PREPARATORY SURVEY
ON
IMPROVEMENT OF SUBSTATIONS AND DISTRIBUTION NETWORK PHASE 2
IN
THE REPUBLIC OF RWANDA

FIELD REPORT

2nd APRIL 2015

Prepared and Submitted by:

工藤義行

Mr. Yoshiyuki KUDO
Chief Consultant
Preparatory Survey Team, JICA

Confirmed and Agreed by:

Eng. NGIZWENAYO Dieudonné
Director of Energy Planning and Design
Energy Development Corporation Limited
Rwanda Energy Group
Implementing Agency for the Project

Confirmed and Agreed by:

Eng. William BIHOYIKI
Ag. Head of Electricity Transmission Unit
Energy Utility Corporation Limited
Rwanda Energy Group
Relevant organization for the Project

JICA PREPARATORY SURVEY TEAM

Yachiyo Engineering Co.,Ltd.

Contents

[Attachment]

1. Outline of the Project

1.1 Background of the Project

In response to the request from the Government of the Republic of Rwanda (Rwanda), the Japan International Cooperation Agency (JICA), in consultation with the Government of Japan, decided to conduct a Preparatory Survey (the Survey) on the Project for Improvement of Substations and Distribution Network Phase 2 (the Project).

JICA sent to Rwanda the Preparatory Survey Team (the Team) headed by Mr. Toshiyuki Hayashi, Senior Advisor, JICA, to conduct the first field survey and the Team is scheduled to stay in the country from 8th March to 16th April, 2015.

The Team continued discussions with the concerned officials of Rwanda and the field survey in Rwanda.

EDCL, EUCL and the Team had series of technical discussions to form mutual understandings about the contents, scope, preconditions for the Outline Design, basic specifications, general layouts, and so on of the Project in the first field survey. EDCL, EUCL and the Team agreed to record the following issues described on this Field Report as a conclusion of the discussions.

Components of the Project will be further examined and may be modified through the consultation with the Japanese Ministry of Foreign Affairs and JICA headquarters. It is important for the Rwanda side to understand that the Preparatory Survey is not a commitment for the future implementation of the Project.

Particularly, in consideration of the schedule and procedures of Japan's Grant Aid projects, the Team explained that the outline design, planning of the implementation schedule, the cost estimation and so on of the Project will be carried out in accordance with the mutual understandings made on this field report immediately after the first field survey. EDCL and EUCL expressed understanding about the schedule and procedures of Japan's Grant Aid projects. EDCL and EUCL agreed for the Team to progress the further study, the outline design, planning of the implementation schedule, the cost estimation and so on of the Project in accordance with the mutual understandings made on this field report immediately after the first field survey.

1.2 Framework for the Project

The framework for the Project is shown as follows.

(1) The responsible ministry is Ministry of Infrastructure (MININFRA).
(2) The implementing agency is Energy Development Corporation Limited (EDCL).
(3) The relevant organization is Energy Utility Corporation Limited (EUCL).

A7-3

1.3 The Scope of the Japanese side

The Scope of the Japanese side is shown in Table 1.3-1 and DWG. No. GA-01.

Two (2) sets of 110/15 kV transformers (20 MVA, Outdoor type) shall be installed as the scope of the Japanese side.

Table 1.3-1 Outline of the Final Components

Components	Capacity
Procurement and Installation Work	
1. **Ndera substation**	
(a) 20 MVA 110/15 kV transformers	2 units
(b) 110 kV switchgear	1 set
(c) 15kV switchgear	1 set
(d) Control and supervisory facilities	1 set
2. **Transmission Line**	
(a) Two circuits of 110 kV transmission lines from the existing line between Birembo and Gasogi substations to Ndera Substation	Approx. 2.2 km
3. **Distribution Line**	
(a) Two circuits of 15 kV distribution lines from Ndera Substation to existing line between Birembo and Free Zone Phase 1 substations	Approx. 650 m
(b) One circuit of 15 kV distribution line from existing Gasogi Substation to Kabuga Ring Main Unit (RMU) Switching Station	Approx. 6.5 km
4. **Modification of existing Gasogi Substation**	
(a) 15 kV switchgear panel for outgoing feeder to Kabuga RMU Switching Station	1 set
5. **RMU Switching Stations**	
(a) RMU Switching Stations at Kabuga and Murindi.	2 sets
Procurement Work	
6. **Maintenance Tools for the Equipment of the Project**	1 lot
7. **Spare Parts for the Equipment of the Project**	1 lot
Construction Work	
8. **Foundation for the Equipment of the Project (Transformers, Towers for 110 kV Transmission Line, etc.)**	1 lot
9. **Building of the Project (Ndera substation, Kabuga and Murindi RMU Switching Stations)**	3 building

[Remark] Quantities shall be examined in the outline design.

1.4 Obligations/Undertakings of the Rwanda side for the Project

Preconditions

① The Rwanda side has agreed to conduct the environmental and social considerations required by JICA Guidelines for Environmental and Social Considerations (2010). An Abbreviated Resettlement Action Plan (ARAP) must be prepared and the land acquisition should be completed by December 2015. An approval on environmental clearance, such as EIA Certificate of Authorization as well as other relevant permits/licenses required for the implementation of the Project must be obtained in a timely manner to meet the Project schedule. An Environmental Management Plan (EMP), monitoring plan and impact mitigation measures must be prepared during an environmental assessment.

Necessary Inputs by the Rwanda side

Prior to the Commencement of the Construction Work

② To do land preparation work and leveling work before commencement of installation work by the Japanese side (refer to 2.1.7 and 2.2.2). Necessary lands are as follows;
(1) Ndera Substation
(2) 110kV connection area near tower No. 212: approx. 32 m x 38 m minimum
(3) 110kV transmission line; approx. 2.2 km
(4) 15kV distribution line for Route-1: approx. 6.5 km, refer to DWG No. DL-11
(5) 15kV distribution line for Route-2: approx. 650 m, refer to DWG No. DL-21
(6) 15kV distribution line for Route-3 approx. 200 m, refer to DWG No. DL-31
(7) Kabuga RMU switching station: 20 m x 15 m
(8) Murindi RMU switching station: 20 m x 15 m
(9) Necessary access road for constructing all transmission and distribution lines

③ To obtain permission from related authorities for 110 kV transmission lines and 15 kV distribution lines to go across the roads before commencement of installation work by the Japanese side.

④ To resettle occupants in accordance with the resettlement plan prepared at the stage of the survey in smooth manner, if necessary.

During the Construction Work

⑤ To schedule both power and communication network shutdown required for construction works of the Project, and carry out in timely manner. The Rwanda side shall also manage any issue concerning the shutdown including related procedures, and compensation to and grievances from customers.

⑥ To modify the NECC SCADA system and the Optical Network Management System to accommodate the new three stations so called Ndera substation and Kabuga & Murindi switching stations. This modification includes the additional network connection measures of the Multiplexer/SDH panel in Gasogi substation for the connection of new optic fiber cable from Kabuga switching station.

⑦ To procure and construct the communication cable (optic fiber cable) from Multiplexer/SDH panel in Murindi switching station to the existing communication network of distribution lines.

⑧ To provide the setting list of protection relays related to the Project for coordination of setting values with new relays to be supplied under the Project. The setting value change at the substations where the transmission lines connected from Ndera substation shall be conducted by the Rwanda side including necessary tests and thier records shall be presented to Japan side.

⑨ To extend 15 kV switching room with cable trench to accommodate one additional 15 kV feeder panel supplied by the Japanese side.

⑩ To secure a temporary storage yard of approximately 5,000 m^2 near the Project site during the construction period of the Project.

⑪ To implement Environmental Management Plan and mitigation measures prepared through the environmental assessment and monitor environmental and social impacts caused by the Project with an adaptive management approach.

⑫ To construct fence and gate for 110 kV connection site, refer to DWG No. TL-05.

⑬ To construct fences and gates at the project sites in accordance with the layout and arrangement of the equipment and facilities of the Project.

⑭ To dismantle the existing towers in order to implement the Project.

After the Commencement of Operation

⑮ To monitor environmental and social impacts during the operation with an adaptive management approach.

2. Technical requirements confirmed in the first field survey

2.1 Technical requirements for the Substation of the Project

2.1.1 General requirement

(a) General Design Condition

Table 2.1.1-1 Basic Conditions for the Facility Design of the Project

Items		Values
Altitude		~~Over 1,000 m upto~~ 2,000 m
Ambient Temperature	Maximum	40 ~~38~~ Degrees Centigrade
	Minimum	5 ~~13~~ Degrees Centigrade
	Mean	20 ~~22~~ Degrees Centigrade
Maximum Wind Velocity		30 m/s
Annual Rain Fall		1,450 1,128 mm/year
Seismic Force		Horizontal 0.10 G
Soil Bearing Capacity		~~40~~ 25 t/m^2 (now on survey)

(b) System voltage

- 110 kV : 110 kV ± 10% (99.0 - 110 - 121.0 kV)
- 15 kV : 15 kV ± 10% (13.5 - 15 – 16.5 kV)

(c) Frequency

50 Hz ± 0.5 Hz (49.5 - 50 – 50.5 Hz)

(d) Short circuit current

According to our approximate system analysis, the following short circuit current is considered.

- 110 kV : 31.5 kA or more
- 15 kV : 25 kA or more

(e) Grounding system

- 110 kV : Solid grounding
- 15 kV : Solid grounding

(f) Pollution level for Insulator

Light (IEC-60815)

(g) Applicable Codes and Standards

As a rule, the transmission and substation system equipment shall be designed in accordance with IEC and IEC compatible standards. (JEC and so on)

2.1.2 Technical requirements for Ndera Substation

The following basic concept is applied for Ndera Substation.

- 110 kV double circuit transmission lines are connected to the substation, one is from Birembo and the other is from Gasogi substations.
- Two sets of 20 MVA transformer (T1 & T2) will be installed and parallel operation of two transformers will be conducted.
- Indoor type 15 kV switchgear with double busbar system will be installed in the new control building.
- Entire earthing system in the substation will be considered.
- One set of control and supervisory equipment will be installed.

Please refer "Single Line Diagram for Ndera Substation (Preliminary)".

A7-7

Table 2.1.2-1 Equipment to be provided for Ndera Substation

No.	Equipment	Q'ty	Unit	Major Specifications
1. Ndera Substation				
(1)	110 kV Switchgear	1	lot	- 2 sets of 110 kV Feeder bay 145 kV*, 31.5 kA or more 1 set (for three phases) comprising of;- • Disconnecting Switch (DS) • Circuit Breaker (CB) • Current Transformer (CT) • DS with Earthing Switch (ES) • Voltage Transformer (VT) • Lightning Arrester (LA) - 2 sets of 110/15 kV Transformer bay 145 kV*, 31.5 kA or more 1 set (for three phases) comprising of;- • Disconnecting Switch (DS) • Circuit Breaker (CB) • Current Transformer (CT) • Lightning Arrester (LA) - 3 phases of 110 kV VT for 110 kV Busbars Note*; Taking into consideration of altitude of the site (approximately 1,500 m), the rated voltage of 110 kV system shall be 145 kV.
(2)	20 MVA, 110/15 kV Transformer	2 ~~25~~ 27 steps	sets	- 2 x 20 MVA Transformers with OLTC - Primary: 110 kV+/- 16% -27T - Secondary: 15 kV - Parallel operation of the two transformers is considered.
(3)	250 kVA, 15/0.4 kV Auxiliary transformer 14	1	set	- 1 x 100 kVA Transformer with NLTC - Primary: 15 kV+/- 2.5%, +/- 5.0% - Secondary: 400-230 V, Three phase, four wires The capacity will be confirmed considering the auxiliary loads in the whole substation.
(4)	Indoor type 15 kV GIS Switchgear with double busbars	1	lot	- 2 sets of 110/15 kV transformer bays 36 kV*, 1,250 A, 25 kA or more - 1 set of 15 kV coupler bay 36 kV*, 2,500 A, 25 kA or more - 8 sets of feeder bays 36 kV*, 800 A, 25 kA Note*; The rated voltage of 15 kV system shall be 36 kV, since the distribution voltage of the whole country is 30 kV, while that in Kigali city is 15 kV.
(5)	110 kV busbar	1	lot	Aluminum tubes for three phase busbars Note; The conductor fittings on the busbars for future 50 MW power plant bay will be provided.
(6)	Gantry towers	1	lot	- Dead-end gantry towers for 2 circuits of 110 kV transmission lines
(7)	Insulators	1	lot	- Support insulators for 110 kV busbar and transmission line wires at gantry towers
(8)	110 kV conductors and fittings	1	lot	- 2 sets for 110 kV transmission line bays - 2 sets for 110/15 kV transformer bays

No.	Equipment	Q'ty	Unit	Major Specifications
				- 1 set for 110 kV busbars
(9)	Towers for Grounding wires	1	lot	- 2 sets of towers for grounding wires
(10)	110 kV Control and Protection Panel for Transmission Line	1	lot	The panel includes the following devices for two (2) circuits;- - Bay control units (ABB REF670 or equivalent) - Protection relays (Areva P545 or equivalent)
(11)	110/15 kV Transformer Control Panels	2	sets	The panel includes;- - On-load tap changer control - Bay control unit (ABB RET670 or equivalent)
(12)	110/15 kV Transformer Protection Panel	1	lot	The panel includes the following devices for two (2) transformers;- - Transformer differential protection relays - Protection relays for neutral circuits
(13)	15 kV Control Panel	1	lot	The panel(s) includes Bay control units for all 15 kV feeders, including Incoming and Bus coupler bays.
(14)	AC Distribution Panel	1	lot	- MCCBs for 400/230 V AC, three phase, four wires
(15)	DC Distribution Panels	1	lot	- MCCBs for 110 V DC - MCCBs for 48 V DC The MCCBs may be installed in Charger panels.
(16)	Battery and Charger Panel	1	lot	- 110 V DC Batteries and Charger - 48 V DC Batteries and Charger
(17)	Uninterruptible Power Supply	1	set	- Input voltage: 400/230 V AC, three or single phase - Output voltage: 230 V AC, single phase The back-up time is at least 1 hour.
(18)	Micro SCADA system	1	lot	- Server and Client (Work Station HMI) with Bay Control Unit (BCU) system for controlling and supervising of the substation - Remote Terminal Unit (RTU) for communication with the existing National Electricity Control Center (NECC) SCADA system (ABB RTU560 or equivalent)
(19)	Communication System	1	lot	The communication system includes;- - SDH multiplexer panel (including ECI BG-20 or equivalent) - IP PBX equipment with telephone sets - Cables including optical fiber cables for the substation inside
(20)	15 kV power cables	1	lot	15 kV power cables and necessary accessories for connection - 15 kV cables between 110/15 kV transformers and 15 kV switchgear (incoming circuits) - 15 kV cables between 15 kV switchgear panels and first 15 kV distribution tower(s) and/or pole(s)
(21)	Low voltage power and control cables	1	lot	- Necessary low voltage power and control cables and necessary accessories for connection
(22)	Earthing system in the substation	1	lot	- Earthing conductors and accessories - Overhead grounding wires for new 110 kV switchgear and transformer area

2.1.3 Technical requirements for 15 kV RMU Switching Stations

The 15 kV RMU Switching Stations will be installed at "Kabuga" and "Murindi" area.

The Switching Stations are received power from the major substations by 15 kV and distribute the power to the other Switching Stations, and transform the voltage to 400 V AC to the surroundings. Table 2.1.2-2 shows the equipment list for each 15 kV RMU Switching Station.

Table 2.1.3-1 Equipment List for each Switching Station at Kabuga and Murindi

No.	Equipment	Q'ty	Unit	Major Specification
(1)	Indoor type 15 kV GIS Switchgear	5	panel	- 36 kV, 1,250 A, 25 kA or more - 4 x Feeder panels - 1 x 15/0.4 kV Transformer feeder panel
(2)	630 kVA Transformer	1	set	- 630 kVA (ONAN) - 15,000±2.5%, ±5.0% / 400-230 V
(3)	AC Distribution panel	1	set	- MCCBs for 400/230 V AC, three phase, four wires
(4)	110 & 48V DC Battery and Charger	1	lot	- MCCBs for 110 V DC - MCCBs for 48 V DC The MCCBs will be installed in each Charger panel.
(5)	Remote Terminal Unit (RTU)	1	lot	- RTU for communication with the existing National Electricity Control Center (NECC) SCADA system (ABB RTU560 or equivalent)
(6)	Communication System	1	lot	The communication system includes;- - SDH multiplexer panel (including ECI BG-20 or equivalent) - IP PBX equipment with telephone set - Cables including optical fiber cables for the substation inside
(7)	15 kV power cables	1	lot	- Between 15 kV Switchgear and 630 kVA Transformer. - 15 kV cables between 15 kV switchgear panels and first 15 kV distribution tower(s) and/or pole(s)
(8)	Low voltage power and control cables	1	lot	Cables and necessary accessories for connection
(9)	Earthing system	1	lot	Earthing conductors and accessories

2.1.4 Technical requirements for 15kV Switchgear Modification of Gasogi Substation

In order to connect an additional distribution line to Kabuga RMU switching station, one additional 15 kV feeder bay has to be extended. The existing 15 kV Switchgear room with cable trench will be extended by the Rwanda side to accommodate one extended switchgear panel supplied by Japanese side.

Table 2.1.3-1 Equipment List for Gasogi Substation

No.	Equipment	Q'ty	Unit	Major Specifications
(1)	Indoor type 15 kV GIS Switchgear feeder panel for extension	1	set	- 15 kV GIS Switchgear feeder panel Type: ZX1.5 (ABB) - 40.5 kV, 1250 A, 25 kA

2.1.5 Technical requirements for the facilities of Ndera Substation

(1) Design Conditions for the Substation Facilities

The design conditions for the substation Facilities are shown in the above mentioned Table 2.1.1-1.

(2) Requirements for the Substation Facilities

Design Ground Level would be set on 1546.5m from sea level. Necessary land preparation including Access Road, Earth wall, Land Leveling, Boundary Fence would be constructed by the Rwanda side. But Pavement of the approach road, Ditch of site rain drainage, Control Building, Cable Pit, TR Foundations, Fire Wall, Gantry Foundations, Bus Structure Foundations and other Equipment Foundations would be constructed by Japanese side.

outdoor lighting
water supply from utility

1) Outline of Control Building

The Outline of Control Building is shown in Table 2.1.5-1 (See DWG A-05, 06, 07, 08).

Ground Floor Level should be +1.0m from Design Ground Level to secure the height of Cable Pit.

Table 2.1.5-1 Outline of the Control Building

Items	Contents	Details
Structure	Reinforced Concrete Ralumen Structure	
Height of story	2 stories BFL-GFL=2.65 m GFL-IFL=3.5 m, 5.1m	BF: Cable Pit with Water Tank (10ton)×2 GF: Control Room, Switchgear Room, Entrance, Office, Meeting Room, Battery Room, Charger Room, Telecom Room, On Duty Room, Toilet, Shower, Kitchen, Corridor, Stair Case
Total Floor Area	Approx. 540 m^2	BF:180m2 GF:360m2
Building Area	Approx. 360 m^2	-
Exterior	Wall Finishing	Concrete with Urethane Exterior Paint Concrete Louver with Urethane Exterior Paint
	Roof Finishing	Concrete Plate t=80 with wire-mesh @200 Urethane joint @2000 each, Insulation t=50 Asphalt Membrane 3 Layer Water Proofing
Interior	Wall Finishing	Paint on Mortar iron trowel
	Floor Finishing	Ceramic Tile 300*300
	Ceiling	LGS Ceiling with Gypsum Board t=12 Paint Finish

roof = like Musha S/S

The outline of major architectural equipment is as following,

a) Electrical work: Lighting system, Socket system, Exterior Lighting system
b) Plumbing work: Water supply, Water tank (10ton 2 units), Septic tank and Soak Pit
c) Mechanical Work: Air-condition (Control Room, Charger Room, Telecom Room)

2) Foundation of 110/15 kV 20MVA Transformers

The Outline of the Foundation of 110/15 kV transformers is shown in Table 2.1.5-2 (See DWG A-05). Ground Floor Level should be +0.2 m from Design Ground Level.

Table 2.1.5-2 Outline of the Foundations of 110/15 kV transformers

Items	Contents	Details
Structure	Reinforced Concrete Mat Foundation	-
Height of story	1 story	GF: 2 units of 20 MVA transformer [Note] For the equipment to avoid submerging to water on heavy rainy days, the floor level of the foundations shall be 0.5 m raised from the Design Ground Level. Fire Wall: Concrete wall H=5.1 m, L=6.0 m, t=250 Total number 1 Oil pit: Around Transformer Foundation D=1.5 m covered with Gravel, overflow piping connected to the oil-water separator set west-beside the foundation Cable Culvert 700mm*1000mm

3) Foundations of Electrical Equipment

The Outline of the foundations of Electrical Equipment, Gantry, CB, DS and others is shown in Table 2.1.5-3 (See DWG A-02 and A-03).

Table 2.1.5-3 Outline of the Foundations of Electrical Equipment

Items	Contents	Details
Structure	Reinforced Concrete Foundation	-
Height of story	0 story	[Note] to avoid submerging to water on heavy rainy days, the floor level of the foundations shall be 0.2 m- raised from the ground level.

4) Cable Pit

The Outline of the Cable Culvert is shown in Table 2.1.5-4 (See DWG A-05).

Table 2.1.5-4 Outline of the Cable Pit

Items	Details
Cable Pit from 20 MVA transformers to Control Building	Reinforced Concrete Box with Concrete Cover t=50mm, t=150mm Length around 30m (W=0.7 m, D=1.0m)

Cable Pit is for smooth installation and maintenance from each transformer to Control Building.

2.1.6 Technical requirements for the facilities of RMU Switching Stations

(1) Design Conditions for RMU Switching Stations Facilities

The design conditions for the Ring Main Unit Facilities are shown in the Table 2.1.2-1. same as Substation Facilities.

(2) Requirements for the RMU Switching Stations Facilities

Necessary land development including Access Road, Earth wall, Land Leveling, Boundary Fence would be constructed by Rwandan side. But Pavement of the approach road, Ditch of site rain drainage, Power Supply Building, equipment Foundations would be constructed by the Japanese side.

1) Outline of RMU Switching Stations Buildings

The Outline of RMU Switching Stations Buildings is shown in Table 2.1.6-1 (See DWG A-03 and A-04).

Table 2.1.6-1 Outline of RMU Switching Stations Station Building

Items	Contents	Details
Structure	Reinforced Concrete Wall Structure	
Height of story	1 stories GFL-1FL=4.0 m	GF: Switchgear Room, Battery Room, AUX Transformer Room
Total Floor Area	Approx. 80 m^2	-
Building Area	Approx. 80 m^2	-
Exterior	Wall Finishing	Concrete with Urethane Exterior Paint
	Roof Finishing	Concrete Plate t=80,wire-mesh @200 Urethane joint @2000 each, Insulation t=50 Asphalt Membrane 3 Layer Water Proofing
Interior	Wall Finishing	Paint on Mortar iron trowel
	Floor Finishing	Ceramic Tile 300*300
	Ceiling	Exposed Concrete Paint Finishing

2.1.7 Preparation Work to be done by the Rwanda Side

Before commencement of construction work to be done by the Japanese side, following works should be completed by the Rwanda Side.

A7-13

(1) Land Preparation Work at the site of Ndera Substation

1) Requirements of Land Preparation Work at the site of Ndera Substation

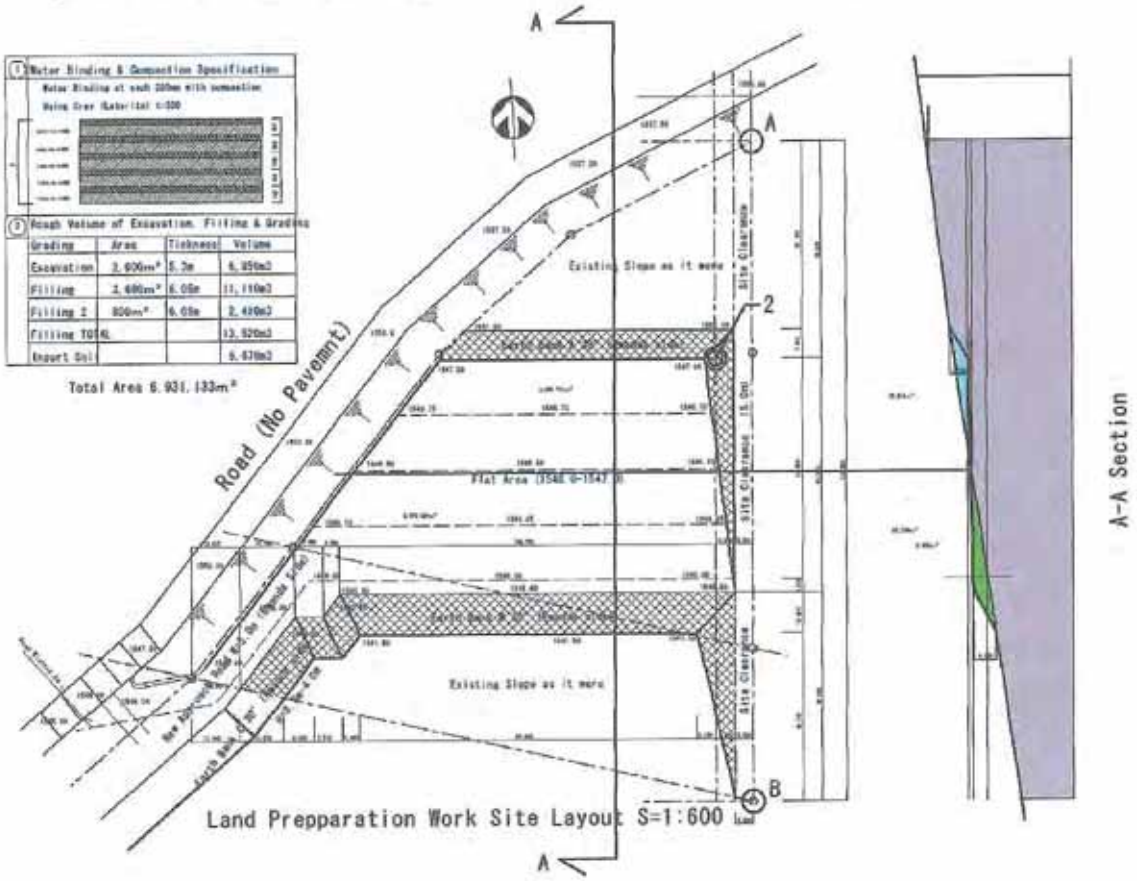


Figure 2.1.7-1 Land Preparation Work Site Layout

According to the Drawing as shown in Figure 2.1.7-1, land preparation work should be done.

Upper part of the site it should be excavated down to the level of 1,546.5 m from see level with bank (30 degree slope). Roughly estimated volume of the excavated soil would be 6,850 m^3.

Lower part of the site it should be land filling with excavated soil and import soil with bank (30 degree slope). Roughly estimated total volume of land filling soil would be 13,520 m^3.

And approach road (W=5.0 m) should be prepared.

At the area of land filling, water binding would be required at each 30 cm with compaction by tamper.

Estimated construction schedule would be from 6 months to 7 months.

Excavation soil Volume: 7,000 m^3

Filling Soil Volume: 13,600 m^3 (Import soil Volume: Cray 6,600 m^3)

Grading Area: 6,560 m^2

(2) Land Preparation Work at the sites of RMU Switching Station

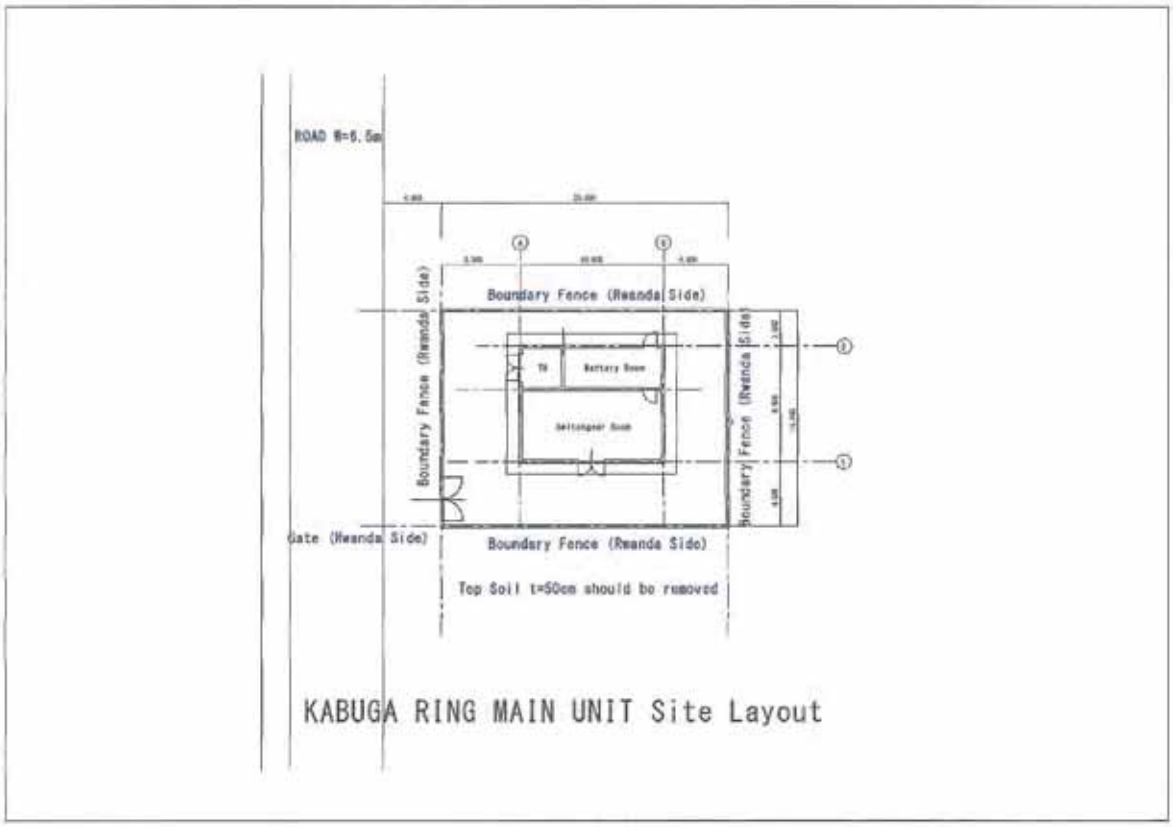


Figure 2.1.7-2 Land Preparation Work Site Layout at Kabuga RMU Switching Station

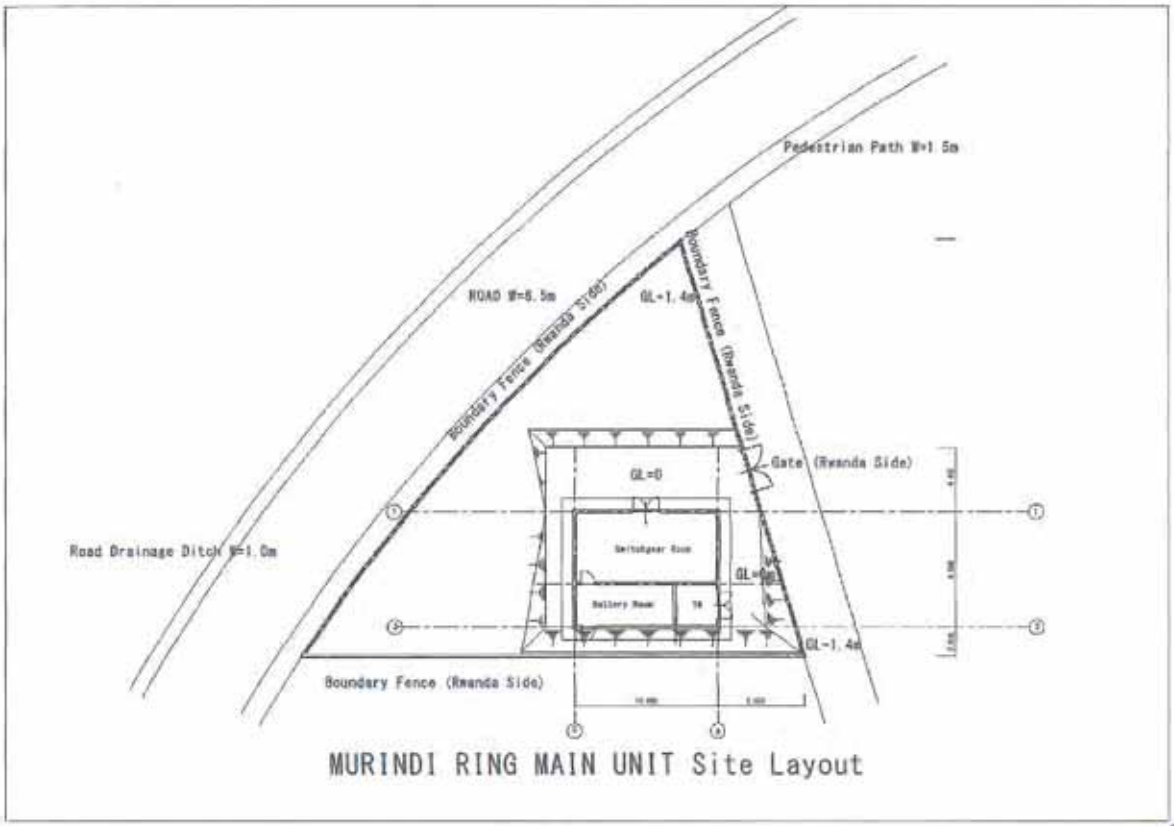


Figure 2.1.7-3 Land Preparation Work at Murindi RMU Switching Station

A7-15

There are two sites of RMU Switching Stations. Topographie Survey has not yet completed.
Proposed site area in Kabuga RMU Switching Station will be 15m in width and 20 m in length as shown in Figure 2.1.7-2 Land Preparation Work at Kabuga RMU Switching Station. Total site area is 300 m^2.

The site is almost flat but top soil of this site is very week, so 30 cm of this top soil should be removed and new cray should be refilled of the same volume. Therefore total volume of land preparation work would be as follows,

Kabuga RMU Swiching Station Site

Excavation and dumping soil Volume: 300 $m^2 \times 0.3$ m = 90 m3
Filling Soil Volume: 90 m^3 (Import soil: Cray)
Grading Area: 300 m^2

Proposed site area in Murindi RMU Switching Station will be as shown in Figure 2.1.7-3 Land Preparation Work at Murindi RMU Switching Station. Total site area is around 530 m^2.
Terrain of this site is down slope from the road border line down to the bottom border line around 2.8 m. So in the middle part of down slope, flat area will be required. The size of the required flat area is 13 m in width and 15 m in length, total flat area is around 200 m^2. Half of this area will be excavated and using excavated soil another half of this area will be landfilling and make it flat area. Top soil of this site is very week, so 30 cm of this top soil should be removed and new cray should be refilled of the same volume. Therefore total volume of land preparation work would be as follows,

Murindi RMU Swiching Station Site

Excavation and dumping soil Volume: 200 $m^2 \times 0.3$ m = 60 m^3
Filling Soil Volume: 46 m^3 (Import soil: Cray)
Grading Area: 200 m^2

(3) Land Preparation Work at the site of 110 kV Transmission Line

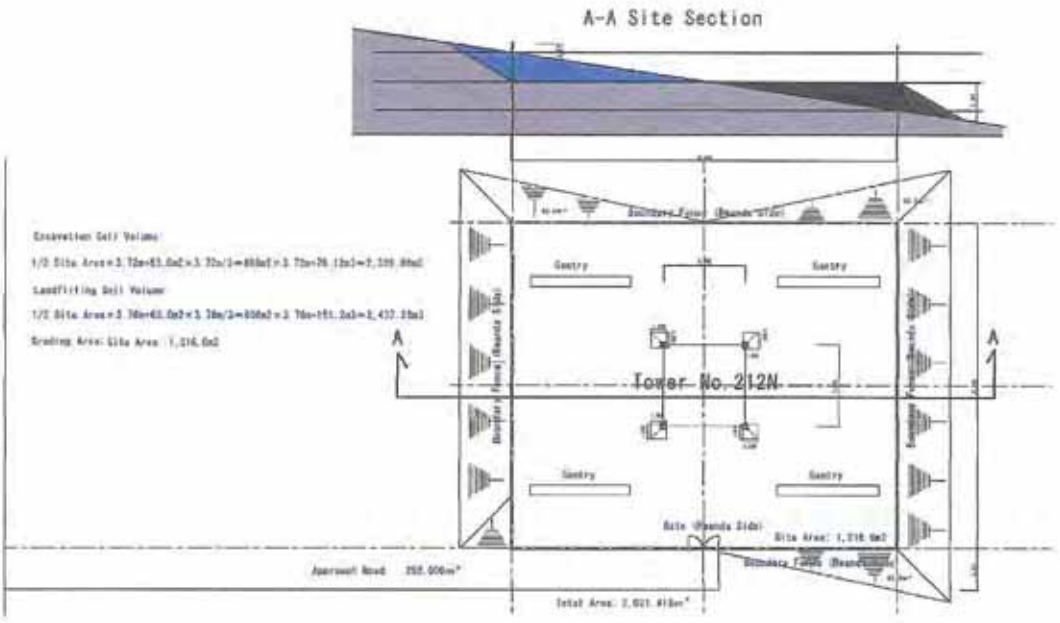


Figure 2.1.7-4 Land Preparation Work at Gantry Tower 110 kV

Proposed site area in 110 kV Gantry Tower No. 222N will be as shown in Figure 2.1.7-4 Land Preparation Work at Gantry Tower 110 kV. Total site area is around 2,030 m^2.

Terrain of this site is down slope from the road border line down to the bottom border line. So in the middle part of down slope, flat area will be required. The size of the required flat area is 38 m in width and 32 m in length, total flat area is around 1,216 m^2. Half of this area will be excavated and using excavated soil another half of this area will be landfilling and make it flat area. Therefore total volume of land preparation work would be as follows,

Murindi RMU Switching Station Site

Excavation soil Volume: 2,340 m^3

Filling Soil Volume: 3,440 m^3

Import soil: Cray: 100 m^3

Grading Area: 1,216 m^2

2.2 Technical requirement for Transmission and Distribution Lines

2.2.1 Technical requirement for Transmission and Distribution Lines

(1) Scope of Work

Project scope of work for transmission and distribution lines shows on DWG No. GA-01 attached hereafter is as follows;

① 110 kV Transmission Line:

New Ndera substation will be energized from existing 110 kV transmission line between Birembo and Musha substations. The tower of No. 212 on the transmission line shall be

re-built with tension type tower form suspension type tower, and then the new tension type tower will be split two way, one is for Birembo substation and another one is for Musha substation via Gosogi substation, refer to attached drawing No. GA-03. The new tension tower named "Tower No. 212N" will be connected to new 110 kV transmission line with double circuits up to Ndera substation line length is approx. 2.2 km, the transmission line route shown on drawing No TL-01 attached.

② 15 kV Distribution Line: Route-1

15 kV distribution line: Route-1with single circuit from Gasogi substation to Kabuga RMU switching station shown on DWG No. DL-11 will be constructed, the line length is approx. 6.0 km. Support of the 15kV distribution line is tower and steel pole types, refer to DWG No. DL12. The 15 kV distribution line shall be considered to be used for 30 kV distribution line.

③ 15 kV Distribution Line: Route-2

15 kV distribution line: Route-2 with double circuits from Ndera substation to existing 15 kV distribution line between Birembo substation and free zone PH-1 RMU station shall be constructed. The line length is approx. 600 m. Conductor configuration is vertical layout with lattice type tower, refer to DWG No. DL-22 attached. This 15 kV Distribution line shall also be used for 30 kV distribution line.

④ 15 kV Distribution Line: Route-3

There was an existing steel tower for 15 kV distribution line from Berimbo substation to Gishaka area, the tower has been located on planned 110 kV transmission line at approaching to new Ndera substation. Therefore, concerned two (2) existing towers of the 15 kV distribution line shall be diverted as shown on DWG No. DL-31 attached. The line configuration is triangle layout shown on DWG No. DL22 attached. This 15 kV Distribution line shall also be used for with 30 kV distribution line.

⑤ Kabuga RMU Swiching Station:

Kabuga RMU switching station will connect 15 kV distribution line: Route-2 above item ③, from Gasogi substation. Outgoing feeders will be comected to existing distribution lines located near the station.

⑥ Murindi RMU Swiching Station

Incoming feeders are connected from existing 15 kV distribution line. The existing tower to be connected to the RMU Swiching Station is suspension type tower; therefore the tower should be needed to re-build to tension type tower. Outgoing feeder will be connected to existing distribution lines located near the station, refer to DWG No. RM-11 attached.

(2) Design Conditions for 110 kV Transmission (T/L) and 15 kV Distribution Lines (D/L)

Natural Conditions and Electrical Conditions are shown in Table 2.2.1-1 and Table 2.2.1-2, respectively.

Table 2.2.1-1 Natural Conditions

Items	Design Values
Altitude	Over 1000m upto 2000m
Conductor temperature	-
Minimum temperature	5 degree C
Everyday temperature	25 degree C
Maximum temperature	80 degree C
Sag calculation to determin steel tower height	50 degree C
Wind speed	30 m/s
Wind load on conductors	56.3 kg/ m^2
Wind load on steel tower	163.1 kg/ m^2
Soil bearing capacity	40 ton/m^2 (now on survey)

Table 2.2.1-2 Electrical Conditions

Items	Design Value
Standard Span Length	350m for 110kV T/L, 250m for 15kV D/L
Wind Span	350m for 110kV T/L, 250m for 15kV D/L
Weight Span	450m for 110kV T/L, 350m for 15kV D/L
Vertical Component	15% of Max Working Tension for 110kV T/L
Right of Way (ROW)	- 110kV T/L: 15m width (7.5m +7.5m) - 15kV D/L for double circuits: 10m width (5m +5m) - 15kV D/L for Single circuit: 6m width (3m +3m)
Height of conductor (See Note 1)	
General area (m)	7 m
Waterway (m)	10 m
Road crossing (m)	8 m
Shield angle for Lightning	30 degree
Minimum nominal specific creepage distance	16 mm/kV
Equivalent salt deposit density	0.063 mg/cm^2

Note:

a) As EUCL's concept, facility for15kV distribution line shall be designed usable for 30kV distribution line.

b) To decide standard tower height, conductor height of 8 meters shall be employed.

(3) Requirements for 110 kV Transmission and Distribution Lines

Specifications for 110 kV Transmission and Distribution Lines are shown as follows.

Table 2.2.1-3 Specifications for 110kV Transmission Line

No.	Items	Specifications	
1)	Line Structure	Type:	Steel lattice type tower
		Configuration of tower:	Dual circuits, vertical layout (See DWG. No. TL-03)
		Type of tower:	Suspension type (110A2: Angle: 3 degree), Tension type (110B2: Angle: 15 degree), Tension type (110C2: Angle 30 degree) Termination tower (Angle: 60 degree or dead-end)
		Safety factor:	1.0 for main body 1.2 for arms
2)	Overhead Line (Conductor)	Type: ACSR Size 240/40 DIN	
3)	Insulator	Standards:	IEC60383-1 or equivalent
		Size:	254 mm suspension insulators
		Creepage distance:	292 mm
		Material:	Porcelain
		Color:	Brown

No.	Items	Specifications
		Ball and socket coupling: 16mm Number of insulators: 9 pcs/phase
4)	Shield Wire and Optical Fiber Cable	Type: OPGW x 2 Number of Optic Fiber Core: 24 cores Shielding angle: less than 30 degree.

Table 2.2.1-4 Specifications for 15kV Distribution Line: Route-1

No.	Items	Specifications
1)	Line Structure	Type: Steel lattice type tower and Steel Pole Configuration of tower: Single circuit, triangle layout for tower and horizontal layout for steel pole, See DWG. No. T-03
2)	Overhead Line (Conductor)	Type: ACSR Size 120/20, DIN
3)	Insulator for Tower	Specification : Same as 110kV Transmission Line but electromechanical Failing Load is 70kN Number of insulators: three (3) units/string to be confirmed
	Insulator for Pole	Type: Pin type on cross arm
4)	Shield Wire	Type: OPGW Number of Optic Fiber Core: 24 cores Shielding angle: less than 30 degree.

Table 2.2.1-5 Specifications for 15kV Distribution Line: Route-2

No.	Items	Specifications
1)	Line Structure	Type: Steel lattice type tower Configuration of tower: Double circuit, vertical layout See DWG. No. T-03
2)	Overhead Line (Conductor)	Type: ACSR Size 120/20, DIN 48204 /4-1974
3)	Insulator for Tower	Specification: Same as 110kV Transmission Line but electromechanical Failing Load is 70kN Number of insulators shall be three (3) units/string to be confirmed
4)	Shield Wire	Type: G655 or equivalent The shielding angle: less than 30 degree.

Table 2.2.1-6 Specifications for 15kV Distribution Line: Route-3

No.	Items	Specifications
1)	Line Structure	Type: Steel lattice type tower Configuration of tower: Single circuit, See DWG. No. T-03
2)	Overhead Line (Conductor)	Type: ACSR Size 120/20, DIN 48204 /4-1974
3)	Insulator for Tower	Specification: Same as 110kV Transmission Line Number of insulators shall be three (3) units/string to be confirmed
4)	Shield Wire	Type: G655 or equivalent The shielding angle: less than 30 degree.

Table 2.2.1-7 Specifications for Power Cable of 15kV Distribution Lines

No.	Items	Specifications
1)	Type	15kV or 30kV, XLPE insulation, PVC sheath, tape armor, copper conductor
2)	Standard	IEC 60502
3)	Size	50mm2, 70mm2, 95mm2, 120mm2, up to 240mm2

(4) Work Demarcation for Transmission Line, Distribution Line and Ring Main Unit

Work Demarcation for Transmission Line, Distribution Line and Ring Main Unit is shown in Attachment-2.

2.2.2 Technical requirements for the Foundation of Transmission and Distribution Lines

(1) Design Conditions for the Facilities

The design conditions for Facilities of the RMU Switching Stations are shown in the Table 2.1.1-1 same as Substation Facilities.

(2) Requirements for the Facilities

Necessary land development including Access Road, Earth wall, Land Leveling, Boundary Fence would be constructed by the Rwanda side.

1) Foundations for Towers of 110 kV Transmission lines

The Outline of the foundations for Towers 110 kV Transmission Lines is shown in Table 2.2.2-1.

Table 2.2.2-1 Outline of the Foundations of 110 kV Transmission Line Tower

Items	Contents	Details
Structure	Reinforced Concrete Foundation (Pad & Chimney Type)	Tower H (Now on study)

2) Foundations for Towers of 15 kV Distribution lines

The Outline of the foundations for Towers 15 kV Distribution Lines is shown in Table 2.2.2-2.

Table 2.2.2-2 Outline of the Foundations of 15 kV Distribution Line Tower

Items	Contents	Details
Structure	Reinforced Concrete Foundation	Tower H (Now on study)

2.3 Environmental and Social Consideration

JICA Study Team will hire a local consultant to assist EDCL in preparation of an Abbreviated Resettlement Action Plan and obtaining the necessary clearance and relevant permits/licenses. EDCL should work in collaboration with the local consultant and facilitate him in accessing necessary data and information to carry out his tasks.

JICA Study Team and EDCL visited Rwandan Environment Management Authority (REMA) and Rwanda Development Board (RDB) to confirm a procedure to obtain an EIA Certificate. It is imperative that EDCL submit a Project Brief to RDB so that RDB can determine whether the Project requires a full EIA or not. Presently EDCL is aiming to submit a Project Brief to RDB by 2 April 2015 and Screening result from RDB is expected by 15 April 2015.

In accordance with the Screening result from RDB, a further environmental study or a full EIA study will be carried out.

EDCL has already started process of acquiring land and resettlement for some of the components. EDCL must apply the above ARAP retrospectively as much as possible to the land acquisition and resettlement that have been already in process.

For the smooth implementation of the project, it is targeted that EDCL completes land acquisition by December 2015. ARAP should be finalized and authorized (or at least acknowledged) by Ministry of Finance by June 2015.

The table below is a schedule for each action to be taken for obtaining an EIA Certificate and preparation of ARAP. In order to complete the land acquisition by December 2015, implementation of the ARAP should start from July 2015. Each action and its schedule for implementation of ARAP will be confirmed with the person in charge of land acquisition at EDCL in the first week of April 2015 and this schedule will be revised and shared among relevant members.

Table 2.3-1 Schedule of Environmental Assessment and Preparation of ARAP

	Action	Actor	Expected Time Period/Target Date	2015 Mar	Apr	May	Jun	Dec
Environmental Assessment	Submission of Project Brief to RDB for Screening	EDCL/JICA ST/Local Consultant(JICA)	02 April 2015		▲			
	Issue of Screening result	RDB	Within 15days after submission of Project Brief		▲			
	Further Environmental study (e.g. a full EIA study), (if required by Screening Result)	EDCL/Local Consultant(JICA)						
	Issue of EIA Certificate	RDB	Issue date is depending Screening Result		▲			
Preparation of ARAP	Mobilization of Local Consultant	JICA/Local Consultant(JICA)			▲			
	ARAP Study	EDCL/Local Consultant(JICA)						
	Submission of ARAP to Min of Finance	EDCL					▲	
	Approval (or acknowledgment) of ARAP	Min of Finance.						
	Submission of ARAP to JICA	EDCL/Local Consultant(JICA)					▲	
Implementation of ARAP	Completion of Land Acquisition	EDCL	December 2015					▲

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 Rwanda 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 Japanese.

Spare parts and maintenance tools listed in Table 2.4-1 and Table 2.4-2 are recommended to be procured. More detailed parts, tools, test equipment and the quantity will be explained with the Draft Final Report.

Table 2.4-1 Recommended Spare Part List

Legend; pc: piece, ea.: each,
N.A.: Not applicable

Name of Spare Parts	Quantity		
	Ndera	Kabuga	Murindi
1. 110 kV Switchgear equipment			
1.1 Circuit Breaker			
(1) Closing coil	1 pc	N.A.	N.A.
(2) Tripping coil	1 pc	N.A.	N.A.
1.2 Disconnecting Switch (DS)			
(1) Fixed and moving contact (3 phase set for DS)	1 set	N.A.	N.A.
(2) Fixed and moving contact (3 phase set for Earthing switch)	1 set	N.A.	N.A.
1.3 Transformer			
1.3.1 110/15 kV Transformer			
(1) Gasket (complete set)	1 set	N.A.	N.A.
(2) Buchholz relay set	1 set	N.A.	N.A.
(3) Oil temperature indicator (main tank and conservator)	1 pc ea.	N.A.	N.A.
(4) Oil level indicators (main tank and conservator)	1 pc ea.	N.A.	N.A.
(5) Silica gel for Breathers	200%	N.A.	N.A.
1.3.2 15/0.4 kV Transformer			
(1) Oil temperature indicator	1 pc	1 pc	1 pc
(2) Silica gel for Breathers	200%	200%	200%

A7-23

Name of Spare Parts	Quantity		
	Ndera	Kabuga	Murindi
2. 15 kV Switchgear equipment			
(1) Closing coil	1 pc	1 pc	1 pc
(2) Tripping coil	1 pc	1 pc	1 pc
(3) Vacuum bulbs complete with necessary accessories for replacement (for three phase)	1 set ea.	1 set ea.	1 set ea.
(4) Isolating main terminals (completed one pole)	1 set ea.	1 set ea.	1 set ea.
(7) Fuse (each type)	100%	100%	100%
(8) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(9) Auxiliary relay (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(10) Necessary accessories for 15 kV cable	1 set	1 set	1 set
3. Control and Protection			
(1) Protection relay (each type)	1 pc ea.	N.A.	N.A.
(2) Bay control unit	1 pc ea.	1 pc ea.	1 pc ea.
(3) Fuse (each type)	100%	100%	100%
(4) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(5) Auxiliary relay (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(6) Control and selector switch, if any (each type)	1 pc ea.	1 pc ea.	1 pc ea.
4. Station LV Power Supply Equipment			
4.1 AC Distribution Board			
(1) MCCB (each type)	1 pc ea.	1 pc ea.	1 pc ea.
(2) Indicating lamp, if any (each type)	100%	100%	100%
(3) Fuse (each type)	100%	100%	100%
(4) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
4.2 DC Distribution Board			
(1) MCCB (each type)			
(2) Indicating lamp, if any (each type)	100%	100%	100%
(3) Fuse (each type)	100%	100%	100%
(4) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
4.3 Battery and Charger			
(1) Battery	2 cells ea.	2 cells ea.	2 cells ea.
(2) Electrolyte (20 letter/tank)	1 tank	1 tank	1 tank
(3) Control Card and diode module	1 pc ea.	1 pc ea.	1 pc ea.
(4) Indicating lamp, if any (each type)	100%	100%	100%
(5) Fuse (each type)	100%	100%	100%
(6) Meter (each type)	1 pc ea.	1 pc ea.	1 pc ea.
5. Communication			
(1) RTU card	1 pc ea.	1 pc ea.	1 pc ea.

2.5 On-the-Job Training (OJT)

On-the-job training (OJT) will be carried out during the construction period. Through the OJT, maintenance and operation staff of the Rwanda 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 110 kV and 15 kV substation equipment
- Protection relay setting
- Fault analysis and operation record management
- Deterioration diagnosis of insulation oil
- Purification processing insulation oil

3. Tentative Implementation Schedule of the Project

The tentative implementation schedule is shown as Attachment-3. In case that the Project is adapted by the Japanese Government, the Project will proceed as follows in the earliest scenario. The installation work of the Project will start in October, 2016. 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 Rwanda and Japanese Government will be signed in March, 2016.
- The Tender Opening will be held in July 2016.
- Installation work of the Project will start in October, 2016.
- Commissioning of the Project will be in May, 2018.

4. Drawings

Part 1 Substation

Part 2 Transmission and Distribution Lines

Part 3 Architectural

A7-25

Attachment

1. Member List of the Study Team

First Field Survey

Name	Assignment	Organization
Toshiyuki HAYASHI	Team Leader	Japan International Corporation Agency
Gaku SAITO	Vice Team Leader	Japan International Corporation Agency
Yoshiyuki KUDO	Chief Consultant/ Transmission and distribution Planning	Yachiyo Engineering Co., Ltd.
Kenji SAKEMURA	Substation Facilities	Yachiyo Engineering Co., Ltd.
Keiichiro OHASHI	Power Flow Analysis/ Protection Control	Yachiyo Engineering Co., Ltd.
Atsuhito URUNO	Transmission Facilities	Yachiyo Engineering Co., Ltd.
Yasuo HORIGOME	Facility Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd
Kyohei KUROHANE	Construction Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd.
Asami KABASAWA	Social and Environmental Considerations	Yachiyo Engineering Co., Ltd.
Tomoya NAKASHIMA	Substation Facilities Assistant	Yachiyo Engineering Co., Ltd.

