2.5 On-the-Job Training (OJT)

On-the-job training (OJT) shall be carried out during the construction period. Through the OJT, maintenance and operation staff of the EDSA side will be able to experience practical and advanced skill from Manufacturer's engineers. Contents of OJT are suggested as follows;

- Operation and maintenance on 33kV substation equipment
- Protection relay setting
- Fault analysis and operation record management

2.6 Technical Transfer to enhance Operation and Maintenance

2.6.1 Operation and Maintenance System

Technical Transfer shall be carried out to enhance operation and maintenance after constructed. Through the Technical Transfer, maintenance and operation staff of the EDSA side will be able to experience practical and advanced skill from Consultant's engineers. Contents of the Technical Transfer are suggested as follows:

(a) Operation of Capacitor Bank

In order to maintain the system voltage suitable, Capacitor banks will be installed at Tombo substation. The capacitor banks are consisting of 6 units of 500 kVar capacitor. EDSA operators should study the operation of the capacitor bank from Consultants, when and how the capacitor banks should be switched in or out from the system, monitoring the Substation Monitoring Panel (SS-07).

(b) Operation of Auto-Recloser

- Auto-Recloser setting
- Operation of Sequential fault detection system
- Support for training and manual preparation

2.6.2 Countermeasures for line faults

(1) Effect of Auto-Recolser

5 sets of Auto-Recloser shall be installed to 11kV distribution lines: Tokeh, Kent, and Kissy feeders. Effect of Auto-Recloser are suggested as follows;

- Reduce power outage area for consumers
- Make it easy to check the accident section
- Accident recovery can be done quickly

(2) Operation of Sequential fault detection system

When the distribution line is divided into several sections by Auto-Reclosers, and a failure occurs in the line, the section is separated by an Auto-Recloser on the power supply side closest to the failure section and energized a normal section, refer to the drawing DL-3.

That is, the circuit breaker of the substation is cut off when the failure occurs in the distribution line, and all Auto-Reclosers of each section are opened. Next, the circuit breaker of the substation is re-closed by the relay, and the Auto-Recloser is input at a constant time interval (This is called the input time limit or the X time limit), and energized one after another in each section. When power is energized to the failure section, the Auto-Recloser is cut off again, but if the Auto-Recloser powers out within a certain time (detection time period or Y time limit) after turning on, and only the Auto-Recloser on the power supply side closest to the failure section is open locked by this re-power failure, and it is not re-turned on unless the lock is released.

(3) Support for training and manual preparation

Consultant shall provide support for training and manual preparation of countermeasures for line faults.

After one year, the operation of countermeasures for line faults shall be evaluated.

2.7 Power flow analysis

(1) Necessity of York Substation

The implementation of power flow analysis was carried out in following steps.

a) Analysis of new substation and distribution line in consideration of power supply from Goderich substation
b) Analysis of the entire Freetown Grid System

In order to analyze above b) section, specifications of existing distribution lines (such as length, conductor type) are needed. Since JICA survey team has not received an answer from EDSA, the analysis of section a) was carried out in advance and the necessity of York S/S was to be clarified.

1) Purpose of the analysis

Since the distance between existing Goderich and Tombo is very long about 50km, survey team examined the necessity of additional S/S in York area which is located at the midpoint between the two S/S.

2) Result of necessity of York S/S

Based on the expected power demand in the Tombo and York area, the power flow analysis has been done by following cases.

- ✓ Case 1: Construction of York and Tombo S/S
- ✓ Case 2: Construction of Tombo S/S only
- ✓ Case 3: Construction of York S/S only

Condition of the power flow analysis are as follows.

- ✓ Normal operation voltage: ±6% (10.34 kV～11 kV～11.56 kV)
- ✓ Based power demand: 2034 (10 years after completion of construction)
- ✓ Transformer Specification

	Tombo S/S	York S/S
Rated Capacity	15MVA	15MVA
Voltage	33/11kV	33/11kV
% impedance	7～8%	7～8%
Cooling method	ONAN	ONAN
Tap	+5% (4 x 1.25%) -20% (16 x 1.25%) 21tap	+5% (4 x 1.25%) -20% (16 x 1.25%) 21tap
Vector Group	Dyn11	Dyn11

- ✓ On the analysis, the bus voltage of the Goderich S/S which is power supply source was set at 30 kV. This is based on actual Goderich operation data.

Based on above three cases, the summary of analysis result is shown as below. The table mentions result of voltage at Tombo and York S/S. The table also include result of voltage at Baw Baw and Kerry town which are grid end of newly installed facilities.

	Reference		Result				
	Bus Voltage at Tombo S/S		Bus Voltage at York S/S		Baw Baw	Kerry Town	Result
voltage	33kV	11kV	33kV	11kV	11kV	11kV	—
Case①	26.7	10.9	27.4	10.9	10.6	10.8	Good
Case②	24.8	10.1	—	—	8.3[illegible]	10.01	NG
Case③	—	—	26.5	10.7	10.3	8.[illegible]	NG

As shown in the above results, if either York or Tombo S/S is missing, proper voltage operation at the end of the grid would not be possible. In both cases (2) and (3), it is difficult to properly operate the voltage not only at the end of the system but also in areas other than the demand area near the substation. Therefore, both York and Tombo S/S are required for stable power supply in the southern part of the Freetown Peninsula.

(2) Power system analysis for entire Freetown grid System

This project is aimed to assist enhancement of distribution facilities in the Southern part of

Freetown peninsula. Therefore, power system analysis shall be performed with the scope shown in figure 2.7-1.

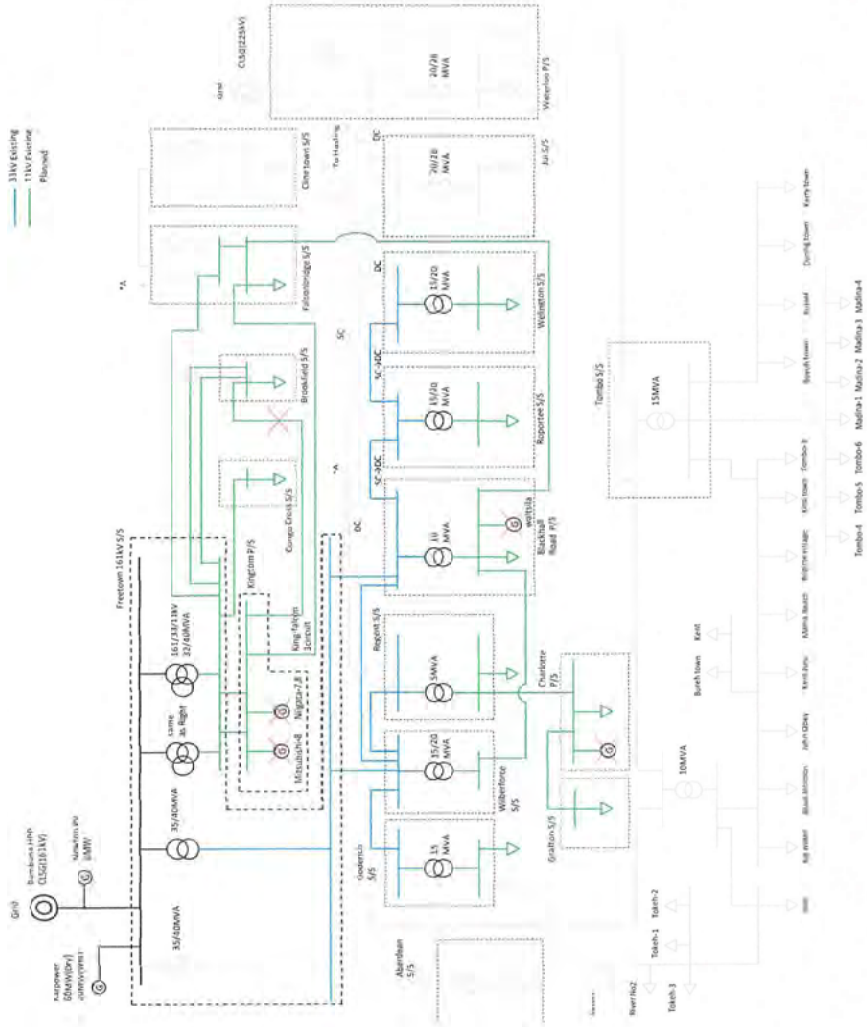


Figure 2.7-1 Scope of power flow analysis

2.8 Environmental and Social Considerations

(1) Schedule

Environmental and social considerations for this project consist of 1) Environmental Impact Assessment (EIA), 2) Preparation of Abbreviated Resettlement Action Plan (ARAP), 3) Implementation of ARAP. The schedule for EIA and ARAP, which will be agreed upon between EDSA and JICA Survey Team, is shown in Table 2.8-1. The details of EIA and ARAP (land acquisition and resettlement) are described in Table 2.8-1 and 2.8-2 respectively.

Table 2.8-1 Schedule of Environmental Assessment and Preparation of ARAP

Item	Activities	Organizations in charge	2021		2022			2022
			Nov.	Dec.	Jan.	Feb.	Mar.	Sep.
EIA	Submission of screening form to EPA-SL for screening	EDSA/JICA						
	Issue of screening results	EPA-SL						
	Further environmental study	EDSA/Local consultant						
	Submission of EIA report to EPA-SL	EDSA/Local consultant						
	Issue of EIA License	EPA-SL						
Preparation of ARAP	ARAP study	EDSA/Local consultant						
	Submission of ARAP to JICA Survey Team	EDSA/ Local consultant						
	Approval of ARAP by EDSA	EDSA						
Implementation of ARAP	Completion of land acquisition/ compensation	EDSA						
Others	Survey conducted by a local consultant	EDSA/Local consultant						

Note: Implementation of ARAP should be fully completed within three months after the approval of the Project by the Japanese Government.
Source: JICA Survey Team

(2) Directions of Land Acquisition and Resettlement

The schedule of land acquisition which will be agreed upon between EDSA and JICA Survey Team is shown in Table 2.8-2. For the smooth implementation of the project, EDSA shall agree to complete all the land acquisition as well as compensation process within three months after the approval of the Project by the Japanese Government.

Table 2.8-2 Schedule of Land Acquisition after ARAP Preparation

Stage	Responsible bodies	Actions	Timeframe
1. Submission of the Payment order to Ministry of Finance (MoF)	EDSA/MoF	From EDSA finance department, the Payment order and the original compensation forms are forwarded to MoF for Payment.	At the beginning of March, 2022
2. Payment	MoF/Central Bank of	MoF submits the Payment Order to the	March to April,

Stage	Responsible bodies	Actions	Timeframe
process by MoF	Sierra Leone	Central Bank of Sierra Leone. The Payment by the Central Bank of Sierra Leone through Project Affected Persons' (PAPs') respective bank accounts.	2022
3. Relocation of PAPs	PAPs/EDSA	The PAPs will be relocated.	April to September, 2022
4. Land title transfer	EDSA/MOE/Ministry of Lands, Housing & Country Planning/	For lands outside of Road Authority's ROW, EDSA/MOE will submit request for transfer of land title to the Ministry of Lands, Housing & Country Planning which has the mandates to allocate ownership to EDSA/MoE.	September 2022 (Within 3 months after the approval of the Project by Japanese Government)

Source: JICA Survey Team

2.8.1 Environmental Impact Assessment

2.8.1.1 Summary of the Project Components

The details of all project components are described in the Chapter 1. Among these, the components that may have impacts on natural and social environments are shown in Table 2.8-3.

Table 2.8-3 Project Components and Land Required for Project

	Project Components	Land Required
1.	York Substation	1,500m²
2.	Tombo Substation	770m²
3.	33kV Distribution Line (from Goderich Substation to Tombo Substation)	Approx. 45.7km, ROW 6m (3m +3m)
4.	11kV Distribution Line (from York Substation to Samuel Town)	Approx. 34.5km ROW 6m (3m +3m)
5.	11/0.4kV Secondary Substation	Approx. 28 sets Land required: 448m²(4 x 4m/set x 28set)

Note: ROW (Right-of-Way): ROW is stipulated in related documents of Sierra Leone.
Source: JICA Survey Team

2.8.1.2 Legal and Institutional Frameworks for Environmental and Social Considerations

(1) Legal Framework for Environmental and Social Considerations in Sierra Leone

Legal framework relevant to environmental and social considerations in Sierra Leone is summarized in Table 2.8-4. According to the Constitution, every citizen is entitled to a healthy and safe environment and every person, together with the State, has the duty to protect, safeguard and promote the environment. Further, environmental laws and development policies and strategies promote proper environmental management system aimed at poverty reduction and sustainable development.

Regarding the ROW, generally, the ROW of transmission and distribution lines includes land set aside for the transmission and distribution lines and associated facilities, land needed to facilitate maintenance, and to avoid risks of fires and other accidents. It provides a safety clearance between the high-voltage lines and surrounding structures. However, for 33/11kV distribution lines in urban

areas (as is the case for this project), it is more economical to restrict the lines to the ROW of the roads so as to limit the social impact on the community.

Table 2.8-4 Legal Framework Concerning Environmental and Social Considerations

Category	Name	Year
Constitution	The Constitution of Sierra Leone	1991
Environment	Environment Protection Agency Act	2008
	Environment Protection Agency Act Amendment	2010
EIA	Sierra Leone Electricity and Water Regulatory Commission Act	2011
	National Protected Area Authority and Conservation Trust Fund Act	2012
	Forestry Act	1988
	Wildlife Conservation Amendment Act	1990
	Factories Act	1974
Land Acquisition and Resettlement	Public Lands Ordinance Law	1898
	National Lands Policy	2015
	Local Government Act	2004
	National Electricity Act	2011
	Sierra Leone Roads Authority (Amendment) Act	2010
	World Bank Operational Policy on Involuntary Resettlement	2001

Source: JICA Survey Team

(2) Institutional Framework for Environmental Impact Assessment

In terms of Environmental Impact Assessment (EIA), in Sierra Leone, the Environment Protection Agency (EPA-SL) is responsible for procedures concerning EIA. The Agency was established in December 2008 based on the Environmental Protection Agency Act, 2008 and under the jurisdiction of the Ministry of Lands, Country Planning and the Environment.

EDSA uses World Bank safeguard policies as a benchmark to handle environmental and social aspects. The Environmental and Social Management Unit with 2 staffs in EDSA is in charge of environmental and social considerations.

(3) EIA Procedure in Sierra Leone

1) Legal Framework of EIA Procedure

The EIA implementation procedures are stipulated in the Environmental Protection Agency Act, as amended in 2010, from Sections 23 to 39. Part IV, Section 23 Subsection 1 of the Act stipulates that projects, as outlined in the First Schedule, require an EIA as a condition of permit to commence works and operation. The Second Schedule of the Act further highlights the factors determining whether a project requires an EIA.

General EIA procedure in Sierra Leone is shown in Figure 2.8-1. The processes are as follows:

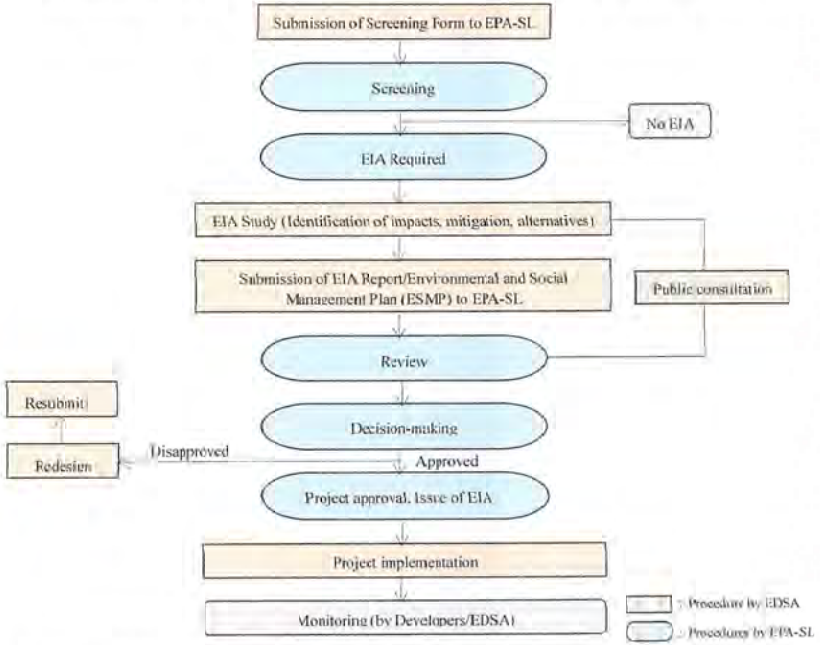
1. The project proponent as the applicant begins the process by registering the project proposal through submitting an application with a filled screening form to EPA-SL. EPA-SL at this stage makes a decision whether an EIA is required or not and the project is categorized once an EIA is required.

2. Upon approval of the screening form, the proponent is then informed that he can proceed in conducting the EIA studies. At the end of the study, findings will be presented in an EIA report. This report is submitted to EPA-SL.

3. The project proponent prepares a detailed scoping report, which identifies the important issues, and a Terms of Reference (ToR) and summit them to EPA-SL.

4. Once this report is approved, the project proponent is requested to carry out a public disclosure meeting with concerned stakeholders to inform and consult with them. The outcome should be incooperated into the report. The completed report is finally submitted to the EPA-SL for a decision on the issuance of an EIA license.

5. The project will proceed to the implementation stage if an EIA license is issued. Environmental Monitoring and Auditing of the project's activities, while it lasts, is undertaken to ensure that the terms and conditions of the EIA License issued are met in accordance with the EPA Act.



Source: Prepared by JICA Survey Team based on ESDA report

Figure 2.8-1 Procedure for EIA in Sierra Leone

2) EIA Screening

Based on a Screening Form submitted to EPA-SL, EPA-SL will carry out screening and the project will be categorized. EIA license registration is required in cases corresponding to projects prescribed under the first schedule shown in Table 2.8-5. In such cases, it is necessary to apply for an EIA license to EPA-SL before the commencement of the project.

Table 2.8-5 First Schedule

Item	Contents
(a)	Major change in use of renewable resources (for example, converting land for agricultural production, forests, pasture, rural development and timber production, etc.)
(b)	Major changes in agriculture and fisheries customs (for example, introduction of new species, large-scale mechanization and use of chemicals in agriculture)
(c)	Water resources development (for example, dam, drainage and irrigation projects, catchment basin development, water supply)
(d)	Infrastructure (for example, roads, bridges, airports, ports, transmission lines, pipelines, railways)
(e)	Industrial activities (for example, metallurgical plants, timber processing plants, chemical plants, power plants, cement plants, refining and petrochemical plants, agriculture)
(f)	Extraction industries (for example, mining, quarrying, extraction of sand, gravel, salt, peat, oil and gas)
(g)	Solid waste management and disposal (for example, sewerage systems and treatment plants, disposal sites, household and hazardous waste treatment plants)
(h)	Residential construction and development schemes
(i)	Establishment of entertainment facilities, car repair shops and welding plants
(j)	Importing of used cars

Source: Prepared by JICA Survey Team based on Environmental Protection Agency Act (2008)

In cases where a project falls under one of the descriptions given under the first schedule, the project proponent must make an application for an EIA license upon appending detailed information on the project. On receiving such an application, EPA-SL determines whether or not an EIA is required within 14 days. The factors for determining whether or not an EIA is required are prescribed under the second schedule shown in Table 2.8-6.

For projects that are not required to have an EIA, EPA-SL will issue an EIA License.

Table 2.8-6 Second Schedule

Item	Contents
(a)	Environmental impact on the community
(b)	Project location
(c)	Will the project cause changes in the project area?
(d)	Will the project cause major changes to the ecosystem in the project area?
(e)	Will the project detract from the aesthetic, leisure, scientific, historical, cultural or environmental properties of the project area?
(f)	Will the project impart risk to the habitats and seeds of flora and fauna?

Item	Contents
(g)	Project scale
(h)	Scope of environmental deterioration
(i)	Will the project lead to greater demand for natural resources in the project area?
(j)	Cumulative environmental impact of the project and other activities

Source: Prepared by JICA Survey Team based on Environmental Protection Agency Act (2008)

3) Obtaining an EIA License for the Project

EDSA is scheduled to submit a Screening Form to EPA-SL on November xx, 2021. EPA-SL issues a letter to EDSA stating the necessity of an EIA study for the project on November xx, 2021. Then, after EDSA submits an EIA Report and ToR to EPA-SL on February xx, 2022, EPA-SL reviews it and issues an EIA License on February xx, 2022.

2.8.2 Land Acquisition and Resettlement

2.8.2.1 Necessity of Land Acquisition and Resettlement

Project components and the land required for each component are presented in Table 2.8-7.

Concerning the construction of 33/11kV distribution lines, it is basically planned to install distribution lines alongside existing roads ROW and to maintain appropriate height and distance between lines and buildings to ensure that there is no need to resettle residents. Depending on the distribution line route, some utility poles and branch lines are located on privately owned land, however, EDSA intends to explain the plan to land users in advance and to secure agreements based on related legislation.

Table 2.8-7 Project Components and Required Land

	Project Components	Land Required	Note
1.	York Substation	1,500m²	Land acquisition has not started yet. Grass lands are to be developed. (Figure 2.8-2)
2.	Tombo Substation	770m²	Land acquisition has not started yet. Naked lands are to be developed. (Figure 2.8-2)
3.	33kV Distribution Line (from Goderich Substation to Tombo Substation)	Approx. 45.7km ROW 6m (3m + 3m)	Land acquisition has not started yet. Even though, most of distribution lines are constructed within ROW of roads, in which no land acquisition is required, several businesses shall be resettled.
4.	11kV Distribution Line (from York Substation to Samuel Town)	Approx. 34.5km ROW 6m (3m + 3m)	Land acquisition has not started yet. No land acquisition is required, because distribution lines are constructed within ROW of roads.
5.	11/0.4kV Secondary Substation	Approx. 28 sets Land required: 448m²(4 x 4m/set x 28set)	Land acquisition for the secondary substations is required. Involuntary resettlement is not necessary.

Source: JICA Survey Team

Figure 2.8-2 Project site (areas to require land acquisition due to the construction of York Substation (left) and Tombo Substation (right))

2.8.2.2 Legal Framework on Land Acquisition and Resettlement

(1) Legal Framework in Sierra Leone

Legal framework for land acquisition and resettlement in Sierra Leone is shown in Table 2.8-4.

The Constitution of Sierra Leone (1991) guarantees the rights of individuals to own private property. The Constitution also sets up the principles under which citizens may be deprived of their properties through compulsory acquisition, where such properties become subjects of state expropriation for public interest.

Public Lands Ordinance Law (1898), Part I of CAP 116 of the Law deals with the acquisition of land. The provision of the ordinance may not apply to the provinces. Under the Law, the GoSL can acquire any land in the public interest as stated in Section 4. The declarations for the warrant of acquisition for such land are published in a gazette. Section 5 of the law outlines the processes.

National Lands Policy (2015) also provides for the compulsory acquisition of land in the public interest. The principles of the land policy include among others: the consideration of land as a common national or communal property resource held in trust for the people and which must be used in the long-term interest of the people of Sierra Leone.

Local Government Act (2004) focuses on having a meaningful decentralization and devolution of government functions through the establishment and operation of local councils around the country including the Western Area Urban and Rural Districts, the operational area of the Project.

National Electricity Act (2011) unbundled the former National Power Authority (NPA) to two separate entities: EGTC and EDSA. Part VI outlines EDSA's cardinal function as the supply, distribution and retailing of electricity for the entire country except in areas where a license has been issued to another qualified entity. Part X of the Act deals with land acquisition and related environmental practices. This Act gives the Minister powers to acquire land for EGTC or EDSA or both even if the land is private or some private interest in the land subject to payment of adequate compensation. Compensation of such land is paid by the GoSL firstly and the Authority or company will reimburse government at a later time.

Sierra Leone Roads Authority (Amendment) Act (2010) stipulates that the Authority has the legal mandate to set out the width of the Right-of-Way (ROW). The Authority is the institution responsible for managing roads in the country. Their mandate is to develop and maintain the national roads network, advise Government on general road policies and contribute to addressing transport concerns, among others. The Authority manages ROW issues in Sierra Leone, hence they have to give clearance for the use of the ROW with respect to this project.

(2) JICA Policies on Resettlement

The key principles of JICA policies on involuntary resettlement are summarized below.

I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.

II. When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.

III. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.

IV. Compensation must be based on the full "replacement cost" as much as possible.

V. Compensation and other kinds of assistance must be provided prior to displacement.

VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.

VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.

IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

The principles above are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that "JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies". Additional key principles based on World Bank OP 4.12 are as follows.

X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an

eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.

XI. Eligibility of Benefits include; the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.

XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

XIII. Provide support for the transition period (between displacement and livelihood restoration).

XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.

XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the core principles of the JICA policy stated above, emphasis is given to a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed financial Plan, etc.

Chapter 3 Obligations/Undertakings of the Japanese side or Sierra Leone side for the Project

In addition to the "Major Undertakings to be taken by the Government of Sierra Leone" attached in the Minutes of Discussions signed between Sierra Leone side (Ministry of Energy, EDSA) and the JICA Preparatory Survey Team, JICA Survey Team has explained the basic obligations to be borne by either Japanese side or Sierra Leone side as indicated in the following table.

JICA Survey Team and EDSA have agreed with the following undertakings and understood that some parts of the works might become additional obligations of Sierra Leone side in the process of Project scoping.

(1) Before the Tender

No.	Items	Deadline	Japan	Sierra Leone (to charge)
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A	-	●(MOF)
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)	-	●(MOF)
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A 1) Advising commission of A/P 2) Payment commission for A/P	1) within 1 month after the signing of the contract(s) 2) every payment	-	●(MOF)
4	To approve IEE/EIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation for EMP and EMoP (and fulfilling conditions of aporoval, if any).	within 1 month after the signing of the G/A	-	●(EDSA)
5	To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP	before notice of the bidding documents	-	●(MOE)
6	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	until land acquisition and resettlement complete	-	●(EDSA)
7	To secure and clear the following lands 1) right of way for the construction of the project 2) project sites for new substation 3) temporary construction yard and stock yard near the Project area 4) borrow pit and disposal site near the Project area	before notice of the bidding documents	-	●(EDSA)
8	To obtain the planning, zoning, building permit	before notice of the bidding documents	-	●(EDSA)
9	To clear, level and reclaim the following sites 1) remove utilities 2) existing facilities 3) leveling and reclaiming the sites for new substation and distribution lines	before notice of the bidding documents	-	●(EDSA)
10	To submit Project Monitoring Report (with the result of Detailed Design)	before preparation of the bidding documents	-	●(EDSA)
11	To obtain Certificate/Title of Land acquisition for substation construction (land ownership, register, etc.)	before preparation of the bidding documents	-	●(EDSA)
12	To issue a letter with project brief to the SLRA to elect power poles and to construct distribution lines on the Right of Way of the Road Authority for coordination.	before preparation of the bidding documents	-	●(EDSA)
13	To hold stakeholder meetings/consultations to explain the project outline to the neighbors in the project area.	before preparation of the bidding documents	-	●(EDSA)
14	To implement a RAP	before preparation of the bidding documents	-	●(EDSA)

Before the commencement of the construction work

No.	Items	Deadline	Japan	Sierra Leone (to charge)
1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)	-	●(MOF)
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A 1) Advising commission of A/P 2) Payment commission for A/P	within 1 month after the signing of the contract(s) every payment	-	●(MOF)
3	Construction of access road to Tombo substation (about 200m from main road to Tombo substation)	within 1 month after the signing of the contract(s)	-	●(EDSA)

(2) During the Project Implementation

No.	Items	Deadline	Japan	Sierra Leone (in charge)
1	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project	-	●(EDSA)
2	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	-	●(EDSA)
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	-	●(MOE)
4	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	-	●(EDSA)
5	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	during the construction	-	●(EDSA)
6	To submit Project Monitoring Report	every month	-	●(EDSA)
7	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within 1 month after issuance of Certificate of Completion for the works under the contract(s)	-	●(EDSA)
8	To submit a report concerning completion of the Project	within 6 months after completion of the Project	-	●(EDSA)
9	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)	during the construction	-	●(EDSA)
	Water Supply The city water distribution main to the site	before start of the construction	-	●(EDSA)
	Drainage The city drainage main (for storm, sewer and others) to the site	6 months before completion of the construction	-	●(EDSA)
10	To cut or trim the tree on the way of distribution line.	before start of the construction	-	●(EDSA)
11	To provide equipment, furniture, facilities necessary for the implementation of the Project in the site(s)	before start of the construction	-	●(EDSA)
12	To ensure the safety of persons engaged in the	during the Project	-	●(EDSA)

No	Items	Deadline	Japan	Sierra Leone (In charge)
	implementation of the Project			
13	To take necessary measures for security and safety of the Project site	during the construction	-	●(EDSA)
14	To implement EMP and EMoP	during the construction	-	●(EDSA)
15	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	-	●(EDSA)
16	To implement RAP (livelihood restoration program)	for a period based on livelihood restoration program	-	●(EDSA)
17	To implement social monitoring, and to submit the monitoring results to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report - Period of the monitoring may be extended if affected persons' livelihoods are not sufficiently restored. Extension of the monitoring will be decided based on agreement between EDSA and JICA.	until the end of livelihood restoration program	-	●(EDSA)
18	Construction of Buildings and Civil Works	based on the Master Work Schedule to be approved before start of the construction	●	-
19	Procurement, Installation and Commissioning of Equipment and Materials other than the ones mentioned in the special notes	based on the Master Work Schedule to be approved before start of the construction	●	
20	Procurement of Spare parts Consumables and Tools	based on the Master Work Schedule to be approved before start of the construction	●	
21	Operation Training Work	based on the Master Work Schedule to be approved before start of the construction	●	-
22	Power outage plan during the construction period including notification in public.	during the Project	-	●(EDSA)
	Construction of Substation			
23	Land leveling work for substations	based on the Master Work Schedule to be approved before start of the construction	●	-
24	Apply for a transportation permit for heavy equipment and improve the road from the port of unloading to the project site (if necessary)	during the Project	-	●(EDSA)
25	Construction of access road from the main road to York substation	based on the Master Work Schedule to be approved before start of the construction	●	-
26	Functional tests of York feeder circuit breaker at Goderich substation	6 months before completion of the construction	-	●(EDSA)
27	Settings of protection relays	before completion of the construction(for York feeder at Goderich substation)	-	●(EDSA)
28	Construction of fence and Gates at Primary substations	before completion of the construction	-	●(EDSA)
	Construction of Distribution Line and Secondary Substation			
29	Connection work of the existing distribution lines to the section switch to be installed by the Japanese side	during the Project	-	●(EDSA)
30	Installation and connection of LV Trunk lines, Branch lines and Service lines.	6 months after the completion of the construction work	-	●(EDSA)
31	Construction of Fence and Gates at Secondary substations	before completion of the construction	-	●(EDSA)
32	Submission of the invertory list of prepaid meters to be connected to the customers Report for installation of prepaid meters and connection to the customers	for one year after completion of the construction	-	●(EDSA)

(3) After the Project

No	Items	Deadline	Japan	Sierra Leone (In charge)
1	To implement EMP and EMoP	for a period based on EMP and EMoP	-	●(EDSA)
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between EDSA and JICA.	for 3 years after the Project	-	●(EDSA)
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	-	●(EDSA)

Remarks:
Other than the Items in the thick-bordered box ▭ are the same items attached in the Minutes of Discussions signed between Sierra Leone side (Ministry of Energy, EDSA) and the JICA Preparatory Survey Team

Abbreviations:

B/A : Banking Arrangement	G/A : Grant Agreement
A/P : Authorization to Pay	IEE : Initial Environmental Examination
EIA : Environmental Impact Assessment	EMP : Environmental Management Plan
EMoP : Environmental Monitoring Plan	SLRA : Sierra Leone Road Authority
RAP : Resettlement Action Plan	JICA : Japan International Cooperation Agency
MOF : Ministry of Finance	EDS : Electricity Distribution Supply Authority

Chapter 4 Tentative Implementation Schedule of the Project

The tentative implementation schedule is shown in Attachment-2. In case that the Project is approved by the Japanese Government, the Project will proceed as below in the earliest scenario. It is important for both sides to understand that the Preparatory Survey is not a commitment for the future implementation of the Project.

- The Exchange of Notes between the Government of Sierra Leone and the Government of Japan shall be signed in August, 2022.
- The Tender Opening will be held in January 2023.
- Installation work of the Project will start in July, 2023.
- Commissioning of the Project will be in August, 2024.

Chapter 5 Outline Drawings

Substation

SS-01:	Single Line Diagram (York S/S)
SS-02:	Overall layout plan (York S/S)
SS-03:	Control Room Layout Plan (York S/S)
SS-04:	Single Line Diagram (Tombo S/S)
SS-05:	Overall layout plan (Tombo S/S)
SS-06:	Control Room Layout Plan (Tombo S/S)
SS-07:	Substation Monitoring Panel
SS-08-1:	Conceptual Diagram for Future SCADA System
SS-08-2:	SCADA Signal List for York S/S
SS-08-3:	SCADA Signal List for Tombo S/S
SS-09:	Pole Mounted Transformer with LV Distribution Board
SS-10:	Typical Arrangement of Distribution Transformer above 315 kVA Capacity

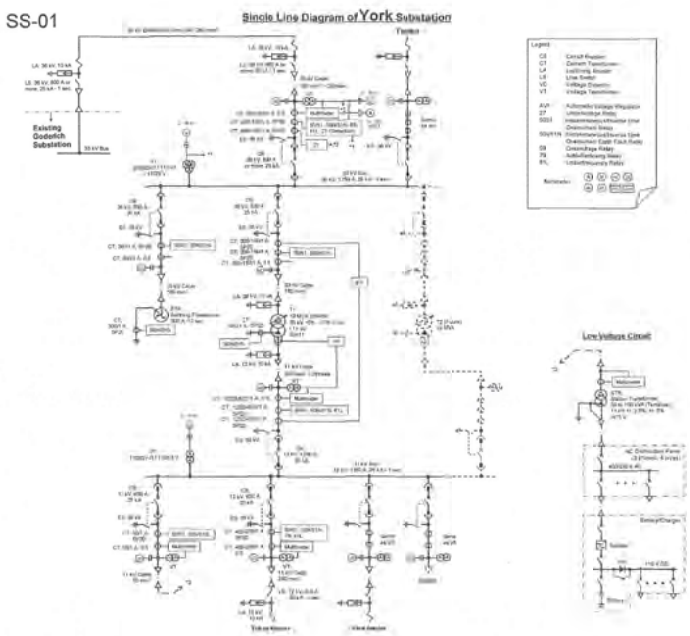
Distribution Line

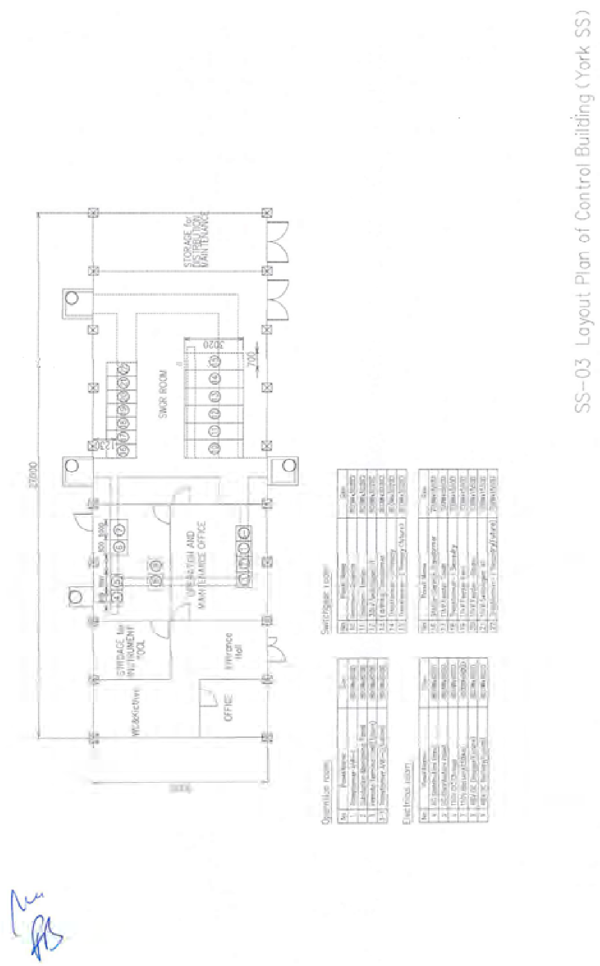
DL-01:	Line Diagram
DL-02:	SA: 11kV Combined Intermediate Pole (Line Angle 0-5 deg.) SC: 11kV Combined Middle Angle Pole (Line Angle 20-60 deg.) CA: 11 & 33kV Combined Intermediate Pole (Line Angle 0-5 deg.) CC: 11 & 33kV Combined Middle Angle Pole (Line Angle 20-60 deg.)
DL-03:	Effect of Auto Recloser

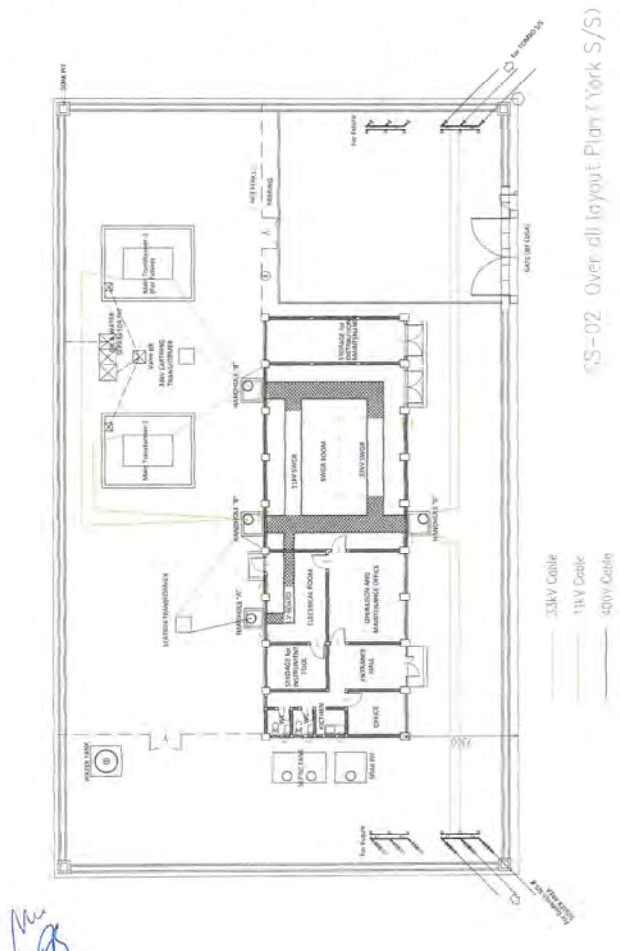
Architectural Drawings

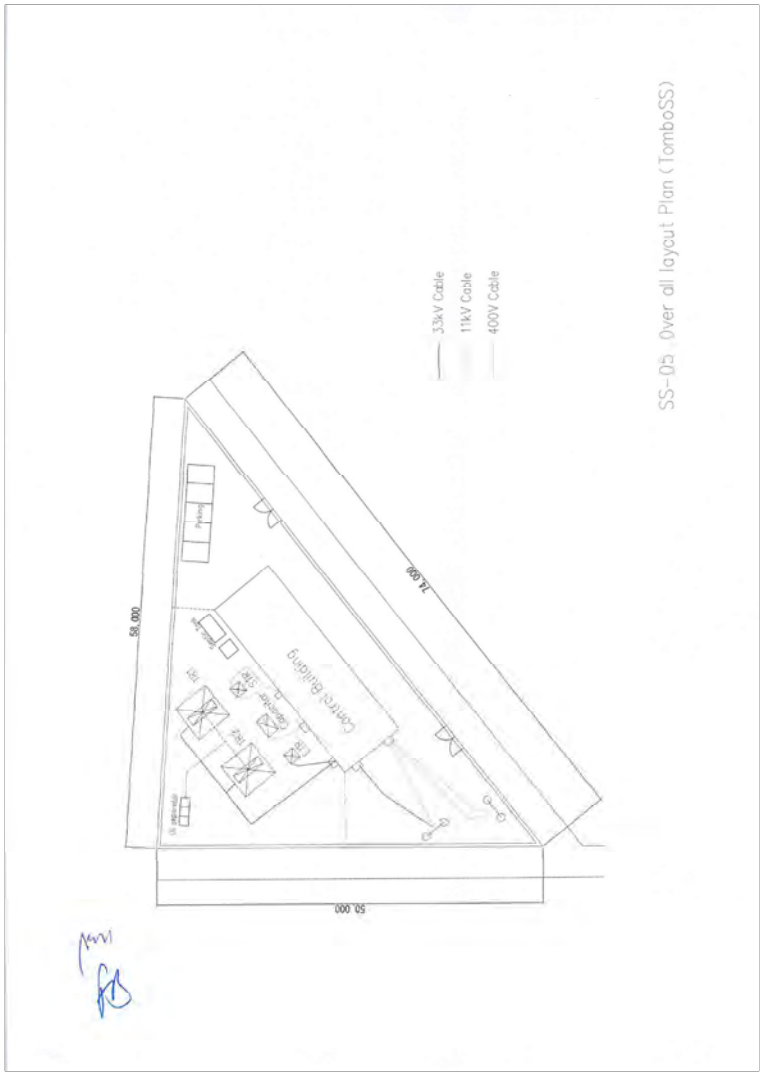
AD-01:	Tombo Substation
AD-02:	York Substation
AD-03:	Section Drawings
AD-04:	Secondary Substation (Tombo-1)

SS-01

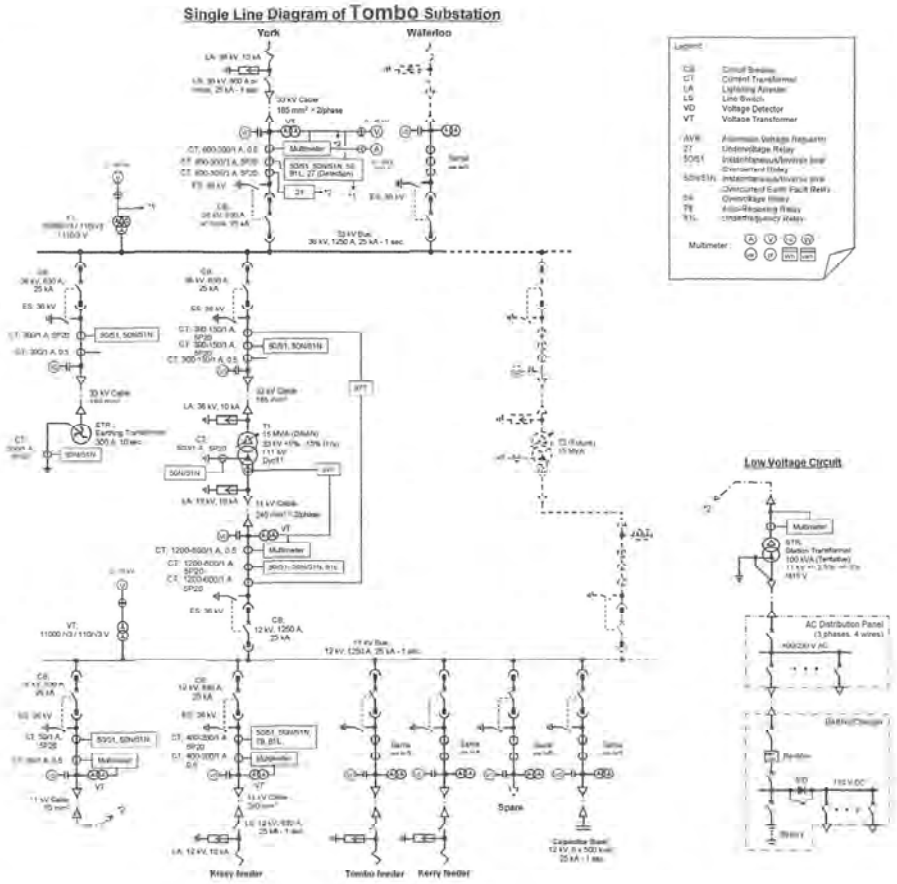


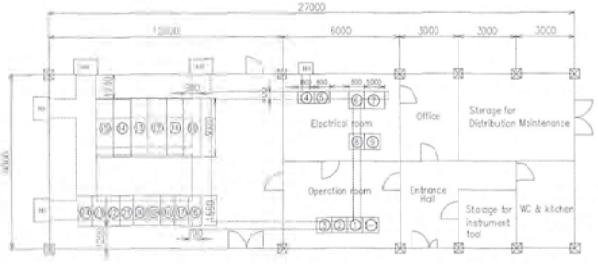

SS-03 Layout Plan of Control Building (York SS)
27000
SWGR ROOM
OPERATION AND MAINTENANCE OFFICE
STORAGE for INSTRUMENT TOOL
STORAGE for DISTRIBUTION MAINTENANCE
Entrance Hall
OFFICE
Operation room
Switchgear room
Electrical room


SS-02 Over all layout Plan (York S/S)
33kV Cable
11kV Cable
400V Cable


SS-05 Over all layout Plan (TomboSS)
33kV Cable
11kV Cable
400V Cable
74.000
58.000
50.000
Control Building

SS-04


Single Line Diagram of Tombo Substation
York
Waterloo
Legend
Multimeter
Low Voltage Circuit
AC Distribution Panel
Spare
Krooy feeder
Tombo feeder
Kerry feeder



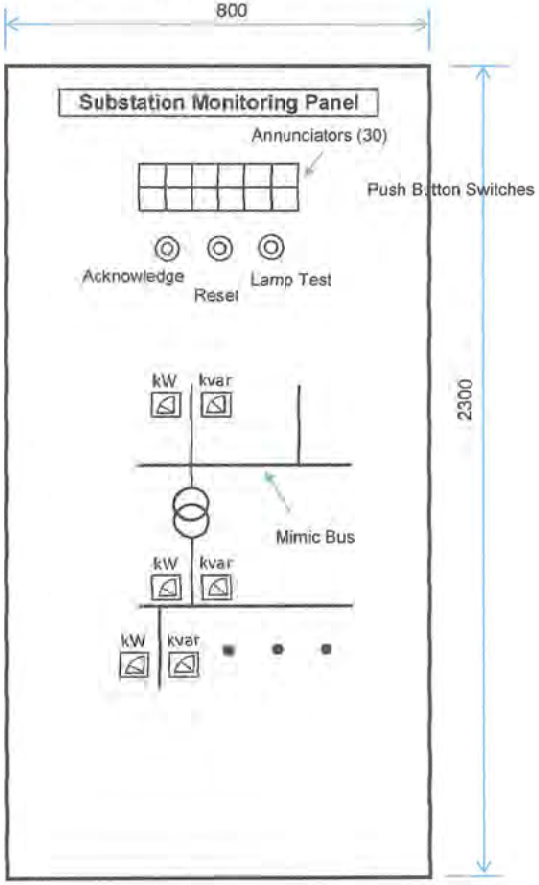
SS-06 Layout Plan of Control Building (Tombo SS)

A5-25

SS-07

Outline of Substation Monitoring Panel

(Preliminary)

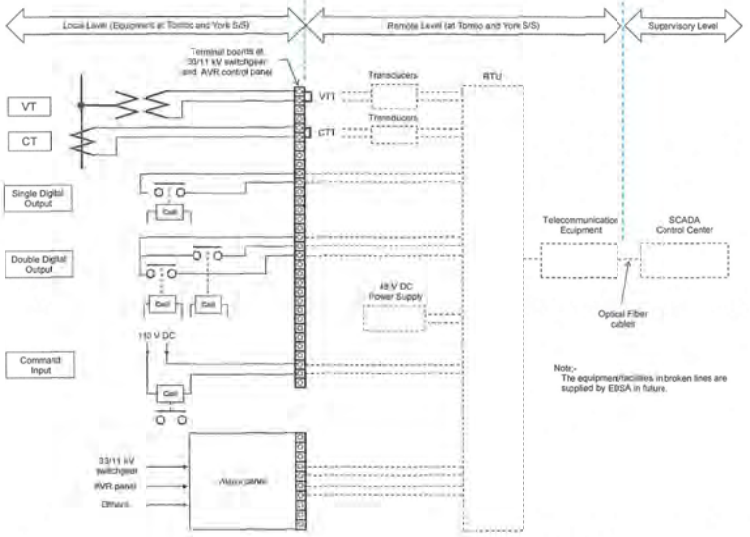


SS-08-1

Conceptual Diagram of "SCADA Ready"

(Preliminary)

November 2021
JICA study team



Note:-
The equipment/facilities in broken lines are supplied by EDSA in future.

