ATTACHMENTS

Contacted Personnel: Sri Lanka Side

Name	Position
Mr. M. M. C Ferdinando	Secretary Ministry of Power and Energy
Mr. J. M. K. Jayasekara	Additional Secretary (Power & Energy), Senior Asst. Secretary (Tenders) Ministry of Power and Energy
Mr. Upali Daranagama	Additional Secretary (Planning and Development) Ministry of Power and Energy
Mr. M.P.D.U.K. Mapa Pathirana	Director General, Department of External Resources Ministry of Finance & Planning
Ms. Yamuna Samarasinghe	Additional General Manager (Transmission) Ceylon Electricity Board (CEB)
Ms. A.D. Tilleceratne	Deputy General Manager (Transmission & Generation Planning) CEB
Mr. T.D. Handagama	Deputy General Manager (System Control) System Control Branch, CEB
Mr. Samitha Midigaspe	Chief Engineer Generation Planning, CEB
Ms. Kamani Jayasekera	Chief Engineer Transmission Planning, CEB
Ms. Thuresha Kothalawala	Electrical Engineer Transmission Planning, CEB
Ms. Nadeesha Wickramasinghe	Electrical Engineer Transmission Planning, CEB
Ms. Gothami Senanayake	Electrical Engineer Transmission Planning, CEB
Mr. G. B. Alahendra	Electrical Engineer Transmission Planning, CEB
Mr. Shireley T. Jayakody	Project Manager Tricomalee Coal Power Project, CEB
Mr. K.S.S Kumara	Project Manager 2 Tricomalee Coal Power Project, CEB
Mr. Nishantha Patabendige	Project Engineer Tricomalee Coal Power Project, CEB
Mr. Anuruddha Tilakaratne	Project Manager Vavuniya Kilinochchi Transmission Project, CEB
Mr. Channa Basnayake	Civil Enbineer Transmission Desing Branch, CEB
Mr. Rohitha Gunawardhana	Head, Environment Unit Transmission Design & Environment Branch, CEB
Mr. Kelum Athukorala	Civil Engineer, Environment Unit Transmission Design & Environment Branch, CEB
Mr. P.J.N. Priris	Deputy General Manager (Training) CEB Training Center
Mr. S. H. N. Somawardana	Deputy General Manager Region 1 Colombo City, CEB
Ms. H.P.R. Wanniarachchi	Chief Engineer (Planning) Region 1 Colombo City, CEB
Mr. N. P. S Karunaratne	Deputy General Manager Region 1 North Western Province, CEB
Mr. M. R. Jayawarudana	Deputy General Manager Region 1 Planning, CEB

Name	Position
Mr. L. A. S Fernando	Additional General Manager Distribution Region-1, CEB
Mr. K. K. P. Perera	Chief Engineer (Development) Region 1, CEB
Mr. M. P. M Wijewarudhama	Deputy General Manager Planning & Development- Region 2, CEB
Mr. R. J. Gunawardana	Additional General Manager Distribution Region-2, CEB
Mr. K. Ratneswaran	Electrical Engineer (Planning) Region 2, CEB
Mr. Pradeep Manage	Chief Engineer Region 2, CEB
Ms. Mahesha Dissanayake	Electricl Engineer Region 2, CEB
Mr. F. K. Mohideen	Additional General Manager Distribution Region-3, CEB
Mr. H. M. Wijekoon	Chief Engineer Region 3, CEB
Mr. Jayatissa	Deputy General Manager Planning Department Region 4, CEB
Mr. M. G. Thilakuratne	Additional General Manager Distribution Region-4, CEB
Ms. Chulaui Gamlath	Electrical Engineer Region 4, CEB
Mr. M.A.A.N Hemakumara	Director Geoinfomatics Central Environmental Authority
Mrs. Chandanie H.Edussuriya	Assistant Director Research & Special Project – GIS/RS Central Environmental Authority
Mr. H.M.K.G.G. Bandare	Director Planning Road Development Authority

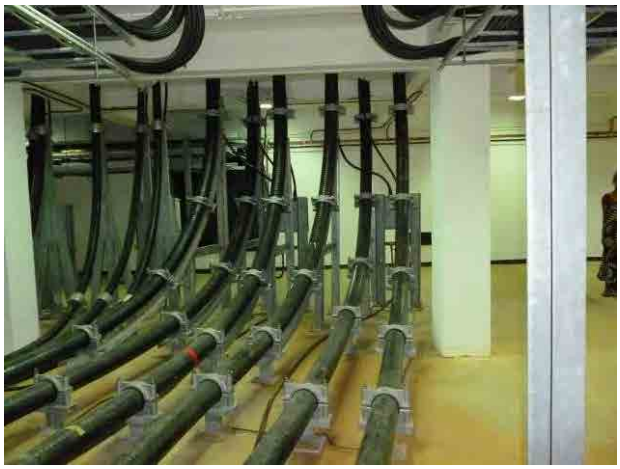
Concerned Personnel: Japan Side and Others

Name	Position
Mr. Harumi AO	Chief Representative JICA Sri Lanka Office
Mr. Takuya OTUSKA	Senior Representative JICA Sri Lanka Office
Mr. Tatsunori HIGUCHI	Representative JICA Sri Lanka Office
Mr. Tsuyoshi HARA	Representative JICA Sri Lanka Office
Mr. Masatoshi KAIMASU	Representative JICA Sri Lanka Office
Dr. Priyantha Serasinghe	Senior Project Specialist JICA Sri Lanka Office

Transmission Line Survey (1/2)

220 kV Kerawalapitiya GS

220 kV GIS Extension Space at Kerawalapitiya GS



220 kV Cable Pit Room at Kerawalapitiya GS

Port Access Road in Planned Route of New 220 kV Kelenitissa - Port Transmission Cable Line

220/132 kV Port GS and 132/11 kV Colombo L GS Candidate Site

Existing 132 kV OF Cable Condition for Colombo E GS

Transmission Line Survey (2/2)

Extension Planned Area of 220 kV Switchyard at Veyangoda GS

Extension Planned Area of 220 kV Switchyard at Veyangoda GS

Control & Protection Room in Veyangoda GS

220/132/33 kV Kirindiwela GS Candidate Site

Crossing River in Planned Route of New 220 kV Veyangoda - Padukka Transmission Line

220/132/33 kV Padukka GS Candidate Site

Grid Substation Survey

220 kV Gas Insulated Switchgear at Kerawalapitiya GS

Extension Planned Area of 220/33 kV 2 x 35 MVA Transformer at Kerawalapitiya GS

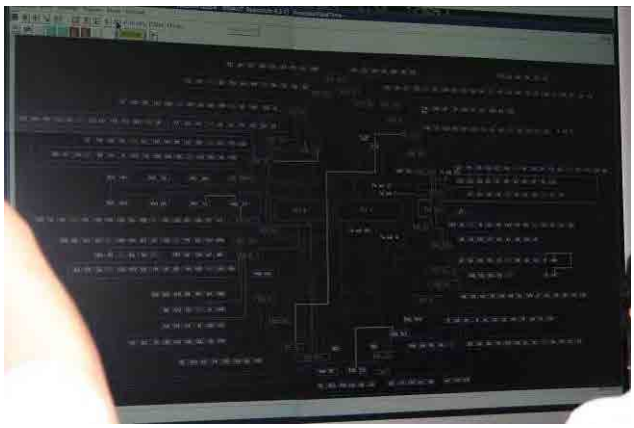
Control & Protection Room in Kerawalapitiya GS

220 kV Gas Insulated Switchgear at Kelanitissa GS

220/132 kV 150 MVA Auto-transformer at Kelanitissa GS

11 kV Switchgear in Colombo E GS

Distribution Line Survey (1/3)



Control Center at Region 1 of Colombo City

11/0.4 kV Ring Main Unit with Transformer
at Region 1 of Colombo City

11 kV O/H Distribution Line (Region 3 of WPS-2)

33 kV Gantry (Region 2 of WPN)

33/0.4 kV Distribution Substation
(Region 2 of Central Province)

33 kV Switchgear at PSs (Region 2 of WPN)

Distribution Line Survey (2/3)

11 kV Switchgear at PSs (Region 2 of WPN)

33/11 kV Transformer at PSs (Region 2 of WPN)

33 kV Backbone Distribution Line (Region 2 of WPN)

33 kV Pole Distribution Line(2 circuits)
(Region 2 of WPN)

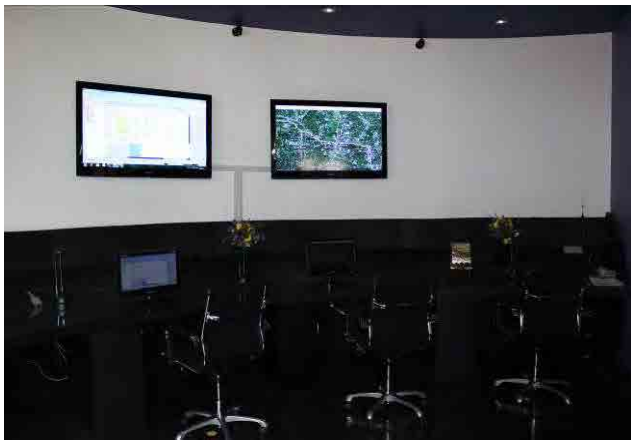
Digital Watt-hour Meters at PSs
without Remote Reading Facility (Region 2 of WPN)

Typical Energy Meter with Remote Reading Facility

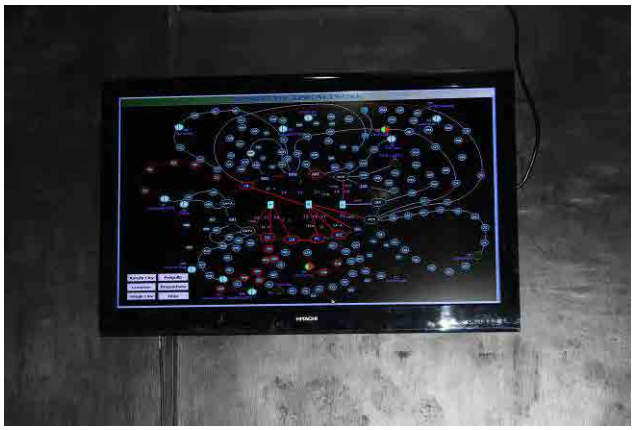
Distribution Line Survey (3/3)