Work Demarcation for the Project

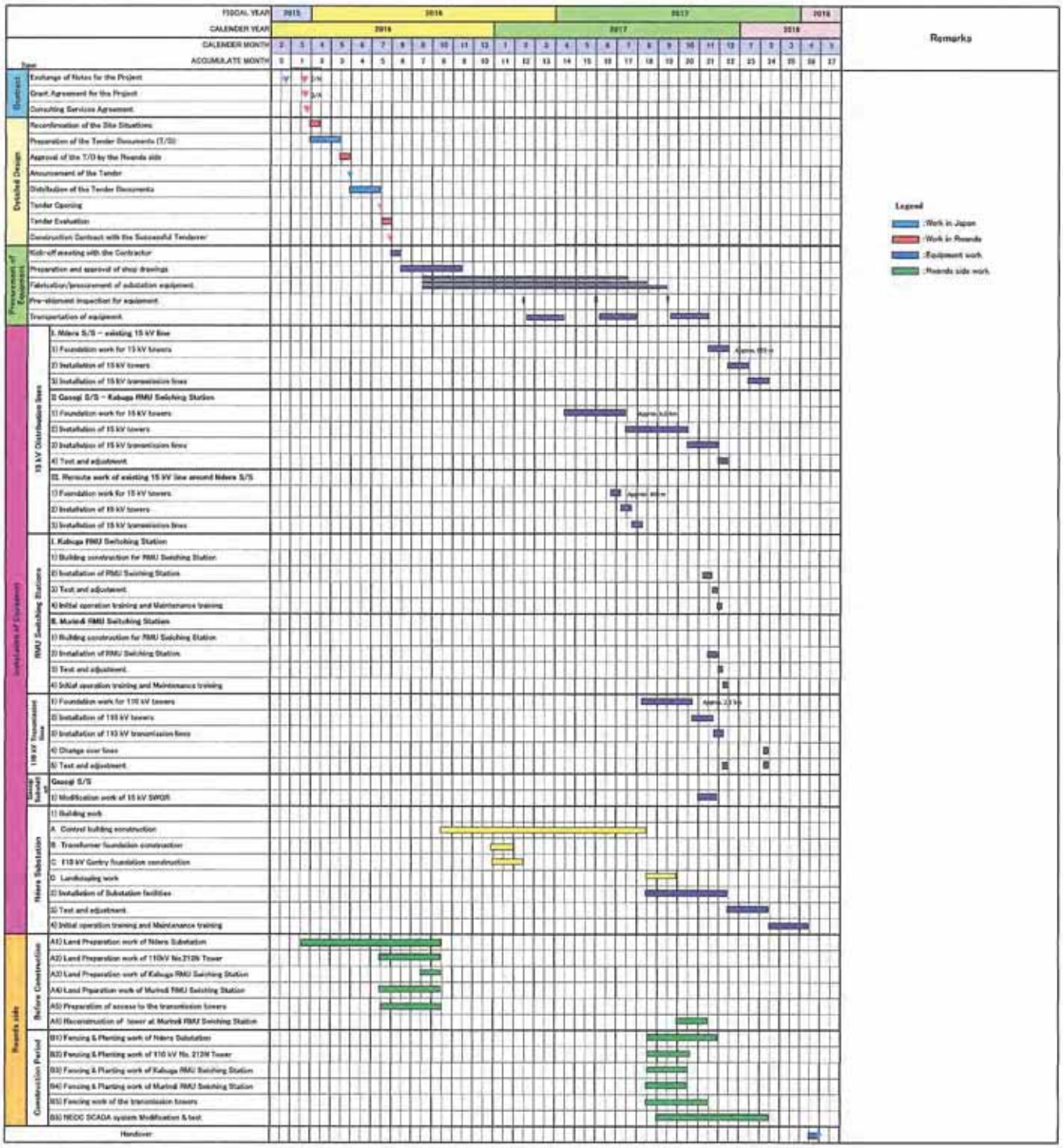
No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
1.	Ndera Substation					
(1)	Secure the Land			•		In REG Land
(2)	Site Leveling				•	
(3)	Gate and Fence			•	•	
(4)	Building work of the substation	•	•			
(5)	110 kV Switchgear	•	•			
(6)	20 MVA Transformers	•	•			
(7)	250 kVA Auxiliary Transformer	•	•			
(8)	15 kV Switchgear	•	•			
(9)	Substation Control and Protection equipment	•	•			
(10)	110 V DC Battery and Charger	•	•			
(11)	48 V DC Battery and Charger	•	•			
(12)	Communication equipment including RTU and SDH equipment	•	•			
(13)	15kV cables between Transformers and Switchgear	•	•			
(14)	Outgoing 15 kV Cables except item 3.2(2) in this table	•	•			
(15)	Protection Relay setting change of the substations where the transmission lines from Ndera substation to be interconnected				•	Birembo & Musha S/Ss
(16)	Spare parts for Substation	•	•			
(17)	Maintenance tools for Substation, etc	•	•			
(18)	Technical training for equipment		•			
2	110 kV Transmission Line (T/L)					
2.1	Secure of Land and Site leveling					
(1)	T/L Connection Area (32m x 38m)			•		
(2)	Site leveling work at the connecting area				•	
(3)	Right of Way for all T/L (2.2 km) (secure of land at T/L tower foundations, etc)			•	•	
(4)	Storage yard for construction materials			•		
2.2	110kV Transmission Line (Approx. 2.2 km) From connection point to Ndera S/S)					
(1)	Connecting Facility such as gantry, insulator, etc, at connecting point of 110 kV T/L	•	•			

No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
(2)	Dismantling of existing 110 kV Tower				•	
(3)	Replacement of line conductors and insulator string sets from nearest both towers	•	•			
3.	15 kV Distribution Line (D/L)					
3.1	Route-1: from Gasogi S/S to Kabuga RMU SS					
(1)	Secure the land with ROW			•		
(2)	Cable from 15 kV SWGR at Gasogi S/S to 15 kV D/L tower/pole	•	•			
(3)	Overhead 15 kV D/L from Gasogi S/S to Kabuga SS (Approx. 6.5 km)	•	•			
(4)	Cable from 15 kV D/L tower to 15 kV SWGR at Kabuga RMU SS	•	•			
(5)	Communication cable from Gosogi S/S to Kabuga RMU SS	•	•			
3.2	Route-2: from Ndera S/S to Existing 15 kV D/L					
(1)	Secure the land with ROW			•		
(2)	Cables from 15 kV SWGR at Ndera S/S to 15 kV D/L first tower, 2 circuits	•	•			For Free zone 1 & Birembo S/Ss
(3)	Overhead 15 kV D/L with dual circuits, between Ndera S/S to the Existing line (Approx. 650 m)	•	•			
(4)	Cables from the new tower to existing tower	•	•			
3.3	Route-3: Line Diversion for securing 110 kV T/L tower in front of Ndera S/S (due to 110 kV T/L impossible to pass over in AZAM factory)					
(1)	Secure the land with ROW			•		
(2)	Overhead line of 15 kV D/L between existing towers	•	•			With 2 towers
(3)	Cable(s) from tower to consumer(s)			•	•	
(4)	Dismantle of one (1) existing tower				•	Tower No.
(5)	Construction of new two (2) Tower	•	•			
(6)	15kV cable from 15kV outgoing feeders	•	•			
4.	RMU Switching Stations					
4.1	Construction of Kabuga RMU Station					
(1)	Secure the Land			•		
(2)	Site Leveling				•	

No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
(3)	Gate and Fence			•	•	
(4)	Building work of the station (8 m x 10 m)	•	•			
(5)	15 kV Switchgear with Bay Control Unit	•	•			
(6)	110 V DC Battery and Charger	•	•			
(7)	48 V DC Battery and Charger	•	•			
(8)	Communication equipment including RTU and SDH equipment	•	•			
(9)	Connection of communication cable at Kabuga RMU SS	•	•			
(10)	Connection of communication cable at Gasogi S/S	•	•			
(11)	630 kVA Auxiliary Transformer	•	•			
(12)	Auxiliary LV distribution Board for the station	•	•			
(13)	LV distribution board for surround consumers	•	•			
(14)	Outgoing LV cables for (13) above			•	•	
(15)	15kV outgoing cables except from Gasogi S/S	•	•			
(16)	Spare parts for Switching station	•	•			
(187	Technical training for equipment		•			
4.2	Construction of Murindi RMU Station					
(1)	Secure the Land of the Station and new Tower			•		
(2)	Site Leveling				•	
(3)	Gate and Fence			•	•	
(4)	Relocation of existing tower	•	•			
(5)	Building work of the station (8m x 10m)	•	•			
(6)	15kV Switchgear with Bay Control Unit	•	•			
(7)	DC 110V Battery and Charger	•	•			
(8)	DC 48V Battery and Charger	•	•			
(9)	Communication equipment including RTU and SDH equipment	•	•			
(10)	Connection of outgoing communication cable from Murindi RMU SS			•	•	
(11)	630kVA Auxiliary Transformer	•	•			
(12)	Auxiliary LV distribution Board for the station	•	•			
(13)	LV distribution board for surround consumers	•	•			
(14)	Outgoing LV cables for (13) above			•	•	
(15)	15kV outgoing cables	•	•			

No.	Work Items	Japan Side		Rwanda Side		Remarks
		Proc.	Cons.	Proc.	Cons.	
(16)	Spare parts for Switching station	•	•			
(17)	Technical training for equipment		•			
(18)	New tension tower near the station	•	•			
(19)	Relocation of 15kV overhead line for Market			•	•	With DS on tower
(20)	Communication network for the Station SCADA			•	•	
5.	Existing Gasogi Substation					
(1)	Expansion of 15kV SWGR for connection of new 15kV cable to Kabuga RMU SS	•	•			
(2)	Expansion of 15kV switchgear room with cable trench				•	
6.	NECC SCADA System					
(1)	Modification of SCADA System of NECC and Network Management system for accommodation of new Ndera S/S, Kabuga RMS SS and Murindi RMS SS			•	•	
(2)	Modification of Gasogi S/S communication equipment (SDH Panel) to connect additional communication cable from Kabuga RMU SS			•	•	

Tentative Implementation Schedule of the Project



Part 1 Substation

Drawing List

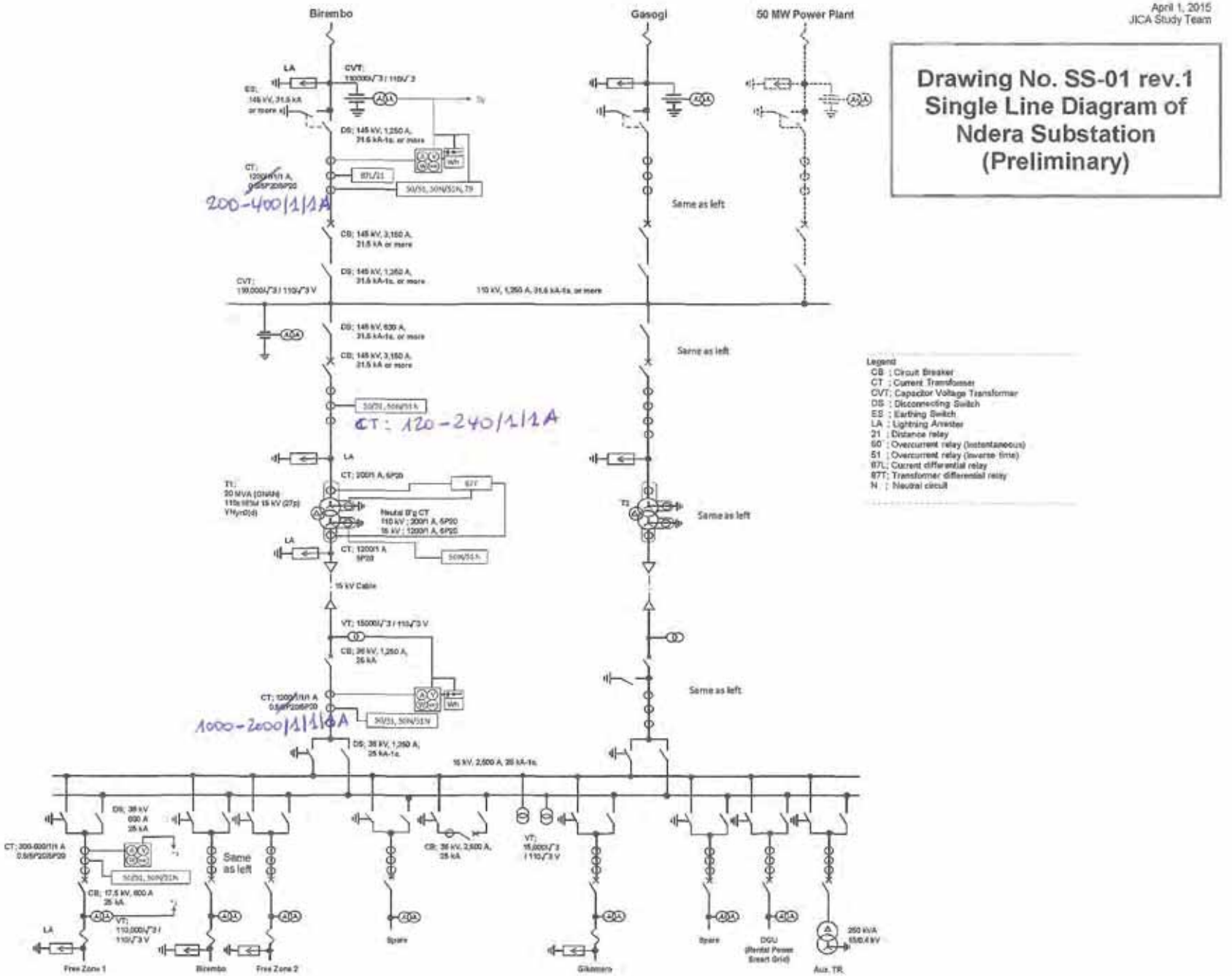
DWG No.	DWG Title

Part 1 Substation

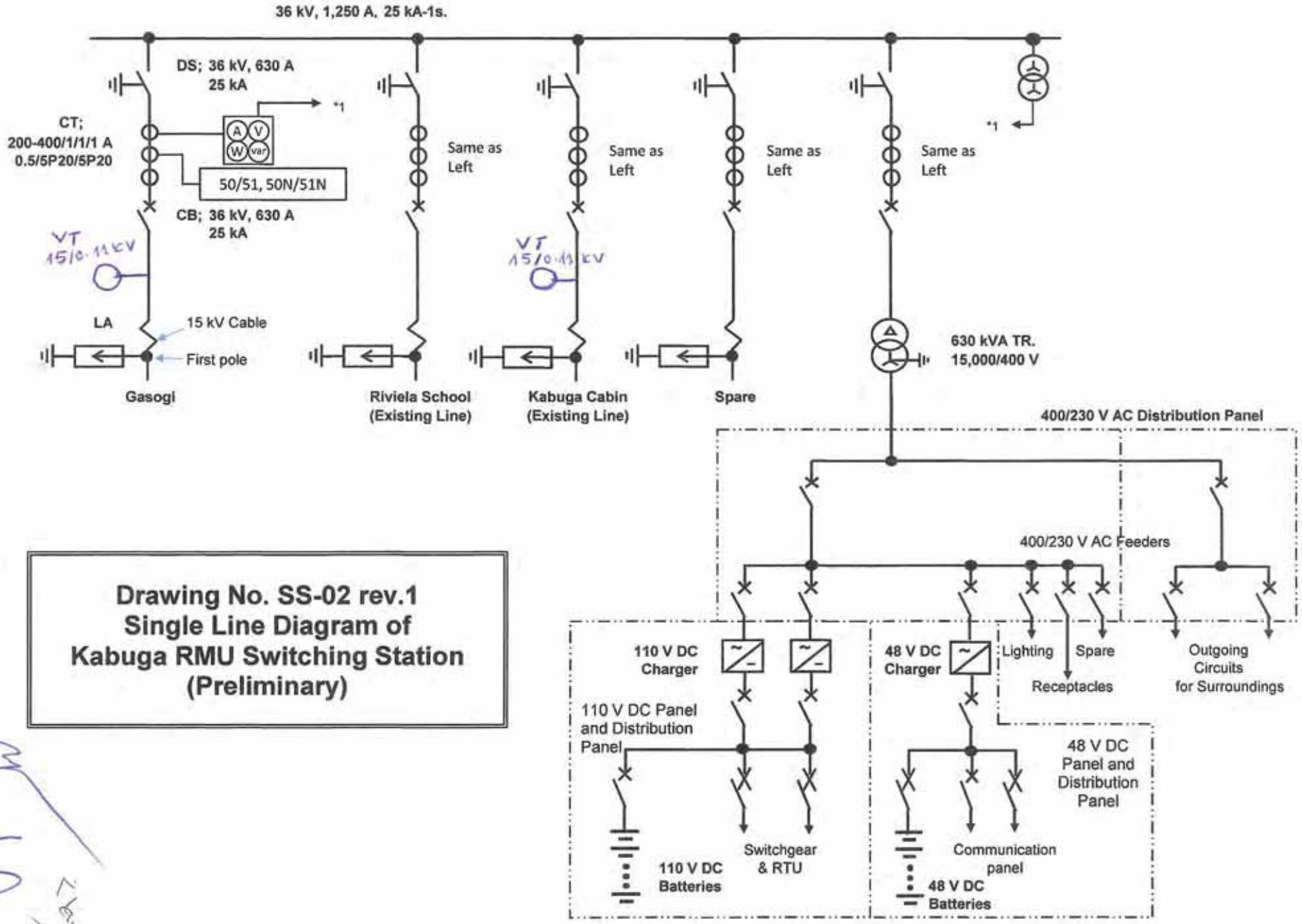
(1)	SS-01:	*Single Line Diagram of Ndera Substation (Preliminary)*
(2)	SS-02	Single Line Diagram of Kabuga RMU Switching Station (Preliminary)
(3)	SS-03	Single Line Diagram of Murindi RMU Switching Station (Preliminary)
(4)	SS-04	Control System Diagram of Ndera Substation and RMU Switching Stations
(5)	SS-05	Single Line Diagram of Gasogi Substation (Preliminary)

April 1, 2015
JICA Study Team

Drawing No. SS-01 rev.1 Single Line Diagram of Ndera Substation (Preliminary)

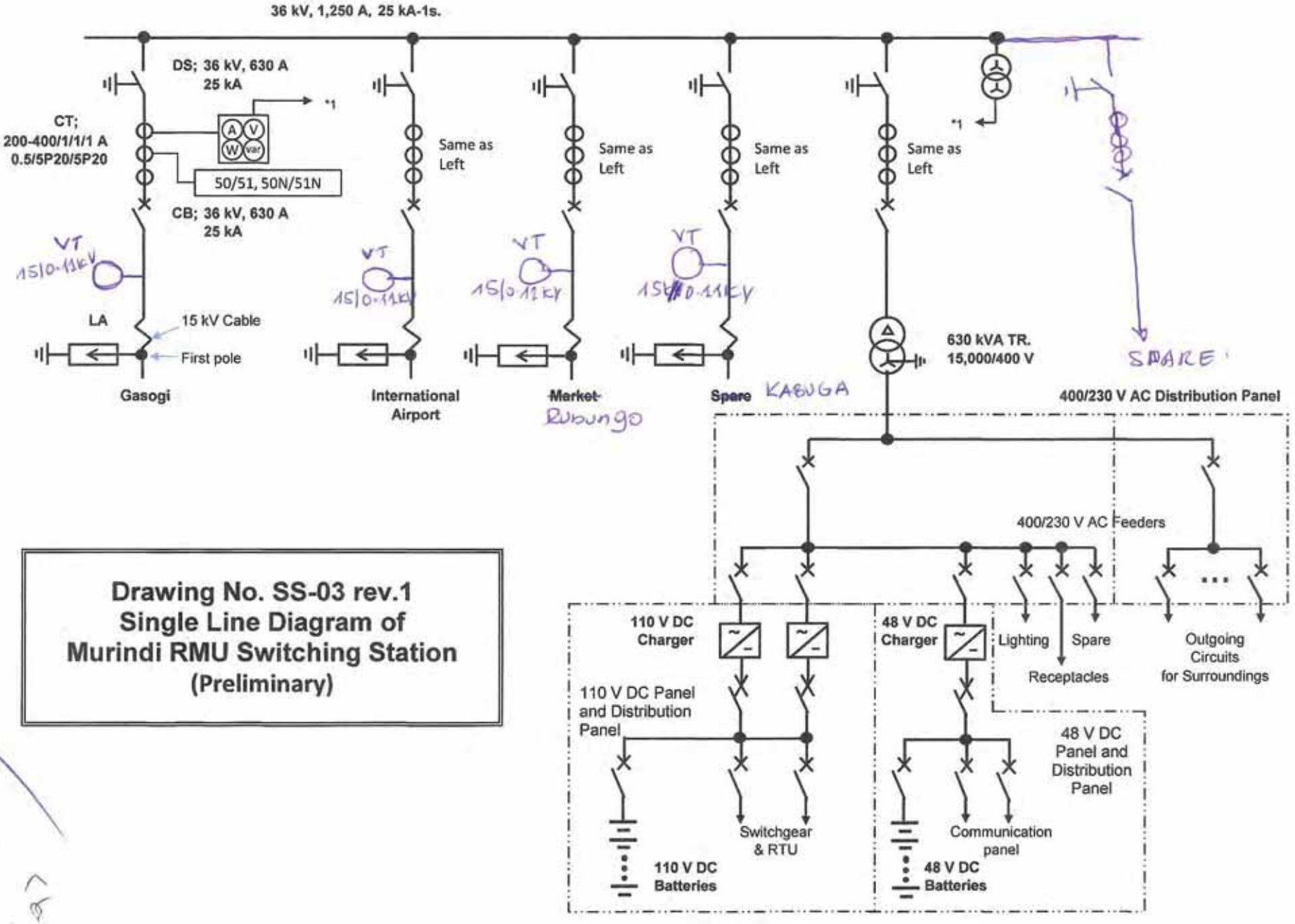


Legend
- CB : Circuit Breaker
- CT : Current Transformer
- CVT; Capacitor Voltage Transformer
- DS : Disconnecting Switch
- ES : Earthing Switch
- LA : Lightning Arrester
- 21 : Distance relay
- 50 : Overcurrent relay (instantaneous)
- 51 : Overcurrent relay (inverse time)
- 87L; Current differential relay
- 87T; Transformer differential relay
- N : Neutral circuit



Drawing No. SS-02 rev.1
Single Line Diagram of
Kabuga RMU Switching Station
(Preliminary)

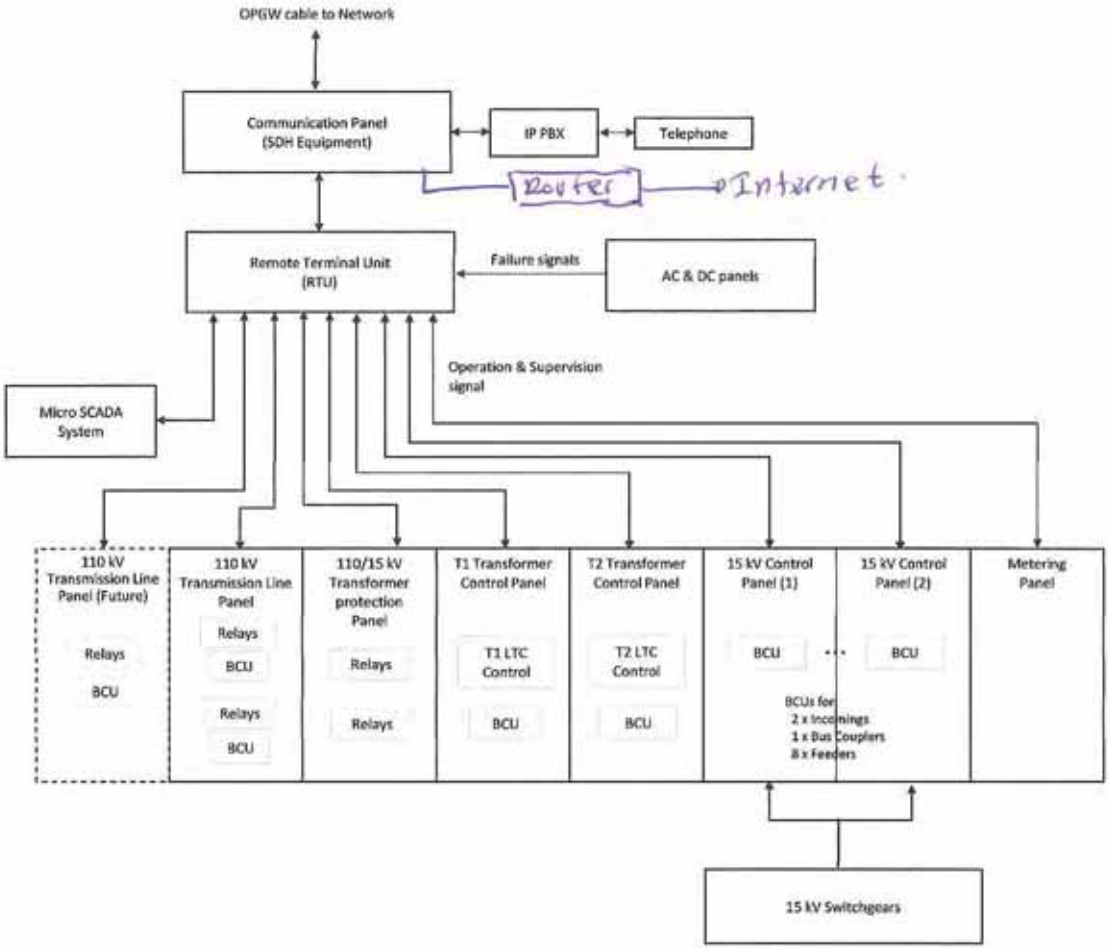
A7-36



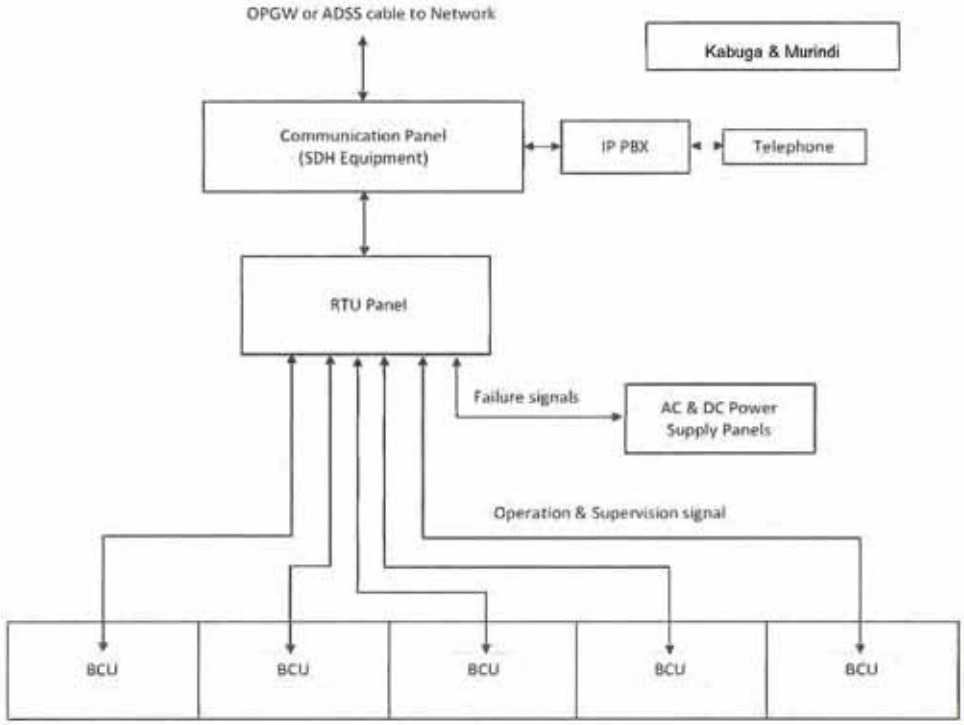
Drawing No. SS-03 rev.1
Single Line Diagram of
Murindi RMU Switching Station
(Preliminary)

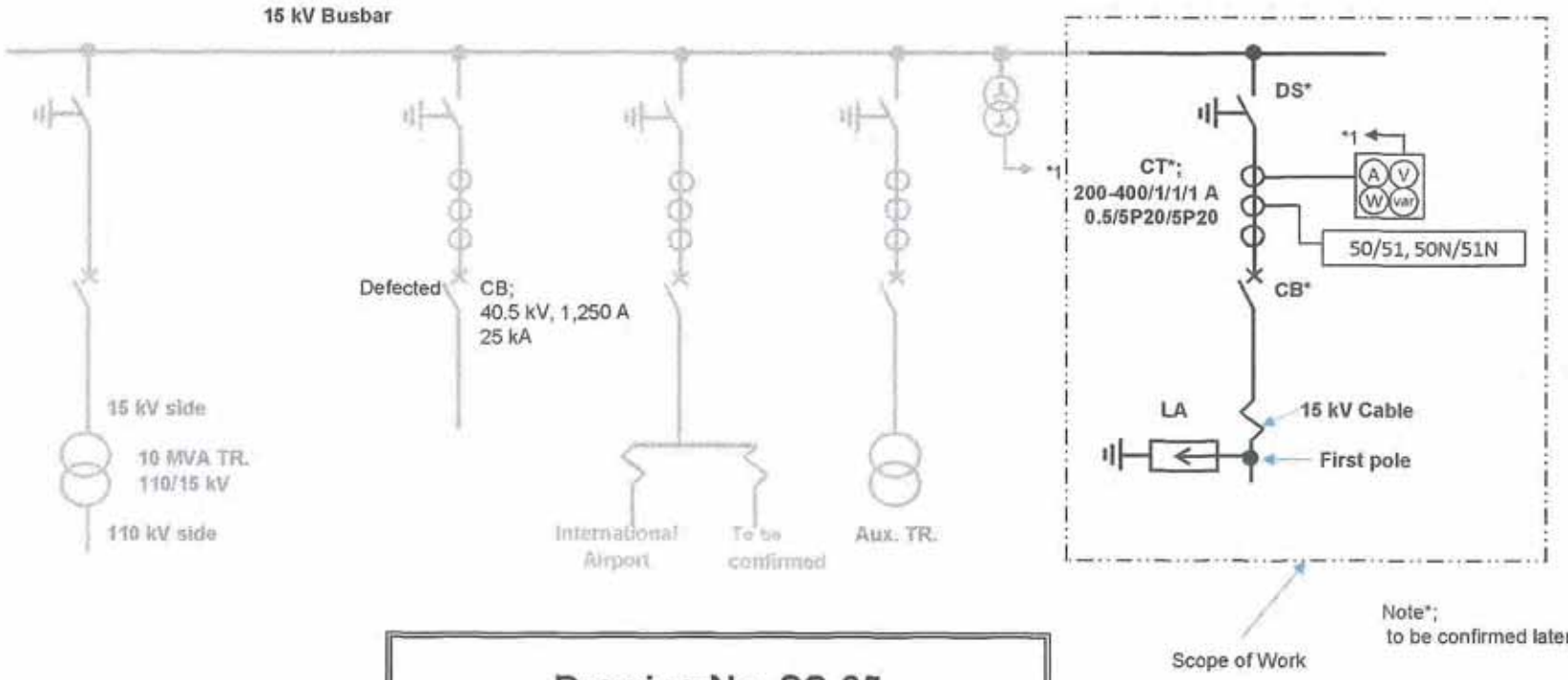
Drawing No. SS-04

Control System Diagram of Ndera Substation



Control System Diagram of RMU Switching station



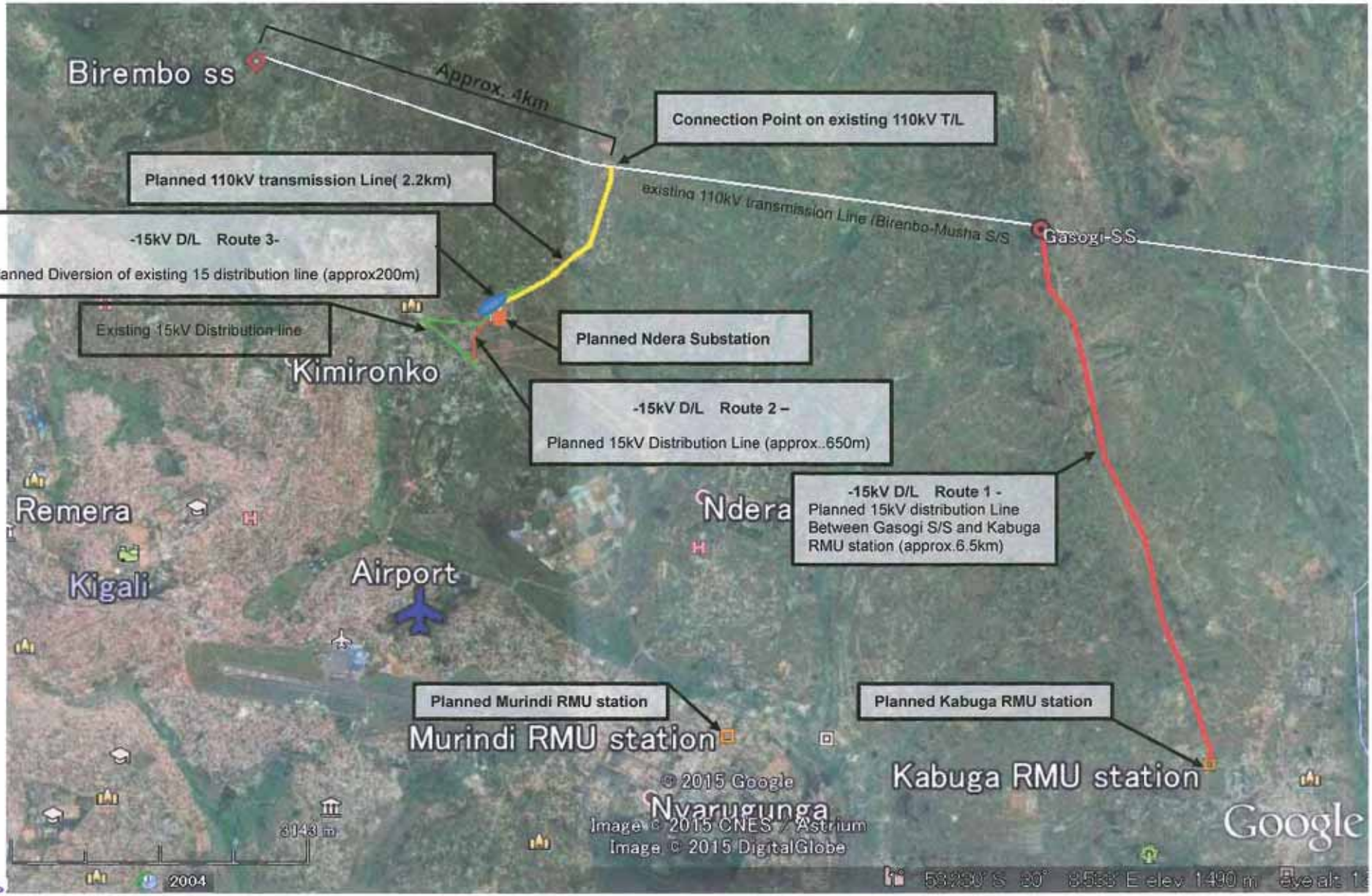


Drawing No. SS-05
Single Line Diagram of
Gasogi Substation
(Preliminary)

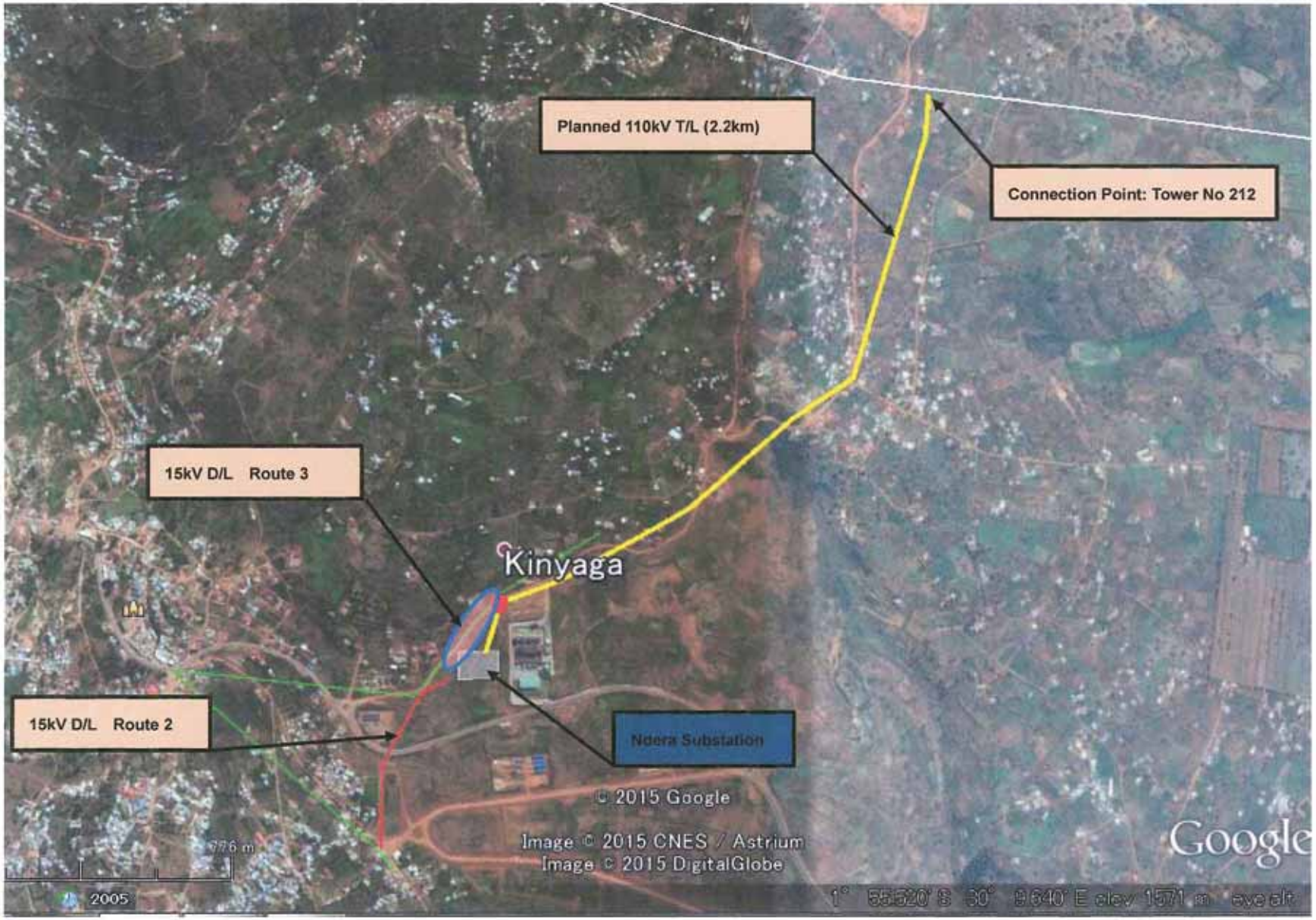
Part 2 Transmission and Distribution Lines

Drawing List

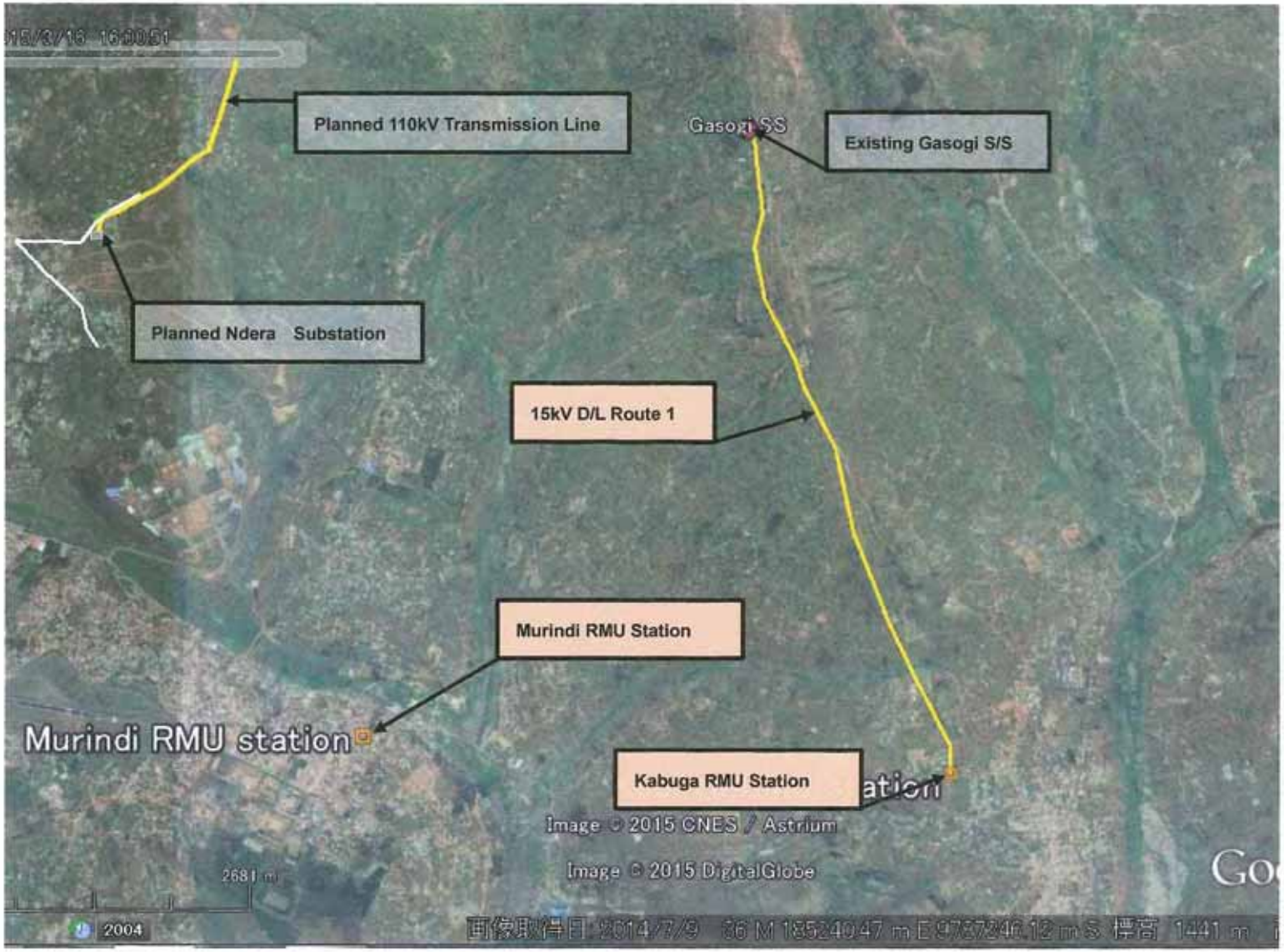
	DWG No.	DWG Title
1.	**General**	
(1)	GA-01:	Project Site Map – Key Map –
(2)	GA-02:	Project Site Map – 110kV T/L, Ndera S/S, 15kV D/L Route 2 &3 -
(3)	GA-03:	Project Site Map – 15kV D/L of Route 1, Kabuga and Murindi RMU Switching Stations -
(4)	GA-04:	Coordination Point of T/L & D/L
(5)	GA-05:	Project Concerned 110/15kV Network Diagram
2.	**110kV Transmission Line (TL)**	
(1)	TL-01:	Plan Drawings for 110kV Transmission Line
(2)	TL-03:	110kV Typical Tower Types (110A2,110B2,110C2&110D2) & (110E1)
(3)	TL-04:	Typical Foundation Plan for 110kV T/L
(4)	TL-05	Plan Drawing at 110kV Connection Point
3.	**15kV Distribution Lines (DL) and Ring Main Unit (RMU) Stations**	
3.1	Route 1: between Gasogi S/S and Kabuga RMU station	
(1)	DL11:	15kV Distribution Line Map: Route-1
(2)	DL12;	Typical Tower/Pole Type of 15kV D/L: Route-1
3.2	Route 2: between Ndera S/S and Existing Connection Point	
(1)	DL21:	15kV Distribution Line Map: Route 2
(2)	DL22:	Typical Tower Type: Route-2
3.3	Route 3: between Existing Connection points	
(1)	DL31:	Re-routing plan of existing 15kV D/L: Route 3
3.4	Site Layout of RMU Switching Station	
(1)	RM01:	Site Layout of Kabuga RMU Station
(2)	RM11:	Site Layout of Murindi RMU Station



DWG No. GA-01: Project Site Map -Key Map-



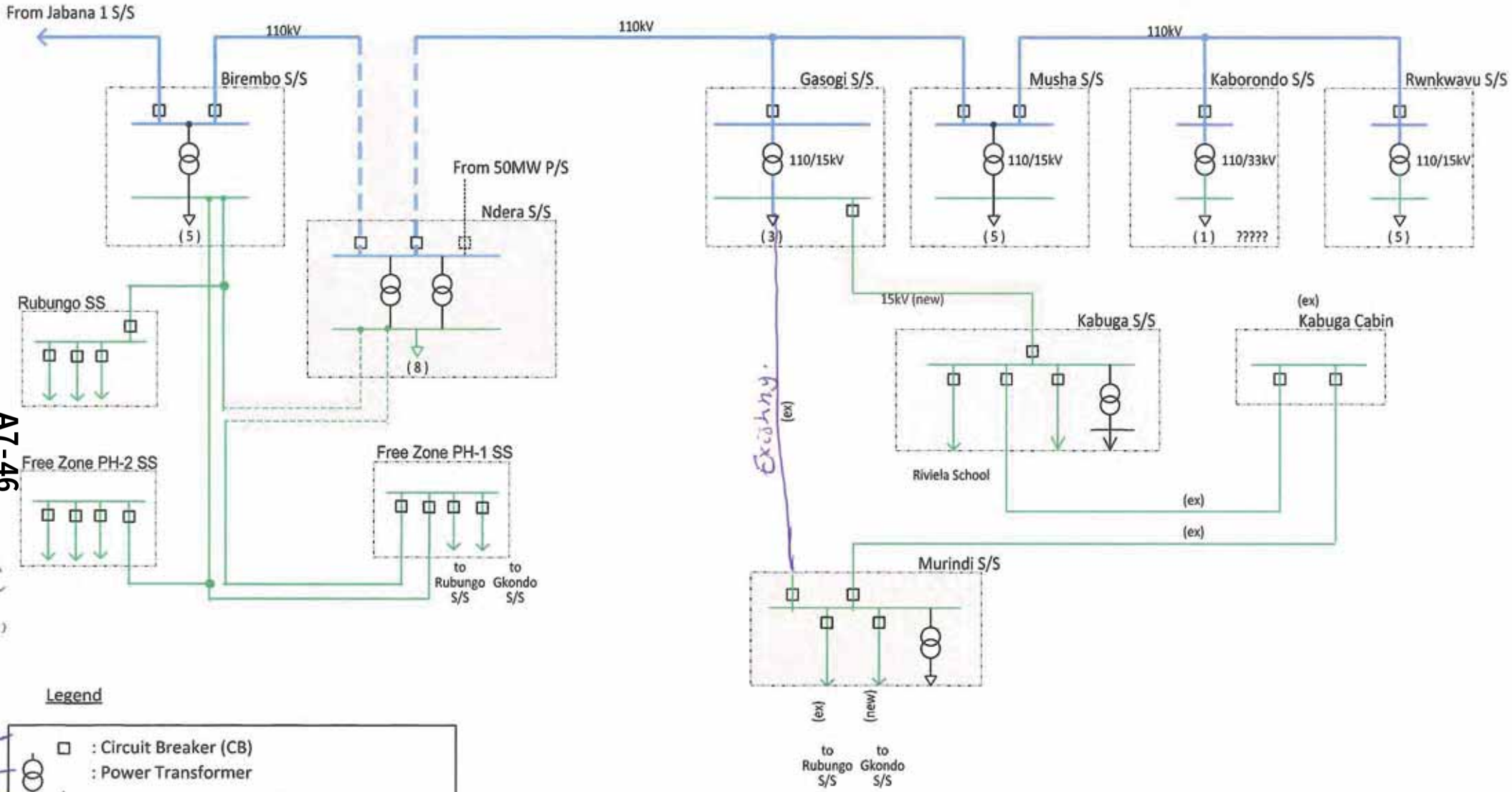
DWG No. GA-02: Project Site Map -110kV T/L, Ndera Substation, 15kV D/L Route 2 and 3-



DWG No. GA-03: Project Site Map -15kV D/L of Route 1, Kabuga and Murindi RMU stations-

DWG No. GA-04: Coordination Point of T/L and D/L (UTM: Zone 36M) by GPS

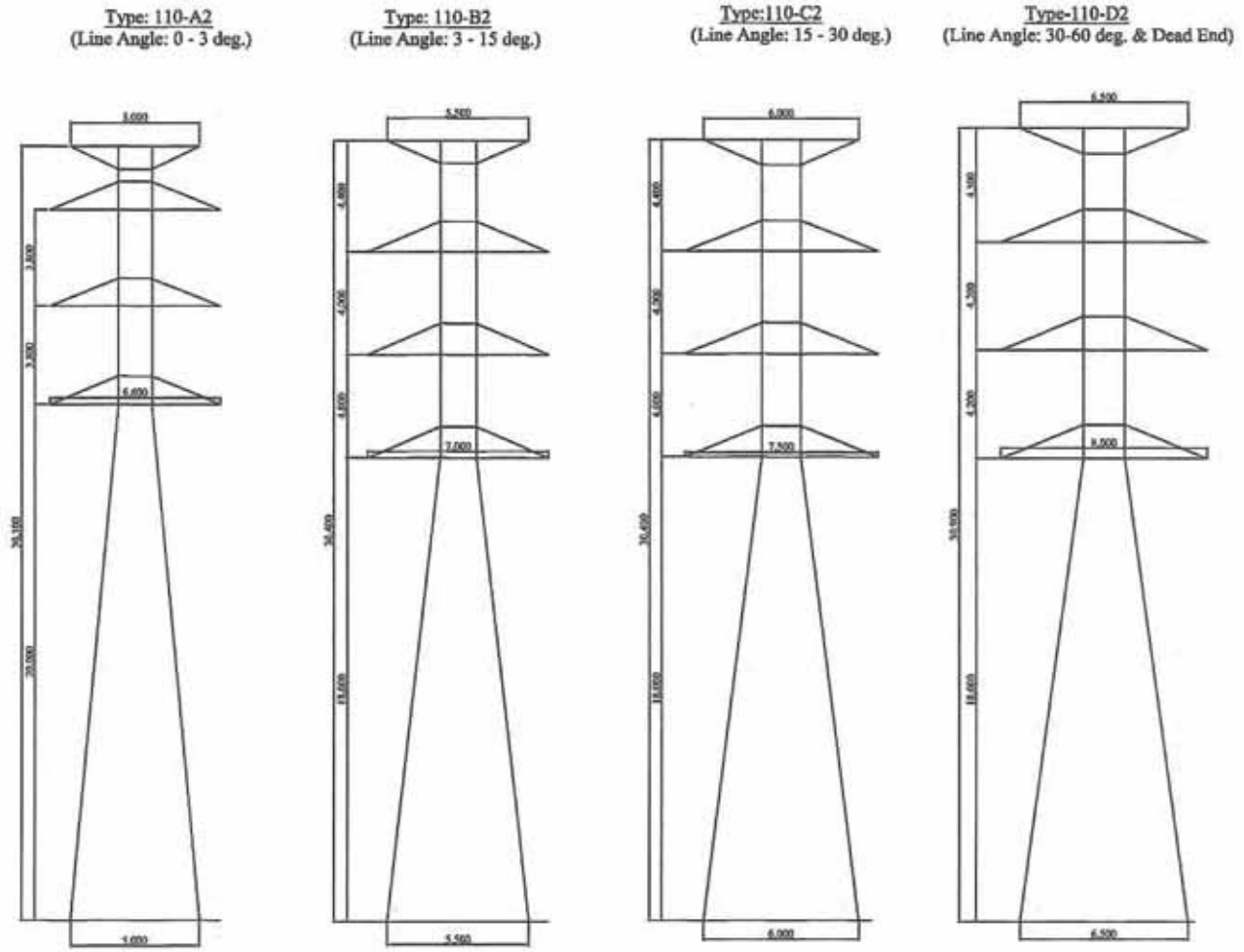
AP No.	Coordination Point		AP No.	Coordination Point		AP No.	Coordination Point	
	East	North		East	North		East	North
110kV T/L (approx. 2.2km)			15kV D/L: Route-1 (approx. 6km)			15kV D/L: Route-2 (approx. 490m)		
AP1	184120.00	9787770.00	AP1	188793.00	9787106.00	AP1	182851.00	9786243.00
AP2	184107.00	9787745.00	AP2	188870.00	9786382.00	AP2	182744.00	9786070.00
AP3	183887.00	9786949.00	AP3	188794.00	9786060.00	AP3	182637.00	9785922.00
AP4	183717.00	9786833.00	AP4	188887.00	9785586.00	AP4	183887.00	9785680.00
AP5	183437.00	9786586.00	AP5	189157.00	9785028.00			
AP6	183096.00	9786395.00	AP6	189222.00	9784795.00	15kV D/L: Route-3 (approx. 430m)		
AP7	182937.05	9786334.50	AP7	189507.00	9784262.00	AP1	182904.00	9786229.00
			AP8	189663.00	9783517.00	AP2	182900.00	9786339.00
			AP9	189973.00	9782743.00			
			AP10	190493.00	9781671.00	Kabuga RMU Station (≒ 300m2)		
			AP11	190485.00	9781439.00	at corner	190492.00	9781431.00
						Murindi RMU Station(≒80m2)		
						at corner	185371.00	9781726.00



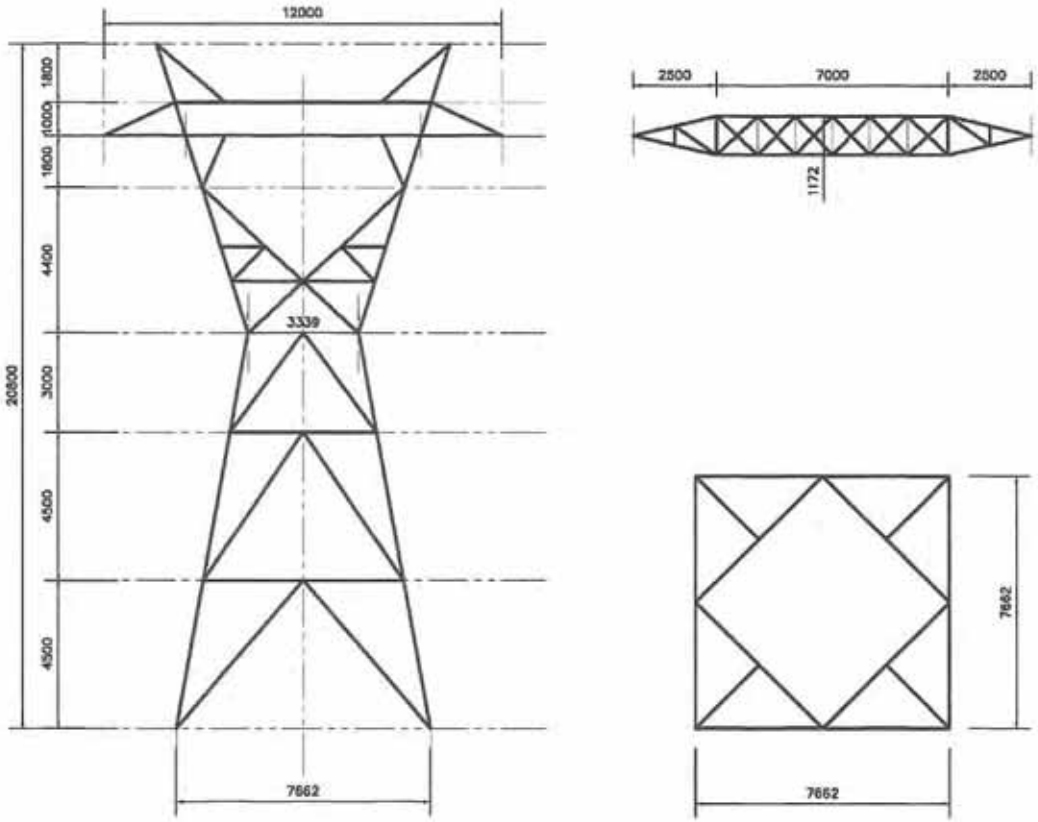
DWG No. GA-05: Project Concerned 110/15kV Network Diagram

19th March 2015

DWG No. TL01: Plan Drawing for 110kV Transmission Line



DWG No. TL-03 (1/2) : 110kV Typical Tower Type (110A2, 110B2, 110C2, 110D2 and 110E1)

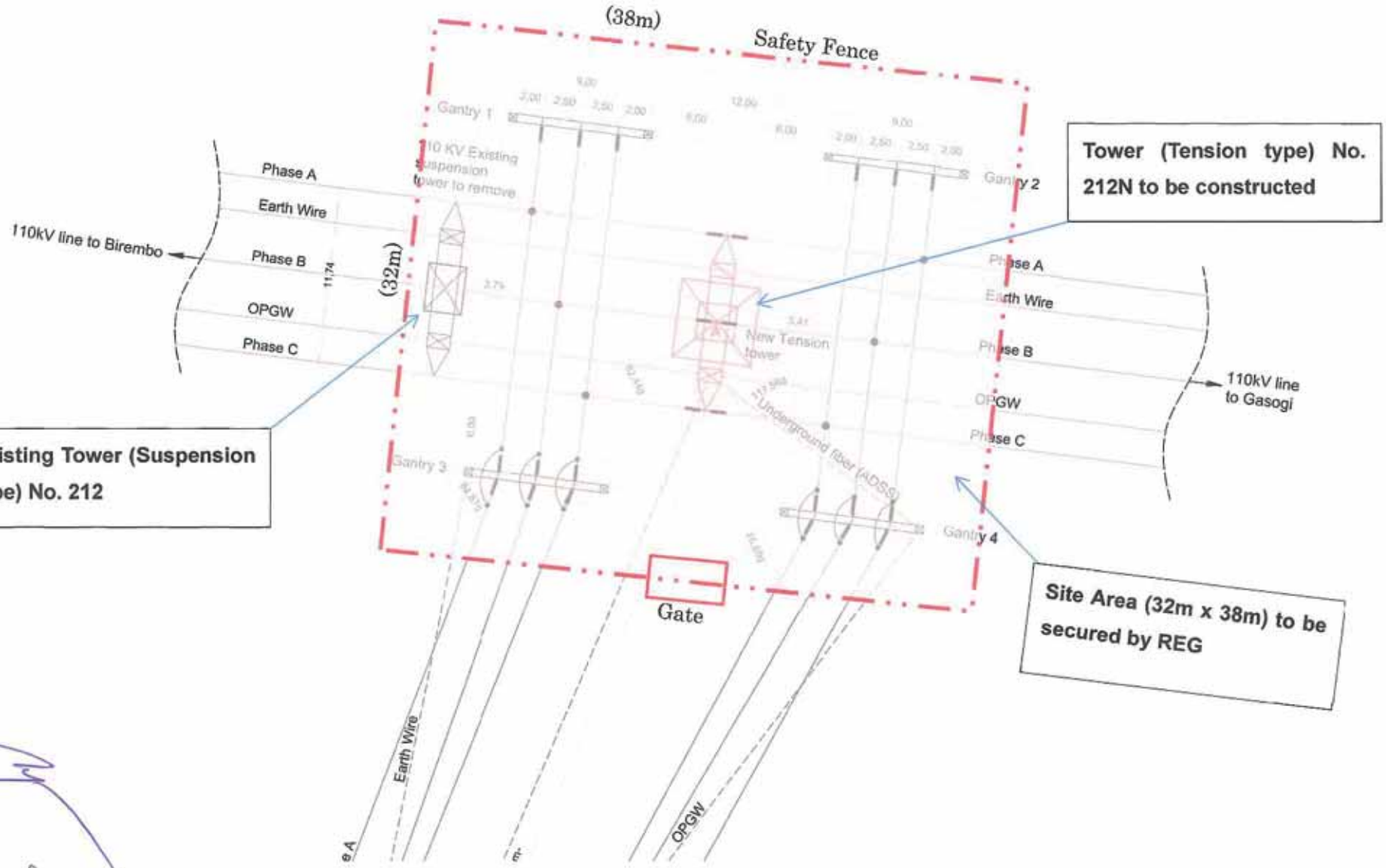


Tower Type 110E1 (110kV Tension type, Single circuit: 1cct)