SS-08-2 SCADA Signal for York substation

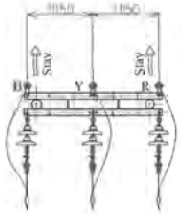
Item No.	Description	Category: Analogue Output	Single Digital Output	Double Digital Output	Command Input
1.	**33 kV Switchgear**				
1.1	Current (33 kV Line) A	2	-	-	-
1.2	Current (33 kV Line) B	2			
1.3	Current (33 kV Line) C	2			
1.4	Voltage (33 kV Bus) A	1	-	-	-
1.5	Voltage (33 kV Bus) B	1			
1.6	Voltage (33 kV Bus) C	1			
1.7	Active Power (kW) (33 kV Line)	2	-	-	-
1.8	Reactive Power (kvar) (33 kV Line)	2	-	-	-
1.9	Circuit Breaker Open/Close	-	-	4	-
1.10	Circuit Breaker Open	-	-	-	4
1.11	Circuit Breaker Close	-	-	-	4
1.12	Circuit Breaker Drawout position	-	-	4	-
1.13	Selector Switch Local/Remote	-	-	4	-
1.14	110 V DC Supply	-	4	-	-
1.15	Main Protection Operated (21)	-	4	-	-
1.16	Back-up Protection Operated (50/51)		4	-	-
1.17	Back-up Protection Operated (Others)	-	4	-	-
1.18	Protection DC Supply	-	4	-	-
1.19	Earthing Switch Open	-	4	-	-
1.20	Earthing Switch Close	-	4	-	-
1.21	Trip circuit supervision	-	4	-	-
	Total	13	32	12	8
2.	**11 kV Switchgear**				
2.1	Current (11 kV Line) A	3	-	-	-
2.2	Current (11 kV Line) B	3			
2.3	Current (11 kV Line) C	3			
2.4	Current (Transformer feeder) A	2	-	-	-
2.5	Current (Transformer feeder) B	2			
2.6	Current (Transformer feeder) C	2			
2.7	Voltage (11 kV Bus) A	1	-	-	-
2.8	Voltage (11 kV Bus) B	1			
2.9	Voltage (11 kV Bus) C	1			
2.10	Active Power (kW) (11 kV Line)	3	-	-	-
2.11	Reactive Power (kW) (11 kV Line)	3	-	-	-
2.12	Active Power (kW) (Transformer)	1	-	-	-
2.13	Reactive Power (kvar) (Transformer)	1	-	-	-
2.14	Circuit Breaker Open/Close	-	-	5	-
2.15	Circuit Breaker Open	-	-	-	5
2.16	Circuit Breaker Close	-	-	-	5
2.17	Circuit Breaker Drawout position	-	-	5	-
2.18	Selector Switch Local/Remote	-	-	5	-
2.19	110 V DC Supply	-	9	-	-
2.20	Main Protection Operated (50/51)	-	5	-	-
2.22	Protection DC Supply	-	5	-	-
2.23	Earthing Switch Open	-	5	-	-
2.24	Earthing Switch Close	-	5	-	-
2.25	Trip circuit supervision	-	5	-	-
	Total	26	30	15	10
3.	**Main Transformer**				
3.1	Selector Switch Local/Remote	-	-	1	-
3.2	Tap changer Raise	-	-	-	1
3.3	Tap changer Lower	-	-	-	1
3.4	Tap change in progress	-	1	-	-
3.5	Tap change incomplete	-	1	-	-
3.6	AVR/Manual control selected	-	-	1	-
3.7	Tap changer AVR selected	-	-	-	1
3.8	Tap changer Manual selected	-	-	-	1
3.9	Tap changer Position	-	1	-	-
3.10	Tap changer Out of Step	-	1	-	-
3.11	Tap changer AVR failure	-	1	-	-
3.12	Tap changer Motor failure	-	1	-	-
3.13	Main Protection Operated (87T, 96, 96-2)	-	3	-	-
3.14	Back-up Protection Operated (others)	-	1	-	-
3.15	Temperature Alarm	-	1	-	-
3.16	Buchholz Alarm (98-1)	-	1	-	-
3.17	Oil Level Low Alarm	-	1	-	-
	Total	0	11	2	4
4.	**Power supply**				
4.1	MCC Trip (AC Distribution panel)	-	1	-	-
4.2	Charger failure	-	1	-	-
4.3	Battery failure	-	1	-	-
4.4	MCC Trip (DC Distribution panel)	-	1	-	-
	Total	0	4	0	0
	Total	39	77	29	22

SS-08-3 SCADA Signal for Tombo substation

Item No.	Description	Category: Analogue Output	Single Digital Output	Double Digital Output	Command Input
1.	**33 kV Switchgear**				
1.1	Current (33 kV Line) A	2	-	-	-
1.2	Current (33 kV Line) B	2	-	-	-
1.3	Current (33 kV Line) C	2	-	-	-
1.4	Voltage (33 kV Bus) A	1	-	-	-
1.5	Voltage (33 kV Bus) B	1	-	-	-
1.6	Voltage (33 kV Bus) C	1	-	-	-
1.7	Active Power (kW) (33 kV Line)	2	-	-	-
1.8	Reactive Power (kvar) (33 kV Line)	2	-	-	-
1.9	Circuit Breaker Open/Close	-	-	4	-
1.10	Circuit Breaker Open	-	-	-	4
1.11	Circuit Breaker Close	-	-	-	4
1.12	Circuit Breaker Drawout position	-	-	4	-
1.13	Selector Switch Local/Remote	-	-	4	-
1.14	110 V DC Supply	-	4	-	-
1.15	Main Protection Operated (71)	-	4	-	-
1.16	Back-up Protection Operated (50/51)	-	4	-	-
1.17	Back-up Protection Operated (Others)	-	4	-	-
1.18	Protection DC Supply	-	4	-	-
1.19	Earthing Switch Open	-	4	-	-
1.20	Earthing Switch Close	-	4	-	-
1.21	Trip circuit supervision	-	4	-	-
	Total	13	32	12	8
2.	**11 kV Switchgear:**				
2.1	Current (11 kV Line) A	4	-	-	-
2.2	Current (11 kV Line) B	4	-	-	-
2.3	Current (11 kV Line) C	4	-	-	-
2.4	Current(Transformer feeder) A	2	-	-	-
2.5	Current(Transformer feeder) B	2	-	-	-
2.6	Current(Transformer feeder) C	2	-	-	-
2.7	Current(Capacitor Bank feeder) A	1	-	-	-
2.8	Current(Capacitor Bank feeder) B	1	-	-	-
2.9	Current(Capacitor Bank feeder) C	1	-	-	-
2.10	Voltage (11 kV Line) A	1	-	-	-
2.11	Voltage (11 kV Bus) B	1	-	-	-
2.12	Voltage (11 kV Bus) C	1	-	-	-
2.13	Active Power (kW) (11 kV Line)	3	-	-	-
2.14	Reactive Power (kVr) (11 kV Line)	3	-	-	-
2.15	Reactive Power (kVr) (Capacitor Bank feeder)	1	-	-	-
2.16	Active Power (kW) (Transformer)	1	-	-	-
2.17	Reactive Power (kvar) (Transformer)	1	-	-	-
2.18	Circuit Breaker Open/Close	-	-	7	-
2.19	Circuit Breaker Open	-	-	-	7
2.20	Circuit Breaker Close	-	-	-	7

Item No.	Description	Category: Analogue Output	Single Digital Output	Double Digital Output	Command Input
2.21	Circuit Breaker Drawout position	-	-	7	-
2.22	Selector Switch Local/Remote	-	-	7	-
2.23	110 V DC Supply	-	7	-	-
2.24	Main Protection Operated (50/51)	-	7	-	-
2.25	Back-up Protection Operated(Others)	-	7	-	-
2.26	Protection DC Supply	-	7	-	-
2.27	Earthing Switch Open	-	7	-	-
2.28	Earthing Switch Close	-	7	-	-
2.29	Trip circuit supervision	-	7	-	-
	Total	33	49	21	14
3.	**Main Transformer**				
3.1	Selector Switch Local/Remote	-	-	1	-
3.2	Tap changer Raise	-	-	-	1
3.3	Tap changer Lower	-	-	-	1
3.4	Tap change in progress	-	1	-	-
3.5	Tap change incomplete	-	1	-	-
3.6	AVR/Manual control selected	-	-	1	-
3.7	Tap changer AVR selected	-	-	-	1
3.8	Tap changer Manual selected	-	-	-	1
3.9	Tap changer Position	-	1	-	-
3.10	Tap changer Out of Step	-	1	-	-
3.11	Tap changer AVR failure	-	1	-	-
3.12	Tap changer Motor failure	-	1	-	-
3.13	Main Protection Operated (87T, 26, 96-2)	-	1	-	-
3.14	Back-up Protection Operated (others)	-	1	-	-
3.15	Temperature Alarm	-	1	-	-
3.16	Buchholz Alarm (96-1)	-	1	-	-
3.17	Oil Level Low Alarm	-	1	-	-
	Total	0	11	2	4
4.	**Power supply**				
4.1	MCCB trip (AC Distribution panel)	-	1	-	-
4.2	Charger failure	-	1	-	-
4.3	Battery failure	-	1	-	-
3.4	MCCB trip (DC Distribution panel)	-	1	-	-
	Total	0	4	0	0
	Total	46	96	35	26

A5-27

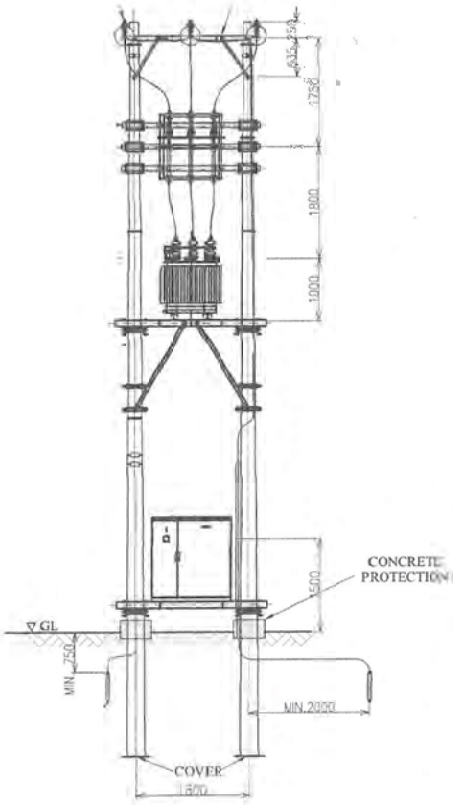


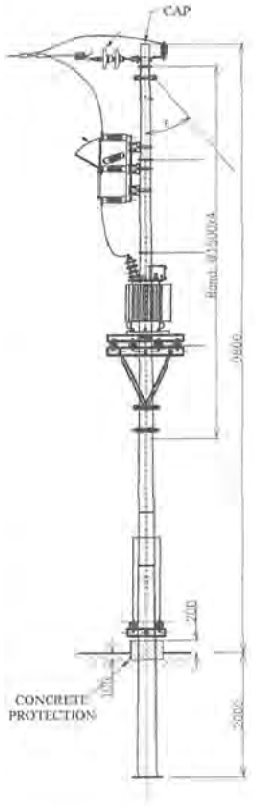
SS-09

Pole Mounted Transformer with LV Disribution Panel

(Preliminary)

Note) The dimensions in the drawing are for reference only.

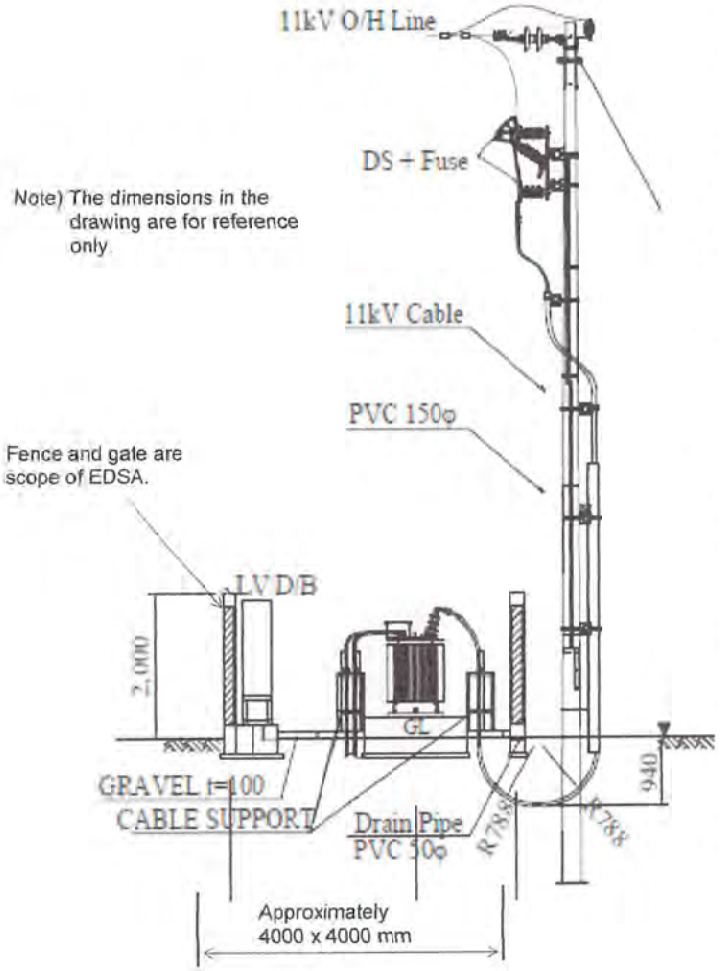


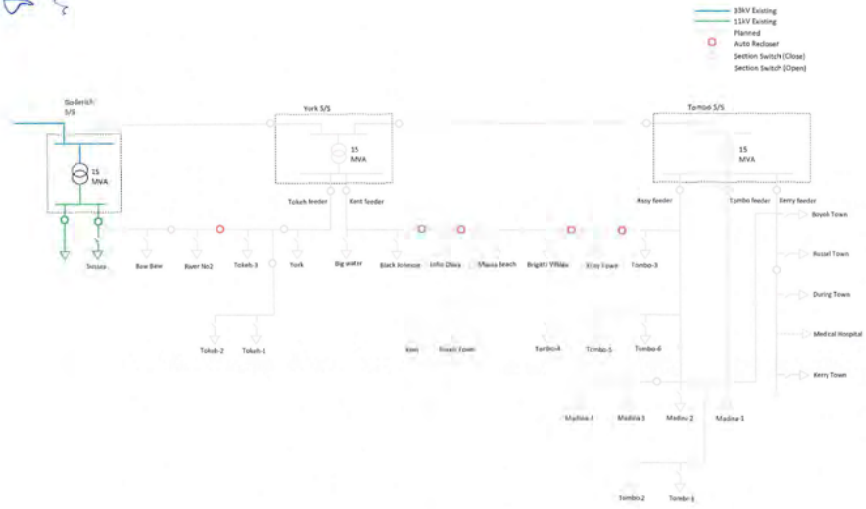


SS-10

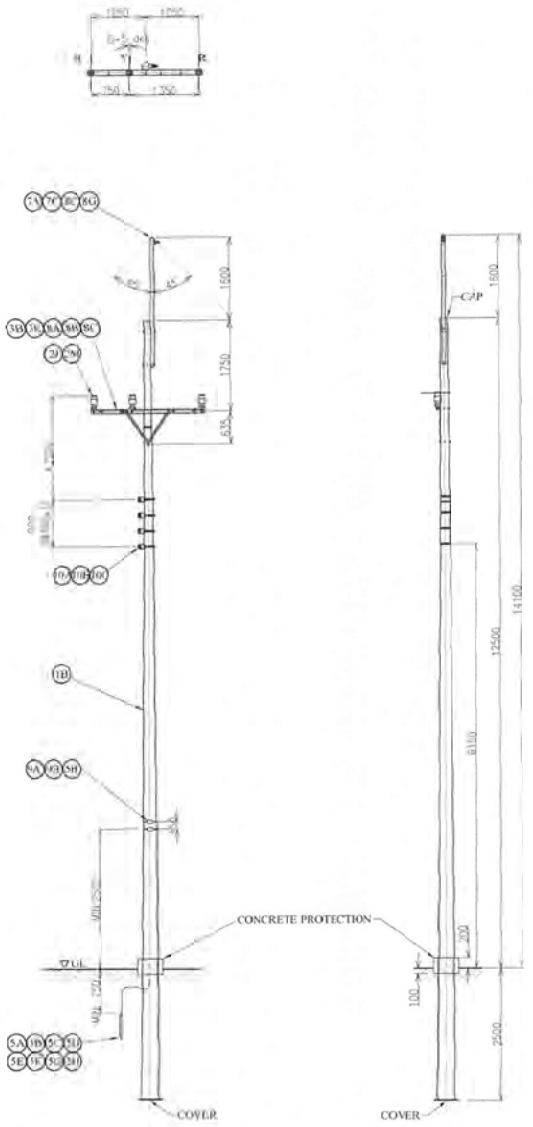
Typical Arrangement of Distribution Transformer above 315 kVA Capacity

(Preliminary)

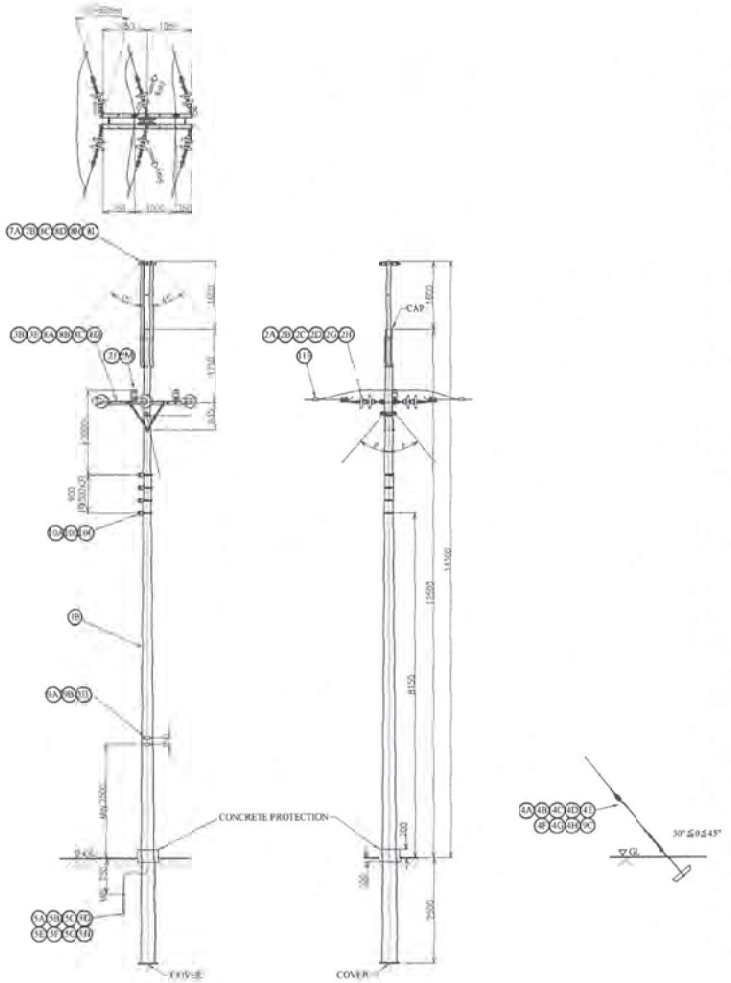




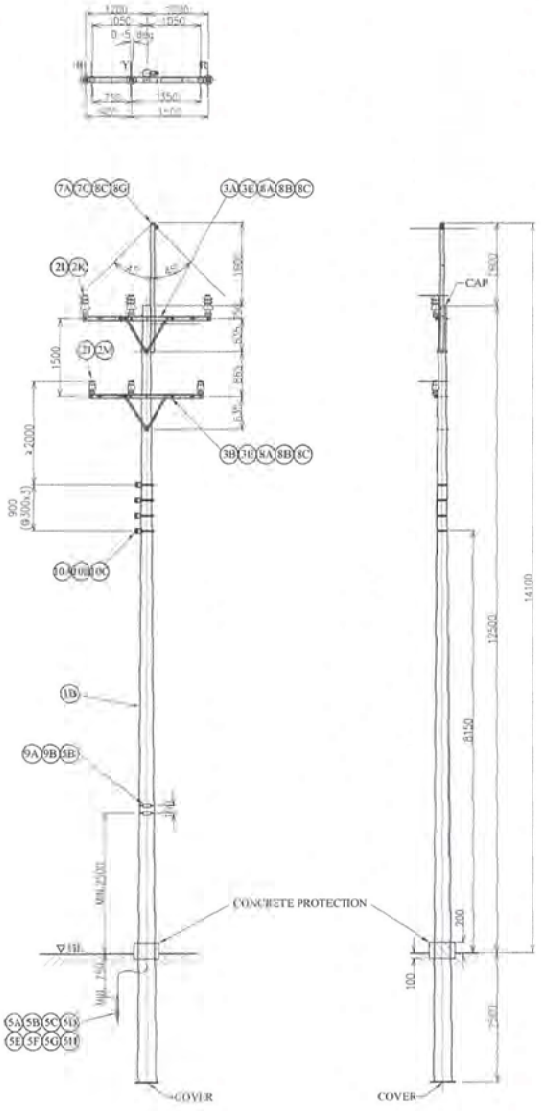
DL-01 Line Diagram



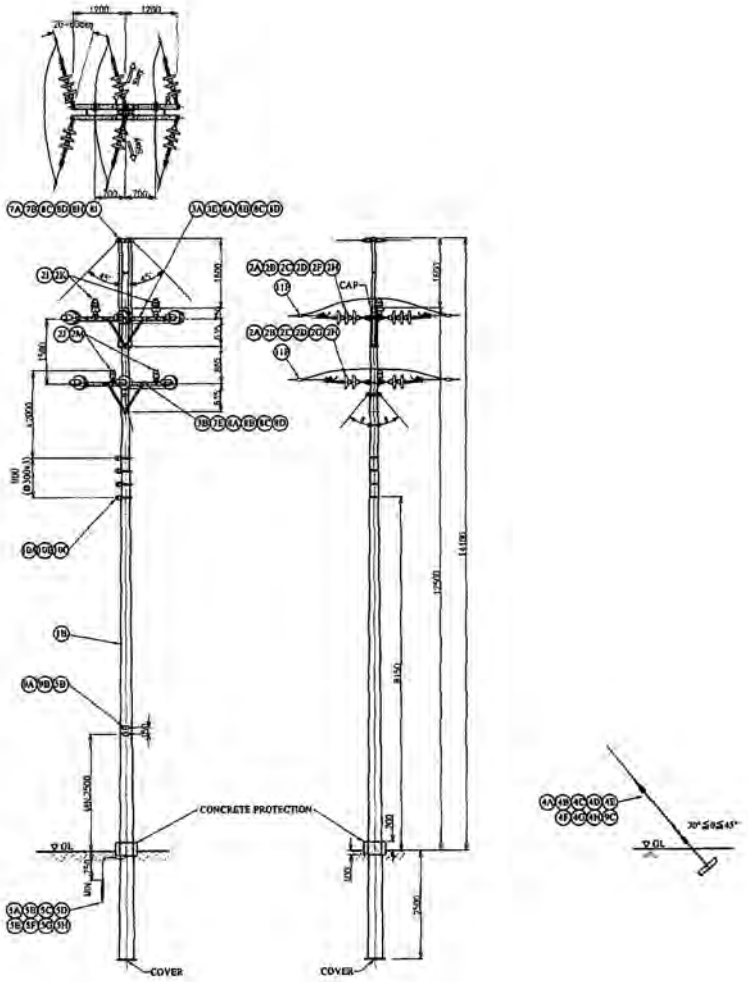
DL-02 SA : 11kV Combined Intermediate Pole (Line Angle 0-5deg.)



DL-02 SC : 11kV Combined Middle Angle Pole (Line Angle 20-60deg.)



DL-02 CA : 11 & 33kV Combined Intermediate Pole (Line Angle 0-5deg.)

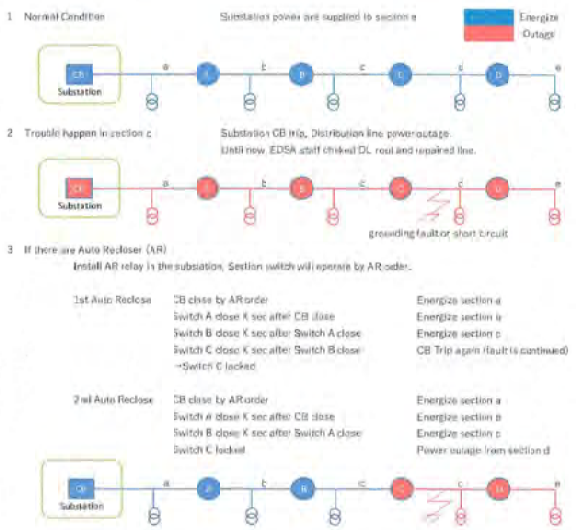


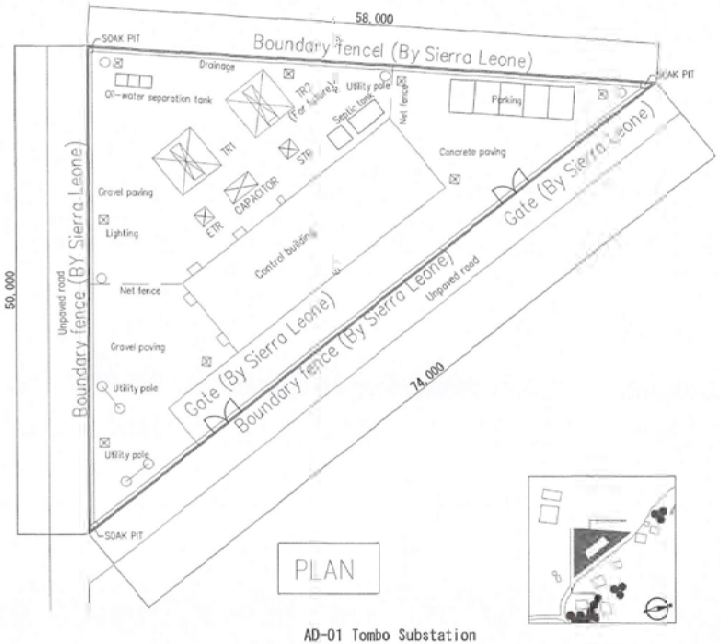
DL-02 CC : 11 & 33kV Combined Middle Angle Pole (Line Angle 20-60deg.)

DL-03

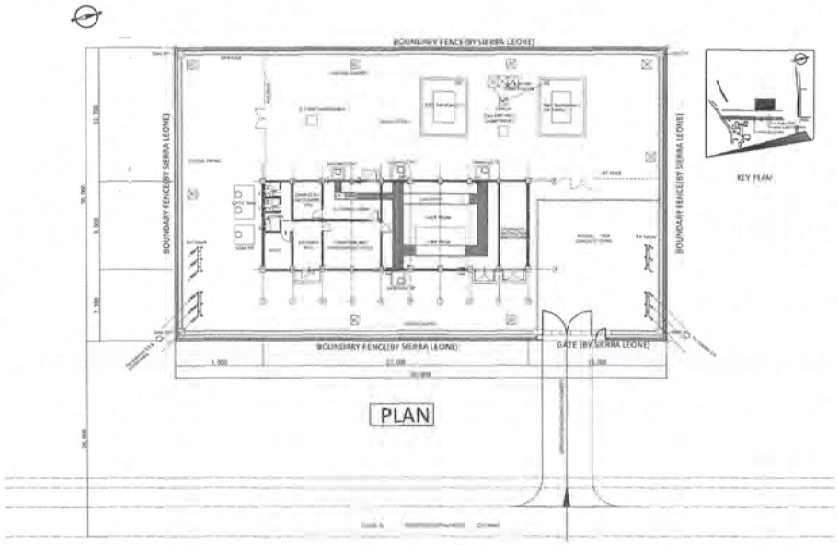
Effect of Auto Recloser

- Reduce power outage area for consumers.
- Make it easy to check the accident section.
- Accident recovery can be done quickly.

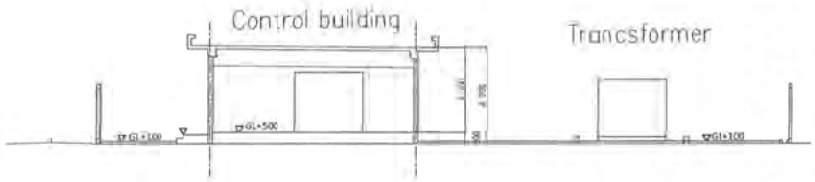




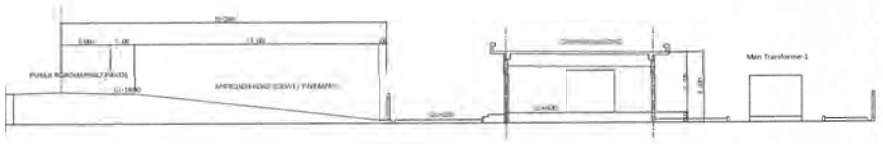
AD-01 Tombo Substation



AD-02 York Substation

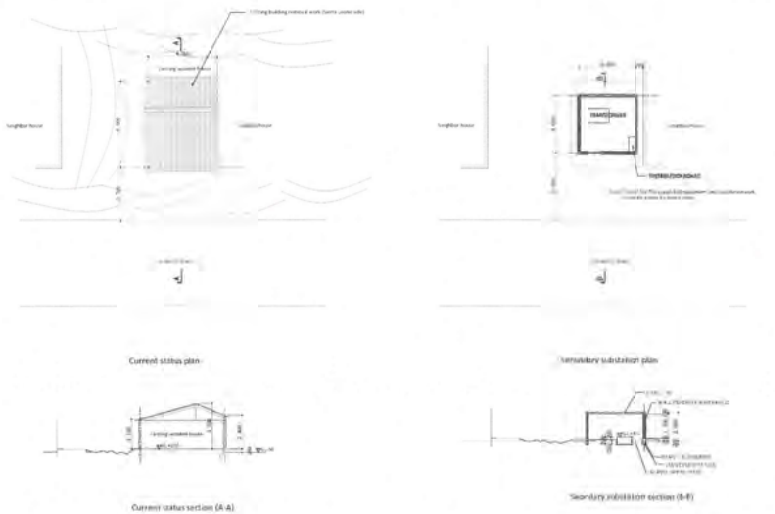


Section Drawing (Tombo substation)



Section Drawing (York substation)

AD-03 Section Drawings



Existing Building
(to be removed by Sierra Leone side)

Secondary Substation Fence and Gate
(to be constructed by Sierra Leone side)

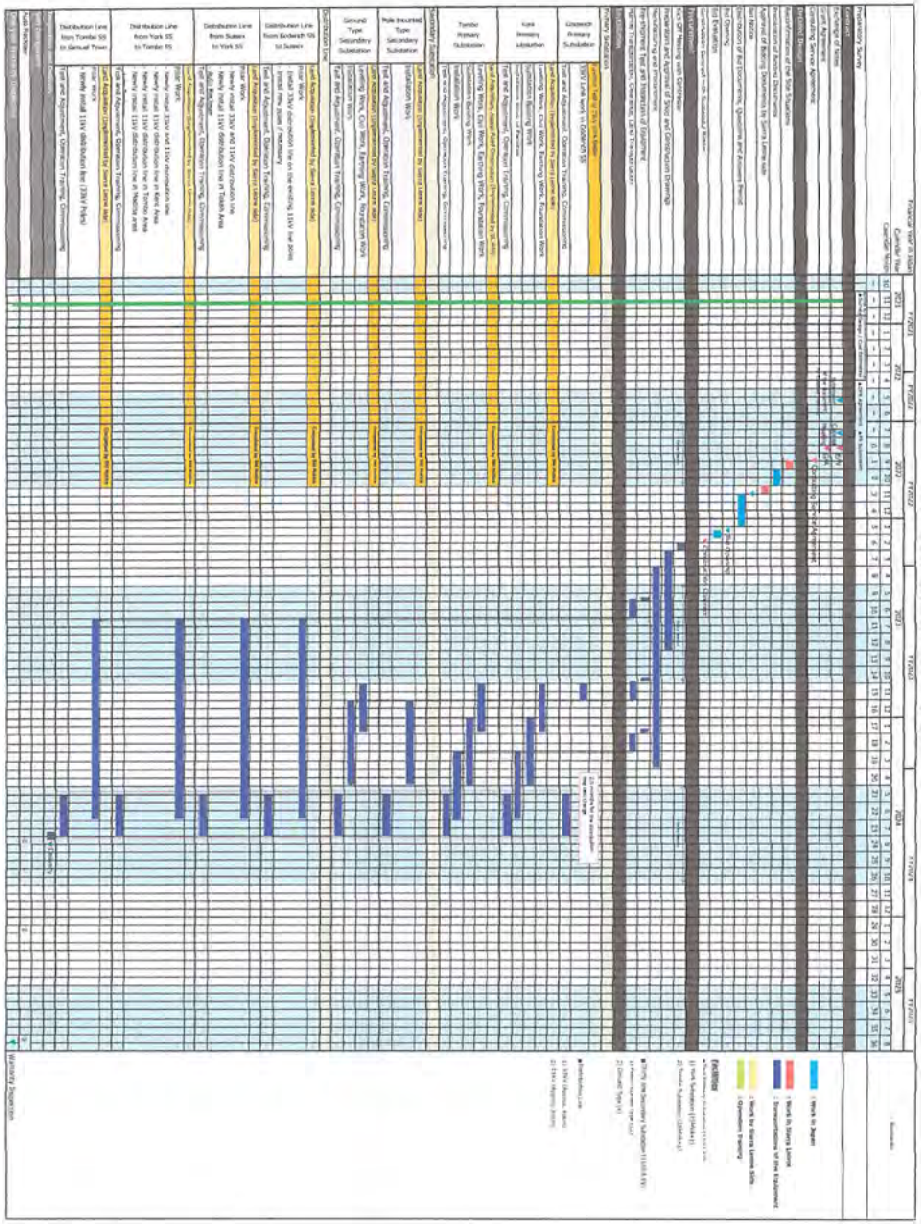
AD-04 Secondary Substation (Tombc-1)

A5-33

Attachment–1 Member List of the Study Team

First Field Survey

Name	Assignment	Organization
Kaisuya KUGE	Team Leader	Japan International Corporation Agency
Aiko KATO	Operation Officer	Japan International Corporation Agency
Makoto ABE	Chief Consultant / Distribution Facilities Planning 1	Yachiyo Engineering Co., Ltd.
Kazuhiko KOEDA	Deputy Chief Consultant / Distribution Facilities Planning 2	Yachiyo Engineering Co., Ltd.
Kenji SAKEMURA	Substation Facilities Planning	West Japan Engineering Consultants, INC.
Shinichi TAKAO	Environmental and Social Consideration	IDEA Consultants, Inc.
Naoki HARA	Social and Economic Analysis	Yachiyo Engineering Co., Ltd.
Mikiko IWAGO	Procurement Planning / Cost Estimation (Equipment)	Yachiyo Engineering Co., Ltd.
Teruo KURUMADA	Facility Planning / Natural Condition Study	Yachiyo Engineering Co., Ltd.
Shohei TERUI	Procurement Planning / Cost Estimation (Facilities)	Yachiyo Engineering Co., Ltd.
Taro NAKAMURA	Power Demand Forecast / Power Flow Analysis / Protection Coordinates	West Japan Engineering Consultants, INC.



Attachment-2 Tentative Implementation Schedule

Attachment-3 List of the Necessary Data/Information

JICA Survey Team has submitted QUESTIONNAIRE to be answered by EDSA in October, 2021. There are lack of the data/information necessary for further study, design and planning for the project. The followings are minimum required data/information requested to EDSA to submit by 10th December, 2021.

No.	Question
1	**Questionnaires (General for Cost Estimation etc.)**
2	**Questionnaires (Distribution Facilities)**
2-1	Codes and Standards to be applied for the project
2-2	Management plan of industrial waste
2-3	Analysis data of power outages in the past 5 years
2-4	System operation situation (related to Project Sites)
2-5	Operation and Maintenance
3	**Questionnaires (Substation)**
4	**Questionnaires (Environmental and Social Considerations)**
5	**Questionnaires (Socio-economic Analysis on Needs for the Project Implementation and Validity)**
5-1	Number of Customers by Customer Type in Recently Electrified Areas near the Project Site
5-2	Tariff by Customer Type to be applied in the Project Site and applied in Recently Electrified Areas near the Project Site
5-3	Electricity Charge Billed and Collected by Customer Type in Recently Electrified Areas near the Project Site in the Recent three (3) years
5-4	Number of Households and Business Establishments that Generate Electricity for their own Use and Average Volume of Electricity Generation by Purpose of the Use in the Project Site and applied in Recently Electrified Areas near the Project Site
5-5	Reduced Hours of Electricity Generation by Customer Type in Recently Electrified Areas near the Project Site
5-6	Price of Generators, Service Life, Service Operation Hours and Fuel Cost for 1kWh by Typical Size in Recently Electrified Areas near the Project Site in Recently Electrified Areas near the Project Site
6	**Questionnaires (Natural Condition and General information for project site)**
6-1	Meteorological data (average of past 10 years)
6-2	Status of land acquisition and resettlement
7	**Questionnaires (Demand forecast/Power flow analysis/Protection coordination)**
7-1	Current population number of the Baw Baw town

6. Outline Design Drawing

6. Outline Design Drawing

The outline design drawings of the Project are described below:

Substation Facilities

DWG No.	Title
SS-01	Single Line Diagram (York S/S)
SS-02	Overall Layout Plan (York S/S)
SS-03	Control Room Layout Plan (York S/S)
SS-04	Single Line Diagram (Tombo S/S)
SS-05	Overall Layout Plan (Tombo S/S)
SS-06	Control Room Layout Plan (Tombo S/S)
SS-07	Substation Monitoring Panel
SS-08-1	SCADA Conceptual Diagram for Future SCADA System
SS-08-2	SCADA Signal List for York S/S
SS-08-3	SCADA Signal List for Tombo S/S
SS-09-1	Pole Mounted Transformer with LV Distribution Board
SS-09-2	2 x Pole Mounted Transformer with LV Distribution Board
SS-10	Typical Arrangement of Distribution Transformer of 630 kVA Capacity
SS-11	Secondary Substation Single Line Diagram
SS-GD-01	Overall Layout Drawing (Goderich S/S)
SS-GD-02	Details –"d"-
SS-GD-03	Details –"f"-

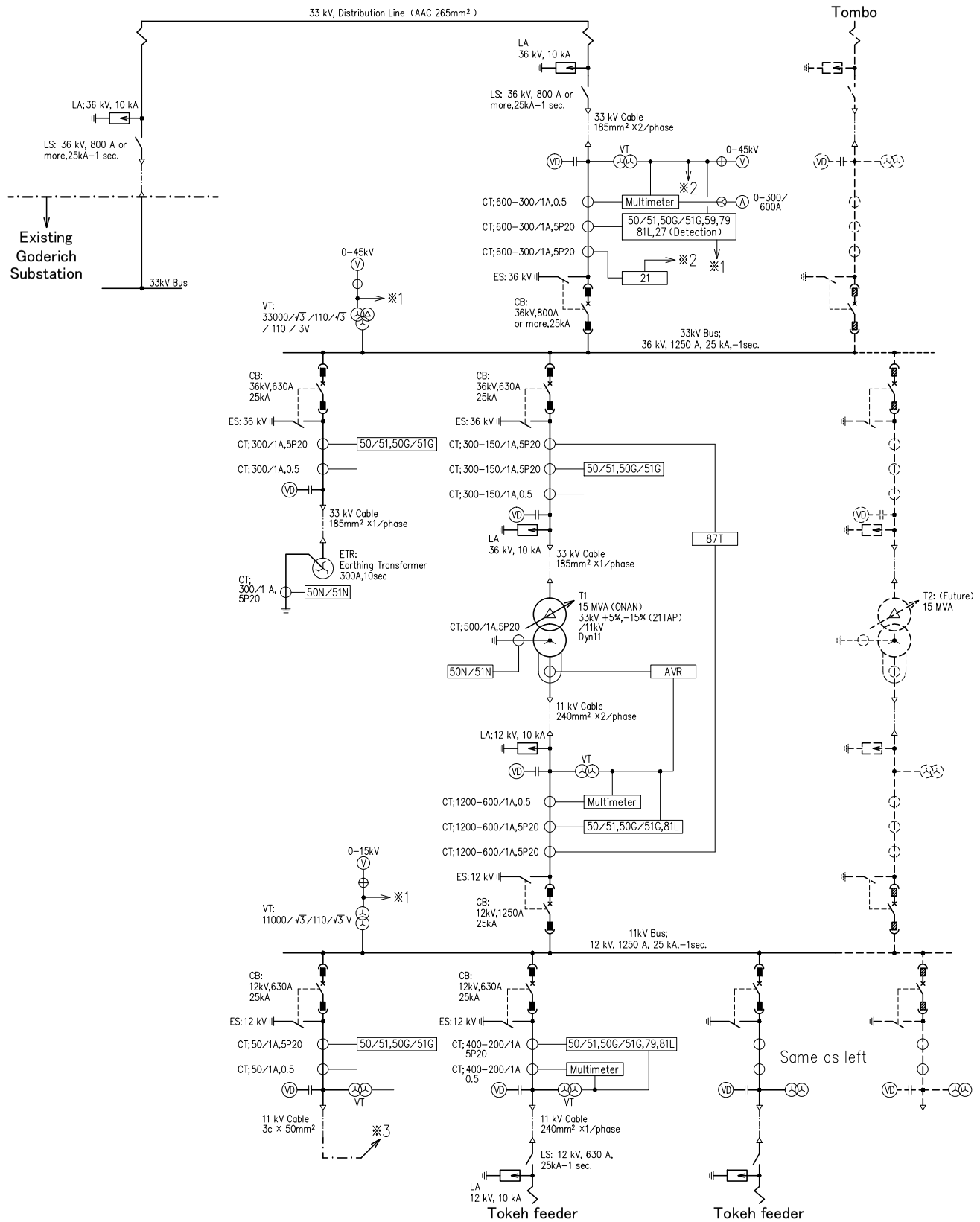
Distribution Line Facilities

DWG No.	Title
DL-01	Line Diagram
DL-02	33&11kV Distribution Line Pole Type
DL-03	Distribution Line Route
DL-04	LV Line Pole Type
DL-05	Distribution Materials

Architect Facilities

DWG No.	Title
AD-01	Tombo Substation
AD-02	York Substation
AD-03	Section Drawings
AD-04	Secondary Substation (Tombo-1)
AD-05	Foundation Drawings of Electrical Equipment (Tombo S/S)
AD-06	Foundation Drawings of Electrical Equipment (York S/S)
AD-07	Foundation Drawings of Electrical Equipment (Secondary S/S)

Single line Diagram of YORK Substation



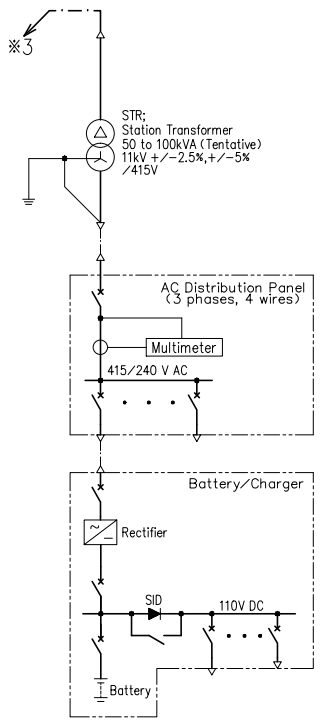
Legend

CB : Cirucuit Breaker
CT : Current Transformer
LA : Lightning Arrester
LS : Line Switch
VD : Voltage Detector
VT : Voltage Transformer

AVR : Automatic Voltage Regulator
21 : Distance Relay
27 : Undervoltage Relay
50/51 : Instantaneous / Inverse time Overcurrent Relay
50G/51G : Instantaneous / Inverse time Overcurrent Earth Fault Relay
50N/51N : Instantaneous / Inverse time Overcurrent Relay on Neutral ine
59 : Overvoltage Relay
79 : Auto-Reclosing Relay
81L : Underfrequency Relay