Energy Meter Setting and PC with
Remote Reading Facility

Electro-mechanical Energy Meter for Small Consumer



Distribution Control Center at Central Province



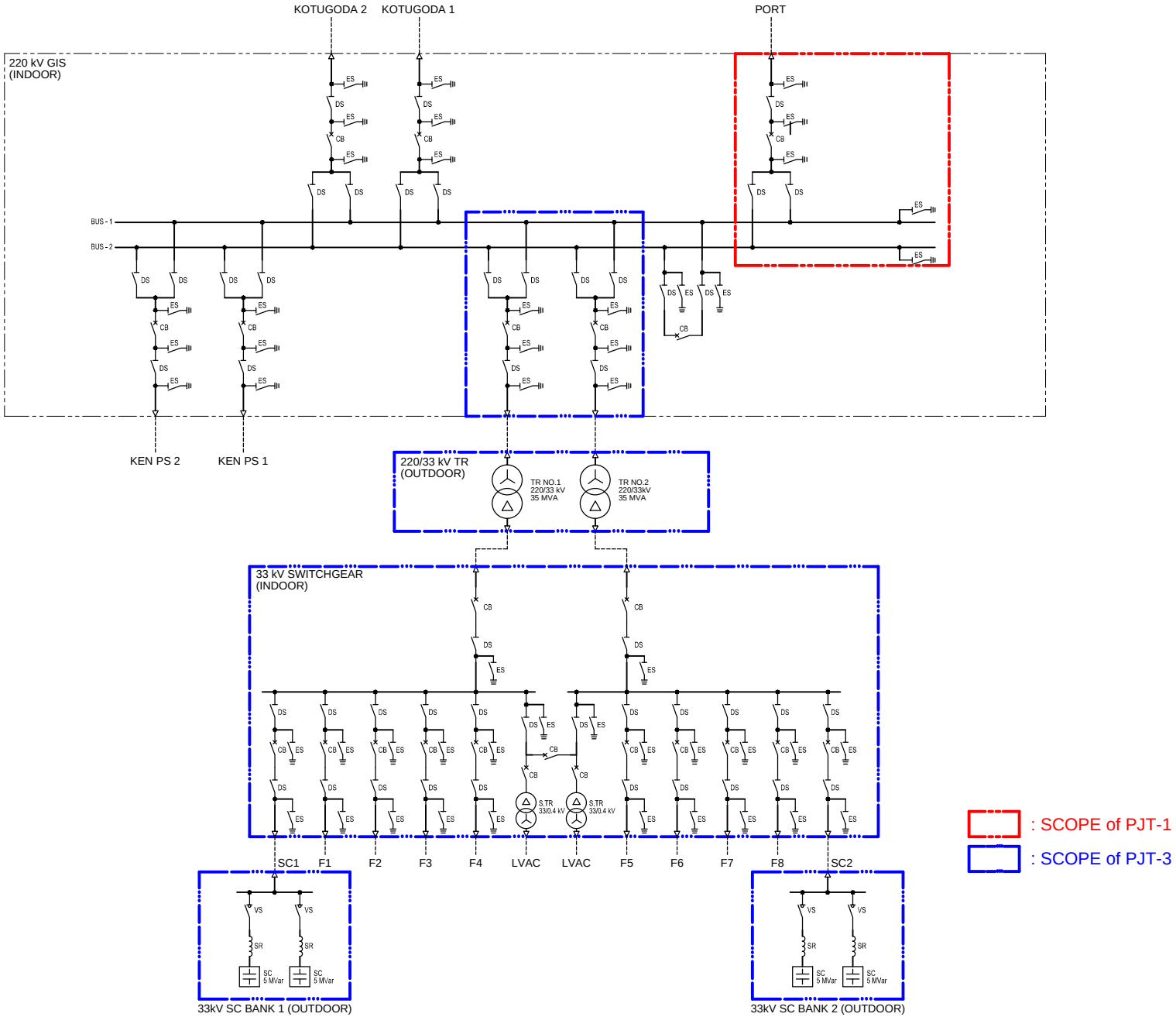
Distribution Control Center at Kandy (Display)

Distribution Control System at Region 3
(under development)

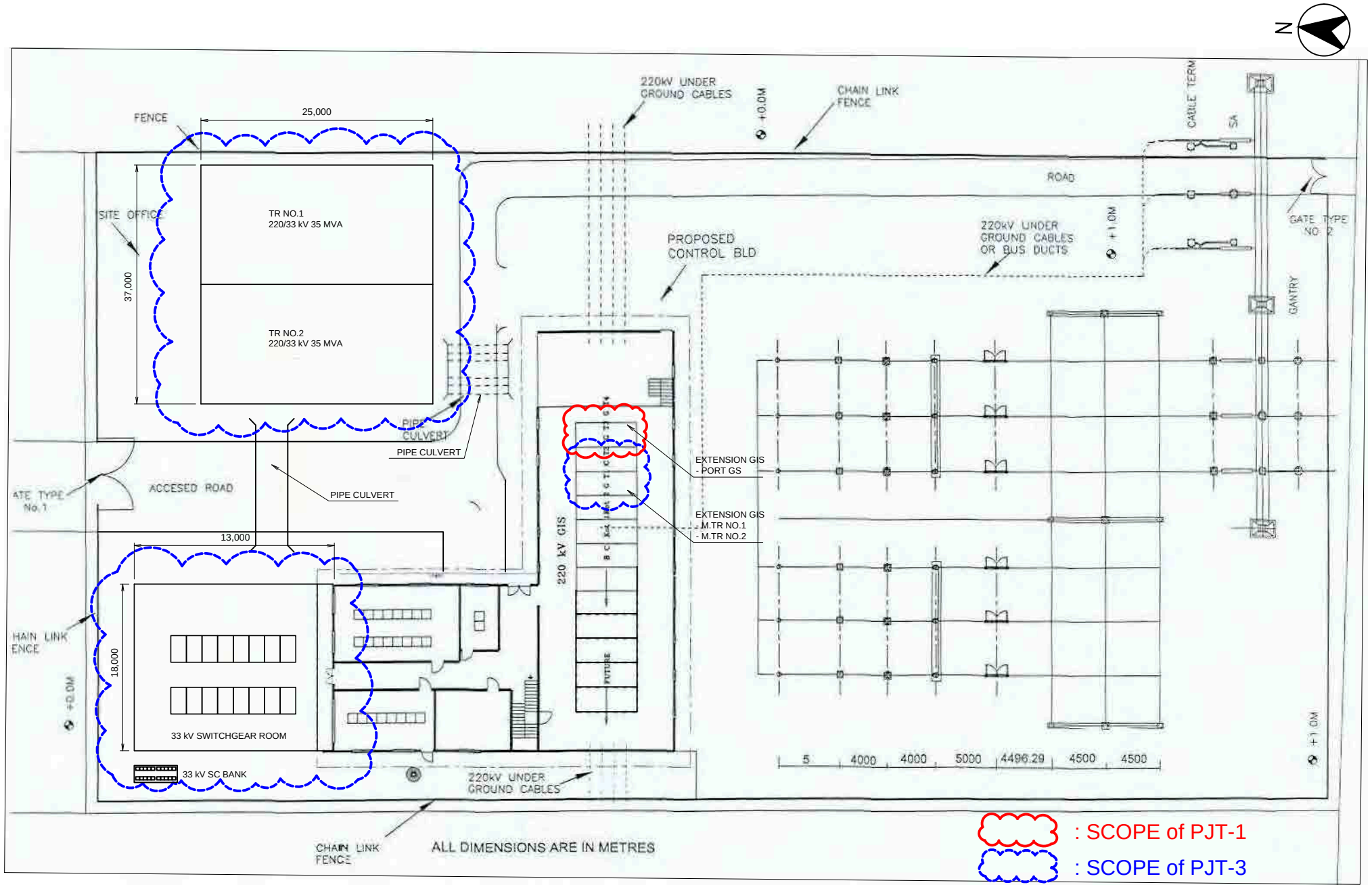
Communication Interface of GSM at Equipment

Attachment-3 Drawings: Single Line Diagrams

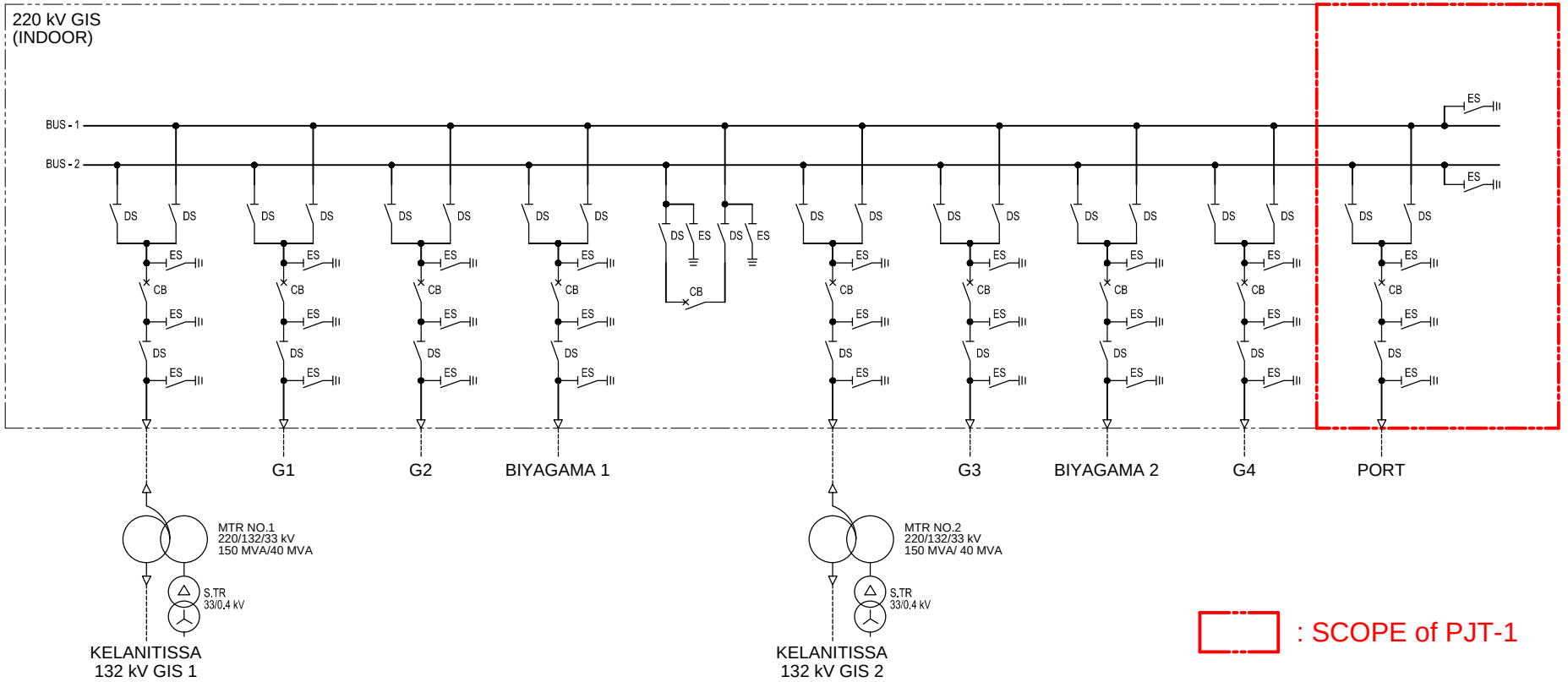
1. Kerawalapitiya GS
2. Kelanitissa GS
3. Port GS
4. Colombo L GS
5. Colombo M GS
6. Colombo E GS
7. Colombo F GS
8. Colombo N GS
9. Colombo A GS
10. Colombo I GS
11. Kolonnawa GS
12. Kappalthurai GS
13. Veyangoda GS
14. Kirindiwela GS (220/132 kV)
15. Kirindiwela GS (132/33 kV)
16. Padukka GS
17. Kosgama GS
18. Kalutara GS
19. Battaramulla GS
20. Typical Distribution Network Development
21. Maharagama PS