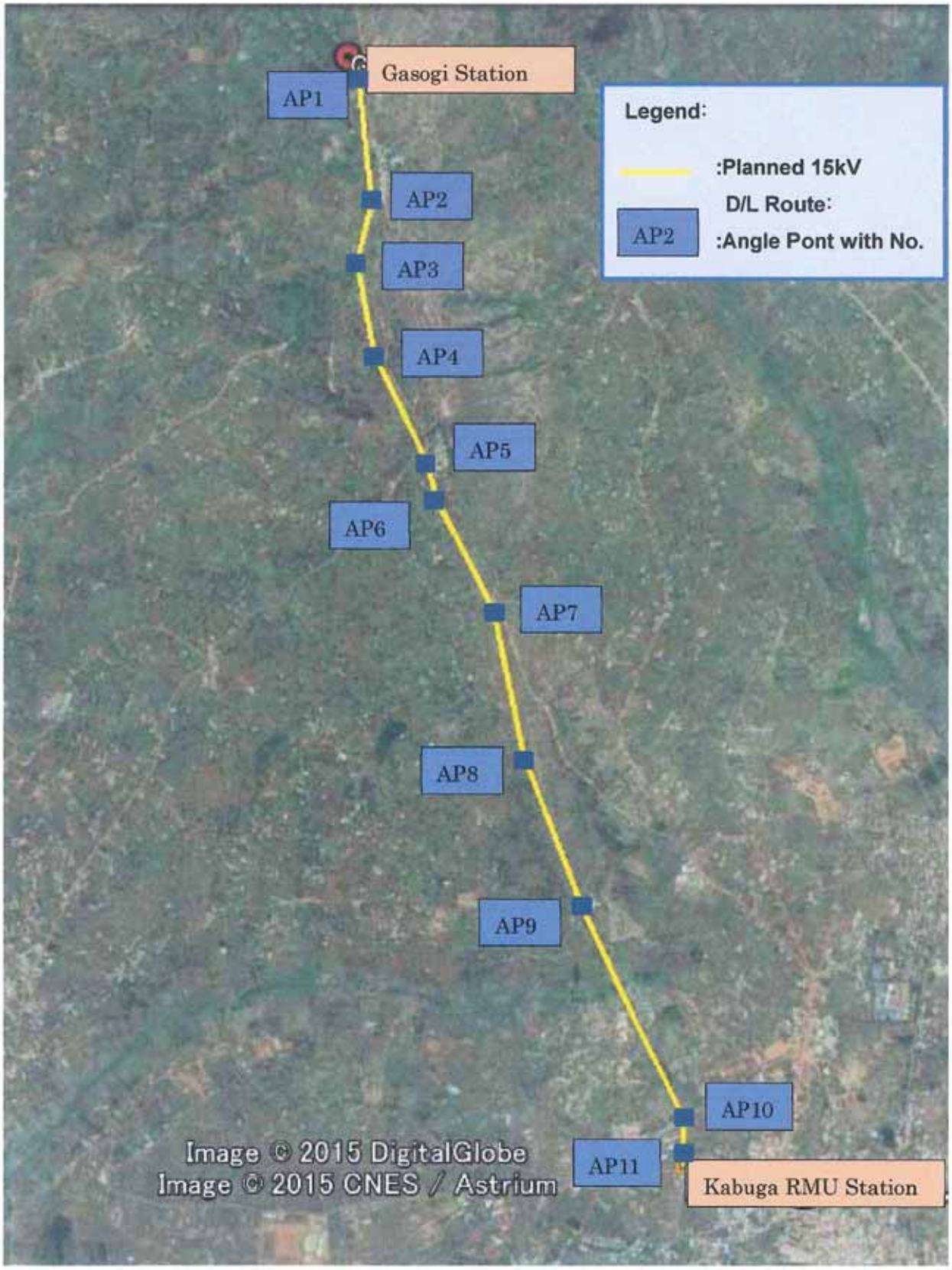
DWG No. TL-03 (2/2): 110kV Typical Tower Type (110A2, 110B2, 110C2, 110D2 & 110E1)

DWG No. TL-04: Typical Foundation Plan for 110kV T/L

110kV Tower type – 110A2 – Land Size to be Secured: 12mx12m 	110kV Tower Type – 110C2 – Land Size to be Secured: 14mx14m
110kV Tower Type – 110B2 – Land Size to be Secured: 13mx13m 	110kV Tower Type – 110D2 – Land Size to be Secured: 16mx16m



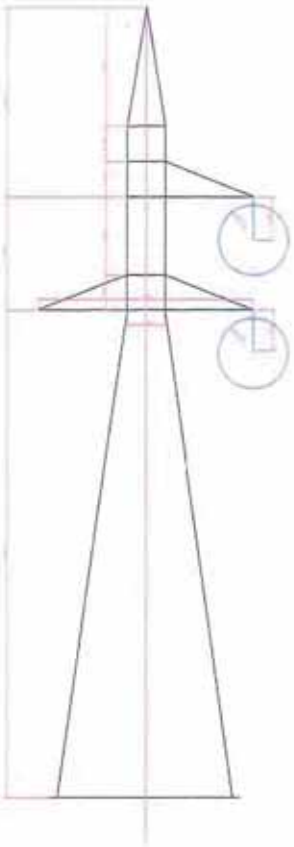
TL-05: Plan Drawing at 110kV Connection Point



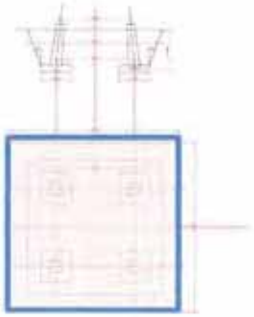
DWG No. DL11: 15kV Distribution Line Map: Route 1

(From Gasogi S/S to Kabuga RMU Station)

Type 15TB1
(Suspension Tower Type)



Type 15TD1
(Tension Tower Type)



Typical Tower Foundation Plan
(Land Area: approx. 8m x 8m)

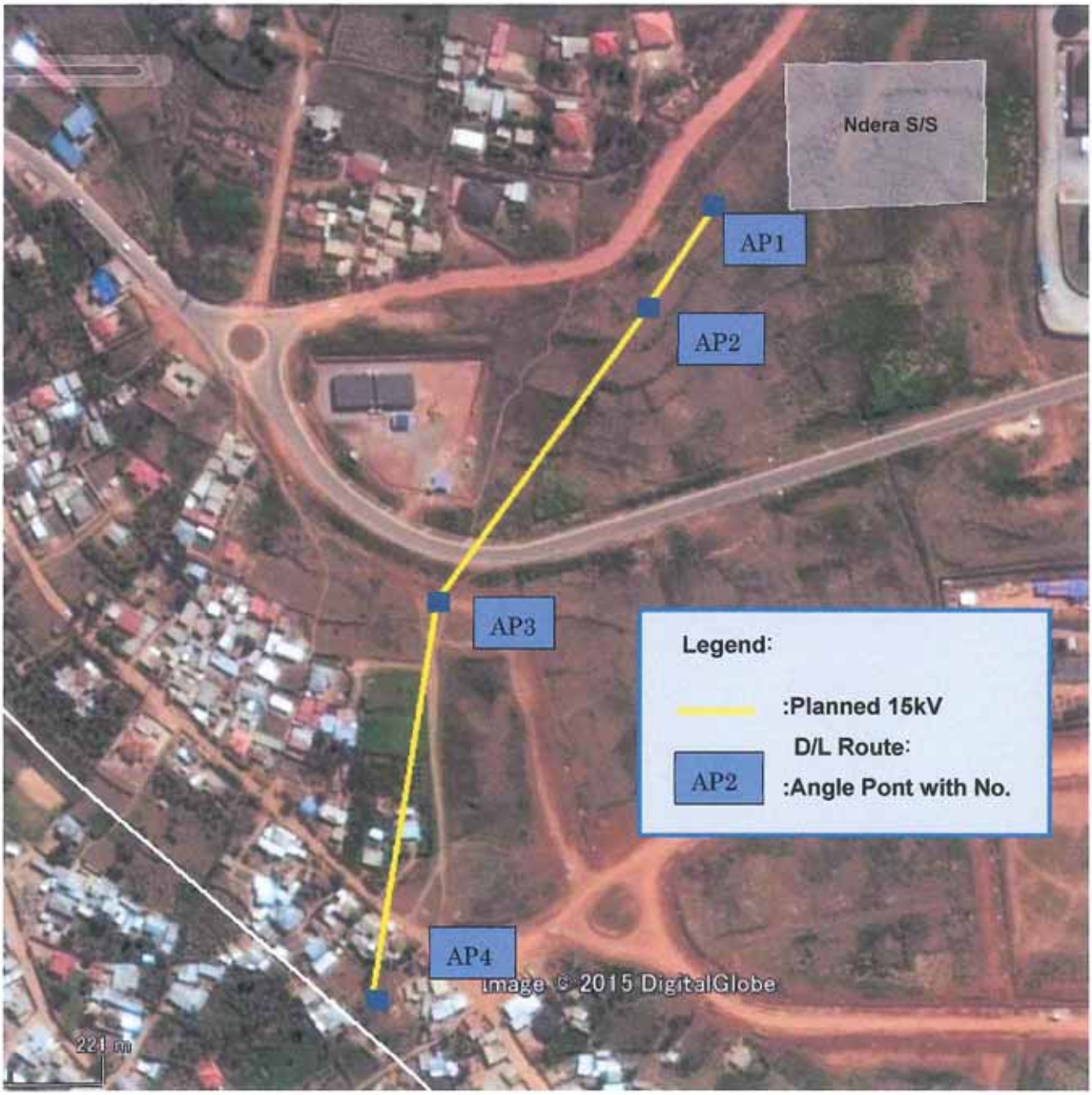
Type 15PB1
(Suspension Pole Type)

Type 15PA1
(Tension Pole Type)

Note: Land area to be secured for 15kV pole foundation: approx. 2m x 2m each

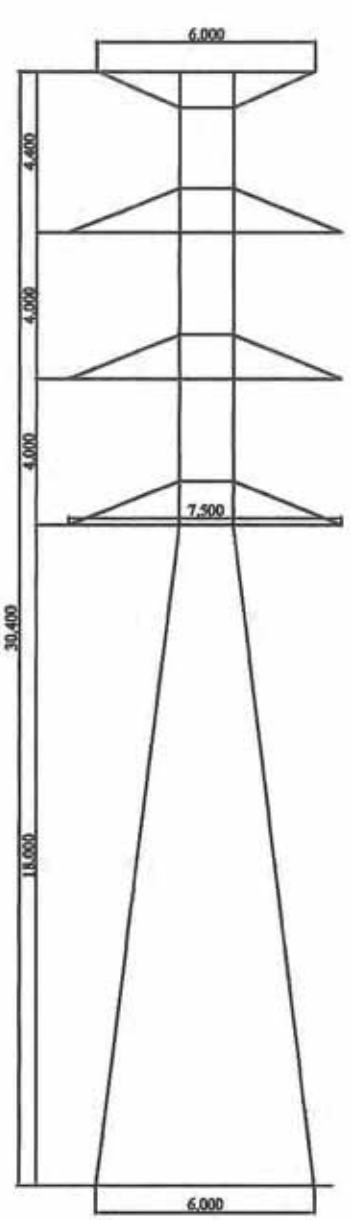
DWG No. DL12: Typical Tower/Pole Type of 15kV D/L (Single Circuit)

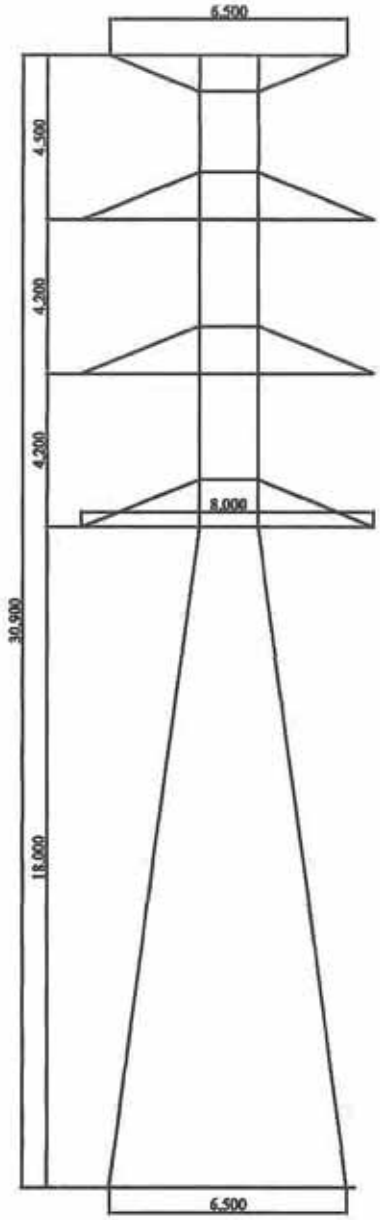
(For 15kV D/L Route 1 and 3, Single Circuit)



DWG No. DL21: 15kV Distribution Line Map: Route 2

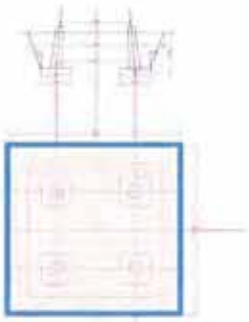
(From Ndera S/S to Existing Tower)





Type 15TB2
(For Tension type, 2 cct)

Type 15TD2
(for Tension and Dead end, 2cct)

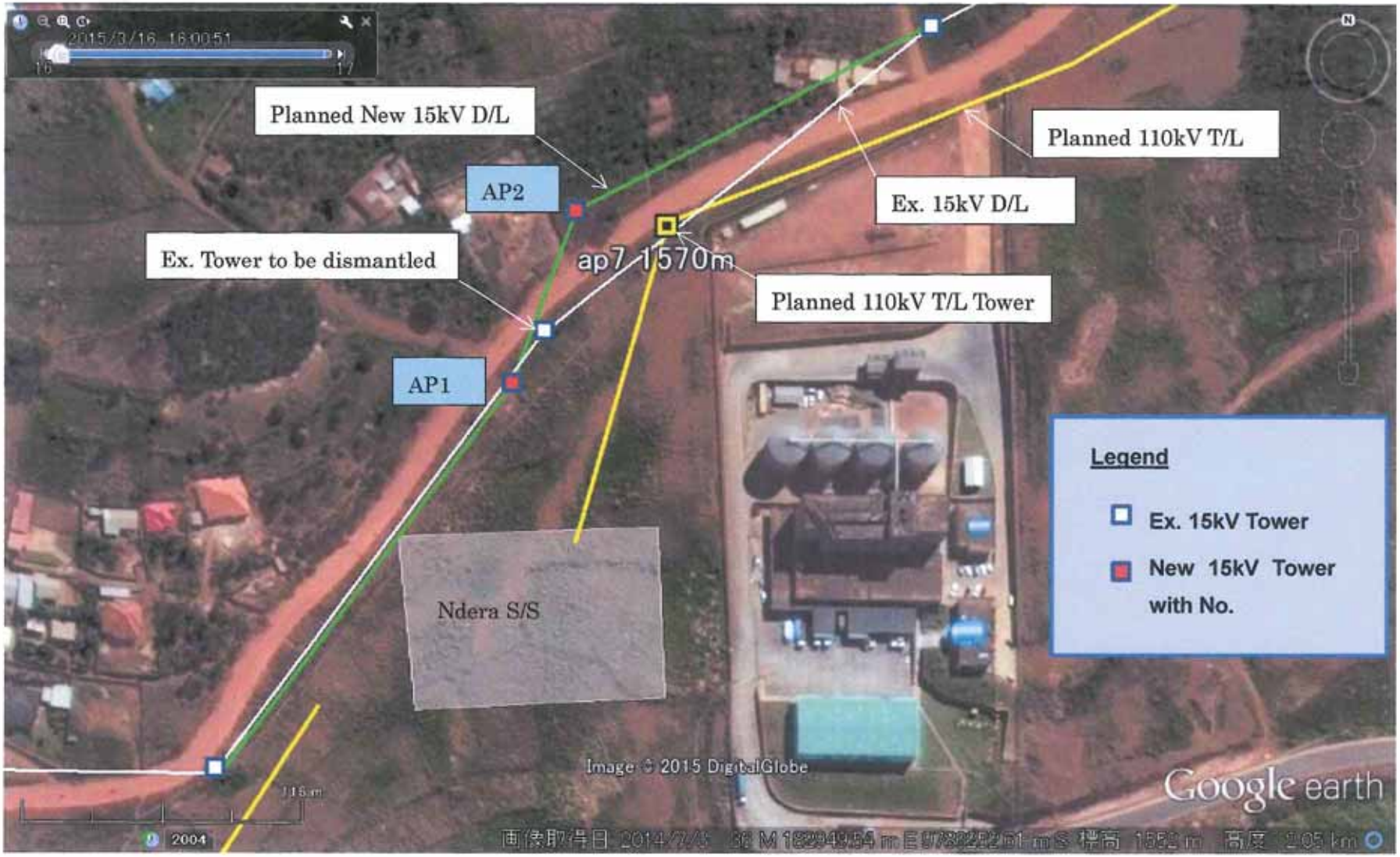


Land Area to be secured: 8m x 8m each

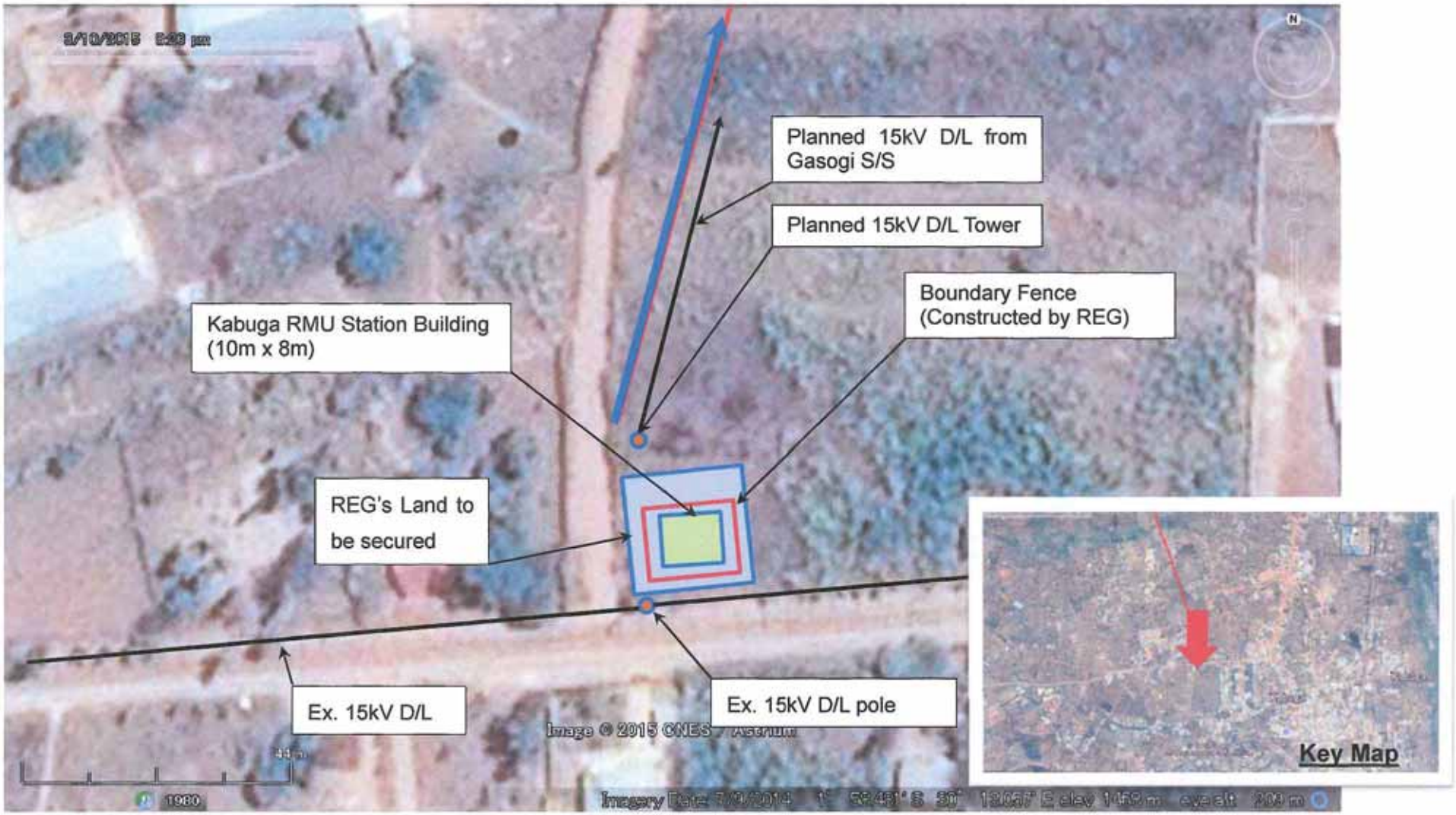
Tower Type Foundation Plan

DWG No. DL22: Typical Tower Type of 15kV D/L

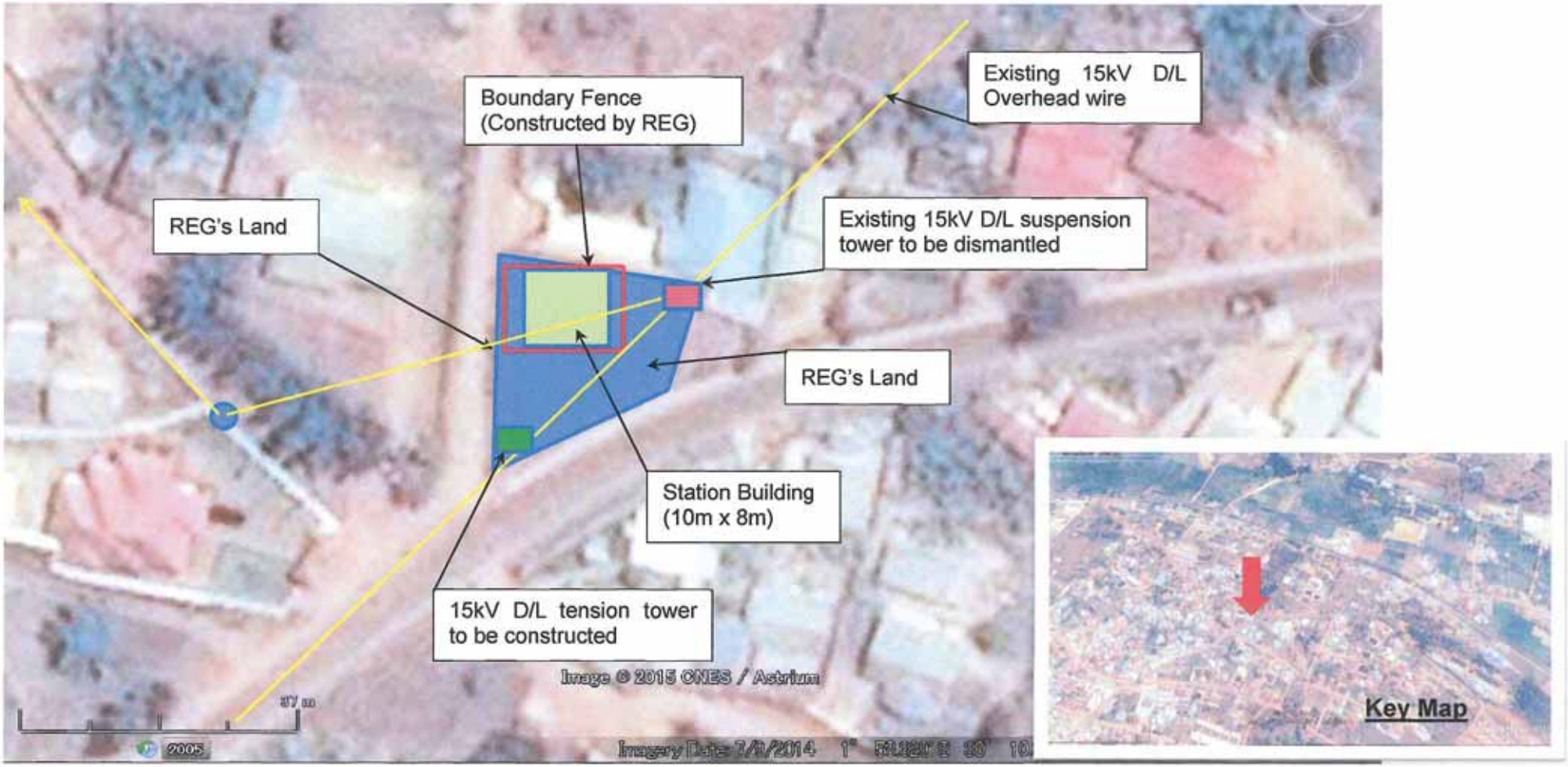
(For 15kV D/L: Route 2)



DWG No. DL-31: Reroute of existing 15kV D/L: Route-3



DWG No. RM-01: Site Layout of Kabuga RMU Station



DWG No. RM-11: Site Layout of Murindi RMU Station

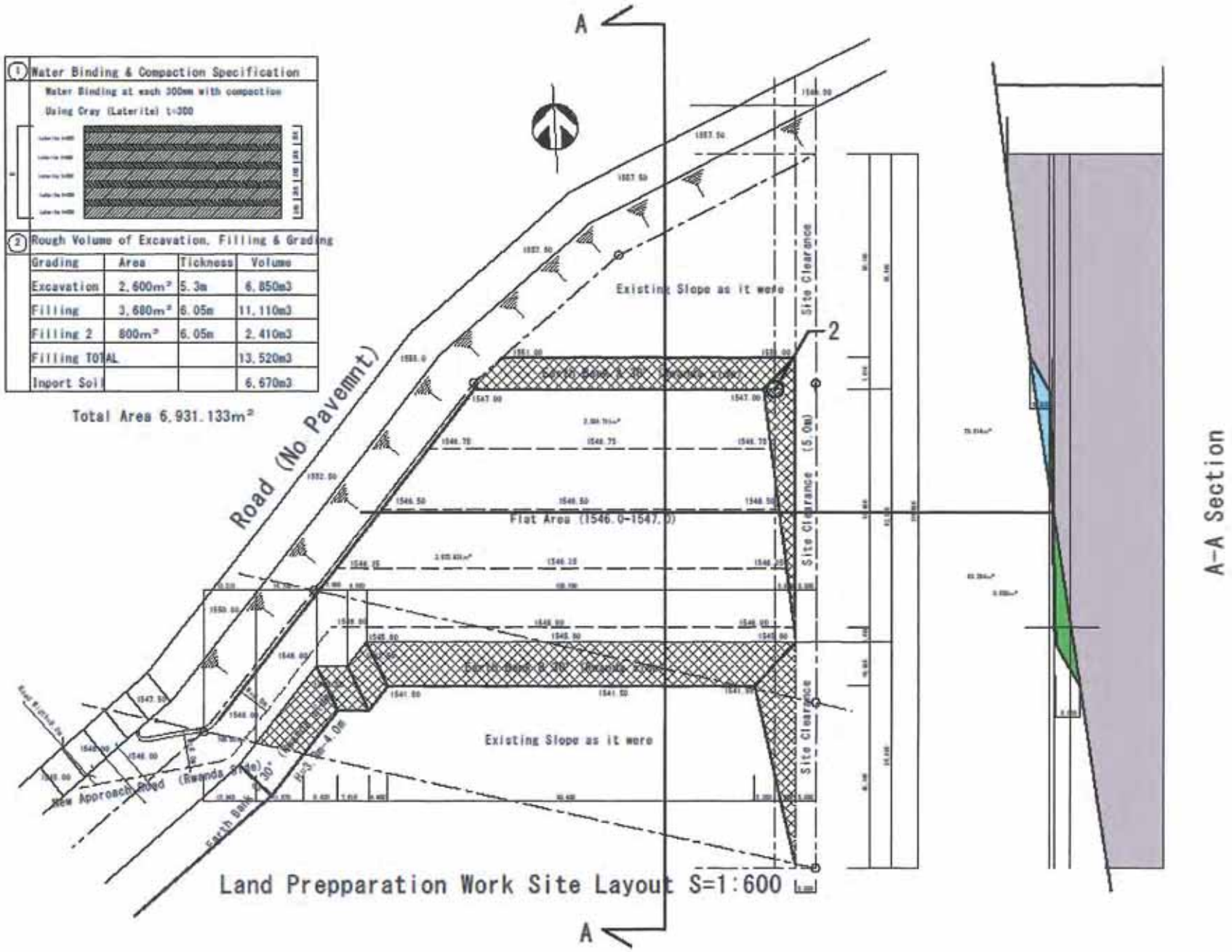
Part 3 Architectural

Drawing List

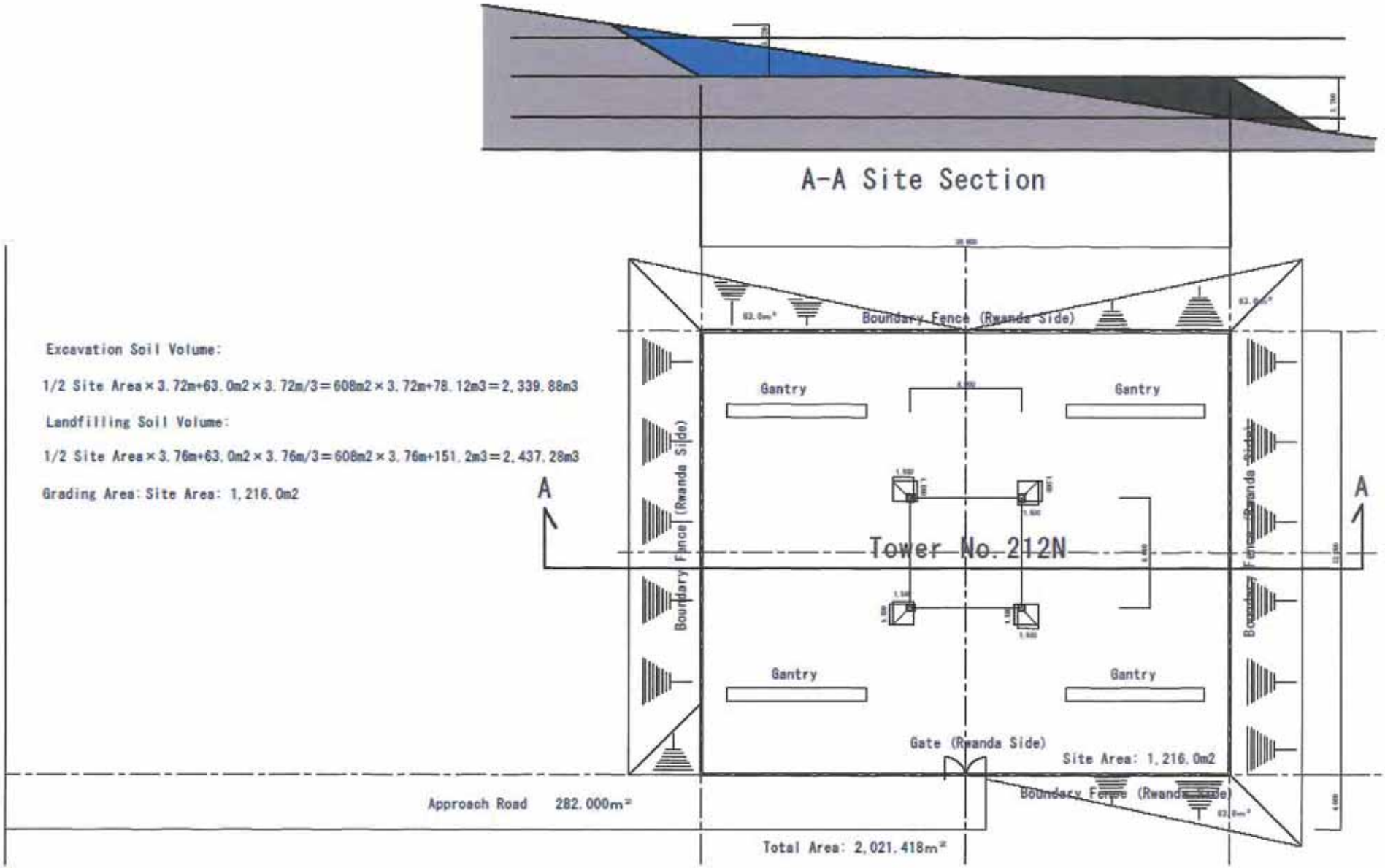
DWG No. DWG Title

Part 3 Architectural

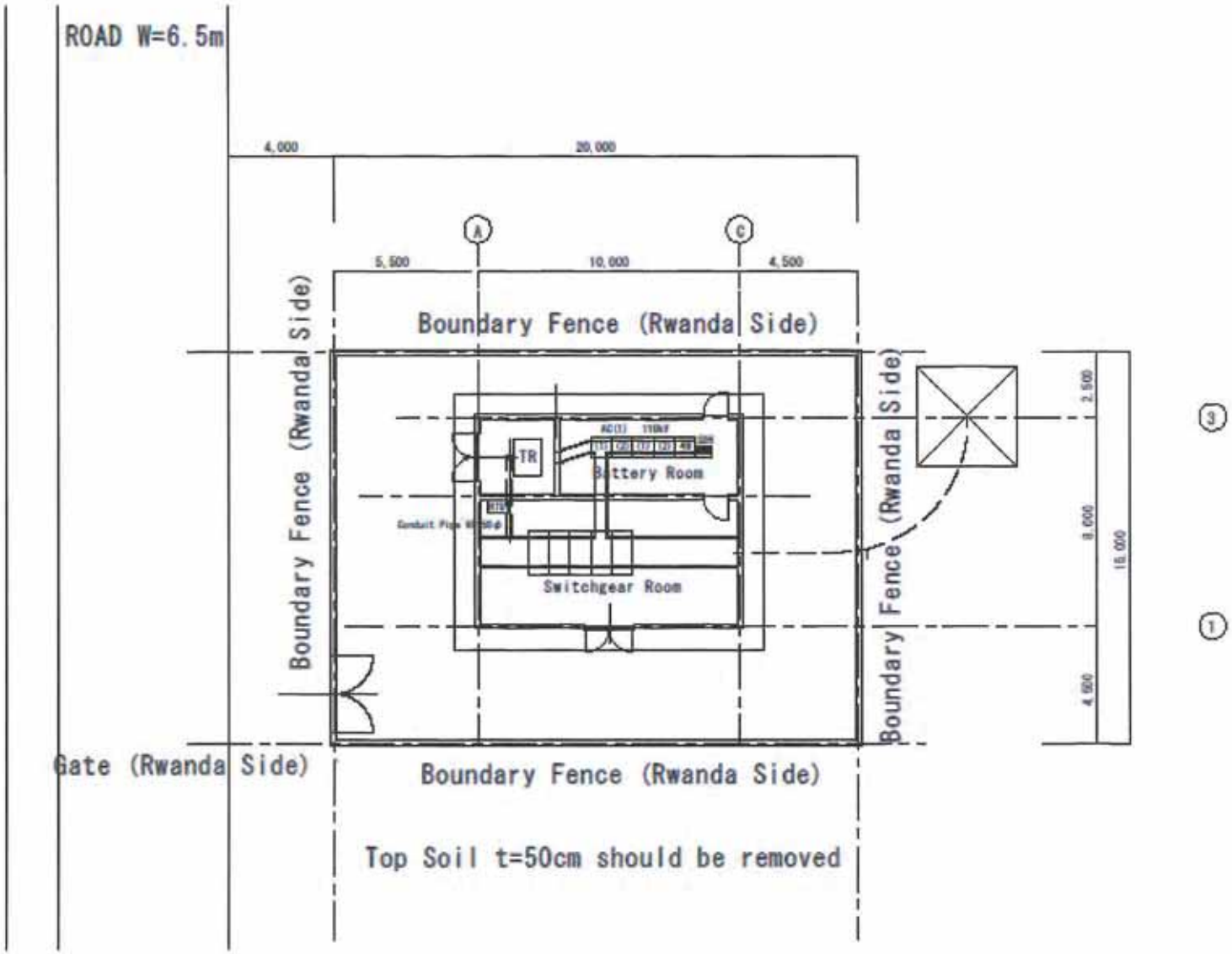
(1) A-1 Land Preparation Work of Ndera Substation
(2) A-2 Land Preparation Work of Tower No.212N
(3) A-3 Land Preparation Work of Kabuga RMU Switching Station
(4) A-4 Land Preparation Work of Murindi RMU Switching Station
(5) A-5 NDERA Substation Site Layout
(6) A-6 NDERA Substation Control Building Plan
(7) A-7 NDERA Substation Control Building Section & Elevation
(8) A-8 NDERA Substation Control Building Section Detail



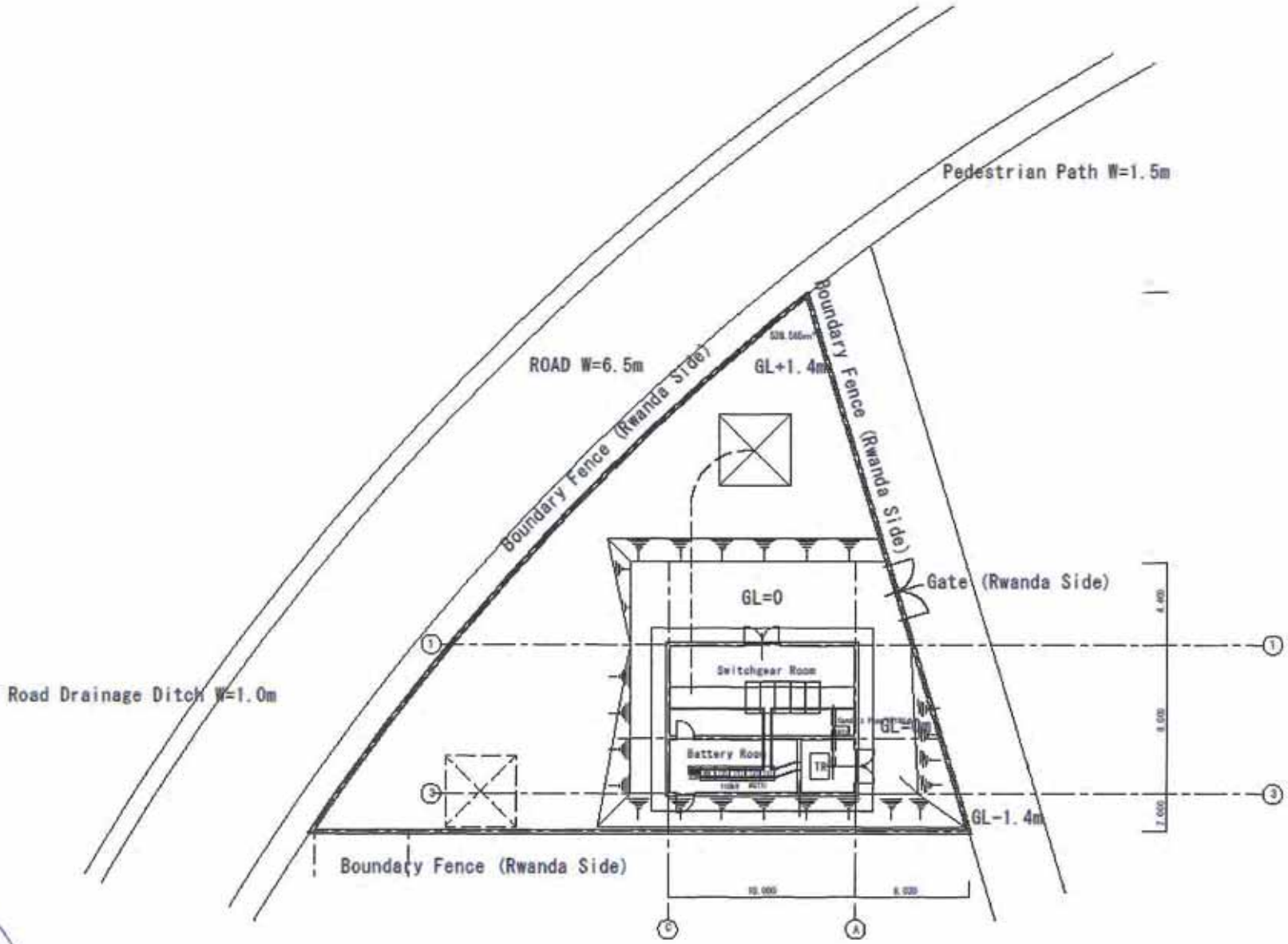
A-1 Land Preparation Work of Ndera Substation



A-2 Land Preparation Work of Tower No.212N

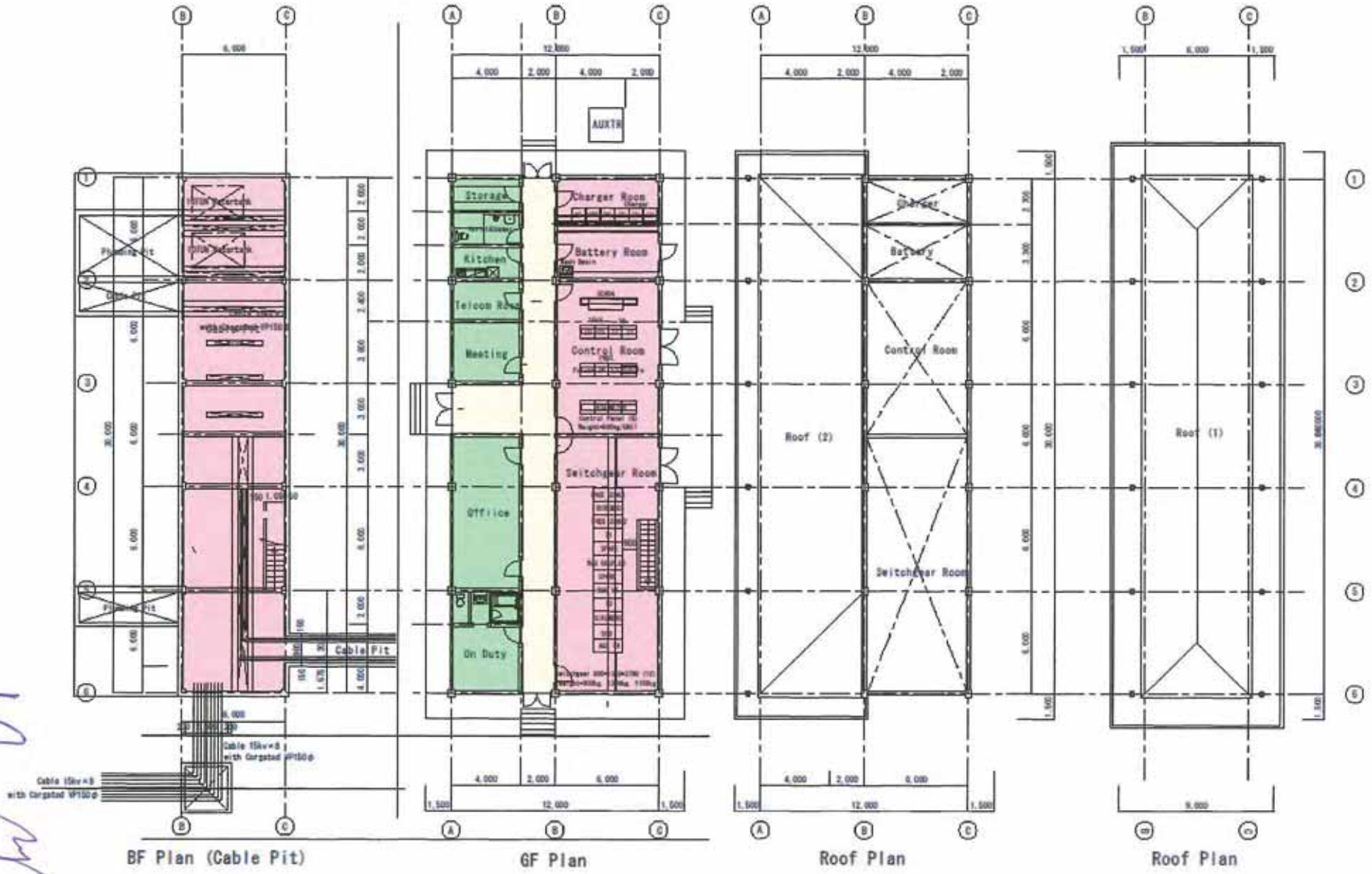


A-3 Land Preparation Work of KABUGA Ring Main Unit

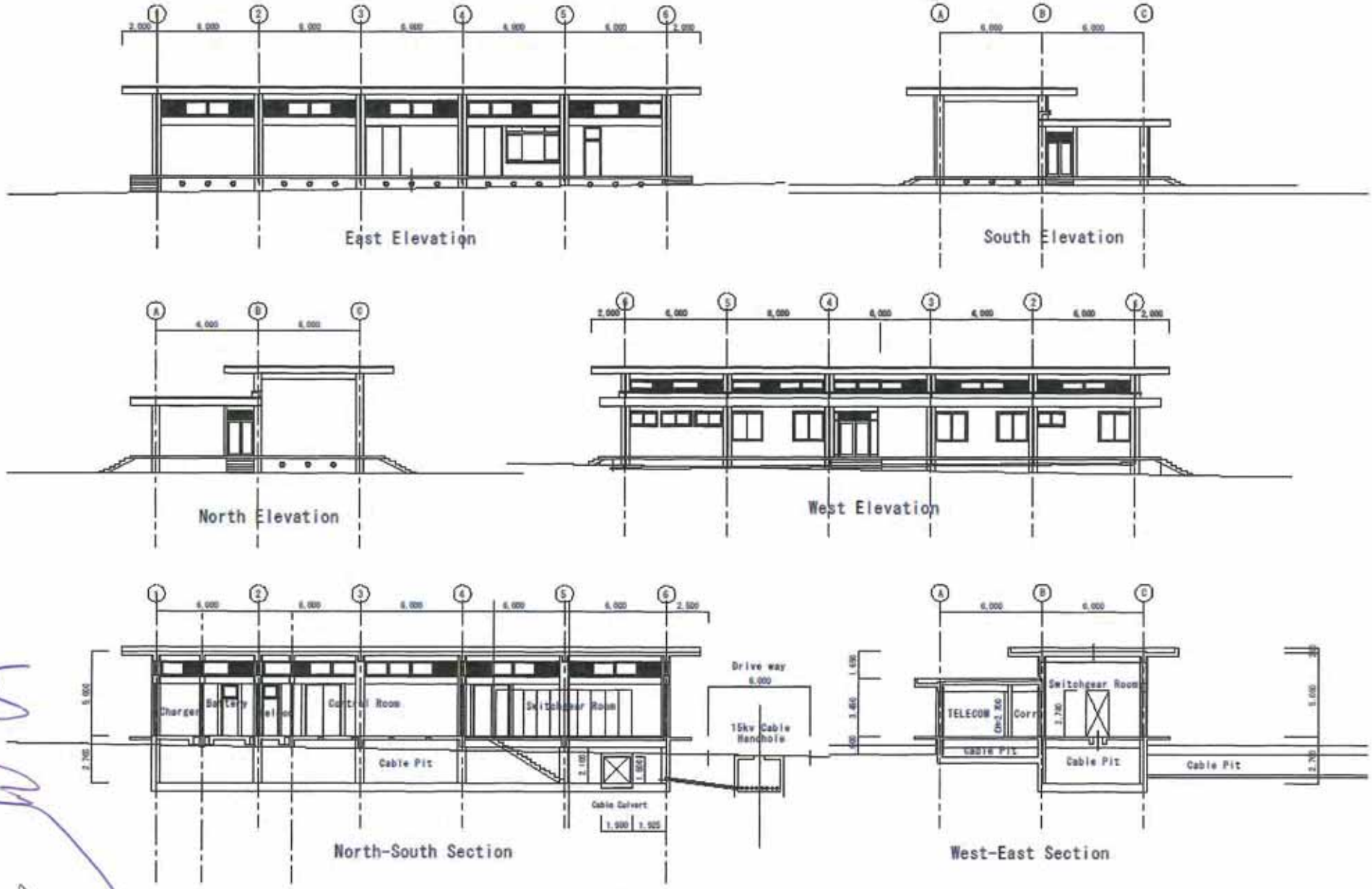


A-4 Land Preparation Work of MURINDI Ring Main Unit

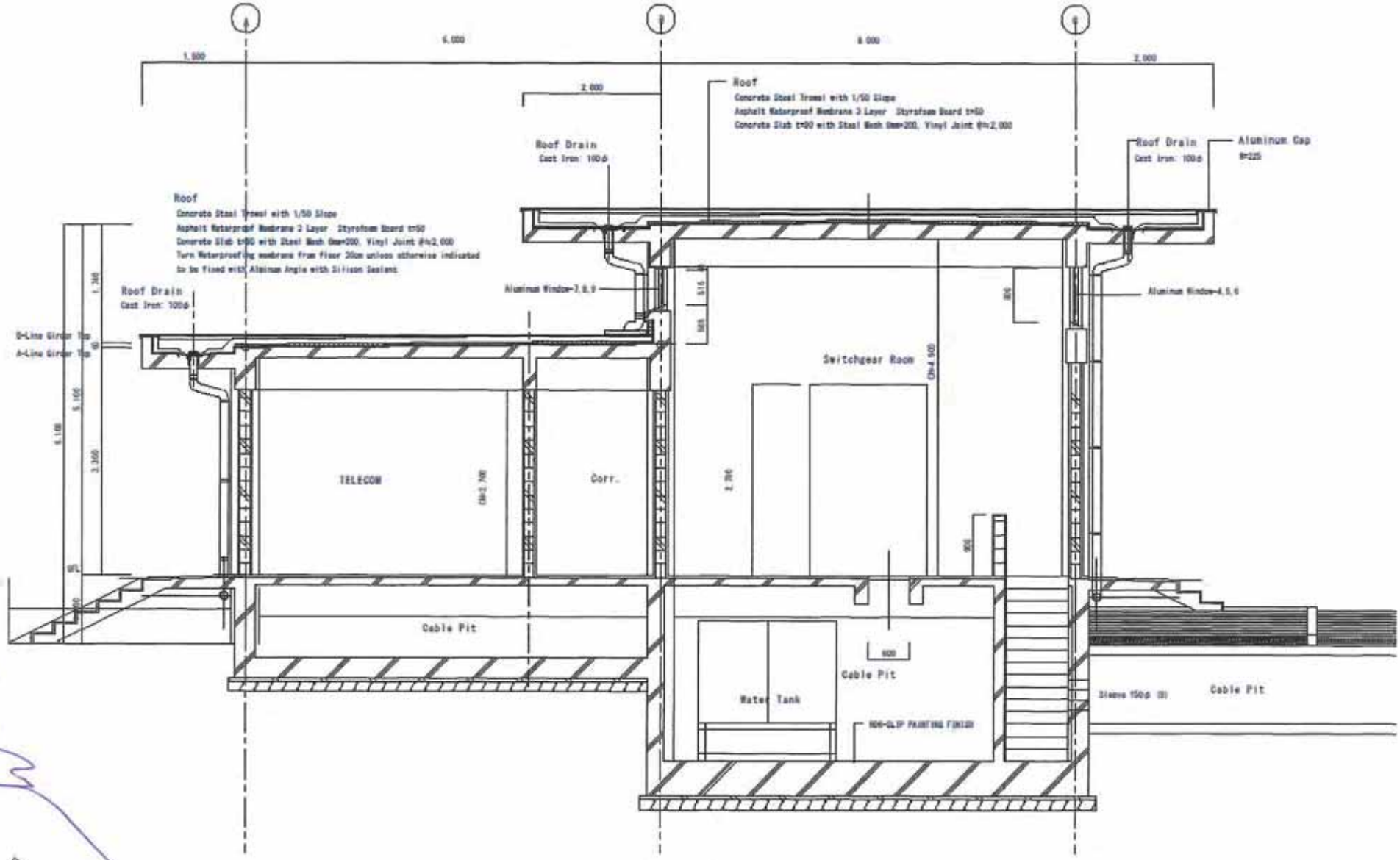
A-5 NDERA Substation SITE LAYOUT



A-6 NDERA Substation Plan



A-7 NDERA Substation Section & Elevation



A-8 NDERA Substation Section Detail

8. フィールドレポート署名に係る議事録

Minutes of Field Report Meeting

Name of the Project	The Project for Improvement of Substations and Distribution Network Phase 2
Date	31st March , 1st & 2nd April, 2015
Time	14:00 - 17:00 (GMT+2)
Venue	EUCL Gikondo Office at Gikondo Substation
Attendees	EUCL members & JICA study Team, Refer to Attendance List
Discussion Summary	All parties went over a draft of the Field Report prepared by the JICA study team; the following items are discussed in the meeting. **A: Regarding Obligations/Undertaking of the Rwanda side;** 1. The Rwanda side requested the JICA Study Team following items; (1) 15kV Power Cable: The JICA Study Tram agreed that all 15kV power cables from 15kV switchgears of the substations and switching stations shall be provided by the Japan side. Regarding the new 15kV outgoing cables for the Ndera substation, the JICA Study Team requested the Rwanda side to confirm and inform the JICA Study Team with all locations where the cables will be connecting with 15kV towers or poles, with their number and coordination points. (2) Power Stoppage Plan: The JICA Study Team will prepare a time chart of power stoppage plan for the existing lines during construction of the 110kV transmission and 15kV distribution lines. The time chart shall be ready after completing the design of the lines approximately by the end of July 2015. 2. Malfunction of the spare 15kV SWGR at the Gasogi substation; The Rwanda side informed that after repairing the malfunction of the spare, the EUCL would use it for a 15kV distribution line feeding to the international airport as double circuits therefore the spare feeder cannot be used for the Kabuga RMU switching station. The JICA Study Team and the Rwandan side agreed on the following demarcation of tasks. ① JICA Study Team shall provide one (1) set of new 15kV SWGR with necessary materials for Kabuga RMU switching station. The details including communication system and other items to be informed later. ② The Rwanda side will expand the 15kV SWGR room with cable trench before construction of the 15kV SWGR.