Multimeter: Ⓐ Ⓥ Hz Ⓦ var pf Wh varh

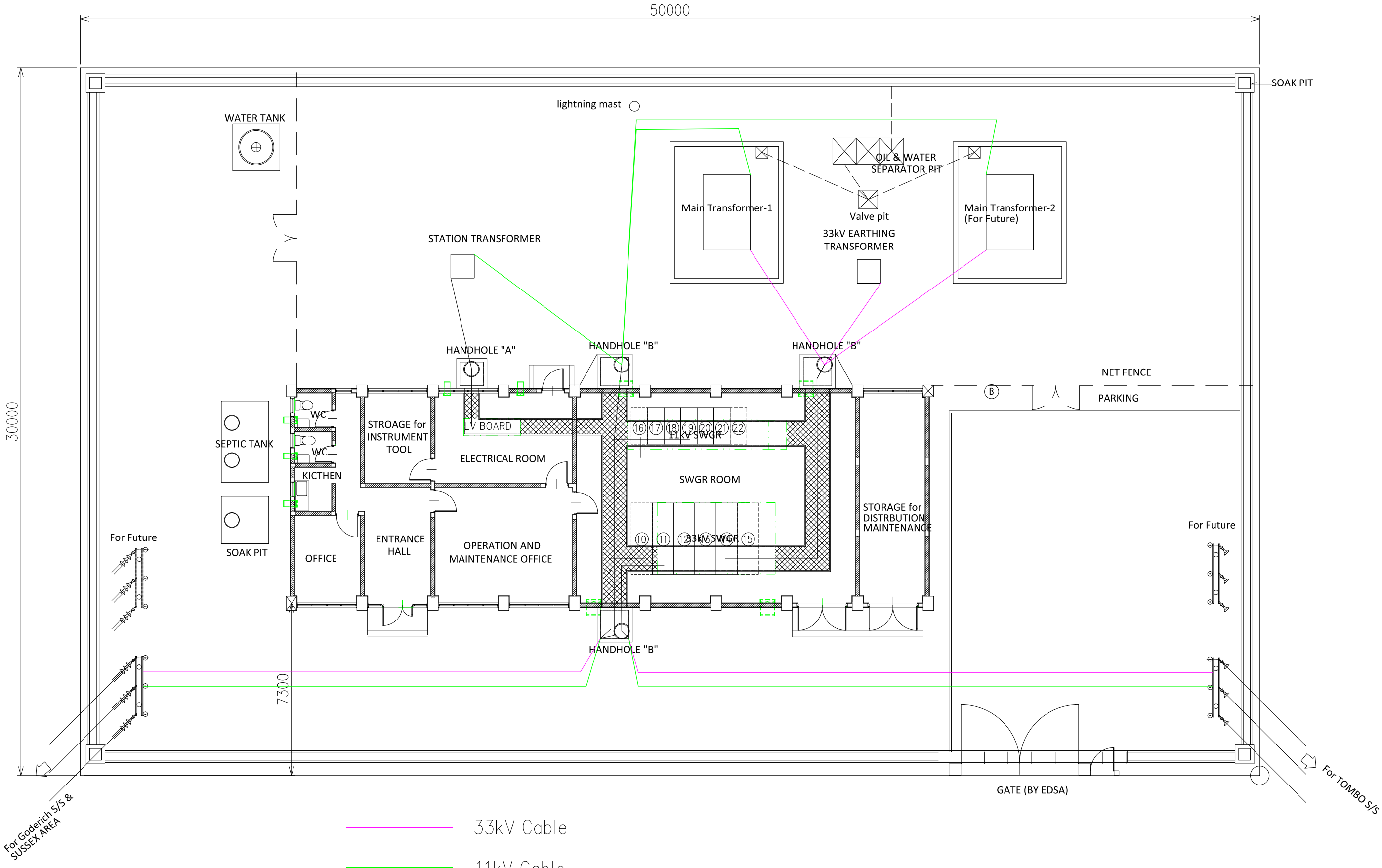
Low Voltage Circuit



Preliminary

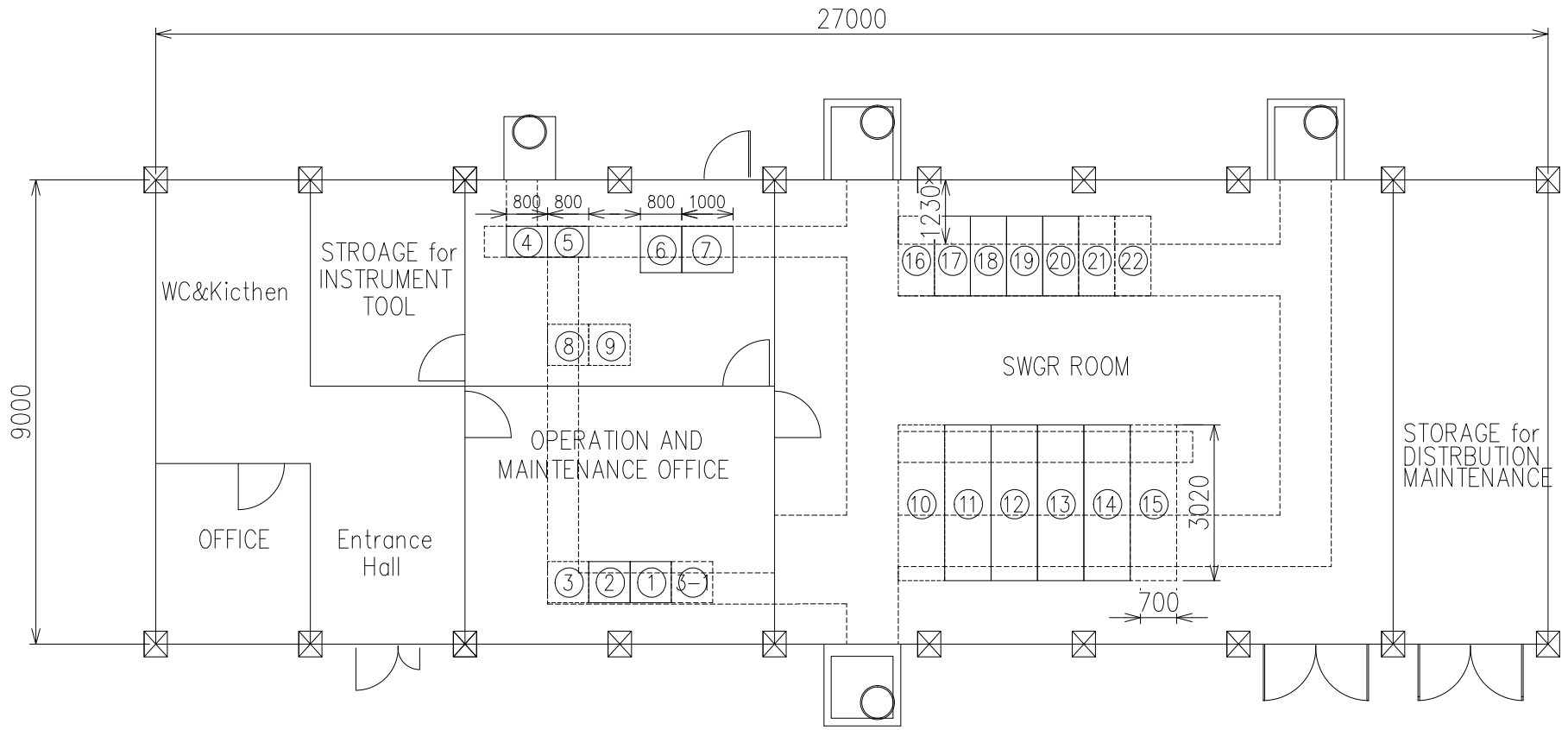
Extension of Power Distribution System Along the Freetown Peninsular in the Republic of Sierra Leone				SCALE
Title: Single Line Diagram (York S/S)				NON
				DWG.No. SS-01
DATE	DESIGNED	CHECKED	APPROVED	REVISION
January.2022	T.NAKAMURA	K.SAKEMURA	M.Abe	2
West Japan Engineering Consultans,INC				

SS-01 Single Line Diagram (York S/S)



SS-02 Over all layout Plan (York S/S)

SS-02 Overall layout plan (York S/S)



Operation room

No	Panel Name	Size
1	Transformer AVR-1	800Wx800D
2	Substation Monitoring Panel	800Wx800D
3	Remote Terminal Unit(future)	800Wx800D
3-1	Transformer AVR-2(future)	800Wx800D

Electrical room

No	Panel Name	Size
4	AC Distribution Panel	800Wx600D
5	DC Distribution Panel	800Wx600D
6	110V DC Charger	800Wx900D
7	110V Battery(150Ah)	1000Wx900D
8	48V DC Charger(Future)	800Wx800D
9	48V DC Battery(Future)	800Wx800D

Switchgear room

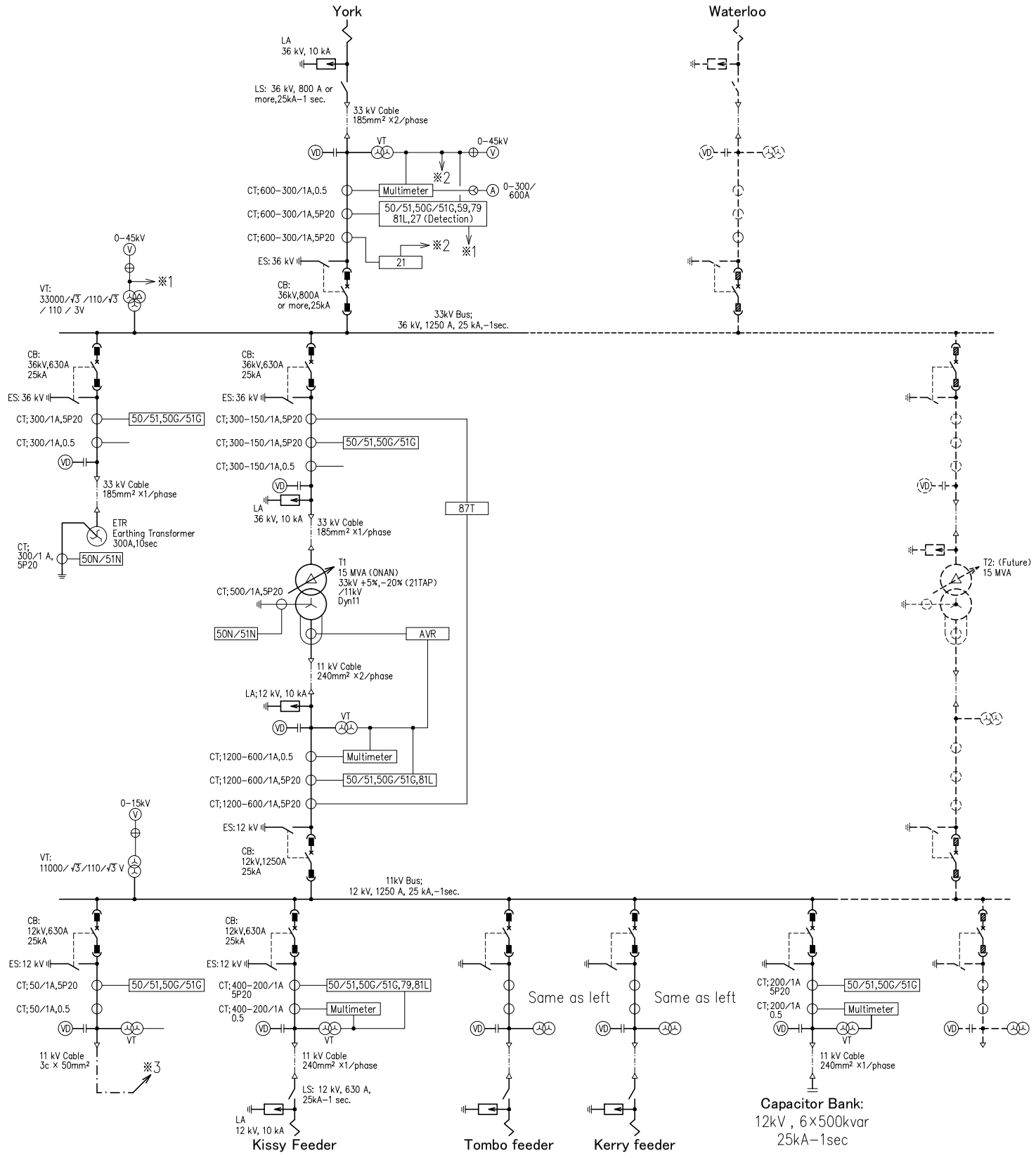
No	Panel Name	Size
10	Incomer-Goderich	900Wx3020D
11	Incomer-Tombo	900Wx3020D
12	33kV Switchgear VT	900Wx3020D
13	Earthing Transformer	900Wx3020D
14	Transformer-1 Primary	900Wx3020D
15	Transformer-2 Primary(future)	900Wx3020D

No	Panel Name	Size
16	Station Service Transformer	700Wx1550D
17	11kV Feeder Tokeh	700Wx1550D
18	Transformer-1 Secondry	700Wx1550D
19	11kV Feeder Kent	700Wx1550D
20	11kV Switchgear VT	700Wx1550D
21	11kV Feeder -Spare(Future)	700Wx1550D
22	Transformer-2 Secondry(Future)	700Wx1550D

SS-03 Layout Plan of Control Building (York SS)

SS-03 Control Room Layout Plan (York S/S)

Single line Diagram of TOMBO Substation



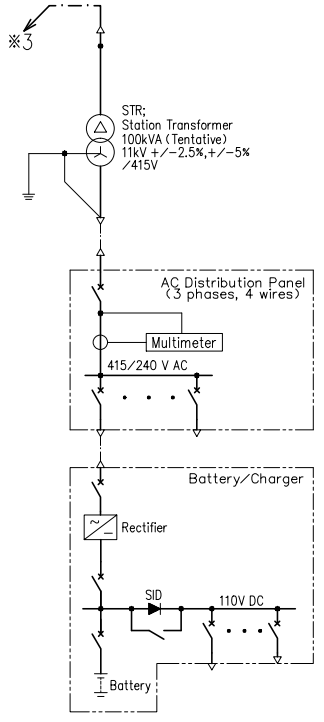
Legend

CB : Cirucuit Breaker
CT : Current Transformer
LA : Lightning Arrester
LS : Line Switch
VD : Voltage Detector
VT : Voltage Transformer

AVR : Automatic Voltage Regulator
21 : Distance Relay
27 : Undervoltage Relay
50/51 : Instantaneous / Inverse time Overcurrent Relay
50G/51G : Instantaneous / Inverse time Overcurrent Earth Fault Relay
50N/51N : Instantaneous / Inverse time Overcurrent Relay on Neutral ine
59 : Overvoltage Relay
79 : Auto–Reclosing Relay
81L : Underfrequency Relay

Multimeter: Ⓐ Ⓥ Hz Ⓦ varh pf Wh varh

Low Voltage Circuit



Preliminary

Extension of Power Distribution System Along the Freetown Peninsular in the Republic of Sierra Leone				SCALE NON
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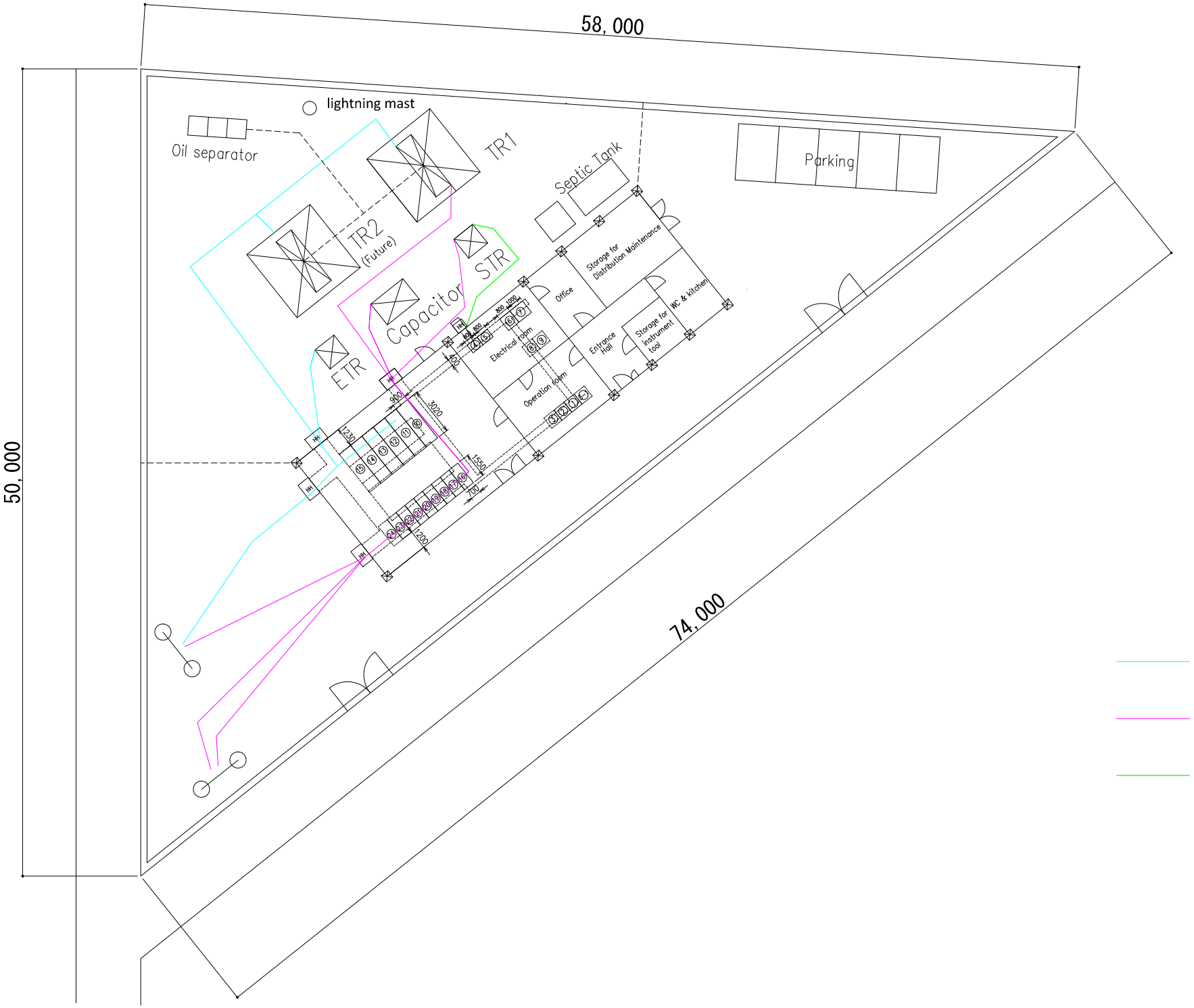
DATE	DESIGNED	CHECKED	APPROVED	REVISION
January.2022	T.NAKAMURA	K.SAKEMURA	M.Abe	2
West Japan Engineering Consultans,INC				

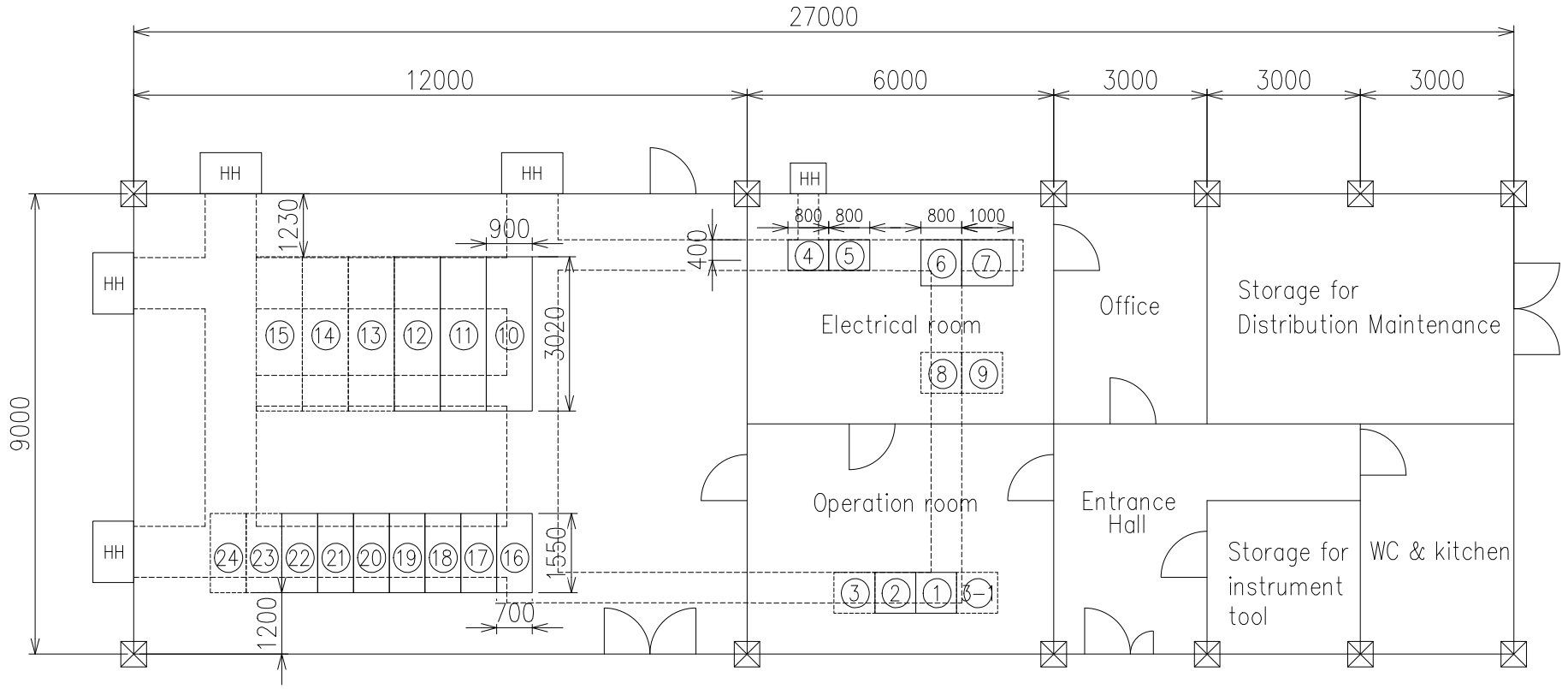
SS–04 Single Line Diagram (Tombo S/S)



SS-05 Overall Layout Plan (Tombo S/S)

SS-05 Over all layout Plan (TomboSS)

A-6-6



Operation room

No	Panel Name	Size
1	Transformer AVR-1	800Wx800D
2	Alarm Panel	800Wx800D
3	Remote Terminal Unit(future)	800Wx800D
3-1	Transformer AVR-2 (Future)	800Wx800D

Electrical room

No	Panel Name	Size
4	AC Distribution Panel	800Wx600D
5	DC Distribution Panel	800Wx600D
6	110V DC Charger	800Wx900D
7	110V Battery(150Ah)	1000Wx900D
8	48V DC Charger(Future)	800Wx800D
9	48V DC Battery(Future)	800Wx800D

Switchgear room

No	Panel Name	Size
10	Incomer-York	900Wx3020D
11	Transformer-1 Primary	900Wx3020D
12	33kV Switchgear VT	900Wx3020D
13	Earthing Transformer	900Wx3020D
14	Incomer-Waterloo (Spare)	900Wx3020D
15	Transformer-2 Primary (future)	900Wx3020D

No	Panel Name	Size
16	Transformer-1 Secondry	700Wx1550D
17	11kV Feeder-Samuel town	700Wx1550D
18	11kV Feeder-Tombo	700Wx1550D
19	11kV Switchgear VT	700Wx1550D
20	11kV Feeder-York	700Wx1550D
21	Station Service Transformer	700Wx1550D
22	Capacitor Bank	700Wx1550D
23	11kV Feeder-Spare(Future)	700Wx1550D
24	Transformer-2 Secondry (Future)	700Wx1550D

SS-06 Control Room Layout Plan (Tombo S/S)

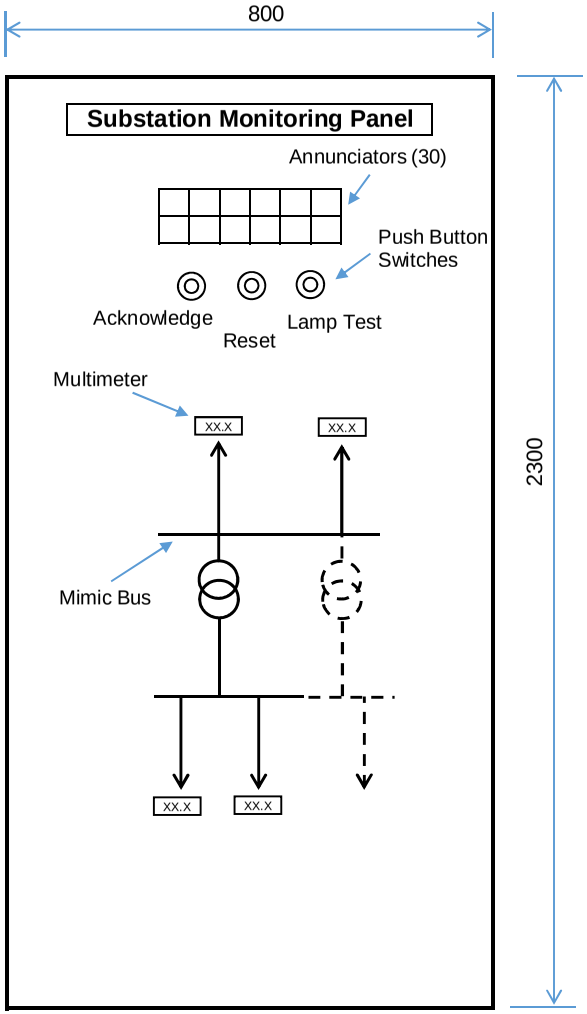
SS-06 Layout Plan of Control Building (Tombo SS)

SS-07

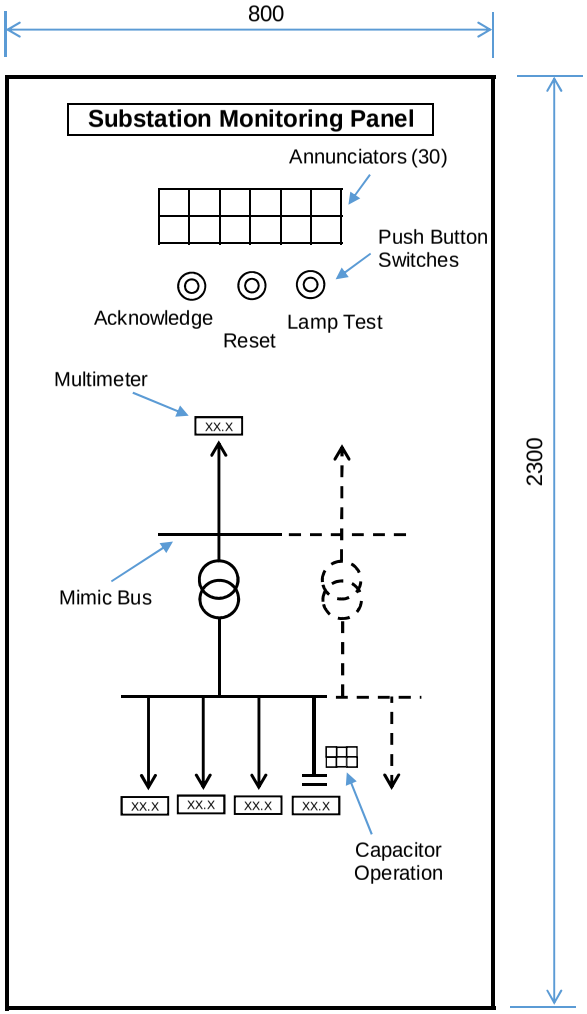
Outline of Substation Monitoring Panel

(Preliminary)

York



Tombo

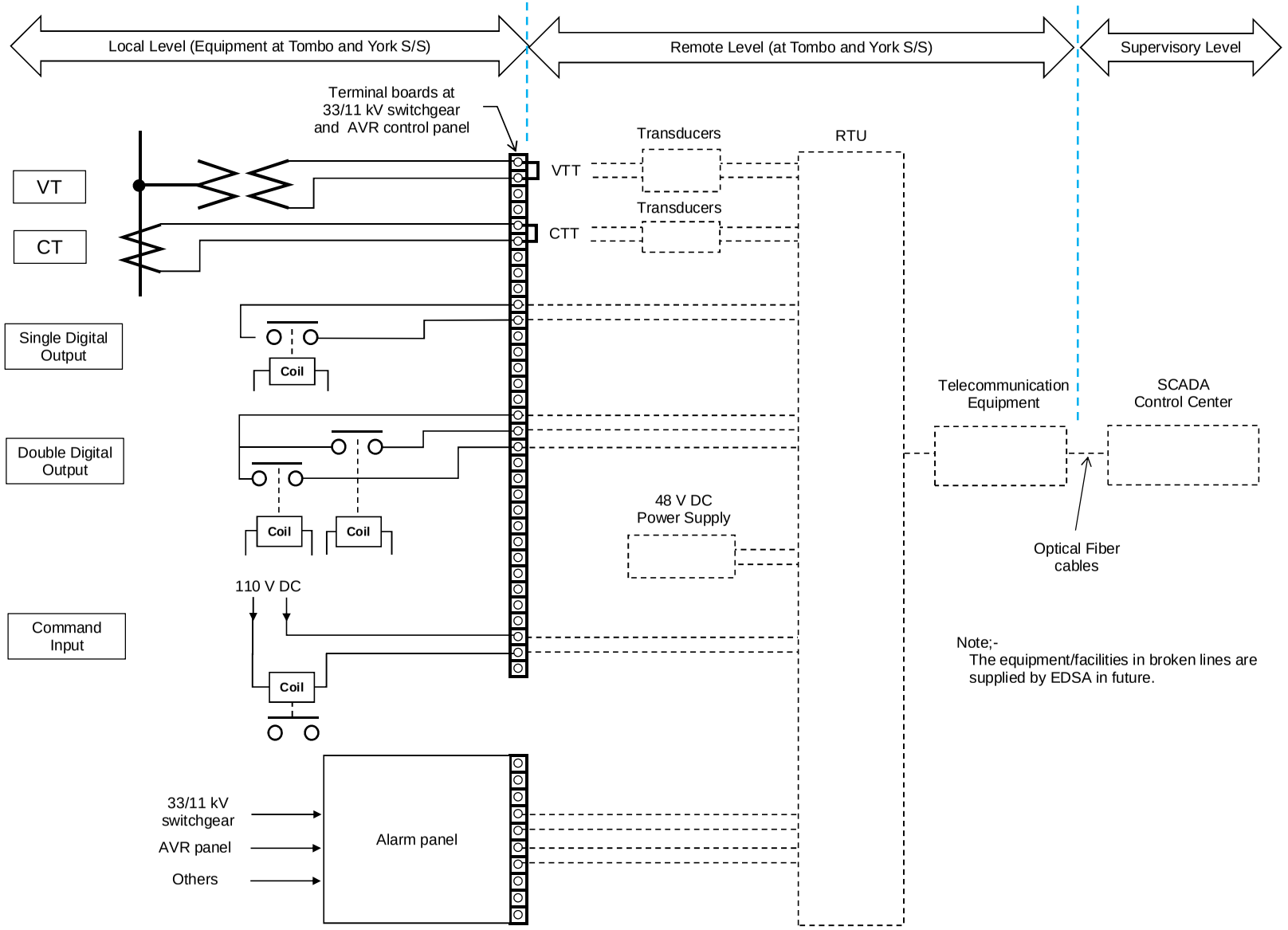


SS-07 Substation Monitoring Panel

SS-08-1 SCADA Conceptual Diagram for Future SCADA System

(Preliminary)

November 2021
JICA study team



SS-08-2 SCADA Signal List for Tombo S/S

Item No.	Description	Category			
		Analogue Output	Single Digital Output	Double Digital Output	Command Input
1.	**33 kV Switchgear**				
1.1	Current (33 kV Line) A	2	-	-	-
1.2	Current (33 kV Line) B	2			
1.3	Current (33 kV Line) C	2			
1.4	Voltage (33 kV Bus) A	1	-	-	-
1.5	Voltage (33 kV Bus) B	1			
1.6	Voltage (33 kV Bus) C	1			
1.7	Active Power (kW) (33 kV Line)	2	-	-	-
1.8	Reactive Power (kvar) (33 kV Line)	2	-	-	-
1.9	Circuit Breaker Open/Close	-	-	4	-
1.10	Circuit Breaker Open	-	-	-	4
1.11	Circuit Breaker Close	-	-	-	4
1.12	Circuit Breaker Drawout position	-	-	4	-
1.13	Selector Switch Local/Remote	-	-	4	-
1.14	110 V DC Supply	-	4	-	-
1.15	Main Protection Operated (21)	-	4	-	-
1.16	Back-up Protection Operated (50/51)		4	-	-
1.17	Back-up Protection Operated (Others)	-	4	-	-
1.18	Protection DC Supply	-	4	-	-
1.19	Earthing Switch Open	-	4	-	-
1.20	Earthing Switch Close	-	4	-	-
1.21	Trip circuit supervision	-	4	-	-
	Total	13	32	12	8

2.	**11 kV Switchgear**				
2.1	Current (11 kV Line) A	3	-	-	-
2.2	Current (11 kV Line) B	3			
2.3	Current (11 kV Line) C	3			
2.4	Current (Transformer feeder) A	2	-	-	-
2.5	Current (Transformer feeder) B	2			
2.6	Current (Transformer feeder) C	2			
2.7	Voltage (11 kV Bus) A	1	-	-	-
2.8	Voltage (11 kV Bus) B	1			
2.9	Voltage (11 kV Bus) C	1			
2.10	Active Power (kW) (11 kV Line)	3	-	-	-
2.11	Reactive Power (kW) (11 kV Line)	3	-	-	-
2.12	Active Power (kW) (Transformer)	1	-	-	-
2.13	Reactive Power (kvar) (Transformer)	1	-	-	-
2.14	Circuit Breaker Open/Close	-	-	5	-
2.15	Circuit Breaker Open	-	-	-	5
2.16	Circuit Breaker Close	-	-	-	5
2.17	Circuit Breaker Drawout position	-	-	5	-
2.18	Selector Switch Local/Remote	-	-	5	-
2.19	110 V DC Supply	-	5	-	-
2.20	Main Protection Operated (50/51)	-	5	-	-
2.22	Protection DC Supply	-	5	-	-
2.23	Earthing Switch Open	-	5	-	-
2.24	Earthing Switch Close	-	5	-	-
2.25	Trip circuit supervision	-	5	-	-
	Total	26	30	15	10

3.	**Main Transformer**				
3.1	Selector Switch Local/Remote	-	-	1	-
3.2	Tap changer Raise	-	-	-	1
3.3	Tap changer Lower	-	-	-	1
3.4	Tap change in progress	-	1	-	-
3.5	Tap change incomplete	-	1	-	-
3.6	AVR/Manual control selected	-	-	1	-
3.7	Tap changer AVR selected	-	-	-	1
3.8	Tap changer Manual selected	-	-	-	1
3.9	Tap changer Position	-	1	-	-
3.10	Tap changer Out of Step	-	1	-	-
3.11	Tap changer AVR failure	-	1	-	-
3.12	Tap changer Motor failure	-	1	-	-
3.13	Main Protection Operated (87T, 26, 96-2)	-	1	-	-
3.14	Back-up Protection Operated (others)	-	1	-	-
3.15	Temperature Alarm	-	1	-	-
3.16	Buchholz Alarm (96-1)	-	1	-	-
3.17	Oil Level Low Alarm	-	1	-	-
	Total	0	11	2	4

4.	**Power supply**				
4.1	MCCB trip (AC Distribution panel)	-	1	-	-
4.2	Charger failure	-	1	-	-
4.3	Battery failure	-	1	-	-
3.4	MCCB trip (DC Distribution panel)	-	1	-	-
	Total	0	4	0	0
	Total	39	77	29	22

SS-08-3 SCADA Signal List for Tombo S/S

Item No.	Description	Category			
		Analogue Output	Single Digital Output	Double Digital Output	Command Input
1.	**33 kV Switchgear**				
1.1	Current (33 kV Line) A	2	-	-	-
1.2	Current (33 kV Line) B	2	-	-	-
1.3	Current (33 kV Line) C	2	-	-	-
1.4	Voltage (33 kV Bus) A	1	-	-	-
1.5	Voltage (33 kV Bus) B	1	-	-	-
1.6	Voltage (33 kV Bus) C	1	-	-	-
1.7	Active Power (kW) (33 kV Line)	2	-	-	-
1.8	Reactive Power (kvar) (33 kV Line)	2	-	-	-
1.9	Circuit Breaker Open/Close	-	-	4	-
1.10	Circuit Breaker Open	-	-	-	4
1.11	Circuit Breaker Close	-	-	-	4
1.12	Circuit Breaker Drawout position	-	-	4	-
1.13	Selector Switch Local/Remote	-	-	4	-
1.14	110 V DC Supply	-	4	-	-
1.15	Main Protection Operated (21)	-	4	-	-
1.16	Back-up Protection Operated (50/51)	-	4	-	-
1.17	Back-up Protection Operated (Others)	-	4	-	-
1.18	Protection DC Supply	-	4	-	-
1.19	Earthing Switch Open	-	4	-	-
1.20	Earthing Switch Close	-	4	-	-
1.21	Trip circuit suprevision	-	4	-	-
	Total	13	32	12	8

2.	**11 kV Switchgear**				
2.1	Current (11 kV Line) A	4	-	-	-
2.2	Current (11 kV Line) B	4	-	-	-
2.3	Current (11 kV Line) C	4	-	-	-
2.4	Current (Transformer feeder) A	2	-	-	-
2.5	Current (Transformer feeder) B	2	-	-	-
2.6	Current (Transformer feeder) C	2	-	-	-
2.7	Current (Capacitor Bank feeder) A	1	-	-	-
2.8	Current (Capacitor Bank feeder) B	1	-	-	-
2.9	Current (Capacitor Bank feeder) C	1	-	-	-
2.10	Voltage (11 kV Bus) A	1	-	-	-
2.11	Voltage (11 kV Bus) B	1	-	-	-
2.12	Voltage (11 kV Bus) C	1	-	-	-
2.13	Active Power (kW) (11 kV Line)	3	-	-	-
2.14	Reactive Power (kW) (11 kV Line)	3	-	-	-
2.15	Reactive Power (kW) (Capacitor Bank feeder)	1	-	-	-
2.16	Active Power (kW) (Transformer)	1	-	-	-
2.17	Reactive Power (kvar) (Transformer)	1	-	-	-
2.18	Circuit Breaker Open/Close	-	-	7	-
2.19	Circuit Breaker Open	-	-	-	7
2.20	Circuit Breaker Close	-	-	-	7
2.21	Circuit Breaker Drawout position	-	-	7	-
2.22	Selector Switch Local/Remote	-	-	7	-
2.23	110 V DC Supply	-	7	-	-
2.24	Main Protection Operated (50/51)	-	7	-	-
2.25	Back-up Protection Operated (Others)	-	7	-	-
2.26	Protection DC Supply	-	7	-	-
2.27	Earthing Switch Open	-	7	-	-
2.28	Earthing Switch Close	-	7	-	-
2.29	Trip circuit suprevision	-	7	-	-
	Total	33	49	21	14

3.	**Main Transformer**				
3.1	Selector Switch Local/Remote	-	-	1	-
3.2	Tap changer Raise	-	-	-	1
3.3	Tap changer Lower	-	-	-	1
3.4	Tap change in progress	-	1	-	-
3.5	Tap change incomplete	-	1	-	-
3.6	AVR/Manual control selected	-	-	1	-
3.7	Tap changer AVR selected	-	-	-	1
3.8	Tap changer Manual selected	-	-	-	1
3.9	Tap changer Position	-	1	-	-
3.10	Tap changer Out of Step	-	1	-	-
3.11	Tap changer AVR failure	-	1	-	-
3.12	Tap changer Motor failure	-	1	-	-
3.13	Main Protection Operated (87T, 26, 96-2)	-	1	-	-
3.14	Back-up Protection Operated (others)	-	1	-	-
3.15	Temperature Alarm	-	1	-	-
3.16	Buchholz Alarm (96-1)	-	1	-	-
3.17	Oil Level Low Alarm	-	1	-	-
	Total	0	11	2	4

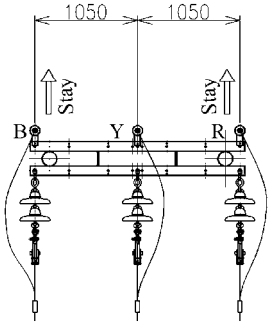
4.	**Power supply**				
4.1	MCCB trip (AC Distribution panel)	-	1	-	-
4.2	Charger failure	-	1	-	-
4.3	Battery failure	-	1	-	-
3.4	MCCB trip (DC Distribution panel)	-	1	-	-
	Total	0	4	0	0
	Total	46	96	35	26

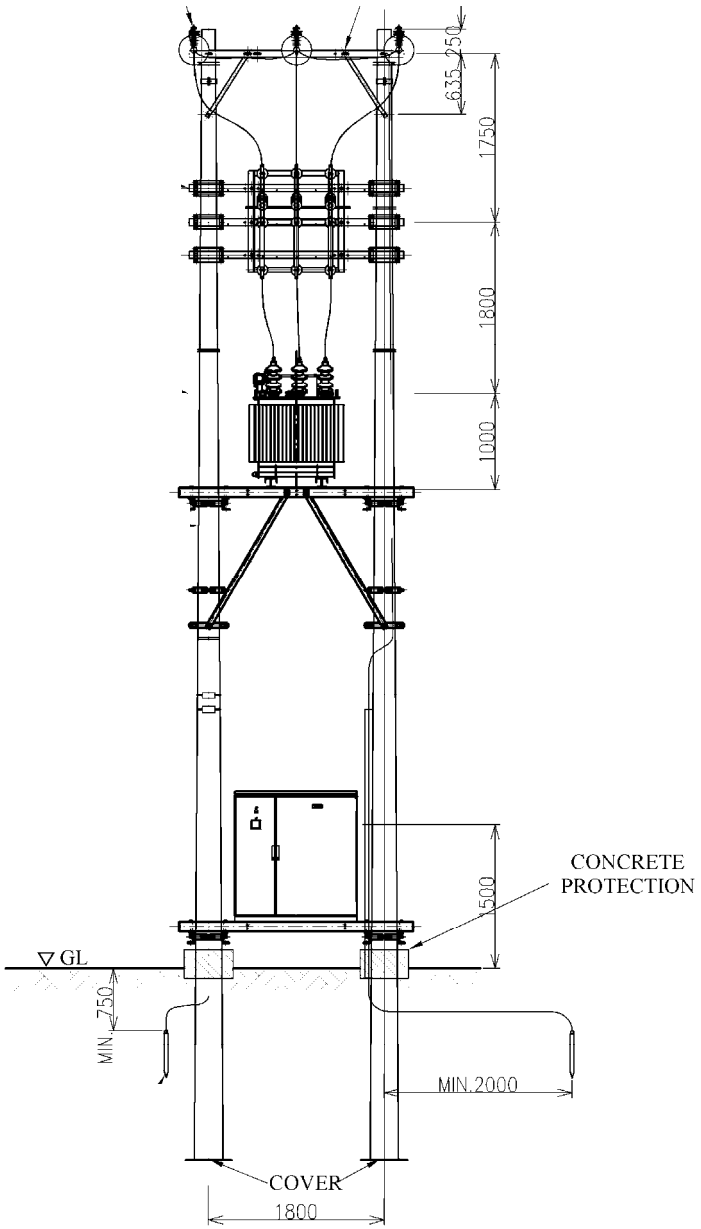
SS-09-1

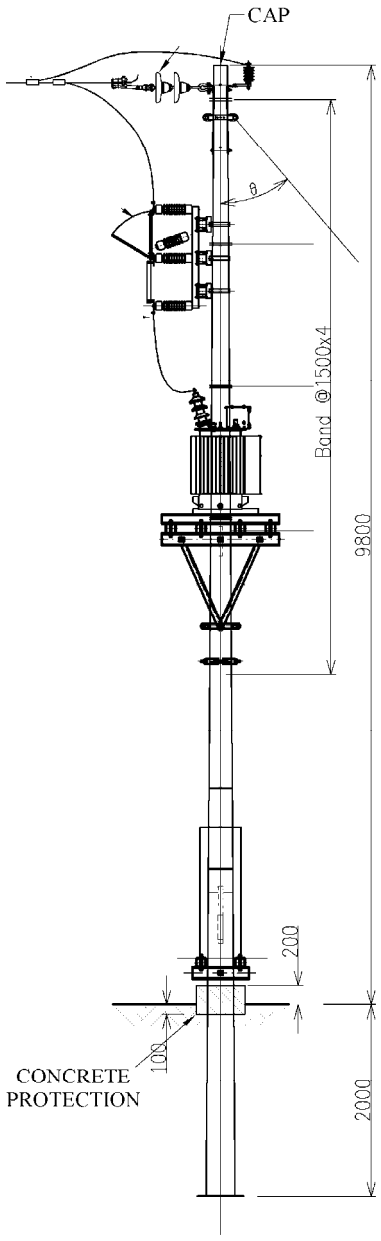
Pole Mounted Transformer with LV Distribution Board

(Preliminary)

Note) The dimensions in the drawing are for reference only.





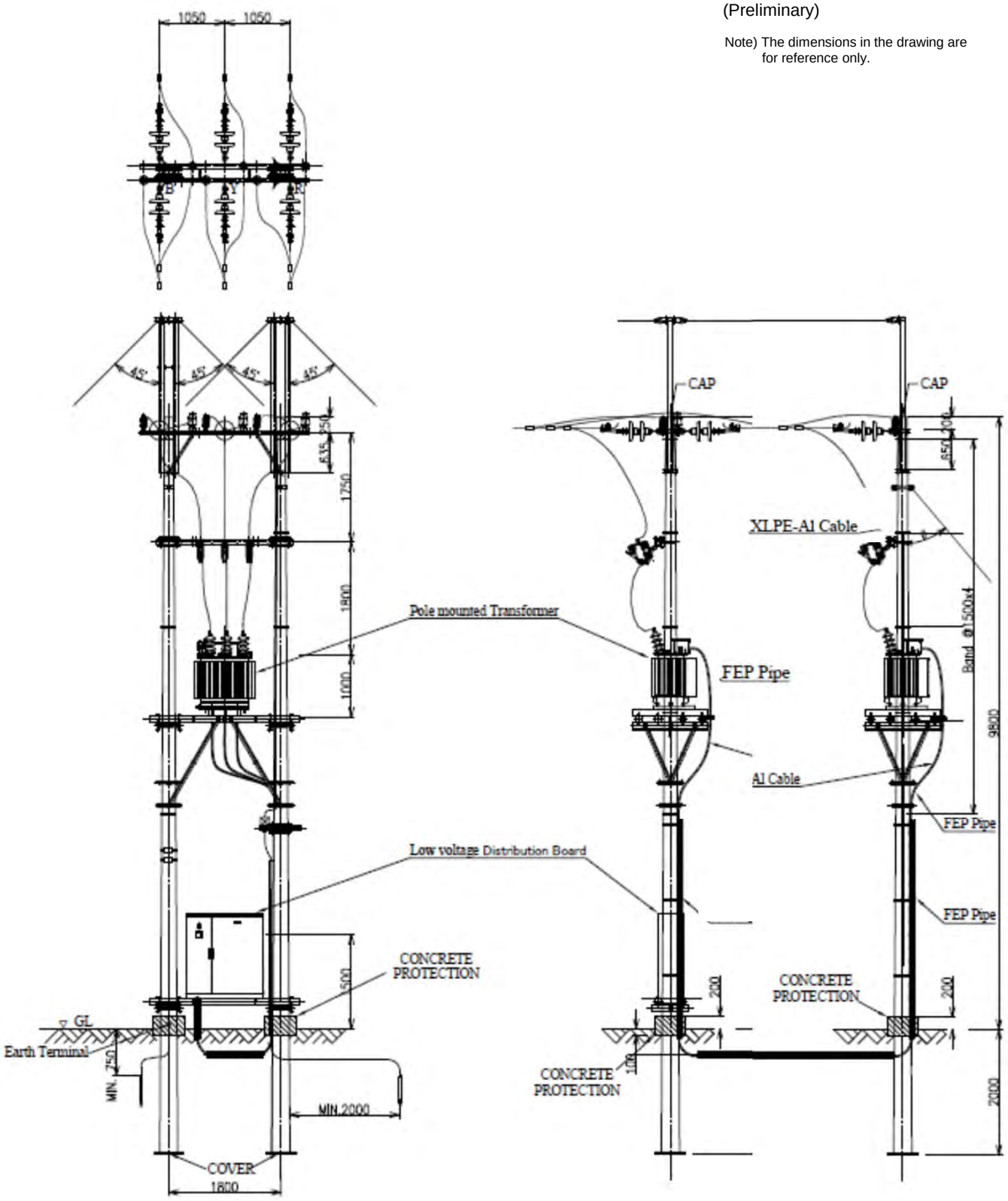


SS-09-2

2 x Pole Mounted Transformer with LV Distribution Board

(Preliminary)

Note) The dimensions in the drawing are for reference only.