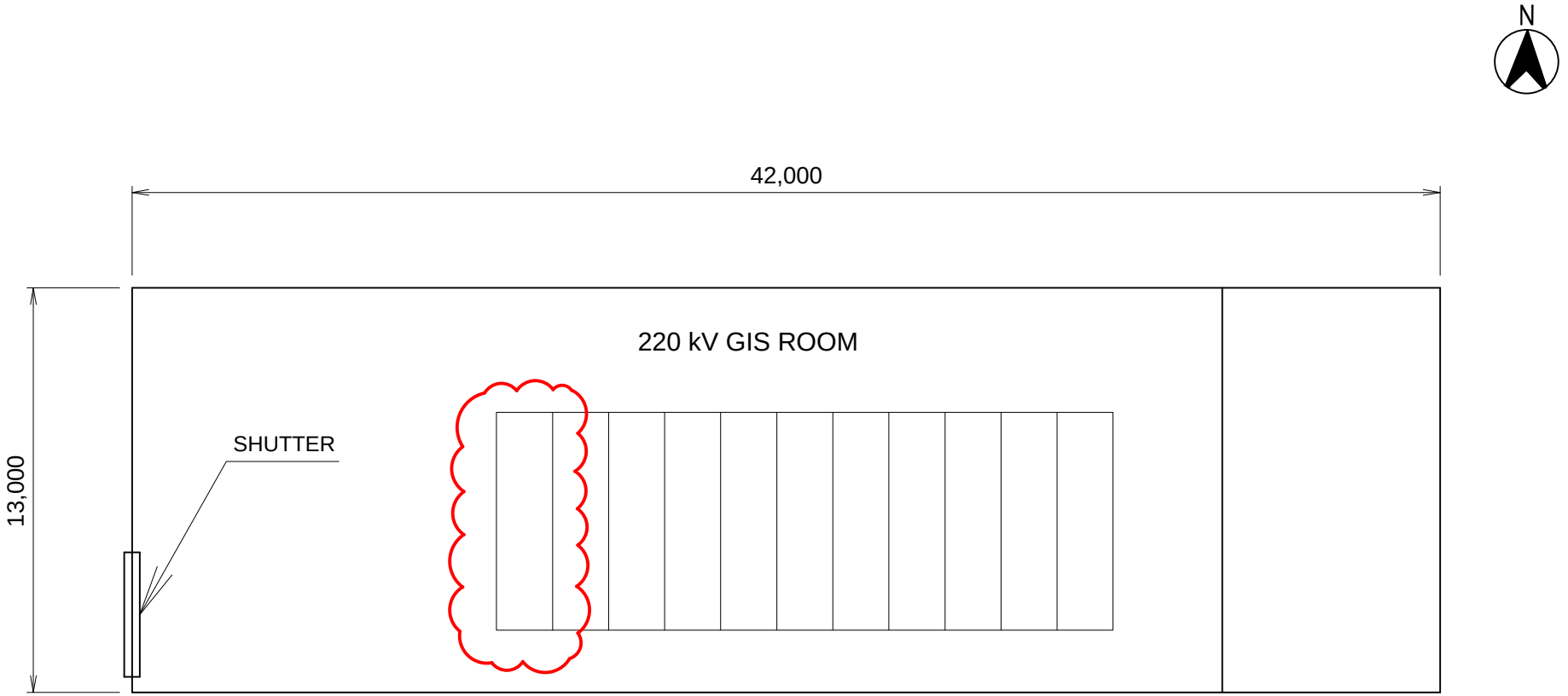
KERAWALAPITIYA GS



KERAWALAPITIYA GS



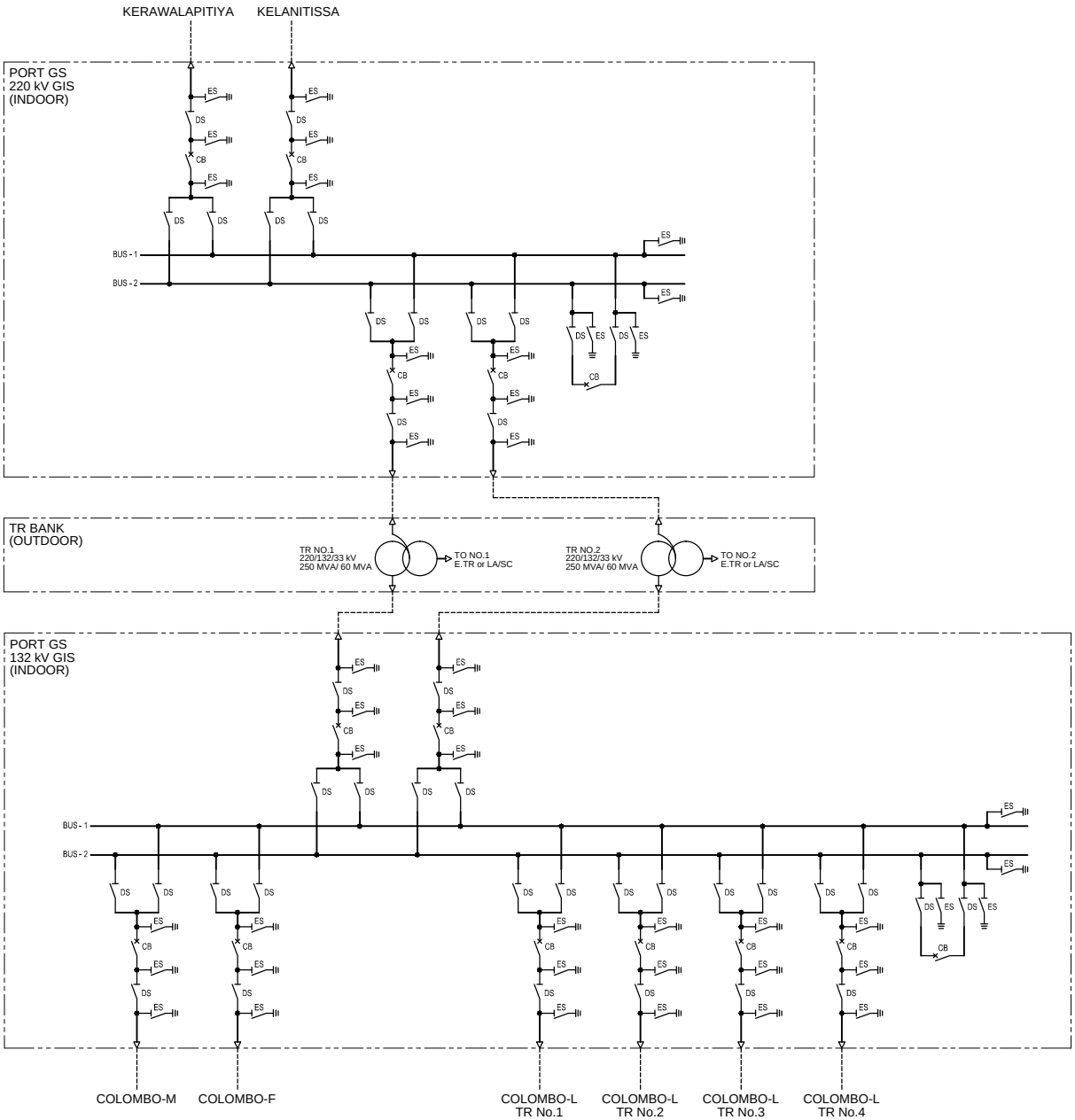
KELANITISSA (220 kV) GS



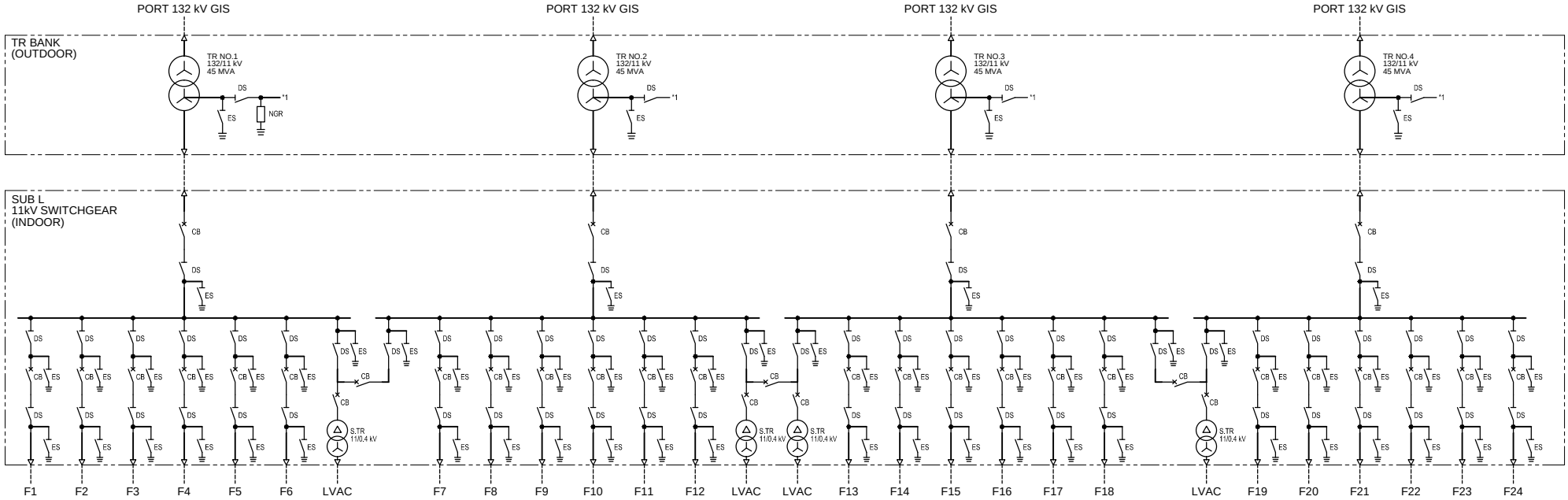
220 kV GIS ROOM: GROUND FLOOR

: SCOPE of PJT-1

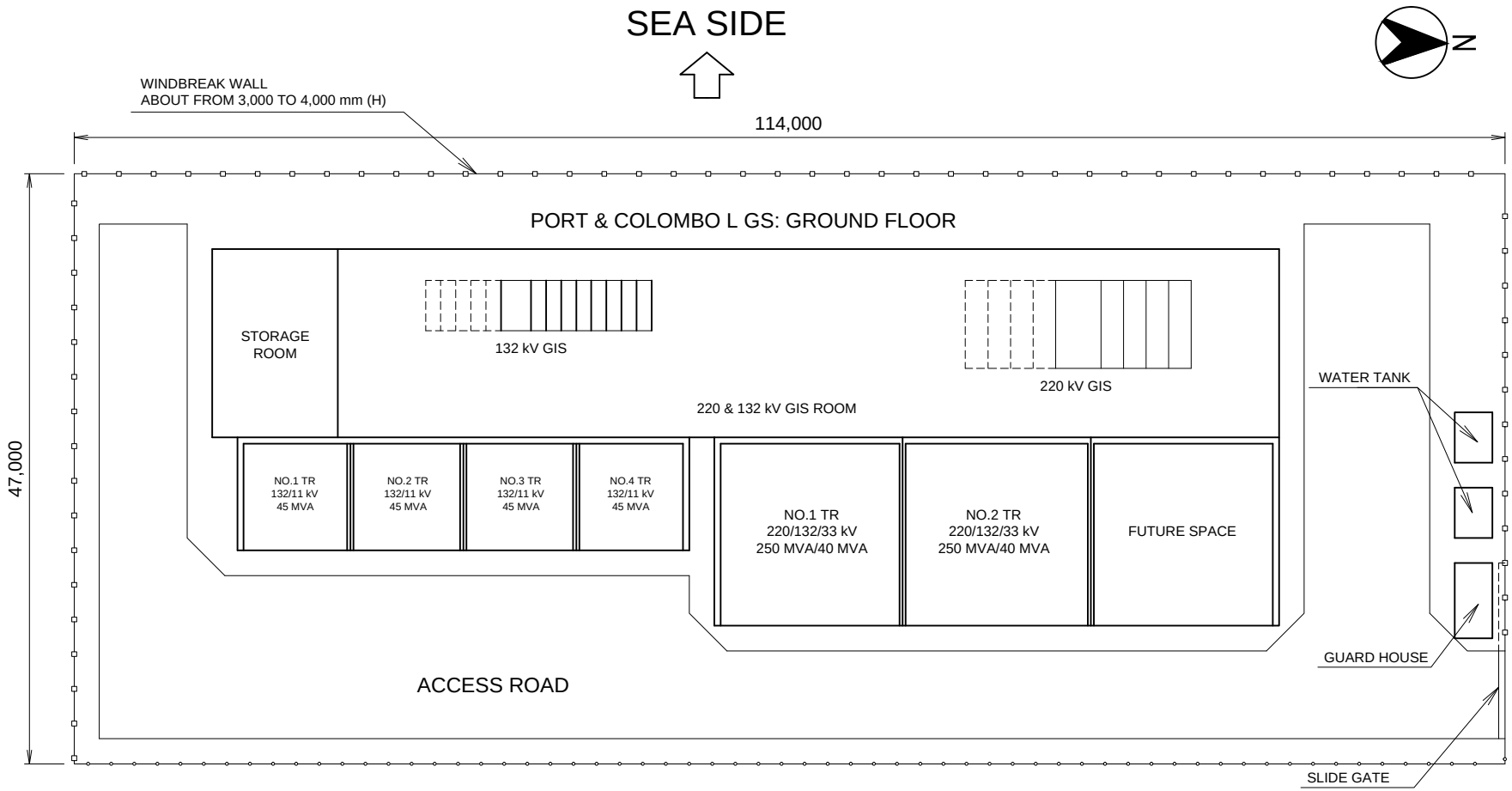
KELANITISSA GS

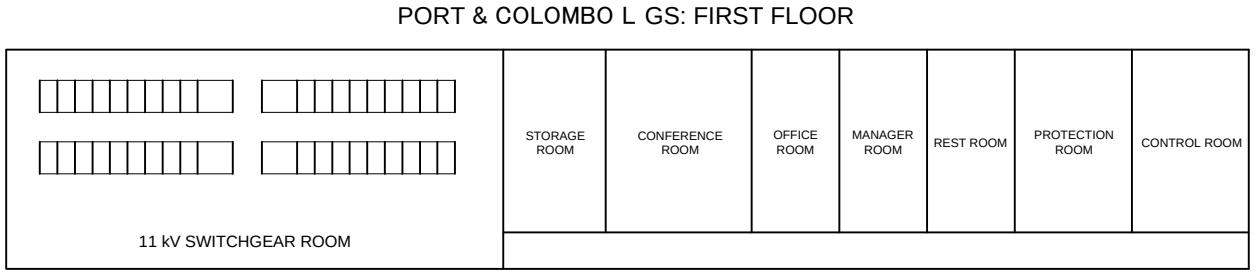

KERAWALAPITIYA
KELANITISSA
PORT GS
220 kV GIS
(INDOOR)
BUS - 1
BUS - 2
TR BANK
(OUTDOOR)
TR NO.1
220/132/33 kV
250 MVA/ 60 MVA
TO NO.1
E.TR or LA/SC
TR NO.2
220/132/33 kV
250 MVA/ 60 MVA
TO NO.2
E.TR or LA/SC
PORT GS
132 kV GIS
(INDOOR)
BUS - 1
BUS - 2
COLOMBO-M
COLOMBO-F
COLOMBO-L
TR No.1
COLOMBO-L
TR No.2
COLOMBO-L
TR No.3
COLOMBO-L
TR No.4

PORT GS

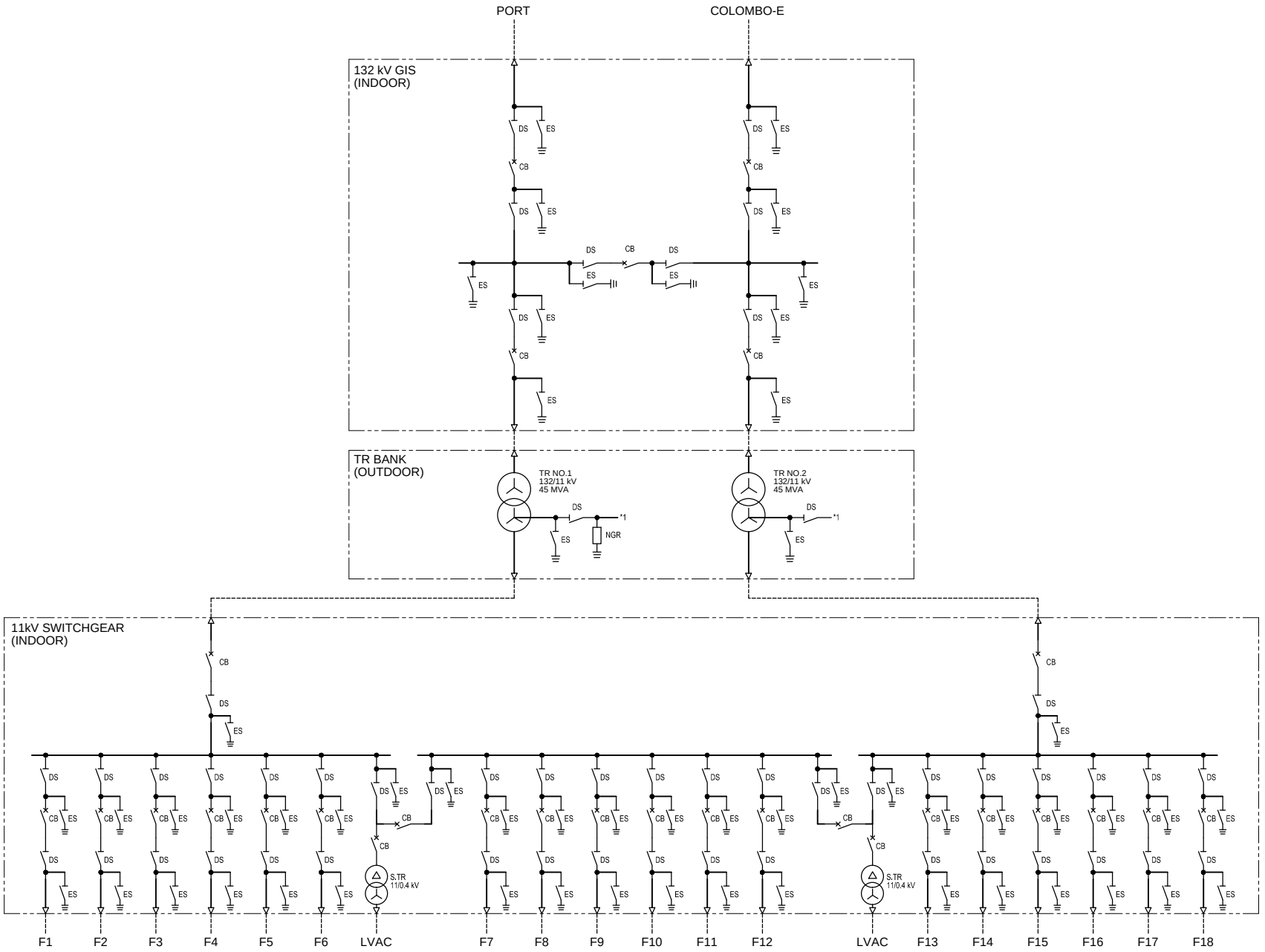