	[B Technical Issue] 1. Air Condition (A/C) in the Control Building at the Ndera substation The Rwanda side will internally discuss and inform the JICA Study Team whether the A/C for control building is necessary or not. 2. The width of an entrance road in Ndera substation: The Rwanda side and the JICA Study Team agreed that the width of entrance should be 5 meter, instead of 8m. 3. Confirmation of the planned110kV and 15kV line alignment to Concerned Authorities: JICA requested the Rwanda side to explain and confirm with concerned authorities regarding the planned alignment of the 110kV and 15kV lines shown in the Field Report. The Rwanda side will inform the JICA Study Team by the mid-April 2015, if the authorities have any concerns or comments. 4. Estimation Cost: The Rwanda side agreed that they estimate costs on each work item listed on the Demarcation Work Table of the Field Report and inform the JICA Study Team as soon as possible. 5. Substation The Rwanda side and the JICA Study Team agreed that the JICA Study Team confirm a license of BG-20. 6. The Connection Point of the 110kV Transmission Line with the Existing Transmission Line The Rwanda side suggested another connection method of 110kV T/L proposed by EUCL in order to minimize the site size, which is currently planned as 32m x 38m. The JICA study team has confirmed the suggested method during the site visit on 1st April and will investigate the method and inform EUCL with results as soon as possible.
Handouts	Draft of Field Report

Project for IMPROVEMENT OF SUBSTATIONS AND DISTRIBUTION NETWORK PHASE 2

Attendance List

Date: 31st March 2015 Location: Gikondo Substation

Purpose: Meeting on Field Report

No.	Name	Organization	Title	Telephone	Email
1	BUTERA Lambert	EUCL/REG	Transmission ENG	0785775879	butelam@yahoo.co.uk
2	Simon JAYARAMIYE	EUCL/REG	Transmission ENG.	0788483731	sjayaramiye@eucl.reg.rw
3	Kazungu Fredrick	REG/EUCL	Transmisson Engineer	0785563539	fkazungu@eucl.reg.rw
4	Kudo Toshiyuki	JICA Study Team	chief consultant	0784379258	fwga1013@nifty.com
5	Atsuhito Ununo	JICA Study Team	Transmission/Distribution Facility	0786370046	ununo@intl.yachiyo-eng.co.jp
6	Yasuo Horigome	〃	Facility Planning	078 636 9068	yasuo.horigome@msn.com
7	Kenji SAKEMURA	〃	Substation	078 637 0037	k-sakemura@wjec.co.jp
8	Asami KABASAWA	〃	Env & Soc Considerations	078 236 8864	asamikabasawa@gmail.com
9	Kyohei KUROHANE	〃	Construction Planning	078 236 9446	ky-kurohane@intl.yachiyo-eng.co.jp
10	BIHOZIKI William	EUCL/REG	Head of transmission	0788568426	wbihozigiti@eucl.reg.rw
11					
12					
13					

A8-3

添付資料- 9
系統解析に係るデータ

目　　次

1. 変電所への需要想定負荷の配分

変電所への需要想定負荷の配分

（単位: MW）

高ケース	2015 (1月実績)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
ギコンド変電所	25.06	37.0	41.4	25.0	27.2	29.6	32.3	35.3	38.5	42.1	46.0	50.2	54.8	59.8	65.2	71.2	77.6	84.7	92.3
ジャバナ変電所	14.45	21.4	23.6	24.4	26.5	28.9	31.5	34.4	37.6	41.1	44.8	49.0	53.5	58.3	63.7	69.5	75.8	82.6	90.1
ビレンボ変電所	6.18	9.9	11.2	11.7	12.7	13.9	15.1	16.5	18.0	19.7	21.5	23.5	25.6	28.0	30.5	33.3	36.3	39.6	43.2
ガソギ変電所	3.89	7.0	7.8	8.2	8.9	9.7	10.6	11.6	12.6	13.8	15.1	16.5	18.0	19.6	21.4	23.3	25.5	27.8	30.3
マウント･キガリ変電所(15kV)	*4.22*			*6.9*	*7.5*	*8.2*	*8.9*	*9.7*	*10.6*	*11.6*	*12.7*	*13.8*	*15.1*	*16.5*	*18.0*	*19.6*	*21.4*	*23.4*	*25.5*
マウント･キガリ変電所(30kV)	*3.06*			*8.9*	*9.7*	*10.5*	*11.5*	*12.6*	*13.7*	*15.0*	*16.4*	*17.9*	*19.5*	*21.3*	*23.2*	*25.3*	*27.6*	*30.1*	*32.9*
マウント･キガリ変電所(合計)	7.28	26.3	30.5	15.8	17.2	18.7	20.4	22.3	24.4	26.6	29.0	31.7	34.6	37.8	41.2	45.0	49.1	53.5	58.4
ンデラ変電所				9.5	10.3	11.3	12.3	13.4	14.6	16.0	17.5	19.1	20.8	22.7	24.8	27.0	29.5	32.2	35.1
ガハンガ変電所				3.8	4.1	4.5	4.9	5.4	5.9	6.4	7.0	7.6	8.3	9.1	9.9	10.8	11.8	12.9	14.0
ニャブゴゴ変電所				8.2	8.9	9.7	10.6	11.6	12.6	13.8	15.1	16.5	18.0	19.6	21.4	23.3	25.5	27.8	30.3
ルリマ変電所				15.8	17.2	18.7	20.4	22.3	24.4	26.6	29.0	31.7	34.6	37.8	41.2	45.0	49.1	53.5	58.4
中央地区負荷合計	57	102	115	122	133	145	158	173	189	206	225	246	268	293	319	348	380	415	452
ムシャ変電所	2.6	18.0	20.5	18.2	19.5	21.2	23.2	25.2	27.4	29.7	32.2	35.0	37.9	41.0	44.5	48.1	52.1	56.5	61.2
＋ガラマ変電所負荷				4.1	4.4	4.8	5.2	5.7	6.2	6.7	7.3	7.9	8.5	9.2	10.0	10.8	11.7	12.7	13.8
カバロンド変電所	4.924	7.8	9.1	9.5	10.2	11.1	12.1	13.2	14.3	15.5	16.8	18.2	19.8	21.4	23.2	25.1	27.2	29.5	31.9
ルウィンクワブ変電所	0.427	1.8	2.5	2.8	3.0	3.3	3.6	3.9	4.2	4.6	5.0	5.4	5.8	6.3	6.8	7.4	8.0	8.7	9.4
＋キレヘ変電所負荷				2.8	3.0	3.3	3.6	3.9	4.2	4.6	5.0	5.4	5.8	6.3	6.8	7.4	8.0	8.7	9.4
東地区負荷合計		28	32	37	40	44	48	52	56	61	66	72	78	84	91	99	107	116	126

（単位: MW）

中ケース	2015 (1月実績)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
ギコンド変電所	25.06	32.2	35.7	21.4	23.4	25.6	28.0	30.7	33.6	36.8	40.3	44.0	48.1	52.5	57.2	62.4	68.0	74.0	80.6
ジャバナ変電所	14.45	18.6	20.3	20.8	22.8	25.0	27.4	30.0	32.8	35.9	39.3	42.9	46.9	51.2	55.9	60.9	66.3	72.3	78.6
ビレンボ変電所	6.18	8.6	9.7	10.0	10.9	12.0	13.1	14.4	15.7	17.2	18.8	20.6	22.5	24.6	26.8	29.2	31.8	34.6	37.7
ガソギ変電所	3.89	6.1	6.7	7.0	7.7	8.4	9.2	10.1	11.0	12.1	13.2	14.4	15.8	17.2	18.8	20.5	22.3	24.3	26.4
マウント･キガリ変電所(15kV)	*4.22*			*5.9*	*6.5*	*7.1*	*7.7*	*8.5*	*9.3*	*10.2*	*11.1*	*12.1*	*13.3*	*14.5*	*15.8*	*17.2*	*18.8*	*20.4*	*22.2*
マウント･キガリ変電所(30kV)	*3.06*			*7.6*	*8.3*	*9.1*	*10.0*	*10.9*	*12.0*	*13.1*	*14.3*	*15.7*	*17.1*	*18.7*	*20.4*	*22.2*	*24.2*	*26.4*	*28.7*
マウント･キガリ変電所(合計)	7.28	22.9	26.3	13.5	14.8	16.2	17.7	19.4	21.2	23.3	25.4	27.8	30.4	33.2	36.2	39.4	43.0	46.8	50.9
ンデラ変電所				8.1	8.9	9.7	10.7	11.7	12.8	14.0	15.3	16.7	18.3	19.9	21.7	23.7	25.8	28.1	30.6
ガハンガ変電所				3.2	3.6	3.9	4.3	4.7	5.1	5.6	6.1	6.7	7.3	8.0	8.7	9.5	10.3	11.3	12.2
ニャブゴゴ変電所				7.0	7.7	8.4	9.2	10.1	11.0	12.1	13.2	14.4	15.8	17.2	18.8	20.5	22.3	24.3	26.4
ルリマ変電所				13.5	14.8	16.2	17.7	19.4	21.2	23.3	25.4	27.8	30.4	33.2	36.2	39.4	43.0	46.8	50.9
中央地区負荷合計	57	89	99	105	114	125	137	150	165	180	197	215	235	257	280	305	333	362	394
ムシャ変電所	2.6	15.7	17.7	15.6	16.8	18.4	20.1	21.9	23.9	26.0	28.2	30.6	33.2	36.0	39.0	42.2	45.7	49.4	53.4
＋ガラマ変電所負荷				3.5	3.8	4.1	4.5	4.9	5.4	5.9	6.4	6.9	7.5	8.1	8.8	9.5	10.3	11.1	12.0
カバロンド変電所	4.924	6.8	7.8	8.1	8.7	9.6	10.5	11.4	12.5	13.6	14.7	16.0	17.3	18.8	20.4	22.0	23.8	25.8	27.9
ルウィンクワブ変電所	0.427	1.6	2.2	2.4	2.6	2.8	3.1	3.4	3.7	4.0	4.3	4.7	5.1	5.5	6.0	6.5	7.0	7.6	8.2
＋キレヘ変電所負荷				2.4	2.6	2.8	3.1	3.4	3.7	4.0	4.3	4.7	5.1	5.5	6.0	6.5	7.0	7.6	8.2
東地区負荷合計		24	28	31	34	38	41	45	49	53	58	63	68	74	80	87	94	101	110

（単位: MW）

低ケース	2015 (1月実績)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
ギコンド変電所	25.06	25.6	27.8	16.5	18.4	20.4	22.6	25.0	27.6	30.5	33.6	36.9	40.5	44.5	48.7	53.2	58.1	63.4	69.1
ジャバナ変電所	14.45	14.8	15.9	16.1	17.9	19.9	22.0	24.4	26.9	29.7	32.8	36.0	39.6	43.4	47.5	51.9	56.7	61.9	67.5
ビレンボ変電所	6.18	6.8	7.5	7.7	8.6	9.5	10.6	11.7	12.9	14.3	15.7	17.3	19.0	20.8	22.8	24.9	27.2	29.7	32.4
ガソギ変電所	3.89	4.8	5.2	5.4	6.0	6.7	7.4	8.2	9.1	10.0	11.0	12.1	13.3	14.6	16.0	17.5	19.1	20.8	22.7
マウント･キガリ変電所(15kV)	*4.22*			*4.6*	*5.1*	*5.6*	*6.2*	*6.9*	*7.6*	*8.4*	*9.3*	*10.2*	*11.2*	*12.3*	*13.4*	*14.7*	*16.0*	*17.5*	*19.1*
マウント･キガリ変電所(30kV)	*3.06*			*5.9*	*6.5*	*7.3*	*8.0*	*8.9*	*9.8*	*10.8*	*12.0*	*13.1*	*14.4*	*15.8*	*17.3*	*18.9*	*20.7*	*22.6*	*24.6*
マウント･キガリ変電所(合計)	7.28	18.2	20.5	10.4	11.6	12.9	14.3	15.8	17.5	19.3	21.2	23.3	25.6	28.1	30.8	33.6	36.7	40.1	43.7
ンデラ変電所				6.3	7.0	7.7	8.6	9.5	10.5	11.6	12.8	14.0	15.4	16.9	18.5	20.2	22.1	24.1	26.3
ガハンガ変電所				2.5	2.8	3.1	3.4	3.8	4.2	4.6	5.1	5.6	6.2	6.8	7.4	8.1	8.8	9.6	10.5
ニャブゴゴ変電所				5.4	6.0	6.7	7.4	8.2	9.1	10.0	11.0	12.1	13.3	14.6	16.0	17.5	19.1	20.8	22.7
ルリマ変電所				10.4	11.6	12.9	14.3	15.8	17.5	19.3	21.2	23.3	25.6	28.1	30.8	33.6	36.7	40.1	43.7
中央地区負荷合計	57	70	77	81	90	100	111	122	135	149	164	181	199	218	238	261	285	311	338
ムシャ変電所	2.6	12.5	13.8	12.1	13.2	14.6	16.2	17.8	19.6	21.5	23.6	25.7	28.0	30.5	33.2	36.0	39.0	42.3	45.8
＋ガラマ変電所負荷				2.7	3.0	3.3	3.6	4.0	4.4	4.8	5.3	5.8	6.3	6.9	7.5	8.1	8.8	9.5	10.3
カバロンド変電所	4.924	5.4	6.1	6.3	6.9	7.6	8.4	9.3	10.2	11.2	12.3	13.4	14.6	15.9	17.3	18.8	20.4	22.1	23.9
ルウィンクワブ変電所	0.427	1.2	1.7	1.9	2.0	2.2	2.5	2.7	3.0	3.3	3.6	4.0	4.3	4.7	5.1	5.5	6.0	6.5	7.0
＋キレヘ変電所負荷				1.9	2.0	2.2	2.5	2.7	3.0	3.3	3.6	4.0	4.3	4.7	5.1	5.5	6.0	6.5	7.0
東地区負荷合計		19	22	24	27	30	33	37	40	44	48	53	58	63	68	74	80	87	94

2. 潮流計算報告書

1) 2018 年断面（詳細）

Electrical Transient Analyzer Program

Load Flow Analysis

Loading Category (1): Design

Generation Category (1): Grid Balance

Load Diversity Factor: None

	Swing	V-Control	Load	Total
Number of Buses:	1	11	68	80

	XFMR2	XFMR3	Reactor	Line/Cable	Impedance	Tie PD	Total
Number of Branches:	30	0	0	17	0	42	89

Method of Solution:	Newton-Raphson Method
Maximum No. of Iteration:	9999
Precision of Solution:	0.0001000
System Frequency:	50.00 Hz
Unit System:	Metric
Project Filename:	Rwanda-Imp SSs Ph 2
Output Filename:	C:\Users\3010\Documents\ SugarSync Business\ 2 \Rwanda ETAP Project File\R-LF-2018 w HFO.lfr

Adjustments

Tolerance	Apply Adjustments	Individual /Global	Percent
Transformer Impedance:	Yes	Individual	
Reactor Impedance:	Yes	Individual	
Overload Heater Resistance:	No		
Transmission Line Length:	No		
Cable Length:	No		

Temperature Correction	Apply Adjustments	Individual /Global	Degree C
Transmission Line Resistance:	Yes	Individual	
Cable Resistance:	Yes	Individual	

Bus Input Data

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
10-Kba/Msh/Rwi-B	110.000	1	100.0	0.0								
B-1-Jb1-Jb3-1	15.000	1	100.0	0.0								
B-1-Jb1-Jb3-2	15.000	1	100.0	0.0								
B-10-Bre-Gso-1	110.000	1	100.0	0.0								
B-10-Bre-Jb1-1	110.000	1	100.0	0.0								
B-10-Bre-Jb1-2	110.000	1	100.0	0.0								
B-10-Bre-Nde-2	110.000	1	100.0	0.0								
B-10-Bre-Sha-1D	110.000	1	100.0	0.0								
B-10-Bre-Sha-1DT-F	110.000	1	100.0	0.0								
B-10-Bre-Sha-2D	110.000	1	100.0	0.0								
B-10-Bre-Sha-2DT-F	110.000	1	100.0	0.0								
B-10-Gha-MKi-1	110.000	1	100.0	0.0								
B-10-Gha-MKi-2	110.000	1	100.0	0.0								
B-10-Gko-Jb1-1	110.000	1	100.0	0.0								
B-10-Gko-Jb1-2	110.000	1	100.0	0.0								
B-10-Gko-MKi-1	110.000	1	100.0	0.0								
B-10-Gko-MKi-2	110.000	1	100.0	0.0								
B-10-Gso-Msh-1	110.000	1	100.0	0.0								
B-10-Gso-Msh-2	110.000	1	100.0	0.0								
B-10-Gso-Nde-1	110.000	1	100.0	0.0								
B-10-Gso-Nde-2	110.000	1	100.0	0.0								
B-10-Jb-Grid-1	110.000	1	100.0	0.0								
B-10-Jb1-Jb2-1	110.000	1	100.0	0.0								
B-10-Jb1-Jb2-2	110.000	1	100.0	0.0								
B-10-Jb1-Nbg-1	110.000	1	100.0	0.0								
B-10-Jb1-Nbg-2	110.000	1	100.0	0.0								
B-10-Kba-Msh-2	110.000	1	100.0	0.0								
B-10-Kba-Rwi-2	110.000	1	100.0	0.0								
B-10-Mki-Grid-1	110.000	1	100.0	0.0								
B-10-MKi-Nbg-1	110.000	1	100.0	0.0								
B-10-MKi-Nbg-2	110.000	1	100.0	0.0								
B-20-Sha-Grid-1	220.000	1	100.0	0.0								
Bre-1-B-1	15.000	1	100.0	0.0	1.755	0.577	9.945	3.269				
Bre-10-B-1	110.000	1	100.0	0.0								
C-BN	110.000	1	100.0	0.0								
C-GN	110.000	1	100.0	0.0								

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
C-Kab-3-B	30.000	1	100.0	0.0								
C-Msh-1-B	15.000	1	100.0	0.0								
C-Rwi-B-1	15.000	1	100.0	0.0								
G-Jb2-10-B	110.000	1	100.0	0.0								
G-Jb3-1-B	15.000	1	100.0	0.0								
G-Kse-1-B2	110.000	1	100.0	0.0								
Gha-1-B-1	15.000	1	100.0	0.0	0.570	0.187	3.230	1.062				
Gha-10-B-1	110.000	1	100.0	0.0								
Gko-1-B-1	15.000	1	100.0	0.0	5.000	1.643	20.000	6.574				
Gko-10-B-1	110.000	1	100.0	0.0								
Gso-1-B-1	15.000	1	100.0	0.0	1.230	0.404	6.970	2.291				
Gso-10-B-1	110.000	1	100.0	0.0								
Jb1-1-B-1	15.000	1	100.0	0.0	3.660	1.203	20.740	6.817				
Jb1-10-B-1	110.000	1	100.0	0.0								
Jb2-.6-B-1	6.600	1	103.0	0.0								
Jb2-10-B-1	110.000	1	100.0	0.0								
Jb2-10-B-2	110.000	1	100.0	0.0								
Jb3-1-B-1	15.000	1	100.0	0.0								
Jb3-1-B-2	15.000	1	100.0	0.0								
Jb3-1-B-2d	15.000	1	100.0	0.0								
Kba-3-B-1	30.000	1	100.0	0.0	0.950	0.312	8.550	2.810				
Kba-10-B-1	110.000	1	100.0	0.0								
Kse-1-B-5	11.000	1	103.0	0.0								
Kse-1-B-6	11.000	1	103.0	0.0								
Kse-10-B3	110.000	1	100.0	0.0								
MKi-1-B-1	15.000	1	100.0	0.0	1.035	0.340	5.865	1.928				
MKi-3-B-1	30.000	1	100.0	0.0	1.335	0.439	7.565	2.486				
MKi-10-B-1	110.000	1	100.0	0.0								
Msh-1-B-1	15.000	1	100.0	0.0	2.730	0.897	15.470	5.085				
Msh-10-B-1	110.000	1	100.0	0.0	0.410	0.135	3.690	1.213				
N-Jb3-.04-1	0.400	1	103.0	0.0								
N-Jb3-.04-2	0.400	1	103.0	0.0								
N-Jb3-.04-3	0.400	1	103.0	0.0								
N-Jb3-.04-4	0.400	1	103.0	0.0								
N-Jb3-.04-5	0.400	1	103.0	0.0								
N-Jb3-.04-6	0.400	1	103.0	0.0								
Nbg-1-B-1	15.000	1	100.0	0.0	1.230	0.404	6.970	2.291				
Nbg-10-B-1	110.000	1	100.0	0.0								
Nde-1-B-1	15.000	1	100.0	0.0	1.425	0.468	8.075	2.654				

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
Nde-10-B-1	110.000	1	100.0	0.0								
Rwi-1-B-1	15.000	1	100.0	0.0	0.280	0.092	2.520	0.828				
Rwi-10-B-1	110.000	1	100.0	0.0	0.280	0.092	2.520	0.828				
Sha-10-B-1	110.000	1	100.0	0.0								
Sha-20-B-1	220.000	1	100.0	0.0								
Total Number of Buses: 80					21.890	7.195	122.110	40.136	0.000	0.000	0.000	0.000

Generation Bus				Voltage		Generation			Mvar Limits	
ID	kV	Type	Sub-sys	% Mag.	Angle	MW	Mvar	% PF	Max	Min
B-10-Jb-Grid-1	110.000	Voltage Control	1	100.0	0.0	10.000			7.000	0.000
B-10-Mki-Grid-1	110.000	Voltage Control	1	100.0	0.0	15.000			10.000	0.000
B-20-Sha-Grid-1	220.000	Swing	1	100.0	0.0					
Jb2-.6-B-1	6.600	Voltage Control	1	103.0	0.0	18.600			15.300	0.000
Kse-1-B-5	11.000	Voltage Control	1	103.0	0.0	40.000			30.000	0.000
Kse-1-B-6	11.000	Voltage Control	1	103.0	0.0	10.000			7.500	0.000
N-Jb3-.04-1	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-2	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-3	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-4	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-5	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-6	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
						100.800	0.000			

Line/Cable Input Data

Line/Cable			Ohms or Siemens/1000 m per Conductor (Cable) or per Phase (Line)						
			Length						
ID	Library	Size	Adj. (m)	% Tol.	#/Phase	T (°C)	R	X	Y
1-Jb1-Jb3	15NCUS3	240	50.0	0.0	1	75	0.094138	0.089300	
10-Bre-Jb1(S/C)		176.	7500.0	0.0	1	75	0.232520	0.477340	0.0000024
10-Bre-Nde-1(S/C)		176.	4000.0	0.0	1	75	0.232506	0.441167	0.0000026
10-Bre-Nde-2(S/C)		282.	2200.0	0.0	1	75	0.072450	0.188633	0.0000061
10-Bre-Sha-1		282.	8600.0	0.0	2	75	0.036268	0.124622	0.0000092
10-Bre-Sha-2		282.	8600.0	0.0	2	75	0.036268	0.124622	0.0000092
10-Gha-MKi(S/C)		282.	7900.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gko-Jb1(S/C)		282.	9100.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gko-MKi(S/C)		282.	5400.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gso-Msh(S/C)		176.	19000.0	0.0	1	75	0.232506	0.441167	0.0000026
10-Gso-Nde-1(S/C)		176.	5400.0	0.0	1	75	0.232506	0.441167	0.0000026
10-Gso-Nde-2(S/C)		282.	2200.0	0.0	1	75	0.072450	0.188633	0.0000061
10-Jb1-Jb2(S/C)		282.	1200.0	0.0	1	75	0.144906	0.426513	0.0000027
10-Jb1-Nbg(S/C)		282.	7800.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Kba-Msh(S/C)		176.	25200.0	0.0	1	75	0.232506	0.441167	0.0000026
10-Kba-Rwi(S/C)		176.	7700.0	0.0	1	75	0.232506	0.441167	0.0000026
10-MKi-Nbg(S/C)		282.	6400.0	0.0	1	75	0.144920	0.462685	0.0000025

Line / Cable resistances are listed at the specified temperatures.

2-Winding Transformer Input Data

Transformer		Rating					Z Variation			% Tap Setting		Adjusted	Phase Shift	
ID	Phase	MVA	Prim. kV	Sec. kV	% Z1	X1/R1	+ 5%	- 5%	% Tol.	Prim.	Sec.	% Z	Type	Angle
Bre-10/1-T-1	3-Phase	20.000	110.000	15.000	10.46	22.00	0	0	0	0	0	10.4600	YNyn	0.000
Gha-10/1-T-1n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Gko-10/1-T-1	3-Phase	15.000	110.000	15.000	9.00	20.00	0	0	5.0	0	0	9.4500	YNyn	0.000
Gko-10/1-T-2	3-Phase	15.000	110.000	15.000	8.93	20.00	0	0	5.0	0	0	9.3765	YNyn	0.000
Gko-10/1-T-3	3-Phase	15.000	110.000	15.000	9.20	20.00	0	0	5.0	0	0	9.6600	YNyn	0.000
Gso-10/1-T-1	3-Phase	10.000	110.000	15.000	9.32	13.00	0	0	5.0	0	0	9.7860	YNyn	0.000
Gso-10/1-T-2F	3-Phase	15.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Jb1-10/1-T-1	3-Phase	10.000	110.000	15.000	10.20	13.00	0	0	5.0	0	0	10.7100	YNyn	0.000
Jb1-10/1-T-2	3-Phase	10.000	110.000	15.000	10.20	13.00	0	0	5.0	0	0	10.7100	YNyn	0.000
Jb2-10/.6-TG-1	3-Phase	15.000	110.000	6.600	10.40	19.00	0	0	5.0	0	0	10.9200	YNd	0.000
Jb2-10/.6-TG-2	3-Phase	15.000	110.000	6.600	10.40	19.00	0	0	5.0	0	0	10.9200	YNd	0.000
Jb3-1/0-TG-1	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-2	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-3	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-4	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-5	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-6	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Kba-10/3-T-1	3-Phase	10.000	110.000	30.000	8.35	13.00	0	0	0	0	0	8.3500	YNyn	0.000
Kse-10/1-TG-1n2	3-Phase	62.500	110.000	11.000	12.50	45.00	0	0	5.0	0	0	13.1250	YNd	0.000
Kse-10/1-TG-2n2	3-Phase	15.000	110.000	11.000	10.00	20.00	0	0	0	0	0	10.0000	YNd	0.000
MKi-10/1-T-1	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
MKi-10/3-T-1	3-Phase	20.000	110.000	30.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Msh-10/1-T-1	3-Phase	10.000	110.000	15.000	10.20	20.00	0	0	5.0	0	0	10.7100	YNd	0.000
Msh-10/1-T-1F	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	0	0	0	10.0000	YNd	0.000
Nbg-10/1-T-1n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Nbg-10/1-T-2n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Nde-10/1-T-1n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Nde-10/1-T-2n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Rwi-10/1-T-1n	3-Phase	10.000	110.000	15.000	10.00	13.00	0	0	5.0	0	0	10.5000	YNd	0.000
Sha-20/10-T-1n	3-Phase	90.000	220.000	110.000	12.50	45.00	0	0	10.0	0	0	13.7500	YNd	0.000

2-Winding Transformer Load Tap Changer (LTC) Settings

Transformer	Connected Buses ("*" LTC Side)		Transformer Load Tap Changer Setting					
ID	Primary Bus ID	Secondary Bus ID	% Min. Tap	% Max. Tap	% Step	Regulated Bus ID	% V	kV
Bre-10/1-T-1	*Bre-10-B-1	Bre-1-B-1	-10.00	14.00	1.000	Bre-1-B-1	100.00	15.000
Gha-10/1-T-1n	*Gha-10-B-1	Gha-1-B-1	-16.00	16.00	1.300	Gha-1-B-1	100.00	15.000

2-Winding Transformer Load Tap Changer (LTC) Settings

Transformer	Connected Buses ("*" LTC Side)		Transformer Load Tap Changer Setting					
ID	Primary Bus ID	Secondary Bus ID	% Min. Tap	% Max. Tap	% Step	Regulated Bus ID	% V	kV
Gko-10/1-T-2	*Gko-10-B-1	Gko-1-B-1	-15.99	16.00	1.230	Gko-1-B-1	100.00	15.000
Gko-10/1-T-3	*Gko-10-B-1	Gko-1-B-1	-16.00	16.09	1.231	Gko-1-B-1	100.00	15.000
Gso-10/1-T-1	*Gso-10-B-1	Gso-1-B-1	-15.99	16.00	1.230	Gso-1-B-1	100.00	15.000
Gso-10/1-T-2F	*Gso-10-B-1	Gso-1-B-1	-16.00	16.00	1.230	Gso-1-B-1	100.00	15.000
Jb1-10/1-T-1	*Jb1-10-B-1	Jb1-1-B-1	-16.00	16.00	1.230	Jb1-1-B-1	100.00	15.000
Jb1-10/1-T-2	*Jb1-10-B-1	Jb1-1-B-1	-16.00	16.00	1.230	Jb1-1-B-1	100.00	15.000
Kba-10/3-T-1	*Kba-10-B-1	Kba-3-B-1	-8.00	8.00	1.000	Kba-3-B-1	100.00	30.000
MKi-10/1-T-1	*MKi-10-B-1	MKi-1-B-1	-16.00	16.00	1.300	MKi-1-B-1	100.00	15.000
MKi-10/3-T-1	*MKi-10-B-1	MKi-3-B-1	-16.00	16.00	1.300	MKi-3-B-1	100.00	30.000
Msh-10/1-T-1	*Msh-10-B-1	Msh-1-B-1	-10.00	10.00	1.250	Msh-1-B-1	100.00	15.000
Msh-10/1-T-1F	*Msh-10-B-1	Msh-1-B-1	-10.00	10.00	1.250	Msh-1-B-1	100.00	15.000
Nbg-10/1-T-1n	*Nbg-10-B-1	Nbg-1-B-1	-16.00	16.00	1.300	Nbg-1-B-1	100.00	15.000
Nbg-10/1-T-2n	*Nbg-10-B-1	Nbg-1-B-1	-16.00	16.00	1.300	Nbg-1-B-1	100.00	15.000
Nde-10/1-T-1n	*Nde-10-B-1	Nde-1-B-1	-16.00	16.00	1.230	Nde-1-B-1	100.00	15.000
Nde-10/1-T-2n	*Nde-10-B-1	Nde-1-B-1	-16.00	16.00	1.230	Nde-1-B-1	100.00	15.000
Rwi-10/1-T-1n	*Rwi-10-B-1	Rwi-1-B-1	-16.00	16.00	1.230	Rwi-1-B-1	100.00	15.000
Sha-20/10-T-1n	*Sha-20-B-1	Sha-10-B-1	-10.00	10.00	0.850	Sha-10-B-1	102.00	112.200

Branch Connections

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
Bre-10/1-T-1	2W XFMR	Bre-10-B-1	Bre-1-B-1	2.37	52.25	52.30	
Gha-10/1-T-1n	2W XFMR	Gha-10-B-1	Gha-1-B-1	2.62	52.43	52.50	
Gko-10/1-T-1	2W XFMR	Gko-10-B-1	Gko-1-B-1	3.15	62.92	63.00	
Gko-10/1-T-2	2W XFMR	Gko-10-B-1	Gko-1-B-1	3.12	62.43	62.51	
Gko-10/1-T-3	2W XFMR	Gko-10-B-1	Gko-1-B-1	3.22	64.32	64.40	
Gso-10/1-T-1	2W XFMR	Gso-10-B-1	Gso-1-B-1	7.51	97.57	97.86	
Gso-10/1-T-2F	2W XFMR	Gso-10-B-1	Gso-1-B-1	3.50	69.91	70.00	
Jb1-10/1-T-1	2W XFMR	Jb1-10-B-1	Jb1-1-B-1	8.21	106.78	107.10	
Jb1-10/1-T-2	2W XFMR	Jb1-10-B-1	Jb1-1-B-1	8.21	106.78	107.10	
Jb2-10/.6-TG-1	2W XFMR	Jb2-10-B-2	Jb2-.6-B-1	3.83	72.70	72.80	
Jb2-10/.6-TG-2	2W XFMR	Jb2-10-B-2	Jb2-.6-B-1	3.83	72.70	72.80	
Jb3-1/0-TG-1	2W XFMR	Jb3-1-B-2	N-Jb3-.04-1	66.03	396.21	401.67	
Jb3-1/0-TG-2	2W XFMR	Jb3-1-B-2	N-Jb3-.04-2	66.03	396.21	401.67	
Jb3-1/0-TG-3	2W XFMR	Jb3-1-B-2	N-Jb3-.04-3	66.03	396.21	401.67	
Jb3-1/0-TG-4	2W XFMR	Jb3-1-B-2d	N-Jb3-.04-4	66.03	396.21	401.67	
Jb3-1/0-TG-5	2W XFMR	Jb3-1-B-2d	N-Jb3-.04-5	66.03	396.21	401.67	
Jb3-1/0-TG-6	2W XFMR	Jb3-1-B-2d	N-Jb3-.04-6	66.03	396.21	401.67	
Kba-10/3-T-1	2W XFMR	Kba-10-B-1	Kba-3-B-1	6.40	83.25	83.50	
Kse-10/1-TG-1n2	2W XFMR	Kse-10-B3	Kse-1-B-5	0.47	20.99	21.00	
Kse-10/1-TG-2n2	2W XFMR	Kse-10-B3	Kse-1-B-6	3.33	66.58	66.67	
MKi-10/1-T-1	2W XFMR	MKi-10-B-1	MKi-1-B-1	2.62	52.43	52.50	
MKi-10/3-T-1	2W XFMR	MKi-10-B-1	MKi-3-B-1	2.62	52.43	52.50	
Msh-10/1-T-1	2W XFMR	Msh-10-B-1	Msh-1-B-1	5.35	106.97	107.10	
Msh-10/1-T-1F	2W XFMR	Msh-10-B-1	Msh-1-B-1	2.50	49.94	50.00	
Nbg-10/1-T-1n	2W XFMR	Nbg-10-B-1	Nbg-1-B-1	2.62	52.43	52.50	
Nbg-10/1-T-2n	2W XFMR	Nbg-10-B-1	Nbg-1-B-1	2.62	52.43	52.50	
Nde-10/1-T-1n	2W XFMR	Nde-10-B-1	Nde-1-B-1	2.62	52.43	52.50	
Nde-10/1-T-2n	2W XFMR	Nde-10-B-1	Nde-1-B-1	2.62	52.43	52.50	
Rwi-10/1-T-1n	2W XFMR	Rwi-10-B-1	Rwi-1-B-1	8.05	104.69	105.00	
Sha-20/10-T-1n	2W XFMR	Sha-20-B-1	Sha-10-B-1	0.34	15.27	15.28	
1-Jb1-Jb3	Cable	B-1-Jb1-Jb3-1	B-1-Jb1-Jb3-2	0.21	0.20	0.29	
10-Bre-Jb1(S/C)	Line	B-10-Bre-Jb1-2	B-10-Bre-Jb1-1	1.44	2.96	3.29	0.2193774
10-Bre-Nde-1(S/C)	Line	B-10-Bre-Gso-1	C-BN	0.77	1.46	1.65	0.1269621
10-Bre-Nde-2(S/C)	Line	C-BN	B-10-Bre-Nde-2	0.13	0.34	0.37	0.1626596
10-Bre-Sha-1	Line	B-10-Bre-Sha-2DT-F	B-10-Bre-Sha-1DT-F	0.26	0.89	0.92	0.9599407
10-Bre-Sha-2	Line	B-10-Bre-Sha-2D	B-10-Bre-Sha-1D	0.26	0.89	0.92	0.9599407
10-Gha-MKi(S/C)	Line	B-10-Gha-MKi-1	B-10-Gha-MKi-2	0.95	3.02	3.17	0.2387549
10-Gko-Jb1(S/C)	Line	B-10-Gko-Jb1-2	B-10-Gko-Jb1-1	1.09	3.48	3.65	0.2750214
10-Gko-MKi(S/C)	Line	B-10-Gko-MKi-1	B-10-Gko-MKi-2	0.65	2.06	2.16	0.1631995
10-Gso-Msh(S/C)	Line	B-10-Gso-Msh-1	B-10-Gso-Msh-2	3.65	6.93	7.83	0.6030700

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
10-Gso-Nde-1(S/C)	Line	C-GN	B-10-Gso-Nde-1	1.04	1.97	2.23	0.1713988
10-Gso-Nde-2(S/C)	Line	C-GN	B-10-Gso-Nde-2	0.13	0.34	0.37	0.1626596
10-Jb1-Jb2(S/C)	Line	B-10-Jb1-Jb2-2	B-10-Jb1-Jb2-1	0.14	0.42	0.45	0.0394709
10-Jb1-Nbg(S/C)	Line	B-10-Jb1-Nbg-1	B-10-Jb1-Nbg-2	0.93	2.98	3.13	0.2357326
10-Kba-Msh(S/C)	Line	B-10-Kba-Msh-2	10-Kba/Msh/Rwi-B	4.84	9.19	10.39	0.7998612
10-Kba-Rwi(S/C)	Line	B-10-Kba-Rwi-2	10-Kba/Msh/Rwi-B	1.48	2.81	3.17	0.2444020
10-MKi-Nbg(S/C)	Line	B-10-MKi-Nbg-1	B-10-MKi-Nbg-2	0.77	2.45	2.56	0.1934217
Bre-10-C-1	Tie Breakr	B-10-Bre-Jb1-1	Bre-10-B-1				
Bre-10-C-2	Tie Breakr	B-10-Bre-Sha-1DT-F	Bre-10-B-1				
Bre-10-C-3	Tie Breakr	B-10-Bre-Sha-1D	Bre-10-B-1				
Bre-10-C-4	Tie Breakr	B-10-Bre-Gso-1	Bre-10-B-1				
Gha-10-C-1	Tie Breakr	B-10-Gha-MKi-1	Gha-10-B-1				
Gko-10-C-1	Tie Breakr	B-10-Gko-Jb1-1	Gko-10-B-1				
Gko-10-C-2	Tie Breakr	B-10-Gko-MKi-1	Gko-10-B-1				
Gso-10-C-1	Tie Breakr	B-10-Gso-Nde-1	Gso-10-B-1				
Gso-10-C-2	Tie Breakr	B-10-Gso-Msh-1	Gso-10-B-1				
Jb1-1-C-1	Tie Breakr	Jb1-1-B-1	B-1-Jb1-Jb3-1				
Jb1-10-C-1	Tie Breakr	B-10-Jb1-Jb2-1	Jb1-10-B-1				
Jb1-10-C-2	Tie Breakr	B-10-Jb-Grid-1	Jb1-10-B-1				
Jb1-10-C-3	Tie Breakr	B-10-Bre-Jb1-2	Jb1-10-B-1				
Jb1-10-C-4	Tie Breakr	B-10-Gko-Jb1-2	Jb1-10-B-1				
Jb1-10-C-5	Tie Breakr	B-10-Jb1-Nbg-1	Jb1-10-B-1				
Jb2-10-C-1	Tie Breakr	B-10-Jb1-Jb2-2	Jb2-10-B-1				
Jb3-1-C-1	Tie Breakr	B-1-Jb1-Jb3-2	Jb3-1-B-1				
Kba-10-C-1	Tie Breakr	10-Kba/Msh/Rwi-B	Kba-10-B-1				
MKi-10-C-1	Tie Breakr	MKi-10-B-1	B-10-Mki-Grid-1				
MKi-10-C-2	Tie Breakr	B-10-Gko-MKi-2	MKi-10-B-1				
MKi-10-C-3	Tie Breakr	B-10-MKi-Nbg-2	MKi-10-B-1				
MKi-10-C-4	Tie Breakr	B-10-Gha-MKi-2	MKi-10-B-1				
Msh-10-C-1	Tie Breakr	B-10-Gso-Msh-2	Msh-10-B-1				
Msh-10-C-2	Tie Breakr	B-10-Kba-Msh-2	Msh-10-B-1				
Nbg-10-C-1	Tie Breakr	B-10-Jb1-Nbg-2	Nbg-10-B-1				
Nbg-10-C-2	Tie Breakr	B-10-MKi-Nbg-1	Nbg-10-B-1				
Nde-10-C-1	Tie Breakr	B-10-Bre-Nde-2	Nde-10-B-1				
Nde-10-C-2	Tie Breakr	B-10-Gso-Nde-2	Nde-10-B-1				
Nde-10-C-3	Tie Breakr	G-Kse-1-B2	Nde-10-B-1				
Rwi-10-C-1	Tie Breakr	B-10-Kba-Rwi-2	Rwi-10-B-1				
Sha-10-C-1	Tie Breakr	Sha-10-B-1	B-10-Bre-Sha-2DT-F				
Sha-10-C-2	Tie Breakr	Sha-10-B-1	B-10-Bre-Sha-2D				
Sha-20-C-Grid	Tie Breakr	B-20-Sha-Grid-1	Sha-20-B-1				
C-Rwinkwabu-SW	Tie Switch	Rwi-1-B-1	C-Rwi-B-1				
S-Jb2-10-B-1	Tie Switch	Jb2-10-B-1	G-Jb2-10-B				
S-Jb2-10-B-2	Tie Switch	G-Jb2-10-B	Jb2-10-B-2				

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
S-Jb3-1-B-1	Tie Switch	Jb3-1-B-1	G-Jb3-1-B				
S-Jb3-1-B-2	Tie Switch	G-Jb3-1-B	Jb3-1-B-2				
S-Jb3-1-B-2d	Tie Switch	Jb3-1-B-2	Jb3-1-B-2d				
S-Kba-Bus	Tie Switch	Kba-3-B-1	C-Kab-3-B				
S-Kse-1-B2	Tie Switch	G-Kse-1-B2	Kse-10-B3				
S-Musha-Bus	Tie Switch	Msh-1-B-1	C-Msh-1-B				

LOAD_FLOW_REPORT

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
10-Kba/Msh/Rwi-B	110.000	96.152	-6.2	0	0	0	0	B-10-Kba-Msh-2	-14.766	-5.521	86.1	93.7	
								B-10-Kba-Rwi-2	5.403	1.647	30.8	95.7	
								Kba-10-B-1	9.363	3.874	55.3	92.4	
B-1-Jb1-Jb3-1	15.000	100.171	-9.3	0	0	0	0	B-1-Jb1-Jb3-2	-7.113	-5.188	338.3	80.8	
								Jb1-1-B-1	7.113	5.188	338.3	80.8	
B-1-Jb1-Jb3-2	15.000	100.196	-9.3	0	0	0	0	B-1-Jb1-Jb3-1	7.115	5.190	338.3	80.8	
								Jb3-1-B-1	-7.115	-5.190	338.3	80.8	
B-10-Bre-Gso-1	110.000	100.906	-3.8	0	0	0	0	C-BN	6.081	9.210	57.4	55.1	
								Bre-10-B-1	-6.081	-9.210	57.4	55.1	
B-10-Bre-Jb1-1	110.000	100.906	-3.8	0	0	0	0	B-10-Bre-Jb1-2	27.531	7.865	148.9	96.2	
								Bre-10-B-1	-27.531	-7.865	148.9	96.2	
B-10-Bre-Jb1-2	110.000	100.282	-4.2	0	0	0	0	B-10-Bre-Jb1-1	-27.414	-7.848	149.2	96.1	
								Jb1-10-B-1	27.414	7.848	149.2	96.1	
B-10-Bre-Nde-2	110.000	100.686	-3.8	0	0	0	0	C-BN	-6.070	-9.482	58.7	53.9	
								Nde-10-B-1	6.070	9.482	58.7	53.9	
B-10-Bre-Sha-1D	110.000	100.906	-3.8	0	0	0	0	B-10-Bre-Sha-2D	-22.723	-10.875	131.0	90.2	
								Bre-10-B-1	22.723	10.875	131.0	90.2	
B-10-Bre-Sha-1DT-F	110.000	100.906	-3.8	0	0	0	0	B-10-Bre-Sha-2DT-F	-22.723	-10.875	131.0	90.2	
								Bre-10-B-1	22.723	10.875	131.0	90.2	
B-10-Bre-Sha-2D	110.000	101.056	-3.7	0	0	0	0	B-10-Bre-Sha-1D	22.739	9.951	128.9	91.6	
								Sha-10-B-1	-22.739	-9.951	128.9	91.6	
B-10-Bre-Sha-2DT-F	110.000	101.056	-3.7	0	0	0	0	B-10-Bre-Sha-1DT-F	22.739	9.951	128.9	91.6	
								Sha-10-B-1	-22.739	-9.951	128.9	91.6	
B-10-Gha-MKi-1	110.000	99.868	-4.7	0	0	0	0	B-10-Gha-MKi-2	-3.831	-1.342	21.3	94.4	
								Gha-10-B-1	3.831	1.342	21.3	94.4	
B-10-Gha-MKi-2	110.000	99.942	-4.6	0	0	0	0	B-10-Gha-MKi-1	3.832	1.109	21.0	96.1	
								MKi-10-B-1	-3.832	-1.109	21.0	96.1	
B-10-Gko-Jb1-1	110.000	99.842	-4.6	0	0	0	0	B-10-Gko-Jb1-2	-21.865	-5.839	119.0	96.6	
								Gko-10-B-1	21.865	5.839	119.0	96.6	
B-10-Gko-Jb1-2	110.000	100.282	-4.2	0	0	0	0	B-10-Gko-Jb1-1	21.920	5.742	118.6	96.7	
								Jb1-10-B-1	-21.920	-5.742	118.6	96.7	
B-10-Gko-MKi-1	110.000	99.842	-4.6	0	0	0	0	B-10-Gko-MKi-2	-3.301	-3.872	26.7	64.9	
								Gko-10-B-1	3.301	3.872	26.7	64.9	
B-10-Gko-MKi-2	110.000	99.942	-4.6	0	0	0	0	B-10-Gko-MKi-1	3.303	3.714	26.1	66.5	
								MKi-10-B-1	-3.303	-3.714	26.1	66.5	
B-10-Gso-Msh-1	110.000	99.749	-4.3	0	0	0	0	B-10-Gso-Msh-2	37.661	14.076	211.6	93.7	
								Gso-10-B-1	-37.661	-14.076	211.6	93.7	
B-10-Gso-Msh-2	110.000	97.394	-5.6	0	0	0	0	B-10-Gso-Msh-1	-37.065	-13.531	212.6	93.9	
								Msh-10-B-1	37.065	13.531	212.6	93.9	
B-10-Gso-Nde-1	110.000	99.749	-4.3	0	0	0	0	C-GN	-46.006	-17.120	258.3	93.7	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
								Gso-10-B-1	46.006	17.120	258.3	93.7	
B-10-Gso-Nde-2	110.000	100.686	-3.8	0	0	0	0	C-GN	46.289	17.342	257.7	93.6	
								Nde-10-B-1	-46.289	-17.342	257.7	93.6	
B-10-Jb-Grid-1	110.000	100.282	-4.2	10.000	0.000	0	0	Jb1-10-B-1	10.000	0.000	52.3	100.0	
B-10-Jb1-Jb2-1	110.000	100.282	-4.2	0	0	0	0	B-10-Jb1-Jb2-2	-18.523	-5.826	101.6	95.4	
								Jb1-10-B-1	18.523	5.826	101.6	95.4	
B-10-Jb1-Jb2-2	110.000	100.333	-4.2	0	0	0	0	B-10-Jb1-Jb2-1	18.528	5.802	101.6	95.4	
								Jb2-10-B-1	-18.528	-5.802	101.6	95.4	
B-10-Jb1-Nbg-1	110.000	100.282	-4.2	0	0	0	0	B-10-Jb1-Nbg-2	16.533	3.430	88.4	97.9	
								Jb1-10-B-1	-16.533	-3.430	88.4	97.9	
B-10-Jb1-Nbg-2	110.000	100.023	-4.5	0	0	0	0	B-10-Jb1-Nbg-1	-16.506	-3.582	88.6	97.7	
								Nbg-10-B-1	16.506	3.582	88.6	97.7	
B-10-Kba-Msh-2	110.000	97.394	-5.6	0	0	0	0	10-Kba/Msh/Rwi-B	14.895	5.015	84.7	94.8	
								Msh-10-B-1	-14.895	-5.015	84.7	94.8	
B-10-Kba-Rwi-2	110.000	96.017	-6.3	0	0	0	0	10-Kba/Msh/Rwi-B	-5.398	-1.863	31.2	94.5	
								Rwi-10-B-1	5.398	1.863	31.2	94.5	
B-10-Mki-Grid-1	110.000	99.942	-4.6	15.000	10.000	0	0	MKi-10-B-1	15.000	10.000	94.7	83.2	
B-10-MKi-Nbg-1	110.000	100.023	-4.5	0	0	0	0	B-10-MKi-Nbg-2	8.226	0.667	43.3	99.7	
								Nbg-10-B-1	-8.226	-0.667	43.3	99.7	
B-10-MKi-Nbg-2	110.000	99.942	-4.6	0	0	0	0	B-10-MKi-Nbg-1	-8.221	-0.844	43.4	99.5	
								MKi-10-B-1	8.221	0.844	43.4	99.5	
*B-20-Sha-Grid-1	220.000	100.000	0.0	45.560	23.587	0	0	Sha-20-B-1	45.560	23.587	134.6	88.8	
Bre-1-B-1	15.000	100.493	-7.2	0	0	11.799	3.878	Bre-10-B-1	-11.799	-3.878	475.7	95.0	
Bre-10-B-1	110.000	100.906	-3.8	0	0	0	0	Bre-1-B-1	11.835	4.676	66.2	93.0	-2.000
								B-10-Bre-Jb1-1	27.531	7.865	148.9	96.2	
								B-10-Bre-Sha-1DT-F	-22.723	-10.875	131.0	90.2	
								B-10-Bre-Sha-1D	-22.723	-10.875	131.0	90.2	
								B-10-Bre-Gso-1	6.081	9.210	57.4	55.1	
C-BN	110.000	100.726	-3.8	0	0	0	0	B-10-Bre-Gso-1	-6.072	-9.322	58.0	54.6	
								B-10-Bre-Nde-2	6.072	9.322	58.0	54.6	
C-GN	110.000	100.566	-3.9	0	0	0	0	B-10-Gso-Nde-1	46.257	17.424	258.0	93.6	
								B-10-Gso-Nde-2	-46.257	-17.424	258.0	93.6	
C-Kab-3-B	30.000	98.826	-10.5	0	0	0	0	Kba-3-B-1	0.000	0.000	0.0	0.0	
C-Msh-1-B	15.000	99.993	-9.0	0	0	0	0	Msh-1-B-1	0.000	0.000	0.0	0.0	
C-Rwi-B-1	15.000	99.759	-7.9	0	0	0	0	Rwi-1-B-1	0.000	0.000	0.0	0.0	
G-Jb2-10-B	110.000	100.333	-4.2	0	0	0	0	Jb2-10-B-1	18.528	5.802	101.6	95.4	
								Jb2-10-B-2	-18.528	-5.802	101.6	95.4	
G-Jb3-1-B	15.000	100.196	-9.3	0	0	0	0	Jb3-1-B-1	7.115	5.190	338.3	80.8	
								Jb3-1-B-2	-7.115	-5.190	338.3	80.8	
G-Kse-1-B2	110.000	100.686	-3.8	0	0	0	0	Nde-10-B-1	49.888	11.299	266.6	97.5	
								Kse-10-B3	-49.888	-11.299	266.6	97.5	
Gha-1-B-1	15.000	100.408	-5.8	0	0	3.826	1.258	Gha-10-B-1	-3.826	-1.258	154.4	95.0	
Gha-10-B-1	110.000	99.868	-4.7	0	0	0	0	Gha-1-B-1	3.831	1.342	21.3	94.4	-1.300

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
								B-10-Gha-MKi-1	-3.831	-1.342	21.3	94.4	
Gko-1-B-1	15.000	100.232	-7.5	0	0	25.093	8.248	Gko-10-B-1	-8.403	-2.763	339.7	95.0	
								Gko-10-B-1	-8.469	-2.782	342.3	95.0	
								Gko-10-B-1	-8.221	-2.703	332.3	95.0	
Gko-10-B-1	110.000	99.842	-4.6	0	0	0	0	Gko-1-B-1	8.428	3.253	47.5	93.3	-2.462
								Gko-1-B-1	8.494	3.275	47.9	93.3	-2.460
								Gko-1-B-1	8.245	3.182	46.5	93.3	-2.462
								B-10-Gko-Jb1-1	-21.865	-5.839	119.0	96.6	
								B-10-Gko-MKi-1	-3.301	-3.872	26.7	64.9	
Gso-1-B-1	15.000	100.901	-6.2	0	0	8.326	2.737	Gso-10-B-1	-3.490	-1.087	139.4	95.5	
								Gso-10-B-1	-4.836	-1.650	194.9	94.6	
Gso-10-B-1	110.000	99.749	-4.3	0	0	0	0	Gso-1-B-1	3.500	1.215	19.5	94.5	-2.460
								Gso-1-B-1	4.845	1.829	27.3	93.6	-2.460
								B-10-Gso-Nde-1	-46.006	-17.120	258.3	93.7	
								B-10-Gso-Msh-1	37.661	14.076	211.6	93.7	
Jb1-1-B-1	15.000	100.171	-9.3	0	0	24.471	8.043	Jb1-10-B-1	-8.679	-1.427	338.0	98.7	
								Jb1-10-B-1	-8.679	-1.427	338.0	98.7	
								B-1-Jb1-Jb3-1	-7.113	-5.188	338.3	80.8	
Jb1-10-B-1	110.000	100.282	-4.2	0	0	0	0	Jb1-1-B-1	8.742	2.251	47.2	96.8	-2.460
								Jb1-1-B-1	8.742	2.251	47.2	96.8	-2.460
								B-10-Jb1-Jb2-1	-18.523	-5.826	101.6	95.4	
								B-10-Jb-Grid-1	-10.000	0.000	52.3	100.0	
								B-10-Bre-Jb1-2	-27.414	-7.848	149.2	96.1	
								B-10-Gko-Jb1-2	21.920	5.742	118.6	96.7	
								B-10-Jb1-Nbg-1	16.533	3.430	88.4	97.9	
*Jb2-.6-B-1	6.600	103.000	-0.5	18.600	7.163	0	0	Jb2-10-B-2	9.300	3.582	846.4	93.3	
								Jb2-10-B-2	9.300	3.582	846.4	93.3	
Jb2-10-B-1	110.000	100.333	-4.2	0	0	0	0	B-10-Jb1-Jb2-2	18.528	5.802	101.6	95.4	
								G-Jb2-10-B	-18.528	-5.802	101.6	95.4	
Jb2-10-B-2	110.000	100.333	-4.2	0	0	0	0	Jb2-.6-B-1	-9.264	-2.901	50.8	95.4	
								Jb2-.6-B-1	-9.264	-2.901	50.8	95.4	
								G-Jb2-10-B	18.528	5.802	101.6	95.4	
Jb3-1-B-1	15.000	100.196	-9.3	0	0	0	0	B-1-Jb1-Jb3-2	7.115	5.190	338.3	80.8	
								G-Jb3-1-B	-7.115	-5.190	338.3	80.8	
Jb3-1-B-2	15.000	100.196	-9.3	0	0	0	0	N-Jb3-.04-1	-1.186	-0.865	56.4	80.8	
								N-Jb3-.04-2	-1.186	-0.865	56.4	80.8	
								N-Jb3-.04-3	-1.186	-0.865	56.4	80.8	
								G-Jb3-1-B	7.115	5.190	338.3	80.8	
								Jb3-1-B-2d	-3.557	-2.595	169.2	80.8	
Jb3-1-B-2d	15.000	100.196	-9.3	0	0	0	0	N-Jb3-.04-4	-1.186	-0.865	56.4	80.8	
								N-Jb3-.04-5	-1.186	-0.865	56.4	80.8	
								N-Jb3-.04-6	-1.186	-0.865	56.4	80.8	
								Jb3-1-B-2	3.557	2.595	169.2	80.8	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
Kba-3-B-1	30.000	98.826	-10.5	0	0	9.300	3.057	Kba-10-B-1	-9.300	-3.057	190.6	95.0	
								C-Kab-3-B	0.000	0.000	0.0	0.0	
Kba-10-B-1	110.000	96.152	-6.2	0	0	0	0	Kba-3-B-1	9.363	3.874	55.3	92.4	-6.000
								10-Kba/Msh/Rwi-B	-9.363	-3.874	55.3	92.4	
*Kse-1-B-5	11.000	103.000	0.8	40.000	12.063	0	0	Kse-10-B3	40.000	12.063	2129.0	95.7	
*Kse-1-B-6	11.000	103.000	-0.2	10.000	3.390	0	0	Kse-10-B3	10.000	3.390	538.1	94.7	
Kse-10-B3	110.000	100.686	-3.8	0	0	0	0	Kse-1-B-5	-39.923	-8.609	212.9	97.8	
								Kse-1-B-6	-9.965	-2.690	53.8	96.5	
								G-Kse-1-B2	49.888	11.299	266.6	97.5	
MKi-1-B-1	15.000	101.165	-6.6	0	0	7.038	2.313	MKi-10-B-1	-7.038	-2.313	281.8	95.0	
MKi-3-B-1	30.000	100.730	-7.2	0	0	9.011	2.962	MKi-10-B-1	-9.011	-2.962	181.2	95.0	
MKi-10-B-1	110.000	99.942	-4.6	0	0	0	0	MKi-1-B-1	7.052	2.594	39.5	93.9	-2.600
								MKi-3-B-1	9.034	3.427	50.7	93.5	-2.600
								B-10-Mki-Grid-1	-15.000	-10.000	94.7	83.2	
								B-10-Gko-MKi-2	3.303	3.714	26.1	66.5	
								B-10-MKi-Nbg-2	-8.221	-0.844	43.4	99.5	
								B-10-Gha-MKi-2	3.832	1.109	21.0	96.1	
Msh-1-B-1	15.000	99.993	-9.0	0	0	18.198	5.981	Msh-10-B-1	-5.792	-1.904	234.7	95.0	
								Msh-10-B-1	-12.406	-4.078	502.7	95.0	
								C-Msh-1-B	0.000	0.000	0.0	0.0	
Msh-10-B-1	110.000	97.394	-5.6	0	0	3.910	1.285	Msh-1-B-1	5.812	2.301	33.7	93.0	-5.000
								Msh-1-B-1	12.449	4.929	72.2	93.0	-5.000
								B-10-Gso-Msh-2	-37.065	-13.531	212.6	93.9	
								B-10-Kba-Msh-2	14.895	5.015	84.7	94.8	
N-Jb3-.04-1	0.400	100.396	-7.1	1.200	0.950	0	0	Jb3-1-B-2	1.200	0.950	2200.4	78.4	
N-Jb3-.04-2	0.400	100.396	-7.1	1.200	0.950	0	0	Jb3-1-B-2	1.200	0.950	2200.4	78.4	
N-Jb3-.04-3	0.400	100.396	-7.1	1.200	0.950	0	0	Jb3-1-B-2	1.200	0.950	2200.4	78.4	
N-Jb3-.04-4	0.400	100.396	-7.1	1.200	0.950	0	0	Jb3-1-B-2d	1.200	0.950	2200.4	78.4	
N-Jb3-.04-5	0.400	100.396	-7.1	1.200	0.950	0	0	Jb3-1-B-2d	1.200	0.950	2200.4	78.4	
N-Jb3-.04-6	0.400	100.396	-7.1	1.200	0.950	0	0	Jb3-1-B-2d	1.200	0.950	2200.4	78.4	
Nbg-1-B-1	15.000	100.501	-5.7	0	0	8.270	2.718	Nbg-10-B-1	-4.135	-1.359	166.7	95.0	
								Nbg-10-B-1	-4.135	-1.359	166.7	95.0	
Nbg-10-B-1	110.000	100.023	-4.5	0	0	0	0	Nbg-1-B-1	4.140	1.457	23.0	94.3	-1.300
								Nbg-1-B-1	4.140	1.457	23.0	94.3	-1.300
								B-10-Jb1-Nbg-2	-16.506	-3.582	88.6	97.7	
								B-10-MKi-Nbg-1	8.226	0.667	43.3	99.7	
Nde-1-B-1	15.000	100.961	-5.2	0	0	9.656	3.174	Nde-10-B-1	-4.828	-1.587	193.7	95.0	
								Nde-10-B-1	-4.828	-1.587	193.7	95.0	
Nde-10-B-1	110.000	100.686	-3.8	0	0	0	0	Nde-1-B-1	4.835	1.720	26.7	94.2	-1.230
								Nde-1-B-1	4.835	1.720	26.7	94.2	-1.230
								B-10-Bre-Nde-2	-6.070	-9.482	58.7	53.9	
								B-10-Gso-Nde-2	46.289	17.342	257.7	93.6	
								G-Kse-1-B2	-49.888	-11.299	266.6	97.5	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
Rwi-1-B-1	15.000	99.759	-7.9	0	0	2.788	0.916	Rwi-10-B-1	-2.788	-0.916	113.2	95.0	
								C-Rwi-B-1	0.000	0.000	0.0	0.0	
Rwi-10-B-1	110.000	96.017	-6.3	0	0	2.603	0.856	Rwi-1-B-1	2.795	1.007	16.2	94.1	-4.920
								B-10-Kba-Rwi-2	-5.398	-1.863	31.2	94.5	
Sha-10-B-1	110.000	101.056	-3.7	0	0	0	0	Sha-20-B-1	-45.478	-19.902	257.8	91.6	
								B-10-Bre-Sha-2DT-F	22.739	9.951	128.9	91.6	
								B-10-Bre-Sha-2D	22.739	9.951	128.9	91.6	
Sha-20-B-1	220.000	100.000	0.0	0	0	0	0	Sha-10-B-1	45.560	23.587	134.6	88.8	-4.250
								B-20-Sha-Grid-1	-45.560	-23.587	134.6	88.8	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