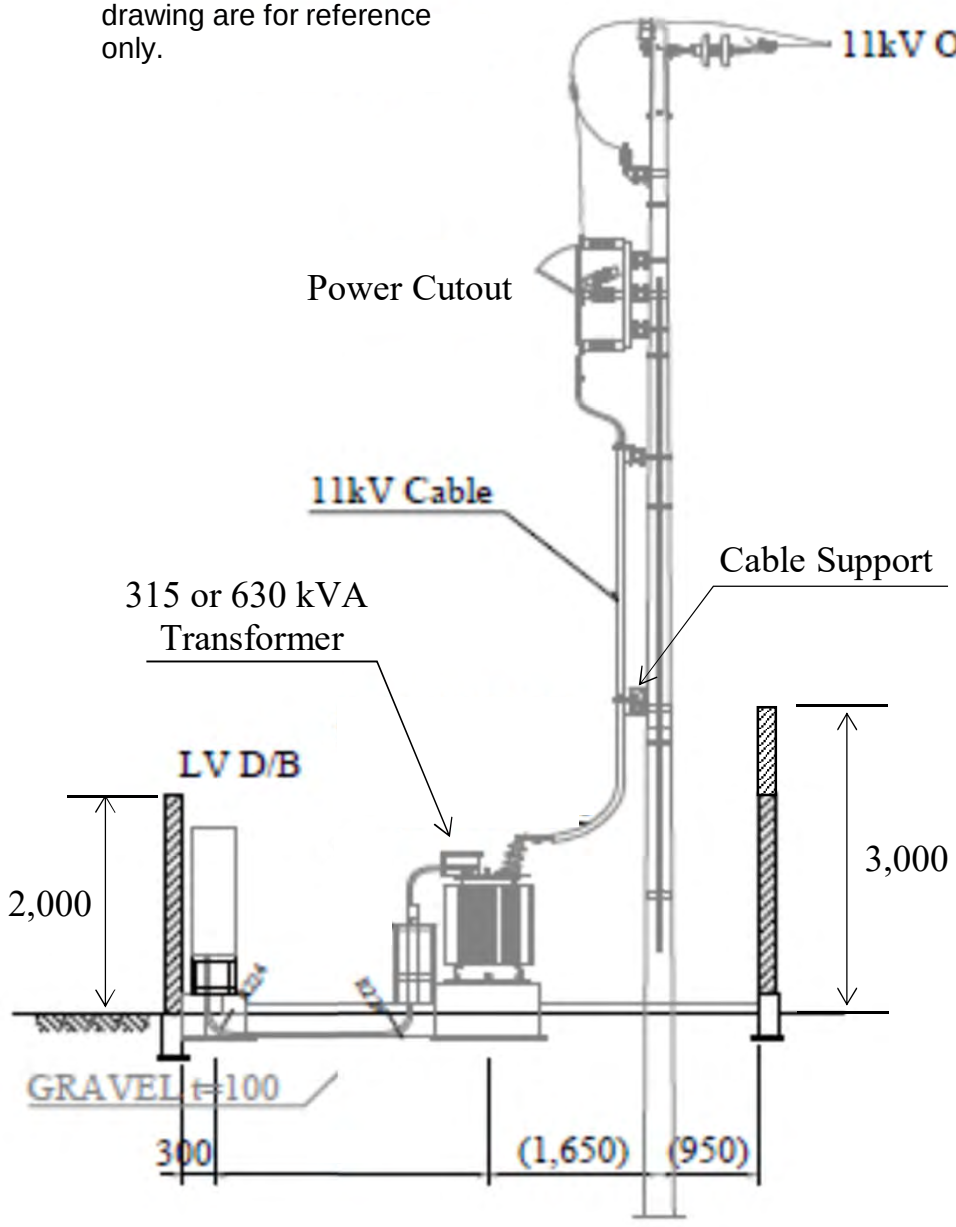


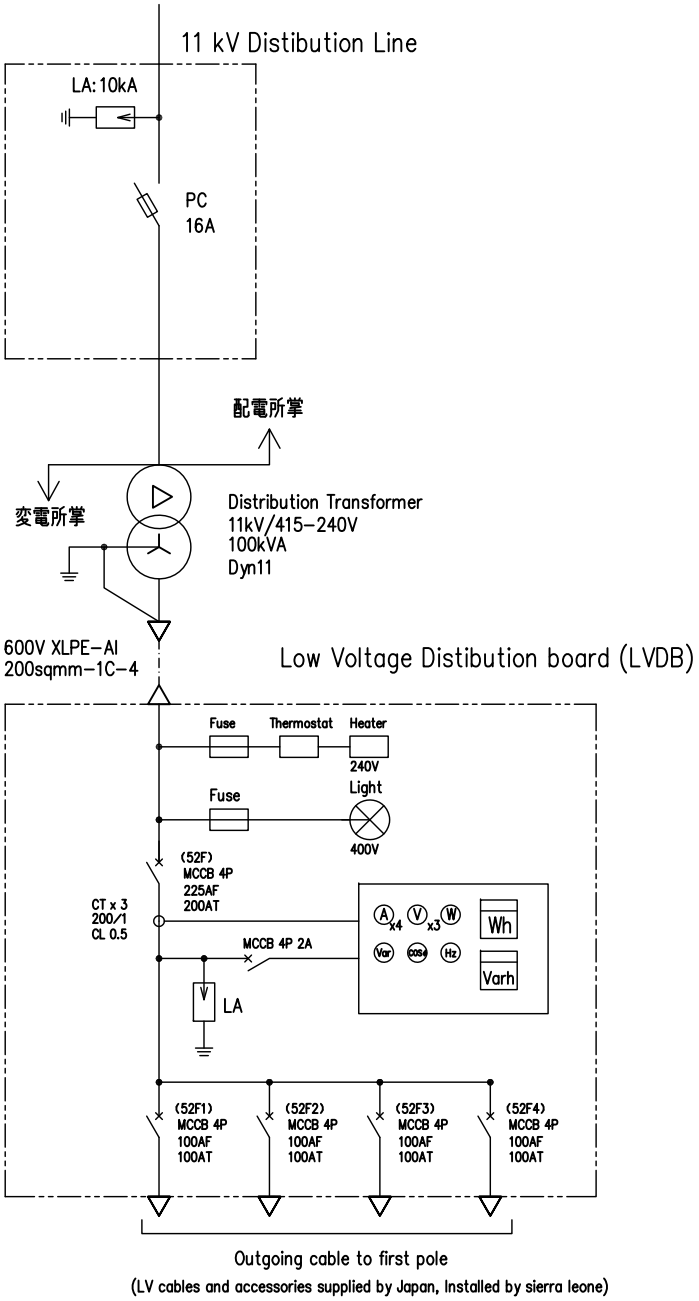
SS-10

Typical Arrangement of Distribution Transformer of 630 kVA Capacity

(Preliminary)

Note) The dimensions in the drawing are for reference only.





Legend

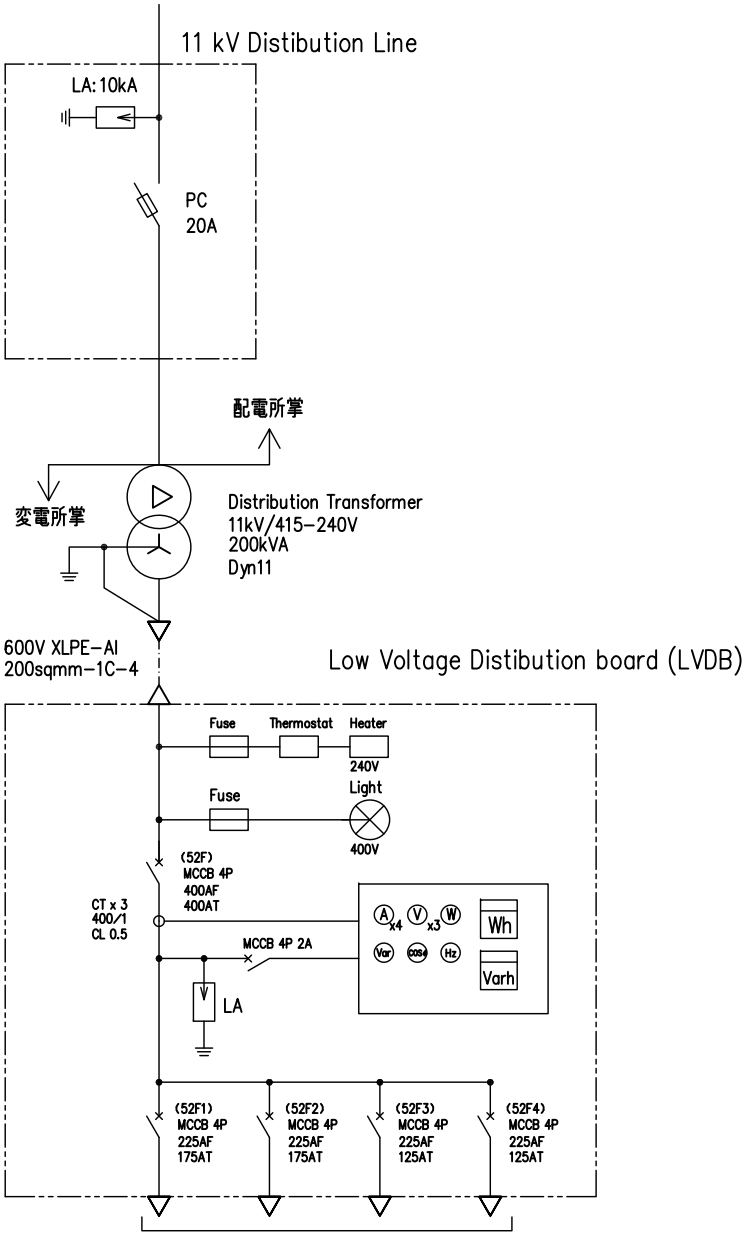
Item	Device name
LA	Lightning Arrester
DS	Disconnecting Switch
MCCB	Molded Case Circuit Breaker
CT	Current Transformer
A	Ammeter
V	Volt meter
W	Watt meter
Wh	Watt hour meter
Var	Var meter
Varh	Var hour meter
Cosϕ	Power Factor
Hz	Frequency

100kVA

Preliminary

SS-11 Secondary Substation Single Diagram (1/6)

Title	DWG.No.
Secondary Substation Single Line Diagram	SS-011-100



Legend

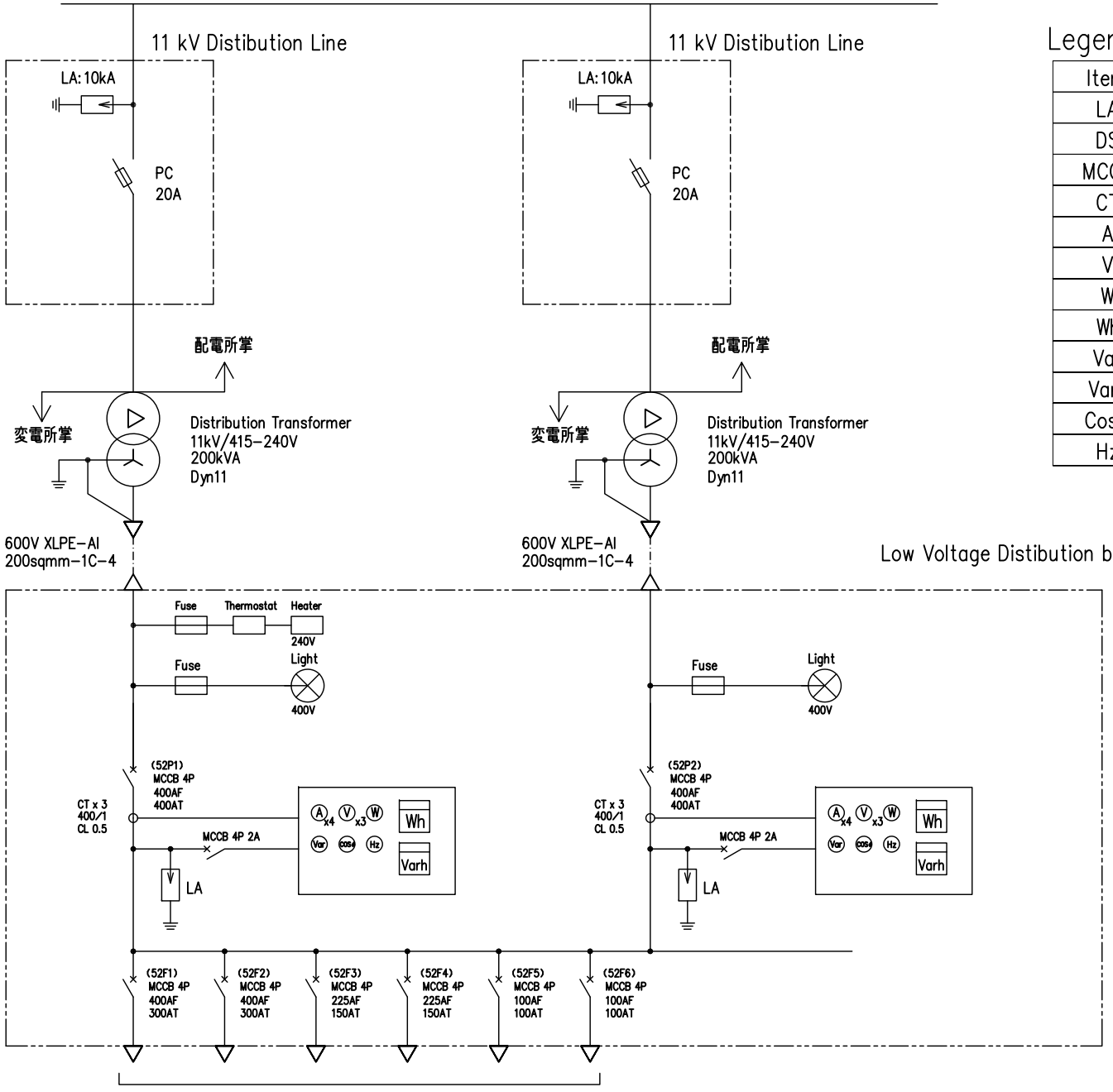
Item	Device name
LA	Lightning Arrester
DS	Disconnecting Switch
MCCB	Molded Case Circuit Breaker
CT	Current Transformer
A	Ammeter
V	Volt meter
W	Watt meter
Wh	Watt hour meter
Var	Var meter
Varh	Var hour meter
Cosϕ	Power Factor
Hz	Frequency

200kVA

Preliminary

SS-11 Secondary Substation Single Diagram (2/6)

Title	DWG.No.
Secondary Substation Single Line Diagram	SS-011-200-1



Legend

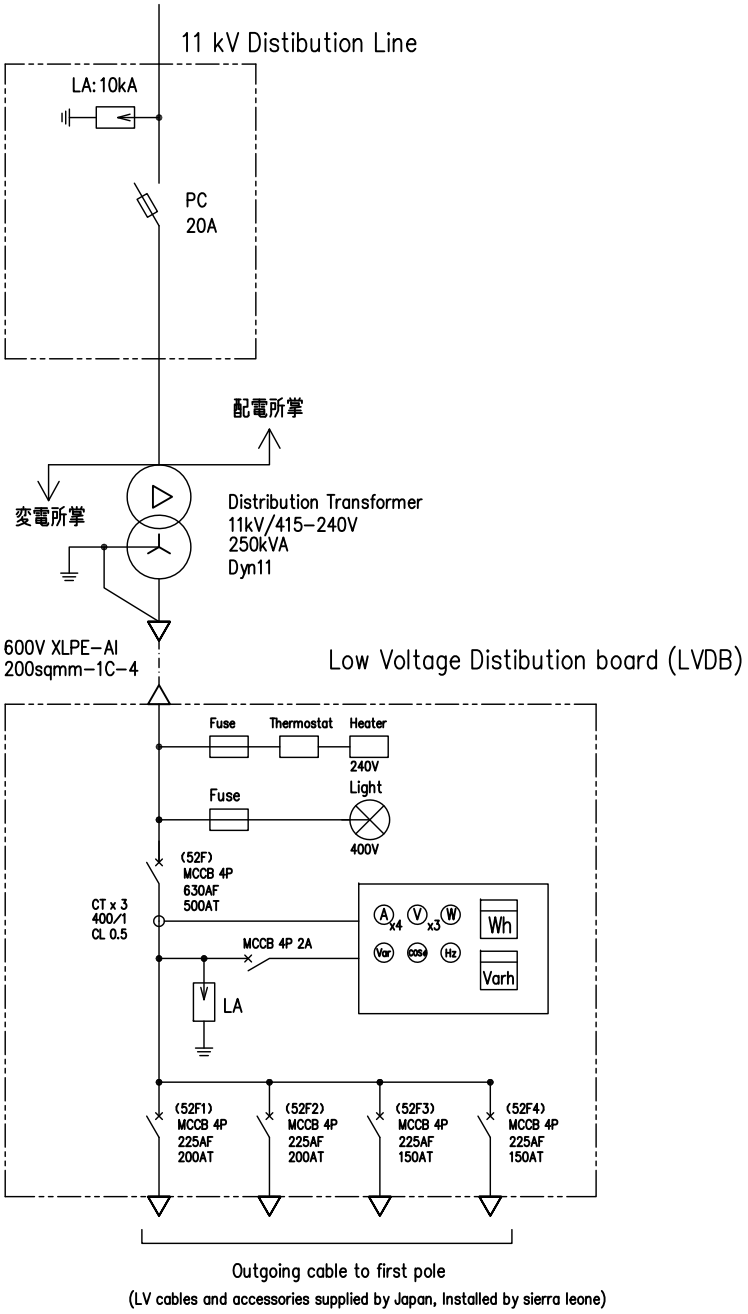
Item	Device name
LA	Lightning Arrester
DS	Disconnecting Switch
MCCB	Molded Case Circuit Breaker
CT	Current Transformer
A	Ammeter
V	Volt meter
W	Watt meter
Wh	Watt hour meter
Var	Var meter
Varh	Var hour meter
Cosϕ	Power Factor
Hz	Frequency

200kVAx2

Preliminary

SS-11 Secondary Substation Single Diagram (3/6)

Title	DWG.No.
Secondary Substation Single Line Diagram	SS-011-200-2



Legend

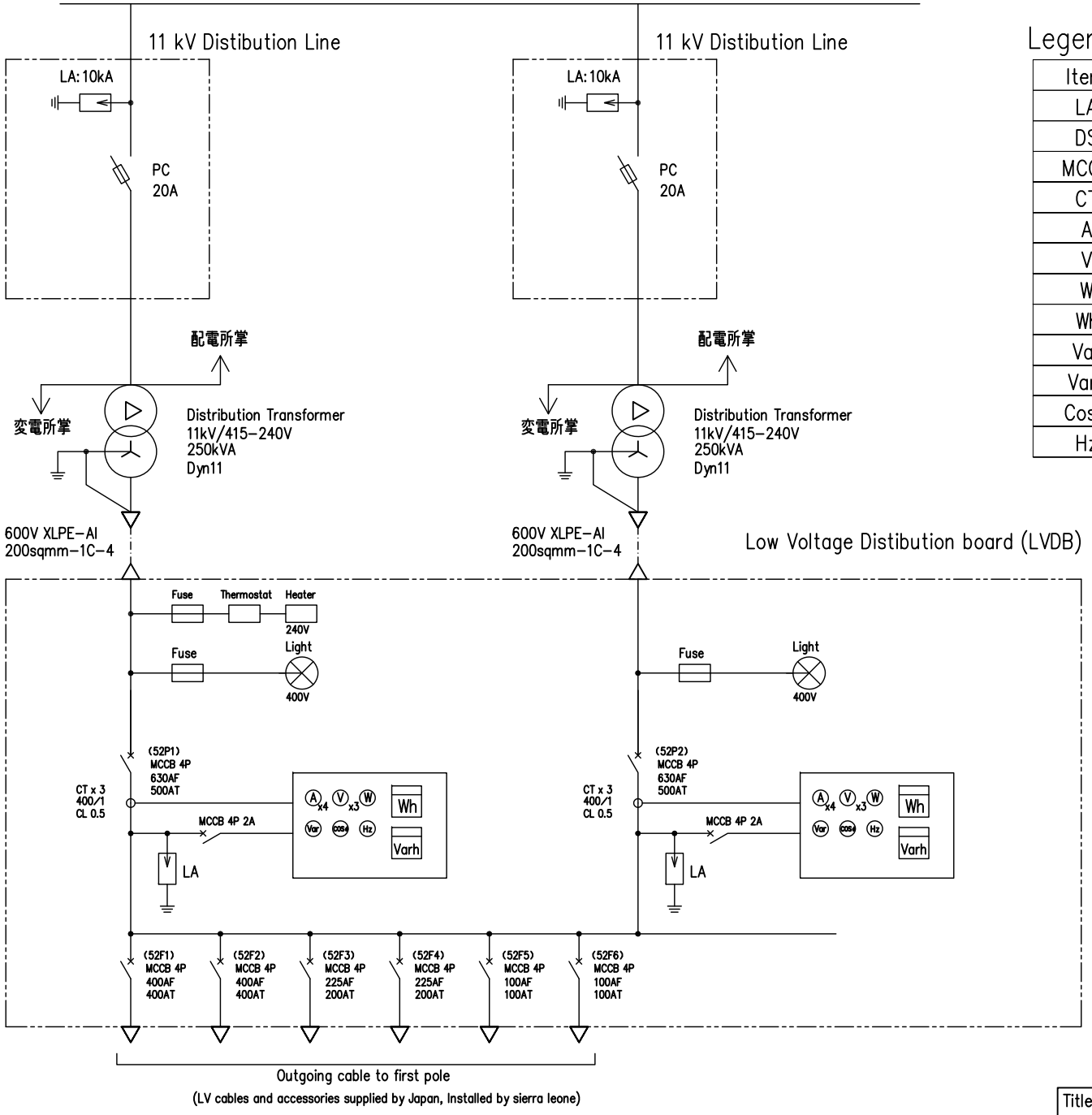
Item	Device name
LA	Lightning Arrester
DS	Disconnecting Switch
MCCB	Molded Case Circuit Breaker
CT	Current Transformer
A	Ammeter
V	Volt meter
W	Watt meter
Wh	Watt hour meter
Var	Var meter
Varh	Var hour meter
Cos ϕ	Power Factor
Hz	Frequency

250kVA

Preliminary

SS-11 Secondary Substation Single Diagram (4/6)

Title	DWG.No.
Secondary Substation Single Line Diagram	SS-011-250-1



Legend

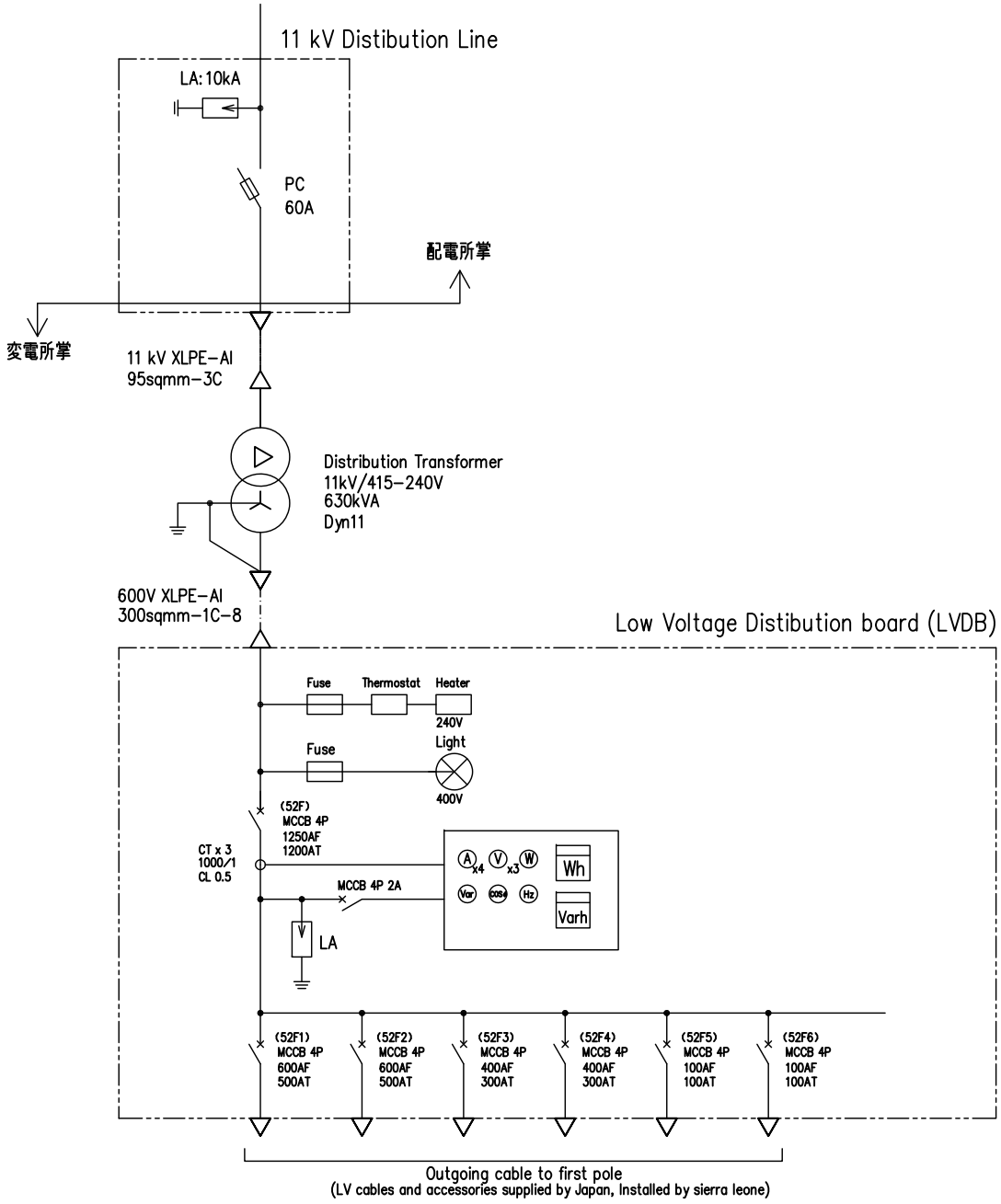
Item	Device name
LA	Lightning Arrester
DS	Disconnecting Switch
MCCB	Molded Case Circuit Breaker
CT	Current Transformer
A	Ammeter
V	Volt meter
W	Watt meter
Wh	Watt hour meter
Var	Var meter
Varh	Var hour meter
Cosφ	Power Factor
Hz	Frequency

250kVAx2

Preliminary

SS-11 Secondary Substation Single Diagram (5/6)

Title	DWG.No.
Secondary Substation Single Line Diagram	SS-011-250-2



Legend

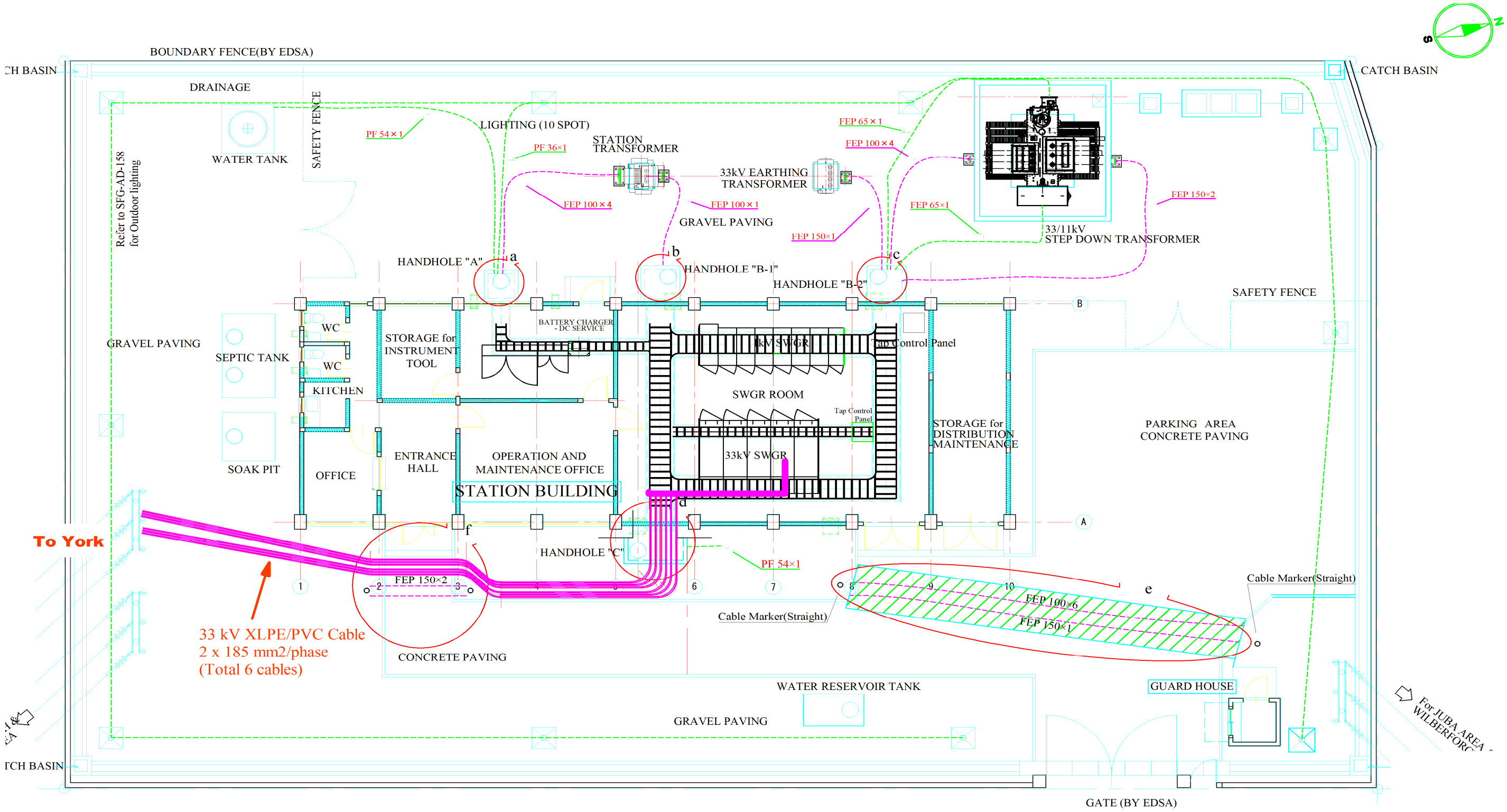
Item	Device name
LA	Lightning Arrester
DS	Disconnecting Switch
MCCB	Molded Case Circuit Breaker
CT	Current Transformer
A	Ammeter
V	Volt meter
W	Watt meter
Wh	Watt hour meter
Var	Var meter
Varh	Var hour meter
Cosϕ	Power Factor
Hz	Frequency

630kVA

Preliminary

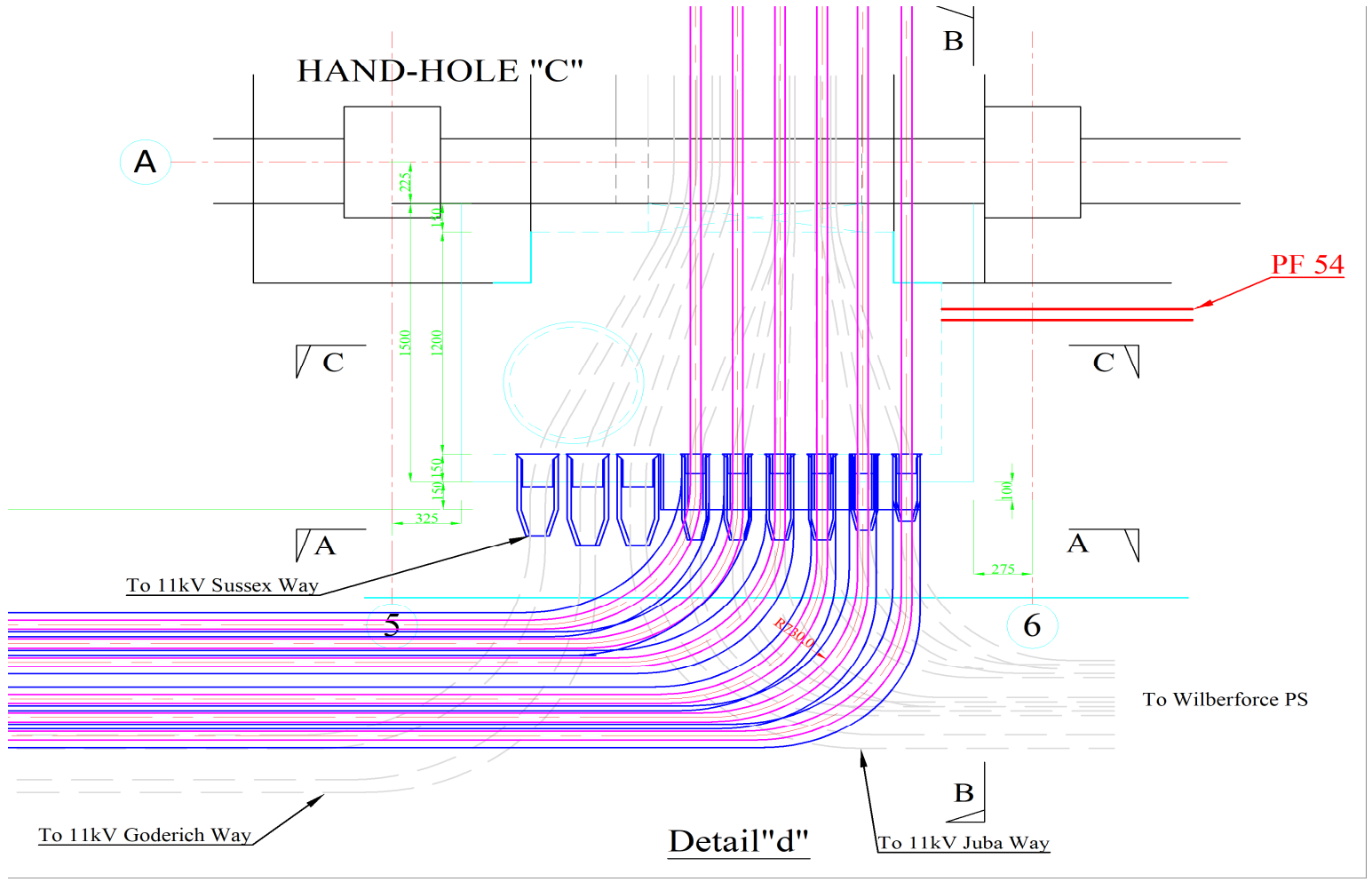
SS-11 Secondary Substation Single Diagram (6/6)

Title	DWG.No.
Secondary Substation Single Line Diagram	SS-011-630

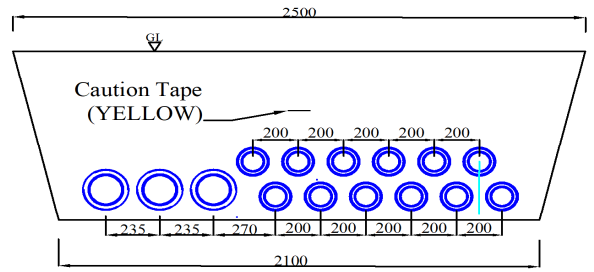


Extension of Power Distribution System Along the Freetown Peninsular in the Republic of Sierra Leone				スケール	
				NON	
Title				図番	
Overall Layout Drawing (Goderich S/S)				SS-GD-1	
日付	作成	審査	承認	改定	
2022年2月				0	

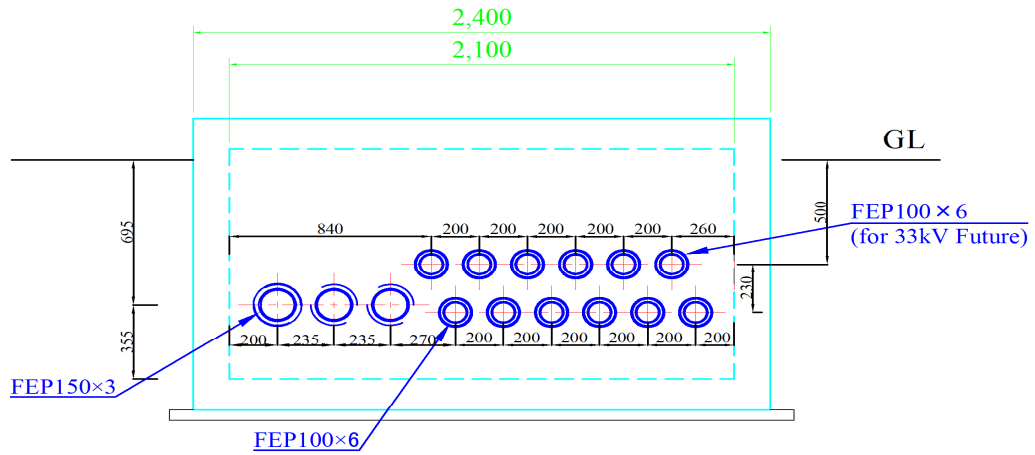
A6-21



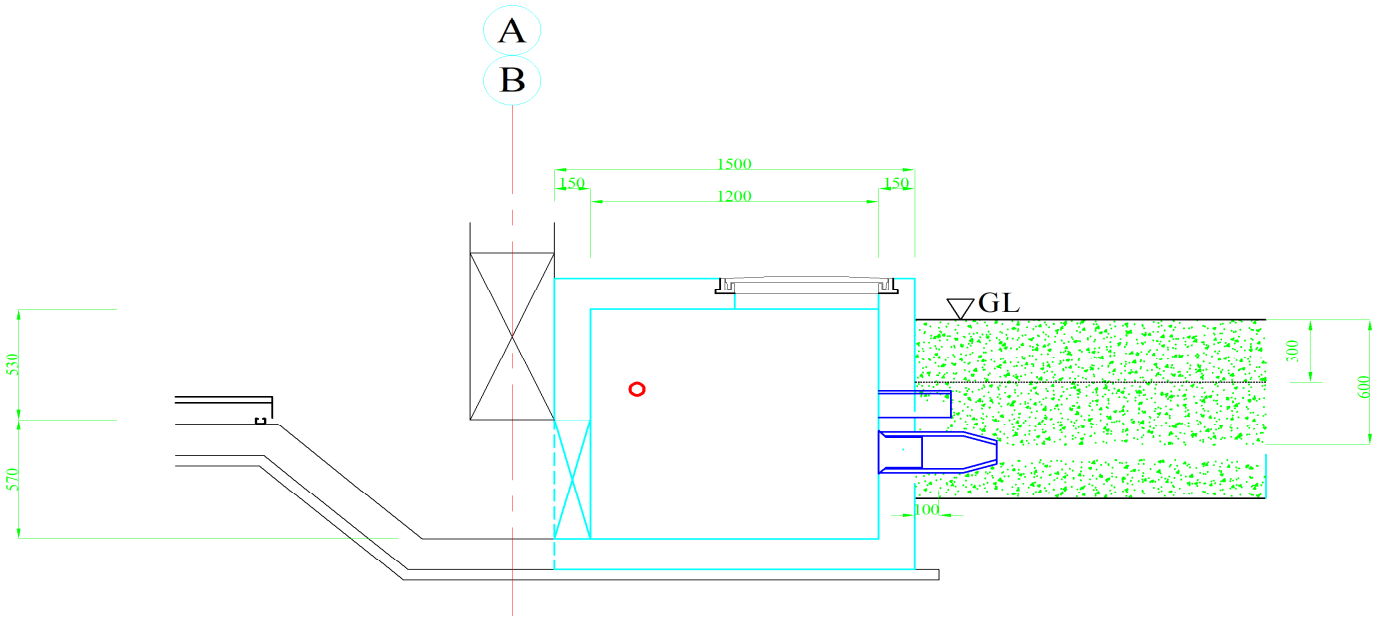
Detail"d"



SECTION A - A

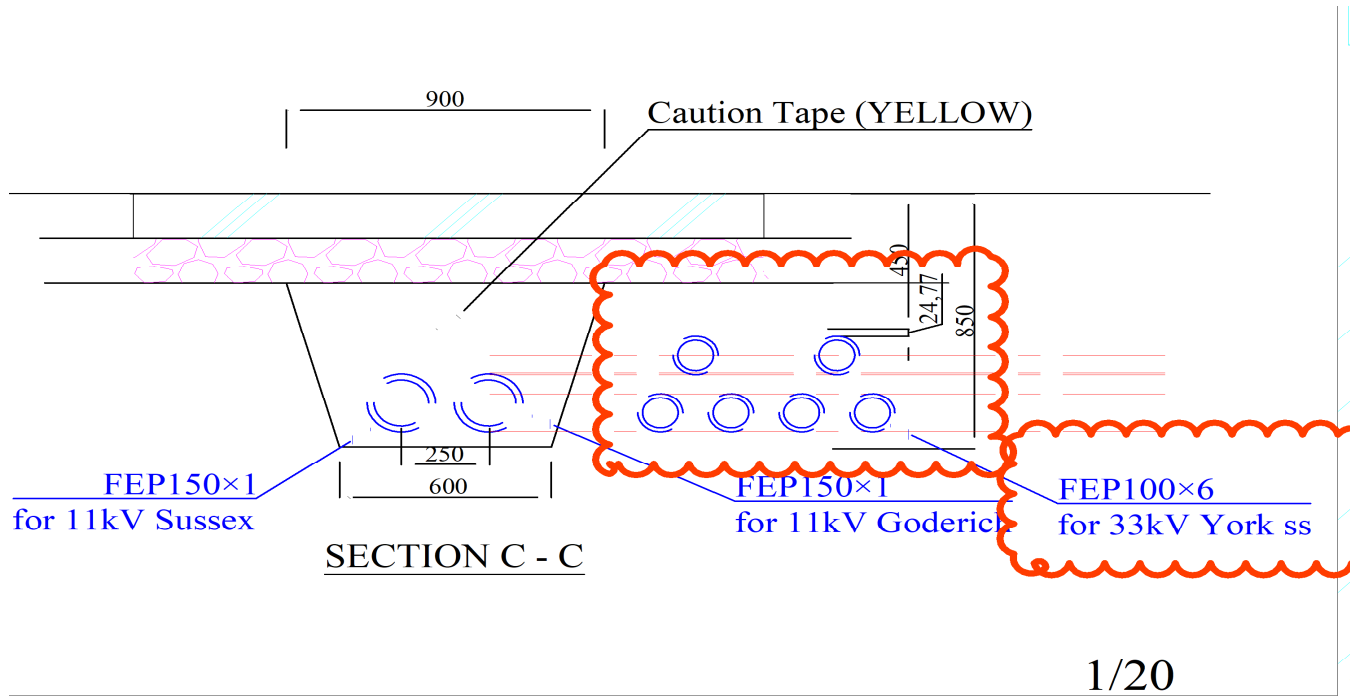


SECTION C - C



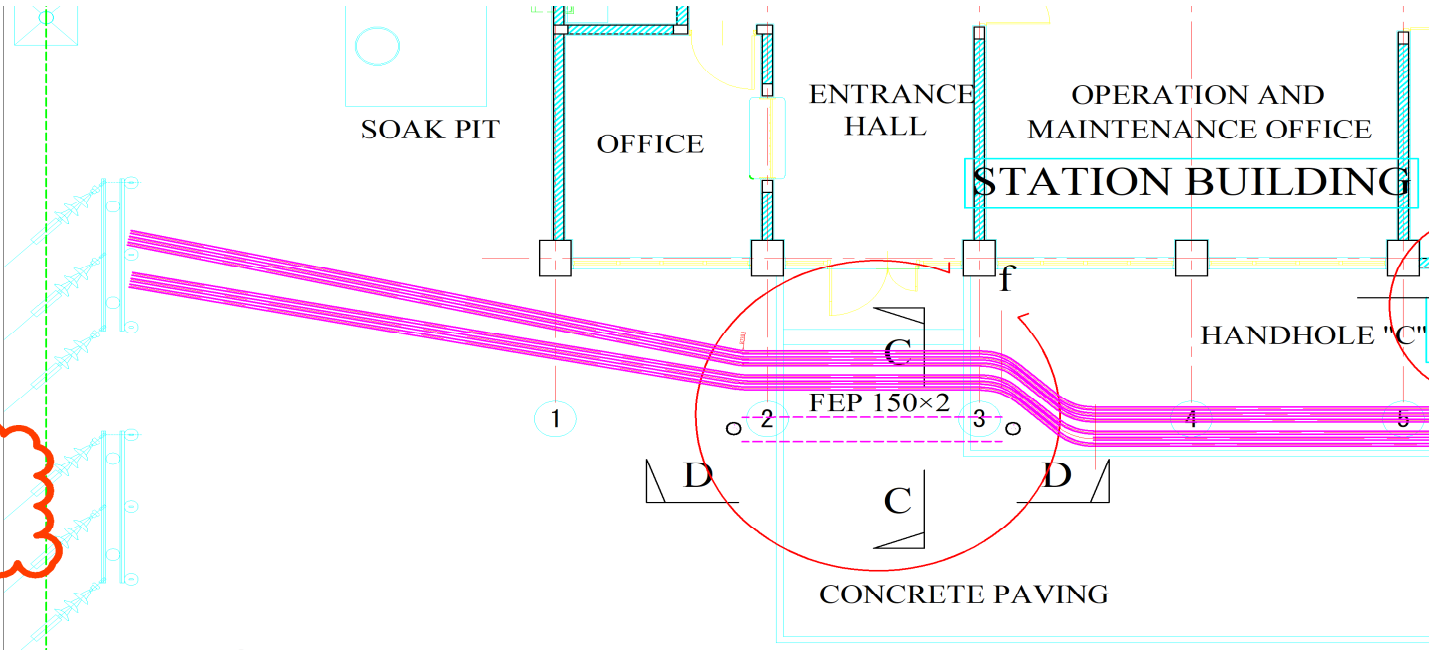
SECTION B - B

Extension of Power Distribution System Along the Freetown Peninsular in the Republic of Sierra Leone				スケール: NON
Title: Details – "d" (Goderich S/S)				図番: SS-GD-2
日付	作成	審査	承認	改定: 0
2022年2月				



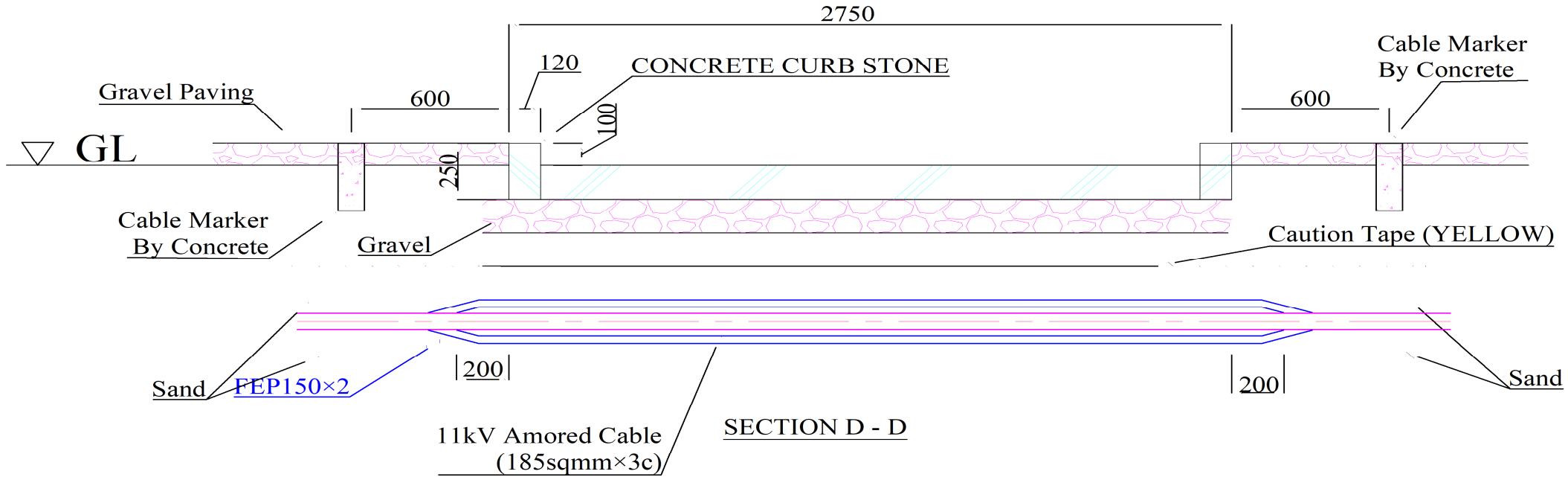
SECTION C - C

1/20



DETAIL"f"

1/100

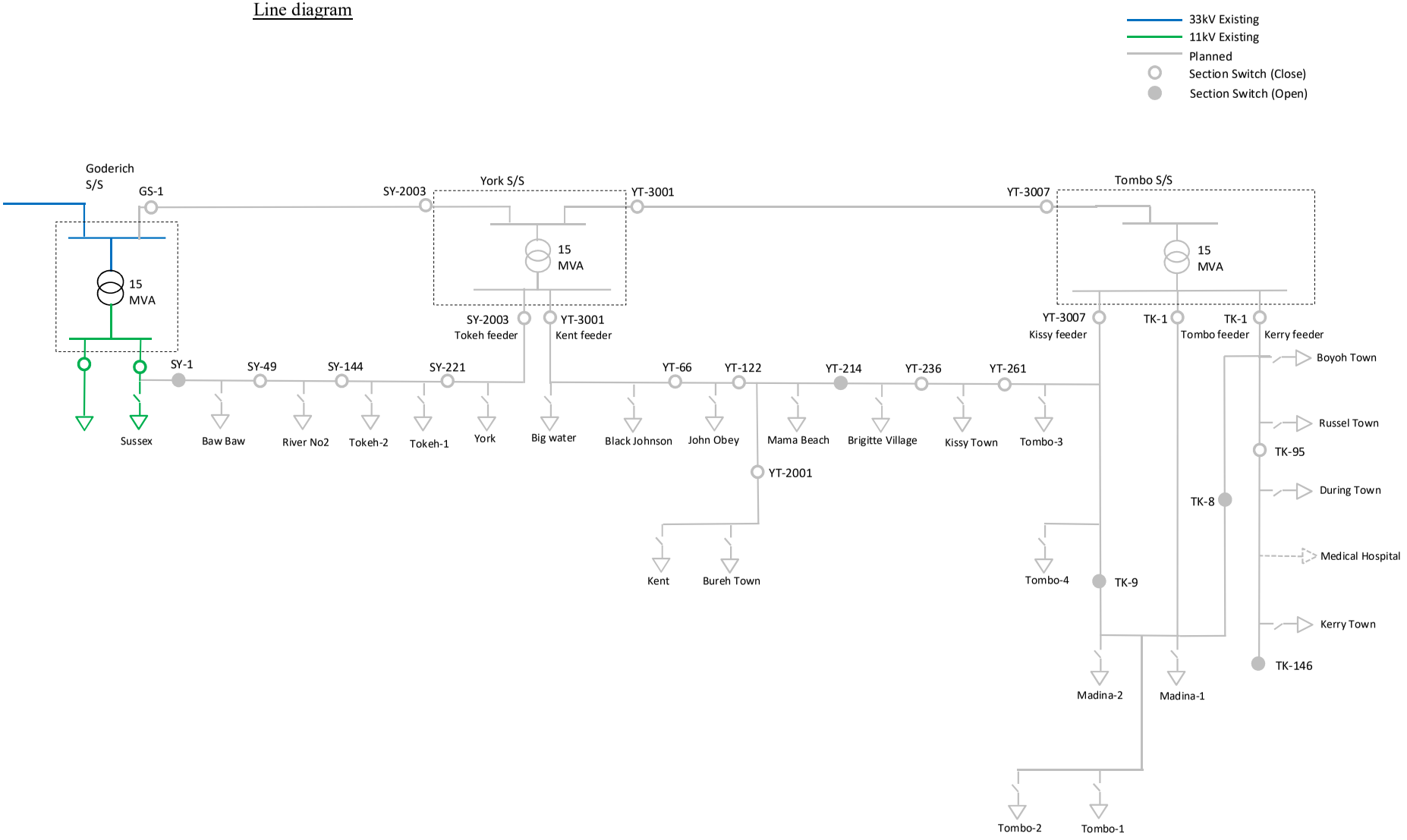


SECTION D - D

Extension of Power Distribution System Along the Freetown Peninsular in the Republic of Sierra Leone				スケール: NON
Title: Details – "f" (Goderich S/S)				図番: SS-GD-3
日付	作成	審査	承認	改定: 0
2022年2月				

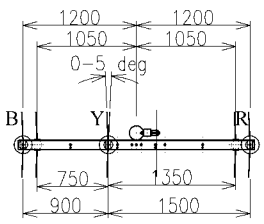
A6-23

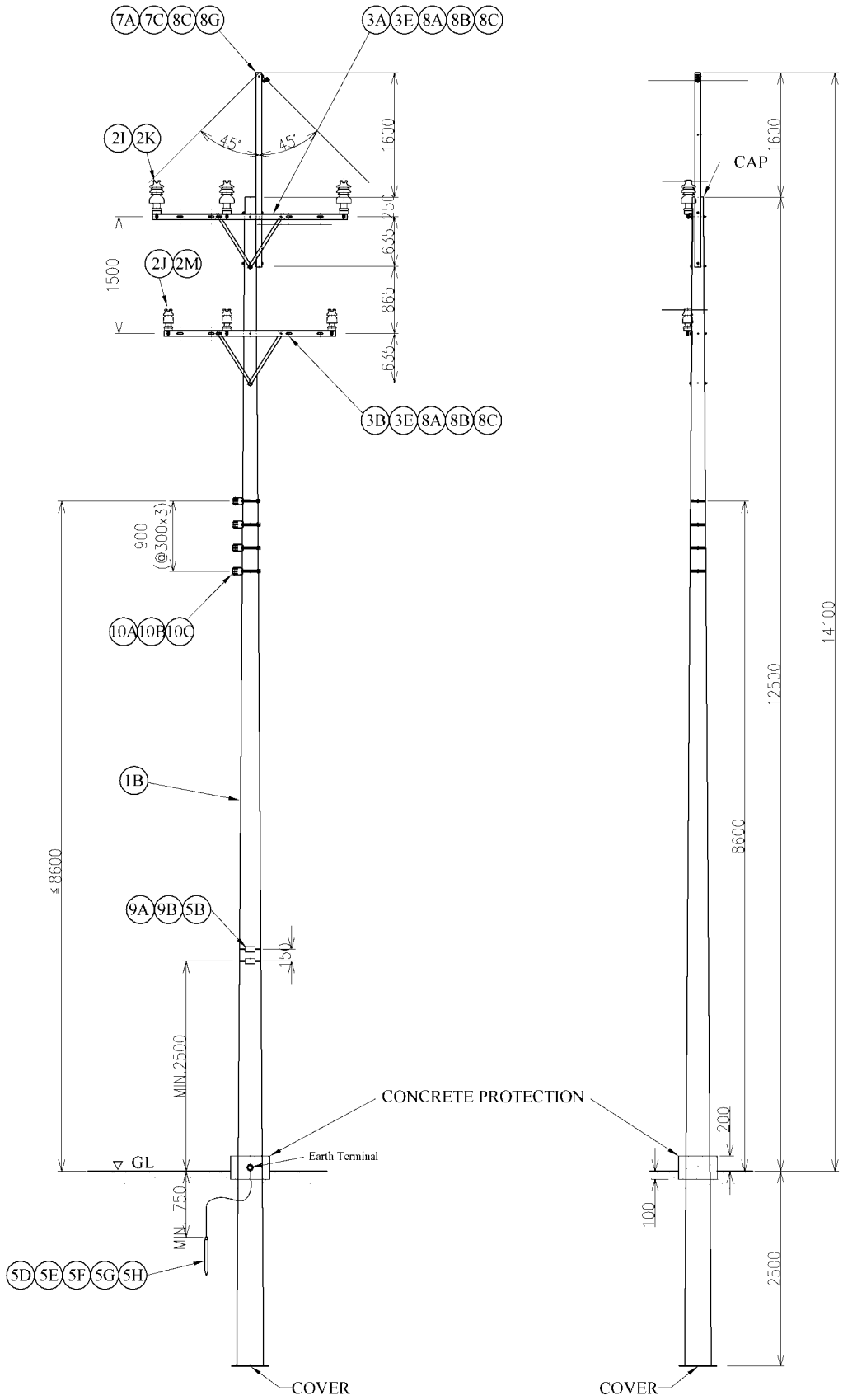
Line diagram



DL-01 Line Diagram

CA	11 & 33kV Combined Intermediate Pole (Line Angle 0-5deg)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2I	33kV Pin Insulator	3
2J	11kV Pin Insulator	3
2K	Preformed Top Tie for AAAC 265 (33kV)	3
2M	Preformed Top Tie for AAAC 150 (11kV)	3
3A	Crossarm for Insulator (for 33kV)	1
3B	Crossarm for Insulator (for 11kV)	1
3E	Crossarm Brace	4
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	20
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Item	Name	Date
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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >

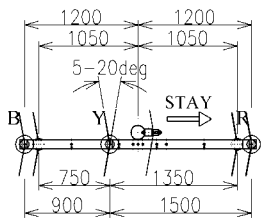
11 & 33kV Combined Intermediate Pole (Line Angle 0-5deg.)