PORT 132 kV GIS
PORT 132 kV GIS
PORT 132 kV GIS
PORT 132 kV GIS
TR BANK
(OUTDOOR)
TR NO.1
132/11 kV
45 MVA
TR NO.2
132/11 kV
45 MVA
TR NO.3
132/11 kV
45 MVA
TR NO.4
132/11 kV
45 MVA
DS
ES
NGR
*1
SUB L
11kV SWITCHGEAR
(INDOOR)
CB
S.TR
11/0.4 kV
F1
F2
F3
F4
F5
F6
LVAC
F7
F8
F9
F10
F11
F12
LVAC
LVAC
F13
F14
F15
F16
F17
F18
LVAC
F19
F20
F21
F22
F23
F24

COLOMBO L GS

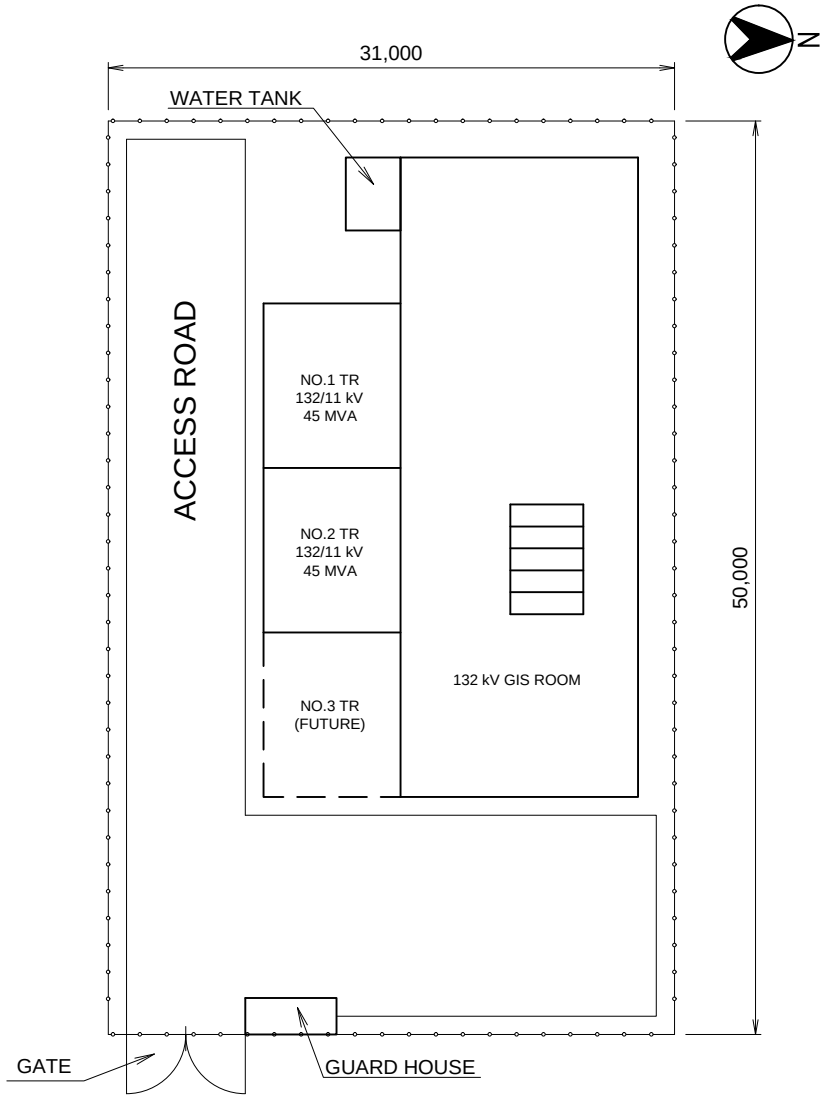




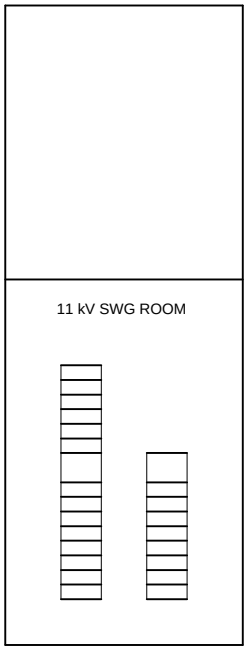
PORT GS AND COLOMBO L GS


PORT
COLOMBO-E
132 kV GIS
(INDOOR)
DS
ES
CB
TR BANK
(OUTDOOR)
TR NO.1
132/11 kV
45 MVA
TR NO.2
132/11 kV
45 MVA
*1
NGR
11kV SWITCHGEAR
(INDOOR)
S.TR
11/0.4 kV
F1
F2
F3
F4
F5
F6
LVAC
F7
F8
F9
F10
F11
F12
LVAC
F13
F14
F15
F16
F17
F18