# Indicates a bus with a load mismatch of more than 0.1 MVA

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
10-Kba/Msh/Rwi-B	110.000	645.0	0	0	0	0	0	0	0	0	15.765	93.7	86.1	13.3
B-1-Jb1-Jb3-1	15.000	99999.0	0	0	0	0	0	0	0	0	8.804	80.8	338.3	0.3
B-1-Jb1-Jb3-2	15.000	99999.0	0	0	0	0	0	0	0	0	8.807	80.8	338.3	0.3
B-10-Bre-Gso-1	110.000	99999.0	0	0	0	0	0	0	0	0	11.037	55.1	57.4	0.1
B-10-Bre-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	28.632	96.2	148.9	0.1
B-10-Bre-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	28.515	96.1	149.2	0.1
B-10-Bre-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	11.259	53.9	58.7	0.1
B-10-Bre-Sha-1D	110.000	99999.0	0	0	0	0	0	0	0	0	25.192	90.2	131.0	0.1
B-10-Bre-Sha-1DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	25.192	90.2	131.0	0.1
B-10-Bre-Sha-2D	110.000	99999.0	0	0	0	0	0	0	0	0	24.821	91.6	128.9	0.1
B-10-Bre-Sha-2DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	24.821	91.6	128.9	0.1
B-10-Gha-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	4.059	94.4	21.3	0.0
B-10-Gha-MKi-2	110.000	99999.0	0	0	0	0	0	0	0	0	3.989	96.1	21.0	0.0
B-10-Gko-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	22.631	96.6	119.0	0.1
B-10-Gko-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	22.660	96.7	118.6	0.1
B-10-Gko-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	5.088	64.9	26.7	0.0
B-10-Gko-MKi-2	110.000	645.0	0	0	0	0	0	0	0	0	4.971	66.5	26.1	4.0
B-10-Gso-Msh-1	110.000		0	0	0	0	0	0	0	0	40.206	93.7	211.6	
B-10-Gso-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	39.458	93.9	212.6	0.2
B-10-Gso-Nde-1	110.000	99999.0	0	0	0	0	0	0	0	0	49.088	93.7	258.3	0.3
B-10-Gso-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	49.431	93.6	257.7	0.3
B-10-Jb-Grid-1	110.000		0	0	0	0	0	0	0	0	10.000	100.0	52.3	
B-10-Jb1-Jb2-1	110.000	99999.0	0	0	0	0	0	0	0	0	19.418	95.4	101.6	0.1
B-10-Jb1-Jb2-2	110.000	99999.0	0	0	0	0	0	0	0	0	19.416	95.4	101.6	0.1
B-10-Jb1-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	16.885	97.9	88.4	0.1
B-10-Jb1-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	16.890	97.7	88.6	0.1
B-10-Kba-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	15.716	94.8	84.7	0.1
B-10-Kba-Rwi-2	110.000	99999.0	0	0	0	0	0	0	0	0	5.710	94.5	31.2	0.0
B-10-Mki-Grid-1	110.000		0	0	0	0	0	0	0	0	18.028	83.2	94.7	
B-10-MKi-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	8.253	99.7	43.3	0.0
B-10-MKi-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	8.264	99.5	43.4	0.0
B-20-Sha-Grid-1	220.000		0	0	0	0	0	0	0	0	51.304	88.8	134.6	
Bre-1-B-1	15.000	2000.0	1.755	0.577	10.044	3.301	0	0	0	0	12.420	95.0	475.7	23.8
Bre-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	50.383	90.2	262.1	8.3
C-BN	110.000		0	0	0	0	0	0	0	0	11.125	54.6	58.0	
C-GN	110.000		0	0	0	0	0	0	0	0	49.430	93.6	258.0	
C-Kab-3-B	30.000		0	0	0	0	0	0	0	0	0	0.0	0.0	
C-Msh-1-B	15.000		0	0	0	0	0	0	0	0	0	0.0	0.0	
C-Rwi-B-1	15.000		0	0	0	0	0	0	0	0	0	0.0	0.0	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
G-Jb2-10-B	110.000	99999.0	0	0	0	0	0	0	0	0	19.416	95.4	101.6	0.1
G-Jb3-1-B	15.000	99999.0	0	0	0	0	0	0	0	0	8.807	80.8	338.3	0.3
G-Kse-1-B2	110.000	99999.0	0	0	0	0	0	0	0	0	51.152	97.5	266.6	0.3
Gha-1-B-1	15.000	800.0	0.570	0.187	3.256	1.070	0	0	0	0	4.028	95.0	154.4	19.3
Gha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	4.059	94.4	21.3	0.7
Gko-1-B-1	15.000	2500.0	5.000	1.643	20.093	6.604	0	0	0	0	26.414	95.0	1014.3	40.6
Gko-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	26.975	93.3	141.8	4.5
Gso-1-B-1	15.000	2000.0	1.230	0.404	7.096	2.332	0	0	0	0	8.764	95.0	334.3	16.7
Gso-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	49.088	93.7	258.3	8.2
Jb1-1-B-1	15.000	2500.0	3.660	1.203	20.811	6.840	0	0	0	0	25.759	95.0	989.8	39.6
Jb1-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	57.584	97.1	301.4	9.6
Jb2-.6-B-1	6.600	3150.0	0	0	0	0	0	0	0	0	19.932	93.3	1692.8	53.7
Jb2-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	19.416	95.4	101.6	3.2
Jb2-10-B-2	110.000	3150.0	0	0	0	0	0	0	0	0	19.416	95.4	101.6	3.2
Jb3-1-B-1	15.000	800.0	0	0	0	0	0	0	0	0	8.807	80.8	338.3	42.3
Jb3-1-B-2	15.000	800.0	0	0	0	0	0	0	0	0	8.807	80.8	338.3	42.3
Jb3-1-B-2d	15.000	410.0	0	0	0	0	0	0	0	0	4.403	80.8	169.2	41.3
Kba-3-B-1	30.000	800.0	0.950	0.312	8.350	2.745	0	0	0	0	9.790	95.0	190.6	23.8
Kba-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	10.133	92.4	55.3	1.8
Kse-1-B-5	11.000	3150.0	0	0	0	0	0	0	0	0	41.779	95.7	2129.0	67.6
Kse-1-B-6	11.000	3150.0	0	0	0	0	0	0	0	0	10.559	94.7	538.1	17.1
Kse-10-B3	110.000	3150.0	0	0	0	0	0	0	0	0	51.152	97.5	266.6	8.5
MKi-1-B-1	15.000	2000.0	1.035	0.340	6.003	1.973	0	0	0	0	7.408	95.0	281.8	14.1
MKi-3-B-1	30.000	2000.0	1.335	0.439	7.676	2.523	0	0	0	0	9.485	95.0	181.2	9.1
MKi-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	25.628	90.6	134.6	4.3
Msh-1-B-1	15.000	2000.0	2.730	0.897	15.468	5.084	0	0	0	0	19.156	95.0	737.4	36.9
Msh-10-B-1	110.000	3150.0	0.410	0.135	3.500	1.150	0	0	0	0	39.458	93.9	212.6	6.8
N-Jb3-.04-1	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2200.4	
N-Jb3-.04-2	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2200.4	
N-Jb3-.04-3	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2200.4	
N-Jb3-.04-4	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2200.4	
N-Jb3-.04-5	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2200.4	
N-Jb3-.04-6	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2200.4	
Nbg-1-B-1	15.000	2500.0	1.230	0.404	7.040	2.314	0	0	0	0	8.705	95.0	333.4	13.3
Nbg-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	16.890	97.7	88.6	2.8
Nde-1-B-1	15.000	2500.0	1.425	0.468	8.231	2.705	0	0	0	0	10.164	95.0	387.5	15.5
Nde-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	59.693	93.7	311.2	9.9
Rwi-1-B-1	15.000	800.0	0.280	0.092	2.508	0.824	0	0	0	0	2.935	95.0	113.2	14.2
Rwi-10-B-1	110.000	3150.0	0.280	0.092	2.323	0.764	0	0	0	0	5.710	94.5	31.2	1.0
Sha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	49.642	91.6	257.8	8.2
Sha-20-B-1	220.000	3150.0	0	0	0	0	0	0	0	0	51.304	88.8	134.6	4.3

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).

Branch Loading Summary Report

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity	Loading		Capability	Loading (input)		Loading (output)	
ID	Type	(Amp)	Amp	%	(MVA)	MVA	%	MVA	%
1-Jb1-Jb3	Cable	480.37	338.31	70.43					
10-Bre-Jb1(S/C)	Line	443.00	149.25	33.69					
10-Bre-Nde-1(S/C)	Line	443.00	57.97	13.09					
10-Bre-Nde-2(S/C)	Line	581.00	58.69	10.10					
10-Bre-Sha-1	Line	1162.00	131.03	11.28					
10-Bre-Sha-2	Line	1162.00	131.03	11.28					
10-Gha-MKi(S/C)	Line	581.00	21.33	3.67					
10-Gko-Jb1(S/C)	Line	581.00	118.97	20.48					
10-Gko-MKi(S/C)	Line	581.00	26.75	4.60					
10-Gso-Msh(S/C)	Line	443.00	212.64	48.00					
10-Gso-Nde-1(S/C)	Line	443.00	258.30	58.31					
10-Gso-Nde-2(S/C)	Line	581.00	257.98	44.40					
10-Jb1-Jb2(S/C)	Line	581.00	101.63	17.49					
10-Jb1-Nbg(S/C)	Line	581.00	88.63	15.25					
10-Kba-Msh(S/C)	Line	443.00	86.05	19.43					
10-Kba-Rwi(S/C)	Line	443.00	31.22	7.05					
10-MKi-Nbg(S/C)	Line	581.00	43.40	7.47					
Bre-10/1-T-1	Transformer				20.000	12.725	63.6	12.420	62.1
Gha-10/1-T-1n	Transformer				20.000	4.059	20.3	4.028	20.1
Gko-10/1-T-1	Transformer				15.000	9.034	60.2	8.846	59.0
Gko-10/1-T-2	Transformer				15.000	9.103	60.7	8.914	59.4
Gko-10/1-T-3	Transformer				15.000	8.838	58.9	8.654	57.7
Gso-10/1-T-1	Transformer				10.000	3.705	37.0	3.655	36.6
Gso-10/1-T-2F	Transformer				15.000	5.179	34.5	5.110	34.1
Jb1-10/1-T-1	Transformer				10.000	9.027	90.3	8.795	88.0
Jb1-10/1-T-2	Transformer				10.000	9.027	90.3	8.795	88.0
Jb2-10/.6-TG-1	Transformer				15.000	9.966	66.4	9.708	64.7
Jb2-10/.6-TG-2	Transformer				15.000	9.966	66.4	9.708	64.7
Jb3-1/0-TG-1	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-2	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-3	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-4	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-5	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-6	Transformer				1.625	1.531	94.2	1.468	90.3
* Kba-10/3-T-1	Transformer				10.000	10.133	101.3	9.790	97.9
Kse-10/1-TG-1n2	Transformer				62.500	41.779	66.8	40.841	65.3

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
Kse-10/1-TG-2n2	Transformer				15.000	10.559	70.4	10.322	68.8
MKi-10/1-T-1	Transformer				20.000	7.514	37.6	7.408	37.0
MKi-10/3-T-1	Transformer				20.000	9.662	48.3	9.485	47.4
Msh-10/1-T-1	Transformer				10.000	6.251	62.5	6.097	61.0
Msh-10/1-T-1F	Transformer				20.000	13.389	66.9	13.059	65.3
Nbg-10/1-T-1n	Transformer				20.000	4.389	21.9	4.353	21.8
Nbg-10/1-T-2n	Transformer				20.000	4.389	21.9	4.353	21.8
Nde-10/1-T-1n	Transformer				20.000	5.131	25.7	5.082	25.4
Nde-10/1-T-2n	Transformer				20.000	5.131	25.7	5.082	25.4
Rwi-10/1-T-1n	Transformer				10.000	2.971	29.7	2.935	29.3
Sha-20/10-T-1n	Transformer				90.000	51.304	57.0	49.642	55.2

* Indicates a branch with operating load exceeding the branch capability.

Branch Losses Summary Report

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	
10-Kba-Msh(S/C)	-14.766	-5.521	14.895	5.015	128.1	-506.0	96.2	97.4	1.24
10-Kba-Rwi(S/C)	5.403	1.647	-5.398	-1.863	5.2	-215.8	96.2	96.0	0.13
1-Jb1-Jb3	-7.113	-5.188	7.115	5.190	1.6	1.5	100.2	100.2	0.03
10-Bre-Nde-1(S/C)	6.081	9.210	-6.072	-9.322	9.3	-111.4	100.9	100.7	0.18
10-Bre-Jb1(S/C)	27.531	7.865	-27.414	-7.848	116.3	16.7	100.9	100.3	0.62
10-Bre-Nde-2(S/C)	-6.070	-9.482	6.072	9.322	1.6	-160.7	100.7	100.7	0.04
10-Bre-Sha-2	-22.723	-10.875	22.739	9.951	15.8	-924.6	100.9	101.1	0.15
10-Bre-Sha-1	-22.723	-10.875	22.739	9.951	15.8	-924.6	100.9	101.1	0.15
10-Gha-MKi(S/C)	-3.831	-1.342	3.832	1.109	1.5	-233.4	99.9	99.9	0.07
10-Gko-Jb1(S/C)	-21.865	-5.839	21.920	5.742	55.8	-97.1	99.8	100.3	0.44
10-Gko-MKi(S/C)	-3.301	-3.872	3.303	3.714	1.6	-157.6	99.8	99.9	0.10
10-Gso-Msh(S/C)	37.661	14.076	-37.065	-13.531	596.3	545.4	99.7	97.4	2.35
10-Gso-Nde-1(S/C)	-46.006	-17.120	46.257	17.424	251.0	304.3	99.7	100.6	0.82
10-Gso-Nde-2(S/C)	46.289	17.342	-46.257	-17.424	31.8	-81.9	100.7	100.6	0.12
10-Jb1-Jb2(S/C)	-18.523	-5.826	18.528	5.802	5.4	-23.9	100.3	100.3	0.05
10-Jb1-Nbg(S/C)	16.533	3.430	-16.506	-3.582	26.6	-151.7	100.3	100.0	0.26
10-MKi-Nbg(S/C)	8.226	0.667	-8.221	-0.844	5.2	-176.7	100.0	99.9	0.08
Bre-10/1-T-1	-11.799	-3.878	11.835	4.676	36.3	798.0	100.5	100.9	0.41
Gha-10/1-T-1n	-3.826	-1.258	3.831	1.342	4.2	84.4	100.4	99.9	0.54
Gko-10/1-T-1	-8.403	-2.763	8.428	3.253	24.5	490.1	100.2	99.8	0.39
Gko-10/1-T-2	-8.469	-2.782	8.494	3.275	24.7	493.8	100.2	99.8	0.39
Gko-10/1-T-3	-8.221	-2.703	8.245	3.182	24.0	479.4	100.2	99.8	0.39
Gso-10/1-T-1	-3.490	-1.087	3.500	1.215	9.8	128.0	100.9	99.7	1.15
Gso-10/1-T-2F	-4.836	-1.650	4.845	1.829	9.0	179.3	100.9	99.7	1.15
Jb1-10/1-T-1	-8.679	-1.427	8.742	2.251	63.3	823.3	100.2	100.3	0.11
Jb1-10/1-T-2	-8.679	-1.427	8.742	2.251	63.3	823.3	100.2	100.3	0.11
Jb2-10/.6-TG-1	9.300	3.582	-9.264	-2.901	35.8	680.6	103.0	100.3	2.67
Jb2-10/.6-TG-2	9.300	3.582	-9.264	-2.901	35.8	680.6	103.0	100.3	2.67
Jb3-1/0-TG-1	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-2	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-3	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-4	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-5	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-6	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Kba-10/3-T-1	-9.300	-3.057	9.363	3.874	62.8	817.0	98.8	96.2	2.67
Kse-10/1-TG-1n2	40.000	12.063	-39.923	-8.609	76.8	3454.3	103.0	100.7	2.31
Kse-10/1-TG-2n2	10.000	3.390	-9.965	-2.690	35.0	699.7	103.0	100.7	2.31
MKi-10/1-T-1	-7.038	-2.313	7.052	2.594	14.1	281.2	101.2	99.9	1.22

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	in Vmag
MKi-10/3-T-1	-9.011	-2.962	9.034	3.427	23.2	464.9	100.7	99.9	0.79
Msh-10/1-T-1	-5.792	-1.904	5.812	2.301	19.9	397.6	100.0	97.4	2.60
Msh-10/1-T-1F	-12.406	-4.078	12.449	4.929	42.6	851.7	100.0	97.4	2.60
Nbg-10/1-T-1n	-4.135	-1.359	4.140	1.457	4.9	98.4	100.5	100.0	0.48
Nbg-10/1-T-2n	-4.135	-1.359	4.140	1.457	4.9	98.4	100.5	100.0	0.48
Nde-10/1-T-1n	-4.828	-1.587	4.835	1.720	6.6	132.9	101.0	100.7	0.27
Nde-10/1-T-2n	-4.828	-1.587	4.835	1.720	6.6	132.9	101.0	100.7	0.27
Rwi-10/1-T-1n	-2.788	-0.916	2.795	1.007	7.0	90.6	99.8	96.0	3.74
Sha-20/10-T-1n	-45.478	-19.902	45.560	23.587	81.9	3685.8	101.1	100.0	1.06
					2071.1	14478.7			

Alert Summary Report

	% Alert Settings
	Critical
Loading	
Bus	100.0
Cable	100.0
Reactor	100.0
Line	100.0
Transformer	100.0
Panel	100.0
Protective Device	100.0
Generator	101.0
Inverter/Charger	100.0
Bus Voltage	
OverVoltage	105.0
UnderVoltage	95.0
Generator Excitation	
OverExcited (Q Max.)	101.0
UnderExcited (Q Min.)	100.0

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
10-Grid-North	Power Grid	Under Excited	0.00	Mvar	0.00	0.0	
Kba-10/3-T-1	Transformer	Overload	10.00	MVA	10.13	101.3	3-Phase

SUMMARY OF TOTAL GENERATION, LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	45.560	23.587	51.304	88.80 Lagging
Source (Non-Swing Buses):	100.800	38.317	107.837	93.47 Lagging
Total Demand:	146.360	61.904	158.913	92.10 Lagging
Total Motor Load:	21.890	7.195	23.042	95.00 Lagging
Total Static Load:	122.399	40.231	128.841	95.00 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	2.071	14.479		
System Mismatch:	0.000	0.000		

Number of Iterations: 2

2. 潮流計算報告書

2) 2021 年断面（要約）

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
10-Kba/Msh/Rwi-B	110.000	645.0	0	0	0	0	0	0	0	0	19.348	98.1	106.4	16.5
B-1-Jb1-Jb3-1	15.000	99999.0	0	0	0	0	0	0	0	0	8.805	80.8	338.2	0.3
B-1-Jb1-Jb3-2	15.000	99999.0	0	0	0	0	0	0	0	0	8.807	80.8	338.2	0.3
B-10-Bre-Gso-1	110.000	99999.0	0	0	0	0	0	0	0	0	22.285	96.3	116.3	0.1
B-10-Bre-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	50.793	98.5	265.0	0.3
B-10-Bre-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	50.340	98.6	265.2	0.3
B-10-Bre-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	22.298	96.0	116.7	0.1
B-10-Bre-Sha-1D	110.000	99999.0	0	0	0	0	0	0	0	0	44.507	97.2	232.2	0.2
B-10-Bre-Sha-1DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	44.507	97.2	232.2	0.2
B-10-Bre-Sha-2D	110.000	99999.0	0	0	0	0	0	0	0	0	44.374	97.6	231.1	0.2
B-10-Bre-Sha-2DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	44.374	97.6	231.1	0.2
B-10-Gha-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	5.261	94.2	27.9	0.0
B-10-Gha-MKi-2	110.000	99999.0	0	0	0	0	0	0	0	0	5.192	95.5	27.5	0.0
B-10-Gko-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	31.569	95.4	167.4	0.2
B-10-Gko-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	31.699	95.3	167.0	0.2
B-10-Gko-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	4.223	54.2	22.4	0.0
B-10-Gko-MKi-2	110.000	645.0	0	0	0	0	0	0	0	0	4.093	56.0	21.7	3.4
B-10-Gso-Msh-1	110.000		0	0	0	0	0	0	0	0	49.003	97.6	259.1	
B-10-Gso-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	47.899	98.0	259.8	0.3
B-10-Gso-Nde-1	110.000	99999.0	0	0	0	0	0	0	0	0	60.364	96.9	319.2	0.3
B-10-Gso-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	60.913	96.7	318.8	0.3
B-10-Jb-Grid-1	110.000		0	0	0	0	0	0	0	0	12.207	81.9	64.3	
B-10-Jb1-Jb2-1	110.000	99999.0	0	0	0	0	0	0	0	0	20.006	92.6	105.4	0.1
B-10-Jb1-Jb2-2	110.000	99999.0	0	0	0	0	0	0	0	0	20.003	92.6	105.3	0.1
B-10-Jb1-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	24.233	96.4	127.7	0.1
B-10-Jb1-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	24.194	96.3	128.0	0.1
B-10-Kba-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	19.475	98.4	105.6	0.1
B-10-Kba-Rwi-2	110.000	99999.0	0	0	0	0	0	0	0	0	7.321	94.4	40.3	0.0
B-10-Mki-Grid-1	110.000		0	0	0	0	0	0	0	0	18.028	83.2	95.5	
B-10-MKi-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	12.825	97.8	67.9	0.1
B-10-MKi-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	12.844	97.6	68.1	0.1
B-20-Sha-Grid-1	220.000		0	0	0	0	0	0	0	0	90.356	96.0	237.1	
Bre-1-B-1	15.000	2000.0	2.265	0.744	12.684	4.169	0	0	0	0	15.736	95.0	609.3	30.5
Bre-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	89.015	97.2	464.5	14.7
C-BN	110.000		0	0	0	0	0	0	0	0	22.264	96.2	116.5	
C-GN	110.000		0	0	0	0	0	0	0	0	60.875	96.7	319.0	
C-Kab-3-B	30.000		0	0	0	-2.975	0	0	0	0	2.975	0.0	57.5	
C-Msh-1-B	15.000		0	0	0	-4.896	0	0	0	0	4.896	0.0	190.4	
C-Rwi-B-1	15.000		0	0	0	0	0	0	0	0	0	0.0	0.0	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
G-Jb2-10-B	110.000	99999.0	0	0	0	0	0	0	0	0	20.003	92.6	105.3	0.1
G-Jb3-1-B	15.000	99999.0	0	0	0	0	0	0	0	0	8.807	80.8	338.2	0.3
G-Kse-1-B2	110.000	99999.0	0	0	0	0	0	0	0	0	51.741	96.4	270.8	0.3
Gha-1-B-1	15.000	800.0	0.735	0.242	4.213	1.385	0	0	0	0	5.209	95.0	199.3	24.9
Gha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	5.261	94.2	27.9	0.9
Gko-1-B-1	15.000	2500.0	6.460	2.123	25.816	8.485	0	0	0	0	33.974	95.0	1308.3	52.3
Gko-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	34.924	92.8	185.2	5.9
Gso-1-B-1	15.000	2000.0	1.590	0.523	9.007	2.961	0	0	0	0	11.155	95.0	429.4	21.5
Gso-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	60.364	96.9	319.2	10.1
Jb1-1-B-1	15.000	2500.0	4.725	1.553	26.885	8.837	0	0	0	0	33.274	95.0	1278.1	51.1
Jb1-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	81.443	96.0	429.1	13.6
Jb2-.6-B-1	6.600	3150.0	0	0	0	0	0	0	0	0	20.669	90.0	1755.4	55.7
Jb2-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	20.003	92.6	105.3	3.3
Jb2-10-B-2	110.000	3150.0	0	0	0	0	0	0	0	0	20.003	92.6	105.3	3.3
Jb3-1-B-1	15.000	800.0	0	0	0	0	0	0	0	0	8.807	80.8	338.2	42.3
Jb3-1-B-2	15.000	800.0	0	0	0	0	0	0	0	0	8.807	80.8	338.2	42.3
Jb3-1-B-2d	15.000	410.0	0	0	0	0	0	0	0	0	4.403	80.8	169.1	41.2
Kba-3-B-1	30.000	800.0	1.210	0.398	10.798	3.549	0	0	0	0	12.640	95.0	244.3	30.5
Kba-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	12.158	99.2	66.8	2.1
Kse-1-B-5	11.000	3150.0	0	0	0	0	0	0	0	0	42.384	94.4	2159.8	68.6
Kse-1-B-6	11.000	3150.0	0	0	0	0	0	0	0	0	10.772	92.8	548.9	17.4
Kse-10-B3	110.000	3150.0	0	0	0	0	0	0	0	0	51.741	96.4	270.8	8.6
MKi-1-B-1	15.000	2000.0	1.335	0.439	7.537	2.477	0	0	0	0	9.339	95.0	360.1	18.0
MKi-3-B-1	30.000	2000.0	1.725	0.567	9.628	3.164	0	0	0	0	11.950	95.0	231.7	11.6
MKi-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	30.365	90.7	160.9	5.1
Msh-1-B-1	15.000	2000.0	3.480	1.144	19.310	6.347	0	0	0	0	23.990	95.0	933.1	46.7
Msh-10-B-1	110.000	3150.0	0.520	0.171	4.383	1.441	0	0	0	0	47.899	98.0	259.8	8.2
N-Jb3-.04-1	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2199.7	
N-Jb3-.04-2	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2199.7	
N-Jb3-.04-3	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2199.7	
N-Jb3-.04-4	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2199.7	
N-Jb3-.04-5	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2199.7	
N-Jb3-.04-6	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2199.7	
Nbg-1-B-1	15.000	2500.0	1.590	0.523	9.147	3.007	0	0	0	0	11.302	95.0	431.8	17.3
Nbg-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	24.194	96.3	128.0	4.1
Nde-1-B-1	15.000	2500.0	1.845	0.606	10.510	3.455	0	0	0	0	13.006	95.0	499.3	20.0
Nde-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	74.038	96.3	387.5	12.3
Rwi-1-B-1	15.000	800.0	0.360	0.118	3.236	1.064	0	0	0	0	3.785	95.0	145.8	18.2
Rwi-10-B-1	110.000	3150.0	0.360	0.118	2.942	0.967	0	0	0	0	7.321	94.4	40.3	1.3
Sha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	88.748	97.6	462.2	14.7
Sha-20-B-1	220.000	3150.0	0	0	0	0	0	0	0	0	90.356	96.0	237.1	7.5

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).

Branch Loading Summary Report

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
1-Jb1-Jb3	Cable	480.37	338.20	70.40					
10-Bre-Jb1(S/C)	Line	443.00	265.23	59.87					
10-Bre-Nde-1(S/C)	Line	443.00	116.46	26.29					
10-Bre-Nde-2(S/C)	Line	581.00	116.70	20.09					
10-Bre-Sha-1	Line	1162.00	232.23	19.99					
10-Bre-Sha-2	Line	1162.00	232.23	19.99					
10-Gha-MKi(S/C)	Line	581.00	27.91	4.80					
10-Gko-Jb1(S/C)	Line	581.00	167.44	28.82					
10-Gko-MKi(S/C)	Line	581.00	22.40	3.86					
10-Gso-Msh(S/C)	Line	443.00	259.79	58.64					
10-Gso-Nde-1(S/C)	Line	443.00	319.23	72.06					
10-Gso-Nde-2(S/C)	Line	581.00	319.01	54.91					
10-Jb1-Jb2(S/C)	Line	581.00	105.40	18.14					
10-Jb1-Nbg(S/C)	Line	581.00	128.00	22.03					
10-Kba-Msh(S/C)	Line	443.00	106.37	24.01					
10-Kba-Rwi(S/C)	Line	443.00	40.32	9.10					
10-MKi-Nbg(S/C)	Line	581.00	68.07	11.72					
Bre-10/1-T-1	Transformer				20.000	16.248	81.2	15.736	78.7
Gha-10/1-T-1n	Transformer				20.000	5.261	26.3	5.209	26.0
Gko-10/1-T-1	Transformer				15.000	11.696	78.0	11.378	75.9
Gko-10/1-T-2	Transformer				15.000	11.786	78.6	11.465	76.4
Gko-10/1-T-3	Transformer				15.000	11.442	76.3	11.131	74.2
Gso-10/1-T-1F	Transformer				15.000	11.497	76.6	11.155	74.4
Jb1-10/1-T-1	Transformer				10.000	6.163	61.6	6.047	60.5
Jb1-10/1-T-2	Transformer				10.000	6.163	61.6	6.047	60.5
Jb1-10/1-T-F1	Transformer				20.000	13.201	66.0	12.952	64.8
Jb2-10/.6-TG-1	Transformer				15.000	10.335	68.9	10.001	66.7
Jb2-10/.6-TG-2	Transformer				15.000	10.335	68.9	10.001	66.7
Jb3-1/0-TG-1	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-2	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-3	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-4	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-5	Transformer				1.625	1.531	94.2	1.468	90.3
Jb3-1/0-TG-6	Transformer				1.625	1.531	94.2	1.468	90.3
Kba-10/3-T-1	Transformer				10.000	6.079	60.8	6.023	60.2
Kba-10/3-T-2	Transformer				10.000	6.079	60.8	6.023	60.2

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
Kse-10/1-TG-1n2	Transformer				62.500	42.384	67.8	41.269	66.0
Kse-10/1-TG-2n2	Transformer				15.000	10.772	71.8	10.488	69.9
MKi-10/1-T-1	Transformer				20.000	9.514	47.6	9.339	46.7
MKi-10/3-T-1	Transformer				20.000	12.244	61.2	11.950	59.8
Msh-10/1-T-1	Transformer				10.000	7.417	74.2	7.300	73.0
Msh-10/1-T-1F	Transformer				20.000	15.888	79.4	15.637	78.2
Nbg-10/1-T-1n	Transformer				20.000	5.713	28.6	5.651	28.3
Nbg-10/1-T-2n	Transformer				20.000	5.713	28.6	5.651	28.3
Nde-10/1-T-1n	Transformer				20.000	6.585	32.9	6.503	32.5
Nde-10/1-T-2n	Transformer				20.000	6.585	32.9	6.503	32.5
Rwi-10/1-T-1n	Transformer				10.000	3.846	38.5	3.785	37.9
Sha-20/10-T-1n	Transformer				90.000	45.178	50.2	44.374	49.3
Sha-20/10-T-2n	Transformer				90.000	45.178	50.2	44.374	49.3

* Indicates a branch with operating load exceeding the branch capability.

Branch Losses Summary Report

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	
10-Kba-Msh(S/C)	-18.973	-3.793	19.170	3.429	197.5	-364.3	95.5	96.8	1.31
10-Kba-Rwi(S/C)	6.918	2.212	-6.910	-2.418	8.6	-205.9	95.5	95.3	0.18
1-Jb1-Jb3	-7.113	-5.189	7.115	5.190	1.6	1.5	100.2	100.2	0.03
10-Bre-Nde-1(S/C)	21.458	6.016	-21.420	-6.073	37.8	-56.4	100.6	100.3	0.25
10-Bre-Jb1(S/C)	50.024	8.807	-49.656	-8.272	367.8	535.1	100.6	99.6	0.97
10-Bre-Nde-2(S/C)	-21.414	-6.219	21.420	6.073	6.5	-146.8	100.3	100.3	0.05
10-Bre-Sha-2	-43.245	-10.523	43.296	9.722	50.2	-800.7	100.6	100.8	0.20
10-Bre-Sha-1	-43.245	-10.523	43.296	9.722	50.2	-800.7	100.6	100.8	0.20
10-Gha-MKi(S/C)	-4.955	-1.767	4.958	1.541	2.6	-225.6	98.9	99.0	0.10
10-Gko-Jb1(S/C)	-30.107	-9.495	30.218	9.577	110.6	82.1	99.0	99.6	0.67
10-Gko-MKi(S/C)	-2.290	-3.548	2.291	3.392	1.1	-156.3	99.0	99.0	0.09
10-Gso-Msh(S/C)	47.847	10.578	-46.955	-9.464	892.4	1113.9	99.2	96.8	2.47
10-Gso-Nde-1(S/C)	-58.488	-14.931	58.872	15.489	383.6	557.4	99.2	100.2	0.91
10-Gso-Nde-2(S/C)	58.921	15.452	-58.872	-15.489	48.6	-36.8	100.3	100.2	0.13
10-Jb1-Jb2(S/C)	-18.517	-7.573	18.523	7.551	5.8	-22.1	99.6	99.7	0.06
10-Jb1-Nbg(S/C)	23.357	6.454	-23.302	-6.510	55.4	-56.0	99.6	99.2	0.41
10-MKi-Nbg(S/C)	12.548	2.651	-12.535	-2.800	12.9	-149.0	99.2	99.0	0.16
Bre-10/1-T-1	-14.950	-4.914	15.009	6.223	59.5	1309.2	99.4	100.6	1.18
Gha-10/1-T-1n	-4.948	-1.626	4.955	1.767	7.0	140.6	100.6	98.9	1.63
Gko-10/1-T-1	-10.809	-3.554	10.850	4.370	40.8	815.4	100.0	99.0	1.00
Gko-10/1-T-2	-10.893	-3.577	10.934	4.399	41.1	821.5	100.0	99.0	1.00
Gko-10/1-T-3	-10.574	-3.477	10.614	4.275	39.9	797.6	100.0	99.0	1.00
Gso-10/1-T-1F	-10.597	-3.483	10.641	4.353	43.5	870.2	100.0	99.2	0.74
Jb1-10/1-T-1	-5.932	-1.174	5.962	1.563	29.9	388.8	100.2	99.6	0.59
Jb1-10/1-T-2	-5.932	-1.174	5.962	1.563	29.9	388.8	100.2	99.6	0.59
Jb1-10/1-T-F1	-12.634	-2.854	12.675	3.688	41.7	834.3	100.2	99.6	0.59
Jb2-10/.6-TG-1	9.300	4.507	-9.261	-3.775	38.5	731.9	103.0	99.7	3.32
Jb2-10/.6-TG-2	9.300	4.507	-9.261	-3.775	38.5	731.9	103.0	99.7	3.32
Jb3-1/0-TG-1	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-2	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-3	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-4	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-5	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Jb3-1/0-TG-6	-1.186	-0.865	1.200	0.950	14.2	85.0	100.2	100.4	4.28
Kba-10/3-T-1	-6.004	-0.486	6.027	0.791	23.4	304.6	99.6	95.5	4.11
Kba-10/3-T-2	-6.004	-0.486	6.027	0.791	23.4	304.6	99.6	95.5	4.11
Kse-10/1-TG-1n2	40.000	14.015	-39.921	-10.460	79.0	3555.0	103.0	100.3	2.71
Kse-10/1-TG-2n2	10.000	4.004	-9.964	-3.275	36.4	728.2	103.0	100.3	2.71

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	in Vmag
MKi-10/1-T-1	-8.872	-2.916	8.895	3.375	23.0	459.0	99.8	99.0	0.78
MKi-10/3-T-1	-11.353	-3.731	11.391	4.492	38.0	760.3	99.2	99.0	0.20
Msh-10/1-T-1	-7.253	-0.826	7.283	1.408	29.1	582.2	99.0	96.8	2.18
Msh-10/1-T-1F	-15.537	-1.769	15.599	3.016	62.4	1247.0	99.0	96.8	2.18
Nbg-10/1-T-1n	-5.369	-1.765	5.377	1.930	8.2	164.9	100.8	99.2	1.55
Nbg-10/1-T-2n	-5.369	-1.765	5.377	1.930	8.2	164.9	100.8	99.2	1.55
Nde-10/1-T-1n	-6.178	-2.031	6.189	2.251	11.0	220.6	100.3	100.3	0.02
Nde-10/1-T-2n	-6.178	-2.031	6.189	2.251	11.0	220.6	100.3	100.3	0.02
Rwi-10/1-T-1n	-3.596	-1.182	3.608	1.332	11.6	150.2	99.9	95.3	4.65
Sha-20/10-T-1n	-43.296	-9.722	43.361	12.683	65.8	2960.6	100.8	100.0	0.79
Sha-20/10-T-2n	-43.296	-9.722	43.361	12.683	65.8	2960.6	100.8	100.0	0.79
					3225.0	22392.8			

Alert Summary Report

	% Alert Settings
	Critical
Loading	
Bus	100.0
Cable	100.0
Reactor	100.0
Line	100.0
Transformer	100.0
Panel	100.0
Protective Device	100.0
Generator	101.0
Inverter/Charger	100.0
Bus Voltage	
OverVoltage	105.0
UnderVoltage	95.0
Generator Excitation	
OverExcited (Q Max.)	101.0
UnderExcited (Q Min.)	100.0

SUMMARY OF TOTAL GENERATION, LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	86.723	25.365	90.356	95.98 Lagging
Source (Non-Swing Buses):	100.800	49.733	112.401	89.68 Lagging
Total Demand:	187.523	75.098	202.001	92.83 Lagging
Total Motor Load:	28.200	9.269	29.684	95.00 Lagging
Total Static Load:	156.098	43.436	162.029	96.34 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	3.225	22.393		
System Mismatch:	0.000	0.000		

Number of Iterations: 2

2. 潮流計算報告書

3) 2023 年断面（要約）

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
10-Kba/Msh/Rwi-B	110.000	645.0	0	0	0	0	0	0	0	0	23.092	97.4	125.7	19.5
B-1-Jb1-Jb3-1	15.000	99999.0	0	0	0	0	0	0	0	0	8.808	80.8	336.7	0.3
B-1-Jb1-Jb3-2	15.000	99999.0	0	0	0	0	0	0	0	0	8.810	80.8	336.7	0.3
B-10-Bre-Gso-1	110.000	99999.0	0	0	0	0	0	0	0	0	37.900	93.0	197.1	0.2
B-10-Bre-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	72.175	98.2	375.3	0.4
B-10-Bre-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	71.218	98.5	375.5	0.4
B-10-Bre-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	37.828	93.0	197.6	0.2
B-10-Bre-Sha-1D	110.000	99999.0	0	0	0	0	0	0	0	0	64.586	96.2	335.8	0.3
B-10-Bre-Sha-1DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	64.586	96.2	335.8	0.3
B-10-Bre-Sha-2D	110.000	99999.0	0	0	0	0	0	0	0	0	64.521	96.5	334.5	0.3
B-10-Bre-Sha-2DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	64.521	96.5	334.5	0.3
B-10-Gha-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	6.290	94.0	33.5	0.0
B-10-Gha-MKi-2	110.000	99999.0	0	0	0	0	0	0	0	0	6.222	95.1	33.1	0.0
B-10-Gko-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	39.953	94.5	212.5	0.2
B-10-Gko-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	40.219	94.3	212.1	0.2
B-10-Gko-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	3.369	34.1	17.9	0.0
B-10-Gko-MKi-2	110.000	645.0	0	0	0	0	0	0	0	0	3.223	35.7	17.1	2.7
B-10-Gso-Msh-1	110.000		0	0	0	0	0	0	0	0	58.980	96.8	311.4	
B-10-Gso-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	58.328	97.2	312.4	0.3
B-10-Gso-Nde-1	110.000	99999.0	0	0	0	0	0	0	0	0	72.807	96.1	384.4	0.4
B-10-Gso-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	73.480	95.8	383.9	0.4
B-10-Jb-Grid-1	110.000		0	0	0	0	0	0	0	0	12.207	81.9	64.4	
B-10-Jb1-Jb2-1	110.000	99999.0	0	0	0	0	0	0	0	0	22.841	81.0	120.4	0.1
B-10-Jb1-Jb2-2	110.000	99999.0	0	0	0	0	0	0	0	0	22.837	81.0	120.3	0.1
B-10-Jb1-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	31.074	95.3	163.8	0.2
B-10-Jb1-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	30.969	95.4	164.2	0.2
B-10-Kba-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	23.310	97.7	124.8	0.1
B-10-Kba-Rwi-2	110.000	99999.0	0	0	0	0	0	0	0	0	8.570	94.3	46.8	0.0
B-10-Mki-Grid-1	110.000		0	0	0	0	0	0	0	0	18.028	83.2	95.8	
B-10-MKi-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	17.483	96.3	92.7	0.1
B-10-MKi-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	17.490	96.2	93.0	0.1
B-20-Sha-Grid-1	220.000		0	0	0	0	0	0	0	0	133.106	93.7	349.3	
Bre-1-B-1	15.000	2000.0	2.700	0.887	15.338	5.041	0	0	0	0	18.988	95.0	729.9	36.5
Bre-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	129.172	96.2	671.7	21.3
C-BN	110.000		0	0	0	0	0	0	0	0	37.803	93.1	197.3	
C-GN	110.000		0	0	0	0	0	0	0	0	73.406	95.8	384.1	
C-Kab-3-B	30.000		0	0	0	-3.008	0	0	0	0	3.008	0.0	57.8	
C-Msh-1-B	15.000		0	0	0	-5.091	0	0	0	0	5.091	0.0	194.2	
C-Rwi-B-1	15.000		0	0	0	0	0	0	0	0	0	0.0	0.0	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
G-Jb2-10-B	110.000	99999.0	0	0	0	0	0	0	0	0	22.837	81.0	120.3	0.1
G-Jb3-1-B	15.000	99999.0	0	0	0	0	0	0	0	0	8.810	80.8	336.7	0.3
G-Kse-1-B2	110.000	99999.0	0	0	0	0	0	0	0	0	51.463	96.9	268.9	0.3
Gha-1-B-1	15.000	800.0	0.885	0.291	5.019	1.650	0	0	0	0	6.214	95.0	239.1	29.9
Gha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	6.290	94.0	33.5	1.1
Gko-1-B-1	15.000	2500.0	7.700	2.531	31.039	10.202	0	0	0	0	40.778	95.0	1563.5	62.5
Gko-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	42.154	92.3	224.2	7.1
Gso-1-B-1	15.000	2000.0	1.890	0.621	10.892	3.580	0	0	0	0	13.455	95.0	513.5	25.7
Gso-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	72.807	96.1	384.4	12.2
Jb1-1-B-1	15.000	2500.0	5.640	1.854	32.404	10.651	0	0	0	0	40.046	95.0	1530.8	61.2
Jb1-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	103.906	94.9	547.8	17.4
Jb2-.6-B-1	6.600	3150.0	0	0	0	0	0	0	0	0	24.084	77.2	2005.1	63.7
Jb2-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	22.837	81.0	120.3	3.8
Jb2-10-B-2	110.000	3150.0	0	0	0	0	0	0	0	0	22.837	81.0	120.3	3.8
Jb3-1-B-1	15.000	800.0	0	0	0	0	0	0	0	0	8.810	80.8	336.7	42.1
Jb3-1-B-2	15.000	800.0	0	0	0	0	0	0	0	0	8.810	80.8	336.7	42.1
Jb3-1-B-2d	15.000	410.0	0	0	0	0	0	0	0	0	4.405	80.8	168.3	41.1
Kba-3-B-1	30.000	800.0	1.430	0.470	12.905	4.242	0	0	0	0	15.089	95.0	290.0	36.3
Kba-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	14.629	98.4	79.6	2.5
Kse-1-B-5	11.000	3150.0	0	0	0	0	0	0	0	0	42.102	95.0	2145.4	68.1
Kse-1-B-6	11.000	3150.0	0	0	0	0	0	0	0	0	10.672	93.7	543.8	17.3
Kse-10-B3	110.000	3150.0	0	0	0	0	0	0	0	0	51.463	96.9	268.9	8.5
MKi-1-B-1	15.000	2000.0	1.590	0.523	9.098	2.990	0	0	0	0	11.251	95.0	430.9	21.5
MKi-3-B-1	30.000	2000.0	2.055	0.675	11.919	3.917	0	0	0	0	14.709	95.0	279.8	14.0
MKi-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	35.093	90.7	186.5	5.9
Msh-1-B-1	15.000	2000.0	4.110	1.351	23.716	7.795	0	0	0	0	29.290	95.0	1117.2	55.9
Msh-10-B-1	110.000	3150.0	0.620	0.204	5.360	1.762	0	0	0	0	58.328	97.2	312.4	9.9
N-Jb3-.04-1	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2189.9	
N-Jb3-.04-2	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2189.9	
N-Jb3-.04-3	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2189.9	
N-Jb3-.04-4	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2189.9	
N-Jb3-.04-5	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2189.9	
N-Jb3-.04-6	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2189.9	
Nbg-1-B-1	15.000	2500.0	1.890	0.621	10.779	3.543	0	0	0	0	13.336	95.0	511.7	20.5
Nbg-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	30.969	95.4	164.2	5.2
Nde-1-B-1	15.000	2500.0	2.190	0.720	12.459	4.095	0	0	0	0	15.420	95.0	592.3	23.7
Nde-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	89.109	95.4	465.5	14.8
Rwi-1-B-1	15.000	800.0	0.420	0.138	3.728	1.225	0	0	0	0	4.366	95.0	169.2	21.2
Rwi-10-B-1	110.000	3150.0	0.420	0.138	3.498	1.150	0	0	0	0	8.570	94.3	46.8	1.5
Sha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	129.042	96.5	668.9	21.2
Sha-20-B-1	220.000	3150.0	0	0	0	0	0	0	0	0	133.106	93.7	349.3	11.1

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).

Branch Loading Summary Report

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
1-Jb1-Jb3	Cable	480.37	336.69	70.09					
10-Bre-Jb1(S/C)	Line	443.00	375.50	84.76					
10-Bre-Nde-1R(S/C)	Line	581.00	197.30	33.96					
10-Bre-Nde-2(S/C)	Line	581.00	197.62	34.01					
10-Bre-Sha-1	Line	1162.00	335.83	28.90					
10-Bre-Sha-2	Line	1162.00	335.83	28.90					
10-Gha-MKi(S/C)	Line	581.00	33.48	5.76					
10-Gko-Jb1(S/C)	Line	581.00	212.53	36.58					
10-Gko-MKi(S/C)	Line	581.00	17.92	3.08					
10-Gso-Msh-R(D/C)	Line	581.00	312.36	53.76					
10-Gso-Nde-1R(S/C)	Line	581.00	384.36	66.15					
10-Gso-Nde-2(S/C)	Line	581.00	384.12	66.11					
10-Jb1-Jb2(S/C)	Line	581.00	120.43	20.73					
10-Jb1-Nbg(S/C)	Line	581.00	164.21	28.26					
10-Kba-Msh(S/C)	Line	443.00	125.73	28.38					
10-Kba-Rwi(S/C)	Line	443.00	46.76	10.56					
10-MKi-Nbg(S/C)	Line	581.00	92.97	16.00					
Bre-10/1-T-1	Transformer				20.000	19.734	98.7	18.988	94.9
Gha-10/1-T-1n	Transformer				20.000	6.290	31.4	6.214	31.1
Gko-10/1-T-1	Transformer				15.000	14.118	94.1	13.657	91.0
Gko-10/1-T-2	Transformer				15.000	14.225	94.8	13.761	91.7
Gko-10/1-T-3	Transformer				15.000	13.811	92.1	13.360	89.1
Gso-10/1-T-1F	Transformer				15.000	13.951	93.0	13.455	89.7
Jb1-10/1-T-1	Transformer				10.000	7.877	78.8	7.674	76.7
Jb1-10/1-T-2	Transformer				10.000	7.877	78.8	7.674	76.7
Jb1-10/1-T-F1	Transformer				20.000	16.873	84.4	16.437	82.2
Jb2-10/.6-TG-1	Transformer				15.000	12.042	80.3	11.418	76.1
Jb2-10/.6-TG-2	Transformer				15.000	12.042	80.3	11.418	76.1
Jb3-1/0-TG-1	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-2	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-3	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-4	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-5	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-6	Transformer				1.625	1.531	94.2	1.468	90.4
Kba-10/3-T-1	Transformer				10.000	7.314	73.1	7.218	72.2
Kba-10/3-T-2	Transformer				10.000	7.314	73.1	7.218	72.2

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
Kse-10/1-TG-1n2	Transformer				62.500	42.102	67.4	41.067	65.7
Kse-10/1-TG-2n2	Transformer				15.000	10.672	71.1	10.410	69.4
MKi-10/1-T-1	Transformer				20.000	11.503	57.5	11.251	56.3
MKi-10/3-T-1	Transformer				20.000	15.143	75.7	14.709	73.5
Msh-10/1-T-1	Transformer				10.000	9.150	91.5	8.950	89.5
Msh-10/1-T-1F	Transformer				20.000	19.599	98.0	19.170	95.8
Nbg-10/1-T-1n	Transformer				20.000	6.755	33.8	6.668	33.3
Nbg-10/1-T-2n	Transformer				20.000	6.755	33.8	6.668	33.3
Nde-10/1-T-1n	Transformer				20.000	7.827	39.1	7.710	38.6
Nde-10/1-T-2n	Transformer				20.000	7.827	39.1	7.710	38.6
Rwi-10/1-T-1n	Transformer				10.000	4.448	44.5	4.366	43.7
Sha-20/10-T-1n	Transformer				90.000	66.553	73.9	64.521	71.7
Sha-20/10-T-2n	Transformer				90.000	66.553	73.9	64.521	71.7

* Indicates a branch with operating load exceeding the branch capability.