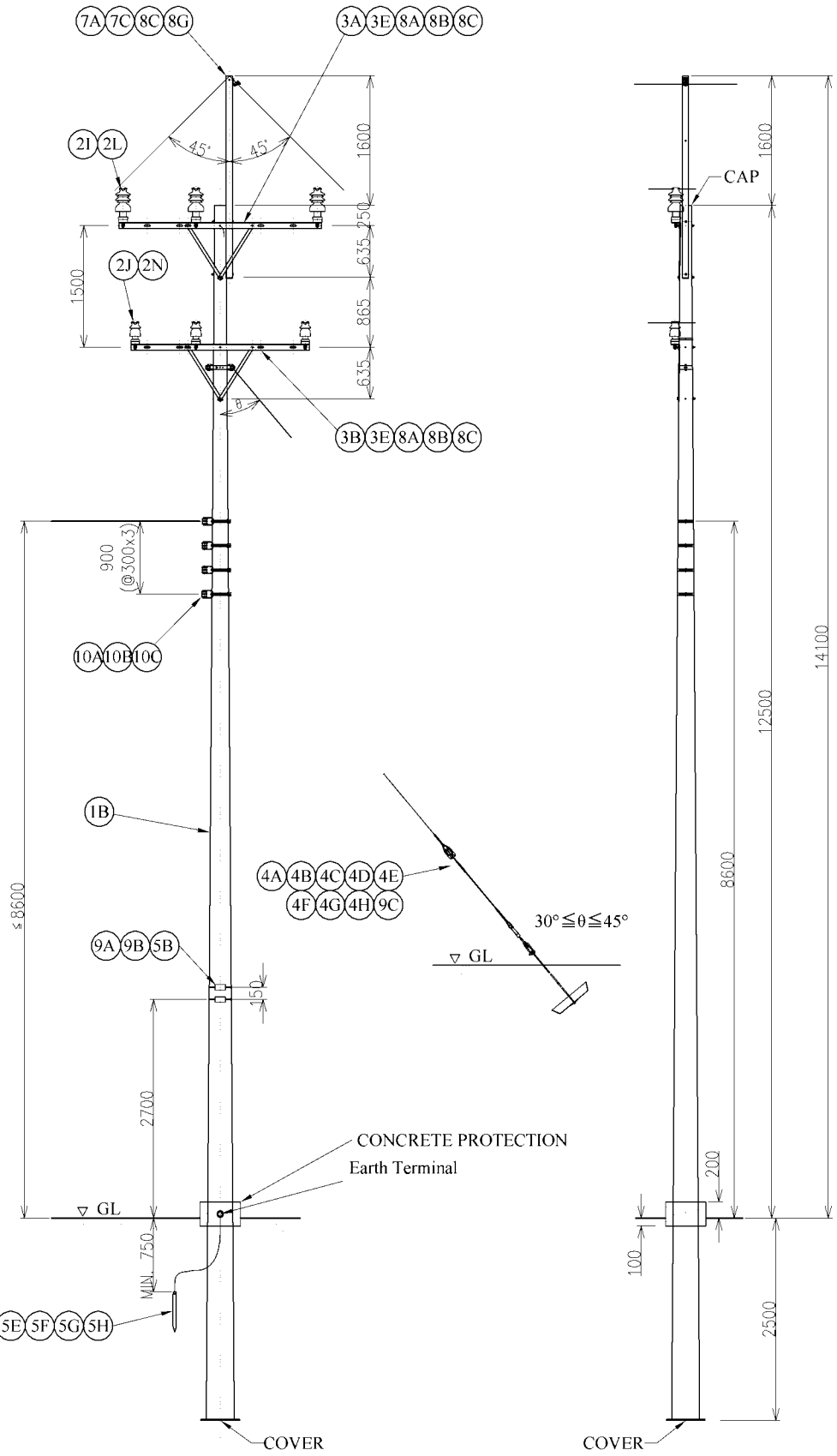
Drawing No. DL-1-1-1 / DL-1-2-1 | Pole Type: CA | Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (1/29)

CB	11 & 33kV Combined Light Angle Pole (Line Angle 5-20deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2I	33kV Pin Insulator	3
2J	11kV Pin Insulator	3
2L	Preformed Side Tie for AAAC 265 (33kV)	3
2N	Preformed Side Tie for AAAC 150 (11kV)	3
3A	Crossarm for Insulator (for 33kV)	1
3B	Crossarm for Insulator (for 11kV)	1
3E	Crossarm Brace	4
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	1
4F	Turnbuckle	1
4G	Stay Rod	1
4H	Stay Plate	1
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	20
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Item	Name	Date
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Rev.	Description	Date	Name

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >

11 & 33kV Combined Light Angle Pole (Line Angle 5-20deg.)

Drawing No. DL-1-1-2 / DL-1-2-2

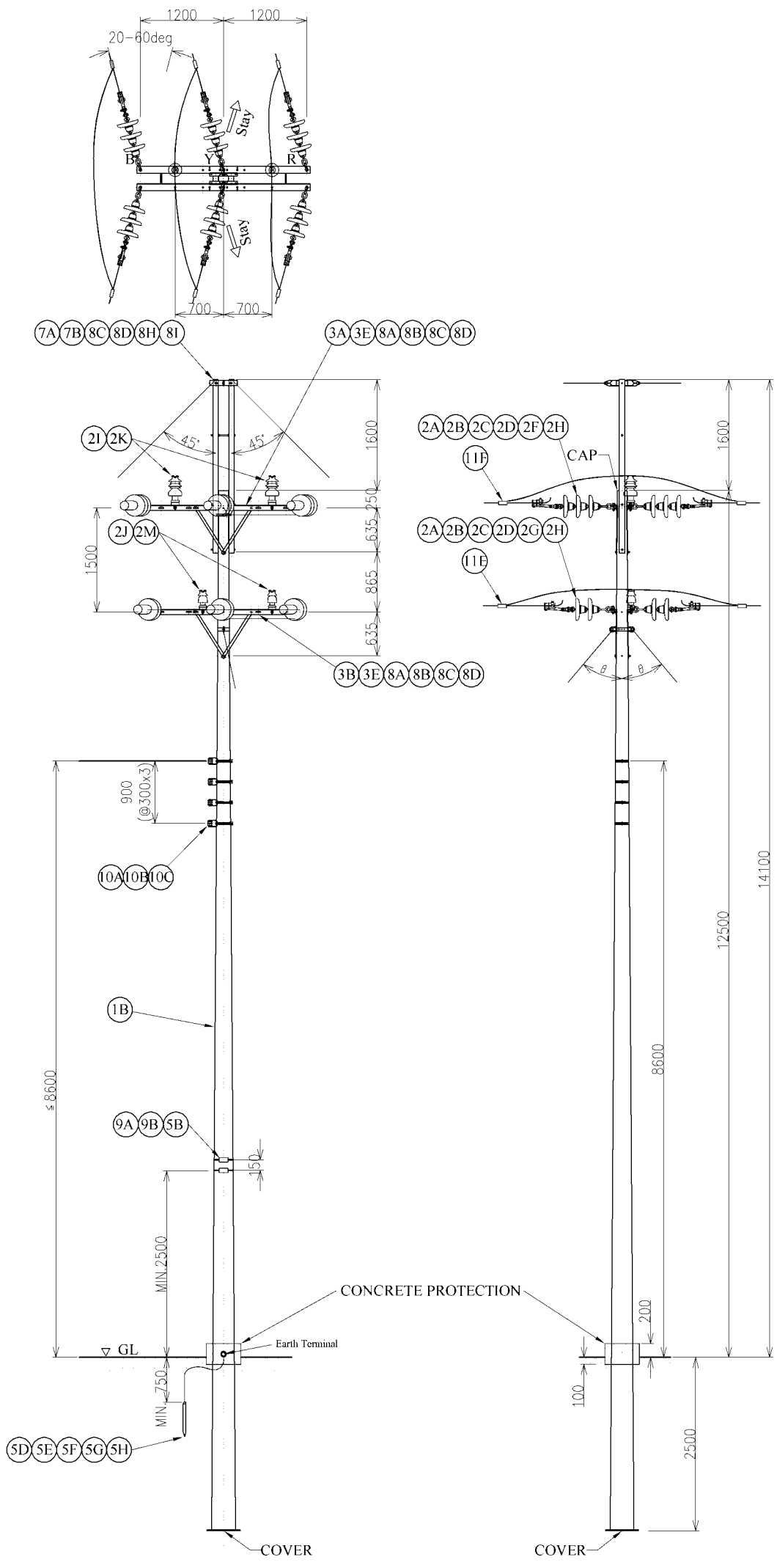
Pole Type: CB

Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (2/29)

CC	11 & 33kV Combined Middle Angle Pole (Line Angle 20-60deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	36
2B	Anchor Shackle	12
2C	Ball Eye	12
2D	Socket Eye	12
2F	Dead End Clamp for 33kV(AAAC 265)	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	12
2I	33kV Pin Insulator	2
2J	11kV Pin Insulator	2
2K	Preformed Top Tie for AAAC 265 (33kV)	2
2M	Preformed Top Tie for AAAC 150 (11kV)	2
3A	Crossarm for Insulator (for 33kV)	2
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	8
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	44
8D	Flush Cut Bolt & Nut M16×360	5
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6
11F	PG Clamp(AAAC 265/265)	6



Electricity Distribution and Supply Authority(EDSA)		
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE		
Title	< Assembly Drawings for Steel Pole > 11 & 33kV Combined Middle Angle Pole (Line Angle 20-60deg.)	
Drawing No.	DL-1-1-3 / DL-1-2-3	Pole Type: CC; Rev.: -
Supplier		

Item	Name	Date
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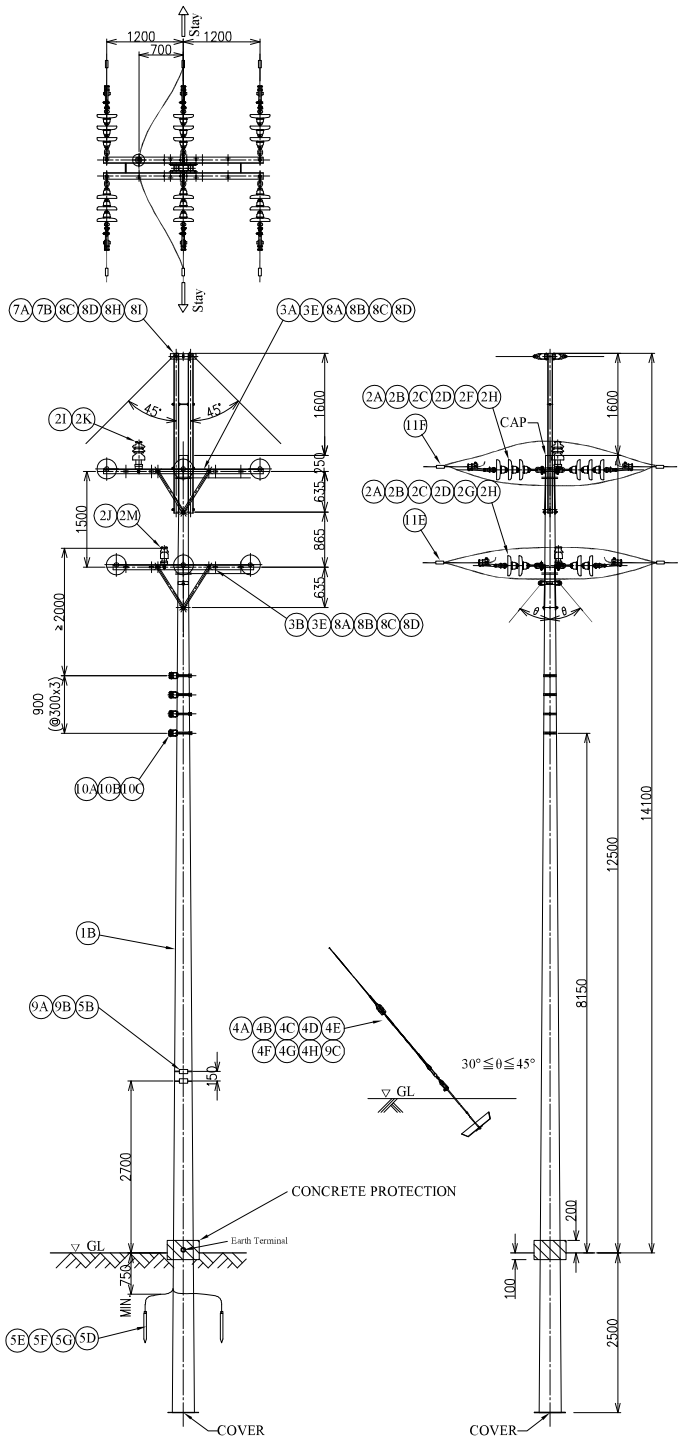
Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (3/29)

COMPONENT LIST OF POLE ASSEMBLY			
Part No.	Description	QTY	DWG No.
1B	Steel pole 15m with Base Plate,Cap	1	153887
2A	Suspension Insulator	30	T24953M
2B	Anchor Shackle	12	AS6
2C	Ball Eye	12	BE1
2D	Socket Eye	12	SE1A
2F	Dead End Clamp for 33kV(ACSR 240)	6	TH-4525AC
2G	Dead End Clamp for 11kV(AAAC 120)	6	KT-000355
2H	Dead end Clamp Adaptor	12	KT-A100
2I	33kV Pin Insulator	1	D-139618
2J	11kV Pin Insulator	1	D-139800
2K	Preformed Top Tie for ACSR240 (33kV)	1	8207
2M	Preformed Top Tie for AAAC120 (11kV)	1	8207
3A	Crossarm for Insulator (for 33kV)	2	DJ13005-0300SA
3B	Crossarm for Insulator (for 11kV)	2	DJ13005-0301SA
3E	Crossarm Brace	8	DJ13005-0304SA
4A	Stay Band with thimble	2	DJ13005-0400SA
4B	Dead End Grip for Thimble	4	8235
4C	Stay Wire	40	
4D	Dead End Grip for Insulator	4	8235
4E	Stay Insulator 33kV	2	DJ13005-0401SA
4F	Turnbuckle	2	DJ13005-0402SA
4G	Stay Rod	2	DJ13005-0403SA
4H	Stay Plate	2	DJ13005-0404SA
5B	Stainless Band (L=1200mm)	2	DJ13005-0500SA
5D	Ground Rod	4	KT-000104
5E	Lead Wire Terminal	4	KT-000104
5F	Compression Connector(Cu22/Cu22)	4	JSA-39001
5G	Compression Terminal(Cu22)	1	DJ13005 0502SA
7A	Support Arm	2	DJ13005 0700SA
7B	Dead end Clamp	2	DJ13005-0701SA
8A	Bolt & Nut M16x50 (Brace/Crossarm)	8	DJ13005-0800SA
8B	Bolt & Nut M16x220 (Pole/Cross arm・Brace)	4	DJ13005-0800SA
8C	Square Washer	52	DJ13005-0801SA
8D	Flush Cut Bolt & Nut M16×360	5	DJ13005-0802SA
8H	Bolt & Nut M16x360 (Pole/Double Support Arm)	2	DJ13005-0800SA
8I	Bolt & Nut M16x200 (Support Arm/Dead End Clamp)	2	DJ13005-0800SA
9A	CDA mark	1	DJ13005-0900SA
9B	Danger Plate	1	DJ13005-0901SA
9C	Ivy Guard	2	DJ13005-0902SA
10A	Insulator	4	DJ13005-1001SA
10B	Arm set	4	DJ13005-1002SA
10C	Bolt & Nut	4	DJ13005-1003SA
11E	PG Clamp(AAAC120/120)	6	A4-8589
11F	PG Clamp(ACSR240/240)	6	A4-8589



Electricity Distribution and Supply Authority(EDSA)			
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE			
Title: < Assembly Drawings for Steel Pole > 11 & 33kV Combined Section Pole			
Drawing No. DL-1-2-4	Pole Type	CE	
	Rev.	–	
Supplier			

Item	Name	Date
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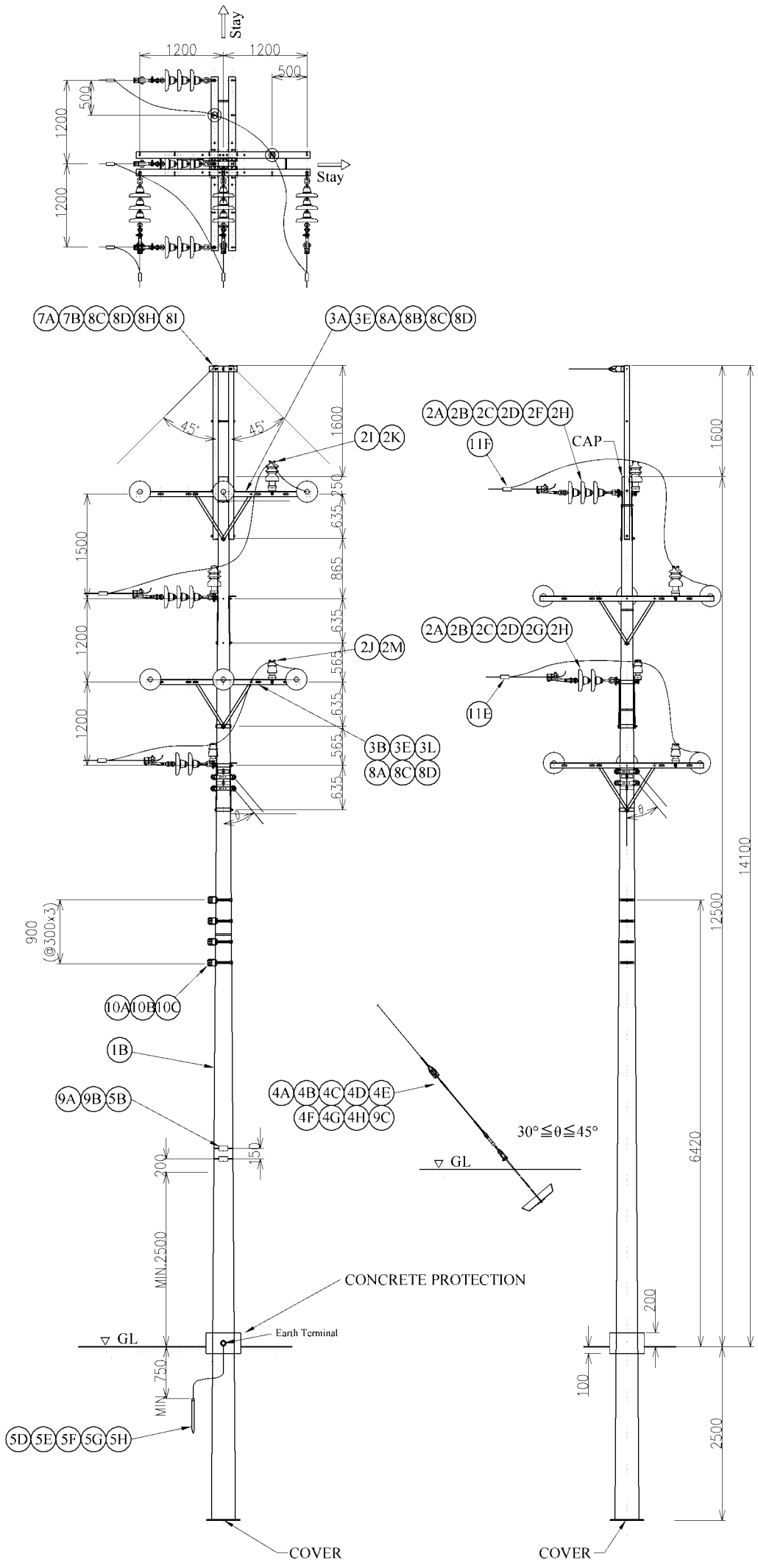
DL-02 33kV&11kV Distribution Line Pole Type (4/29)

CF	11 & 33kV Combined Sharp Angle Pole (Line Angle 90deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	36
2B	Anchor Shackle	12
2C	Ball Eye	12
2D	Socket Eye	12
2F	Dead End Clamp for 33kV(AAAC 265)	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	12
2I	33kV Pin Insulator	2
2J	11kV Pin Insulator	2
2K	Preformed Top Tie for AAAC 265 (33kV)	2
2M	Preformed Top Tie for AAAC 150 (11kV)	2
3A	Crossarm for Insulator (for 33kV)	4
3B	Crossarm for Insulator (for 11kV)	4
3E	Crossarm Brace	16
3L	Band for Crossarm & Brace_FB4E-17	4
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	16
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	66
8D	Flush Cut Bolt & Nut M16×360	8
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	4
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6
11F	PG Clamp(AAAC 265/265)	6



Electricity Distribution and Supply Authority(EDSA)		
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE		
Title	< Assembly Drawings for Steel Pole > 11 & 33kV Combined Sharp Angle Pole (Line Angle 90deg.)	
Drawing No. DL-1-1-4	Pole Type	CF
	Rev.	-
Supplier		

Item	Name	Date
Drawn		
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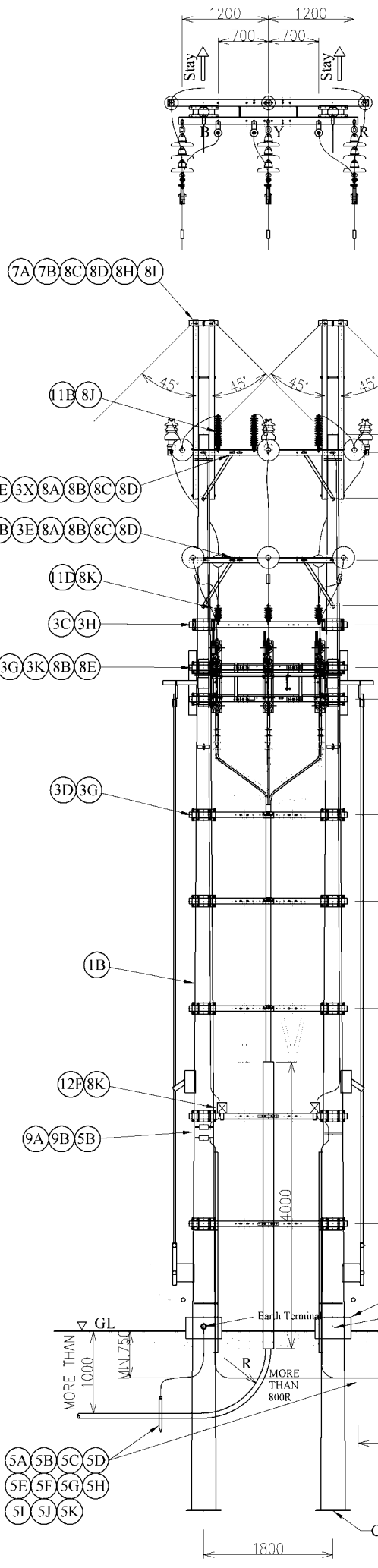
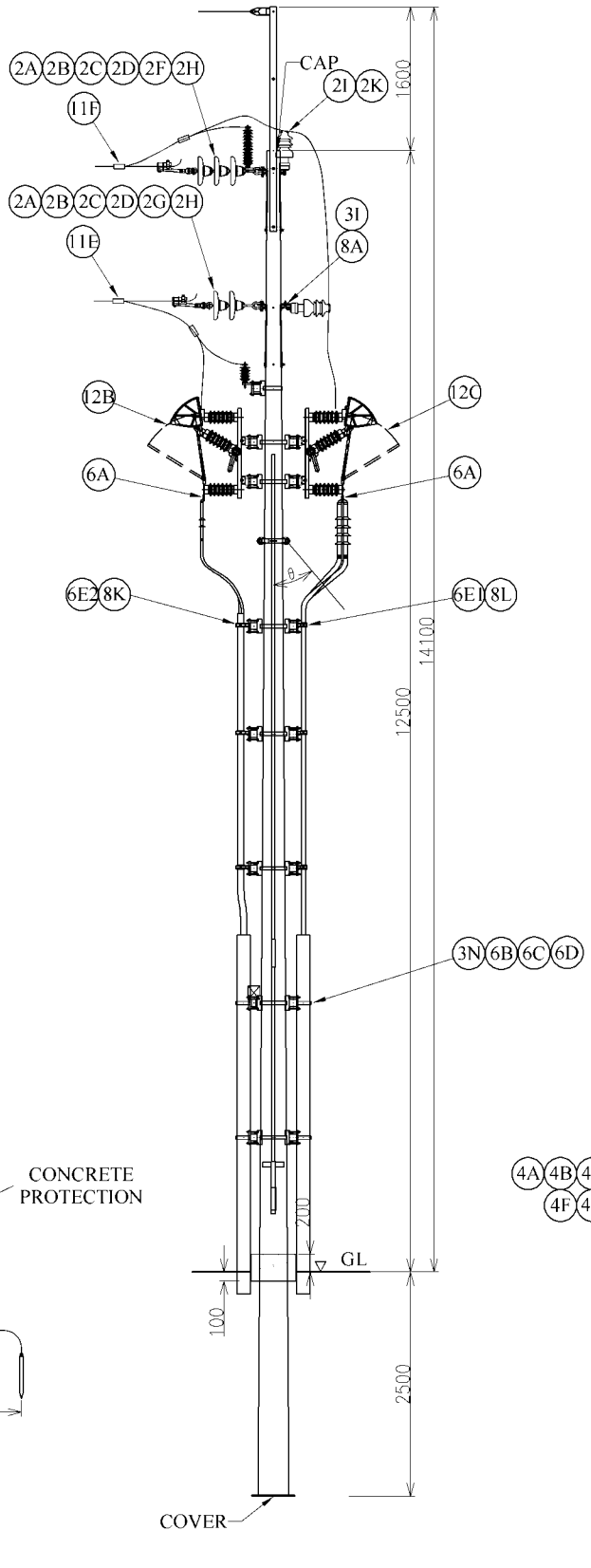
Approved		
Scale	1/80	

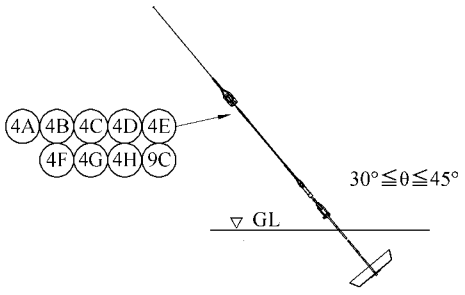
Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (5/29)

CG	11 & 33kV Combined Cable Connection Pole	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	2
2A	Suspension Insulator	18
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2F	Dead End Clamp for 33kV(AAAC 265)	3
2G	Dead End Clamp for 11kV(AAAC 150)	3
2H	Dead end Clamp Adaptor	6
2I	33kV Pin Insulator	6
2K	Preformed Top Tie for AAAC 265 (33kV)	6
3A	Crossarm for Insulator (for 33kV)	1
3B	Crossarm for Insulator (for 11kV)	2
3C	Crossarm for DS & Cutout Swithch, PAS	5
3D	Crossarm for 33kV Cable Support	10
3E	Crossarm Brace	8
3G	W-Crossarm Brace less Band	6
3H	Single Crossarm Brace less Band_15S-DW	2
3I	Support for 33kV/11kV Insulator	3
3K	Support for Disconnecting Switch	8
3N	W-Crossarm Brace less Band SAS-26-DW	4
3X	Crossarm for Insulator (for 33kV) 2800mm	1
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5A	PVC Protection Pipe (L=4.0m)	2
5B	Stainless Band (L=1200mm)	23
5C	Ring Saddle for Stainless Band	9
5D	Ground Rod	2
5E	Lead Wire Terminal	2
5F	Compression Connector(Cu22/Cu22)	2
5G	Crimping Terminal (Cu22, M18type)	4
5H	IV 22sq.mm	20
5I	Compression Terminal (Cu22/Cu100)	2
5J	IV 100sq.mm	40
5K	Crimping Terminal (Cu100, M18type)	4
6A	Compression Terminal (95mm2)	9
6B	Protection Pipe φ150(L=4.0m)	3
6C	Pipe Saddle	6
6D	Bolt & Nut for Bracket M10x100	12
6E1	Bracket (33kV) 240mm²	18
6E2	Bracket (11kV) 95mm²	3
7A	Support Arm	4
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	11
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	16
8C	Square Washer 45×45	72
8D	Flush Cut Bolt & Nut M16×360	6
8E	Bolt & Nut M16x120(Crossarm/Support for DS)	16
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	6
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	4
8J	Bolt & Nut M12x50(Bracket/ Support for Bracket & Surge Counter, Arrester/Crossarm)	3
8K	Bolt & Nut M12x120(Bracket/ Crossarm, Surge Counter/Crossarm, Arrester/Crossarm)	11
8L	Bolt & Nut M10x120(Bracket/ Crossarm)	36
8M	Bolt & Nut M20x160(Crossarm/Cutout switch)	10
8N	Bolt & Nut M20x220(Crossarm/Support for Disconnecting Switch)	10
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
11B	33kV Lightning Arrester 10kA	3
11D	11kV Lightning Arrester 10kA	3
11E	PG Clamp(AAAC 150/150)	6
11F	PG Clamp(AAAC 265/265)	6
12B	11kV Disconnecting Switch	1
12C	33kV Disconnecting Switch	1
12F	Surge Counter	2







Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title

< Assembly Drawings for Steel Pole >

11 & 33kV Combined Cable Connection Pole

Drawing No.	DL-1-1-5	Pole Type	CG
		Rev.	-

Supplier

Item	Name	Date
Drawn		
Checked		
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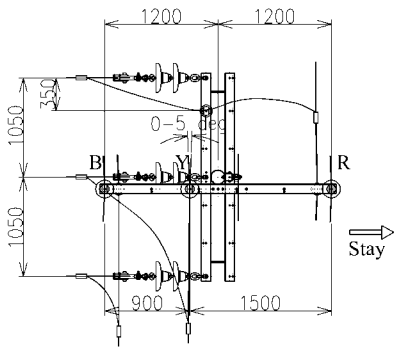
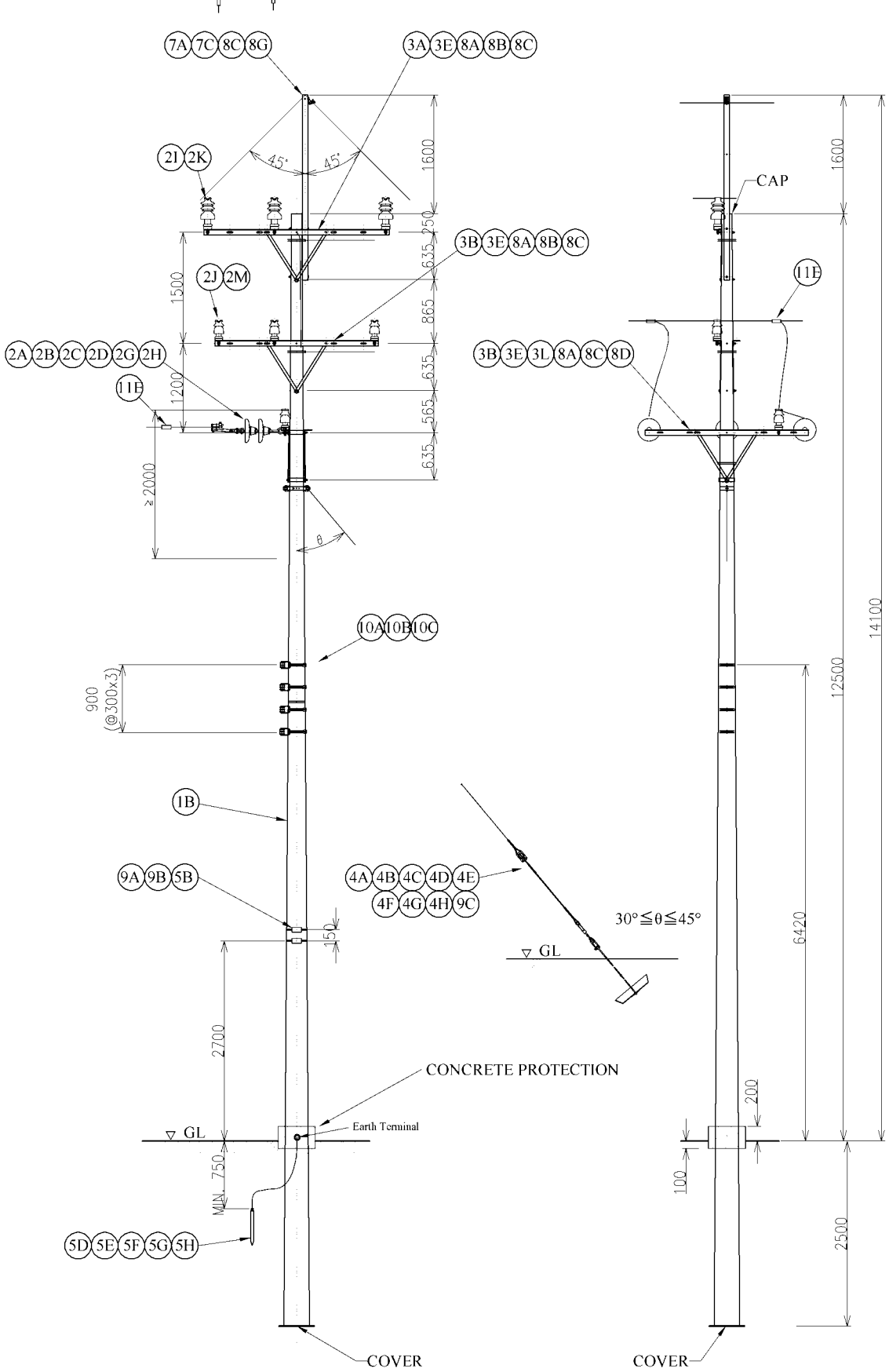
Scale	1/80	

Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (6/29)

CH	11 & 33kV Combined Branch Pole (11kV Line Angle 45deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	6
2B	Anchor Shackle	3
2C	Ball Eye	3
2D	Socket Eye	3
2G	Dead End Clamp for 11kV(AAAC 150)	3
2I	33kV Pin Insulator	3
2J	11kV Pin Insulator	4
2K	Preformed Top Tie for AAAC 265 (33kV)	3
2M	Preformed Top Tie for AAAC 150 (11kV)	4
3A	Crossarm for Insulator (for 33kV)	1
3B	Crossarm for Insulator (for 11kV)	3
3E	Crossarm Brace	8
3L	Band for Crossarm & Brace_FB4E-17	2
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	1
4F	Turnbuckle	1
4G	Stay Rod	1
4H	Stay Plate	1
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7B	Dead end Clump	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	32
8D	Flush Cut Bolt & Nut M16×360	2
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6





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Scale	1/80	

Rev.	Description	Date	Name

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >

11 & 33kV Combined Branch Pole (11kV Line Angle 45deg.)

Drawing No. DL-1-1-6 / DL-1-2-5

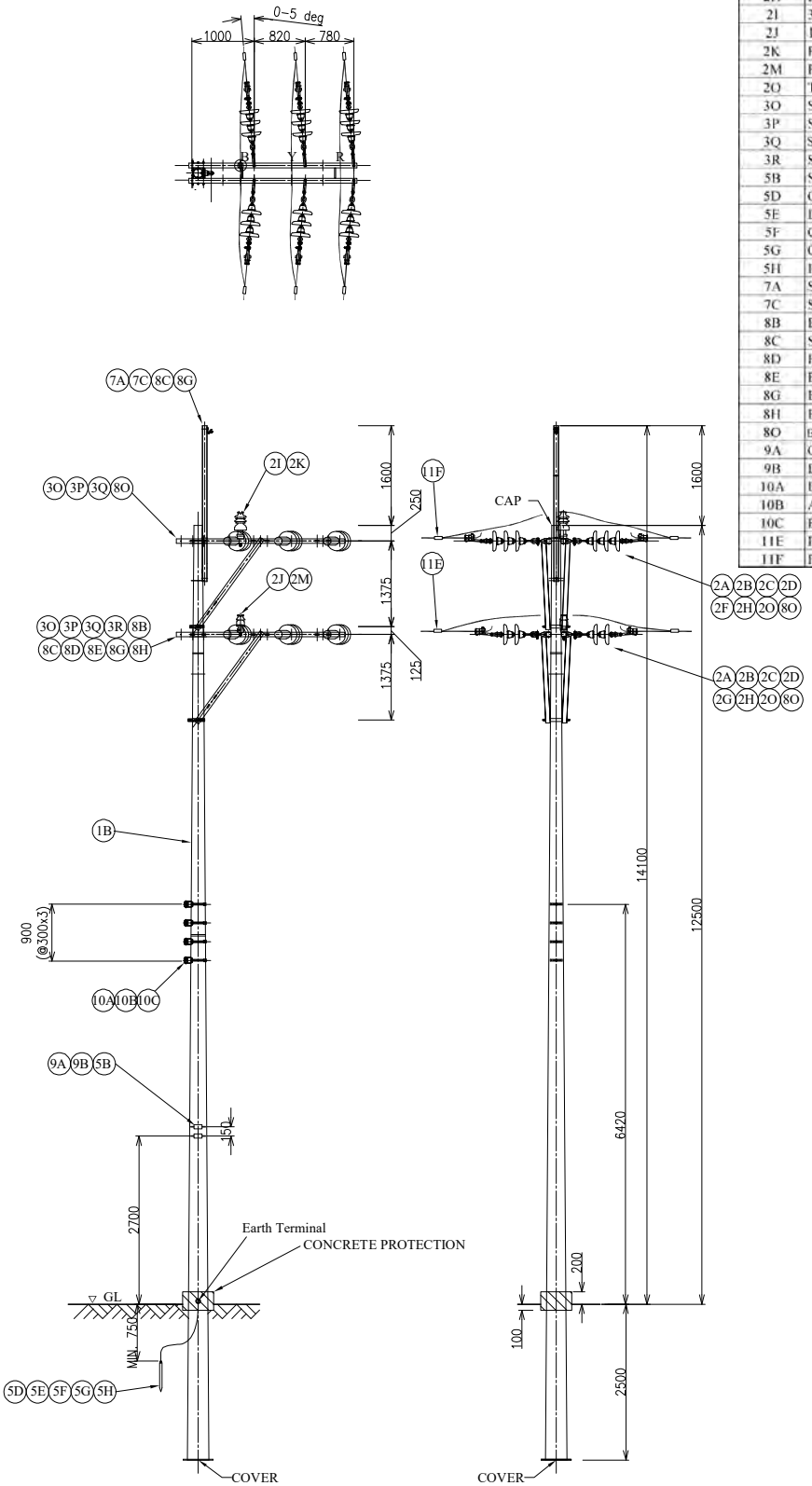
Pole Type: CH

Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (7/29)

CS	11 & 33kVCombined Intermediate Pole(Line Angle 0-5deg. -Special Arm)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	30
2B	Anchor Shackle	12
2C	Ball Eye	12
2D	Socket Eye	12
2F	Dead End Clamp for 33kV(AAAC 265)	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2I	33kV Pin Insulator	1
2J	11kV Pin Insulator	1
2K	Preformed Top Tie for AAAC 265 (33kV)	1
2M	Preformed Top Tie for AAAC 150 (11kV)	1
2O	Tension strap for Suspension Insulator	24
3O	Square Cross arm 2700mm	4
3P	Square Support Arm 1800mm	4
3Q	Stay Band for Square Cross arm(Double Arm Panzer Mast)	2
3R	Stay Band for Panzer D:φ100-φ180	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clamp	1
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	25
8D	Flush Cut Bolt & Nut M16×360	2
8E	Bolt & Nut M16x120(Crossarm/Support for DS)	2
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8O	Bolt & Nut M12xL20 (Square Cross arm/ Dead End Clamp)	6
9A	ODA mark	1
9B	Danger Plate	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6
11F	PG Clamp(AAAC 265/265)	6



Item	Name	Date
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Scale	1/80	

Rev.	Description	Date	Name

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >

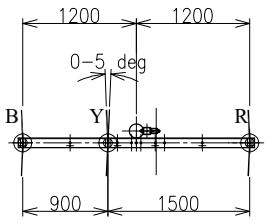
11 & 33kVCombined Intermediate Pole (Line Angle 0-5deg. - Special Arm)

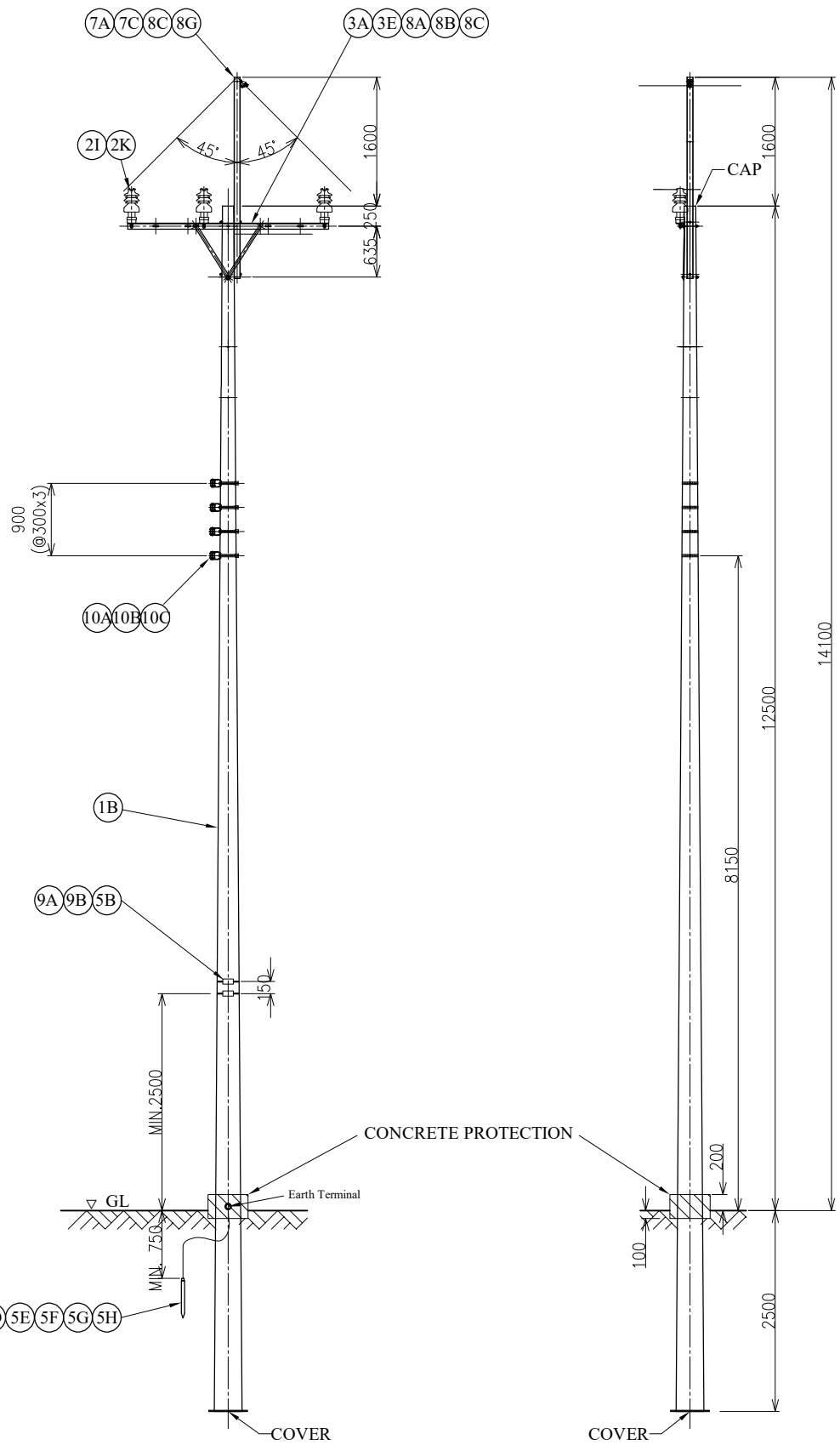
Drawing No. DL-1-2-6 | Pole Type: CS | Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (8/29)

3A	33kV Intermediate Pole (Line Angle 0-5deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2I	33kV Pin Insulator	3
2K	Preformed Top Tie for AAAC 265 (33kV)	3
3A	Crossarm for Insulator (for 33kV)	1
3E	Crossarm Brace	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	1
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	2
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	12
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >
33kV Intermediate Pole
(Line Angle 0-5deg.)