COLOMBO M GS

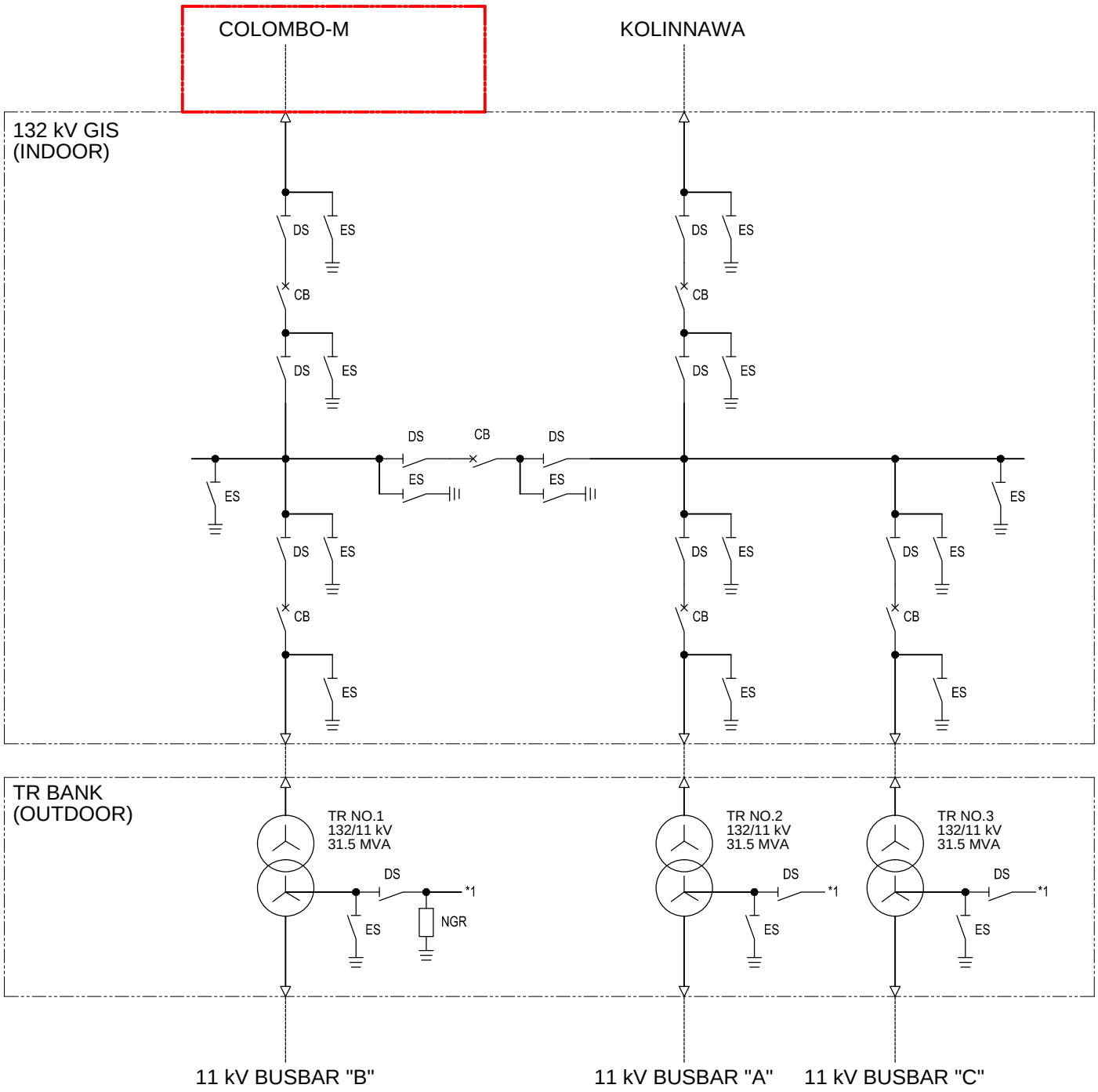


GROUND FLOOR



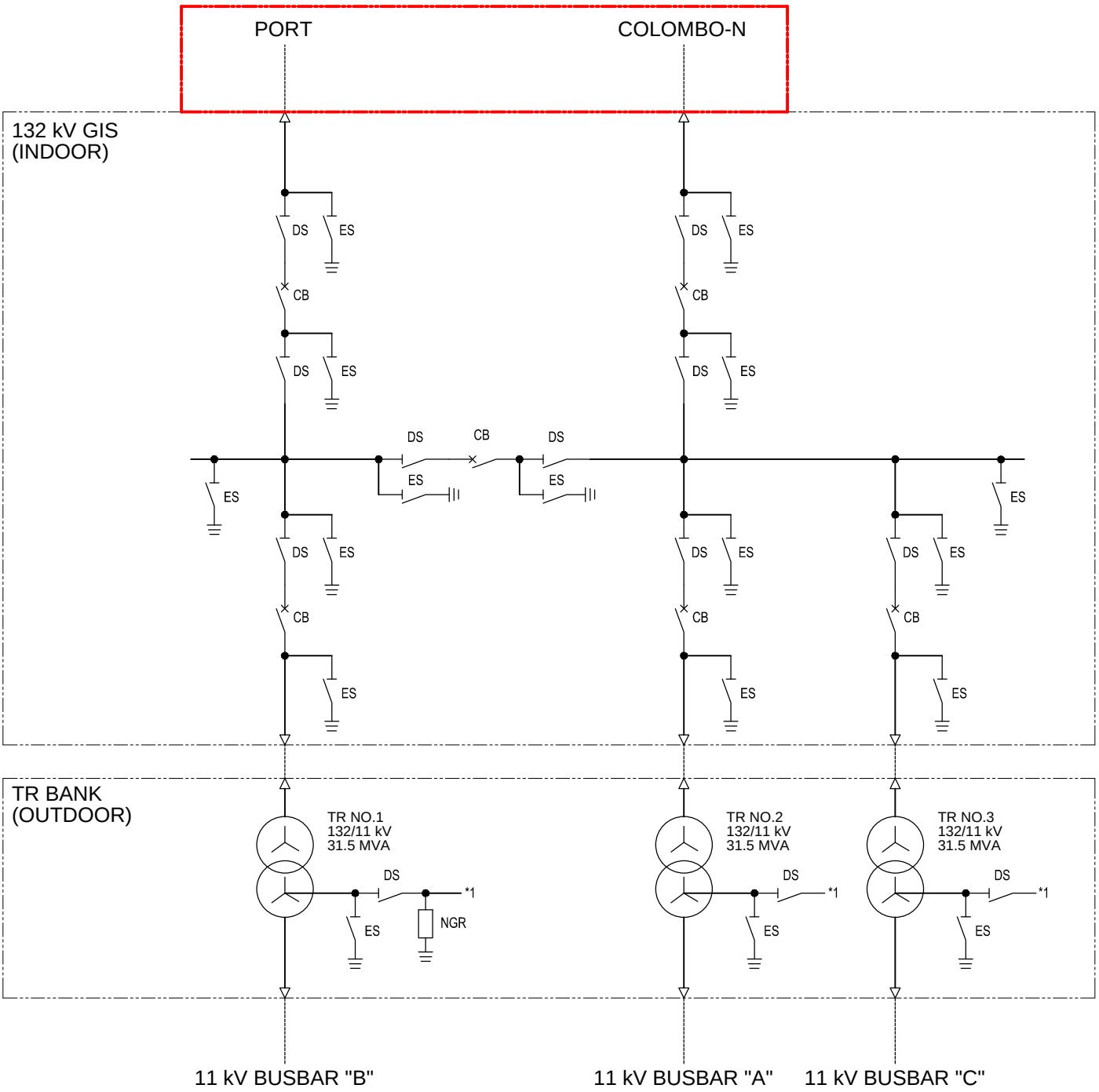
FIRST FLOOR

COLOMBO M GS



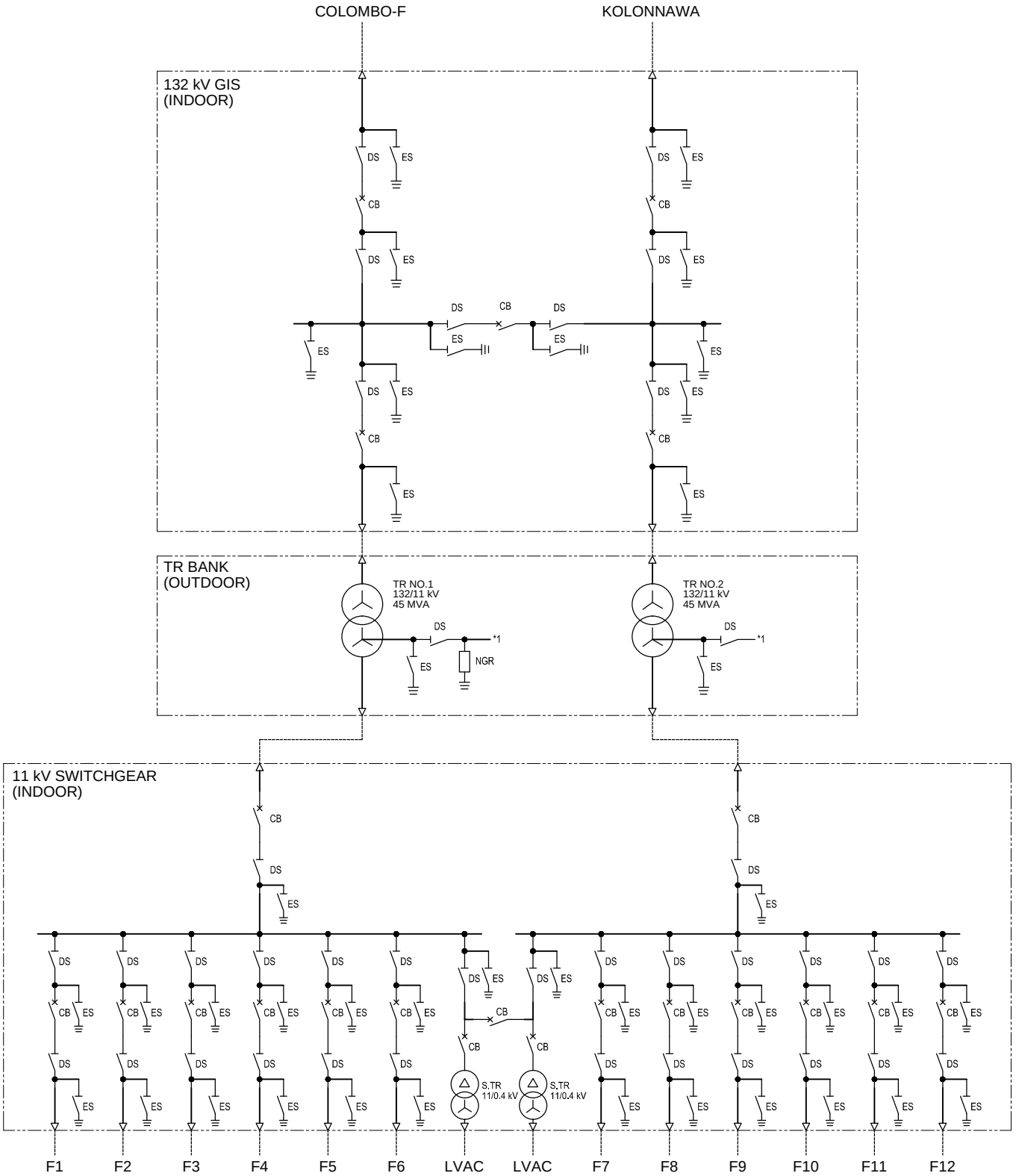
: SCOPE of PJT-1

COLOMBO E GS

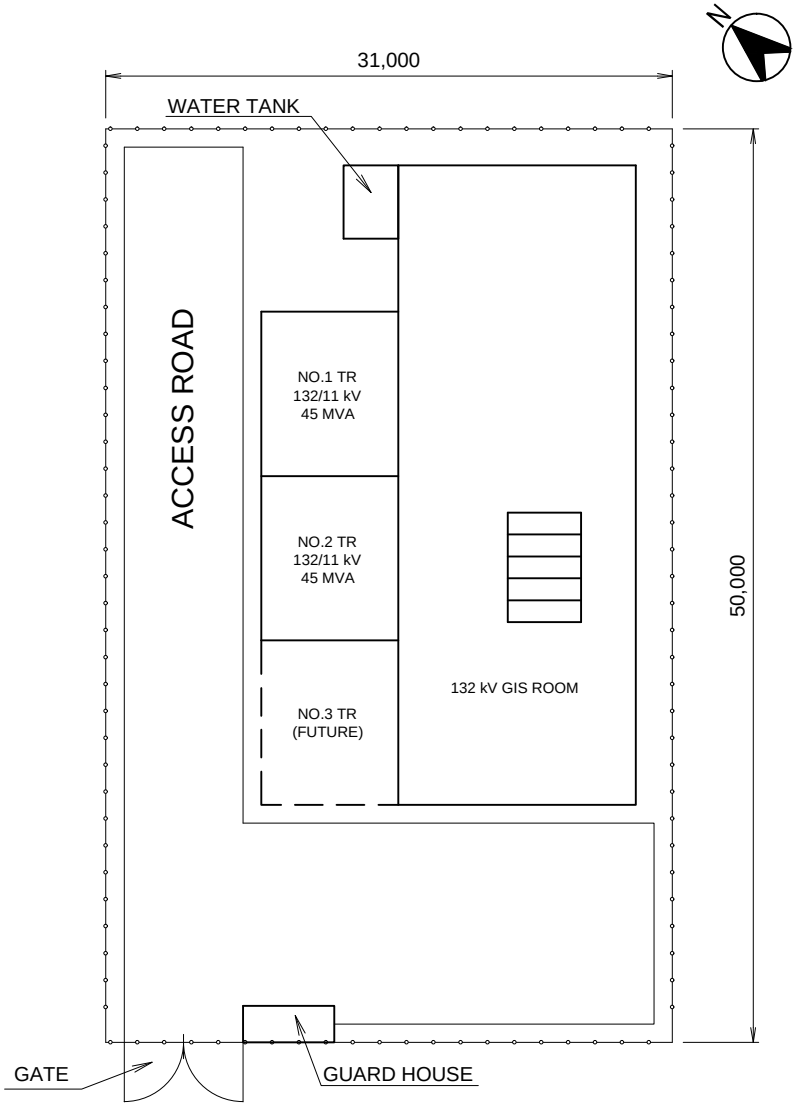


: SCOPE of PJT-1

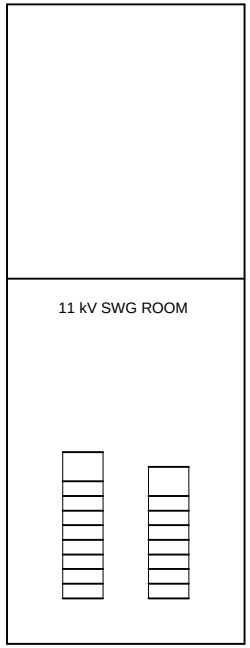
COLOMBO F GS


COLOMBO-F
KOLONNAWA
132 kV GIS
(INDOOR)
DS
ES
CB
TR BANK
(OUTDOOR)
TR NO.1
132/11 kV
45 MVA
TR NO.2
132/11 kV
45 MVA
*1
NGR
11 kV SWITCHGEAR
(INDOOR)
S.TR
11/0.4 kV
F1
F2
F3
F4
F5
F6
LVAC