Branch Losses Summary Report

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	
10-Kba-Msh(S/C)	-22.494	-5.218	22.770	4.985	275.9	-232.3	96.4	98.0	1.61
10-Kba-Rwi(S/C)	8.093	2.649	-8.081	-2.853	11.6	-204.5	96.4	96.2	0.20
1-Jb1-Jb3	-7.114	-5.193	7.116	5.195	1.6	1.5	100.7	100.7	0.03
10-Bre-Nde-1R(S/C)	35.252	13.917	-35.184	-13.824	67.6	93.2	100.9	100.6	0.38
10-Bre-Jb1(S/C)	70.904	13.489	-70.166	-12.195	737.3	1293.1	100.9	99.5	1.39
10-Bre-Nde-2(S/C)	-35.166	-13.940	35.184	13.824	18.6	-115.8	100.5	100.6	0.09
10-Bre-Sha-2	-62.140	-17.607	62.245	16.987	105.1	-619.9	100.9	101.2	0.31
10-Bre-Sha-1	-62.140	-17.607	62.245	16.987	105.1	-619.9	100.9	101.2	0.31
10-Gha-MKi(S/C)	-5.914	-2.143	5.917	1.922	3.8	-220.4	98.6	98.7	0.12
10-Gko-Jb1(S/C)	-37.764	-13.042	37.942	13.341	178.3	299.2	98.7	99.5	0.88
10-Gko-MKi(S/C)	-1.149	-3.167	1.150	3.011	0.7	-156.7	98.7	98.7	0.07
10-Gso-Msh-R(D/C)	57.110	14.734	-56.708	-13.649	401.8	1085.4	99.4	98.0	1.41
10-Gso-Nde-1R(S/C)	-69.955	-20.180	70.301	21.124	346.6	943.9	99.4	100.3	0.88
10-Gso-Nde-2(S/C)	70.372	21.144	-70.301	-21.124	70.5	19.7	100.5	100.3	0.16
10-Jb1-Jb2(S/C)	-18.492	-13.407	18.499	13.390	7.6	-16.9	99.5	99.6	0.08
10-Jb1-Nbg(S/C)	29.625	9.379	-29.534	-9.320	91.2	59.0	99.5	99.0	0.56
10-MKi-Nbg(S/C)	16.841	4.692	-16.817	-4.805	24.0	-112.5	99.0	98.7	0.25
Bre-10/1-T-1	-18.038	-5.929	18.124	7.808	85.4	1878.9	100.1	100.9	0.81
Gha-10/1-T-1n	-5.904	-1.940	5.914	2.143	10.1	202.3	100.0	98.6	1.42
Gko-10/1-T-1	-12.973	-4.266	13.032	5.431	58.2	1164.5	100.4	98.7	1.72
Gko-10/1-T-2	-13.074	-4.293	13.133	5.466	58.7	1173.2	100.4	98.7	1.72
Gko-10/1-T-3	-12.691	-4.173	12.748	5.313	57.0	1139.2	100.4	98.7	1.72
Gso-10/1-T-1F	-12.782	-4.201	12.845	5.446	62.2	1244.5	100.8	99.4	1.43
Jb1-10/1-T-1	-7.492	-1.662	7.539	2.282	47.7	620.2	100.7	99.5	1.15
Jb1-10/1-T-2	-7.492	-1.662	7.539	2.282	47.7	620.2	100.7	99.5	1.15
Jb1-10/1-T-F1	-15.946	-3.988	16.013	5.319	66.5	1330.7	100.7	99.5	1.15
Jb2-10/.6-TG-1	9.300	7.650	-9.250	-6.695	50.3	954.9	105.1	99.6	5.44
Jb2-10/.6-TG-2	9.300	7.650	-9.250	-6.695	50.3	954.9	105.1	99.6	5.44
Jb3-1/0-TG-1	-1.186	-0.866	1.200	0.950	14.0	84.2	100.7	100.9	4.26
Jb3-1/0-TG-2	-1.186	-0.866	1.200	0.950	14.0	84.2	100.7	100.9	4.26
Jb3-1/0-TG-3	-1.186	-0.866	1.200	0.950	14.0	84.2	100.7	100.9	4.26
Jb3-1/0-TG-4	-1.186	-0.866	1.200	0.950	14.0	84.2	100.7	100.9	4.26
Jb3-1/0-TG-5	-1.186	-0.866	1.200	0.950	14.0	84.2	100.7	100.9	4.26
Jb3-1/0-TG-6	-1.186	-0.866	1.200	0.950	14.0	84.2	100.7	100.9	4.26
Kba-10/3-T-1	-7.167	-0.852	7.201	1.284	33.3	432.6	100.1	96.4	3.74
Kba-10/3-T-2	-7.167	-0.852	7.201	1.284	33.3	432.6	100.1	96.4	3.74
Kse-10/1-TG-1n2	40.000	13.135	-39.922	-9.628	78.0	3507.8	103.0	100.5	2.53
Kse-10/1-TG-2n2	10.000	3.727	-9.964	-3.012	35.7	714.8	103.0	100.5	2.53

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	in Vmag
MKi-10/1-T-1	-10.688	-3.513	10.721	4.170	32.9	657.3	100.5	98.7	1.75
MKi-10/3-T-1	-13.974	-4.593	14.029	5.701	55.4	1108.4	101.2	98.7	2.43
Msh-10/1-T-1	-8.856	-1.290	8.898	2.132	42.1	841.4	100.9	98.0	2.90
Msh-10/1-T-1F	-18.970	-2.764	19.060	4.566	90.1	1802.2	100.9	98.0	2.90
Nbg-10/1-T-1n	-6.335	-2.082	6.346	2.314	11.6	231.6	100.3	99.0	1.34
Nbg-10/1-T-2n	-6.335	-2.082	6.346	2.314	11.6	231.6	100.3	99.0	1.34
Nde-10/1-T-1n	-7.325	-2.407	7.340	2.718	15.5	310.5	100.2	100.5	0.27
Nde-10/1-T-2n	-7.325	-2.407	7.340	2.718	15.5	310.5	100.2	100.5	0.27
Rwi-10/1-T-1n	-4.148	-1.363	4.164	1.566	15.6	202.4	99.3	96.2	3.11
Sha-20/10-T-1n	-62.245	-16.987	62.383	23.189	137.8	6202.5	101.2	100.0	1.25
Sha-20/10-T-2n	-62.245	-16.987	62.383	23.189	137.8	6202.5	101.2	100.0	1.25
					3871.9	36473.5			

Alert Summary Report

% Alert Settings

	Critical
Loading	
Bus	100.0
Cable	100.0
Reactor	100.0
Line	100.0
Transformer	100.0
Panel	100.0
Protective Device	100.0
Generator	101.0
Inverter/Charger	100.0
Bus Voltage	
OverVoltage	105.0
UnderVoltage	95.0
Generator Excitation	
OverExcited (Q Max.)	101.0
UnderExcited (Q Min.)	100.0

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Jb2-.6-B-1	Bus	Over Voltage	6.600	kV	6.935	105.1	3-Phase

SUMMARY OF TOTAL GENERATION, LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	124.765	46.379	133.106	93.73 Lagging
Source (Non-Swing Buses):	100.800	54.862	114.763	87.83 Lagging
Total Demand:	225.565	101.241	247.244	91.23 Lagging
Total Motor Load:	33.540	11.024	35.305	95.00 Lagging
Total Static Load:	188.153	53.744	195.678	96.15 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	3.872	36.474		
System Mismatch:	0.000	0.000		

Number of Iterations: 2

2. 潮流計算報告書

4) 2026 年断面（要約）

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
10-Kba/Msh/Rwi-B	110.000	645.0	0	0	0	0	0	0	0	0	28.928	98.6	158.9	24.6
B-1-Jb1-Jb3-1	15.000	99999.0	0	0	0	0	0	0	0	0	8.810	80.8	336.0	0.3
B-1-Jb1-Jb3-2	15.000	99999.0	0	0	0	0	0	0	0	0	8.812	80.8	336.0	0.3
B-10-Bre-Gso-1	110.000	99999.0	0	0	0	0	0	0	0	0	60.702	98.0	316.3	0.3
B-10-Bre-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	112.291	96.4	585.1	0.6
B-10-Bre-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	111.166	96.8	585.5	0.6
B-10-Bre-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	60.407	98.1	316.6	0.3
B-10-Bre-Sha-1D	110.000	99999.0	0	0	0	0	0	0	0	0	99.094	96.6	516.3	0.5
B-10-Bre-Sha-1DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	99.094	96.6	516.3	0.5
B-10-Bre-Sha-2D	110.000	99999.0	0	0	0	0	0	0	0	0	99.303	96.6	515.0	0.5
B-10-Bre-Sha-2DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	99.303	96.6	515.0	0.5
B-10-Gha-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	8.223	93.7	43.9	0.0
B-10-Gha-MKi-2	110.000	99999.0	0	0	0	0	0	0	0	0	8.158	94.6	43.5	0.0
B-10-Gko-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	54.911	94.2	292.8	0.3
B-10-Gko-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	55.507	93.8	292.3	0.3
B-10-Gko-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	1.975	29.8	10.5	0.0
B-10-Gko-MKi-2	110.000	645.0	0	0	0	0	0	0	0	0	1.826	32.2	9.7	1.5
B-10-Gso-Msh-1	110.000		0	0	0	0	0	0	0	0	73.719	98.3	391.0	
B-10-Gso-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	72.726	98.8	391.7	0.4
B-10-Gso-Nde-1	110.000	99999.0	0	0	0	0	0	0	0	0	91.361	97.5	484.6	0.5
B-10-Gso-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	92.401	97.2	484.2	0.5
B-10-Jb-Grid-1	110.000		0	0	0	0	0	0	0	0	12.207	81.9	64.3	
B-10-Jb1-Jb2-1	110.000	99999.0	0	0	0	0	0	0	0	0	22.843	81.0	120.3	0.1
B-10-Jb1-Jb2-2	110.000	99999.0	0	0	0	0	0	0	0	0	22.839	81.0	120.2	0.1
B-10-Jb1-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	43.698	94.3	230.1	0.2
B-10-Jb1-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	43.416	94.5	230.5	0.2
B-10-Kba-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	29.380	98.6	158.3	0.2
B-10-Kba-Rwi-2	110.000	99999.0	0	0	0	0	0	0	0	0	10.935	94.1	60.2	0.1
B-10-Mki-Grid-1	110.000		0	0	0	0	0	0	0	0	18.028	83.2	96.1	
B-10-MKi-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	25.425	95.2	135.0	0.1
B-10-MKi-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	25.384	95.1	135.3	0.1
B-20-Sha-Grid-1	220.000		0	0	0	0	0	0	0	0	204.945	93.8	537.8	
Bre-1-B-1	15.000	2000.0	3.525	1.159	20.100	6.607	0	0	0	0	24.869	95.0	954.2	47.7
Bre-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	198.188	96.6	1032.6	32.8
C-BN	110.000		0	0	0	0	0	0	0	0	60.447	98.1	316.4	
C-GN	110.000		0	0	0	0	0	0	0	0	92.261	97.2	484.4	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
C-Kab-3-B	30.000		0	0	0	-5.964	0	0	0	0	5.964	0.0	115.1	
C-Msh-1-B	15.000		0	0	0	-10.066	0	0	0	0	10.066	0.0	386.2	
C-Rwi-B-1	15.000		0	0	0	0	0	0	0	0	0	0.0	0.0	
G-Jb2-10-B	110.000	99999.0	0	0	0	0	0	0	0	0	22.839	81.0	120.2	0.1
G-Jb3-1-B	15.000	99999.0	0	0	0	0	0	0	0	0	8.812	80.8	336.0	0.3
G-Kse-1-B2	110.000	99999.0	0	0	0	0	0	0	0	0	52.896	94.3	277.2	0.3
Gha-1-B-1	15.000	800.0	1.140	0.375	6.550	2.153	0	0	0	0	8.095	95.0	309.4	38.7
Gha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	8.223	93.7	43.9	1.4
Gko-1-B-1	15.000	2500.0	10.040	3.300	40.954	13.461	0	0	0	0	53.678	95.0	2045.9	81.8
Gko-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	55.573	93.1	296.4	9.4
Gso-1-B-1	15.000	2000.0	2.475	0.813	14.135	4.646	0	0	0	0	17.484	95.0	670.3	33.5
Gso-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	91.361	97.5	484.6	15.4
Jb1-1-B-1	15.000	2500.0	7.350	2.416	42.427	13.945	0	0	0	0	52.397	95.0	1998.2	79.9
Jb1-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	144.406	94.3	760.5	24.1
Jb2-.6-B-1	6.600	3150.0	0	0	0	0	0	0	0	0	24.084	77.2	2003.1	63.6
Jb2-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	22.839	81.0	120.2	3.8
Jb2-10-B-2	110.000	3150.0	0	0	0	0	0	0	0	0	22.839	81.0	120.2	3.8
Jb3-1-B-1	15.000	800.0	0	0	0	0	0	0	0	0	8.812	80.8	336.0	42.0
Jb3-1-B-2	15.000	800.0	0	0	0	0	0	0	0	0	8.812	80.8	336.0	42.0
Jb3-1-B-2d	15.000	410.0	0	0	0	0	0	0	0	0	4.406	80.8	168.0	41.0
Kba-3-B-1	30.000	800.0	1.820	0.598	16.281	5.351	0	0	0	0	19.058	95.0	367.9	46.0
Kba-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	18.257	99.7	100.3	3.2
Kse-1-B-5	11.000	3150.0	0	0	0	0	0	0	0	0	42.602	93.9	2170.9	68.9
Kse-1-B-6	11.000	3150.0	0	0	0	0	0	0	0	0	12.500	80.0	624.6	19.8
Kse-10-B3	110.000	3150.0	0	0	0	0	0	0	0	0	52.896	94.3	277.2	8.8
MKi-1-B-1	15.000	2000.0	2.070	0.680	11.931	3.922	0	0	0	0	14.738	95.0	562.5	28.1
MKi-3-B-1	30.000	2000.0	2.685	0.883	15.183	4.990	0	0	0	0	18.809	95.0	362.4	18.1
MKi-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	43.553	91.2	232.2	7.4
Msh-1-B-1	15.000	2000.0	5.250	1.726	29.948	9.843	0	0	0	0	37.050	95.0	1421.3	71.1
Msh-10-B-1	110.000	3150.0	0.790	0.260	6.751	2.219	0	0	0	0	72.726	98.8	391.7	12.4
N-Jb3-.04-1	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2185.2	
N-Jb3-.04-2	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2185.2	
N-Jb3-.04-3	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2185.2	
N-Jb3-.04-4	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2185.2	
N-Jb3-.04-5	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2185.2	
N-Jb3-.04-6	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2185.2	
Nbg-1-B-1	15.000	2500.0	2.475	0.813	14.338	4.713	0	0	0	0	17.698	95.0	673.7	26.9
Nbg-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	43.416	94.5	230.5	7.3

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
Nde-1-B-1	15.000	2500.0	2.865	0.942	16.450	5.407	0	0	0	0	20.331	95.0	777.4	31.1
Nde-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	113.005	96.6	592.2	18.8
Rwi-1-B-1	15.000	800.0	0.540	0.177	4.771	1.568	0	0	0	0	5.591	95.0	217.2	27.1
Rwi-10-B-1	110.000	3150.0	0.540	0.177	4.411	1.450	0	0	0	0	10.935	94.1	60.2	1.9
Sha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	198.605	96.6	1030.0	32.7
Sha-20-B-1	220.000	3150.0	0	0	0	0	0	0	0	0	204.945	93.8	537.8	17.1

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).

Branch Loading Summary Report

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp	%	Capability (MVA)	Loading (input)		Loading (output)	
ID	Type					MVA	%	MVA	%
1-Jb1-Jb3	Cable	480.37	335.96	69.94					
10-Bre-Jb1-R(D/C)	Line	1162.00	585.48	50.39					
10-Bre-Nde-1R(S/C)	Line	581.00	316.39	54.46					
10-Bre-Nde-2(S/C)	Line	581.00	316.56	54.49					
10-Bre-Sha-1	Line	1162.00	516.30	44.43					
10-Bre-Sha-2	Line	1162.00	516.30	44.43					
10-Gha-MKi(S/C)	Line	581.00	43.91	7.56					
10-Gko-Jb1(S/C)	Line	581.00	292.83	50.40					
10-Gko-MKi(S/C)	Line	581.00	10.53	1.81					
10-Gso-Msh-R(D/C)	Line	581.00	391.73	67.42					
10-Gso-Nde-1R(S/C)	Line	581.00	484.61	83.41					
10-Gso-Nde-2(S/C)	Line	581.00	484.42	83.38					
10-Jb1-Jb2(S/C)	Line	581.00	120.31	20.71					
10-Jb1-Nbg(S/C)	Line	581.00	230.55	39.68					
10-Kba-Msh(S/C)	Line	443.00	158.94	35.88					
10-Kba-Rwi(S/C)	Line	443.00	60.25	13.60					
10-MKi-Nbg(S/C)	Line	581.00	135.32	23.29					
Bre-10/1-T-1	Transformer				20.000	12.742	63.7	12.434	62.2
Bre-10/1-T-1F	Transformer				20.000	12.742	63.7	12.434	62.2
Gha-10/1-T-1n	Transformer				20.000	8.223	41.1	8.095	40.5
Gko-10/1-T-1	Transformer				15.000	11.038	73.6	10.767	71.8
Gko-10/1-T-1F	Transformer				30.000	22.075	73.6	21.534	71.8
Gko-10/1-T-2	Transformer				15.000	11.121	74.1	10.849	72.3
Gko-10/1-T-3	Transformer				15.000	10.798	72.0	10.533	70.2
Gso-10/1-T-1F	Transformer				15.000	8.947	59.6	8.742	58.3
Gso-10/1-T-2F	Transformer				15.000	8.947	59.6	8.742	58.3
Jb1-10/1-T-1	Transformer				10.000	7.195	72.0	7.018	70.2
Jb1-10/1-T-2	Transformer				10.000	7.195	72.0	7.018	70.2
Jb1-10/1-T-F1	Transformer				20.000	15.412	77.1	15.033	75.2
Jb1-10/1-T-F2	Transformer				20.000	15.412	77.1	15.033	75.2
Jb2-10/.6-TG-1	Transformer				15.000	12.042	80.3	11.420	76.1
Jb2-10/.6-TG-2	Transformer				15.000	12.042	80.3	11.420	76.1
Jb3-1/0-TG-1	Transformer				1.625	1.531	94.2	1.469	90.4

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
Jb3-1/0-TG-2	Transformer				1.625	1.531	94.2	1.469	90.4
Jb3-1/0-TG-3	Transformer				1.625	1.531	94.2	1.469	90.4
Jb3-1/0-TG-4	Transformer				1.625	1.531	94.2	1.469	90.4
Jb3-1/0-TG-5	Transformer				1.625	1.531	94.2	1.469	90.4
Jb3-1/0-TG-6	Transformer				1.625	1.531	94.2	1.469	90.4
Kba-10/3-T-1	Transformer				10.000	9.129	91.3	9.051	90.5
Kba-10/3-T-2	Transformer				10.000	9.129	91.3	9.051	90.5
Kse-10/1-TG-1n2	Transformer				62.500	42.602	68.2	41.427	66.3
Kse-10/1-TG-2n2	Transformer				15.000	12.500	83.3	11.919	79.5
MKi-10/1-T-1	Transformer				20.000	15.177	75.9	14.738	73.7
MKi-10/3-T-1	Transformer				20.000	19.555	97.8	18.809	94.0
Msh-10/1-T-1	Transformer				10.000	6.727	67.3	6.667	66.7
Msh-10/1-T-1F	Transformer				20.000	14.410	72.1	14.281	71.4
Msh-10/1-T-2F	Transformer				20.000	14.410	72.1	14.281	71.4
Nbg-10/1-T-1n	Transformer				20.000	9.001	45.0	8.849	44.2
Nbg-10/1-T-2n	Transformer				20.000	9.001	45.0	8.849	44.2
Nde-10/1-T-1n	Transformer				20.000	10.370	51.9	10.166	50.8
Nde-10/1-T-2n	Transformer				20.000	10.370	51.9	10.166	50.8
Rwi-10/1-T-1n	Transformer				10.000	5.728	57.3	5.591	55.9
Sha-20/10-T-1n	Transformer				90.000	68.315	75.9	66.202	73.6
Sha-20/10-T-2n	Transformer				90.000	68.315	75.9	66.202	73.6
Sha-20/10-T-3n	Transformer				90.000	68.315	75.9	66.202	73.6

* Indicates a branch with operating load exceeding the branch capability.

Branch Losses Summary Report

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	
10-Kba-Msh(S/C)	-28.514	-4.878	28.956	4.973	442.2	94.3	95.5	97.4	1.91
10-Kba-Rwi(S/C)	10.307	3.521	-10.287	-3.706	19.4	-185.7	95.5	95.3	0.27
1-Jb1-Jb3	-7.115	-5.195	7.116	5.197	1.6	1.5	100.9	101.0	0.02
10-Bre-Nde-1R(S/C)	59.496	12.044	-59.322	-11.610	174.0	433.5	100.7	100.3	0.46
10-Bre-Jb1-R(D/C)	108.207	30.008	-107.649	-27.742	558.6	2266.3	100.7	99.7	1.08
10-Bre-Nde-2(S/C)	-59.274	-11.649	59.322	11.610	47.9	-38.7	100.2	100.3	0.12
10-Bre-Sha-2	-95.701	-25.711	95.949	25.587	248.8	-123.8	100.7	101.2	0.47
10-Bre-Sha-1	-95.701	-25.711	95.949	25.587	248.8	-123.8	100.7	101.2	0.47
10-Gha-MKi(S/C)	-7.707	-2.866	7.714	2.656	6.6	-210.1	98.3	98.5	0.16
10-Gko-Jb1(S/C)	-51.722	-18.443	52.060	19.255	338.7	811.6	98.4	99.7	1.23
10-Gko-MKi(S/C)	0.589	-1.886	-0.588	1.728	0.2	-157.4	98.4	98.5	0.03
10-Gso-Msh-R(D/C)	72.452	13.610	-71.819	-11.450	632.9	2160.7	98.9	97.4	1.51
10-Gso-Nde-1R(S/C)	-89.115	-20.130	89.666	21.728	551.1	1598.2	98.9	100.0	1.02
10-Gso-Nde-2(S/C)	89.779	21.858	-89.666	-21.728	112.2	129.2	100.2	100.0	0.19
10-Jb1-Jb2(S/C)	-18.492	-13.411	18.500	13.394	7.5	-17.0	99.7	99.7	0.08
10-Jb1-Nbg(S/C)	41.228	14.484	-41.048	-14.142	179.9	342.3	99.7	98.8	0.82
10-MKi-Nbg(S/C)	24.195	7.812	-24.144	-7.838	50.8	-25.9	98.8	98.5	0.38
Bre-10/1-T-1	-11.813	-3.883	11.849	4.685	36.5	802.8	100.3	100.7	0.42
Bre-10/1-T-1F	-11.813	-3.883	11.849	4.685	36.5	802.8	100.3	100.7	0.42
Gha-10/1-T-1n	-7.690	-2.528	7.707	2.866	16.9	338.9	100.7	98.3	2.40
Gko-10/1-T-1	-10.265	-3.249	10.301	3.964	35.8	715.3	101.0	98.4	2.56
Gko-10/1-T-1F	-20.342	-7.065	20.374	8.497	31.8	1432.0	101.0	98.4	2.56
Gko-10/1-T-2	-10.345	-3.268	10.381	3.989	36.0	720.6	101.0	98.4	2.56
Gko-10/1-T-3	-10.042	-3.178	10.077	3.878	35.0	699.8	101.0	98.4	2.56
Gso-10/1-T-1F	-8.305	-2.730	8.332	3.260	26.5	530.2	100.4	98.9	1.44
Gso-10/1-T-2F	-8.305	-2.730	8.332	3.260	26.5	530.2	100.4	98.9	1.44
Jb1-10/1-T-1	-6.821	-1.653	6.861	2.169	39.7	516.3	100.9	99.7	1.27
Jb1-10/1-T-2	-6.821	-1.653	6.861	2.169	39.7	516.3	100.9	99.7	1.27
Jb1-10/1-T-F1	-14.510	-3.930	14.566	5.038	55.4	1107.9	100.9	99.7	1.27
Jb1-10/1-T-F2	-14.510	-3.930	14.566	5.038	55.4	1107.9	100.9	99.7	1.27
Jb2-10/.6-TG-1	9.300	7.650	-9.250	-6.697	50.2	953.0	105.2	99.7	5.44
Jb2-10/.6-TG-2	9.300	7.650	-9.250	-6.697	50.2	953.0	105.2	99.7	5.44
Jb3-1/0-TG-1	-1.186	-0.866	1.200	0.950	14.0	83.9	101.0	101.1	4.25
Jb3-1/0-TG-2	-1.186	-0.866	1.200	0.950	14.0	83.9	101.0	101.1	4.25
Jb3-1/0-TG-3	-1.186	-0.866	1.200	0.950	14.0	83.9	101.0	101.1	4.25

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	in Vmag
Jb3-1/0-TG-4	-1.186	-0.866	1.200	0.950	14.0	83.9	101.0	101.1	4.25
Jb3-1/0-TG-5	-1.186	-0.866	1.200	0.950	14.0	83.9	101.0	101.1	4.25
Jb3-1/0-TG-6	-1.186	-0.866	1.200	0.950	14.0	83.9	101.0	101.1	4.25
Kba-10/3-T-1	-9.051	0.007	9.103	0.679	52.8	686.1	99.7	95.5	4.17
Kba-10/3-T-2	-9.051	0.007	9.103	0.679	52.8	686.1	99.7	95.5	4.17
Kse-10/1-TG-1n2	40.000	14.661	-39.920	-11.070	79.8	3591.7	103.0	100.2	2.84
Kse-10/1-TG-2n2	10.000	7.500	-9.953	-6.557	47.1	942.9	105.0	100.2	4.88
MKi-10/1-T-1	-14.001	-4.602	14.057	5.722	56.0	1119.7	100.9	98.5	2.40
MKi-10/3-T-1	-17.868	-5.873	17.961	7.732	92.9	1858.8	99.9	98.5	1.44
Msh-10/1-T-1	-6.661	-0.284	6.685	0.757	23.6	472.4	100.3	97.4	2.89
Msh-10/1-T-1F	-14.268	-0.609	14.319	1.621	50.6	1011.8	100.3	97.4	2.89
Msh-10/1-T-2F	-14.268	-0.609	14.319	1.621	50.6	1011.8	100.3	97.4	2.89
Nbg-10/1-T-1n	-8.407	-2.763	8.427	3.165	20.1	401.6	101.1	98.8	2.27
Nbg-10/1-T-2n	-8.407	-2.763	8.427	3.165	20.1	401.6	101.1	98.8	2.27
Nde-10/1-T-1n	-9.657	-3.174	9.684	3.709	26.7	534.8	100.7	100.2	0.50
Nde-10/1-T-2n	-9.657	-3.174	9.684	3.709	26.7	534.8	100.7	100.2	0.50
Rwi-10/1-T-1n	-5.311	-1.746	5.337	2.079	25.6	333.3	99.1	95.3	3.82
Sha-20/10-T-1n	-63.966	-17.058	64.111	23.594	145.2	6535.3	101.2	100.0	1.21
Sha-20/10-T-2n	-63.966	-17.058	64.111	23.594	145.2	6535.3	101.2	100.0	1.21
Sha-20/10-T-3n	-63.966	-17.058	64.111	23.594	145.2	6535.3	101.2	100.0	1.21
					5338.4	52378.3			

Alert Summary Report

% Alert Settings

	Critical
Loading	
Bus	100.0
Cable	100.0
Reactor	100.0
Line	100.0
Transformer	100.0
Panel	100.0
Protective Device	100.0
Generator	101.0
Inverter/Charger	100.0
Bus Voltage	
OverVoltage	105.0
UnderVoltage	95.0
Generator Excitation	
OverExcited (Q Max.)	101.0
UnderExcited (Q Min.)	100.0

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Jb2-.6-B-1	Bus	Over Voltage	6.600	kV	6.942	105.2	3-Phase
Kse-1-B-6	Bus	Over Voltage	11.000	kV	11.555	105.0	3-Phase

SUMMARY OF TOTAL GENERATION, LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	192.335	70.781	204.945	93.85 Lagging
Source (Non-Swing Buses):	100.800	60.161	117.388	85.87 Lagging
Total Demand:	293.135	130.942	321.051	91.30 Lagging
Total Motor Load:	43.565	14.319	45.858	95.00 Lagging
Total Static Load:	244.231	64.245	252.540	96.71 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	5.338	52.378		
System Mismatch:	0.000	0.000		

Number of Iterations: 2

2. 潮流計算報告書

5) 2028 年断面（詳細）

Electrical Transient Analyzer Program

Load Flow Analysis

Loading Category (1): Design

Generation Category (1): Grid Balance

Load Diversity Factor: None

	Swing	V-Control	Load	Total
Number of Buses:	1	11	68	80

	XFMR2	XFMR3	Reactor	Line/Cable	Impedance	Tie PD	Total
Number of Branches:	40	0	0	17	0	42	99

Method of Solution:	Newton-Raphson Method
Maximum No. of Iteration:	9999
Precision of Solution:	0.0001000
System Frequency:	50.00 Hz
Unit System:	Metric
Project Filename:	Rwanda-Imp SSs Ph 2
Output Filename:	C:\Users\3010\Documents\ SugarSync Business\ \Rwanda ETAP Project File\R-LF-2028.lfr 2

Adjustments

Tolerance	Apply Adjustments	Individual /Global	Percent
Transformer Impedance:	Yes	Individual	
Reactor Impedance:	Yes	Individual	
Overload Heater Resistance:	No		
Transmission Line Length:	No		
Cable Length:	No		

Temperature Correction	Apply Adjustments	Individual /Global	Degree C
Transmission Line Resistance:	Yes	Individual	
Cable Resistance:	Yes	Individual	

Bus Input Data

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
10-Kba/Msh/Rwi-B	110.000	1	100.0	0.0								
B-1-Jb1-Jb3-1	15.000	1	100.0	0.0								
B-1-Jb1-Jb3-2	15.000	1	100.0	0.0								
B-10-Bre-Gso-1	110.000	1	100.0	0.0								
B-10-Bre-Jb1-1	110.000	1	100.0	0.0								
B-10-Bre-Jb1-2	110.000	1	100.0	0.0								
B-10-Bre-Nde-2	110.000	1	100.0	0.0								
B-10-Bre-Sha-1D	110.000	1	100.0	0.0								
B-10-Bre-Sha-1DT-F	110.000	1	100.0	0.0								
B-10-Bre-Sha-2D	110.000	1	100.0	0.0								
B-10-Bre-Sha-2DT-F	110.000	1	100.0	0.0								
B-10-Gha-MKi-1	110.000	1	100.0	0.0								
B-10-Gha-MKi-2	110.000	1	100.0	0.0								
B-10-Gko-Jb1-1	110.000	1	100.0	0.0								
B-10-Gko-Jb1-2	110.000	1	100.0	0.0								
B-10-Gko-MKi-1	110.000	1	100.0	0.0								
B-10-Gko-MKi-2	110.000	1	100.0	0.0								
B-10-Gso-Msh-1	110.000	1	100.0	0.0								
B-10-Gso-Msh-2	110.000	1	100.0	0.0								
B-10-Gso-Nde-1	110.000	1	100.0	0.0								
B-10-Gso-Nde-2	110.000	1	100.0	0.0								
B-10-Jb-Grid-1	110.000	1	100.0	0.0								
B-10-Jb1-Jb2-1	110.000	1	100.0	0.0								
B-10-Jb1-Jb2-2	110.000	1	100.0	0.0								
B-10-Jb1-Nbg-1	110.000	1	100.0	0.0								
B-10-Jb1-Nbg-2	110.000	1	100.0	0.0								
B-10-Kba-Msh-2	110.000	1	100.0	0.0								
B-10-Kba-Rwi-2	110.000	1	100.0	0.0								
B-10-Mki-Grid-1	110.000	1	100.0	0.0								
B-10-MKi-Nbg-1	110.000	1	100.0	0.0								
B-10-MKi-Nbg-2	110.000	1	100.0	0.0								
B-20-Sha-Grid-1	220.000	1	100.0	0.0								
Bre-1-B-1	15.000	1	100.0	0.0	5.600	1.840	22.400	7.360				

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
Bre-10-B-1	110.000	1	100.0	0.0								
C-BN	110.000	1	100.0	0.0								
C-GN	110.000	1	100.0	0.0								
C-Kab-3-B	30.000	1	100.0	0.0			0.000	-6.000				
C-Msh-1-B	15.000	1	100.0	0.0			0.000	-10.000				
C-Rwi-B-1	15.000	1	100.0	0.0			0.000	-1.000				
G-Jb2-10-B	110.000	1	100.0	0.0								
G-Jb3-1-B	15.000	1	100.0	0.0								
G-Kse-1-B2	110.000	1	100.0	0.0								
Gha-1-B-1	15.000	1	100.0	0.0	1.365	0.449	7.735	2.542				
Gha-10-B-1	110.000	1	100.0	0.0								
Gko-1-B-1	15.000	1	100.0	0.0	11.960	3.931	47.840	15.724				
Gko-10-B-1	110.000	1	100.0	0.0								
Gso-1-B-1	15.000	1	100.0	0.0	2.940	0.966	16.660	5.476				
Gso-10-B-1	110.000	1	100.0	0.0								
Jb1-1-B-1	15.000	1	100.0	0.0	8.745	2.874	49.555	16.288				
Jb1-10-B-1	110.000	1	100.0	0.0								
Jb2-.6-B-1	6.600	1	103.0	0.0								
Jb2-10-B-1	110.000	1	100.0	0.0								
Jb2-10-B-2	110.000	1	100.0	0.0								
Jb3-1-B-1	15.000	1	100.0	0.0								
Jb3-1-B-2	15.000	1	100.0	0.0								
Jb3-1-B-2d	15.000	1	100.0	0.0								
Kba-3-B-1	30.000	1	100.0	0.0	2.140	0.703	19.260	6.330				
Kba-10-B-1	110.000	1	100.0	0.0								
Kse-1-B-5	11.000	1	103.0	0.0								
Kse-1-B-6	11.000	1	103.0	0.0								
Kse-10-B3	110.000	1	100.0	0.0								
MKi-1-B-1	15.000	1	100.0	0.0	2.475	0.813	14.025	4.610				
MKi-3-B-1	30.000	1	100.0	0.0	3.195	1.050	18.105	5.951				
MKi-10-B-1	110.000	1	100.0	0.0								
Msh-1-B-1	15.000	1	100.0	0.0	6.150	2.021	34.850	11.455				
Msh-10-B-1	110.000	1	100.0	0.0	0.920	0.302	8.280	2.722				
N-Jb3-.04-1	0.400	1	103.0	0.0								
N-Jb3-.04-2	0.400	1	103.0	0.0								

Bus			Initial Voltage		Load							
					Constant kVA		Constant Z		Constant I		Generic	
ID	kV	Sub-sys	% Mag.	Ang.	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar
N-Jb3-.04-3	0.400	1	103.0	0.0								
N-Jb3-.04-4	0.400	1	103.0	0.0								
N-Jb3-.04-5	0.400	1	103.0	0.0								
N-Jb3-.04-6	0.400	1	103.0	0.0								
Nbg-1-B-1	15.000	1	100.0	0.0	2.940	0.966	16.660	5.476				
Nbg-10-B-1	110.000	1	100.0	0.0								
Nde-1-B-1	15.000	1	100.0	0.0	3.405	1.119	19.295	6.342				
Nde-10-B-1	110.000	1	100.0	0.0								
Rwi-1-B-1	15.000	1	100.0	0.0	0.630	0.207	5.670	1.864				
Rwi-10-B-1	110.000	1	100.0	0.0	0.630	0.207	5.670	1.864				
Sha-10-B-1	110.000	1	100.0	0.0								
Sha-20-B-1	220.000	1	100.0	0.0								
Total Number of Buses: 80					53.095	17.451	286.005	77.003	0.000	0.000	0.000	0.000

Generation Bus				Voltage		Generation			Mvar Limits	
ID	kV	Type	Sub-sys	% Mag.	Angle	MW	Mvar	% PF	Max	Min
B-10-Jb-Grid-1	110.000	Voltage Control	1	100.0	0.0	10.000			7.000	0.000
B-10-Mki-Grid-1	110.000	Voltage Control	1	100.0	0.0	15.000			10.000	0.000
B-20-Sha-Grid-1	220.000	Swing	1	100.0	0.0					
Jb2-.6-B-1	6.600	Voltage Control	1	103.0	0.0	18.600			15.300	0.000
Kse-1-B-5	11.000	Voltage Control	1	103.0	0.0	40.000			30.000	0.000
Kse-1-B-6	11.000	Voltage Control	1	103.0	0.0	10.000			7.500	0.000
N-Jb3-.04-1	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-2	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-3	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-4	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-5	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
N-Jb3-.04-6	0.400	Voltage Control	1	103.0	0.0	1.200			0.950	0.000
						100.800	0.000			

Line/Cable Input Data

Line/Cable ID	Library	Size	Length Adj. (m)	% Tol.	#/Phase	T (°C)	Ohms or Siemens/1000 m per Conductor (Cable) or per Phase (Line) R	X	Y
1-Jb1-Jb3	15NCUS3	240	50.0	0.0	1	75	0.094138	0.089300	
10-Bre-Jb1-R(D/C)		282.	7500.0	0.0	2	75	0.072473	0.334693	0.0000034
10-Bre-Nde-1R(S/C)		282.	4000.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Bre-Nde-2(S/C)		282.	2200.0	0.0	1	75	0.072450	0.188633	0.0000061
10-Bre-Sha-1		282.	8600.0	0.0	2	75	0.036268	0.124622	0.0000092
10-Bre-Sha-2		282.	8600.0	0.0	2	75	0.036268	0.124622	0.0000092
10-Gha-MKi(S/C)		282.	7900.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gko-Jb1(S/C)		282.	9100.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gko-MKi(S/C)		282.	5400.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gso-Msh-R(D/C)		282.	19000.0	0.0	2	75	0.072473	0.334693	0.0000034
10-Gso-Nde-1R(S/C)		282.	5400.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Gso-Nde-2(S/C)		282.	2200.0	0.0	1	75	0.072450	0.188633	0.0000061
10-Jb1-Jb2(S/C)		282.	1200.0	0.0	1	75	0.144906	0.426513	0.0000027
10-Jb1-Nbg(S/C)		282.	7800.0	0.0	1	75	0.144920	0.462685	0.0000025
10-Kba-Msh-R(D/C)		282.	25200.0	0.0	2	75	0.072473	0.334693	0.0000034
10-Kba-Rwi(S/C)		176.	7700.0	0.0	1	75	0.232506	0.441167	0.0000026
10-MKi-Nbg(S/C)		282.	6400.0	0.0	1	75	0.144920	0.462685	0.0000025

Line / Cable resistances are listed at the specified temperatures.

2-Winding Transformer Input Data

Transformer		Rating					Z Variation			% Tap Setting		Adjusted	Phase Shift	
ID	Phase	MVA	Prim. kV	Sec. kV	% Z1	X1/R1	+ 5%	- 5%	% Tol.	Prim.	Sec.	% Z	Type	Angle
Bre-10/1-T-1	3-Phase	20.000	110.000	15.000	10.46	22.00	0	0	0	0	0	10.4600	YNyn	0.000
Bre-10/1-T-1F	3-Phase	20.000	110.000	15.000	10.46	22.00	0	0	0	0	0	10.4600	YNyn	0.000
Gha-10/1-T-1n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Gko-10/1-T-1	3-Phase	15.000	110.000	15.000	9.00	20.00	0	0	5.0	0	0	9.4500	YNyn	0.000
Gko-10/1-T-1F	3-Phase	30.000	110.000	15.000	9.00	45.00	0	0	5.0	0	0	9.4500	YNyn	0.000
Gko-10/1-T-2	3-Phase	15.000	110.000	15.000	8.93	20.00	0	0	5.0	0	0	9.3765	YNyn	0.000
Gko-10/1-T-3	3-Phase	15.000	110.000	15.000	9.20	20.00	0	0	5.0	0	0	9.6600	YNyn	0.000
Gso-10/1-T-1F	3-Phase	15.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Gso-10/1-T-2F	3-Phase	15.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Jb1-10/1-T-1	3-Phase	10.000	110.000	15.000	10.20	13.00	0	0	5.0	0	0	10.7100	YNyn	0.000
Jb1-10/1-T-2	3-Phase	10.000	110.000	15.000	10.20	13.00	0	0	5.0	0	0	10.7100	YNyn	0.000
Jb1-10/1-T-F1	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	0	0	0	10.0000	YNyn	0.000
Jb1-10/1-T-F2	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	0	0	0	10.0000	YNyn	0.000
Jb2-10/.6-TG-1	3-Phase	15.000	110.000	6.600	10.40	19.00	0	0	5.0	0	0	10.9200	YNd	0.000
Jb2-10/.6-TG-2	3-Phase	15.000	110.000	6.600	10.40	19.00	0	0	5.0	0	0	10.9200	YNd	0.000
Jb3-1/0-TG-1	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-2	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-3	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-4	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-5	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Jb3-1/0-TG-6	3-Phase	1.625	15.610	0.400	5.74	6.00	0	0	5.0	0	0	6.0270	YNd	0.000
Kba-10/3-T-1	3-Phase	10.000	110.000	30.000	8.35	13.00	0	0	0	0	0	8.3500	YNyn	0.000
Kba-10/3-T-2	3-Phase	10.000	110.000	30.000	8.35	13.00	0	0	0	0	0	8.3500	YNyn	0.000
Kba-10/3-T-3	3-Phase	10.000	110.000	30.000	8.35	13.00	0	0	0	0	0	8.3500	YNyn	0.000
Kse-10/1-TG-1n2	3-Phase	62.500	110.000	11.000	12.50	45.00	0	0	5.0	0	0	13.1250	YNd	0.000
Kse-10/1-TG-2n2	3-Phase	15.000	110.000	11.000	10.00	20.00	0	0	0	0	0	10.0000	YNd	0.000
MKi-10/1-T-1	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
MKi-10/3-T-1	3-Phase	20.000	110.000	30.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
MKi-10/3-T-2	3-Phase	20.000	110.000	30.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Msh-10/1-T-1	3-Phase	10.000	110.000	15.000	10.20	20.00	0	0	5.0	0	0	10.7100	YNd	0.000
Msh-10/1-T-1F	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	0	0	0	10.0000	YNd	0.000
Msh-10/1-T-2F	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	0	0	0	10.0000	YNd	0.000
Nbg-10/1-T-1n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Nbg-10/1-T-2n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000

Transformer		Rating					Z Variation			% Tap Setting		Adjusted	Phase Shift	
ID	Phase	MVA	Prim. kV	Sec. kV	% Z1	X1/R1	+ 5%	- 5%	% Tol.	Prim.	Sec.	% Z	Type	Angle
Nde-10/1-T-1n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Nde-10/1-T-2n	3-Phase	20.000	110.000	15.000	10.00	20.00	0	0	5.0	0	0	10.5000	YNyn	0.000
Rwi-10/1-T-1n	3-Phase	10.000	110.000	15.000	10.00	13.00	0	0	5.0	0	0	10.5000	YNd	0.000
Sha-20/10-T-1n	3-Phase	90.000	220.000	110.000	12.50	45.00	0	0	10.0	0	0	13.7500	YNd	0.000
Sha-20/10-T-2n	3-Phase	90.000	220.000	110.000	12.50	45.00	0	0	10.0	0	0	13.7500	YNd	0.000
Sha-20/10-T-3n	3-Phase	90.000	220.000	110.000	12.50	45.00	0	0	10.0	0	0	13.7500	YNd	0.000

2-Winding Transformer Load Tap Changer (LTC) Settings

Transformer	Connected Buses ("*" LTC Side)		Transformer Load Tap Changer Setting					
ID	Primary Bus ID	Secondary Bus ID	% Min. Tap	% Max. Tap	% Step	Regulated Bus ID	% V	kV
Bre-10/1-T-1	*Bre-10-B-1	Bre-1-B-1	-10.00	14.00	1.000	Bre-1-B-1	100.00	15.000
Bre-10/1-T-1F	*Bre-10-B-1	Bre-1-B-1	-10.00	14.00	1.000	Bre-1-B-1	100.00	15.000
Gha-10/1-T-1n	*Gha-10-B-1	Gha-1-B-1	-16.00	16.00	1.300	Gha-1-B-1	100.00	15.000
Gko-10/1-T-1	*Gko-10-B-1	Gko-1-B-1	-16.00	16.00	1.231	Gko-1-B-1	100.00	15.000
Gko-10/1-T-1F	*Gko-10-B-1	Gko-1-B-1	-16.00	16.09	1.231	Gko-1-B-1	100.00	15.000
Gko-10/1-T-2	*Gko-10-B-1	Gko-1-B-1	-15.99	16.00	1.230	Gko-1-B-1	100.00	15.000
Gko-10/1-T-3	*Gko-10-B-1	Gko-1-B-1	-16.00	16.09	1.231	Gko-1-B-1	100.00	15.000
Gso-10/1-T-1F	*Gso-10-B-1	Gso-1-B-1	-16.00	16.00	1.230	Gso-1-B-1	100.00	15.000
Gso-10/1-T-2F	*Gso-10-B-1	Gso-1-B-1	-16.00	16.00	1.230	Gso-1-B-1	100.00	15.000
Jb1-10/1-T-1	*Jb1-10-B-1	Jb1-1-B-1	-16.00	16.00	1.230	Jb1-1-B-1	100.00	15.000
Jb1-10/1-T-2	*Jb1-10-B-1	Jb1-1-B-1	-16.00	16.00	1.230	Jb1-1-B-1	100.00	15.000
Jb1-10/1-T-F1	*Jb1-10-B-1	Jb1-1-B-1	-16.00	16.00	1.230	Jb1-1-B-1	100.00	15.000
Jb1-10/1-T-F2	*Jb1-10-B-1	Jb1-1-B-1	-16.00	16.00	1.230	Jb1-1-B-1	100.00	15.000
Kba-10/3-T-1	*Kba-10-B-1	Kba-3-B-1	-8.00	8.00	1.000	Kba-3-B-1	100.00	30.000
Kba-10/3-T-2	*Kba-10-B-1	Kba-3-B-1	-8.00	8.00	1.000	Kba-3-B-1	100.00	30.000
Kba-10/3-T-3	*Kba-10-B-1	Kba-3-B-1	-8.00	8.00	1.000	Kba-3-B-1	100.00	30.000
MKi-10/1-T-1	*MKi-10-B-1	MKi-1-B-1	-16.00	16.00	1.300	MKi-1-B-1	100.00	15.000
MKi-10/3-T-1	*MKi-10-B-1	MKi-3-B-1	-16.00	16.00	1.300	MKi-3-B-1	100.00	30.000
MKi-10/3-T-2	*MKi-10-B-1	MKi-3-B-1	-16.00	16.00	1.300	MKi-3-B-1	100.00	30.000
Msh-10/1-T-1	*Msh-10-B-1	Msh-1-B-1	-10.00	10.00	1.250	Msh-1-B-1	100.00	15.000
Msh-10/1-T-1F	*Msh-10-B-1	Msh-1-B-1	-10.00	10.00	1.250	Msh-1-B-1	100.00	15.000
Msh-10/1-T-2F	*Msh-10-B-1	Msh-1-B-1	-10.00	10.00	1.250	Msh-1-B-1	100.00	15.000
Nbg-10/1-T-1n	*Nbg-10-B-1	Nbg-1-B-1	-16.00	16.00	1.300	Nbg-1-B-1	100.00	15.000
Nbg-10/1-T-2n	*Nbg-10-B-1	Nbg-1-B-1	-16.00	16.00	1.300	Nbg-1-B-1	100.00	15.000
Nde-10/1-T-1n	*Nde-10-B-1	Nde-1-B-1	-16.00	16.00	1.230	Nde-1-B-1	100.00	15.000

2-Winding Transformer Load Tap Changer (LTC) Settings

Transformer	Connected Buses ("*" LTC Side)		Transformer Load Tap Changer Setting					
ID	Primary Bus ID	Secondary Bus ID	% Min. Tap	% Max. Tap	% Step	Regulated Bus ID	% V	kV
Nde-10/1-T-2n	*Nde-10-B-1	Nde-1-B-1	-16.00	16.00	1.230	Nde-1-B-1	100.00	15.000
Rwi-10/1-T-1n	*Rwi-10-B-1	Rwi-1-B-1	-16.00	16.00	1.230	Rwi-1-B-1	100.00	15.000
Sha-20/10-T-1n	*Sha-20-B-1	Sha-10-B-1	-10.00	10.00	0.850	Sha-10-B-1	102.00	112.200
Sha-20/10-T-2n	*Sha-20-B-1	Sha-10-B-1	-10.00	10.00	0.850	Sha-10-B-1	102.00	112.200
Sha-20/10-T-3n	*Sha-20-B-1	Sha-10-B-1	-10.00	10.00	0.850	Sha-10-B-1	102.00	112.200

Branch Connections

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
Bre-10/1-T-1	2W XFMR	Bre-10-B-1	Bre-1-B-1	2.37	52.25	52.30	
Bre-10/1-T-1F	2W XFMR	Bre-10-B-1	Bre-1-B-1	2.37	52.25	52.30	
Gha-10/1-T-1n	2W XFMR	Gha-10-B-1	Gha-1-B-1	2.62	52.43	52.50	
Gko-10/1-T-1	2W XFMR	Gko-10-B-1	Gko-1-B-1	3.15	62.92	63.00	
Gko-10/1-T-1F	2W XFMR	Gko-10-B-1	Gko-1-B-1	0.70	31.49	31.50	
Gko-10/1-T-2	2W XFMR	Gko-10-B-1	Gko-1-B-1	3.12	62.43	62.51	
Gko-10/1-T-3	2W XFMR	Gko-10-B-1	Gko-1-B-1	3.22	64.32	64.40	
Gso-10/1-T-1F	2W XFMR	Gso-10-B-1	Gso-1-B-1	3.50	69.91	70.00	
Gso-10/1-T-2F	2W XFMR	Gso-10-B-1	Gso-1-B-1	3.50	69.91	70.00	
Jb1-10/1-T-1	2W XFMR	Jb1-10-B-1	Jb1-1-B-1	8.21	106.78	107.10	
Jb1-10/1-T-2	2W XFMR	Jb1-10-B-1	Jb1-1-B-1	8.21	106.78	107.10	
Jb1-10/1-T-F1	2W XFMR	Jb1-10-B-1	Jb1-1-B-1	2.50	49.94	50.00	
Jb1-10/1-T-F2	2W XFMR	Jb1-10-B-1	Jb1-1-B-1	2.50	49.94	50.00	
Jb2-10/.6-TG-1	2W XFMR	Jb2-10-B-2	Jb2-.6-B-1	3.83	72.70	72.80	
Jb2-10/.6-TG-2	2W XFMR	Jb2-10-B-2	Jb2-.6-B-1	3.83	72.70	72.80	
Jb3-1/0-TG-1	2W XFMR	Jb3-1-B-2	N-Jb3-.04-1	66.03	396.21	401.67	
Jb3-1/0-TG-2	2W XFMR	Jb3-1-B-2	N-Jb3-.04-2	66.03	396.21	401.67	
Jb3-1/0-TG-3	2W XFMR	Jb3-1-B-2	N-Jb3-.04-3	66.03	396.21	401.67	
Jb3-1/0-TG-4	2W XFMR	Jb3-1-B-2d	N-Jb3-.04-4	66.03	396.21	401.67	
Jb3-1/0-TG-5	2W XFMR	Jb3-1-B-2d	N-Jb3-.04-5	66.03	396.21	401.67	
Jb3-1/0-TG-6	2W XFMR	Jb3-1-B-2d	N-Jb3-.04-6	66.03	396.21	401.67	
Kba-10/3-T-1	2W XFMR	Kba-10-B-1	Kba-3-B-1	6.40	83.25	83.50	
Kba-10/3-T-2	2W XFMR	Kba-10-B-1	Kba-3-B-1	6.40	83.25	83.50	
Kba-10/3-T-3	2W XFMR	Kba-10-B-1	Kba-3-B-1	6.40	83.25	83.50	
Kse-10/1-TG-1n2	2W XFMR	Kse-10-B3	Kse-1-B-5	0.47	20.99	21.00	
Kse-10/1-TG-2n2	2W XFMR	Kse-10-B3	Kse-1-B-6	3.33	66.58	66.67	
MKi-10/1-T-1	2W XFMR	MKi-10-B-1	MKi-1-B-1	2.62	52.43	52.50	
MKi-10/3-T-1	2W XFMR	MKi-10-B-1	MKi-3-B-1	2.62	52.43	52.50	
MKi-10/3-T-2	2W XFMR	MKi-10-B-1	MKi-3-B-1	2.62	52.43	52.50	
Msh-10/1-T-1	2W XFMR	Msh-10-B-1	Msh-1-B-1	5.35	106.97	107.10	
Msh-10/1-T-1F	2W XFMR	Msh-10-B-1	Msh-1-B-1	2.50	49.94	50.00	
Msh-10/1-T-2F	2W XFMR	Msh-10-B-1	Msh-1-B-1	2.50	49.94	50.00	
Nbg-10/1-T-1n	2W XFMR	Nbg-10-B-1	Nbg-1-B-1	2.62	52.43	52.50	
Nbg-10/1-T-2n	2W XFMR	Nbg-10-B-1	Nbg-1-B-1	2.62	52.43	52.50	
Nde-10/1-T-1n	2W XFMR	Nde-10-B-1	Nde-1-B-1	2.62	52.43	52.50	
Nde-10/1-T-2n	2W XFMR	Nde-10-B-1	Nde-1-B-1	2.62	52.43	52.50	
Rwi-10/1-T-1n	2W XFMR	Rwi-10-B-1	Rwi-1-B-1	8.05	104.69	105.00	

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
Sha-20/10-T-1n	2W XFMR	Sha-20-B-1	Sha-10-B-1	0.34	15.27	15.28	
Sha-20/10-T-2n	2W XFMR	Sha-20-B-1	Sha-10-B-1	0.34	15.27	15.28	
Sha-20/10-T-3n	2W XFMR	Sha-20-B-1	Sha-10-B-1	0.34	15.27	15.28	
1-Jb1-Jb3	Cable	B-1-Jb1-Jb3-1	B-1-Jb1-Jb3-2	0.21	0.20	0.29	
10-Bre-Jb1-R(D/C)	Line	B-10-Bre-Jb1-2	B-10-Bre-Jb1-1	0.45	2.07	2.12	0.3120199
10-Bre-Nde-1R(S/C)	Line	B-10-Bre-Gso-1	C-BN	0.48	1.53	1.60	0.1208885
10-Bre-Nde-2(S/C)	Line	C-BN	B-10-Bre-Nde-2	0.13	0.34	0.37	0.1626596
10-Bre-Sha-1	Line	B-10-Bre-Sha-2DT-F	B-10-Bre-Sha-1DT-F	0.26	0.89	0.92	0.9599407
10-Bre-Sha-2	Line	B-10-Bre-Sha-2D	B-10-Bre-Sha-1D	0.26	0.89	0.92	0.9599407
10-Gha-MKi(S/C)	Line	B-10-Gha-MKi-1	B-10-Gha-MKi-2	0.95	3.02	3.17	0.2387549
10-Gko-Jb1(S/C)	Line	B-10-Gko-Jb1-2	B-10-Gko-Jb1-1	1.09	3.48	3.65	0.2750214
10-Gko-MKi(S/C)	Line	B-10-Gko-MKi-1	B-10-Gko-MKi-2	0.65	2.06	2.16	0.1631995
10-Gso-Msh-R(D/C)	Line	B-10-Gso-Msh-1	B-10-Gso-Msh-2	1.14	5.26	5.38	0.7904503
10-Gso-Nde-1R(S/C)	Line	C-GN	B-10-Gso-Nde-1	0.65	2.06	2.16	0.1631995
10-Gso-Nde-2(S/C)	Line	C-GN	B-10-Gso-Nde-2	0.13	0.34	0.37	0.1626596
10-Jb1-Jb2(S/C)	Line	B-10-Jb1-Jb2-2	B-10-Jb1-Jb2-1	0.14	0.42	0.45	0.0394709
10-Jb1-Nbg(S/C)	Line	B-10-Jb1-Nbg-1	B-10-Jb1-Nbg-2	0.93	2.98	3.13	0.2357326
10-Kba-Msh-R(D/C)	Line	B-10-Kba-Msh-2	10-Kba/Msh/Rwi-B	1.51	6.97	7.13	1.0483870
10-Kba-Rwi(S/C)	Line	B-10-Kba-Rwi-2	10-Kba/Msh/Rwi-B	1.48	2.81	3.17	0.2444020
10-MKi-Nbg(S/C)	Line	B-10-MKi-Nbg-1	B-10-MKi-Nbg-2	0.77	2.45	2.56	0.1934217
Bre-10-C-1	Tie Breakr	B-10-Bre-Jb1-1	Bre-10-B-1				
Bre-10-C-2	Tie Breakr	B-10-Bre-Sha-1DT-F	Bre-10-B-1				
Bre-10-C-3	Tie Breakr	B-10-Bre-Sha-1D	Bre-10-B-1				
Bre-10-C-4	Tie Breakr	B-10-Bre-Gso-1	Bre-10-B-1				
Gha-10-C-1	Tie Breakr	B-10-Gha-MKi-1	Gha-10-B-1				
Gko-10-C-1	Tie Breakr	B-10-Gko-Jb1-1	Gko-10-B-1				
Gko-10-C-2	Tie Breakr	B-10-Gko-MKi-1	Gko-10-B-1				
Gso-10-C-1	Tie Breakr	B-10-Gso-Nde-1	Gso-10-B-1				
Gso-10-C-2	Tie Breakr	B-10-Gso-Msh-1	Gso-10-B-1				
Jb1-1-C-1	Tie Breakr	Jb1-1-B-1	B-1-Jb1-Jb3-1				
Jb1-10-C-1	Tie Breakr	B-10-Jb1-Jb2-1	Jb1-10-B-1				
Jb1-10-C-2	Tie Breakr	B-10-Jb-Grid-1	Jb1-10-B-1				
Jb1-10-C-3	Tie Breakr	B-10-Bre-Jb1-2	Jb1-10-B-1				
Jb1-10-C-4	Tie Breakr	B-10-Gko-Jb1-2	Jb1-10-B-1				
Jb1-10-C-5	Tie Breakr	B-10-Jb1-Nbg-1	Jb1-10-B-1				
Jb2-10-C-1	Tie Breakr	B-10-Jb1-Jb2-2	Jb2-10-B-1				
Jb3-1-C-1	Tie Breakr	B-1-Jb1-Jb3-2	Jb3-1-B-1				
Kba-10-C-1	Tie Breakr	10-Kba/Msh/Rwi-B	Kba-10-B-1				
MKi-10-C-1	Tie Breakr	MKi-10-B-1	B-10-Mki-Grid-1				

CKT/Branch		Connected Bus ID		% Impedance, Pos. Seq., 100 MVA Base			
ID	Type	From Bus	To Bus	R	X	Z	Y
MKi-10-C-2	Tie Breakr	B-10-Gko-MKi-2	MKi-10-B-1				
MKi-10-C-3	Tie Breakr	B-10-MKi-Nbg-2	MKi-10-B-1				
MKi-10-C-4	Tie Breakr	B-10-Gha-MKi-2	MKi-10-B-1				
Msh-10-C-1	Tie Breakr	B-10-Gso-Msh-2	Msh-10-B-1				
Msh-10-C-2	Tie Breakr	B-10-Kba-Msh-2	Msh-10-B-1				
Nbg-10-C-1	Tie Breakr	B-10-Jb1-Nbg-2	Nbg-10-B-1				
Nbg-10-C-2	Tie Breakr	B-10-MKi-Nbg-1	Nbg-10-B-1				
Nde-10-C-1	Tie Breakr	B-10-Bre-Nde-2	Nde-10-B-1				
Nde-10-C-2	Tie Breakr	B-10-Gso-Nde-2	Nde-10-B-1				
Nde-10-C-3	Tie Breakr	G-Kse-1-B2	Nde-10-B-1				
Rwi-10-C-1	Tie Breakr	B-10-Kba-Rwi-2	Rwi-10-B-1				
Sha-10-C-1	Tie Breakr	Sha-10-B-1	B-10-Bre-Sha-2DT-F				
Sha-10-C-2	Tie Breakr	Sha-10-B-1	B-10-Bre-Sha-2D				
Sha-20-C-Grid	Tie Breakr	B-20-Sha-Grid-1	Sha-20-B-1				
C-Rwinkwabu-SW	Tie Switch	Rwi-1-B-1	C-Rwi-B-1				
S-Jb2-10-B-1	Tie Switch	Jb2-10-B-1	G-Jb2-10-B				
S-Jb2-10-B-2	Tie Switch	G-Jb2-10-B	Jb2-10-B-2				
S-Jb3-1-B-1	Tie Switch	Jb3-1-B-1	G-Jb3-1-B				
S-Jb3-1-B-2	Tie Switch	G-Jb3-1-B	Jb3-1-B-2				
S-Jb3-1-B-2d	Tie Switch	Jb3-1-B-2	Jb3-1-B-2d				
S-Kba-Bus	Tie Switch	Kba-3-B-1	C-Kab-3-B				
S-Kse-1-B2	Tie Switch	G-Kse-1-B2	Kse-10-B3				
S-Musha-Bus	Tie Switch	Msh-1-B-1	C-Msh-1-B				