Drawing No. DL1-3-1 | Pole Type 3A | Rev. -

Supplier

Item	Name	Date
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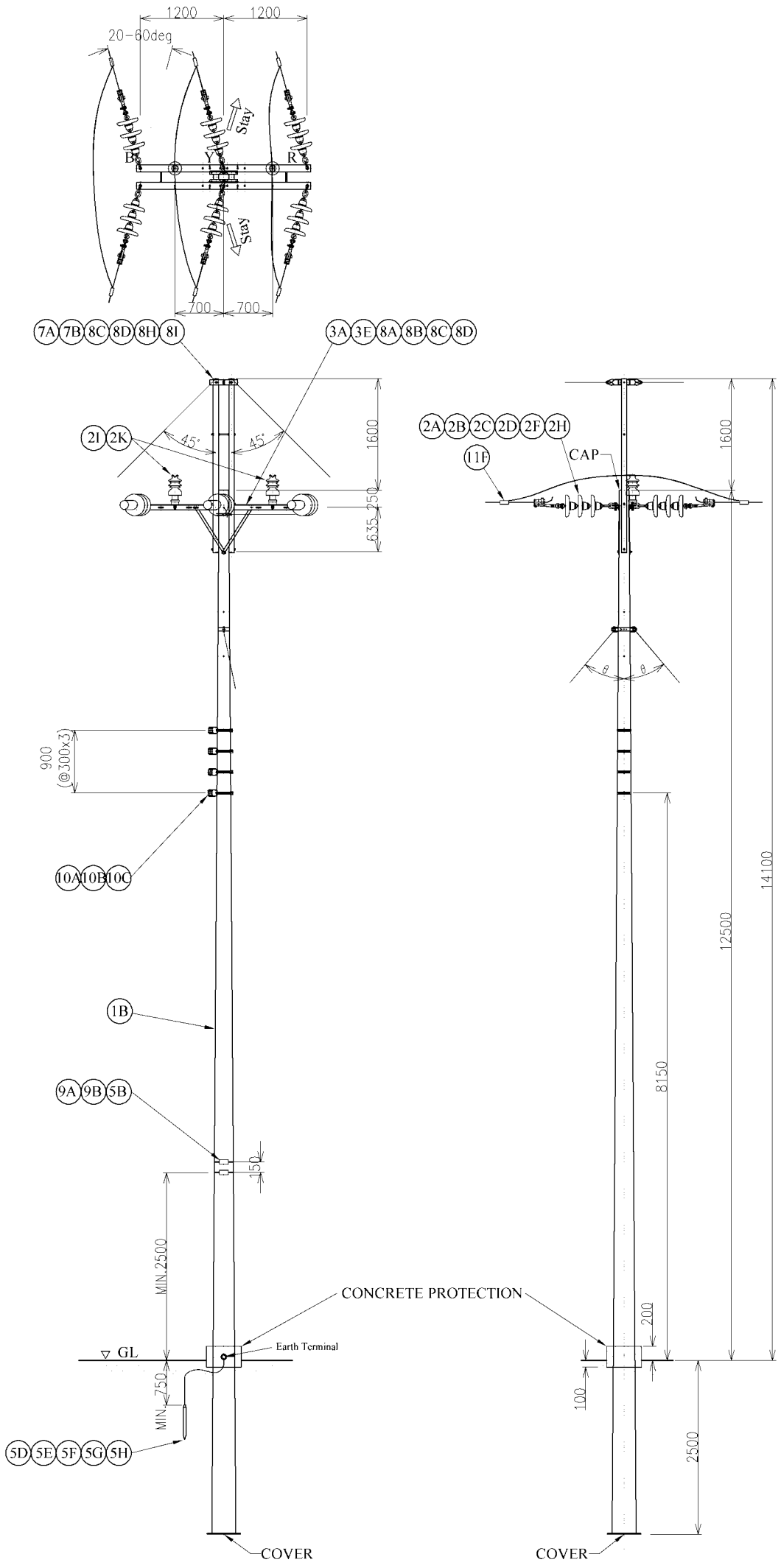
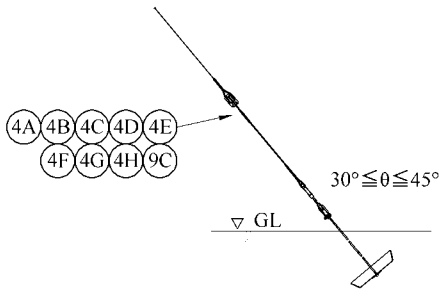
Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (9/29)

3C	33kV Middle Angle Pole(Line Angle 20-60deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	24
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2F	Dead End Clamp for 33kV(AAAC 265)	6
2H	Dead end Clamp Adaptor	6
2I	33kV Pin Insulator	2
2K	Preformed Top Tie for AAAC 265 (33kV)	2
3A	Crossarm for Insulator (for 33kV)	2
3E	Crossarm Brace	4
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	28
8D	Flush Cut Bolt & Nut M16×360	3
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11F	PG Clamp(AAAC 265/265)	6





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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

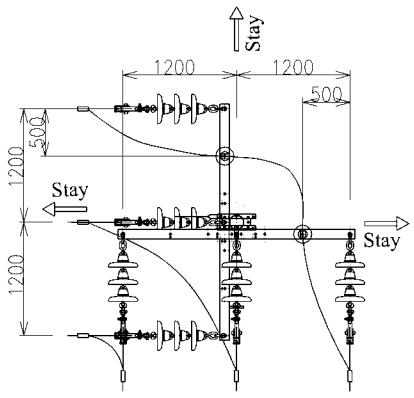
Title: < Assembly Drawings for Steel Pole >
33kV Middle Angle Pole
(Line Angle 20-60deg.)

Drawing No. DL-1-3-2 | Pole Type 3C | Rev. -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (10/29)

3F	33kV Sharp Angle Pole (Line Angle 90deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	24
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2F	Dead End Clamp for 33kV(AAAC 265)	6
2H	Dead end Clamp Adaptor	6
2I	33kV Pin Insulator	2
2K	Preformed Top Tie for AAAC 265 (33kV)	2
3A	Crossarm for Insulator (for 33kV)	2
3E	Crossarm Brace	4
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5C	Ring Saddle for Stainless Band	6
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	44
8D	Flush Cut Bolt & Nut M16×360	5
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
11F	PG Clamp(AAAC 265/265)	6



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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

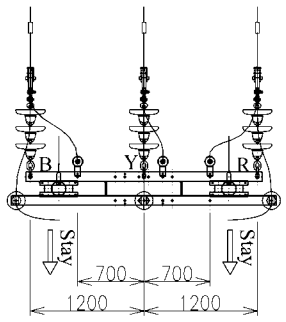
Title: < Assembly Drawings for Steel Pole >
33kV Sharp Angle Pole
(Line Angle 90 deg.)

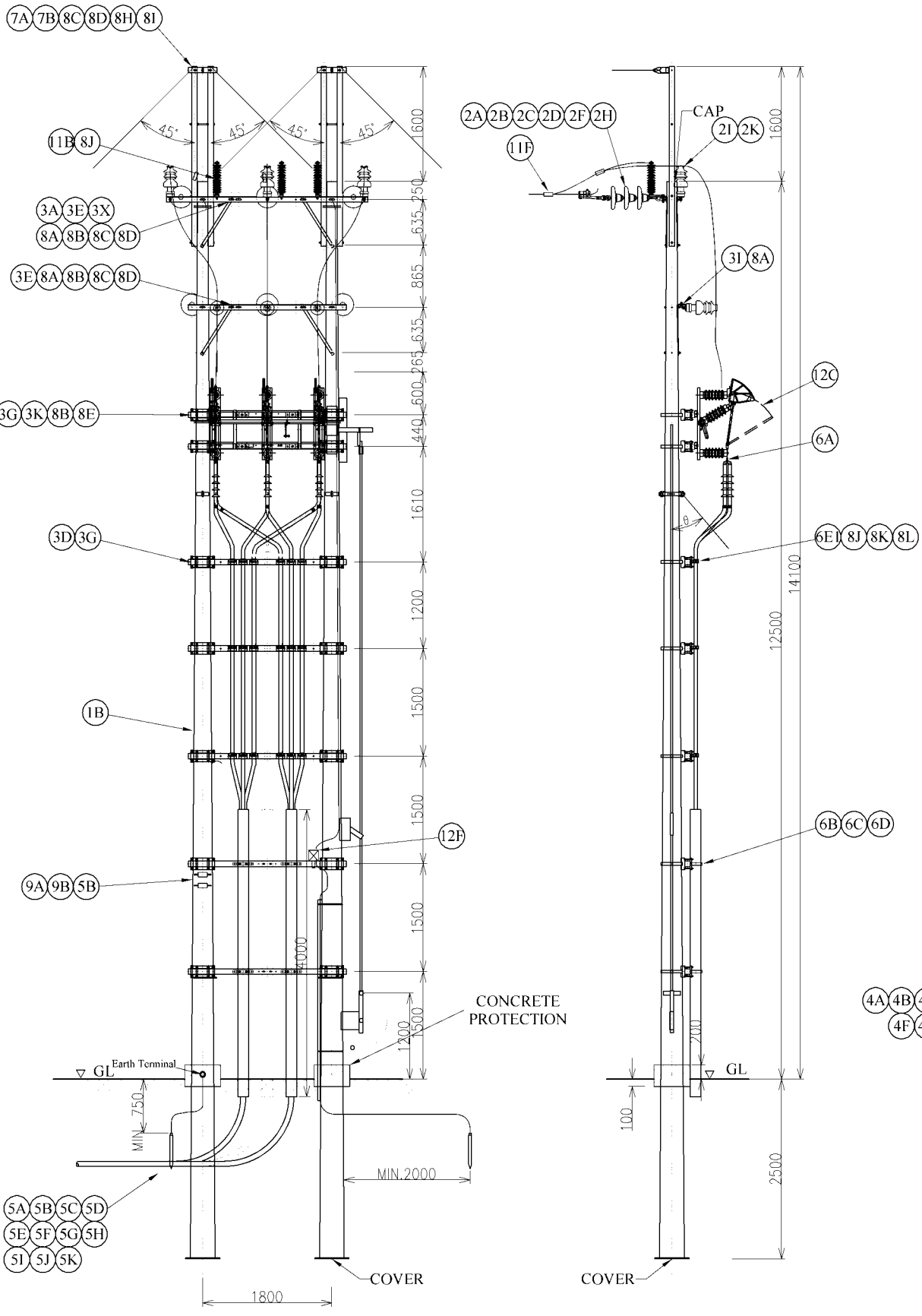
Drawing No. DL-1-3-3 | Pole Type 3F | Rev. -

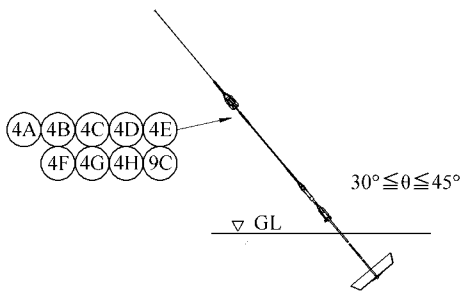
Supplier

DL-02 33kV&11kV Distribution Line Pole Type (11/29)

3G	33kV Cable Connection Pole	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	12
2B	Anchor Shackle	3
2C	Ball Eye	3
2D	Socket Eye	3
2F	Dead End Clamp for 33kV(AAAC 265)	3
2H	Dead end Clamp Adaptor	3
2I	33kV Pin Insulator	6
2K	Preformed Top Tie for AAAC 265 (33kV)	6
3A	Crossarm for Insulator (for 33kV)	2
3C	Crossarm for DS & Cutout Swithch, PAS	5
3D	Crossarm for 33kV Cable Support	10
3E	Crossarm Brace	6
3G	W-Crossarm Brace less Band	6
3H	Single Crossarm Brace less Band_15S-DW	2
3I	Support for 33kV/11kV Insulator	3
3K	Support for Disconnecting Switch	8
3X	Crossarm for Insulator (for 33kV) 2800mm	1
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5A	PVC Protection Pipe (L=4.0m)	1
5B	Stainless Band (L=1200mm)	9
5C	Ring Saddle for Stainless Band	9
5D	Ground Rod	2
5E	Lead Wire Terminal	2
5F	Compression Connector(Cu22/Cu22)	2
5G	Crimping Terminal (Cu22, M18type)	2
5H	IV 22sq.mm	5
5I	Compression Terminal (Cu22/Cu100)	2
5J	IV 100sq.mm	30
5K	Crimping Terminal (Cu100, M18type)	4
6A	Compression Terminal (95mm2)	6
6B	Protection Pipe φ150(L=4.0m)	2
6C	Pipe Saddle	4
6D	Bolt & Nut for Bracket M10x100	8
6E1	Bracket (33kV) 240mm²	12
7A	Support Arm	4
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	116
8D	Flush Cut Bolt & Nut M16×360	4
8E	Bolt & Nut M16x120(Crossarm/Support for DS)	8
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	6
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	4
8J	Bolt & Nut M12x50(Bracket/ Support for Bracket & Surge Counter, Arrester/Crossarm)	3
8K	Bolt & Nut M12x120(Bracket/ Crossarm, Surge Counter/Crossarm, Arrester/Crossarm)	1
8L	Bolt & Nut M10x120(Bracket/ Crossarm)	24
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
11B	33kV Lightning Arrester 10kA	3
11F	PG Clamp(AAAC 265/265)	6
12C	33kV Disconnecting Switch	1
12F	Surge Counter	1







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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

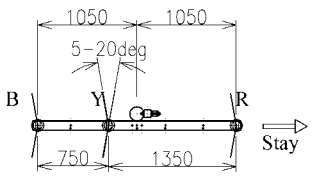
Title: < Assembly Drawings for Steel Pole >
33kV Cable Connection Pole

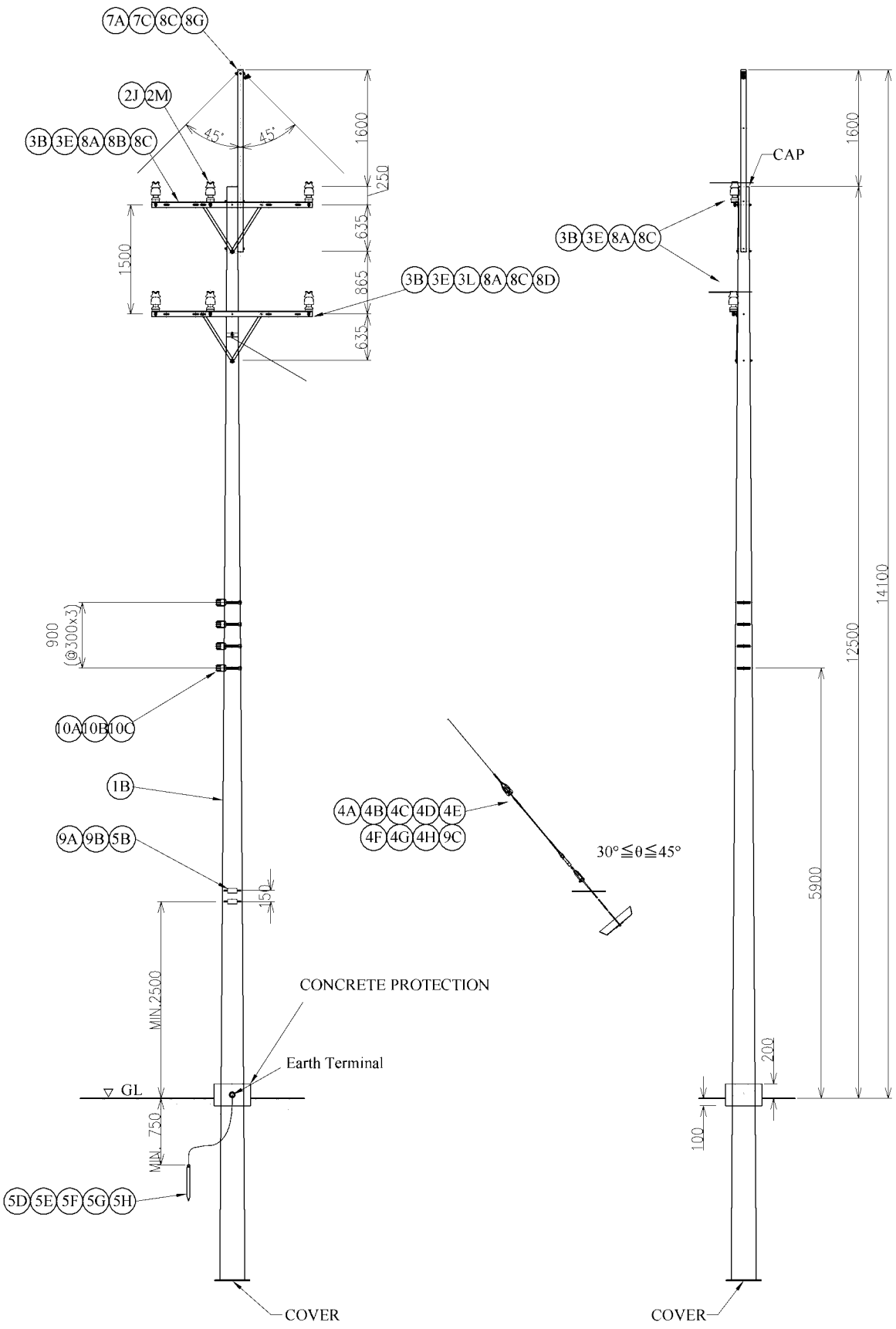
Drawing No. DL-1-3-4 | Pole Type 3G | Rev. -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (12/29)

DB	11kV Double Light Angle Pole (Line Angle 5-20deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2J	11kV Pin Insulator	6
2M	Preformed Top Tie for AAAC 150 (11kV)	6
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	4
3L	Band for Crossarm & Brace_FB4E-17	2
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	1
4F	Turnbuckle	1
4G	Stay Rod	1
4H	Stay Plate	1
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	16
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Electricity Distribution and Supply Authority(EDSA)			
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE			
Title	< Assembly Drawings for Steel Pole > 11kV Double Light Angle Pole (Line Angle 5-20deg.)		
Drawing No.	DL-1-4-1	Pole Type	DB
		Rev.	-
Supplier			

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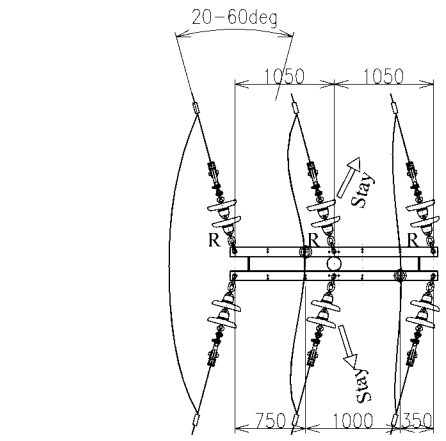
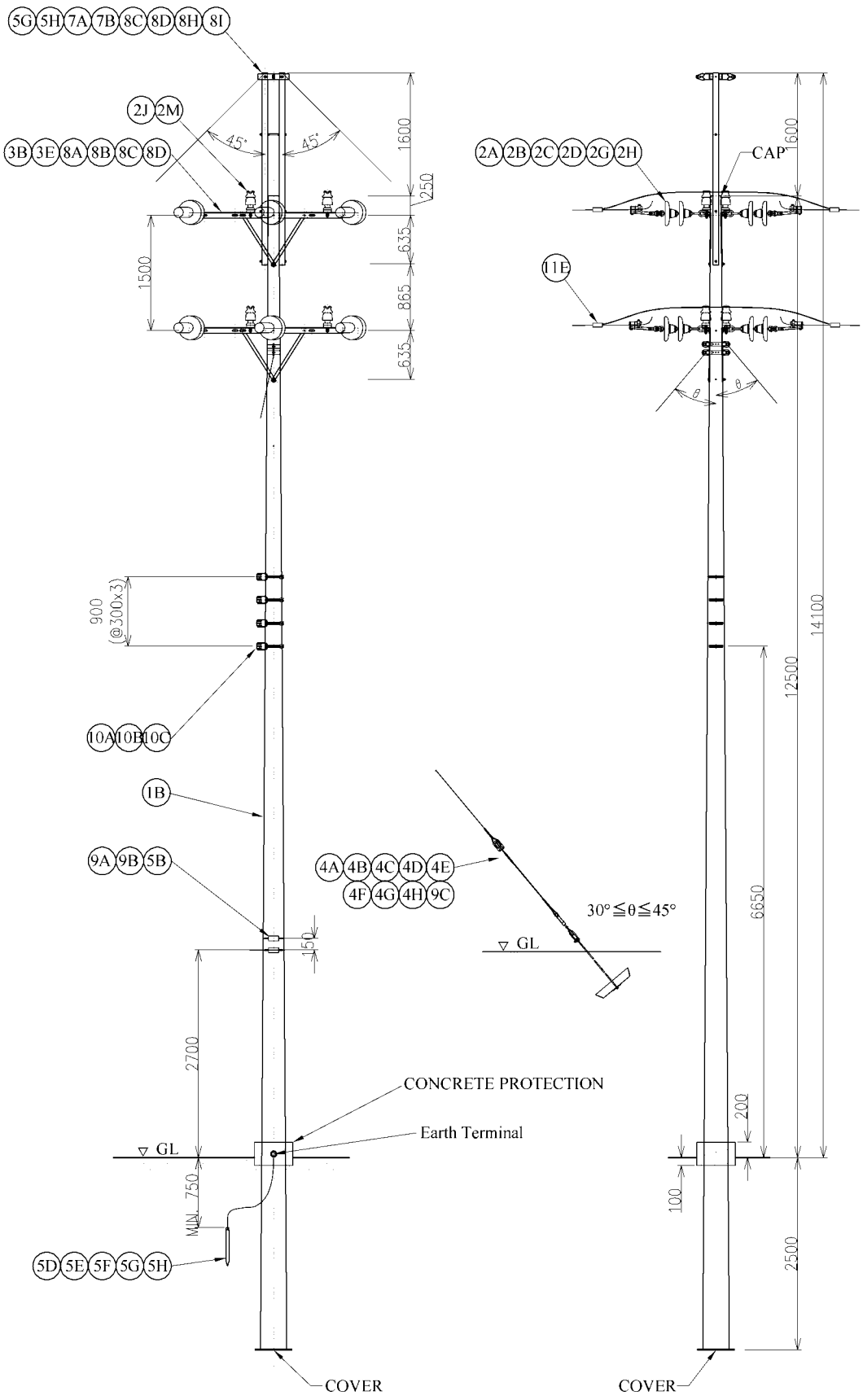
DL-02 33kV&11kV Distribution Line Pole Type (13/29)

DC	11kV Double Middle Angle Pole (Line Angle 20-60deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	24
2B	Anchor Shackle	12
2C	Ball Eye	12
2D	Socket Eye	12
2G	Dead End Clamp for 11kV(AAAC 150)	12
2H	Dead end Clamp Adaptor	12
2J	11kV Pin Insulator	4
2M	Preformed Top Tie for AAAC 150 (11kV)	4
3B	Crossarm for Insulator (for 11kV)	4
3E	Crossarm Brace	8
3L	Band for Crossarm & Brace_FB4E-17	2
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	44
8D	Flush Cut Bolt & Nut M16×360	5
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	12





Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >
11kV Double Middle Angle Pole
(Line Angle 20-60deg.)

Drawing No. DL-1-4-2 | Pole Type: DC | Rev.: -

Supplier

Item	Name	Date
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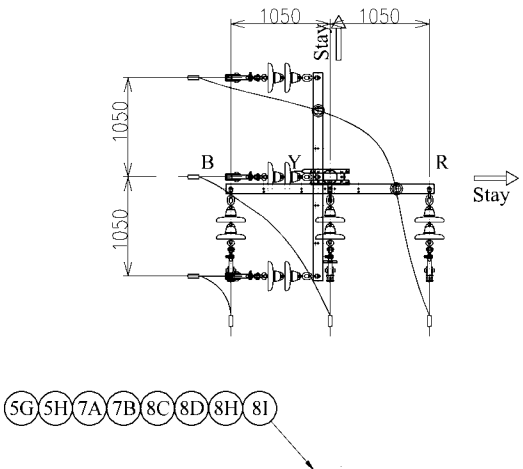
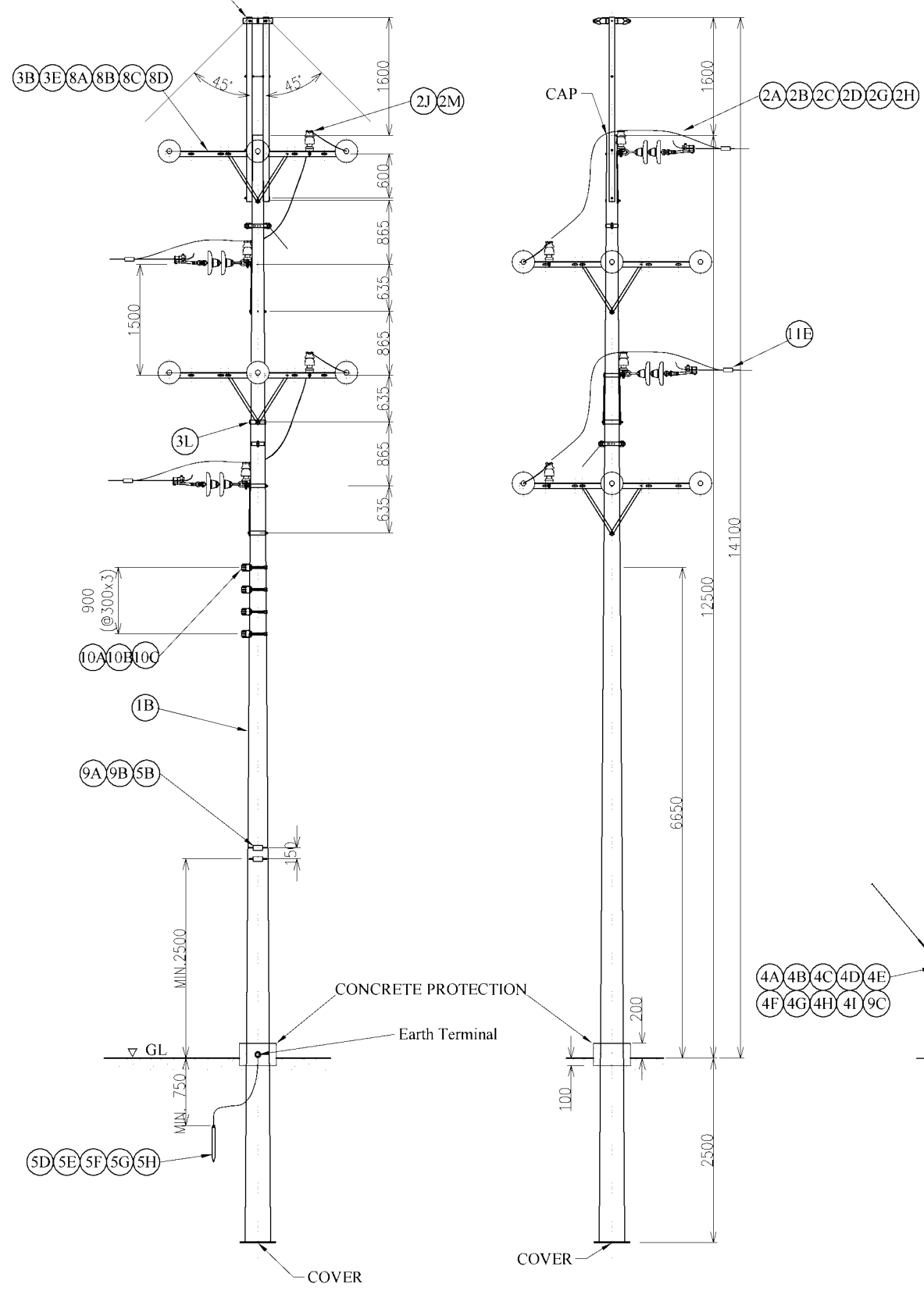
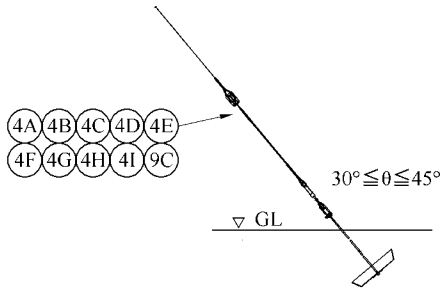
DL-02 33kV&11kV Distribution Line Pole Type (14/29)

DF	11kV Double Sharp Angle Pole (Line Angle 90deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	24
2B	Anchor Shackle	12
2C	Ball Eye	12
2D	Socket Eye	12
2G	Dead End Clamp for 11kV(AAAC 150)	12
2H	Dead end Clamp Adaptor	12
2J	11kV Pin Insulator	4
2M	Preformed Top Tie for AAAC 150 (11kV)	4
3B	Crossarm for Insulator (for 11kV)	4
3E	Crossarm Brace	8
3L	Band for Crossarm & Brace_FB4E-17	4
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
4I	Stay Band with thimble D17	1
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	40
8D	Flush Cut Bolt & Nut M16×360	5
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	12







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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >

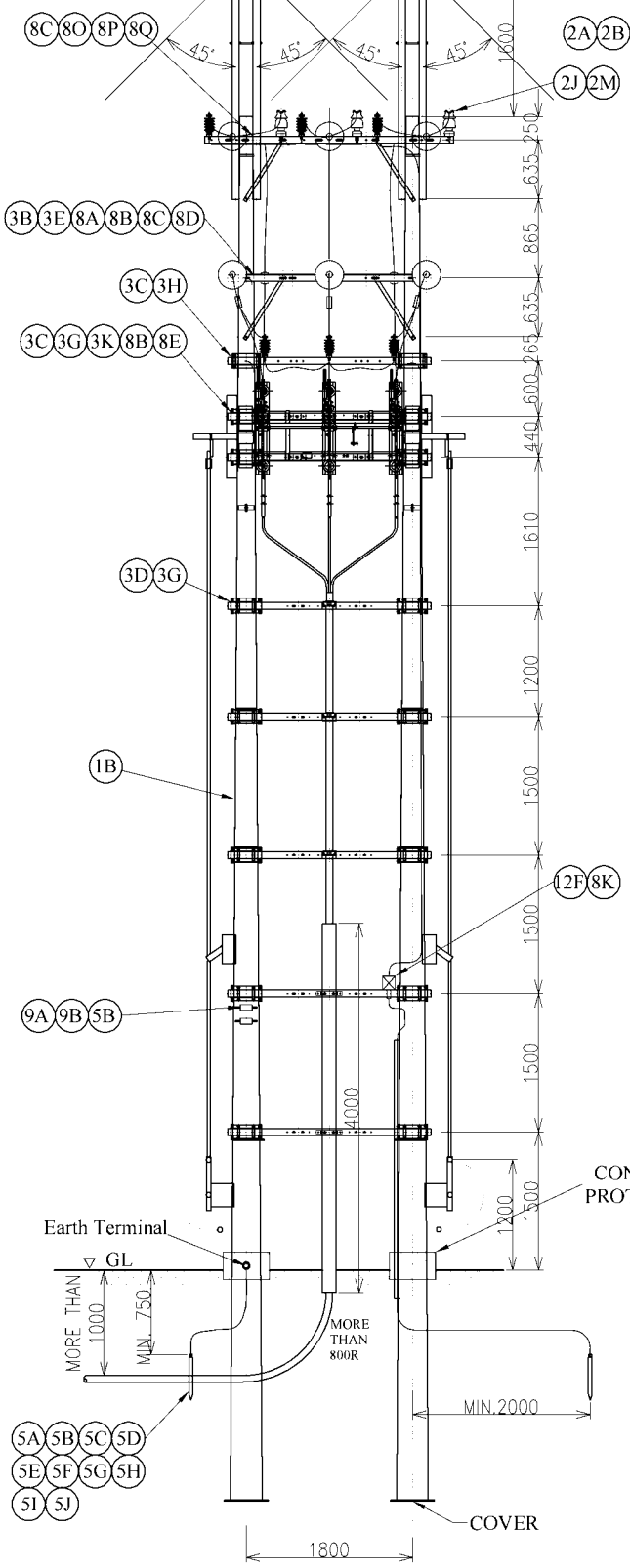
11kV Double Sharp Angle Pole (Line Angle 90deg.)

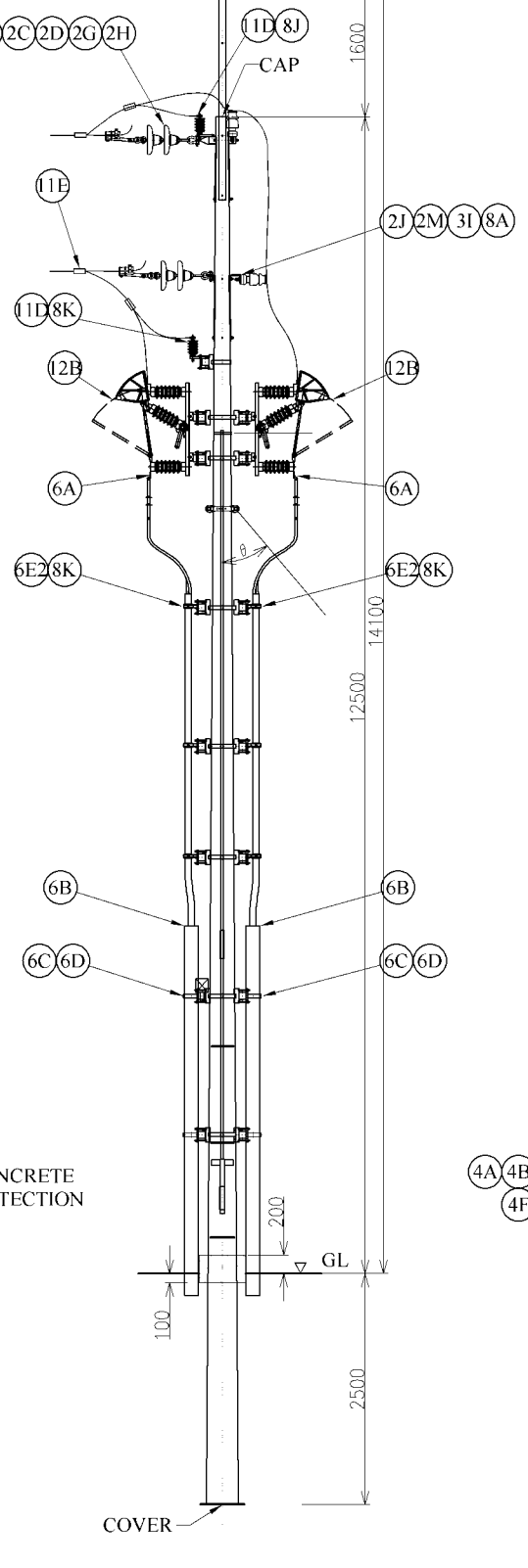
Drawing No. DL-1-4-3 | Pole Type: DF | Rev.: -

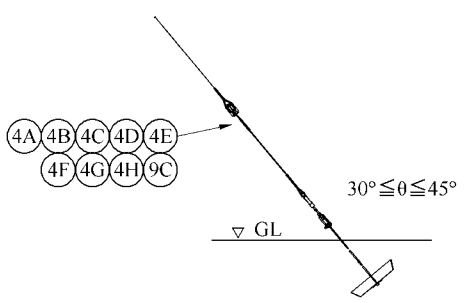
Supplier

DL-02 33kV&11kV Distribution Line Pole Type (15/29)

DG	11kV Double Cable Pole	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	2
2A	Suspension Insulator	12
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2J	11kV Pin Insulator	6
2M	Preformed Top Tie for AAAC 150 (11kV)	6
3B	Crossarm for Insulator (for 11kV)	4
3C	Crossarm for DS & Cutout Swithch, PAS	5
3D	Crossarm for 33kV Cable Support	10
3E	Crossarm Brace	8
3G	W-Crossarm Brace less Band	6
3H	Single Crossarm Brace less Band_15S-DW	2
3I	Support for 33kV/11kV Insulator	3
3K	Support for Disconnecting Switch	8
3N	W-Crossarm Brace less Band SAS-26-DW	4
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
4I	Stay Band with thimble D17	2
5A	PVC Protection Pipe (L=4.0m)	2
5B	Stainless Band (L=1200mm)	23
5C	Ring Saddle for Stainless Band	9
5D	Ground Rod	2
5E	Lead Wire Terminal	2
5F	Compression Connector(Cu22/Cu22)	2
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	20
5I	Compression Terminal (Cu22/Cu100)	1
5J	IV 100sq.mm	20
5K	Crimping Terminal (Cu100, M18type)	8
6A	Compression Terminal (95mm2)	6
6B	Protection Pipe φ150(L=4.0m)	2
6C	Pipe Saddle	4
6D	Bolt & Nut for Bracket M10x100	8
6E2	Bracket (11kV) 95mm²	6
7A	Support Arm	4
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	11
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	16
8C	Square Washer 45×45	202
8D	Flush Cut Bolt & Nut M16×360	4
8E	Bolt & Nut M16x120(Crossarm/Support for DS)	16
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	6
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
8J	Bolt & Nut M12x50(Bracket/ Support for Bracket & Surge Counter, Arrester/Crossarm)	3
8K	Bolt & Nut M12x120(Bracket/ Crossarm、Surge Counter/Crossarm, Arrester/Crossarm)	17
8L	Bolt & Nut M10x120(Bracket/ Crossarm)	6
8M	Bolt & Nut M20x160(Crossarm/Cutout switch)	10
8N	Bolt & Nut M20x220(Crossarm/Support for Disconnecting Switch)	10
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
11D	11kV Lightning Arrester 10kA	6
11E	PG Clamp(AAAC 150/150)	12
12B	11kV Disconnecting Switch	2
12F	Surge Counter	2







Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title: < Assembly Drawings for Steel Pole >
11kV Double Cable Pole

Drawing No. DL-1-4-4 | Pole Type DG | Rev. -

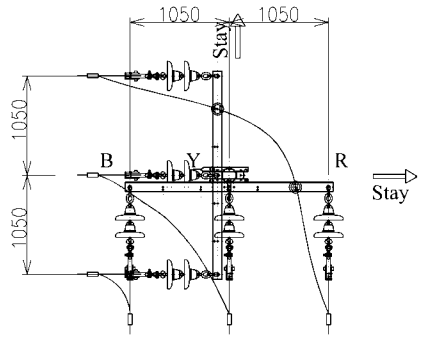
Supplier

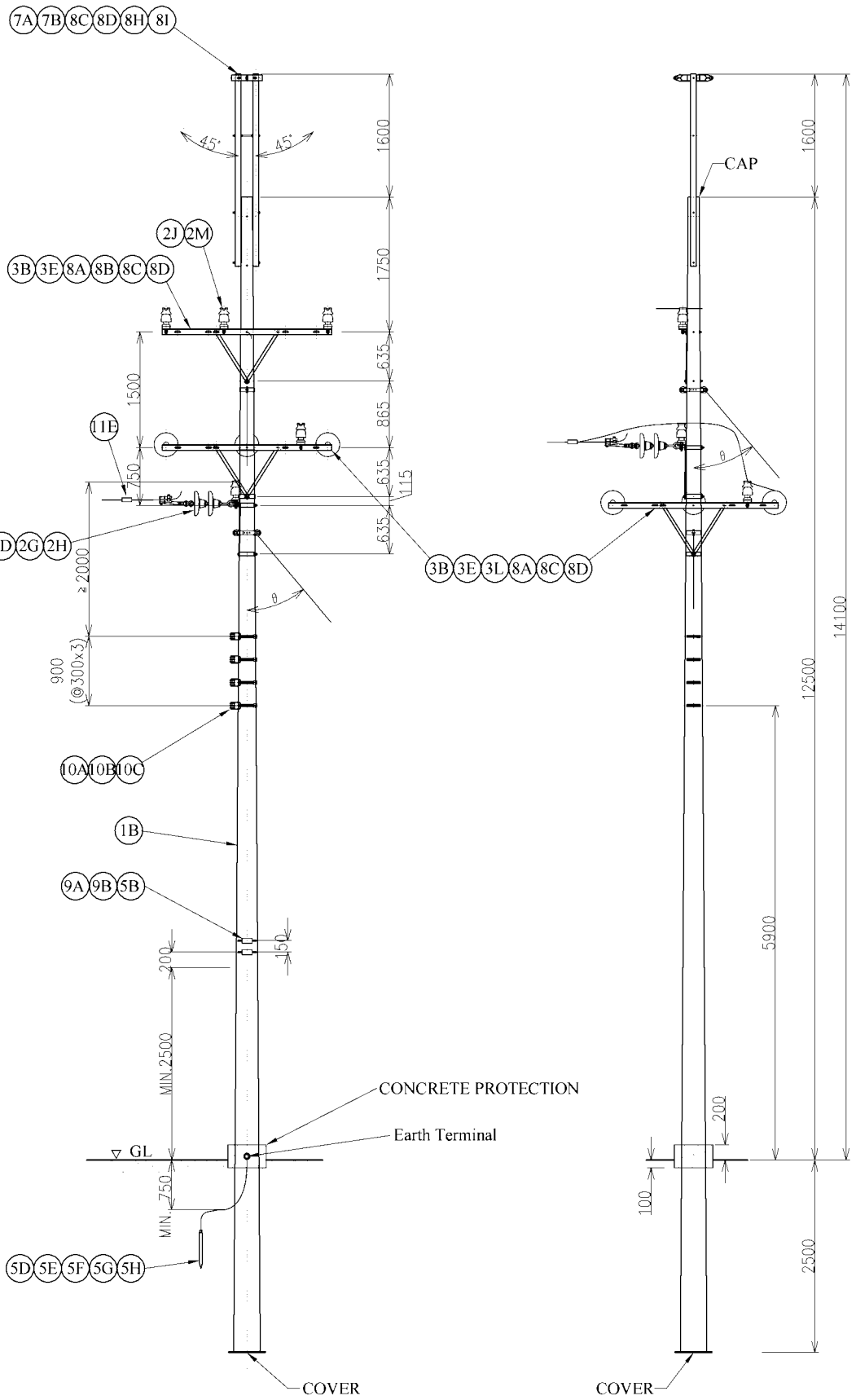
Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (16/29)

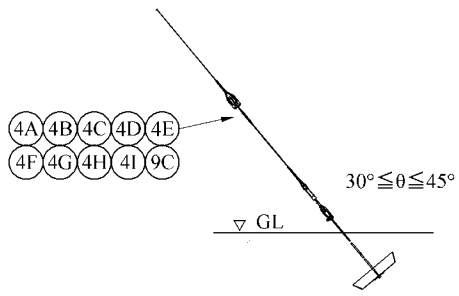
DH	11kV Double Branch Pole (Line Angle 90deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	12
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2J	11kV Pin Insulator	5
2M	Preformed Top Tie for AAAC 150 (11kV)	5
3B	Crossarm for Insulator (for 11kV)	3
3C	Crossarm for DS & Cutout Swithch, PAS	6
3E	Crossarm Brace	10
3L	Band for Crossarm & Brace_FB4E-17	4
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
4I	Stay Band with thimble D17	1
5B	Stainless Band (L=1200mm)	2
5C	Ring Saddle for Stainless Band	6
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	10
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	60
8D	Flush Cut Bolt & Nut M16×360	5
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6





0～5
Upper: Intermediate

5～20
Low: Sharp Angle



Item	Name	Date
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Approved		
Scale	1/80	

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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

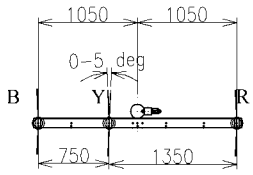
Title: < Assembly Drawings for Steel Pole >
11kV Double Branch Pole
(Line Angle 90deg.)

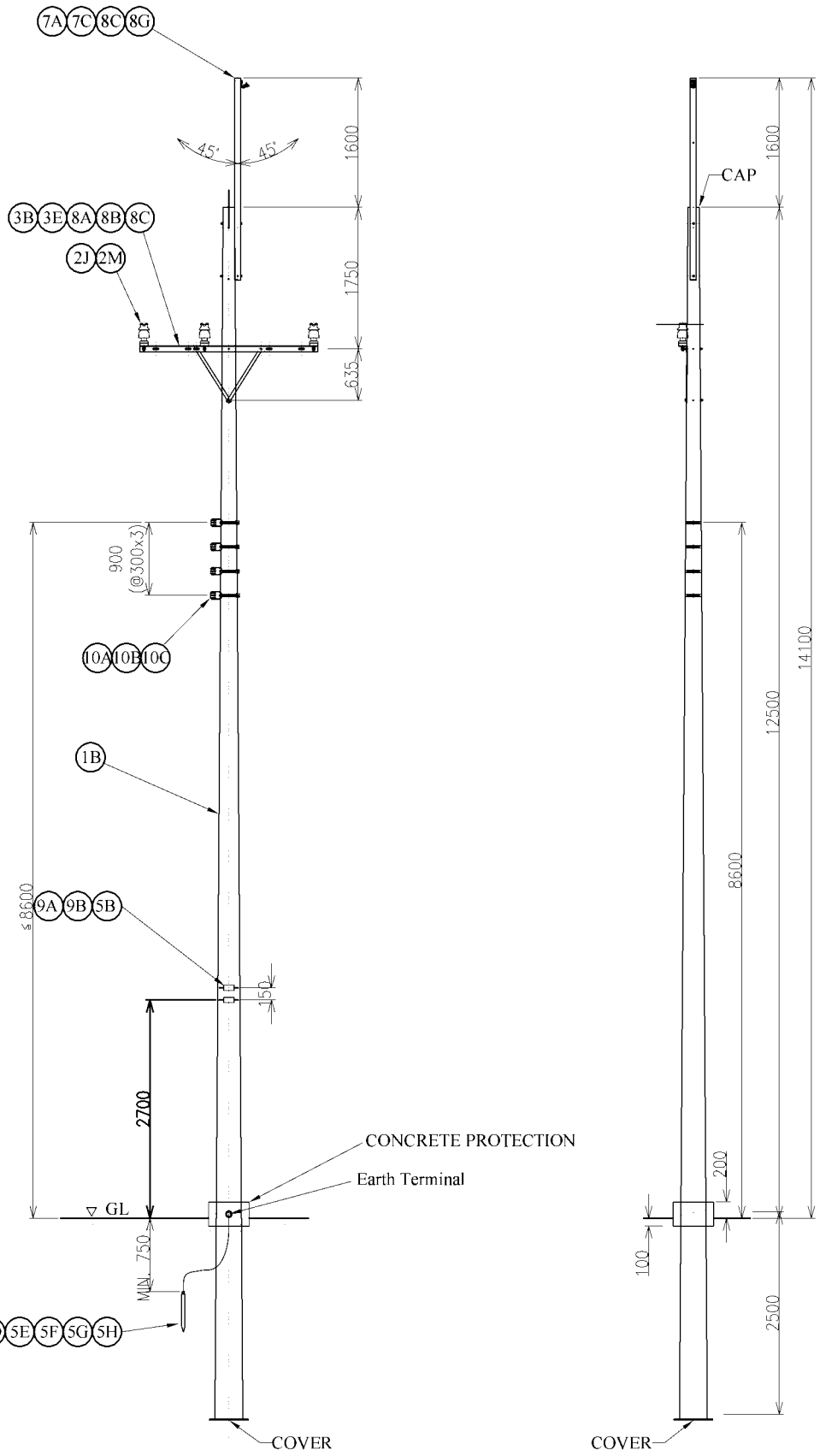
Drawing No. DL-1-4-5 | Pole Type: DH | Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (17/29)

SA	11kV Combined Intermediate Pole(Line Angle 0-5deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2J	11kV Pin Insulator	3
2M	Preformed Top Tie for AAAC 150 (11kV)	3
3B	Crossarm for Insulator (for 11kV)	1
3E	Crossarm Brace	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	2
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	12
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Item	Name	Date
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Approved		
Scale	1/80	

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Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

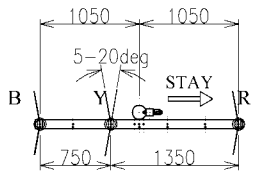
Title: < Assembly Drawings for Steel Pole >
11kV Combined Intermediate Pole
(Line Angle 0-5deg.)