LVAC
F7
F8
F9
F10
F11
F12

COLOMBO N GS

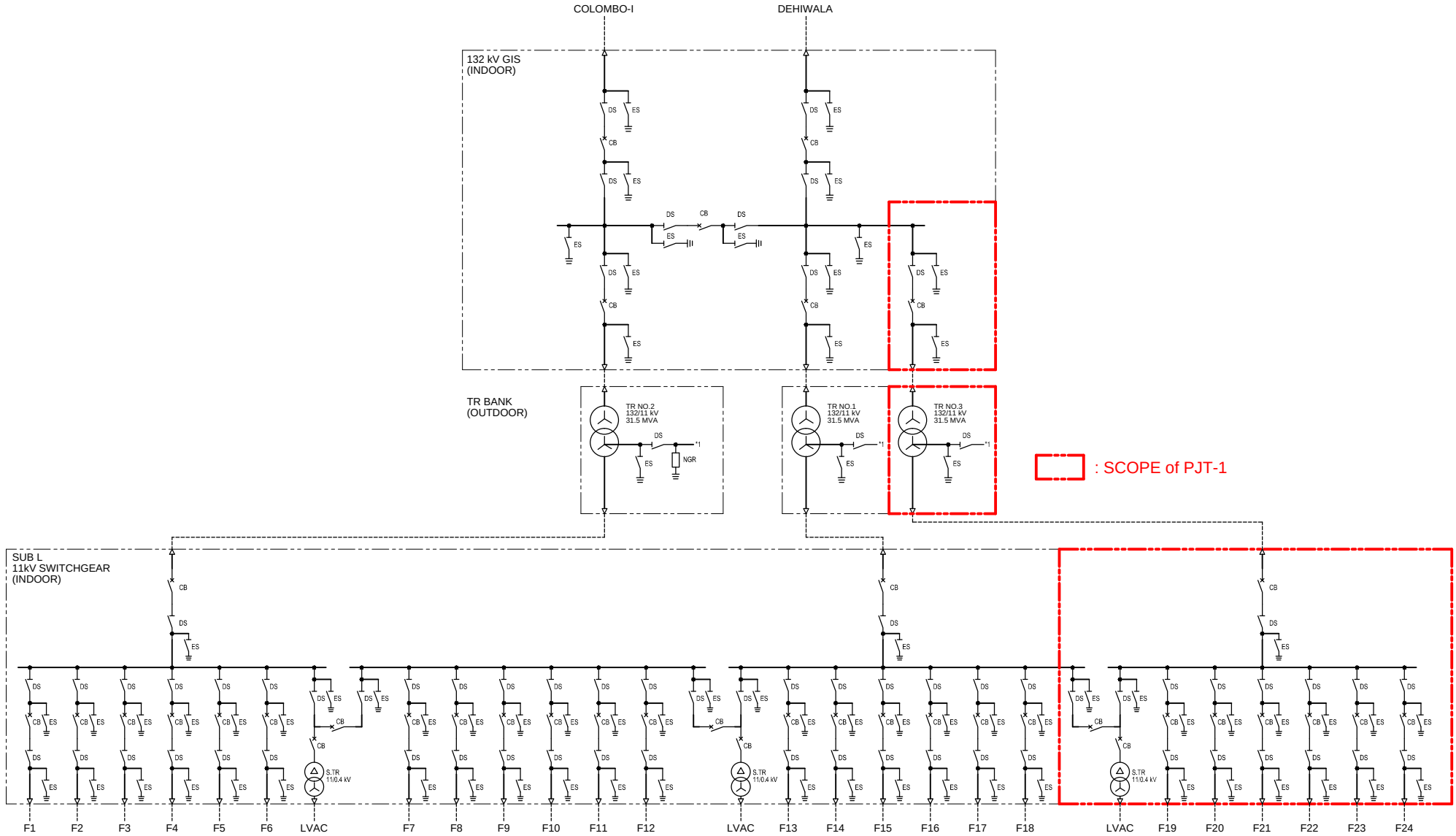


GROUND FLOOR

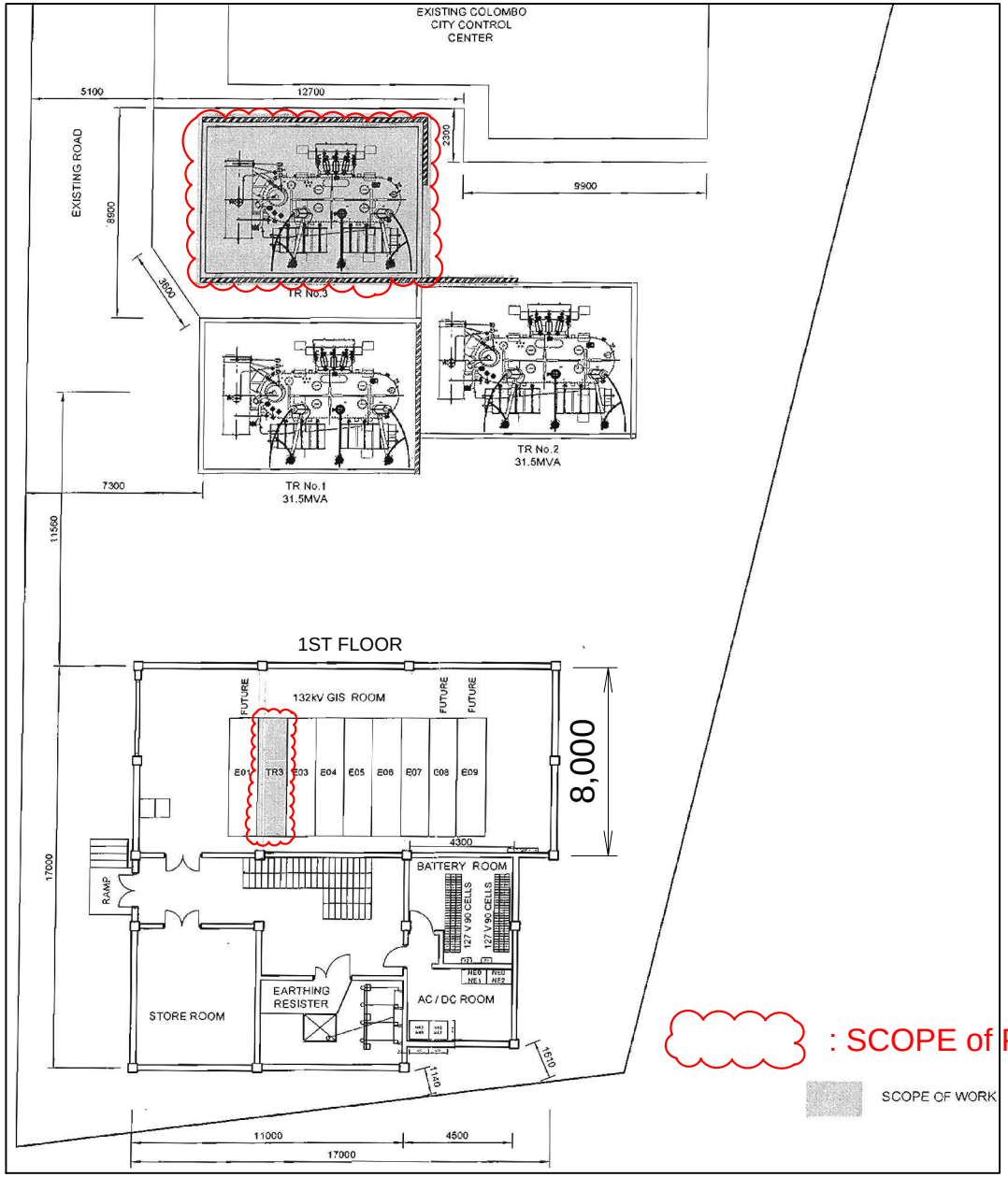


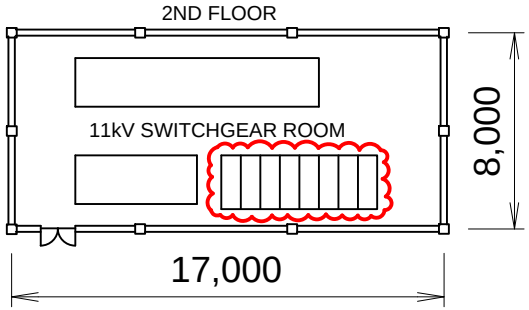
FIRST FLOOR

COLOMBO N GS


COLOMBO-I
DEHIWALA
132 kV GIS
(INDOOR)
TR BANK
(OUTDOOR)
TR NO.2
132/11 kV
31.5 MVA
TR NO.1
132/11 kV
31.5 MVA
TR NO.3
132/11 kV
31.5 MVA
NGR
: SCOPE of PJT-1
SUB L
11kV SWITCHGEAR
(INDOOR)
S.TR
11/0.4 kV
F1
F2
F3
F4
F5
F6
LVAC
F7
F8
F9
F10
F11
F12
LVAC
F13
F14
F15
F16
F17
F18
LVAC
F19
F20
F21
F22
F23
F24