LOAD_FLOW_REPORT

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
10-Kba/Msh/Rwi-B	110.000	95.480	-13.5	0	0	0	0	B-10-Kba-Msh-2	-33.985	-5.569	189.3	98.7	
								B-10-Kba-Rwi-2	12.233	3.244	69.6	96.7	
								Kba-10-B-1	21.752	2.325	120.3	99.4	
B-1-Jb1-Jb3-1	15.000	100.743	-13.6	0	0	0	0	B-1-Jb1-Jb3-2	-7.114	-5.194	336.5	80.8	
								Jb1-1-B-1	7.114	5.194	336.5	80.8	
B-1-Jb1-Jb3-2	15.000	100.768	-13.6	0	0	0	0	B-1-Jb1-Jb3-1	7.116	5.195	336.5	80.8	
								Jb3-1-B-1	-7.116	-5.195	336.5	80.8	
B-10-Bre-Gso-1	110.000	100.438	-7.3	0	0	0	0	C-BN	79.479	7.390	417.1	99.6	
								Bre-10-B-1	-79.479	-7.390	417.1	99.6	
B-10-Bre-Jb1-1	110.000	100.438	-7.3	0	0	0	0	B-10-Bre-Jb1-2	138.699	46.109	763.8	94.9	
								Bre-10-B-1	-138.699	-46.109	763.8	94.9	
B-10-Bre-Jb1-2	110.000	98.898	-8.9	0	0	0	0	B-10-Bre-Jb1-1	-137.747	-42.022	764.3	95.6	
								Jb1-10-B-1	137.747	42.022	764.3	95.6	
B-10-Bre-Nde-2	110.000	99.826	-8.1	0	0	0	0	C-BN	-79.093	-6.491	417.3	99.7	
								Nde-10-B-1	79.093	6.491	417.3	99.7	
B-10-Bre-Sha-1D	110.000	100.438	-7.3	0	0	0	0	B-10-Bre-Sha-2D	-123.264	-32.532	666.2	96.7	
								Bre-10-B-1	123.264	32.532	666.2	96.7	
B-10-Bre-Sha-1DT-F	110.000	100.438	-7.3	0	0	0	0	B-10-Bre-Sha-2DT-F	-123.264	-32.532	666.2	96.7	
								Bre-10-B-1	123.264	32.532	666.2	96.7	
B-10-Bre-Sha-2D	110.000	101.042	-6.8	0	0	0	0	B-10-Bre-Sha-1D	123.678	32.982	664.9	96.6	
								Sha-10-B-1	-123.678	-32.982	664.9	96.6	
B-10-Bre-Sha-2DT-F	110.000	101.042	-6.8	0	0	0	0	B-10-Bre-Sha-1DT-F	123.678	32.982	664.9	96.6	
								Sha-10-B-1	-123.678	-32.982	664.9	96.6	
B-10-Gha-MKi-1	110.000	97.171	-10.2	0	0	0	0	B-10-Gha-MKi-2	-9.214	-3.506	53.2	93.5	
								Gha-10-B-1	9.214	3.506	53.2	93.5	
B-10-Gha-MKi-2	110.000	97.366	-10.0	0	0	0	0	B-10-Gha-MKi-1	9.224	3.310	52.8	94.1	
								MKi-10-B-1	-9.224	-3.310	52.8	94.1	
B-10-Gko-Jb1-1	110.000	97.347	-10.0	0	0	0	0	B-10-Gko-Jb1-2	-62.904	-23.249	361.6	93.8	
								Gko-10-B-1	62.904	23.249	361.6	93.8	
B-10-Gko-Jb1-2	110.000	98.898	-8.9	0	0	0	0	B-10-Gko-Jb1-1	63.420	24.633	361.1	93.2	
								Jb1-10-B-1	-63.420	-24.633	361.1	93.2	
B-10-Gko-MKi-1	110.000	97.347	-10.0	0	0	0	0	B-10-Gko-MKi-2	2.261	-1.663	15.1	-80.6	
								Gko-10-B-1	-2.261	1.663	15.1	-80.6	
B-10-Gko-MKi-2	110.000	97.366	-10.0	0	0	0	0	B-10-Gko-MKi-1	-2.260	1.510	14.7	-83.2	
								MKi-10-B-1	2.260	-1.510	14.7	-83.2	
B-10-Gso-Msh-1	110.000	98.319	-9.5	0	0	0	0	B-10-Gso-Msh-2	84.886	18.610	463.9	97.7	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
								Gso-10-B-1	-84.886	-18.610	463.9	97.7	
B-10-Gso-Msh-2	110.000	96.418	-12.1	0	0	0	0	B-10-Gso-Msh-1	-83.995	-15.246	464.7	98.4	
								Msh-10-B-1	83.995	15.246	464.7	98.4	
B-10-Gso-Nde-1	110.000	98.319	-9.5	0	0	0	0	C-GN	-104.755	-26.616	577.0	96.9	
								Gso-10-B-1	104.755	26.616	577.0	96.9	
B-10-Gso-Nde-2	110.000	99.826	-8.1	0	0	0	0	C-GN	105.695	29.203	576.5	96.4	
								Nde-10-B-1	-105.695	-29.203	576.5	96.4	
B-10-Jb-Grid-1	110.000	98.898	-8.9	10.000	7.000	0	0	Jb1-10-B-1	10.000	7.000	64.8	81.9	
B-10-Jb1-Jb2-1	110.000	98.898	-8.9	0	0	0	0	B-10-Jb1-Jb2-2	-18.491	-13.384	121.1	81.0	
								Jb1-10-B-1	18.491	13.384	121.1	81.0	
B-10-Jb1-Jb2-2	110.000	98.982	-8.8	0	0	0	0	B-10-Jb1-Jb2-1	18.498	13.367	121.0	81.1	
								Jb2-10-B-1	-18.498	-13.367	121.0	81.1	
B-10-Jb1-Nbg-1	110.000	98.898	-8.9	0	0	0	0	B-10-Jb1-Nbg-2	50.608	18.702	286.3	93.8	
								Jb1-10-B-1	-50.608	-18.702	286.3	93.8	
B-10-Jb1-Nbg-2	110.000	97.862	-9.7	0	0	0	0	B-10-Jb1-Nbg-1	-50.329	-18.041	286.8	94.1	
								Nbg-10-B-1	50.329	18.041	286.8	94.1	
B-10-Kba-Msh-2	110.000	96.418	-12.1	0	0	0	0	10-Kba/Msh/Rwi-B	34.181	5.507	188.5	98.7	
								Msh-10-B-1	-34.181	-5.507	188.5	98.7	
B-10-Kba-Rwi-2	110.000	95.192	-13.7	0	0	0	0	10-Kba/Msh/Rwi-B	-12.207	-3.416	69.9	96.3	
								Rwi-10-B-1	12.207	3.416	69.9	96.3	
B-10-Mki-Grid-1	110.000	97.366	-10.0	15.000	10.000	0	0	MKi-10-B-1	15.000	10.000	97.2	83.2	
B-10-MKi-Nbg-1	110.000	97.862	-9.7	0	0	0	0	B-10-MKi-Nbg-2	30.290	10.339	171.7	94.6	
								Nbg-10-B-1	-30.290	-10.339	171.7	94.6	
B-10-MKi-Nbg-2	110.000	97.366	-10.0	0	0	0	0	B-10-MKi-Nbg-1	-30.208	-10.261	172.0	94.7	
								MKi-10-B-1	30.208	10.261	172.0	94.7	
*B-20-Sha-Grid-1	220.000	100.000	0.0	248.083	98.646	0	0	Sha-20-B-1	248.083	98.646	700.6	92.9	
Bre-1-B-1	15.000	100.547	-11.3	0	0	28.246	9.281	Bre-10-B-1	-14.123	-4.640	569.1	95.0	
								Bre-10-B-1	-14.123	-4.640	569.1	95.0	
Bre-10-B-1	110.000	100.438	-7.3	0	0	0	0	Bre-1-B-1	14.175	5.782	80.0	92.6	-3.000
								Bre-1-B-1	14.175	5.782	80.0	92.6	-3.000
								B-10-Bre-Jb1-1	138.699	46.109	763.8	94.9	
								B-10-Bre-Sha-1DT-F	-123.264	-32.532	666.2	96.7	
								B-10-Bre-Sha-1D	-123.264	-32.532	666.2	96.7	
								B-10-Bre-Gso-1	79.479	7.390	417.1	99.6	
C-BN	110.000	99.953	-8.0	0	0	0	0	B-10-Bre-Gso-1	-79.176	-6.546	417.2	99.7	
								B-10-Bre-Nde-2	79.176	6.546	417.2	99.7	
C-GN	110.000	99.586	-8.3	0	0	0	0	B-10-Gso-Nde-1	105.536	28.951	576.8	96.4	
								B-10-Gso-Nde-2	-105.536	-28.951	576.8	96.4	
C-Kab-3-B	30.000	100.654	-16.8	0	0	0.000	-6.079	Kba-3-B-1	0.000	6.079	116.2	0.0	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
C-Msh-1-B	15.000	100.037	-16.7	0	0	0.000	-10.007	Msh-1-B-1	0.000	10.007	385.0	0.0	
C-Rwi-B-1	15.000	100.929	-17.3	0	0	0.000	-1.019	Rwi-1-B-1	0.000	1.019	38.8	0.0	
G-Jb2-10-B	110.000	98.982	-8.8	0	0	0	0	Jb2-10-B-1	18.498	13.367	121.0	81.1	
								Jb2-10-B-2	-18.498	-13.367	121.0	81.1	
G-Jb3-1-B	15.000	100.768	-13.6	0	0	0	0	Jb3-1-B-1	7.116	5.195	336.5	80.8	
								Jb3-1-B-2	-7.116	-5.195	336.5	80.8	
G-Kse-1-B2	110.000	99.826	-8.1	0	0	0	0	Nde-10-B-1	49.848	31.850	311.0	84.3	
								Kse-10-B3	-49.848	-31.850	311.0	84.3	
Gha-1-B-1	15.000	100.578	-12.8	0	0	9.190	3.021	Gha-10-B-1	-9.190	-3.021	370.2	95.0	
Gha-10-B-1	110.000	97.171	-10.2	0	0	0	0	Gha-1-B-1	9.214	3.506	53.2	93.5	-5.200
								B-10-Gha-MKi-1	-9.214	-3.506	53.2	93.5	
Gko-1-B-1	15.000	100.674	-14.2	0	0	60.447	19.868	Gko-10-B-1	-12.168	-3.851	488.0	95.3	
								Gko-10-B-1	-24.113	-8.375	975.9	94.5	
								Gko-10-B-1	-12.262	-3.874	491.7	95.4	
								Gko-10-B-1	-11.903	-3.768	477.4	95.3	
Gko-10-B-1	110.000	97.347	-10.0	0	0	0	0	Gko-1-B-1	12.219	4.863	70.9	92.9	-6.155
								Gko-1-B-1	24.158	10.400	141.8	91.9	-6.155
								Gko-1-B-1	12.313	4.892	71.4	92.9	-6.150
								Gko-1-B-1	11.953	4.757	69.4	92.9	-6.155
								B-10-Gko-Jb1-1	-62.904	-23.249	361.6	93.8	
								B-10-Gko-MKi-1	2.261	-1.663	15.1	-80.6	
Gso-1-B-1	15.000	100.580	-13.3	0	0	19.794	6.506	Gso-10-B-1	-9.897	-3.253	398.7	95.0	
								Gso-10-B-1	-9.897	-3.253	398.7	95.0	
Gso-10-B-1	110.000	98.319	-9.5	0	0	0	0	Gso-1-B-1	9.934	4.003	57.2	92.8	-4.920
								Gso-1-B-1	9.934	4.003	57.2	92.8	-4.920
								B-10-Gso-Nde-1	-104.755	-26.616	577.0	96.9	
								B-10-Gso-Msh-1	84.886	18.610	463.9	97.7	
Jb1-1-B-1	15.000	100.743	-13.6	0	0	59.039	19.405	Jb1-10-B-1	-8.304	-2.110	327.3	96.9	
								Jb1-10-B-1	-8.304	-2.110	327.3	96.9	
								Jb1-10-B-1	-17.659	-4.996	701.2	96.2	
								Jb1-10-B-1	-17.659	-4.996	701.2	96.2	
								B-1-Jb1-Jb3-1	-7.114	-5.194	336.5	80.8	
Jb1-10-B-1	110.000	98.898	-8.9	0	0	0	0	Jb1-1-B-1	8.363	2.883	46.9	94.5	-4.920
								Jb1-1-B-1	8.363	2.883	46.9	94.5	-4.920
								Jb1-1-B-1	17.742	6.653	100.6	93.6	-4.920
								Jb1-1-B-1	17.742	6.653	100.6	93.6	-4.920
								B-10-Jb1-Jb2-1	-18.491	-13.384	121.1	81.0	
								B-10-Jb-Grid-1	-10.000	-7.000	64.8	81.9	
								B-10-Bre-Jb1-2	-137.747	-42.022	764.3	95.6	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
								B-10-Gko-Jb1-2	63.420	24.633	361.1	93.2	
								B-10-Jb1-Nbg-1	50.608	18.702	286.3	93.8	
Jb2-.6-B-1	6.600	104.453	-5.2	18.600	15.300	0	0	Jb2-10-B-2	9.300	7.650	1008.5	77.2	
								Jb2-10-B-2	9.300	7.650	1008.5	77.2	
Jb2-10-B-1	110.000	98.982	-8.8	0	0	0	0	B-10-Jb1-Jb2-2	18.498	13.367	121.0	81.1	
								G-Jb2-10-B	-18.498	-13.367	121.0	81.1	
Jb2-10-B-2	110.000	98.982	-8.8	0	0	0	0	Jb2-.6-B-1	-9.249	-6.684	60.5	81.1	
								Jb2-.6-B-1	-9.249	-6.684	60.5	81.1	
								G-Jb2-10-B	18.498	13.367	121.0	81.1	
Jb3-1-B-1	15.000	100.768	-13.6	0	0	0	0	B-1-Jb1-Jb3-2	7.116	5.195	336.5	80.8	
								G-Jb3-1-B	-7.116	-5.195	336.5	80.8	
Jb3-1-B-2	15.000	100.768	-13.6	0	0	0	0	N-Jb3-.04-1	-1.186	-0.866	56.1	80.8	
								N-Jb3-.04-2	-1.186	-0.866	56.1	80.8	
								N-Jb3-.04-3	-1.186	-0.866	56.1	80.8	
								G-Jb3-1-B	7.116	5.195	336.5	80.8	
								Jb3-1-B-2d	-3.558	-2.598	168.3	80.8	
Jb3-1-B-2d	15.000	100.768	-13.6	0	0	0	0	N-Jb3-.04-4	-1.186	-0.866	56.1	80.8	
								N-Jb3-.04-5	-1.186	-0.866	56.1	80.8	
								N-Jb3-.04-6	-1.186	-0.866	56.1	80.8	
								Jb3-1-B-2	3.558	2.598	168.3	80.8	
Kba-3-B-1	30.000	100.654	-16.8	0	0	21.653	7.117	Kba-10-B-1	-7.218	-0.346	138.2	99.9	
								Kba-10-B-1	-7.218	-0.346	138.2	99.9	
								Kba-10-B-1	-7.218	-0.346	138.2	99.9	
								C-Kab-3-B	0.000	-6.079	116.2	0.0	
Kba-10-B-1	110.000	95.480	-13.5	0	0	0	0	Kba-3-B-1	7.251	0.775	40.1	99.4	-6.000
								Kba-3-B-1	7.251	0.775	40.1	99.4	-6.000
								Kba-3-B-1	7.251	0.775	40.1	99.4	-6.000
								10-Kba/Msh/Rwi-B	-21.752	-2.325	120.3	99.4	
Kse-1-B-5	11.000	105.657	-3.7	40.000	30.000	0	0	Kse-10-B3	40.000	30.000	2483.8	80.0	
Kse-1-B-6	11.000	104.725	-4.6	10.000	7.500	0	0	Kse-10-B3	10.000	7.500	626.5	80.0	
Kse-10-B3	110.000	99.826	-8.1	0	0	0	0	Kse-1-B-5	-39.896	-25.298	248.4	84.5	
								Kse-1-B-6	-9.953	-6.551	62.6	83.5	
								G-Kse-1-B2	49.848	31.850	311.0	84.3	
MKi-1-B-1	15.000	100.496	-14.8	0	0	16.640	5.469	MKi-10-B-1	-16.640	-5.469	670.8	95.0	
MKi-3-B-1	30.000	100.438	-13.1	0	0	21.459	7.053	MKi-10-B-1	-10.729	-3.527	216.4	95.0	
								MKi-10-B-1	-10.729	-3.527	216.4	95.0	
MKi-10-B-1	110.000	97.366	-10.0	0	0	0	0	MKi-1-B-1	16.719	7.062	97.8	92.1	-6.500
								MKi-3-B-1	10.763	4.190	62.3	93.2	-5.200
								MKi-3-B-1	10.763	4.190	62.3	93.2	-5.200

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
								B-10-Mki-Grid-1	-15.000	-10.000	97.2	83.2	
								B-10-Gko-MKi-2	-2.260	1.510	14.7	-83.2	
								B-10-MKi-Nbg-2	-30.208	-10.261	172.0	94.7	
								B-10-Gha-MKi-2	9.224	3.310	52.8	94.1	
Msh-1-B-1	15.000	100.037	-16.7	0	0	41.026	13.485	Msh-10-B-1	-7.764	-0.658	299.8	99.6	
								Msh-10-B-1	-16.631	-1.410	642.2	99.6	
								Msh-10-B-1	-16.631	-1.410	642.2	99.6	
								C-Msh-1-B	0.000	-10.007	385.0	0.0	
Msh-10-B-1	110.000	96.418	-12.1	0	0	8.618	2.832	Msh-1-B-1	7.797	1.307	43.0	98.6	-5.000
								Msh-1-B-1	16.700	2.800	92.2	98.6	-5.000
								Msh-1-B-1	16.700	2.800	92.2	98.6	-5.000
								B-10-Gso-Msh-2	-83.995	-15.246	464.7	98.4	
								B-10-Kba-Msh-2	34.181	5.507	188.5	98.7	
N-Jb3-.04-1	0.400	100.925	-11.4	1.200	0.950	0	0	Jb3-1-B-2	1.200	0.950	2188.9	78.4	
N-Jb3-.04-2	0.400	100.925	-11.4	1.200	0.950	0	0	Jb3-1-B-2	1.200	0.950	2188.9	78.4	
N-Jb3-.04-3	0.400	100.925	-11.4	1.200	0.950	0	0	Jb3-1-B-2	1.200	0.950	2188.9	78.4	
N-Jb3-.04-4	0.400	100.925	-11.4	1.200	0.950	0	0	Jb3-1-B-2d	1.200	0.950	2188.9	78.4	
N-Jb3-.04-5	0.400	100.925	-11.4	1.200	0.950	0	0	Jb3-1-B-2d	1.200	0.950	2188.9	78.4	
N-Jb3-.04-6	0.400	100.925	-11.4	1.200	0.950	0	0	Jb3-1-B-2d	1.200	0.950	2188.9	78.4	
Nbg-1-B-1	15.000	101.143	-12.5	0	0	19.983	6.568	Nbg-10-B-1	-9.991	-3.284	400.2	95.0	
								Nbg-10-B-1	-9.991	-3.284	400.2	95.0	
Nbg-10-B-1	110.000	97.862	-9.7	0	0	0	0	Nbg-1-B-1	10.020	3.851	57.6	93.3	-5.200
								Nbg-1-B-1	10.020	3.851	57.6	93.3	-5.200
								B-10-Jb1-Nbg-2	-50.329	-18.041	286.8	94.1	
								B-10-MKi-Nbg-1	30.290	10.339	171.7	94.6	
Nde-1-B-1	15.000	101.210	-11.4	0	0	23.170	7.615	Nde-10-B-1	-11.585	-3.808	463.8	95.0	
								Nde-10-B-1	-11.585	-3.808	463.8	95.0	
Nde-10-B-1	110.000	99.826	-8.1	0	0	0	0	Nde-1-B-1	11.623	4.569	65.7	93.1	-3.690
								Nde-1-B-1	11.623	4.569	65.7	93.1	-3.690
								B-10-Bre-Nde-2	-79.093	-6.491	417.3	99.7	
								B-10-Gso-Nde-2	105.695	29.203	576.5	96.4	
								G-Kse-1-B2	-49.848	-31.850	311.0	84.3	
Rwi-1-B-1	15.000	100.929	-17.3	0	0	6.406	2.105	Rwi-10-B-1	-6.406	-1.087	247.8	98.6	
								C-Rwi-B-1	0.000	-1.019	38.8	0.0	
Rwi-10-B-1	110.000	95.192	-13.7	0	0	5.768	1.896	Rwi-1-B-1	6.439	1.521	36.5	97.3	-7.380
								B-10-Kba-Rwi-2	-12.207	-3.416	69.9	96.3	
Sha-10-B-1	110.000	101.042	-6.8	0	0	0	0	Sha-20-B-1	-82.452	-21.988	443.3	96.6	
								Sha-20-B-1	-82.452	-21.988	443.3	96.6	
								Sha-20-B-1	-82.452	-21.988	443.3	96.6	

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
								B-10-Bre-Sha-2DT-F	123.678	32.982	664.9	96.6	
								B-10-Bre-Sha-2D	123.678	32.982	664.9	96.6	
Sha-20-B-1	220.000	100.000	0.0	0	0	0	0	Sha-10-B-1	82.694	32.882	233.5	92.9	-5.100
								Sha-10-B-1	82.694	32.882	233.5	92.9	-5.100
								Sha-10-B-1	82.694	32.882	233.5	92.9	-5.100
								B-20-Sha-Grid-1	-248.083	-98.646	700.6	92.9	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

\# Indicates a bus with a load mismatch of more than 0.1 MVA

Bus Loading Summary Report

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
10-Kba/Msh/Rwi-B	110.000	645.0	0	0	0	0	0	0	0	0	34.438	98.7	189.3	29.4
B-1-Jb1-Jb3-1	15.000	99999.0	0	0	0	0	0	0	0	0	8.808	80.8	336.5	0.3
B-1-Jb1-Jb3-2	15.000	99999.0	0	0	0	0	0	0	0	0	8.811	80.8	336.5	0.3
B-10-Bre-Gso-1	110.000	99999.0	0	0	0	0	0	0	0	0	79.822	99.6	417.1	0.4
B-10-Bre-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	146.162	94.9	763.8	0.8
B-10-Bre-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	144.014	95.6	764.3	0.8
B-10-Bre-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	79.359	99.7	417.3	0.4
B-10-Bre-Sha-1D	110.000	99999.0	0	0	0	0	0	0	0	0	127.485	96.7	666.2	0.7
B-10-Bre-Sha-1DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	127.485	96.7	666.2	0.7
B-10-Bre-Sha-2D	110.000	99999.0	0	0	0	0	0	0	0	0	128.000	96.6	664.9	0.7
B-10-Bre-Sha-2DT-F	110.000	99999.0	0	0	0	0	0	0	0	0	128.000	96.6	664.9	0.7
B-10-Gha-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	9.858	93.5	53.2	0.1
B-10-Gha-MKi-2	110.000	99999.0	0	0	0	0	0	0	0	0	9.800	94.1	52.8	0.1
B-10-Gko-Jb1-1	110.000	99999.0	0	0	0	0	0	0	0	0	67.063	93.8	361.6	0.4
B-10-Gko-Jb1-2	110.000	99999.0	0	0	0	0	0	0	0	0	68.036	93.2	361.1	0.4
B-10-Gko-MKi-1	110.000	99999.0	0	0	0	0	0	0	0	0	2.806	80.6	15.1	0.0
B-10-Gko-MKi-2	110.000	645.0	0	0	0	0	0	0	0	0	2.718	83.2	14.7	2.3
B-10-Gso-Msh-1	110.000		0	0	0	0	0	0	0	0	86.902	97.7	463.9	
B-10-Gso-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	85.368	98.4	464.7	0.5
B-10-Gso-Nde-1	110.000	99999.0	0	0	0	0	0	0	0	0	108.084	96.9	577.0	0.6
B-10-Gso-Nde-2	110.000	99999.0	0	0	0	0	0	0	0	0	109.655	96.4	576.5	0.6
B-10-Jb-Grid-1	110.000		0	0	0	0	0	0	0	0	12.207	81.9	64.8	
B-10-Jb1-Jb2-1	110.000	99999.0	0	0	0	0	0	0	0	0	22.826	81.0	121.1	0.1
B-10-Jb1-Jb2-2	110.000	99999.0	0	0	0	0	0	0	0	0	22.823	81.1	121.0	0.1
B-10-Jb1-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	53.953	93.8	286.3	0.3
B-10-Jb1-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	53.465	94.1	286.8	0.3
B-10-Kba-Msh-2	110.000	99999.0	0	0	0	0	0	0	0	0	34.621	98.7	188.5	0.2
B-10-Kba-Rwi-2	110.000	99999.0	0	0	0	0	0	0	0	0	12.676	96.3	69.9	0.1
B-10-Mki-Grid-1	110.000		0	0	0	0	0	0	0	0	18.028	83.2	97.2	
B-10-MKi-Nbg-1	110.000	99999.0	0	0	0	0	0	0	0	0	32.006	94.6	171.7	0.2
B-10-MKi-Nbg-2	110.000	99999.0	0	0	0	0	0	0	0	0	31.903	94.7	172.0	0.2
B-20-Sha-Grid-1	220.000		0	0	0	0	0	0	0	0	266.976	92.9	700.6	
Bre-1-B-1	15.000	2000.0	5.600	1.840	22.646	7.441	0	0	0	0	29.731	95.0	1138.1	56.9
Bre-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	254.969	96.7	1332.4	42.3
C-BN	110.000		0	0	0	0	0	0	0	0	79.446	99.7	417.2	
C-GN	110.000		0	0	0	0	0	0	0	0	109.435	96.4	576.8	

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
C-Kab-3-B	30.000		0	0	0	-6.079	0	0	0	0	6.079	0.0	116.2	
C-Msh-1-B	15.000		0	0	0	-10.007	0	0	0	0	10.007	0.0	385.0	
C-Rwi-B-1	15.000		0	0	0	-1.019	0	0	0	0	1.019	0.0	38.8	
G-Jb2-10-B	110.000	99999.0	0	0	0	0	0	0	0	0	22.823	81.1	121.0	0.1
G-Jb3-1-B	15.000	99999.0	0	0	0	0	0	0	0	0	8.811	80.8	336.5	0.3
G-Kse-1-B2	110.000	99999.0	0	0	0	0	0	0	0	0	59.154	84.3	311.0	0.3
Gha-1-B-1	15.000	800.0	1.365	0.449	7.825	2.572	0	0	0	0	9.673	95.0	370.2	46.3
Gha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	9.858	93.5	53.2	1.7
Gko-1-B-1	15.000	2500.0	11.960	3.931	48.487	15.937	0	0	0	0	63.628	95.0	2432.7	97.3#
Gko-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	67.657	93.0	364.8	11.6
Gso-1-B-1	15.000	2000.0	2.940	0.966	16.854	5.540	0	0	0	0	20.836	95.0	797.3	39.9
Gso-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	108.084	96.9	577.0	18.3
Jb1-1-B-1	15.000	2500.0	8.745	2.874	50.294	16.531	0	0	0	0	62.147	95.0	2374.4	95.0
Jb1-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	177.565	93.6	942.4	29.9
Jb2-.6-B-1	6.600	3150.0	0	0	0	0	0	0	0	0	24.084	77.2	2017.0	64.0
Jb2-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	22.823	81.1	121.0	3.8
Jb2-10-B-2	110.000	3150.0	0	0	0	0	0	0	0	0	22.823	81.1	121.0	3.8
Jb3-1-B-1	15.000	800.0	0	0	0	0	0	0	0	0	8.811	80.8	336.5	42.1
Jb3-1-B-2	15.000	800.0	0	0	0	0	0	0	0	0	8.811	80.8	336.5	42.1
Jb3-1-B-2d	15.000	410.0	0	0	0	0	0	0	0	0	4.405	80.8	168.3	41.0
Kba-3-B-1	30.000	800.0	2.140	0.703	19.513	6.414	0	0	0	0	22.792	95.0	435.8	54.5
Kba-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	21.876	99.4	120.3	3.8
Kse-1-B-5	11.000	3150.0	0	0	0	0	0	0	0	0	50.000	80.0	2483.8	78.9
Kse-1-B-6	11.000	3150.0	0	0	0	0	0	0	0	0	12.500	80.0	626.5	19.9
Kse-10-B3	110.000	3150.0	0	0	0	0	0	0	0	0	59.154	84.3	311.0	9.9
MKi-1-B-1	15.000	2000.0	2.475	0.813	14.165	4.656	0	0	0	0	17.515	95.0	670.8	33.5
MKi-3-B-1	30.000	2000.0	3.195	1.050	18.264	6.003	0	0	0	0	22.588	95.0	432.8	21.6
MKi-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	51.611	92.0	278.2	8.8
Msh-1-B-1	15.000	2000.0	6.150	2.021	34.876	11.463	0	0	0	0	43.185	95.0	1661.6	83.1
Msh-10-B-1	110.000	3150.0	0.920	0.302	7.698	2.530	0	0	0	0	85.368	98.4	464.7	14.8
N-Jb3-.04-1	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2188.9	
N-Jb3-.04-2	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2188.9	
N-Jb3-.04-3	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2188.9	
N-Jb3-.04-4	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2188.9	
N-Jb3-.04-5	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2188.9	
N-Jb3-.04-6	0.400		0	0	0	0	0	0	0	0	1.531	78.4	2188.9	
Nbg-1-B-1	15.000	2500.0	2.940	0.966	17.043	5.602	0	0	0	0	21.035	95.0	800.5	32.0
Nbg-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	53.465	94.1	286.8	9.1

Bus			Directly Connected Load								Total Bus Load			
			Constant kVA		Constant Z		Constant I		Generic					
ID	kV	Rated Amp	MW	Mvar	MW	Mvar	MW	Mvar	MW	Mvar	MVA	% PF	Amp	Percent Loading
Nde-1-B-1	15.000	2500.0	3.405	1.119	19.765	6.496	0	0	0	0	24.389	95.0	927.5	37.1
Nde-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	134.521	95.9	707.3	22.5
Rwi-1-B-1	15.000	800.0	0.630	0.207	5.776	1.898	0	0	0	0	6.743	95.0	257.1	32.1
Rwi-10-B-1	110.000	3150.0	0.630	0.207	5.138	1.689	0	0	0	0	12.676	96.3	69.9	2.2
Sha-10-B-1	110.000	3150.0	0	0	0	0	0	0	0	0	256.001	96.6	1329.8	42.2
Sha-20-B-1	220.000	3150.0	0	0	0	0	0	0	0	0	266.976	92.9	700.6	22.2

* Indicates operating load of a bus exceeds the bus critical limit (100.0% of the Continuous Ampere rating).

Branch Loading Summary Report

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
1-Jb1-Jb3	Cable	480.37	336.53	70.06					
10-Bre-Jb1-R(D/C)	Line	1162.00	764.30	65.77					
10-Bre-Nde-1R(S/C)	Line	581.00	417.18	71.80					
10-Bre-Nde-2(S/C)	Line	581.00	417.25	71.82					
10-Bre-Sha-1	Line	1162.00	666.20	57.33					
10-Bre-Sha-2	Line	1162.00	666.20	57.33					
10-Gha-MKi(S/C)	Line	581.00	53.25	9.17					
10-Gko-Jb1(S/C)	Line	581.00	361.58	62.23					
10-Gko-MKi(S/C)	Line	581.00	15.13	2.60					
10-Gso-Msh-R(D/C)	Line	581.00	464.71	79.98					
10-Gso-Nde-1R(S/C)	Line	581.00	576.99	99.31					
10-Gso-Nde-2(S/C)	Line	581.00	576.77	99.27					
10-Jb1-Jb2(S/C)	Line	581.00	121.14	20.85					
10-Jb1-Nbg(S/C)	Line	581.00	286.75	49.35					
10-Kba-Msh-R(D/C)	Line	581.00	189.31	32.58					
10-Kba-Rwi(S/C)	Line	443.00	69.89	15.78					
10-MKi-Nbg(S/C)	Line	581.00	171.98	29.60					
Bre-10/1-T-1	Transformer				20.000	15.309	76.5	14.866	74.3
Bre-10/1-T-1F	Transformer				20.000	15.309	76.5	14.866	74.3
Gha-10/1-T-1n	Transformer				20.000	9.858	49.3	9.673	48.4
Gko-10/1-T-1	Transformer				15.000	13.151	87.7	12.763	85.1
Gko-10/1-T-1F	Transformer				30.000	26.301	87.7	25.526	85.1
Gko-10/1-T-2	Transformer				15.000	13.250	88.3	12.860	85.7
Gko-10/1-T-3	Transformer				15.000	12.865	85.8	12.486	83.2
Gso-10/1-T-1F	Transformer				15.000	10.711	71.4	10.418	69.5
Gso-10/1-T-2F	Transformer				15.000	10.711	71.4	10.418	69.5
Jb1-10/1-T-1	Transformer				10.000	8.846	88.5	8.568	85.7
Jb1-10/1-T-2	Transformer				10.000	8.846	88.5	8.568	85.7
Jb1-10/1-T-F1	Transformer				20.000	18.948	94.7	18.352	91.8
Jb1-10/1-T-F2	Transformer				20.000	18.948	94.7	18.352	91.8
Jb2-10/.6-TG-1	Transformer				15.000	12.042	80.3	11.411	76.1
Jb2-10/.6-TG-2	Transformer				15.000	12.042	80.3	11.411	76.1
Jb3-1/0-TG-1	Transformer				1.625	1.531	94.2	1.468	90.4

CKT / Branch		Cable & Reactor			Transformer				
		Ampacity (Amp)	Loading Amp		Capability (MVA)	Loading (input)		Loading (output)	
ID	Type			%		MVA	%	MVA	%
Jb3-1/0-TG-2	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-3	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-4	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-5	Transformer				1.625	1.531	94.2	1.468	90.4
Jb3-1/0-TG-6	Transformer				1.625	1.531	94.2	1.468	90.4
Kba-10/3-T-1	Transformer				10.000	7.292	72.9	7.226	72.3
Kba-10/3-T-2	Transformer				10.000	7.292	72.9	7.226	72.3
Kba-10/3-T-3	Transformer				10.000	7.292	72.9	7.226	72.3
Kse-10/1-TG-1n2	Transformer				62.500	50.000	80.0	47.240	75.6
Kse-10/1-TG-2n2	Transformer				15.000	12.500	83.3	11.915	79.4
MKi-10/1-T-1	Transformer				20.000	18.150	90.7	17.515	87.6
MKi-10/3-T-1	Transformer				20.000	11.549	57.7	11.294	56.5
MKi-10/3-T-2	Transformer				20.000	11.549	57.7	11.294	56.5
Msh-10/1-T-1	Transformer				10.000	7.905	79.1	7.792	77.9
Msh-10/1-T-1F	Transformer				20.000	16.933	84.7	16.690	83.5
Msh-10/1-T-2F	Transformer				20.000	16.933	84.7	16.690	83.5
Nbg-10/1-T-1n	Transformer				20.000	10.734	53.7	10.517	52.6
Nbg-10/1-T-2n	Transformer				20.000	10.734	53.7	10.517	52.6
Nde-10/1-T-1n	Transformer				20.000	12.489	62.4	12.195	61.0
Nde-10/1-T-2n	Transformer				20.000	12.489	62.4	12.195	61.0
Rwi-10/1-T-1n	Transformer				10.000	6.616	66.2	6.497	65.0
Sha-20/10-T-1n	Transformer				90.000	88.992	98.9	85.334	94.8
Sha-20/10-T-2n	Transformer				90.000	88.992	98.9	85.334	94.8
Sha-20/10-T-3n	Transformer				90.000	88.992	98.9	85.334	94.8

* Indicates a branch with operating load exceeding the branch capability.

Branch Losses Summary Report

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop in Vmag
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	
10-Kba-Msh-R(D/C)	-33.985	-5.569	34.181	5.507	195.5	-62.3	95.5	96.4	0.94
10-Kba-Rwi(S/C)	12.233	3.244	-12.207	-3.416	26.1	-172.6	95.5	95.2	0.29
1-Jb1-Jb3	-7.114	-5.194	7.116	5.195	1.6	1.5	100.7	100.8	0.03
10-Bre-Nde-1R(S/C)	79.479	7.390	-79.176	-6.546	302.6	844.8	100.4	100.0	0.49
10-Bre-Jb1-R(D/C)	138.699	46.109	-137.747	-42.022	952.0	4086.4	100.4	98.9	1.54
10-Bre-Nde-2(S/C)	-79.093	-6.491	79.176	6.546	83.2	54.4	99.8	100.0	0.13
10-Bre-Sha-2	-123.264	-32.532	123.678	32.982	414.5	450.0	100.4	101.0	0.60
10-Bre-Sha-1	-123.264	-32.532	123.678	32.982	414.5	450.0	100.4	101.0	0.60
10-Gha-MKi(S/C)	-9.214	-3.506	9.224	3.310	9.7	-195.0	97.2	97.4	0.20
10-Gko-Jb1(S/C)	-62.904	-23.249	63.420	24.633	516.5	1384.4	97.3	98.9	1.55
10-Gko-MKi(S/C)	2.261	-1.663	-2.260	1.510	0.5	-153.0	97.3	97.4	0.02
10-Gso-Msh-R(D/C)	84.886	18.610	-83.995	-15.246	890.7	3364.1	98.3	96.4	1.90
10-Gso-Nde-1R(S/C)	-104.755	-26.616	105.536	28.951	781.3	2334.7	98.3	99.6	1.27
10-Gso-Nde-2(S/C)	105.695	29.203	-105.536	-28.951	159.0	252.3	99.8	99.6	0.24
10-Jb1-Jb2(S/C)	-18.491	-13.384	18.498	13.367	7.6	-16.1	98.9	99.0	0.08
10-Jb1-Nbg(S/C)	50.608	18.702	-50.329	-18.041	278.4	660.8	98.9	97.9	1.04
10-MKi-Nbg(S/C)	30.290	10.339	-30.208	-10.261	82.1	78.0	97.9	97.4	0.50
Bre-10/1-T-1	-14.123	-4.640	14.175	5.782	51.9	1142.0	100.5	100.4	0.11
Bre-10/1-T-1F	-14.123	-4.640	14.175	5.782	51.9	1142.0	100.5	100.4	0.11
Gha-10/1-T-1n	-9.190	-3.021	9.214	3.506	24.3	485.0	100.6	97.2	3.41
Gko-10/1-T-1	-12.168	-3.851	12.219	4.863	50.6	1011.3	100.7	97.3	3.33
Gko-10/1-T-1F	-24.113	-8.375	24.158	10.400	45.0	2024.6	100.7	97.3	3.33
Gko-10/1-T-2	-12.262	-3.874	12.313	4.892	50.9	1018.7	100.7	97.3	3.33
Gko-10/1-T-3	-11.903	-3.768	11.953	4.757	49.5	989.3	100.7	97.3	3.33
Gso-10/1-T-1F	-9.897	-3.253	9.934	4.003	37.5	750.0	100.6	98.3	2.26
Gso-10/1-T-2F	-9.897	-3.253	9.934	4.003	37.5	750.0	100.6	98.3	2.26
Jb1-10/1-T-1	-8.304	-2.110	8.363	2.883	59.4	772.3	100.7	98.9	1.85
Jb1-10/1-T-2	-8.304	-2.110	8.363	2.883	59.4	772.3	100.7	98.9	1.85
Jb1-10/1-T-F1	-17.659	-4.996	17.742	6.653	82.9	1657.1	100.7	98.9	1.85
Jb1-10/1-T-F2	-17.659	-4.996	17.742	6.653	82.9	1657.1	100.7	98.9	1.85
Jb2-10/.6-TG-1	9.300	7.650	-9.249	-6.684	50.9	966.3	104.5	99.0	5.47
Jb2-10/.6-TG-2	9.300	7.650	-9.249	-6.684	50.9	966.3	104.5	99.0	5.47
Jb3-1/0-TG-1	-1.186	-0.866	1.200	0.950	14.0	84.1	100.8	100.9	4.26
Jb3-1/0-TG-2	-1.186	-0.866	1.200	0.950	14.0	84.1	100.8	100.9	4.26
Jb3-1/0-TG-3	-1.186	-0.866	1.200	0.950	14.0	84.1	100.8	100.9	4.26

CKT / Branch	From-To Bus Flow		To-From Bus Flow		Losses		% Bus Voltage		Vd % Drop
ID	MW	Mvar	MW	Mvar	kW	kvar	From	To	in Vmag
Jb3-1/0-TG-4	-1.186	-0.866	1.200	0.950	14.0	84.1	100.8	100.9	4.26
Jb3-1/0-TG-5	-1.186	-0.866	1.200	0.950	14.0	84.1	100.8	100.9	4.26
Jb3-1/0-TG-6	-1.186	-0.866	1.200	0.950	14.0	84.1	100.8	100.9	4.26
Kba-10/3-T-1	-7.218	-0.346	7.251	0.775	33.0	429.1	100.7	95.5	5.17
Kba-10/3-T-2	-7.218	-0.346	7.251	0.775	33.0	429.1	100.7	95.5	5.17
Kba-10/3-T-3	-7.218	-0.346	7.251	0.775	33.0	429.1	100.7	95.5	5.17
Kse-10/1-TG-1n2	40.000	30.000	-39.896	-25.298	104.5	4701.7	105.7	99.8	5.83
Kse-10/1-TG-2n2	10.000	7.500	-9.953	-6.551	47.4	948.6	104.7	99.8	4.90
MKi-10/1-T-1	-16.640	-5.469	16.719	7.062	79.6	1592.8	100.5	97.4	3.13
MKi-10/3-T-1	-10.729	-3.527	10.763	4.190	33.2	663.0	100.4	97.4	3.07
MKi-10/3-T-2	-10.729	-3.527	10.763	4.190	33.2	663.0	100.4	97.4	3.07
Msh-10/1-T-1	-7.764	-0.658	7.797	1.307	32.4	649.0	100.0	96.4	3.62
Msh-10/1-T-1F	-16.631	-1.410	16.700	2.800	69.5	1390.1	100.0	96.4	3.62
Msh-10/1-T-2F	-16.631	-1.410	16.700	2.800	69.5	1390.1	100.0	96.4	3.62
Nbg-10/1-T-1n	-9.991	-3.284	10.020	3.851	28.3	567.0	101.1	97.9	3.28
Nbg-10/1-T-2n	-9.991	-3.284	10.020	3.851	28.3	567.0	101.1	97.9	3.28
Nde-10/1-T-1n	-11.585	-3.808	11.623	4.569	38.1	761.2	101.2	99.8	1.38
Nde-10/1-T-2n	-11.585	-3.808	11.623	4.569	38.1	761.2	101.2	99.8	1.38
Rwi-10/1-T-1n	-6.406	-1.087	6.439	1.521	33.4	433.9	100.9	95.2	5.74
Sha-20/10-T-1n	-82.452	-21.988	82.694	32.882	242.1	10894.0	101.0	100.0	1.04
Sha-20/10-T-2n	-82.452	-21.988	82.694	32.882	242.1	10894.0	101.0	100.0	1.04
Sha-20/10-T-3n	-82.452	-21.988	82.694	32.882	242.1	10894.0	101.0	100.0	1.04
					7446.3	79029.3			

Alert Summary Report

% Alert Settings

	Critical
Loading	
Bus	100.0
Cable	100.0
Reactor	100.0
Line	100.0
Transformer	100.0
Panel	100.0
Protective Device	100.0
Generator	101.0
Inverter/Charger	100.0
Bus Voltage	
OverVoltage	105.0
UnderVoltage	95.0
Generator Excitation	
OverExcited (Q Max.)	101.0
UnderExcited (Q Min.)	100.0

Critical Report

Device ID	Type	Condition	Rating/Limit	Unit	Operating	% Operating	Phase Type
Kse-1-B-5	Bus	Over Voltage	11.00	kV	11.62	105.7	3-Phase

SUMMARY OF TOTAL GENERATION, LOADING & DEMAND

	MW	Mvar	MVA	% PF
Source (Swing Buses):	248.083	98.646	266.976	92.92 Lagging
Source (Non-Swing Buses):	100.800	75.500	125.940	80.04 Lagging
Total Demand:	348.883	174.146	389.931	89.47 Lagging
Total Motor Load:	53.095	17.451	55.889	95.00 Lagging
Total Static Load:	288.342	77.666	298.618	96.56 Lagging
Total Constant I Load:	0.000	0.000	0.000	
Total Generic Load:	0.000	0.000	0.000	
Apparent Losses:	7.446	79.029		
System Mismatch:	0.000	0.000		

Number of Iterations: 2

3. 三相短絡電流計算報告書

1) 2018 年断面

Short-Circuit Summary Report

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
10-Kba/Msh/Rwi-B	110.000	10-Kba/Msh/Rwi-B	Open Air					2.294	4.185				2.187
	110.000	Kba-10-C-1	CB	80.000	31.500	33.618	11.743	2.294	4.185	2.294	2.294	0.005	
B-1-Jb1-Jb3-1	15.000	B-1-Jb1-Jb3-1	Open Air					11.059	27.946				9.990
	15.000	Jb1-1-C-1	CB	63.000	25.000	26.681	9.320	11.059	27.946	10.844	11.363	3.395	
B-1-Jb1-Jb3-2	15.000	B-1-Jb1-Jb3-2	Open Air					11.015	27.710				9.956
	15.000	Jb3-1-C-1	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
B-10-Bre-Gso-1	110.000	B-10-Bre-Gso-1	Open Air					14.274	32.457				13.885
	110.000	Bre-10-C-4	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
B-10-Bre-Jb1-1	110.000	B-10-Bre-Jb1-1	Open Air					14.274	32.457				13.885
	110.000	Bre-10-C-1	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
B-10-Bre-Jb1-2	110.000	B-10-Bre-Jb1-2	Open Air					20.757	49.315				20.290
	110.000	Jb1-10-C-3	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
B-10-Bre-Nde-2	110.000	B-10-Bre-Nde-2	Open Air					10.444	22.376				10.107
	110.000	Nde-10-C-1	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
B-10-Bre-Sha-1D	110.000	B-10-Bre-Sha-1D	Open Air					14.274	32.457				13.885
	110.000	Bre-10-C-3	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
B-10-Bre-Sha-2D	110.000	B-10-Bre-Sha-2D	Open Air					13.658	31.309				13.324
	110.000	Sha-10-C-2	CB	80.000	31.500	33.618	11.743	13.658	31.309	13.579	14.536	5.188	
B-10-Gha-MKi-1	110.000	B-10-Gha-MKi-1	Open Air					9.334	20.064				9.226
	110.000	Gha-10-C-1	CB	80.000	31.500	33.618	11.743	9.334	20.064	9.334	9.337	0.235	
B-10-Gha-MKi-2	110.000	B-10-Gha-MKi-2	Open Air					18.916	44.674				18.543
	110.000	MKi-10-C-4	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
B-10-Gko-Jb1-1	110.000	B-10-Gko-Jb1-1	Open Air					15.389	34.647				15.041
	110.000	Gko-10-C-1	CB	80.000	31.500	33.618	11.743	15.389	34.647	15.384	15.406	0.819	
B-10-Gko-Jb1-2	110.000	B-10-Gko-Jb1-2	Open Air					20.757	49.315				20.290
	110.000	Jb1-10-C-4	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
B-10-Gko-MKi-1	110.000	B-10-Gko-MKi-1	Open Air					15.389	34.647				15.041
	110.000	Gko-10-C-2	CB	80.000	31.500	33.618	11.743	15.389	34.647	15.384	15.406	0.819	
B-10-Gso-Msh-2	110.000	B-10-Gso-Msh-2	Open Air					3.796	7.133				3.600
	110.000	Msh-10-C-1	CB	80.000	40.000	42.689	14.911	3.796	7.133	3.796	3.796	0.028	
B-10-Gso-Nde-1	110.000	B-10-Gso-Nde-1	Open Air					7.261	14.562				6.989
	110.000	Gso-10-C-1	CB	80.000	31.500	33.618	11.743	7.261	14.562	7.233	7.238	0.273	
B-10-Gso-Nde-2	110.000	B-10-Gso-Nde-2	Open Air					10.444	22.376				10.107
	110.000	Nde-10-C-2	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
B-10-Jb1-Jb2-1	110.000	B-10-Jb1-Jb2-1	Open Air					20.757	49.315				20.290
	110.000	Jb1-10-C-1	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
B-10-Jb1-Jb2-2	110.000	B-10-Jb1-Jb2-2	Open Air					18.061	41.682				17.710
	110.000	Jb2-10-C-1	CB	80.000	31.500	33.618	11.743	18.061	41.682	17.982	18.064	1.719	
B-10-Jb1-Nbg-1	110.000	B-10-Jb1-Nbg-1	Open Air					20.757	49.315				20.290

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
B-10-Jb1-Nbg-1	110.000	Jb1-10-C-5	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
B-10-Jb1-Nbg-2	110.000	B-10-Jb1-Nbg-2	Open Air					15.316	34.403				15.048
	110.000	Nbg-10-C-1	CB	80.000	31.500	33.618	11.743	15.316	34.403	15.310	15.329	0.759	
B-10-Kba-Msh-2	110.000	B-10-Kba-Msh-2	Open Air					3.796	7.133				3.600
	110.000	Msh-10-C-2	CB	80.000	40.000	42.689	14.911	3.796	7.133	3.796	3.796	0.028	
B-10-Kba-Rwi-2	110.000	B-10-Kba-Rwi-2	Open Air					2.042	3.705				1.953
	110.000	Rwi-10-C-1	CB	80.000	31.500	33.618	11.743	2.042	3.705	2.042	2.042	0.004	
B-10-MKi-Nbg-1	110.000	B-10-MKi-Nbg-1	Open Air					15.316	34.403				15.048
	110.000	Nbg-10-C-2	CB	80.000	31.500	33.618	11.743	15.316	34.403	15.310	15.329	0.759	
B-10-MKi-Nbg-2	110.000	B-10-MKi-Nbg-2	Open Air					18.916	44.674				18.543
	110.000	MKi-10-C-3	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
Bre-1-B-1	15.000	Bre-1-B-1	Open Air					8.143	21.236				7.622
	15.000	Bre-10/1-CL-1	CB	63.000	25.000	26.681	9.320	8.143	21.236	8.143	9.254	4.396	
Bre-10-B-1	110.000	Bre-10-B-1	Open Air					14.274	32.457				13.885
	110.000	Bre-10/1-CH-1	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
	110.000	Bre-10-C-3	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
	110.000	Bre-10-C-4	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
	110.000	Bre-10-C-2	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
	110.000	Bre-10-C-1	CB	80.000	40.000	42.689	14.911	14.274	32.457	14.168	14.857	4.471	
G-Jb2-10-B	110.000	G-Jb2-10-B	Open Air					18.061	41.682				17.710
G-Jb3-1-B	15.000	G-Jb3-1-B	Open Air					11.015	27.710				9.956
Gha-10-B-1	110.000	Gha-10-B-1	Open Air					9.334	20.064				9.226
	110.000	Gha-10-C-1	CB	80.000	31.500	33.618	11.743	9.334	20.064	9.334	9.337	0.235	
	110.000	Gha-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	9.334	20.064	9.334	9.337	0.235	
Gko-1-B-1	15.000	Gko-1-B-1	Open Air					20.065	51.246				18.583
	15.000	Gko-10/1-CL-1	CB	63.000	25.000	26.681	9.320	20.065	51.246	20.065	21.324	7.219	
	15.000	Gko-10/1-CL-2	CB	63.000	25.000	26.681	9.320	20.065	51.246	20.065	21.324	7.219	
	15.000	Gko-10/1-CL-3	CB	63.000	25.000	26.681	9.320	20.065	51.246	20.065	21.324	7.219	
Gko-10-B-1	110.000	Gko-10-B-1	Open Air					15.389	34.647				15.041
	110.000	Gko-10/1-CH-3	CB	80.000	40.000	42.689	14.911	15.389	34.647	15.384	15.406	0.819	
	110.000	Gko-10/1-CH-2	CB	80.000	40.000	42.689	14.911	15.389	34.647	15.384	15.406	0.819	
	110.000	Gko-10/1-CH-1	CB	80.000	40.000	42.689	14.911	15.389	34.647	15.384	15.406	0.819	
	110.000	Gko-10-C-2	CB	80.000	31.500	33.618	11.743	15.389	34.647	15.384	15.406	0.819	
	110.000	Gko-10-C-1	CB	80.000	31.500	33.618	11.743	15.389	34.647	15.384	15.406	0.819	
Gso-1-B-1	15.000	Gso-1-B-1	Open Air					9.901	24.319				9.492
	15.000	Gso-10/1-CL-1	CB	63.000	25.000	26.681	9.320	9.901	24.319	9.901	10.230	2.570	
	15.000	Gso-10/1-CL-2F	CB	63.000	25.000	26.681	9.320	9.901	24.319	9.901	10.230	2.570	
Gso-10-B-1	110.000	Gso-10-B-1	Open Air					7.261	14.562				6.989
	110.000	Gso-10-C-2	CB	80.000	31.500	33.618	11.743	7.261	14.562	7.233	7.238	0.273	
	110.000	Gso-10-C-1	CB	80.000	31.500	33.618	11.743	7.261	14.562	7.233	7.238	0.273	
	110.000	Gso-10/1-CH-1	CB	80.000	31.500	33.618	11.743	7.261	14.562	7.233	7.238	0.273	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Gso-10-B-1	110.000	Gso-10/1-CH-2F	CB	80.000	31.500	33.618	11.743	7.261	14.562	7.233	7.238	0.273	
Jb1-1-B-1	15.000	Jb1-1-B-1	Open Air					11.059	27.946				9.990
	15.000	Jb1-10/1-CL-1	CB	63.000	25.000	26.681	9.320	11.059	27.946	10.844	11.363	3.395	
	15.000	Jb1-10/1-CL-2	CB	63.000	25.000	26.681	9.320	11.059	27.946	10.844	11.363	3.395	
	15.000	Jb1-1-C-1	CB	63.000	25.000	26.681	9.320	11.059	27.946	10.844	11.363	3.395	
Jb1-10-B-1	110.000	Jb1-10-B-1	Open Air					20.757	49.315				20.290
	110.000	Jb1-10/1-CH-2	CB	80.000	40.000	42.689	14.911	20.757	49.315	20.655	20.877	3.037	
	110.000	Jb1-10/1-CH-1	CB	80.000	40.000	42.689	14.911	20.757	49.315	20.655	20.877	3.037	
	110.000	Jb1-10-C-5	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
	110.000	Jb1-10-C-1	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
	110.000	Jb1-10-C-2	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
	110.000	Jb1-10-C-3	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
	110.000	Jb1-10-C-4	CB	80.000	31.500	33.618	11.743	20.757	49.315	20.655	20.877	3.037	
Jb2-.6-B-1	6.600	Jb2-.6-B-1	Open Air					39.961	104.006				26.850
	6.600	Jb2-.6-CG-1	CB	125.000	31.500	33.618	11.743	39.961	104.006	37.162*	41.598*	18.692*	
	6.600	Jb2-10/.6-CL-2	CB	125.000	31.500	33.618	11.743	39.961	104.006	37.162*	41.598*	18.692*	
	6.600	Jb2-10/.6-CL-1	CB	125.000	31.500	33.618	11.743	39.961	104.006	37.162*	41.598*	18.692*	
	6.600	Jb2-.6-CG-2	CB	125.000	31.500	33.618	11.743	39.961	104.006	37.162*	41.598*	18.692*	
	6.600	Jb2-.6-CG-3	CB	125.000	31.500	33.618	11.743	39.961	104.006	37.162*	41.598*	18.692*	
Jb2-10-B-1	110.000	Jb2-10-B-1	Open Air					18.061	41.682				17.710
	110.000	Jb2-10-C-1	CB	80.000	31.500	33.618	11.743	18.061	41.682	17.982	18.064	1.719	
Jb2-10-B-2	110.000	Jb2-10-B-2	Open Air					18.061	41.682				17.710
	110.000	Jb2-10/.6-CH-1	CB	80.000	31.500	33.618	11.743	18.061	41.682	17.982	18.064	1.719	
	110.000	Jb2-10/.6-CH-2	CB	80.000	31.500	33.618	11.743	18.061	41.682	17.982	18.064	1.719	
Jb3-1-B-1	15.000	Jb3-1-B-1	Open Air					11.015	27.710				9.956
	15.000	Jb3-1-C-1	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
Jb3-1-B-2	15.000	Jb3-1-B-2	Open Air					11.015	27.710				9.956
	15.000	Jb3-1/0-CH-1	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
	15.000	Jb3-1/0-CH-2	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
	15.000	Jb3-1/0-CH-3	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
Jb3-1-B-2d	15.000	Jb3-1-B-2d	Open Air					11.015	27.710				9.956
	15.000	Jb3-1/0-CH-4	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
	15.000	Jb3-1/0-CH-5	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
	15.000	Jb3-1/0-CH-6	CB	63.000	25.000	26.681	9.320	11.015	27.710	10.800	11.255	3.169	
Kba-3-B-1	30.000	Kba-3-B-1	Open Air					2.107	4.862				1.956
	30.000	Kba-10/3-CL-1	CB	31.500	12.500	13.340	4.660	2.107	4.862	2.107	2.116	0.186	
Kba-10-B-1	110.000	Kba-10-B-1	Open Air					2.294	4.185				2.187
	110.000	Kba-10/3-CH-1	CB	80.000	31.500	33.618	11.743	2.294	4.185	2.294	2.294	0.005	
	110.000	Kba-10-C-1	CB	80.000	31.500	33.618	11.743	2.294	4.185	2.294	2.294	0.005	
MKi-3-B-1	30.000	MKi-3-B-1	SwtchGear					4.426	11.551				4.228
	30.000	MKi-10/3-CL-1	CB	31.500	12.500	13.340	4.660	4.426	11.551	4.426	4.935	2.184	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
MKi-10-B-1	110.000	MKi-10-B-1	Open Air					18.916	44.674				18.543
	110.000	MKi-10-C-3	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
	110.000	MKi-10-C-2	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
	110.000	MKi-10-C-4	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
	110.000	MKi-10/3-CH-1	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
	110.000	MKi-10-C-1	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
	110.000	MKi-10/1-CH-1	CB	80.000	31.500	33.618	11.743	18.916	44.674	18.910	19.105	2.720	
Msh-1-B-1	15.000	Msh-1-B-1	Open Air					9.699	22.450				8.836
	15.000	Msh-10/1-CL-1	CB	40.000	16.000	17.076	5.965	9.699	22.450	9.699	9.754	1.035	
	15.000	Msh-10/1-CL-1F	CB	40.000	16.000	17.076	5.965	9.699	22.450	9.699	9.754	1.035	
Msh-10-B-1	110.000	Msh-10-B-1	Open Air					3.796	7.133				3.600
	110.000	Msh-10/1-CH-1	CB	80.000	40.000	42.689	14.911	3.796	7.133	3.796	3.796	0.028	
	110.000	Msh-10-C-2	CB	80.000	40.000	42.689	14.911	3.796	7.133	3.796	3.796	0.028	
	110.000	Msh-10-C-1	CB	80.000	40.000	42.689	14.911	3.796	7.133	3.796	3.796	0.028	
	110.000	Msh-10/1-CH-1F	CB	80.000	31.500	33.618	11.743	3.796	7.133	3.796	3.796	0.028	
N-Jb3-.04-1	0.400	N-Jb3-.04-1	Bus					55.710	132.641				55.254
N-Jb3-.04-2	0.400	N-Jb3-.04-2	Bus					55.710	132.641				55.254
N-Jb3-.04-3	0.400	N-Jb3-.04-3	Bus					55.710	132.641				55.254
N-Jb3-.04-4	0.400	N-Jb3-.04-4	Bus					55.710	132.641				55.254
N-Jb3-.04-5	0.400	N-Jb3-.04-5	Bus					55.710	132.641				55.254
N-Jb3-.04-6	0.400	N-Jb3-.04-6	Bus					55.710	132.641				55.254
Nbg-10-B-1	110.000	Nbg-10-B-1	Open Air					15.316	34.403				15.048
	110.000	Nbg-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	15.316	34.403	15.310	15.329	0.759	
	110.000	Nbg-10/1-CH-2n	CB	80.000	31.500	33.618	11.743	15.316	34.403	15.310	15.329	0.759	
	110.000	Nbg-10-C-2	CB	80.000	31.500	33.618	11.743	15.316	34.403	15.310	15.329	0.759	
	110.000	Nbg-10-C-1	CB	80.000	31.500	33.618	11.743	15.316	34.403	15.310	15.329	0.759	
Nde-1-B-1	15.000	Nde-1-B-1	Open Air					15.038	37.811				14.549
	15.000	Nde-10/1-CL-1n	CB	80.000	25.000	26.681	9.320	15.038	37.811	15.038	16.147	5.881	
	15.000	Nde-10/1-CL-2n	CB	80.000	31.500	33.618	11.743	15.038	37.811	15.038	16.147	5.881	
Nde-10-B-1	110.000	Nde-10-B-1	Open Air					10.444	22.376				10.107
	110.000	Nde-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
	110.000	Nde-10/1-CH-2n	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
	110.000	Nde-10-C-1	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
	110.000	Nde-10-C-3	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
	110.000	Nde-10-C-2	CB	80.000	31.500	33.618	11.743	10.444	22.376	10.321	10.451	1.645	
Rwi-1-B-1	15.000	Rwi-1-B-1	Open Air					3.580	8.259				3.469
	15.000	Rwi-10/1-CL-1n	CB	31.500	25.000	26.681	9.320	3.580	8.259	3.580	3.594	0.317	
Rwi-10-B-1	110.000	Rwi-10-B-1	Open Air					2.042	3.705				1.953
	110.000	Rwi-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	2.042	3.705	2.042	2.042	0.004	
	110.000	Rwi-10-C-1	CB	80.000	31.500	33.618	11.743	2.042	3.705	2.042	2.042	0.004	
Sha-10-B-1	110.000	Sha-10-B-1	Open Air					13.658	31.309				13.324

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Sha-10-B-1	110.000	Sha-20/10-CL-1n	CB	80.000	31.500	33.618	11.743	13.658	31.309	13.579	14.536	5.188	
	110.000	Sha-10-C-1	CB	80.000	31.500	33.618	11.743	13.658	31.309	13.579	14.536	5.188	
	110.000	Sha-10-C-2	CB	80.000	31.500	33.618	11.743	13.658	31.309	13.579	14.536	5.188	
Sha-20-B-1	220.000	Sha-20-B-1	Open Air					33.069	81.661				33.050
	220.000	Sha-20-C-Grid	CB	80.000	31.500	33.618	11.743	33.069	81.661*	33.069*	33.849*	7.224	
	220.000	Sha-20/10-CH-1n	CB	80.000	31.500	33.618	11.743	33.069	81.661*	33.069*	33.849*	7.224	

ip is calculated using method C
Ib does not include decay of non-terminal faulted induction motors
Ik is the maximum steady state fault current
Idc is based on X/R from Method C and Ib as specified above

LV CB duty determined based on service rating.
Total through current is used for device duty.