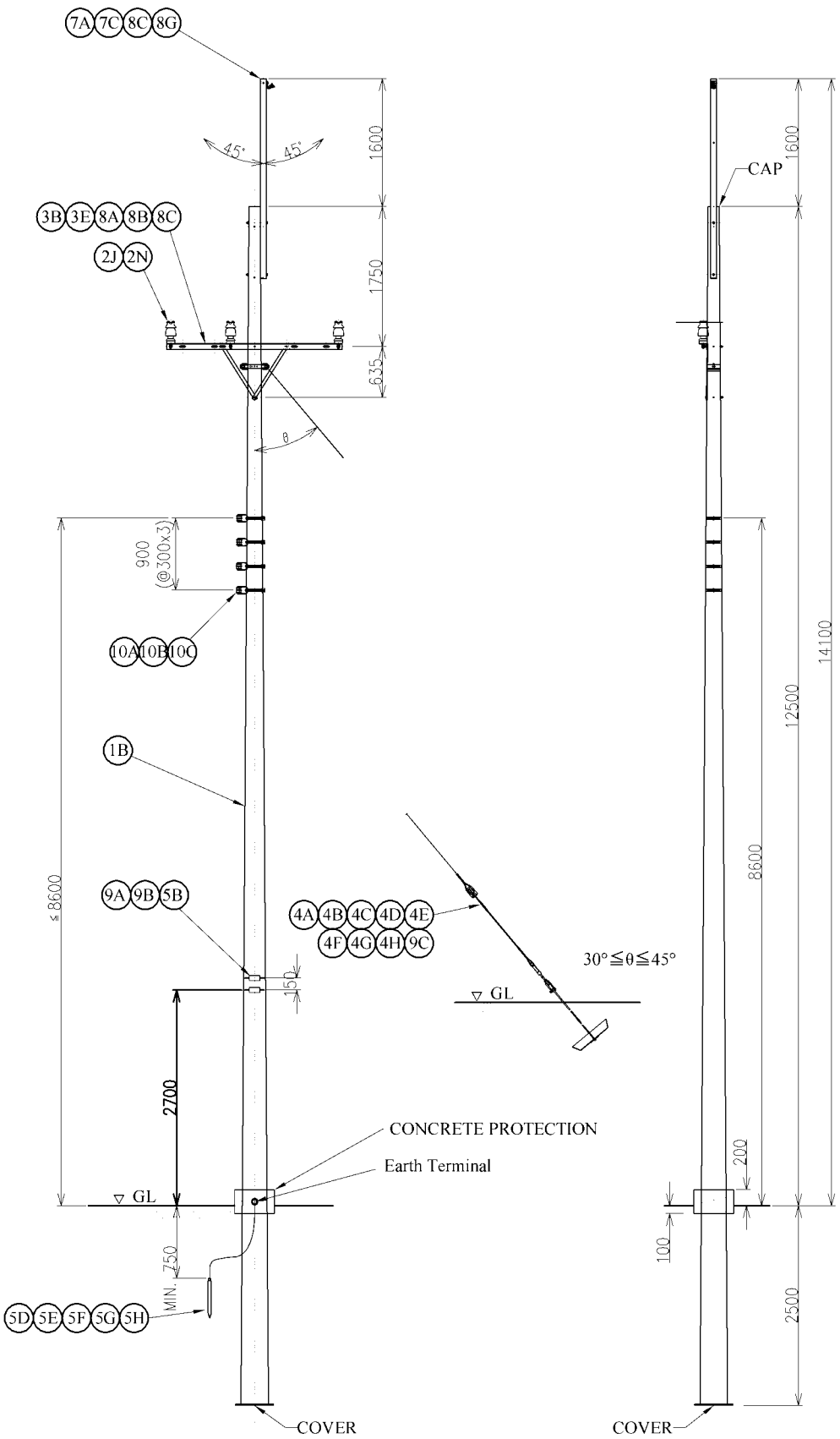
Drawing No. DL-1-5-1 | Pole Type: SA | Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (18/29)

SB	11kV Combined Light Angle Pole (Line Angle 5-20deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2J	11kV Pin Insulator	3
2N	Preformed Side Tie for AAAC 150 (11kV)	3
3B	Crossarm for Insulator (for 11kV)	1
3E	Crossarm Brace	2
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	1
4F	Turnbuckle	1
4G	Stay Rod	1
4H	Stay Plate	1
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	2
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	12
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Rev.	Description	Date	Name

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

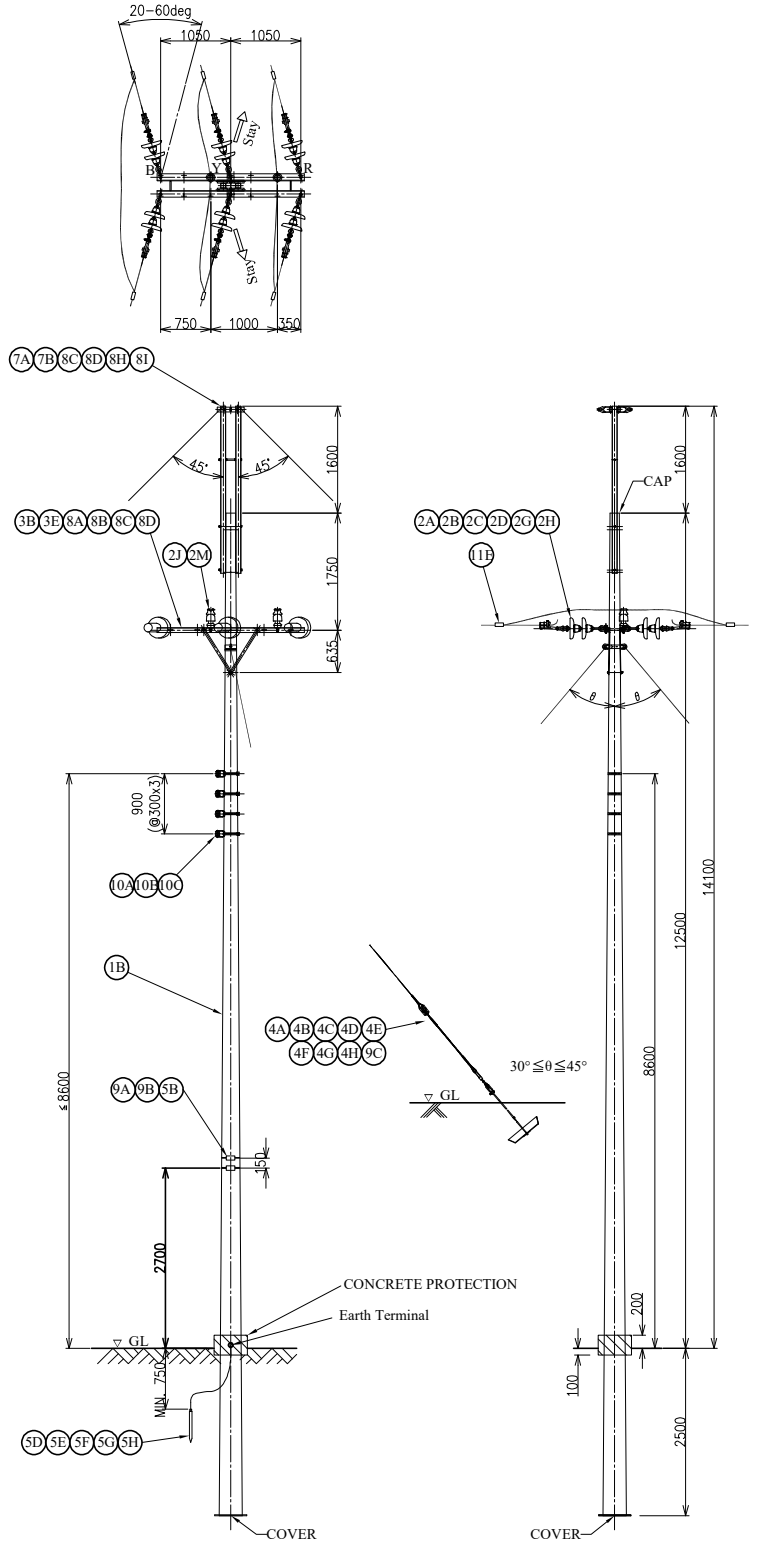
Title: < Assembly Drawings for Steel Pole >
11kV Combined Light Angle Pole
(Line Angle 5-20deg.)

Drawing No. DL-1-5-2 | Pole Type: SB | Rev.: -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (19/29)

SC	11kV Combined Middle Angle Pole (Line Angle 20-60deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	12
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2J	11kV Pin Insulator	2
2M	Preformed Top Tie for AAAC 150 (11kV)	2
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	4
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	28
8D	Flush Cut Bolt & Nut M16×360	3
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6



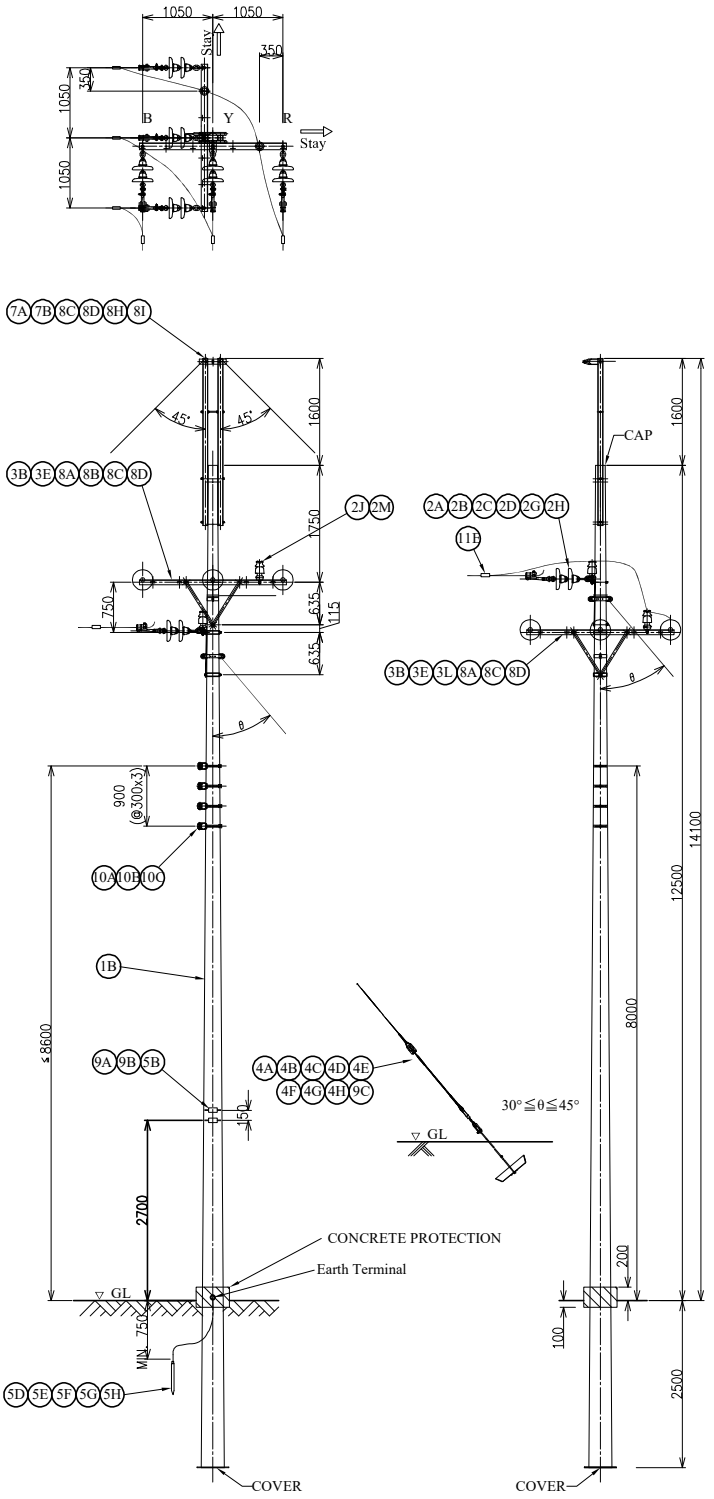
Electricity Distribution and Supply Authority(EDSA)			
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE			
Title	< Assembly Drawings for Steel Pole > 11kV Combined Middle Angle Pole (Line Angle 20-60deg.)		
Drawing No.	DL-1-5-3	Pole Type	SC
		Rev.	-
Supplier			

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (20/29)

SF	11kV Combined Sharp Angle Pole (Line Angle 90deg.)	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	12
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2J	11kV Pin Insulator	2
2M	Preformed Top Tie for AAAC 150 (11kV)	2
3B	Crossarm for Insulator (for 11kV)	3
3E	Crossarm Brace	6
3L	Band for Crossarm & Brace_FB4E-17	2
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clamp	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	40
8D	Flush Cut Bolt & Nut M16×360	5
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	3
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	OIDA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6



	Electricity Distribution and Supply Authority(EDSA)		
	THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE		
Title	< Assembly Drawings for Steel Pole > 11kV Combined Sharp Angle Pole (Line Angle 90deg.)		
Drawing No.	DL-1-5-4	Pole Type	SF
		Rev.	-
Supplier			

Item	Name	Date
Drawn		
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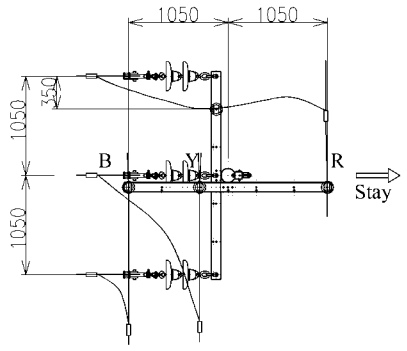
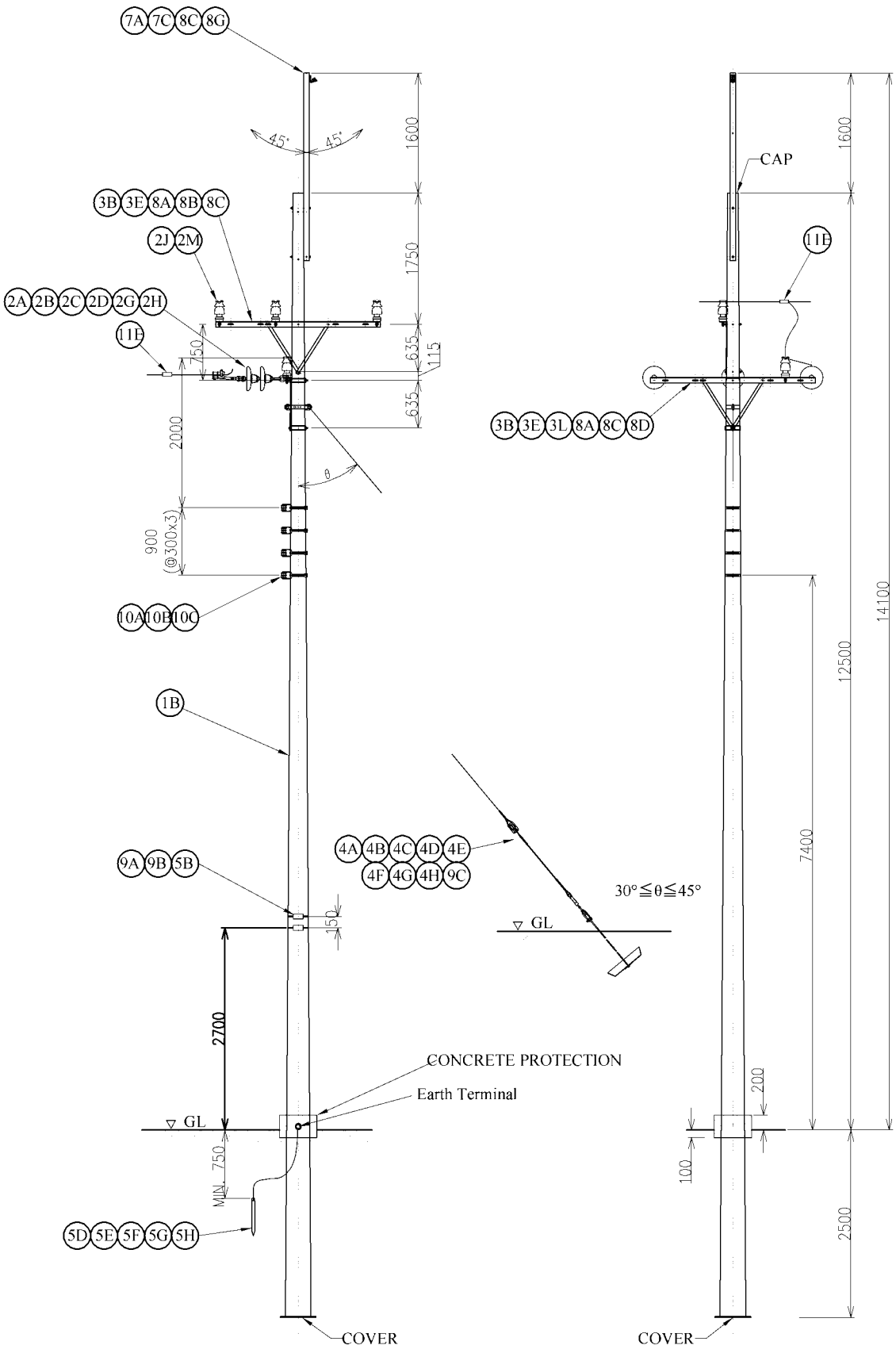
Approved		
Scale	1/80	

Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (21/29)

SH	11kV Combined Branch Pole	
Part No.	Part Name	Q'ty
1B	Steel pole 15m with Base Plate,Cap	1
2A	Suspension Insulator	6
2B	Anchor Shackle	3
2C	Ball Eye	3
2D	Socket Eye	3
2G	Dead End Clamp for 11kV(AAAC 150)	3
2H	Dead end Clamp Adaptor	3
2J	11kV Pin Insulator	4
2M	Preformed Top Tie for AAAC 150 (11kV)	4
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	4
3L	Band for Crossarm & Brace_FB4E-17	2
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	1
4F	Turnbuckle	1
4G	Stay Rod	1
4H	Stay Plate	1
5A	PVC Protection Pipe (L=4.0m)	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	6
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	33
8D	Flush Cut Bolt & Nut M16×360	2
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6





Item	Name	Date
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Scale	1/80	

Rev.	Description	Date	Name

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title

< Assembly Drawings for Steel Pole >

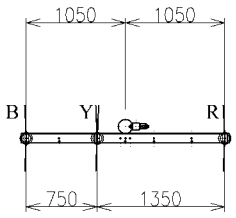
11kV Combined Branch Pole

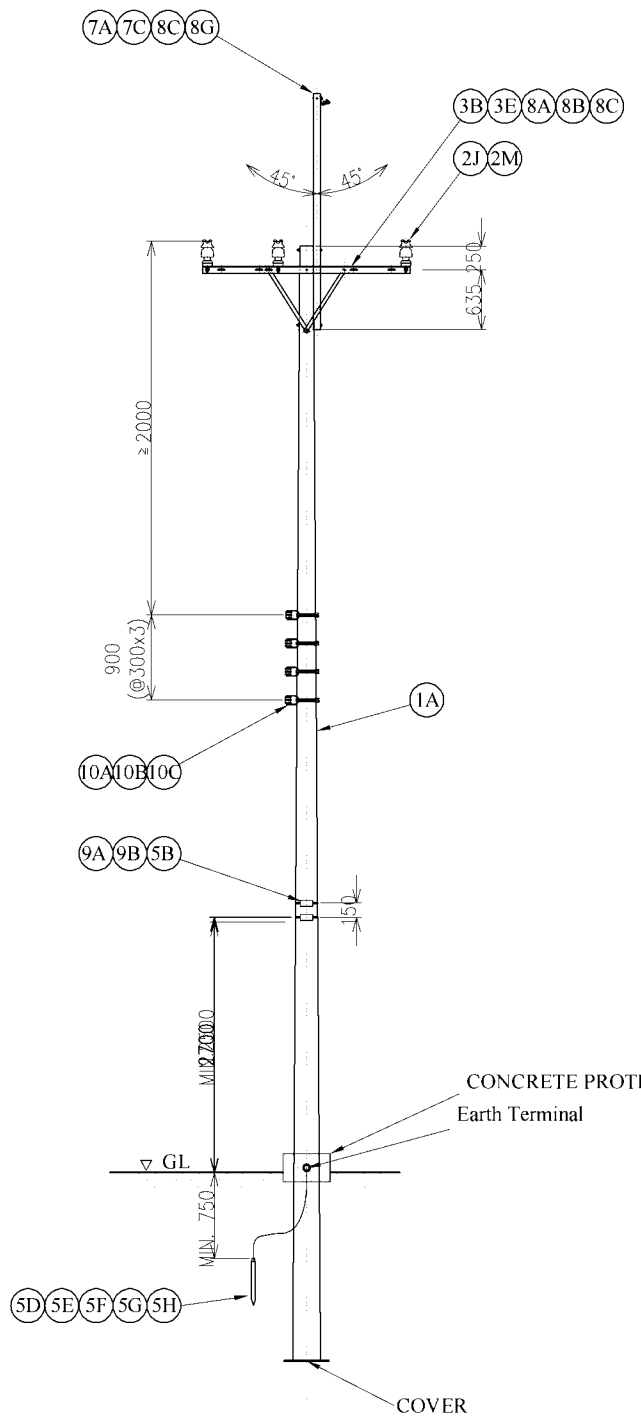
Drawing No. DL-1-5-5 | Pole Type: SH | Rev.: -

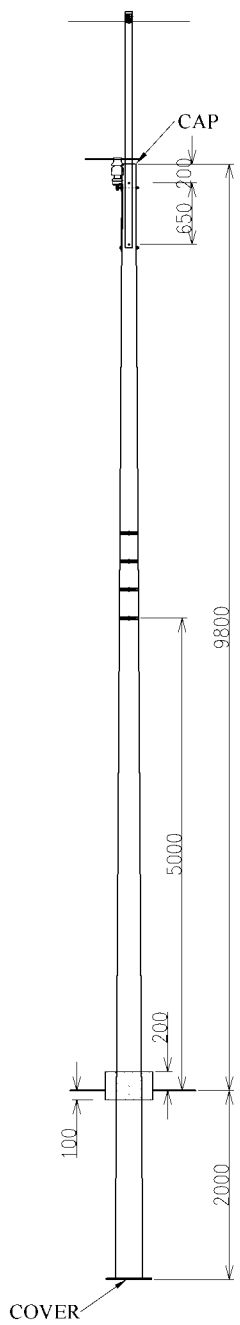
Supplier

DL-02 33kV&11kV Distribution Line Pole Type (22/29)

1A	11kV Intermediate Pole (Line Angle 0-5deg.)	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	1
2J	11kV Pin Insulator	3
2M	Preformed Top Tie for AAAC 150 (11kV)	3
3B	Crossarm for Insulator (for 11kV)	1
3E	Crossarm Brace	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	2
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	12
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4







Rev.	Description	Date	Name

Item	Name	Date
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Approved		
Scale	1/80	

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

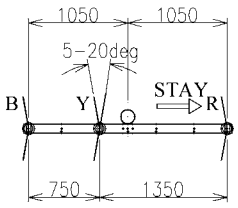
Title: < Assembly Drawings for Steel Pole >
11kV Intermediate Pole
(Line Angle 0-5deg.)

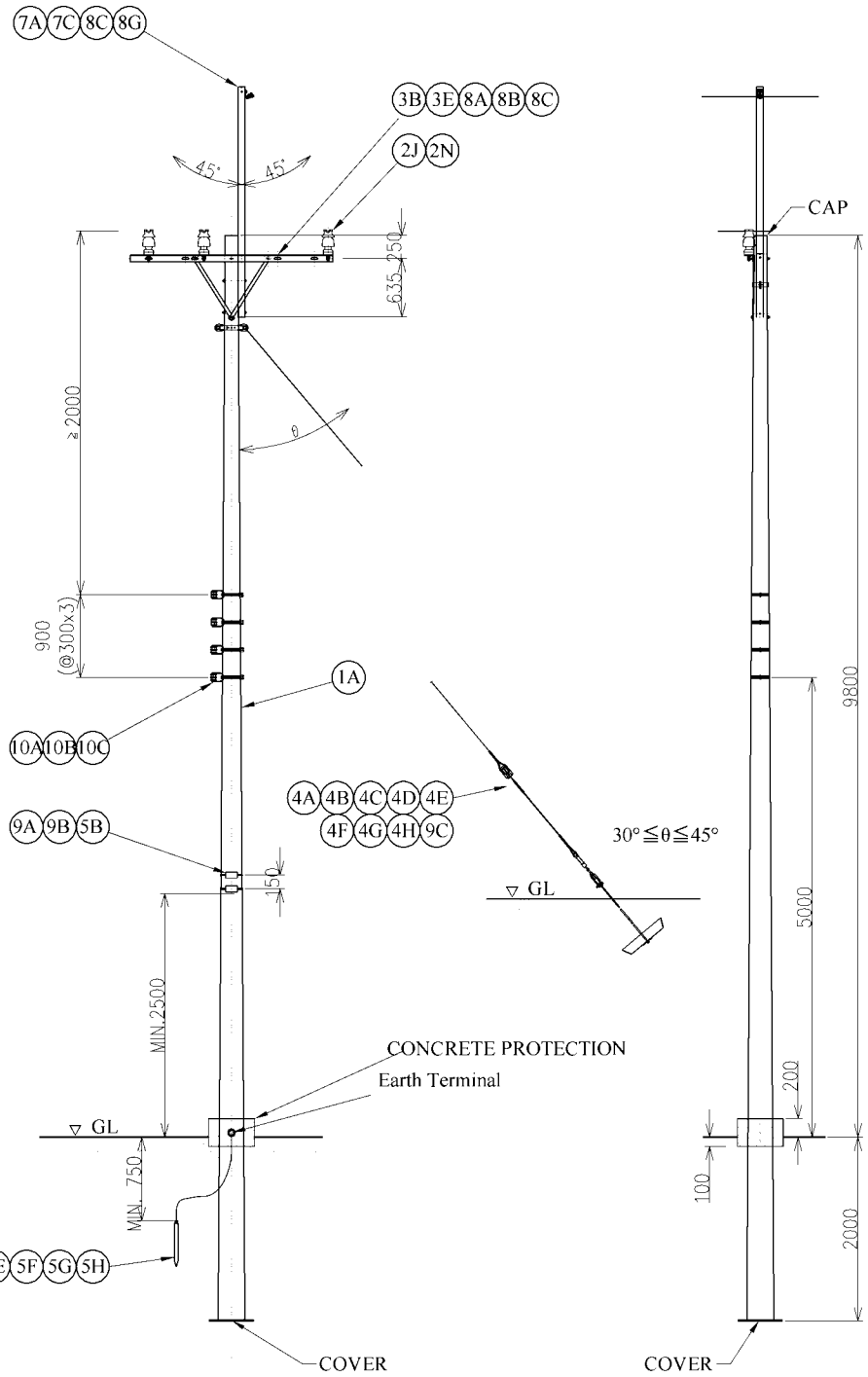
Drawing No. DL-1-6-1 | Pole Type 1A | Rev. -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (23/29)

1B	11kV Light Angle Pole (Line Angle 5-20deg.)	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	1
2J	11kV Pin Insulator	3
2N	Preformed Side Tie for AAAC 150 (11kV)	3
3B	Crossarm for Insulator (for 11kV)	1
3E	Crossarm Brace	2
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	1
4F	Turnbuckle	1
4G	Stay Rod	1
4H	Stay Plate	1
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	2
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	12
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	1
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4





Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Rev.	Description	Date	Name

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

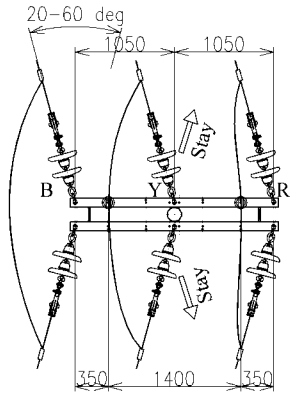
Title: < Assembly Drawings for Steel Pole >
11kV Light Angle Pole
(Line Angle 5-20deg.)

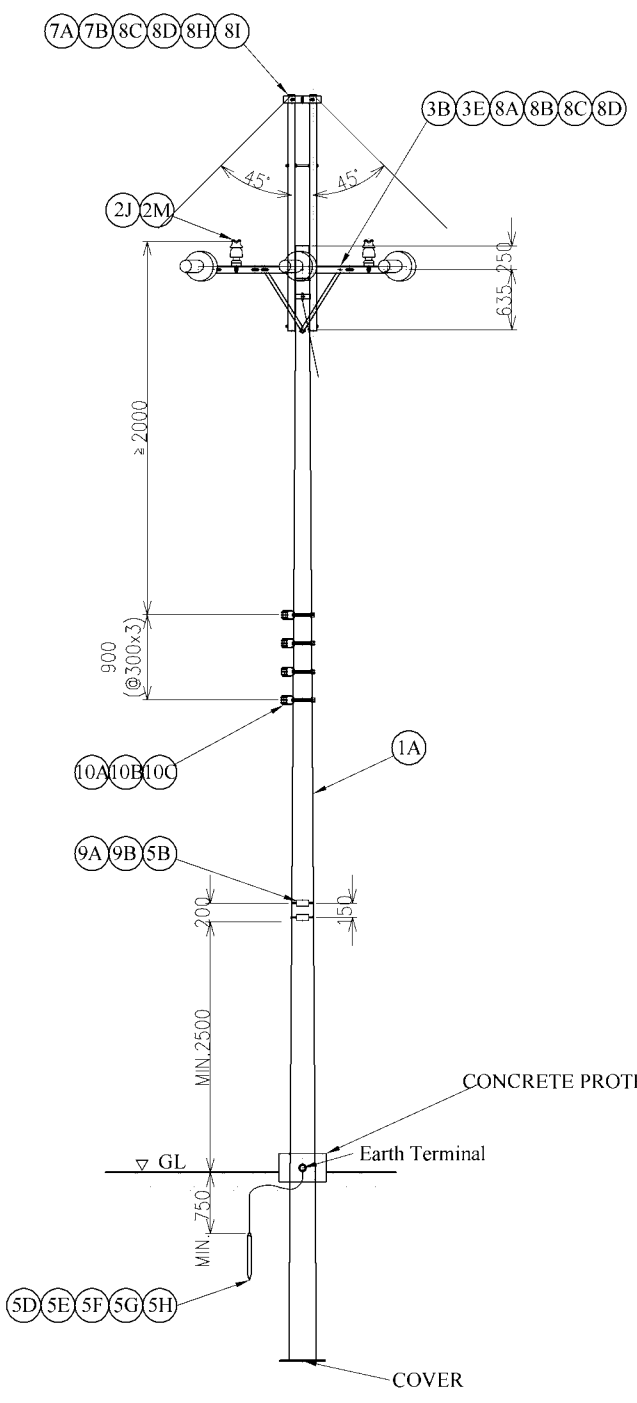
Drawing No. DL-1-6-2 | Pole Type 1B | Rev. -

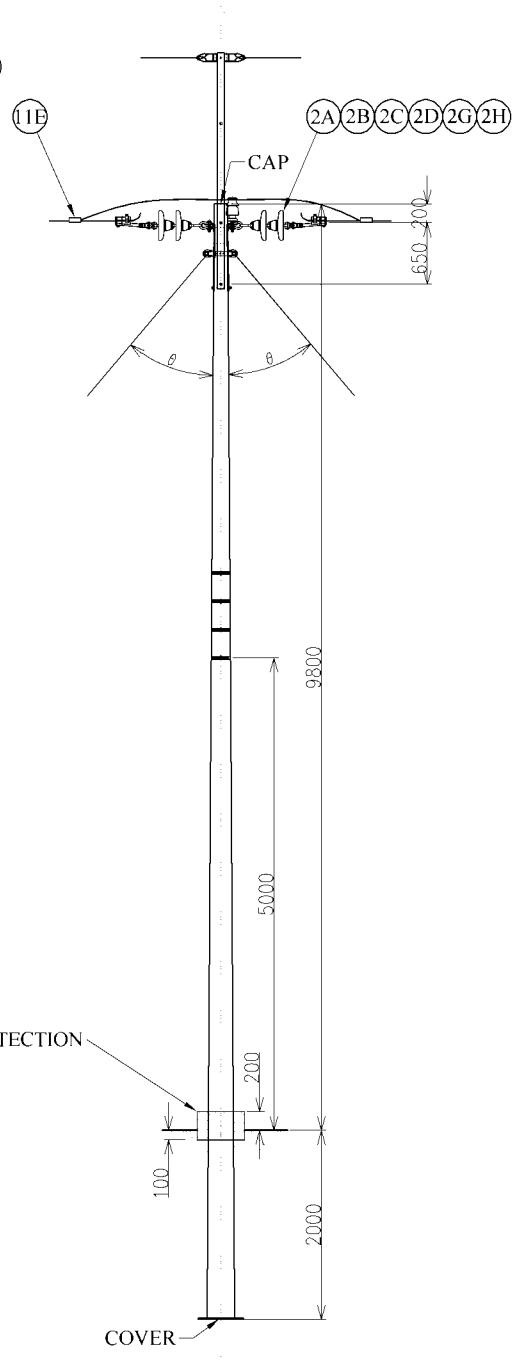
Supplier

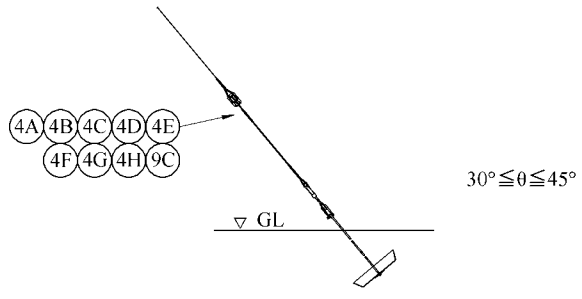
DL-02 33kV&11kV Distribution Line Pole Type (24/29)

1C	11kV Middle Angle Pole (Line Angle 20-60deg.)	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	1
2A	Suspension Insulator	12
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2J	11kV Pin Insulator	2
2M	Preformed Top Tie for AAAC 150 (11kV)	2
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	4
4A	Stay Band with thimble	1
4B	Dead End Grip for Thimble	2
4C	Stay Wire	20
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	2
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	4
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	24
8D	Flush Cut Bolt & Nut M16×360	2
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	2
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6









Rev.	Description	Date	Name

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

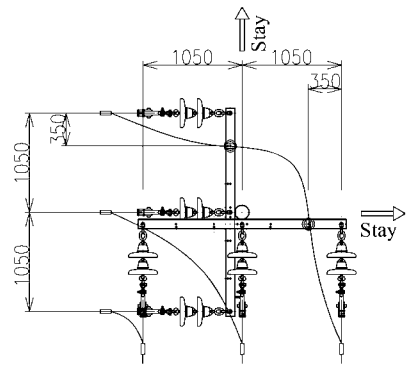
Title: < Assembly Drawings for Steel Pole >
11kV Middle Angle Pole
(Line Angle 20-60deg.)

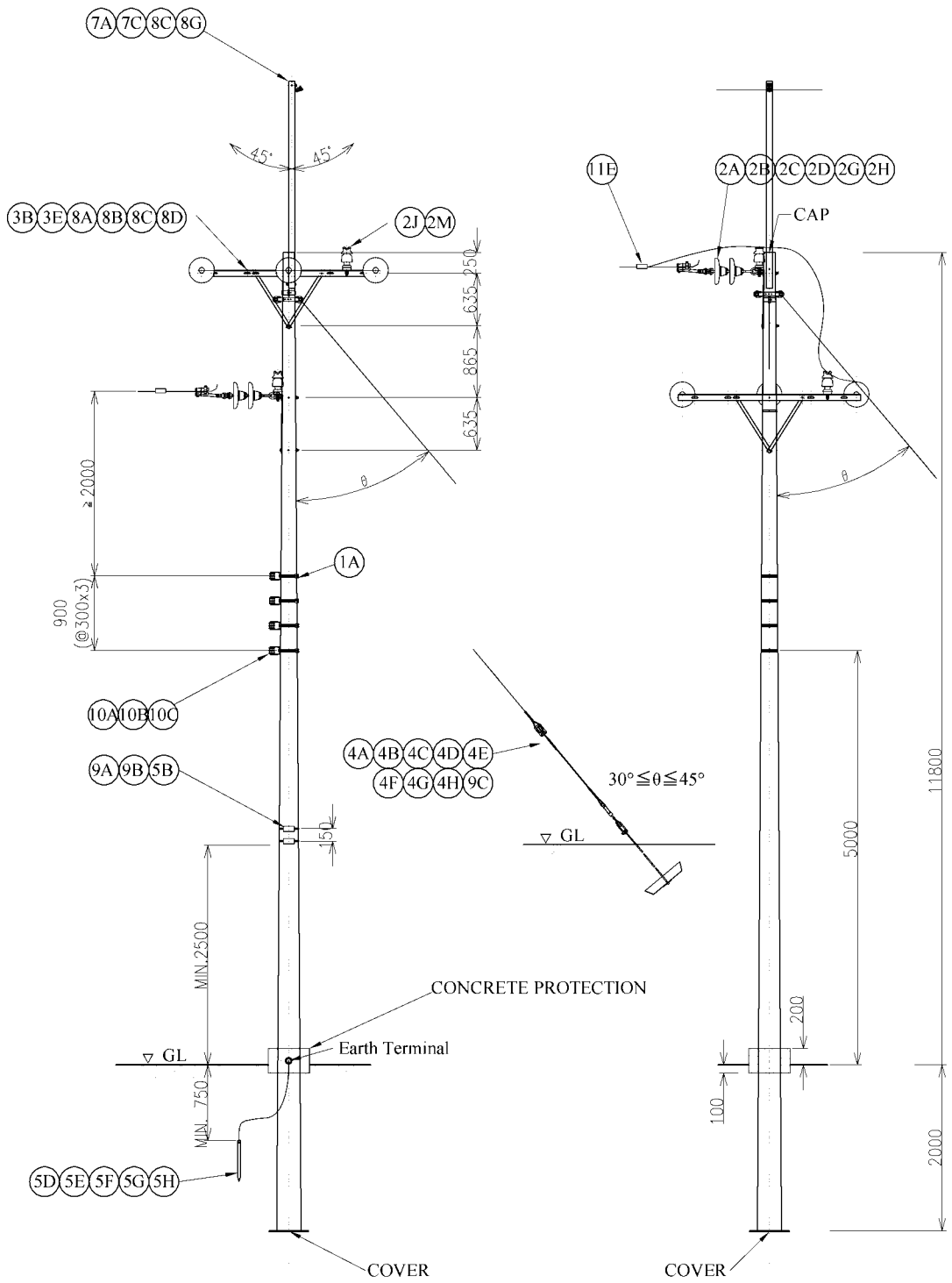
Drawing No. DL-1-6-3 | Pole Type 1C | Rev. -

Supplier

DL-02 33kV&11kV Distribution Line Pole Type (25/29)

1F	11kV Sharp Angle Pole (Line Angle 90deg.)	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	1
2A	Suspension Insulator	12
2B	Anchor Shackle	6
2C	Ball Eye	6
2D	Socket Eye	6
2G	Dead End Clamp for 11kV(AAAC 150)	6
2H	Dead end Clamp Adaptor	6
2J	11kV Pin Insulator	2
2M	Preformed Top Tie for AAAC 150 (11kV)	2
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	4
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	36
8D	Flush Cut Bolt & Nut M16×360	4
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6



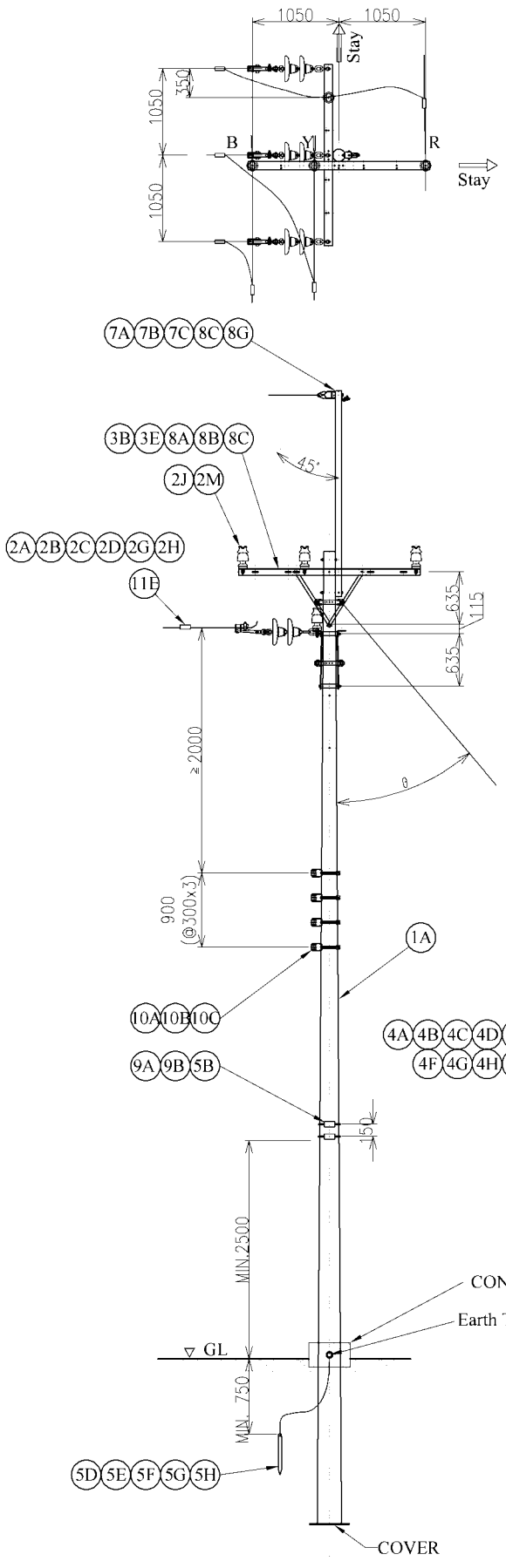


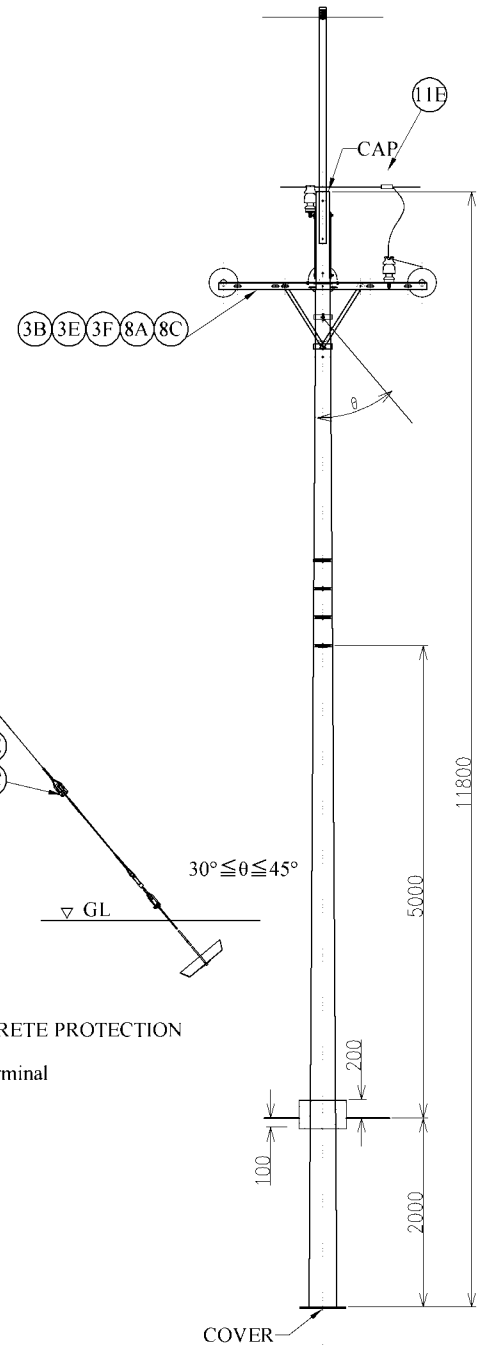
Electricity Distribution and Supply Authority(EDSA)		
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE		
Title	< Assembly Drawings for Steel Pole > 11kV Sharp Angle Pole (Line Angle 90deg.)	
Drawing No. DL-1-6-4	Pole Type	1F
	Rev.	-
Supplier		

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Rev.	Description	Date	Name

1H	11kV Light Brach Pole	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	1
2A	Suspension Insulator	6
2B	Anchor Shackle	3
2C	Ball Eye	3
2D	Socket Eye	3
2G	Dead End Clamp for 11kV(AAAC 150)	3
2H	Dead end Clamp Adaptor	3
2J	11kV Pin Insulator	4
2M	Preformed Top Tie for AAAC 150 (11kV)	4
3B	Crossarm for Insulator (for 11kV)	2
3E	Crossarm Brace	4
3F	Single Crossarm Brace less Band	2
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	2
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5B	Stainless Band (L=1200mm)	2
5D	Ground Rod	1
5E	Lead Wire Terminal	1
5F	Compression Connector(Cu22/Cu22)	1
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	5
7A	Support Arm	1
7B	Dead end Clump	1
7C	Strain Clump	1
8A	Bolt & Nut M16x50(Brace/Crossarm)	8
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	2
8C	Square Washer 45×45	28
8D	Flush Cut Bolt & Nut M16×360	2
8G	Bolt & Nut M16x280(Pole/Single Support Arm)	2
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
10A	Insulator	4
10B	Arm set	4
10C	Bolt & Nut	4
11E	PG Clamp(AAAC 150/150)	6





Rev.	Description	Date	Name

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Electricity Distribution and Supply Authority(EDSA)

THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE

Title

< Assembly Drawings for Steel Pole >

11kV Light Brach Pole

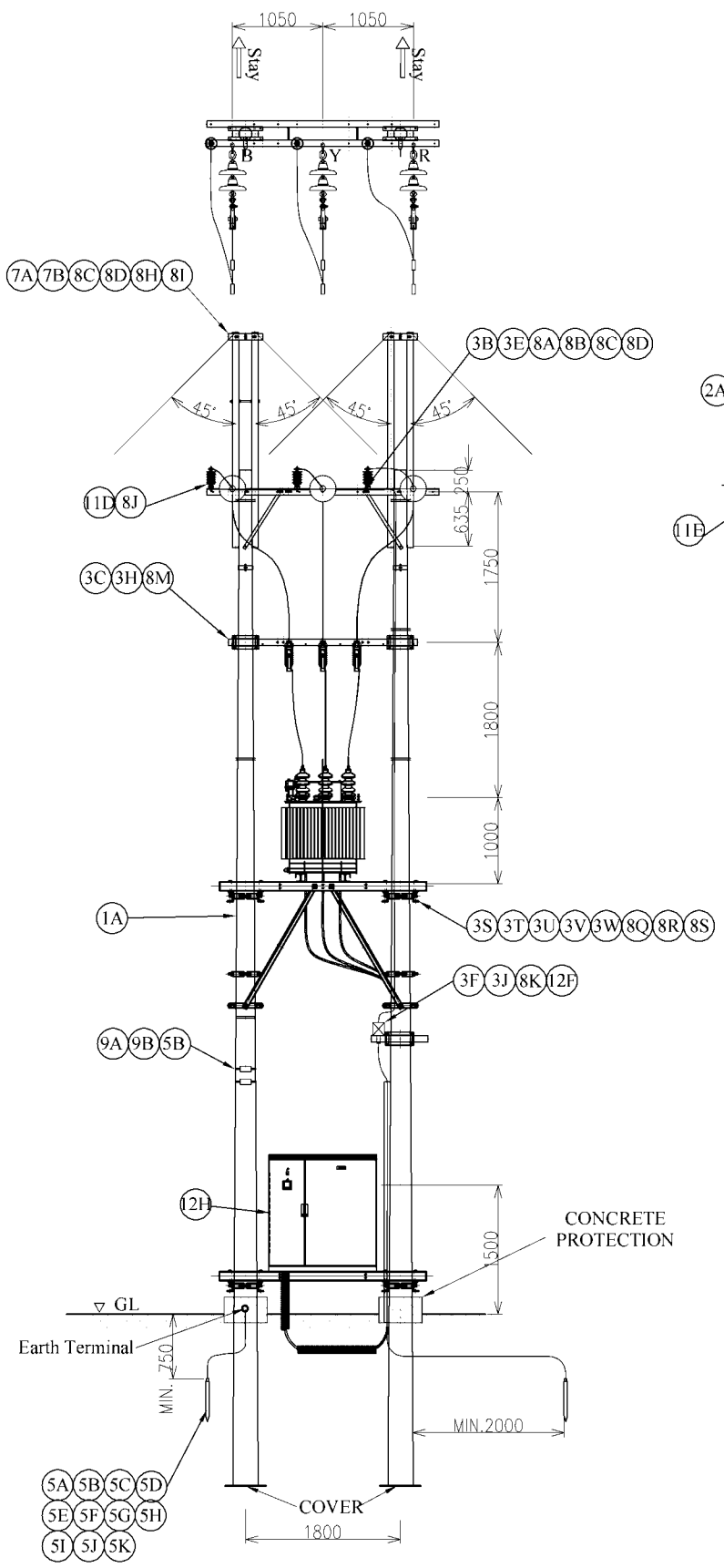
Drawing No. DL-1-6-5

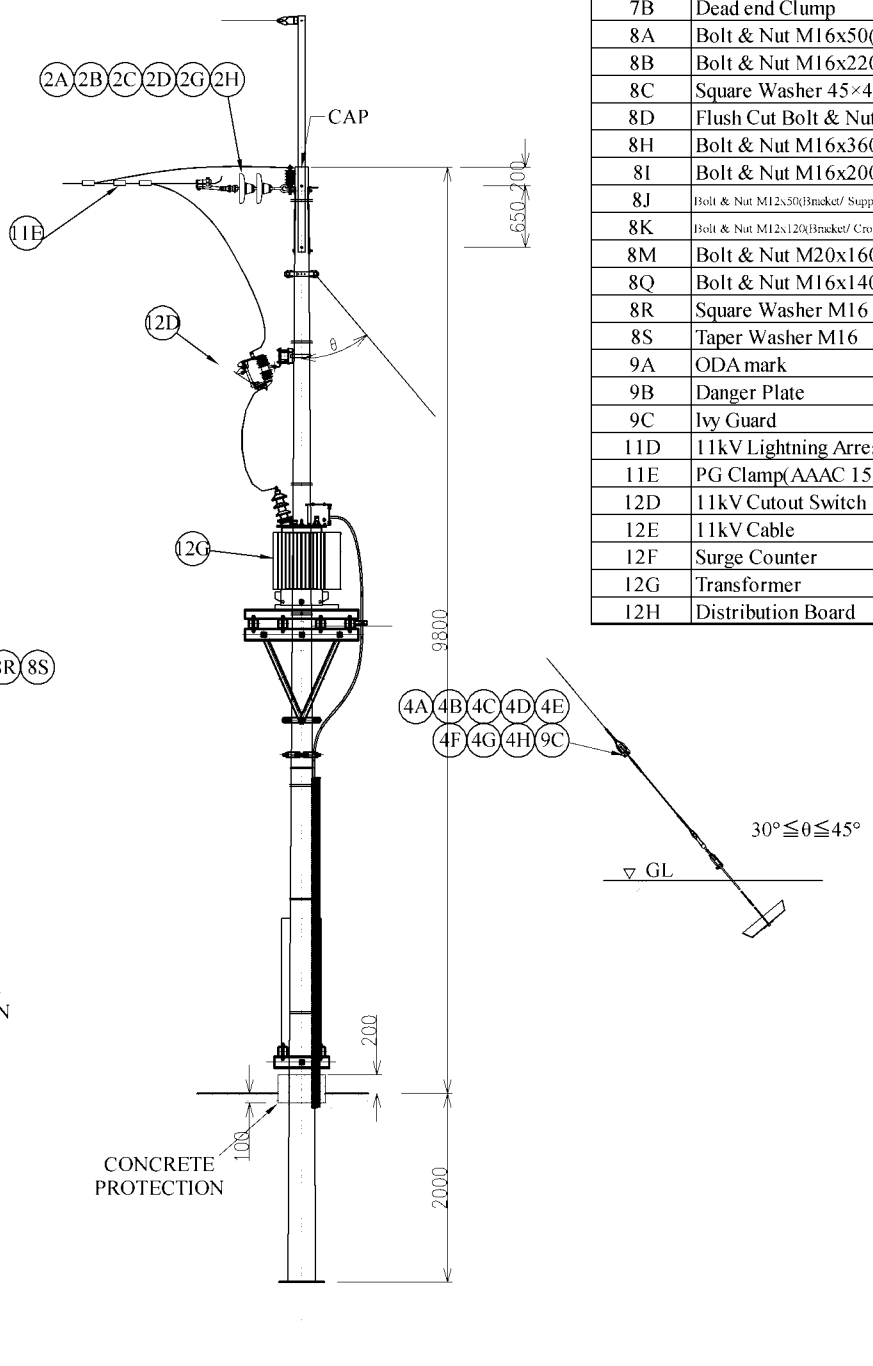
Pole Type 1H

Rev. -

Supplier

1L-1	11kV Transformer Connection Pole(Pole mouted)	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	2
2A	Suspension Insulator	6
2B	Anchor Shackle	3
2C	Ball Eye	3
2D	Socket Eye	3
2G	Dead End Clamp for 11kV(AAAC 150)	3
2H	Dead end Clamp Adaptor	3
3C	Crossarm for DS & Cutout Swithch, PAS	1
3E	Crossarm Brace	4
3F	Single Crossarm Brace less Band	1
3H	Single Crossarm Brace less Band_15S-DW	2
3J	Support for Bracket & Surge Counter	1
3S	Crossarm Brace for Squere pipe of Transformer, Distribution Board	4
3T	Crossarm Brace for Squere pipe of Transformer, Distribution Board	8
3U	Crossarm C channel	8
3V	Crossarm Squere Pipe	6
3W	CPS-Band	8
3X	Crossarm for Insulator (for 33kV) 2800mm	2
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5A	PVC Protection Pipe (L=4.0m)	1
5B	Stainless Band (L=1200mm)	20
5C	Ring Saddle for Stainless Band	9
5D	Ground Rod	2
5E	Lead Wire Terminal	2
5F	Compression Connector(Cu22/Cu22)	2
5G	Crimping Terminal (Cu22, M18type)	2
5H	IV 22sq.mm	30
5I	Compression Terminal (Cu22/Cu100)	1
5J	IV 100sq.mm	15
5K	Crimping Terminal (Cu100, M18type)	6
6A	Compression Terminal (95mm2)	3
7A	Support Arm	4
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	12
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	132
8D	Flush Cut Bolt & Nut M16×360	4
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	2
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
8J	Bolt & Nut M12x50(Bracket/ Support for Bracket & Surge Counter, Arrester/Crossarm)	3
8K	Bolt & Nut M12x120(Bracket/ Crossarm、Surge Counter/Crossarm, Arrester/Crossarm)	5
8M	Bolt & Nut M20x160(Crossarm/Cutout switch)	6
8Q	Bolt & Nut M16x140	28
8R	Square Washer M16	60
8S	Taper Washer M16	24
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
11D	11kV Lightning Arrester 10kA	3
11E	PG Clamp(AAAC 150/150)	6
12D	11kV Cutout Switch	1
12E	11kV Cable	50
12F	Surge Counter	1
12G	Transformer	1
12H	Distribution Board	1



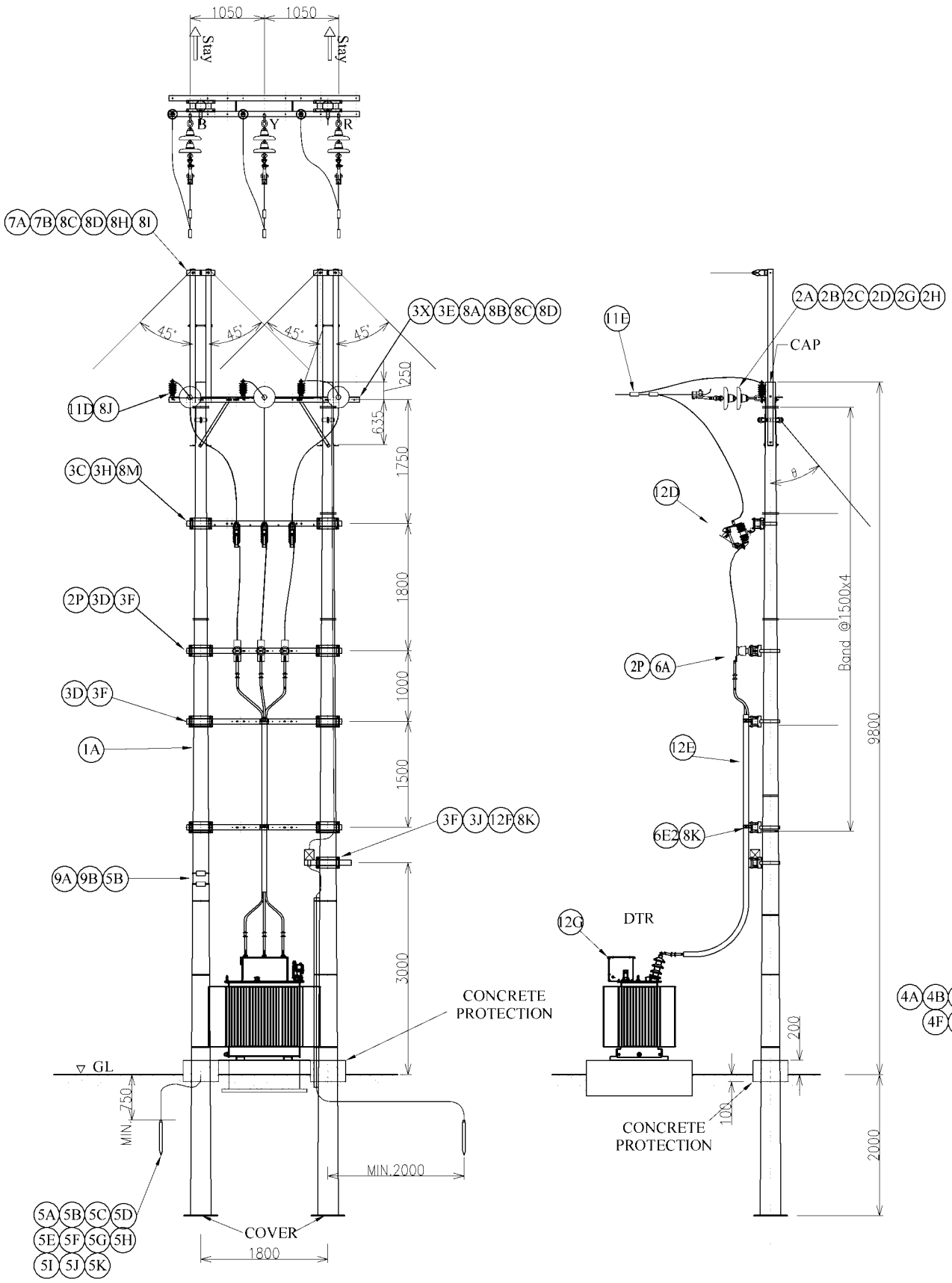


Electricity Distribution and Supply Authority(EDSA)		
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE		
Title: < Assembly Drawings for Steel Pole > 11kV Transformer Connection Pole		
Drawing No. DL-1-6-6	Pole Type	1L
	Rev.	-
Supplier		

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Rev.	Description	Date	Name

1M	11kV Transformer Connection Pole(Ground mouted)	
Part No.	Part Name	Q'ty
1A	Steel pole 12m with Base Plate,Cap	2
2A	Suspension Insulator	6
2B	Anchor Shackle	3
2C	Ball Eye	3
2D	Socket Eye	3
2G	Dead End Clamp for 11kV(AAAC 150)	3
2H	Dead end Clamp Adaptor	3
2P	11kV Insulator with Copper bar	3
3C	Crossarm for DS & Cutout Swithch, PAS	1
3D	Crossarm for 33kV Cable Support	3
3E	Crossarm Brace	4
3F	Single Crossarm Brace less Band	7
3H	Single Crossarm Brace less Band_15S-DW	2
3J	Support for Bracket & Surge Counter	1
3X	Crossarm for Insulator (for 33kV) 2800mm	2
4A	Stay Band with thimble	2
4B	Dead End Grip for Thimble	4
4C	Stay Wire	40
4D	Dead End Grip for Insulator	4
4E	Stay Insulator	2
4F	Turnbuckle	2
4G	Stay Rod	2
4H	Stay Plate	2
5A	PVC Protection Pipe (L=4.0m)	1
5B	Stainless Band (L=1200mm)	20
5C	Ring Saddle for Stainless Band	9
5D	Ground Rod	2
5E	Lead Wire Terminal	2
5F	Compression Connector(Cu22/Cu22)	2
5G	Crimping Terminal (Cu22, M18type)	1
5H	IV 22sq.mm	30
5I	Compression Terminal (Cu22/Cu100)	1
5J	IV 100sq.mm	15
5K	Crimping Terminal (Cu100, M18type)	5
6A	Compression Terminal (95mm2)	3
6E2	Bracket (11kV) 95mm²	2
7A	Support Arm	4
7B	Dead end Clump	2
8A	Bolt & Nut M16x50(Brace/Crossarm)	12
8B	Bolt & Nut M16x220(Pole/Cross arm・Brace)	4
8C	Square Washer 45×45	86
8D	Flush Cut Bolt & Nut M16×360	4
8H	Bolt & Nut M16x360(Pole/Double Support Arm)	4
8I	Bolt & Nut M16x200(Support Arm/Dead End Clamp)	2
8J	Bolt & Nut M12x50(Bracket/ Support for Bracket & Surge Counter, Arrester/Crossarm)	3
8K	Bolt & Nut M12x120(Bracket/ Crossarm、Surge Counter/Crossarm, Arrester/Crossarm)	6
8M	Bolt & Nut M20x160(Crossarm/Cutout switch)	8
9A	ODA mark	1
9B	Danger Plate	1
9C	Ivy Guard	2
11D	11kV Lightning Arrester 10kA	3
11E	PG Clamp(AAAC 150/150)	6
12D	11kV Cutout Switch	3
12E	11kV Cable	15
12F	Surge Counter	1
12G	Transformer	1

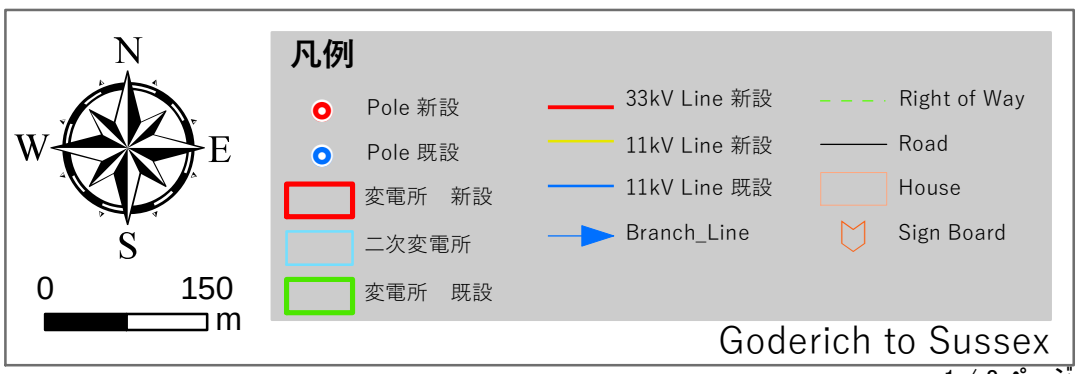


Electricity Distribution and Supply Authority(EDSA)			
THE PROJECT FOR EXTENSION OF POWER DISTRIBUTION SYSTEM ALONG THE FREETOWN PENINSULAR IN REPUBLIC OF SIERRA LEONE			
Title	< Assembly Drawings for Steel Pole > 11kV Transformer Connection Pole (Ground mounted)		
Drawing No.	DL-1-6-7	Pole Type	1M
		Rev.	-
Supplier			

Item	Name	Date
Drawn		
Checked		
Approved		
Scale	1/80	

Rev.	Description	Date	Name

DL-02 33kV&11kV Distribution Line Pole Type (29/29)



DL-03　Distribution Line Route (1/40)

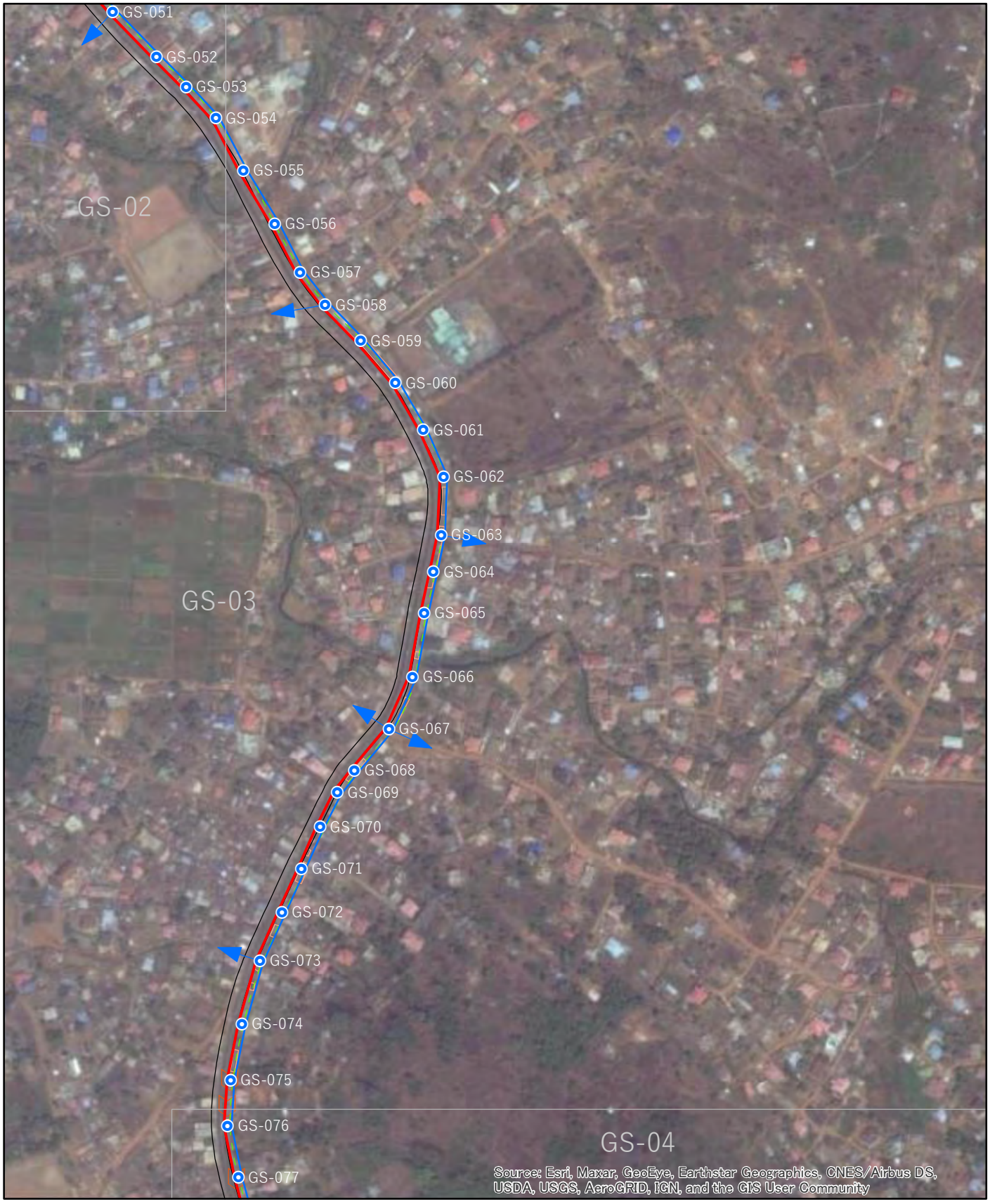
N
W
E
S
0
150
m

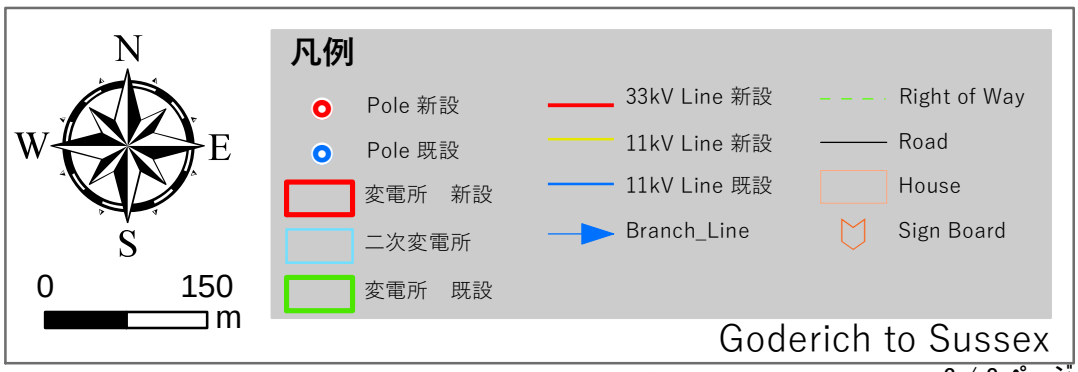
凡例

- Pole 新設
- Pole 既設
- 変電所　新設
- 二次変電所
- 変電所　既設
- 33kV Line 新設
- 11kV Line 新設
- 11kV Line 既設
- Branch_Line
- Right of Way
- Road
- House
- Sign Board

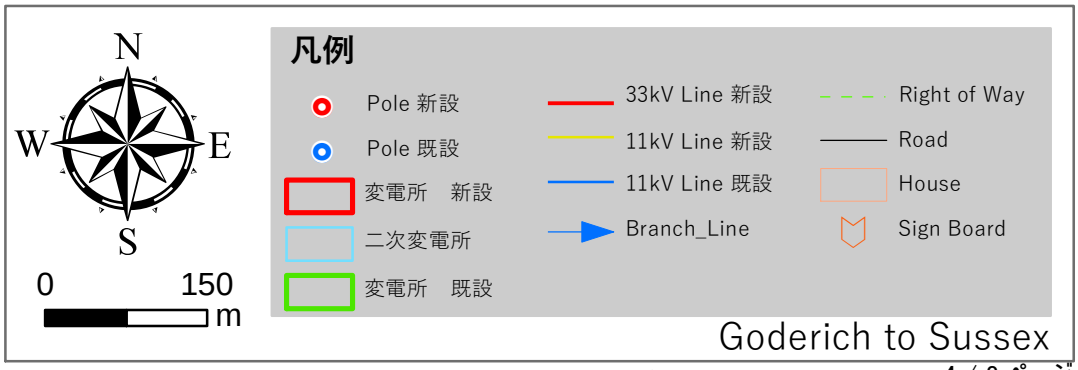
Goderich to Sussex

DL-03　Distribution Line Route (2/40)

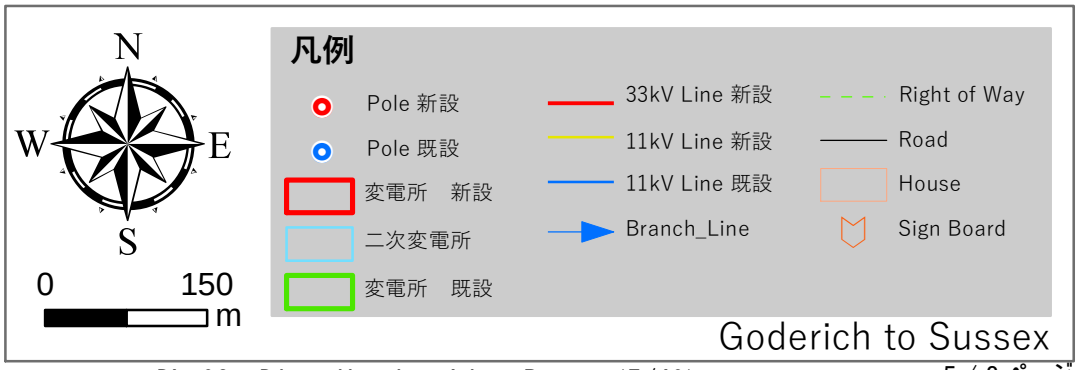




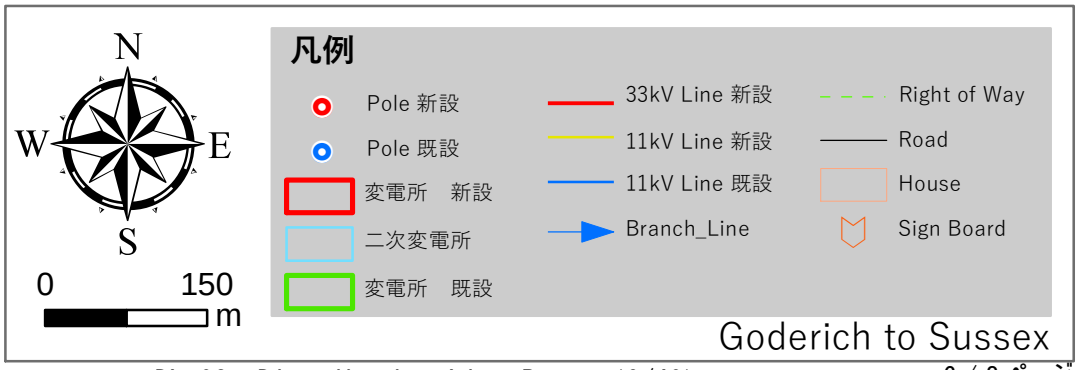
DL-03　Distribution Line Route (3/40)



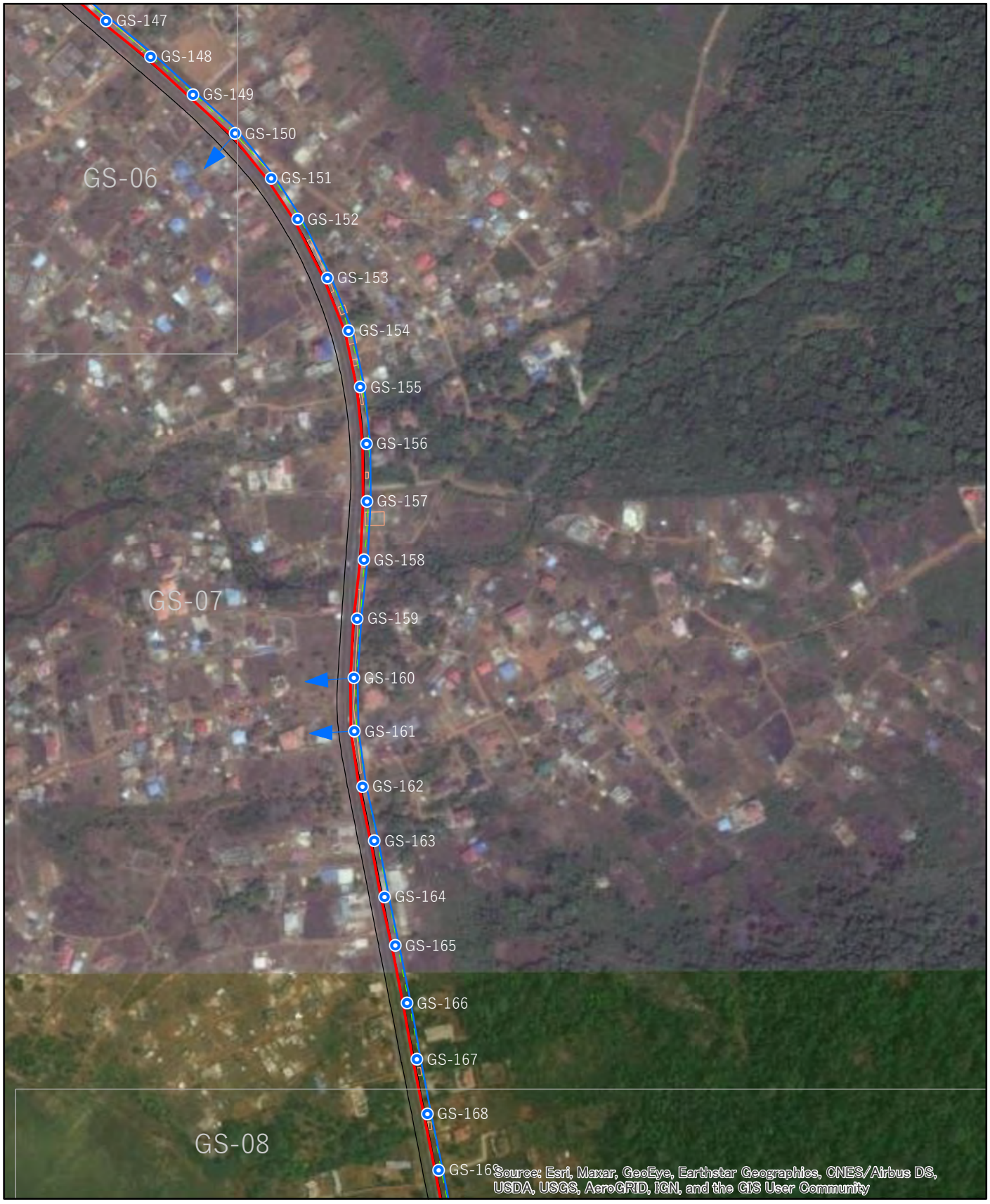
DL-03　Distribution Line Route (4/40)



DL-03　Distribution Line Route (5/40)



DL-03　Distribution Line Route (6/40)



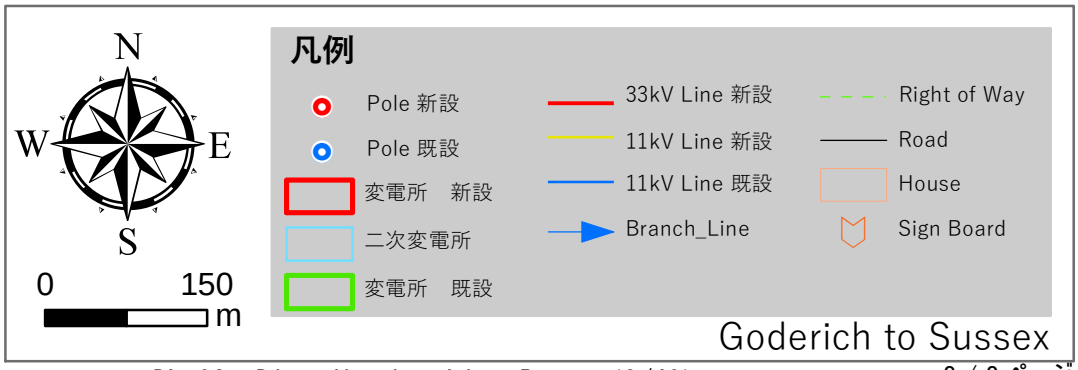
N
W
E
S
0
150
m

凡例

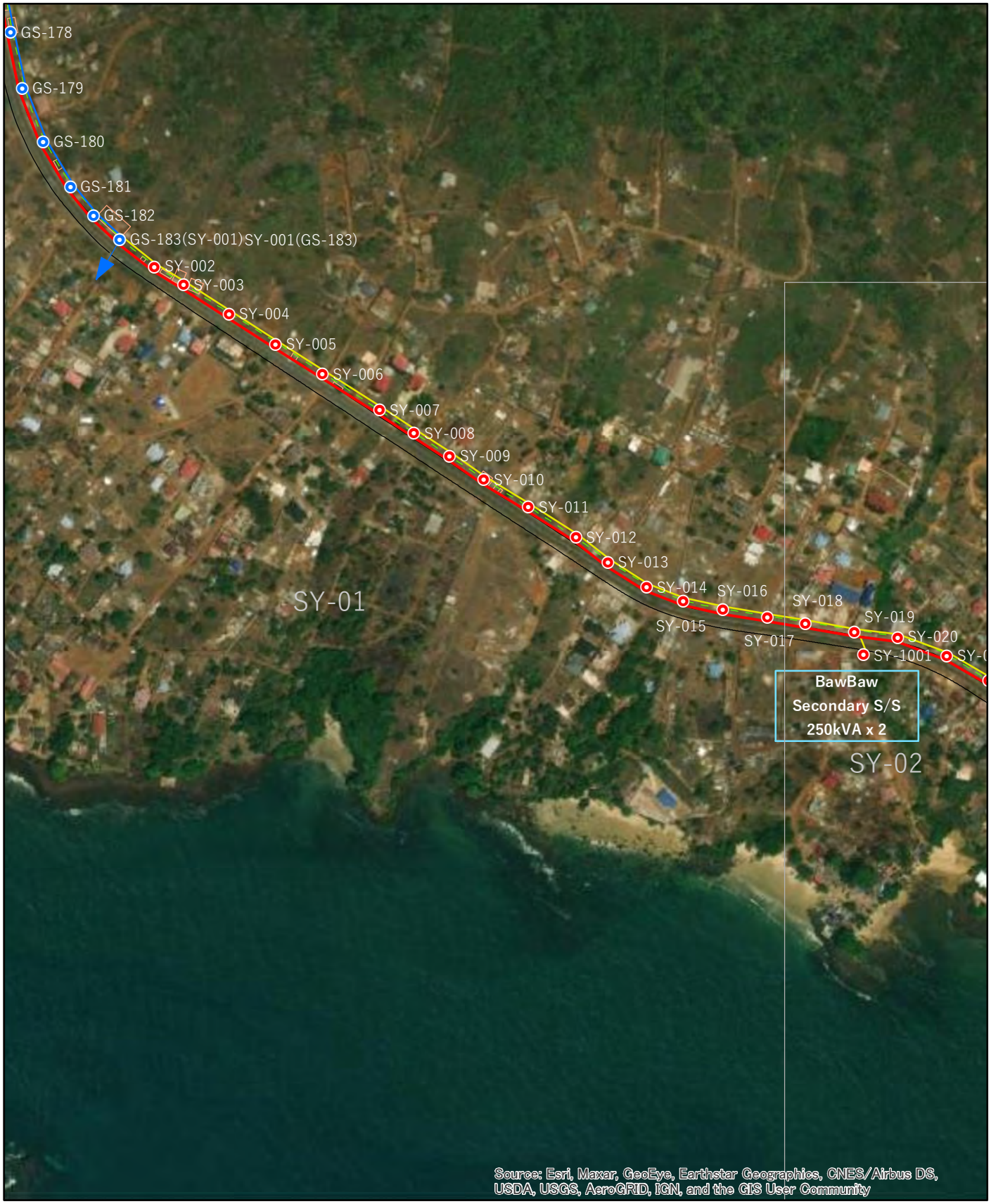
- Pole 新設
- Pole 既設
- 変電所　新設
- 二次変電所
- 変電所　既設
- 33kV Line 新設
- 11kV Line 新設
- 11kV Line 既設
- Branch_Line
- Right of Way
- Road
- House
- Sign Board

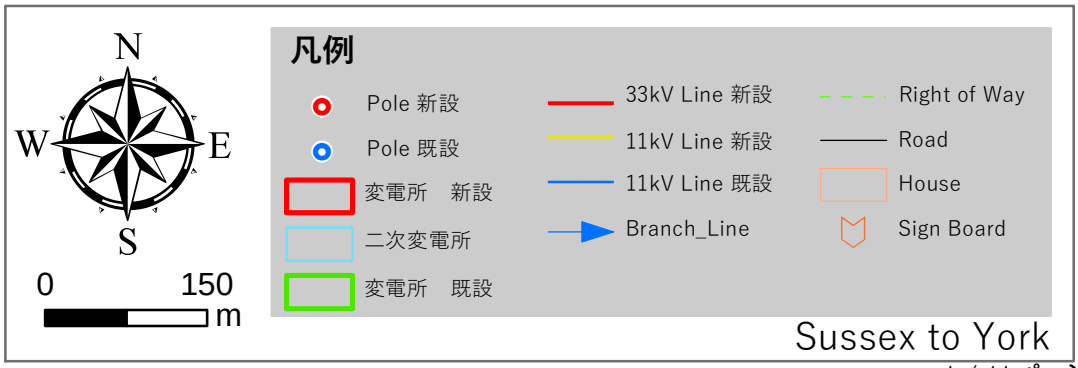
Goderich to Sussex

DL-03　Distribution Line Route (7/40)

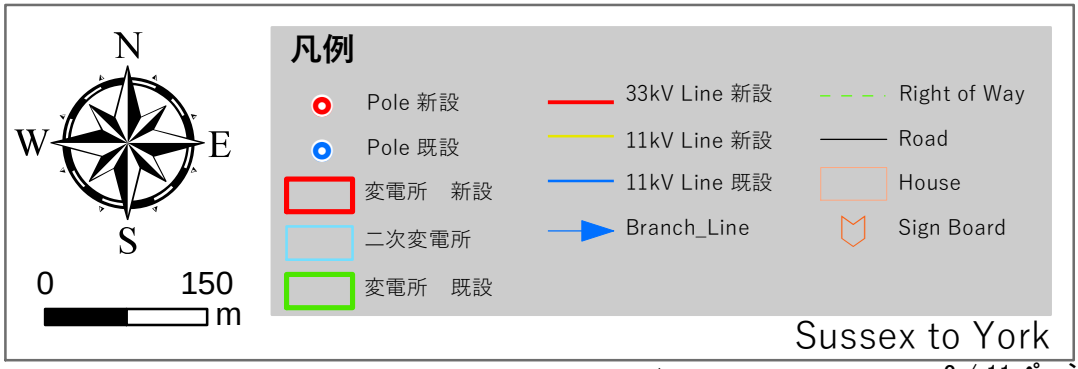


DL-03　Distribution Line Route (8/40)





DL-03　Distribution Line Route (9/40)



DL-03　Distribution Line Route (10/40)

N
W
E
S
0
150
m

凡例

- Pole 新設
- Pole 既設
- 変電所　新設
- 二次変電所
- 変電所　既設
- 33kV Line 新設
- 11kV Line 新設
- 11kV Line 既設
- Branch_Line
- Right of Way
- Road
- House
- Sign Board

Sussex to York

DL-03　Distribution Line Route (11/40)

N
W
E
S
0
150
m

凡例

- Pole 新設
- Pole 既設
- 変電所　新設
- 二次変電所
- 変電所　既設
- 33kV Line 新設
- 11kV Line 新設
- 11kV Line 既設
- Branch_Line
- Right of Way
- Road
- House
- Sign Board

Sussex to York

DL-03　Distribution Line Route (12/40)

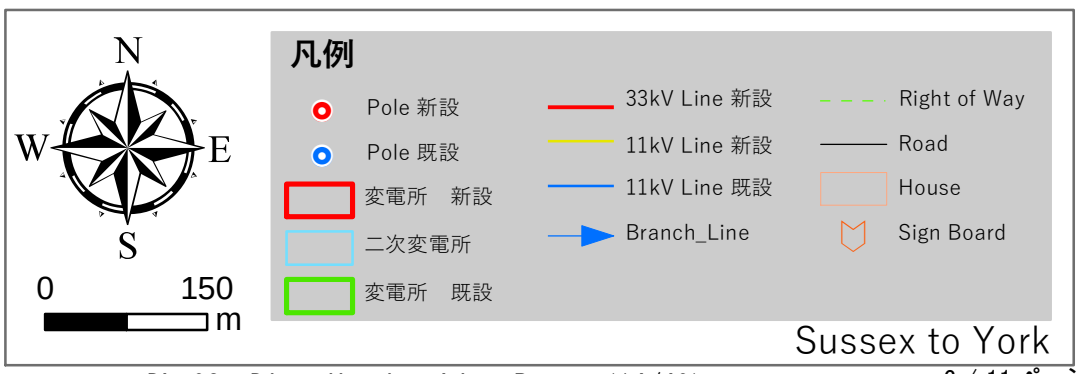
N
W
E
S
0
150
m

凡例

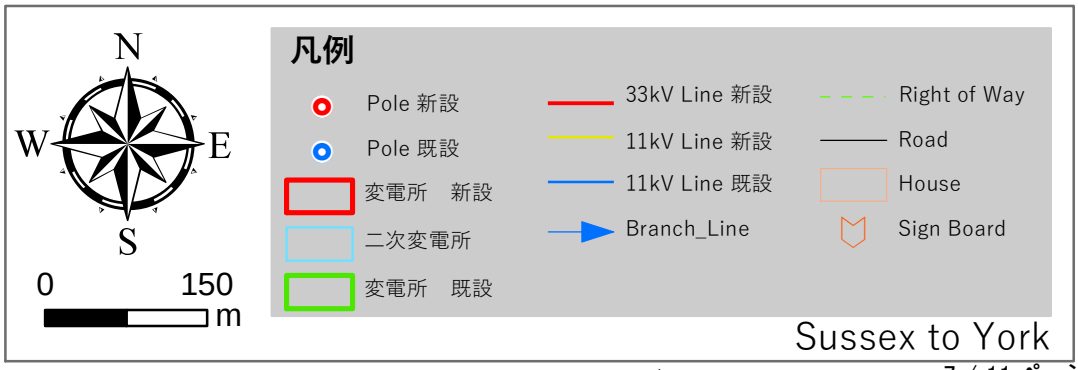
- Pole 新設
- Pole 既設
- 変電所　新設
- 二次変電所
- 変電所　既設
- 33kV Line 新設
- 11kV Line 新設
- 11kV Line 既設
- Branch_Line
- Right of Way
- Road
- House
- Sign Board

Sussex to York

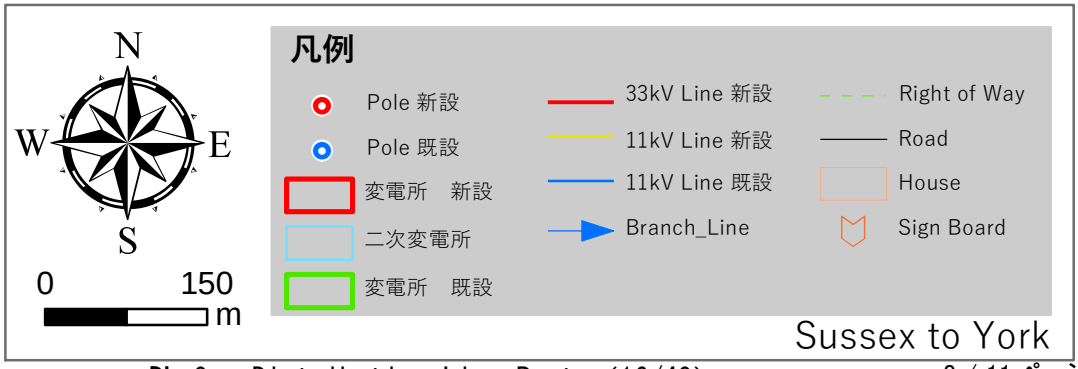
DL-03　Distribution Line Route (13/40)



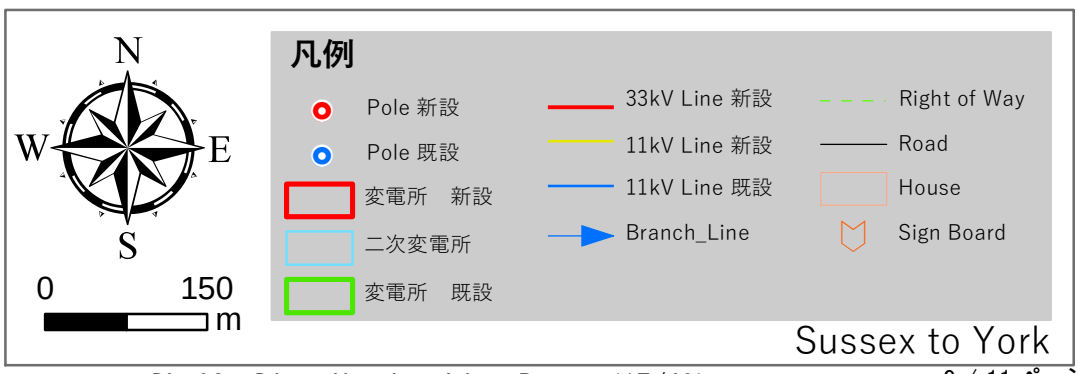
DL-03　Distribution Line Route (14/40)



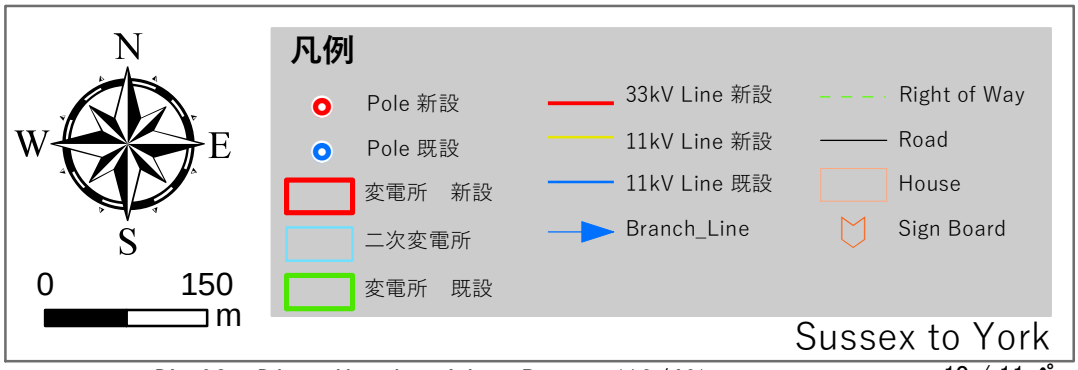
DL-0　Distribution Line Route (15/40)



DL-0　Distribution Line Route (16/40)



DL-03　Distribution Line Route (17/40)



DL-03　Distribution Line Route (18/40)

N
W
E
S
0
150
m

凡例

- Pole 新設
- Pole 既設
- 変電所　新設
- 二次変電所
- 変電所　既設
- 33kV Line 新設
- 11kV Line 新設
- 11kV Line 既設
- Branch_Line
- Right of Way
- Road
- House
- Sign Board

Sussex to York

DL-03　Distribution Line Route (19/40)