COLOMBO A GS

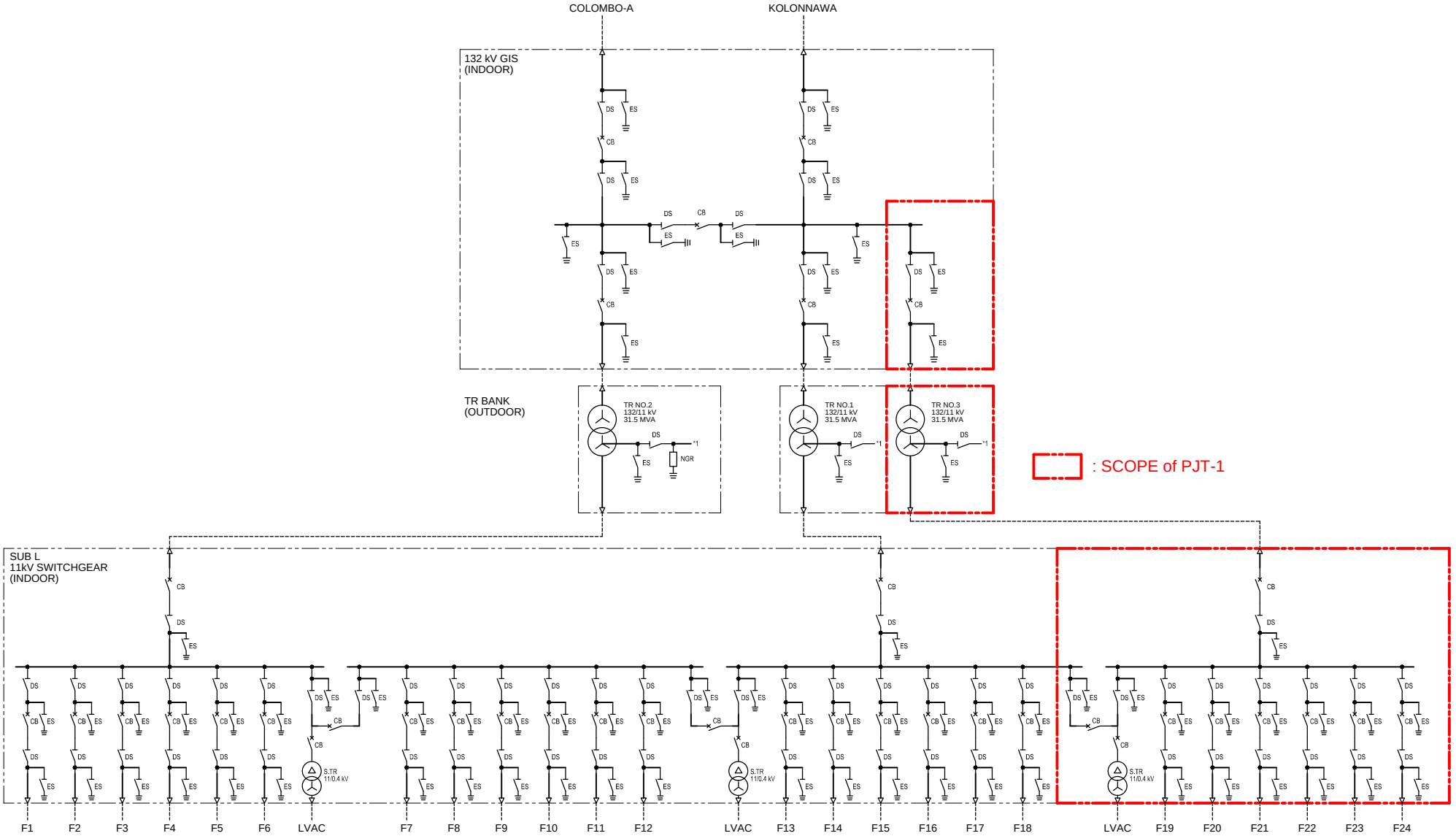




: SCOPE of PJT-1

SCOPE OF WORK

COLOMBO A GS


COLOMBO-A
KOLONNAWA
132 kV GIS
(INDOOR)
DS
ES
CB
TR BANK
(OUTDOOR)
TR NO.2
132/11 kV
31.5 MVA
TR NO.1
132/11 kV
31.5 MVA
TR NO.3
132/11 kV
31.5 MVA
*1
NGR
: SCOPE of PJT-1
SUB L
11kV SWITCHGEAR
(INDOOR)
S.TR
11/0.4 kV
LVAC
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
F15
F16
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F18
F19
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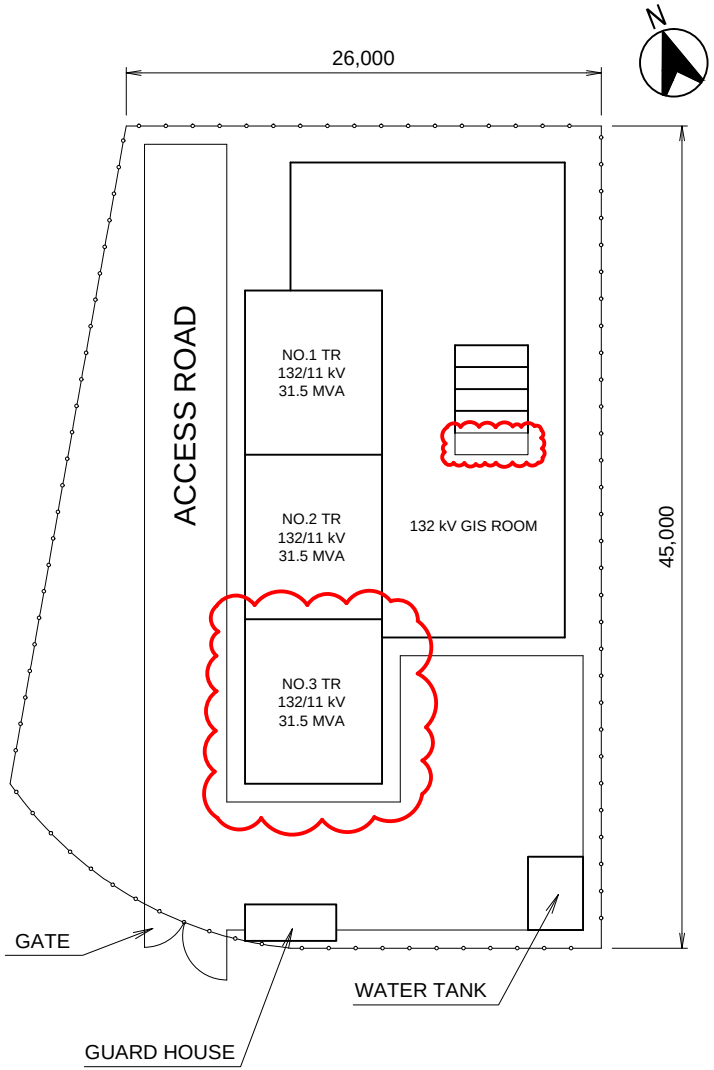
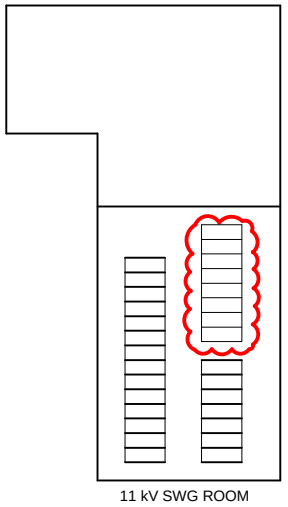
F21
F22
F23
F24