* Indicates a device with calculated duty exceeding the device capability.

# Indicates a device with calculated duty exceeding the device marginal limit. (95 % times device capability)

3. 三相短絡電流計算報告書

2) 2021 年断面

Short-Circuit Summary Report

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
10-Kba/Msh/Rwi-B	110.000	10-Kba/Msh/Rwi-B	Open Air					2.382	4.347				2.252
	110.000	Kba-10-C-1	CB	80.000	31.500	33.618	11.743	2.382	4.347	2.382	2.382	0.007	
B-1-Jb1-Jb3-1	15.000	B-1-Jb1-Jb3-1	Open Air					18.771	47.907				17.374
	15.000	Jb1-1-C-1	CB	63.000	25.000	26.681	9.320	18.771	47.907	18.557	19.812	6.939	
B-1-Jb1-Jb3-2	15.000	B-1-Jb1-Jb3-2	Open Air					18.626	47.101				17.252
	15.000	Jb3-1-C-1	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
B-10-Bre-Gso-1	110.000	B-10-Bre-Gso-1	Open Air					17.838	41.687				17.340
	110.000	Bre-10-C-4	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
B-10-Bre-Jb1-1	110.000	B-10-Bre-Jb1-1	Open Air					17.838	41.687				17.340
	110.000	Bre-10-C-1	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
B-10-Bre-Jb1-2	110.000	B-10-Bre-Jb1-2	Open Air					22.655	53.036				22.094
	110.000	Jb1-10-C-3	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
B-10-Bre-Nde-2	110.000	B-10-Bre-Nde-2	Open Air					12.093	25.884				11.679
	110.000	Nde-10-C-1	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
B-10-Bre-Sha-1D	110.000	B-10-Bre-Sha-1D	Open Air					17.838	41.687				17.340
	110.000	Bre-10-C-3	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
B-10-Bre-Sha-2D	110.000	B-10-Bre-Sha-2D	Open Air					17.543	41.691				17.116
	110.000	Sha-10-C-2	CB	80.000	31.500	33.618	11.743	17.543	41.691	17.464	19.320	8.262	
B-10-Gha-MKi-1	110.000	B-10-Gha-MKi-1	Open Air					9.495	20.309				9.369
	110.000	Gha-10-C-1	CB	80.000	31.500	33.618	11.743	9.495	20.309	9.495	9.498	0.232	
B-10-Gha-MKi-2	110.000	B-10-Gha-MKi-2	Open Air					19.591	45.853				19.144
	110.000	MKi-10-C-4	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
B-10-Gko-Jb1-1	110.000	B-10-Gko-Jb1-1	Open Air					16.030	35.747				15.610
	110.000	Gko-10-C-1	CB	80.000	31.500	33.618	11.743	16.030	35.747	16.026	16.046	0.801	
B-10-Gko-Jb1-2	110.000	B-10-Gko-Jb1-2	Open Air					22.655	53.036				22.094
	110.000	Jb1-10-C-4	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
B-10-Gko-MKi-1	110.000	B-10-Gko-MKi-1	Open Air					16.030	35.747				15.610
	110.000	Gko-10-C-2	CB	80.000	31.500	33.618	11.743	16.030	35.747	16.026	16.046	0.801	
B-10-Gso-Msh-2	110.000	B-10-Gso-Msh-2	Open Air					4.020	7.535				3.779
	110.000	Msh-10-C-1	CB	80.000	40.000	42.689	14.911	4.020	7.535	4.020	4.020	0.029	
B-10-Gso-Nde-1	110.000	B-10-Gso-Nde-1	Open Air					8.035	16.011				7.704
	110.000	Gso-10-C-1	CB	80.000	31.500	33.618	11.743	8.035	16.011	8.013	8.016	0.203	
B-10-Gso-Nde-2	110.000	B-10-Gso-Nde-2	Open Air					12.093	25.884				11.679
	110.000	Nde-10-C-2	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
B-10-Jb1-Jb2-1	110.000	B-10-Jb1-Jb2-1	Open Air					22.655	53.036				22.094
	110.000	Jb1-10-C-1	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
B-10-Jb1-Jb2-2	110.000	B-10-Jb1-Jb2-2	Open Air					19.462	44.273				19.051
	110.000	Jb2-10-C-1	CB	80.000	31.500	33.618	11.743	19.462	44.273	19.392	19.458	1.601	
B-10-Jb1-Nbg-1	110.000	B-10-Jb1-Nbg-1	Open Air					22.655	53.036				22.094

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
B-10-Jb1-Nbg-1	110.000	Jb1-10-C-5	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
B-10-Jb1-Nbg-2	110.000	B-10-Jb1-Nbg-2	Open Air					15.975	35.516				15.659
	110.000	Nbg-10-C-1	CB	80.000	31.500	33.618	11.743	15.975	35.516	15.970	15.986	0.728	
B-10-Kba-Msh-2	110.000	B-10-Kba-Msh-2	Open Air					4.020	7.535				3.779
	110.000	Msh-10-C-2	CB	80.000	40.000	42.689	14.911	4.020	7.535	4.020	4.020	0.029	
B-10-Kba-Rwi-2	110.000	B-10-Kba-Rwi-2	Open Air					2.112	3.834				2.004
	110.000	Rwi-10-C-1	CB	80.000	31.500	33.618	11.743	2.112	3.834	2.112	2.112	0.005	
B-10-MKi-Nbg-1	110.000	B-10-MKi-Nbg-1	Open Air					15.975	35.516				15.659
	110.000	Nbg-10-C-2	CB	80.000	31.500	33.618	11.743	15.975	35.516	15.970	15.986	0.728	
B-10-MKi-Nbg-2	110.000	B-10-MKi-Nbg-2	Open Air					19.591	45.853				19.144
	110.000	MKi-10-C-3	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
Bre-1-B-1	15.000	Bre-1-B-1	Open Air					8.402	21.981				7.735
	15.000	Bre-10/1-CL-1	CB	63.000	25.000	26.681	9.320	8.402	21.981	8.402	9.578	4.600	
Bre-10-B-1	110.000	Bre-10-B-1	Open Air					17.838	41.687				17.340
	110.000	Bre-10/1-CH-1	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
	110.000	Bre-10-C-3	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
	110.000	Bre-10-C-4	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
	110.000	Bre-10-C-2	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
	110.000	Bre-10-C-1	CB	80.000	40.000	42.689	14.911	17.838	41.687	17.732	18.736	6.052	
G-Jb2-10-B	110.000	G-Jb2-10-B	Open Air					19.462	44.273				19.051
G-Jb3-1-B	15.000	G-Jb3-1-B	Open Air					18.626	47.101				17.252
Gha-10-B-1	110.000	Gha-10-B-1	Open Air					9.495	20.309				9.369
	110.000	Gha-10-C-1	CB	80.000	31.500	33.618	11.743	9.495	20.309	9.495	9.498	0.232	
	110.000	Gha-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	9.495	20.309	9.495	9.498	0.232	
Gko-1-B-1	15.000	Gko-1-B-1	Open Air					20.608	52.544				18.701
	15.000	Gko-10/1-CL-1	CB	63.000	25.000	26.681	9.320	20.608	52.544	20.608	21.870	7.320	
	15.000	Gko-10/1-CL-2	CB	63.000	25.000	26.681	9.320	20.608	52.544	20.608	21.870	7.320	
	15.000	Gko-10/1-CL-3	CB	63.000	25.000	26.681	9.320	20.608	52.544	20.608	21.870	7.320	
Gko-10-B-1	110.000	Gko-10-B-1	Open Air					16.030	35.747				15.610
	110.000	Gko-10/1-CH-3	CB	80.000	40.000	42.689	14.911	16.030	35.747	16.026	16.046	0.801	
	110.000	Gko-10/1-CH-2	CB	80.000	40.000	42.689	14.911	16.030	35.747	16.026	16.046	0.801	
	110.000	Gko-10/1-CH-1	CB	80.000	40.000	42.689	14.911	16.030	35.747	16.026	16.046	0.801	
	110.000	Gko-10-C-2	CB	80.000	31.500	33.618	11.743	16.030	35.747	16.026	16.046	0.801	
	110.000	Gko-10-C-1	CB	80.000	31.500	33.618	11.743	16.030	35.747	16.026	16.046	0.801	
Gso-1-B-1	15.000	Gso-1-B-1	Open Air					6.542	16.603				6.061
	15.000	Gso-10/1-CL-1F	CB	63.000	25.000	26.681	9.320	6.542	16.603	6.542	6.952	2.351	
Gso-10-B-1	110.000	Gso-10-B-1	Open Air					8.035	16.011				7.704
	110.000	Gso-10-C-2	CB	80.000	31.500	33.618	11.743	8.035	16.011	8.013	8.016	0.203	
	110.000	Gso-10-C-1	CB	80.000	31.500	33.618	11.743	8.035	16.011	8.013	8.016	0.203	
	110.000	Gso-10/1-CH-1F	CB	80.000	31.500	33.618	11.743	8.035	16.011	8.013	8.016	0.203	
Jb1-1-B-1	15.000	Jb1-1-B-1	Open Air					18.771	47.907				17.374

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Jb1-1-B-1	15.000	Jb1-10/1-CL-1	CB	63.000	25.000	26.681	9.320	18.771	47.907	18.557	19.812	6.939	
	15.000	Jb1-10/1-CL-2	CB	63.000	25.000	26.681	9.320	18.771	47.907	18.557	19.812	6.939	
	15.000	Jb1-10/1-CL-F1	CB	63.000	25.000	26.681	9.320	18.771	47.907	18.557	19.812	6.939	
	15.000	Jb1-1-C-1	CB	63.000	25.000	26.681	9.320	18.771	47.907	18.557	19.812	6.939	
Jb1-10-B-1	110.000	Jb1-10-B-1	Open Air					22.655	53.036				22.094
	110.000	Jb1-10/1-CH-2	CB	80.000	40.000	42.689	14.911	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10/1-CH-1	CB	80.000	40.000	42.689	14.911	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10-C-5	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10-C-1	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10-C-2	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10-C-3	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10-C-4	CB	80.000	31.500	33.618	11.743	22.655	53.036	22.566	22.750	2.884	
	110.000	Jb1-10/1-CH-F1	CB	80.000	40.000	42.689	14.911	22.655	53.036	22.566	22.750	2.884	
Jb2-.6-B-1	6.600	Jb2-.6-B-1	Open Air					40.149	104.448				27.037
	6.600	Jb2-.6-CG-1	CB	125.000	31.500	33.618	11.743	40.149	104.448	37.349*	41.778*	18.721*	
	6.600	Jb2-10/.6-CL-2	CB	125.000	31.500	33.618	11.743	40.149	104.448	37.349*	41.778*	18.721*	
	6.600	Jb2-10/.6-CL-1	CB	125.000	31.500	33.618	11.743	40.149	104.448	37.349*	41.778*	18.721*	
	6.600	Jb2-.6-CG-2	CB	125.000	31.500	33.618	11.743	40.149	104.448	37.349*	41.778*	18.721*	
	6.600	Jb2-.6-CG-3	CB	125.000	31.500	33.618	11.743	40.149	104.448	37.349*	41.778*	18.721*	
Jb2-10-B-1	110.000	Jb2-10-B-1	Open Air					19.462	44.273				19.051
	110.000	Jb2-10-C-1	CB	80.000	31.500	33.618	11.743	19.462	44.273	19.392	19.458	1.601	
Jb2-10-B-2	110.000	Jb2-10-B-2	Open Air					19.462	44.273				19.051
	110.000	Jb2-10/.6-CH-1	CB	80.000	31.500	33.618	11.743	19.462	44.273	19.392	19.458	1.601	
	110.000	Jb2-10/.6-CH-2	CB	80.000	31.500	33.618	11.743	19.462	44.273	19.392	19.458	1.601	
Jb3-1-B-1	15.000	Jb3-1-B-1	Open Air					18.626	47.101				17.252
	15.000	Jb3-1-C-1	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
Jb3-1-B-2	15.000	Jb3-1-B-2	Open Air					18.626	47.101				17.252
	15.000	Jb3-1/0-CH-1	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
	15.000	Jb3-1/0-CH-2	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
	15.000	Jb3-1/0-CH-3	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
Jb3-1-B-2d	15.000	Jb3-1-B-2d	Open Air					18.626	47.101				17.252
	15.000	Jb3-1/0-CH-4	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
	15.000	Jb3-1/0-CH-5	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
	15.000	Jb3-1/0-CH-6	CB	63.000	25.000	26.681	9.320	18.626	47.101	18.410	19.374	6.035	
Kba-3-B-1	30.000	Kba-3-B-1	Open Air					3.417	7.520				3.200
	30.000	Kba-10/3-CL-1	CB	31.500	12.500	13.340	4.660	3.417	7.520	3.417	3.421	0.168	
	30.000	Kba-10/3-CL-2	CB	31.500	12.500	13.340	4.660	3.417	7.520	3.417	3.421	0.168	
Kba-10-B-1	110.000	Kba-10-B-1	Open Air					2.382	4.347				2.252
	110.000	Kba-10/3-CH-1	CB	80.000	31.500	33.618	11.743	2.382	4.347	2.382	2.382	0.007	
	110.000	Kba-10-C-1	CB	80.000	31.500	33.618	11.743	2.382	4.347	2.382	2.382	0.007	
	110.000	Kba-10/3-CH-2	CB	80.000	31.500	33.618	11.743	2.382	4.347	2.382	2.382	0.007	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
MKi-3-B-1	30.000	MKi-3-B-1	SwtchGear					4.491	11.709				4.237
	30.000	MKi-10/3-CL-1	CB	31.500	12.500	13.340	4.660	4.491	11.709	4.491	5.001	2.199	
MKi-10-B-1	110.000	MKi-10-B-1	Open Air					19.591	45.853				19.144
	110.000	MKi-10-C-3	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
	110.000	MKi-10-C-2	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
	110.000	MKi-10-C-4	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
	110.000	MKi-10/3-CH-1	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
	110.000	MKi-10-C-1	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
	110.000	MKi-10/1-CH-1	CB	80.000	31.500	33.618	11.743	19.591	45.853	19.586	19.775	2.724	
Msh-1-B-1	15.000	Msh-1-B-1	Open Air					10.068	23.385				8.979
	15.000	Msh-10/1-CL-1	CB	40.000	16.000	17.076	5.965	10.068	23.385	10.068	10.128	1.101	
	15.000	Msh-10/1-CL-1F	CB	40.000	16.000	17.076	5.965	10.068	23.385	10.068	10.128	1.101	
Msh-10-B-1	110.000	Msh-10-B-1	Open Air					4.020	7.535				3.779
	110.000	Msh-10/1-CH-1	CB	80.000	40.000	42.689	14.911	4.020	7.535	4.020	4.020	0.029	
	110.000	Msh-10-C-2	CB	80.000	40.000	42.689	14.911	4.020	7.535	4.020	4.020	0.029	
	110.000	Msh-10-C-1	CB	80.000	40.000	42.689	14.911	4.020	7.535	4.020	4.020	0.029	
	110.000	Msh-10/1-CH-1F	CB	80.000	31.500	33.618	11.743	4.020	7.535	4.020	4.020	0.029	
N-Jb3-.04-1	0.400	N-Jb3-.04-1	Bus					57.538	136.517				57.322
N-Jb3-.04-2	0.400	N-Jb3-.04-2	Bus					57.538	136.517				57.322
N-Jb3-.04-3	0.400	N-Jb3-.04-3	Bus					57.538	136.517				57.322
N-Jb3-.04-4	0.400	N-Jb3-.04-4	Bus					57.538	136.517				57.322
N-Jb3-.04-5	0.400	N-Jb3-.04-5	Bus					57.538	136.517				57.322
N-Jb3-.04-6	0.400	N-Jb3-.04-6	Bus					57.538	136.517				57.322
Nbg-10-B-1	110.000	Nbg-10-B-1	Open Air					15.975	35.516				15.659
	110.000	Nbg-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	15.975	35.516	15.970	15.986	0.728	
	110.000	Nbg-10/1-CH-2n	CB	80.000	31.500	33.618	11.743	15.975	35.516	15.970	15.986	0.728	
	110.000	Nbg-10-C-2	CB	80.000	31.500	33.618	11.743	15.975	35.516	15.970	15.986	0.728	
	110.000	Nbg-10-C-1	CB	80.000	31.500	33.618	11.743	15.975	35.516	15.970	15.986	0.728	
Nde-1-B-1	15.000	Nde-1-B-1	Open Air					15.546	39.274				14.938
	15.000	Nde-10/1-CL-1n	CB	80.000	25.000	26.681	9.320	15.546	39.274	15.546	16.651	5.965	
	15.000	Nde-10/1-CL-2n	CB	80.000	31.500	33.618	11.743	15.546	39.274	15.546	16.651	5.965	
Nde-10-B-1	110.000	Nde-10-B-1	Open Air					12.093	25.884				11.679
	110.000	Nde-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
	110.000	Nde-10/1-CH-2n	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
	110.000	Nde-10-C-1	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
	110.000	Nde-10-C-3	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
	110.000	Nde-10-C-2	CB	80.000	31.500	33.618	11.743	12.093	25.884	11.970	12.055	1.425	
Rwi-1-B-1	15.000	Rwi-1-B-1	Open Air					3.629	8.390				3.491
	15.000	Rwi-10/1-CL-1n	CB	31.500	25.000	26.681	9.320	3.629	8.390	3.629	3.645	0.341	
Rwi-10-B-1	110.000	Rwi-10-B-1	Open Air					2.112	3.834				2.004
	110.000	Rwi-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	2.112	3.834	2.112	2.112	0.005	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Rwi-10-B-1	110.000	Rwi-10-C-1	CB	80.000	31.500	33.618	11.743	2.112	3.834	2.112	2.112	0.005	
Sha-10-B-1	110.000	Sha-10-B-1	Open Air					17.543	41.691				17.116
	110.000	Sha-20/10-CL-1n	CB	80.000	31.500	33.618	11.743	17.543	41.691	17.464	19.320	8.262	
	110.000	Sha-10-C-1	CB	80.000	31.500	33.618	11.743	17.543	41.691	17.464	19.320	8.262	
	110.000	Sha-10-C-2	CB	80.000	31.500	33.618	11.743	17.543	41.691	17.464	19.320	8.262	
	110.000	Sha-20/10-CL-2n	CB	80.000	31.500	33.618	11.743	17.543	41.691	17.464	19.320	8.262	
Sha-20-B-1	220.000	Sha-20-B-1	Open Air					33.866	83.374				33.811
	220.000	Sha-20-C-Grid	CB	80.000	31.500	33.618	11.743	33.866	83.374*	33.866*	34.624*	7.205	
	220.000	Sha-20/10-CH-1n	CB	80.000	31.500	33.618	11.743	33.866	83.374*	33.866*	34.624*	7.205	
	220.000	Sha-20/10-CH-2n	CB	80.000	31.500	33.618	11.743	33.866	83.374*	33.866*	34.624*	7.205	

ip is calculated using method C
Ib does not include decay of non-terminal faulted indunction motors
Ik is the maximum steady state fault current
Idc is based on X/R from Method C and Ib as specified above

LV CB duty determined based on service rating.
Total through current is used for device duty.

* Indicates a device with calculated duty exceeding the device capability.

# Indicates a device with calculated duty exceeding the device marginal limit. (95 % times device capability)

3. 三相短絡電流計算報告書

3) 2028 年断面

Short-Circuit Summary Report

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
				Making									
ID	kV	ID	Type	Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
10-Kba/Msh/Rwi-B	110.000	10-Kba/Msh/Rwi-B	Open Air					3.246	7.069				2.990
	110.000	Kba-10-C-1	CB	80.000	31.500	33.618	11.743	3.246	7.069	3.246	3.249	0.124	
B-1-Jb1-Jb3-1	15.000	B-1-Jb1-Jb3-1	Open Air					26.960	69.118				24.334
	15.000	Jb1-1-C-1	CB	63.000	25.000	26.681	9.320	26.960	69.118*	26.746*	28.771*	10.603*	
B-1-Jb1-Jb3-2	15.000	B-1-Jb1-Jb3-2	Open Air					26.642	67.350				24.080
	15.000	Jb3-1-C-1	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
B-10-Bre-Gso-1	110.000	B-10-Bre-Gso-1	Open Air					22.958	56.456				21.933
	110.000	Bre-10-C-4	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
B-10-Bre-Jb1-1	110.000	B-10-Bre-Jb1-1	Open Air					22.958	56.456				21.933
	110.000	Bre-10-C-1	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
B-10-Bre-Jb1-2	110.000	B-10-Bre-Jb1-2	Open Air					25.420	61.139				24.341
	110.000	Jb1-10-C-3	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
B-10-Bre-Nde-2	110.000	B-10-Bre-Nde-2	Open Air					14.241	32.231				13.477
	110.000	Nde-10-C-1	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
B-10-Bre-Sha-1D	110.000	B-10-Bre-Sha-1D	Open Air					22.958	56.456				21.933
	110.000	Bre-10-C-3	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
B-10-Bre-Sha-2D	110.000	B-10-Bre-Sha-2D	Open Air					22.786	56.750				21.931
	110.000	Sha-10-C-2	CB	80.000	31.500	33.618	11.743	22.786	56.750	22.710	24.859	10.111	
B-10-Gha-MKi-1	110.000	B-10-Gha-MKi-1	Open Air					9.755	20.840				9.536
	110.000	Gha-10-C-1	CB	80.000	31.500	33.618	11.743	9.755	20.840	9.755	9.757	0.228	
B-10-Gha-MKi-2	110.000	B-10-Gha-MKi-2	Open Air					20.651	48.406				19.854
	110.000	MKi-10-C-4	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
B-10-Gko-Jb1-1	110.000	B-10-Gko-Jb1-1	Open Air					17.041	38.156				16.281
	110.000	Gko-10-C-1	CB	80.000	31.500	33.618	11.743	17.041	38.156	17.039	17.060	0.837	
B-10-Gko-Jb1-2	110.000	B-10-Gko-Jb1-2	Open Air					25.420	61.139				24.341
	110.000	Jb1-10-C-4	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
B-10-Gko-MKi-1	110.000	B-10-Gko-MKi-1	Open Air					17.041	38.156				16.281
	110.000	Gko-10-C-2	CB	80.000	31.500	33.618	11.743	17.041	38.156	17.039	17.060	0.837	
B-10-Gso-Msh-2	110.000	B-10-Gso-Msh-2	Open Air					5.196	11.298				4.741
	110.000	Msh-10-C-1	CB	80.000	40.000	42.689	14.911	5.196	11.298	5.196	5.201	0.222	
B-10-Gso-Nde-1	110.000	B-10-Gso-Nde-1	Open Air					9.085	19.565				8.490
	110.000	Gso-10-C-1	CB	80.000	31.500	33.618	11.743	9.085	19.565	9.069	9.077	0.391	
B-10-Gso-Nde-2	110.000	B-10-Gso-Nde-2	Open Air					14.241	32.231				13.477
	110.000	Nde-10-C-2	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
B-10-Jb1-Jb2-1	110.000	B-10-Jb1-Jb2-1	Open Air					25.420	61.139				24.341

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
ID	kV	ID	Type	Making Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
B-10-Jb1-Jb2-1	110.000	Jb1-10-C-1	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
B-10-Jb1-Jb2-2	110.000	B-10-Jb1-Jb2-2	Open Air					21.463	49.724				20.696
	110.000	Jb2-10-C-1	CB	80.000	31.500	33.618	11.743	21.463	49.724	21.392	21.492	2.063	
B-10-Jb1-Nbg-1	110.000	B-10-Jb1-Nbg-1	Open Air					25.420	61.139				24.341
	110.000	Jb1-10-C-5	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
B-10-Jb1-Nbg-2	110.000	B-10-Jb1-Nbg-2	Open Air					16.944	37.811				16.383
	110.000	Nbg-10-C-1	CB	80.000	31.500	33.618	11.743	16.944	37.811	16.941	16.957	0.736	
B-10-Kba-Msh-2	110.000	B-10-Kba-Msh-2	Open Air					5.196	11.298				4.741
	110.000	Msh-10-C-2	CB	80.000	40.000	42.689	14.911	5.196	11.298	5.196	5.201	0.222	
B-10-Kba-Rwi-2	110.000	B-10-Kba-Rwi-2	Open Air					2.781	5.816				2.579
	110.000	Rwi-10-C-1	CB	80.000	31.500	33.618	11.743	2.781	5.816	2.781	2.782	0.049	
B-10-MKi-Nbg-1	110.000	B-10-MKi-Nbg-1	Open Air					16.944	37.811				16.383
	110.000	Nbg-10-C-2	CB	80.000	31.500	33.618	11.743	16.944	37.811	16.941	16.957	0.736	
B-10-MKi-Nbg-2	110.000	B-10-MKi-Nbg-2	Open Air					20.651	48.406				19.854
	110.000	MKi-10-C-3	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
Bre-1-B-1	15.000	Bre-1-B-1	Open Air					16.609	43.456				14.938
	15.000	Bre-10/1-CL-1	CB	63.000	25.000	26.681	9.320	16.609	43.456	16.609	18.795	8.798	
	15.000	Bre-10/1-CL-1F	CB	63.000	25.000	26.681	9.320	16.609	43.456	16.609	18.795	8.798	
Bre-10-B-1	110.000	Bre-10-B-1	Open Air					22.958	56.456				21.933
	110.000	Bre-10/1-CH-1	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
	110.000	Bre-10-C-3	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
	110.000	Bre-10-C-4	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
	110.000	Bre-10/1-CH-1F	CB	80.000	31.500	33.618	11.743	22.958	56.456	22.848	23.903	7.025	
	110.000	Bre-10-C-2	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
	110.000	Bre-10-C-1	CB	80.000	40.000	42.689	14.911	22.958	56.456	22.848	23.903	7.025	
G-Jb2-10-B	110.000	G-Jb2-10-B	Open Air					21.463	49.724				20.696
G-Jb3-1-B	15.000	G-Jb3-1-B	Open Air					26.642	67.350				24.080
Gha-10-B-1	110.000	Gha-10-B-1	Open Air					9.755	20.840				9.536
	110.000	Gha-10-C-1	CB	80.000	31.500	33.618	11.743	9.755	20.840	9.755	9.757	0.228	
	110.000	Gha-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	9.755	20.840	9.755	9.757	0.228	
Gko-1-B-1	15.000	Gko-1-B-1	Open Air					32.051	81.599				28.452
	15.000	Gko-10/1-CL-1	CB	63.000	25.000	26.681	9.320	32.051	81.599*	32.051*	33.997*	11.337*	
	15.000	Gko-10/1-CL-2	CB	63.000	25.000	26.681	9.320	32.051	81.599*	32.051*	33.997*	11.337*	
	15.000	Gko-10/1-CL-3	CB	63.000	25.000	26.681	9.320	32.051	81.599*	32.051*	33.997*	11.337*	
	15.000	Gko-10/1-CL-1F	CB	63.000	25.000	26.681	9.320	32.051	81.599*	32.051*	33.997*	11.337*	
Gko-10-B-1	110.000	Gko-10-B-1	Open Air					17.041	38.156				16.281
	110.000	Gko-10/1-CH-3	CB	80.000	40.000	42.689	14.911	17.041	38.156	17.039	17.060	0.837	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
				Making									
ID	kV	ID	Type	Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Gko-10-B-1	110.000	Gko-10/1-CH-2	CB	80.000	40.000	42.689	14.911	17.041	38.156	17.039	17.060	0.837	
	110.000	Gko-10/1-CH-1	CB	80.000	40.000	42.689	14.911	17.041	38.156	17.039	17.060	0.837	
	110.000	Gko-10-C-2	CB	80.000	31.500	33.618	11.743	17.041	38.156	17.039	17.060	0.837	
	110.000	Gko-10-C-1	CB	80.000	31.500	33.618	11.743	17.041	38.156	17.039	17.060	0.837	
	110.000	Gko-10/1-CH-1F	CB	80.000	40.000	42.689	14.911	17.041	38.156	17.039	17.060	0.837	
Gso-1-B-1	15.000	Gso-1-B-1	Open Air					12.094	30.597				11.136
	15.000	Gso-10/1-CL-1F	CB	63.000	25.000	26.681	9.320	12.094	30.597	12.094	12.738	3.998	
	15.000	Gso-10/1-CL-2F	CB	63.000	25.000	26.681	9.320	12.094	30.597	12.094	12.738	3.998	
Gso-10-B-1	110.000	Gso-10-B-1	Open Air					9.085	19.565				8.490
	110.000	Gso-10-C-2	CB	80.000	31.500	33.618	11.743	9.085	19.565	9.069	9.077	0.391	
	110.000	Gso-10-C-1	CB	80.000	31.500	33.618	11.743	9.085	19.565	9.069	9.077	0.391	
	110.000	Gso-10/1-CH-1F	CB	80.000	31.500	33.618	11.743	9.085	19.565	9.069	9.077	0.391	
	110.000	Gso-10/1-CH-2F	CB	80.000	31.500	33.618	11.743	9.085	19.565	9.069	9.077	0.391	
Jb1-1-B-1	15.000	Jb1-1-B-1	Open Air					26.960	69.118				24.334
	15.000	Jb1-10/1-CL-1	CB	63.000	25.000	26.681	9.320	26.960	69.118*	26.746*	28.771*	10.603*	
	15.000	Jb1-10/1-CL-2	CB	63.000	25.000	26.681	9.320	26.960	69.118*	26.746*	28.771*	10.603*	
	15.000	Jb1-10/1-CL-F1	CB	63.000	25.000	26.681	9.320	26.960	69.118*	26.746*	28.771*	10.603*	
	15.000	Jb1-1-C-1	CB	63.000	25.000	26.681	9.320	26.960	69.118*	26.746*	28.771*	10.603*	
	15.000	Jb1-10/1-CL-F2	CB	63.000	25.000	26.681	9.320	26.960	69.118*	26.746*	28.771*	10.603*	
Jb1-10-B-1	110.000	Jb1-10-B-1	Open Air					25.420	61.139				24.341
	110.000	Jb1-10/1-CH-2	CB	80.000	40.000	42.689	14.911	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10/1-CH-1	CB	80.000	40.000	42.689	14.911	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10-C-5	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10-C-1	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10-C-2	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10-C-3	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10-C-4	CB	80.000	31.500	33.618	11.743	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10/1-CH-F1	CB	80.000	40.000	42.689	14.911	25.420	61.139	25.327	25.688	4.289	
	110.000	Jb1-10/1-CH-F2	CB	80.000	40.000	42.689	14.911	25.420	61.139	25.327	25.688	4.289	
Jb2-.6-B-1	6.600	Jb2-.6-B-1	Open Air					40.368	105.230				27.226
	6.600	Jb2-.6-CG-1	CB	125.000	31.500	33.618	11.743	40.368	105.230	37.568*	42.209*	19.240*	
	6.600	Jb2-10/.6-CL-2	CB	125.000	31.500	33.618	11.743	40.368	105.230	37.568*	42.209*	19.240*	
	6.600	Jb2-10/.6-CL-1	CB	125.000	31.500	33.618	11.743	40.368	105.230	37.568*	42.209*	19.240*	
	6.600	Jb2-.6-CG-2	CB	125.000	31.500	33.618	11.743	40.368	105.230	37.568*	42.209*	19.240*	
	6.600	Jb2-.6-CG-3	CB	125.000	31.500	33.618	11.743	40.368	105.230	37.568*	42.209*	19.240*	
Jb2-10-B-1	110.000	Jb2-10-B-1	Open Air					21.463	49.724				20.696
	110.000	Jb2-10-C-1	CB	80.000	31.500	33.618	11.743	21.463	49.724	21.392	21.492	2.063	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
				Making Peak									
ID	kV	ID	Type		Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Jb2-10-B-2	110.000	Jb2-10-B-2	Open Air					21.463	49.724				20.696
	110.000	Jb2-10/.6-CH-1	CB	80.000	31.500	33.618	11.743	21.463	49.724	21.392	21.492	2.063	
	110.000	Jb2-10/.6-CH-2	CB	80.000	31.500	33.618	11.743	21.463	49.724	21.392	21.492	2.063	
Jb3-1-B-1	15.000	Jb3-1-B-1	Open Air					26.642	67.350				24.080
	15.000	Jb3-1-C-1	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
Jb3-1-B-2	15.000	Jb3-1-B-2	Open Air					26.642	67.350				24.080
	15.000	Jb3-1/0-CH-1	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
	15.000	Jb3-1/0-CH-2	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
	15.000	Jb3-1/0-CH-3	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
Jb3-1-B-2d	15.000	Jb3-1-B-2d	Open Air					26.642	67.350				24.080
	15.000	Jb3-1/0-CH-4	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
	15.000	Jb3-1/0-CH-5	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
	15.000	Jb3-1/0-CH-6	CB	63.000	25.000	26.681	9.320	26.642	67.350*	26.427*	27.780*	8.564	
Kba-3-B-1	30.000	Kba-3-B-1	Open Air					4.928	11.745				4.514
	30.000	Kba-10/3-CL-1	CB	31.500	12.500	13.340	4.660	4.928	11.745	4.928	4.974	0.673	
	30.000	Kba-10/3-CL-2	CB	31.500	12.500	13.340	4.660	4.928	11.745	4.928	4.974	0.673	
	30.000	Kba-10/3-CL-3	CB	31.500	12.500	13.340	4.660	4.928	11.745	4.928	4.974	0.673	
Kba-10-B-1	110.000	Kba-10-B-1	Open Air					3.246	7.069				2.990
	110.000	Kba-10/3-CH-1	CB	80.000	31.500	33.618	11.743	3.246	7.069	3.246	3.249	0.124	
	110.000	Kba-10-C-1	CB	80.000	31.500	33.618	11.743	3.246	7.069	3.246	3.249	0.124	
	110.000	Kba-10/3-CH-2	CB	80.000	31.500	33.618	11.743	3.246	7.069	3.246	3.249	0.124	
	110.000	Kba-10/3-CH-3	CB	80.000	31.500	33.618	11.743	3.246	7.069	3.246	3.249	0.124	
MKi-3-B-1	30.000	MKi-3-B-1	SwtchGear					8.517	22.082				8.025
	30.000	MKi-10/3-CL-1	CB	31.500	12.500	13.340	4.660	8.517	22.082	8.517	9.361	3.884	
	30.000	MKi-10/3-CL-2	CB	31.500	12.500	13.340	4.660	8.517	22.082	8.517	9.361	3.884	
MKi-10-B-1	110.000	MKi-10-B-1	Open Air					20.651	48.406				19.854
	110.000	MKi-10-C-3	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
	110.000	MKi-10-C-2	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
	110.000	MKi-10-C-4	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
	110.000	MKi-10/3-CH-1	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
	110.000	MKi-10-C-1	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
	110.000	MKi-10/1-CH-1	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
	110.000	MKi-10/3-CH-2	CB	80.000	31.500	33.618	11.743	20.651	48.406	20.648	20.832	2.759	
Msh-1-B-1	15.000	Msh-1-B-1	Open Air					15.393	37.498				13.370
	15.000	Msh-10/1-CL-1	CB	40.000	16.000	17.076	5.965	15.393	37.498	15.393	15.674	2.958	
	15.000	Msh-10/1-CL-1F	CB	40.000	16.000	17.076	5.965	15.393	37.498	15.393	15.674	2.958	
	15.000	Msh-10/1-CL-2F	CB	40.000	16.000	17.076	5.965	15.393	37.498	15.393	15.674	2.958	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
				Making Peak									
ID	kV	ID	Type		Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Msh-10-B-1	110.000	Msh-10-B-1	Open Air					5.196	11.298				4.741
	110.000	Msh-10/1-CH-1	CB	80.000	40.000	42.689	14.911	5.196	11.298	5.196	5.201	0.222	
	110.000	Msh-10-C-2	CB	80.000	40.000	42.689	14.911	5.196	11.298	5.196	5.201	0.222	
	110.000	Msh-10-C-1	CB	80.000	40.000	42.689	14.911	5.196	11.298	5.196	5.201	0.222	
	110.000	Msh-10/1-CH-1F	CB	80.000	31.500	33.618	11.743	5.196	11.298	5.196	5.201	0.222	
	110.000	Msh-10/1-CH-2F	CB	80.000	31.500	33.618	11.743	5.196	11.298	5.196	5.201	0.222	
N-Jb3-.04-1	0.400	N-Jb3-.04-1	Bus					58.371	138.250				58.164
N-Jb3-.04-2	0.400	N-Jb3-.04-2	Bus					58.371	138.250				58.164
N-Jb3-.04-3	0.400	N-Jb3-.04-3	Bus					58.371	138.250				58.164
N-Jb3-.04-4	0.400	N-Jb3-.04-4	Bus					58.371	138.250				58.164
N-Jb3-.04-5	0.400	N-Jb3-.04-5	Bus					58.371	138.250				58.164
N-Jb3-.04-6	0.400	N-Jb3-.04-6	Bus					58.371	138.250				58.164
Nbg-10-B-1	110.000	Nbg-10-B-1	Open Air					16.944	37.811				16.383
	110.000	Nbg-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	16.944	37.811	16.941	16.957	0.736	
	110.000	Nbg-10/1-CH-2n	CB	80.000	31.500	33.618	11.743	16.944	37.811	16.941	16.957	0.736	
	110.000	Nbg-10-C-2	CB	80.000	31.500	33.618	11.743	16.944	37.811	16.941	16.957	0.736	
	110.000	Nbg-10-C-1	CB	80.000	31.500	33.618	11.743	16.944	37.811	16.941	16.957	0.736	
Nde-1-B-1	15.000	Nde-1-B-1	Open Air					16.358	41.944				15.265
	15.000	Nde-10/1-CL-1n	CB	80.000	25.000	26.681	9.320	16.358	41.944	16.358	17.660	6.657	
	15.000	Nde-10/1-CL-2n	CB	80.000	31.500	33.618	11.743	16.358	41.944	16.358	17.660	6.657	
Nde-10-B-1	110.000	Nde-10-B-1	Open Air					14.241	32.231				13.477
	110.000	Nde-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
	110.000	Nde-10/1-CH-2n	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
	110.000	Nde-10-C-1	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
	110.000	Nde-10-C-3	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
	110.000	Nde-10-C-2	CB	80.000	31.500	33.618	11.743	14.241	32.231	14.118	14.207	1.593	
Rwi-1-B-1	15.000	Rwi-1-B-1	Open Air					3.876	9.448				3.649
	15.000	Rwi-10/1-CL-1n	CB	31.500	25.000	26.681	9.320	3.876	9.448	3.876	3.943	0.719	
Rwi-10-B-1	110.000	Rwi-10-B-1	Open Air					2.781	5.816				2.579
	110.000	Rwi-10/1-CH-1n	CB	80.000	31.500	33.618	11.743	2.781	5.816	2.781	2.782	0.049	
	110.000	Rwi-10-C-1	CB	80.000	31.500	33.618	11.743	2.781	5.816	2.781	2.782	0.049	
Sha-10-B-1	110.000	Sha-10-B-1	Open Air					22.786	56.750				21.931
	110.000	Sha-20/10-CL-1n	CB	80.000	31.500	33.618	11.743	22.786	56.750	22.710	24.859	10.111	
	110.000	Sha-10-C-1	CB	80.000	31.500	33.618	11.743	22.786	56.750	22.710	24.859	10.111	
	110.000	Sha-10-C-2	CB	80.000	31.500	33.618	11.743	22.786	56.750	22.710	24.859	10.111	
	110.000	Sha-20/10-CL-2n	CB	80.000	31.500	33.618	11.743	22.786	56.750	22.710	24.859	10.111	
	110.000	Sha-20/10-CL-3n	CB	80.000	31.500	33.618	11.743	22.786	56.750	22.710	24.859	10.111	

3-Phase Fault Currents

Bus		Device		Device Capacity (kA)				Short-Circuit Current (kA)					
				Making									
ID	kV	ID	Type	Peak	Ib sym	Ib asym	Idc	I"k	ip	Ib sym	Ib asym	Idc	Ik
Sha-20-B-1	220.000	Sha-20-B-1	Open Air					34.636	85.537				34.498
	220.000	Sha-20-C-Grid	CB	80.000	31.500	33.618	11.743	34.636	85.537*	34.636*	35.452*	7.561	
	220.000	Sha-20/10-CH-1n	CB	80.000	31.500	33.618	11.743	34.636	85.537*	34.636*	35.452*	7.561	
	220.000	Sha-20/10-CH-2n	CB	80.000	31.500	33.618	11.743	34.636	85.537*	34.636*	35.452*	7.561	
	220.000	Sha-20/10-CH-3n	CB	80.000	31.500	33.618	11.743	34.636	85.537*	34.636*	35.452*	7.561	

ip is calculated using method C
Ib does not include decay of non-terminal faulted indunction motors
Ik is the maximum steady state fault current
Idc is based on X/R from Method C and Ib as specified above

LV CB duty determined based on service rating.
Total through current is used for device duty.

* Indicates a device with calculated duty exceeding the device capability.

# Indicates a device with calculated duty exceeding the device marginal limit. (95 % times device capability)

Ref. No. RW-01

Date: 15th April 2015

To: Eng. William BIHOYIKI
Ag. Head of Electricity Transmission Unit
Energy Utility Corporation Limited
Rwanda Energy Group

Eng. NGIZWENAYO Dieudonné
Director of Energy Planning and Design
Energy Development Corporation Limited
Rwanda Energy Group

Preparatory Survey on
The Project for Improvement of Substations and Distribution Network Phase 2.

Subject: Resettlement and Land Acquisition Criteria

Dear Eng. BIHOYIKI and Eng. NGIZWENAYO

We would like to ask you to clarify resettlement and land acquisition criteria for preparation of an Abbreviated Resettlement Action Plan on the captioned project.

We understand that there is no formal regulations/guidelines concerning Right of Way or electrical line clearance in Rwanda and EDCL/EUCL have applied different criteria to projects in the past. For the captioned project, the Right of Way for each electrical line is set and indicated in Table 2.2.1-2 Electrical Conditions (p.20) in the Field Report singed by the JICA Study Team, EDCL and EUCL on 2 April 2015. Hence, it was our understanding that these ROW are the criteria for land acquisition and resettlement. We understood that lands will be acquired only where towers are constructed and required areas will vary depending on the type of tower. We also understood that for resettlement, ALL structures such as houses and shops and trees within the ROW should be resettled.

However, through telephonic communications between me and Eng. BIHOKI, we learned that there is an additional condition, that “the structures and trees with a certain distance from the lowest conductor are not subject of resettlement,” which is not indicated in the Field Report, nor mentioned during discussions between the JICA Study Team and EUCL/EDCL.

Please present criteria in writing including the following information.

1. The ROW for each electrical line.

2. Criteria for Land Acquisition

3. Criteria for Resettlement such as a minimum clearance (in meters) from the lowest conductor or any other conditions applicable.

We would like to ask you to present criteria by **22 April 2015** as this information is required in a report submitted by the JICA Study Team to the JICA Head Quarter.

We hope you understand the importance of this clarification and common understanding on this issue among all parties involved. Without clear criteria, we are not able to embark on the preparation of a resettlement action plan; hence it may lead to a delay in implementing the project.

Your prompt reaction is highly appreciated.

Sincerely yours,

Asami KABASAWA
JICA Study Team
Yachiyo Engineering Co.,Ltd

Rwanda Energy Group | Energy Utility Corporation Limited

Kigali, 16 April 2015

Ref: 11.07.023/...../15/MD/LVM/WB/kf

Attn: Ms.Asami KABASAWA
JICA Phase-II Study Team,
Yachiyo Engineering Co.,Ltd,
Tel :+(81)-3-5906-3749,
Fax: :+(81)-3-3221-5705.

Dear Ms.Kabasawa;

Ref : Preparatory Survey on The Project for Improvement of Substations and Distribution Network JICA-Phase 2.

Sub: ROW, Resettlement and Land Acquisition Criteria

Reference is made to the letter No.RW-01 dated on 15th April 2014, requesting for the information related to ROW, Land acquisition and Resettlement criteria for the preparation of Resettlement Action Plan on the captioned project above (Improvement of Substations and Distribution Network JICA-Phase2).

I would like to inform you that, the ROW of 15kV Single circuit indicated in the Table2.2.1-2 Electrical Conditions (pg17) of the Field Report signed by EUCL and EDCL representatives on 2nd April, 2015 is revised as 10m width (5m+5m) instead of 6m wide (3m+3m). All other information as requested are here with attached:

Yours Sincerely,

William BIHOYIKI
Ag. Head of Electricity Transmission Unit

Cc:

- DOP-EUCL
- Director of Planning-EDCL
- MD-EDCL;
- CEO-REG

PREPARATORY SURVEY ON IMPROVEMENT OF SUBSTATIONS AND DISTRIBUTION NETWORK JICA-PHASE 2 IN THE REPUBLIC OF RWANDA

Table A: Criteria for Resettlement

No	Items	ROW, Land Acquisition and Criteria for Resettlement
1	ROW	110kV T/L: 15m width (7.5m +7.5m) 15kV D/L for double circuits: 10m width (5m +5m) 15kV D/L for Single circuit: 10m width (5m +5m)
2	Land Acquisition	Lands are acquired only where towers will be erected. The details of lands required for towers (GIS coordinates, surface area, height, etc...,) will be provided after lines (Line route, Line profile and Tower spotting) design is completed.
3	Resettlement of structures lived or used by people such as houses, shops, etc.	A minimum vertical clearance from the lowest conductor to the top of structures is 5m. This is applied to the transmission line (110kV) and all distribution lines (15kV) of the captioned project. Structures within ROW that do not meet the above minimum clearance, meaning the distance between the lowest conductor and the top of structures is less than 5m, are subject of resettlement.
4	Resettlement of trees	All trees within ROW must be removed.
5	Resettlement of other objects	Other objects within ROW not meeting the minimum clearance will be evaluated based on social impacts and safety.

N.B:

The minimum clearance for this project is established with reference to the international standards such as IEC and other good practice. The clearance is set with an additional distance as a precautionary safety measure.

Bizimana Emmanuel
Ag. Head of ETD
15/04

Kazungu Evariste
Project Manager (JICA-2 Project)
15/04/2015

11．RDBによるスクリーニング結果

RDB | RWANDA DEVELOPMENT BOARD

Kigali.....07/05/2015.....
Ref.: RDB/3/EC/JDK/.107../05/15

Mr Emmanuel KAMANZI
Managing Director
Energy Development Corporation Limited
P.O.Box 537 Kigali-Rwanda
Tel.: + (250) 252 573 666

Dear Sir,

Re: Transmission of Terms of Reference for Environmental Impact Assessment (EIA) study.

Reference made to your letter REF N° 11.07.023/401/DIR-MD/EK/pk submitting the brief for the construction and improvement of substations, electrical transmission lines & distribution of network in Kigali (Gasogi, Kabuga and Ndera);

After review and analysis of the document, the field visit and consideration of the provisions of laws and regulations governing EIA in Rwanda, we would like to inform you that the project falls in the category of those projects that have to undertake an environment impact assessment study prior to their implementation.

It is in this regard that the attached Terms of Reference were prepared to guide the conduct of EIA study for the project. The certificate of approval will be issued after review and approval of the EIA study report.

Sincerely,

RWANDA DEVELOPMENT BOARD (RDB) OSC

for
Clare AKAMANZI
Chief Operating Officer

Cc:
- Mayor of Kigali City
- Director General of REMA
- Managing Director/EUCL
- Mayor of Gasabo District

EIA TERMS OF REFERENCE

CONSTRUCTION AND IMPROVEMENT OF SUBSTATIONS, ELECTRICAL TRANSMISSION LINES & DISTRIBUTION OF NETWORK IN KIGALI

A. Introduction

These Terms of Reference (TOR) outline the aspects of an Environmental Impact Assessment (EIA) which when thoroughly addressed will provide a comprehensive evaluation of the site, in terms of predicted environmental impacts, needed mitigation strategies, potentially viable alternatives to the development proposed and all related legislation.

Special consideration should be given to:

Upland Areas: Issues such as slope stability, impact on drainage patterns, property etc. should be examined. The path of the corridor cleared of vegetation for transmission lines and substations should be the major focus of this exercise.

Rivers/ Riverine Areas: Issues such as erosion and siltation, macro-invertebrate habitat destruction, disrupting of regular flow of the river and the possible impact of upstream activities on the wetland.

Distinct Terrestrial Forest Types: Issues relating to the specific growth form of the vegetation, the carrying capacity, the successional stage of the forest and the projected level of disturbance which the forest can withstand.

Sites located within and adjacent to areas listed as protected or having protected species: The main issue(s) of concern will in part be determined by the local legislation as well as GoR responsibilities under applicable international conventions. The impact of the development on the specific sensitivities of the

protected area should be highlighted. Mitigation of impacts should assess if the post mitigation status would be acceptable in the protected area context. Alternative sites should be rigorously evaluated.

Socio-Economic issues such as land acquisition and impact of these conveyances on daily subsistence and commerce in the community should be closely examined.

B. **Terms of Reference**

The Environmental Impact Assessment should:

1) Provide a complete description of the corridor proposed for development. This should include a description of the main elements of the development, highlighting areas to be reserved for construction, the creation of verges and other green areas.
2) Identify the major environmental issues of concern through the presentation of baseline data which should include social and cultural considerations. Assess public perception of the proposed development.
3) Outline the Legislations and Regulations relevant to the project and highlight how compliant the project is and will be throughout its life span.
4) Predict the likely impacts of the development on the described environment, including direct, indirect and cumulative impacts, and indicate their relative importance to the design of the development's facilities.
5) Identify mitigation actions to be taken to minimize adverse impacts and quantify associated costs.
6) Design a Monitoring Plan which should ensure that the mitigation plan is adhered to.
7) Describe the alternatives to the project that could be considered at that

site

C. Tasks

To ensure that a thorough Environmental Impact Assessment is carried out, it is expected that the following tasks be undertaken:

1. Description of the Project

Provide a comprehensive description of the project, noting areas to be reserved for construction, verges and proposed green areas. This will also include an account of activities and features which will introduce risks or generate impact (negative and positive) on the environment. This should involve the use of maps; site plans, aerial photographs and other graphic aids and images, as appropriate, and include information on location, general layout and size, as well as pre-construction, construction, and post construction plans. If the project is to be done on a phased basis it is expected that all phases be clearly defined, the relevant time schedules provided and phased maps, diagrams and appropriate visual aids be included.

The need and objectives of the project should clearly elaborated in the report.

2. Description of the Environment

This task involves the generation of baseline data which is used to describe the study area as follows:

i) Physical environment

ii) biological environment

iii) socio-economic and cultural constraints.

It is expected that methodologies employed to obtain baseline and other data be clearly detailed.

Baseline data should include:

(A) Physical

i) a detailed description of the existing **geology** and **hydrology.** Special emphasis should be placed on storm water run-off and drainage patterns. Any slope stability issues that could arise should be thoroughly explored.

ii) **Water quality** of any existing rivers, ponds, or streams in the vicinity of the corridor or substation. Quality Indicators should include but not necessarily be limited to suspended solids, turbidity, oil and grease.

iii) Climatic conditions and air quality in the area of influence including particulate matter, NO_X, SO_X, wind speed and direction, precipitation, relative humidity and ambient temperatures,

iv) Noise levels of the undeveloped site and the ambient noise in the area of influence.

v) Topographic/relief aspect of the project corridor should be presented, together with the type of rock/soil (geology)

v) Obvious sources of pollution existing and extent of contamination.

(B) Biological

Present a detailed description of the flora and fauna (aquatic and terrestrial) in the proposed corridor of influence, with special emphasis on rare, endemic, protected or endangered species. Migratory species should also be considered. There may be the need to incorporate micro-organisms to obtain an accurate baseline assessment. Generally, species dependence, niche specificity, community structure and diversity ought to be considered.

(C) Socio-economic & cultural

Present and projected population; present and proposed land use; planned development activities, issues relating to squatting and relocation, community structure, employment, distribution of income, goods and services; recreation; public health and safety; cultural peculiarities, aspirations and attitudes should be explored. The historical importance of the area should also be examined. While this analysis is being conducted, it is expected that an assessment of public perception of the proposed development be conducted. This assessment may vary with community structure and may take multiple forms such as public meetings or questionnaires.

3 - Legislative and Regulatory Considerations

Outline the pertinent regulations and standards governing environmental quality, safety and health, protection of sensitive areas, protection of endangered species, siting and land use control at the national and local levels.

The examination of the legislation will include those pertinent to electrical transmission line construction and operation projects and the appropriate international convention where applicable.

Emphasis should be put on showing how compliant the project is or will be with relation to the listed laws and regulations.

Demonstrate how the project goes in line with City Master Plan.

For the purpose of compliance monitoring, an institutional and administrative framework should be set in accordance and relevance of roles with regard to this specific project.

4 - Identification of Potential Impacts

Identify the major environmental and public health issues of concern and indicate their relative importance to the design and operation of the development. Identify potential impacts as they relate to, (but are not restricted by) the following:

- public health and safety
- change in drainage pattern
- flooding potential
- aesthetics
- landscape impacts of excavation and construction
- loss of natural features, habitats and species by construction and operation
- pollution of potable, surface and ground water
- air pollution
- socio-economic and cultural impacts.
- risk assessment
- noise

Distinguish between significant positive and negative impacts, direct and indirect, long term and immediate impacts. Identify trigger, avoidable reversible and irreversible impacts. Characterize the extent and quality of the available data, explaining significant information deficiencies and any uncertainties associated with the predictions of impacts. A major environmental issue is determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It is also determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts should be represented in matrix form with separate matrices for pre and post mitigation scenarios. An exhaustive list of impacts including a numerical weighting based on a stated methodology should

be included.

5 Mitigation

Prepare guidelines for avoiding, as far as possible, any adverse impacts due to proposed usage of the corridor and utilizing of existing environmental attributes for optimum development. Quantify and assign financial and economic values to mitigating methods. Mitigation measures should be tangible and concrete actions.

6 Monitoring

Design a plan to monitor implementation of mitigatory or compensatory measures and project impacts during and post construction and decommissioning of the power plant. An Environmental Management Plan for the long term operations of the development should also be prepared.

An outline monitoring programme should be included in the EIA, and a detailed version submitted to RDB for approval after the granting of the permit and prior to the commencement of the development. At the minimum the monitoring programme and report should include:

- Introduction outlining the need for a monitoring programme and the relevant specific provisions of the permit license(s) granted.
- The activity being monitored and the parameters chosen to effectively carry out the exercise.
- The methodology to be employed and the frequency of monitoring.
- The sites being monitored. These may in instances, be pre-determined by the local authority and should incorporate a control site where no impact from the development is expected.
- Frequency of reporting to REMA

The Monitoring report should also include, at minimum:

- Raw data collected. Tables and graphs are to be used where appropriate
- Discussion of results with respect to the development in progress, highlighting any parameter(s) which exceeds the expected standard(s).
- Recommendations
- Appendices of data and photographs if necessary.

7 - Project Alternatives

Examine alternatives to the project including the no-action alternative. This examination of project alternatives should incorporate the use history of the overall area in which the corridor is located and previous uses of the site itself. Refer to REMA guidelines for EIA preparation.

All Findings must be presented in the **EIA report** and must reflect the headings in the body of the TORs, as well as references. One hard copy and an electronic copy with Word and PDF files of the report should be submitted. The report should include an appendix with items such as maps, site plans, the study team, photographs, and other relevant information.