COLOMBO I GS



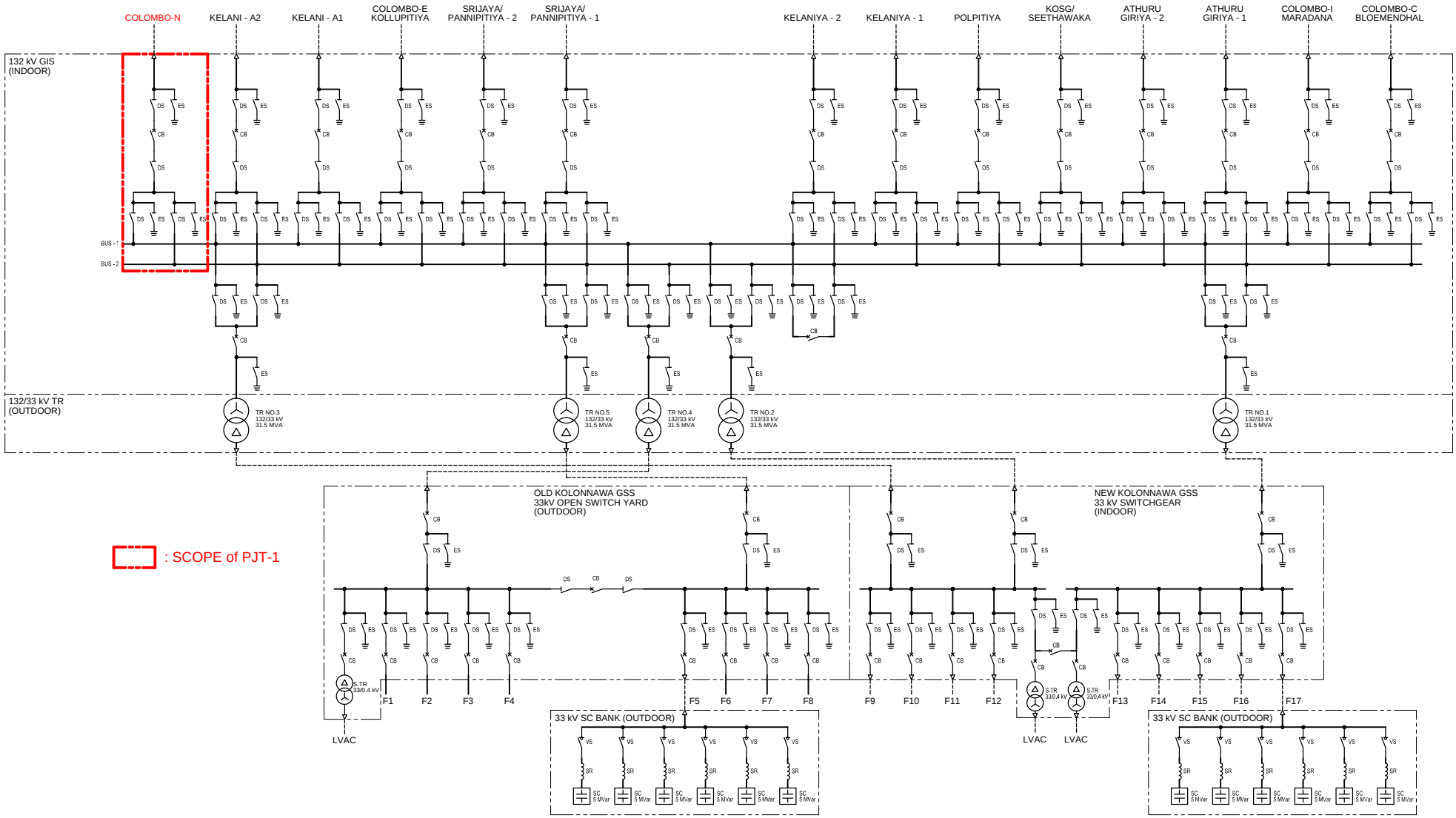
GROUND FLOOR



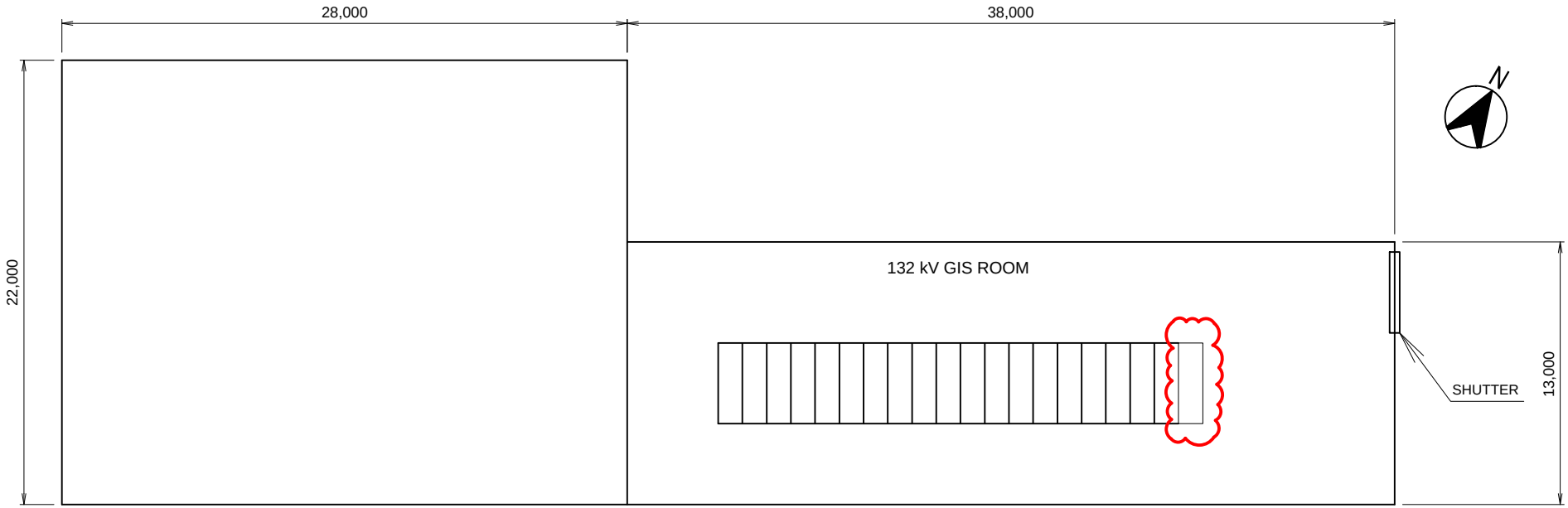
FIRST FLOOR

: SCOPE of PJT-1

COLOMBO I GS



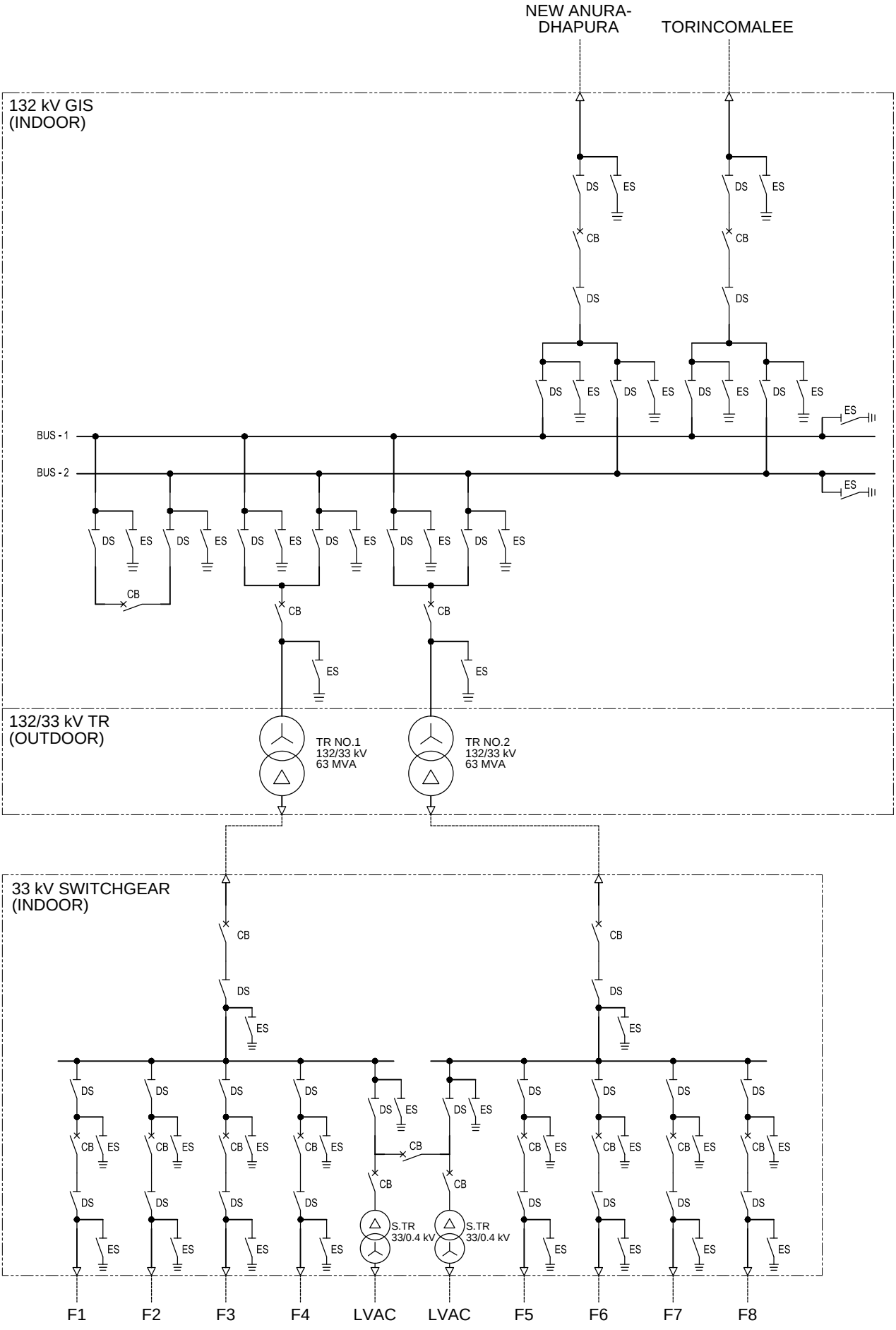
KOLONNAWA GS



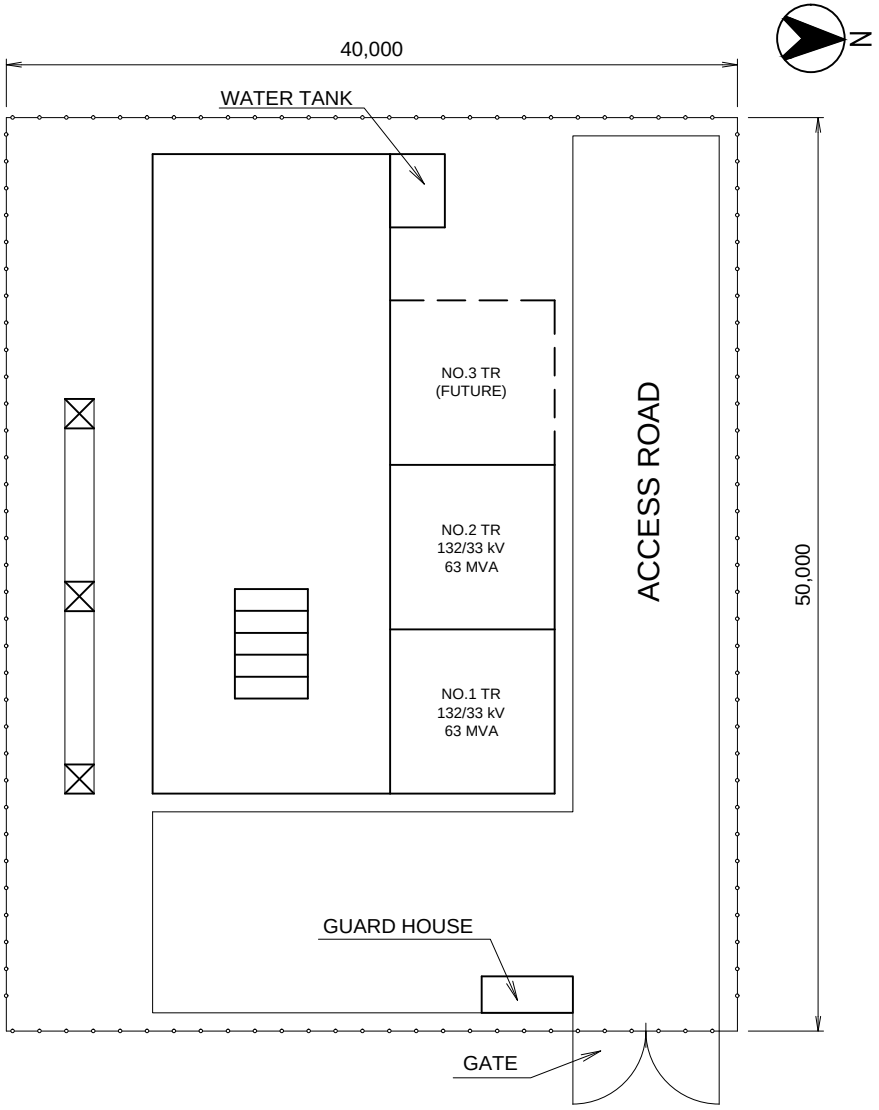
220 kV GIS ROOM & 33 kV SWG ROOM: GROUND FLOOR

: SCOPE of PJT-1

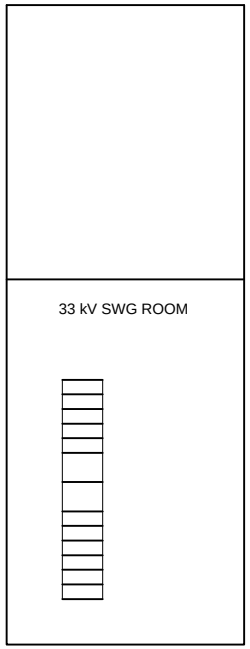
KOLONNAWA GS



KAPPALTHURAI GS

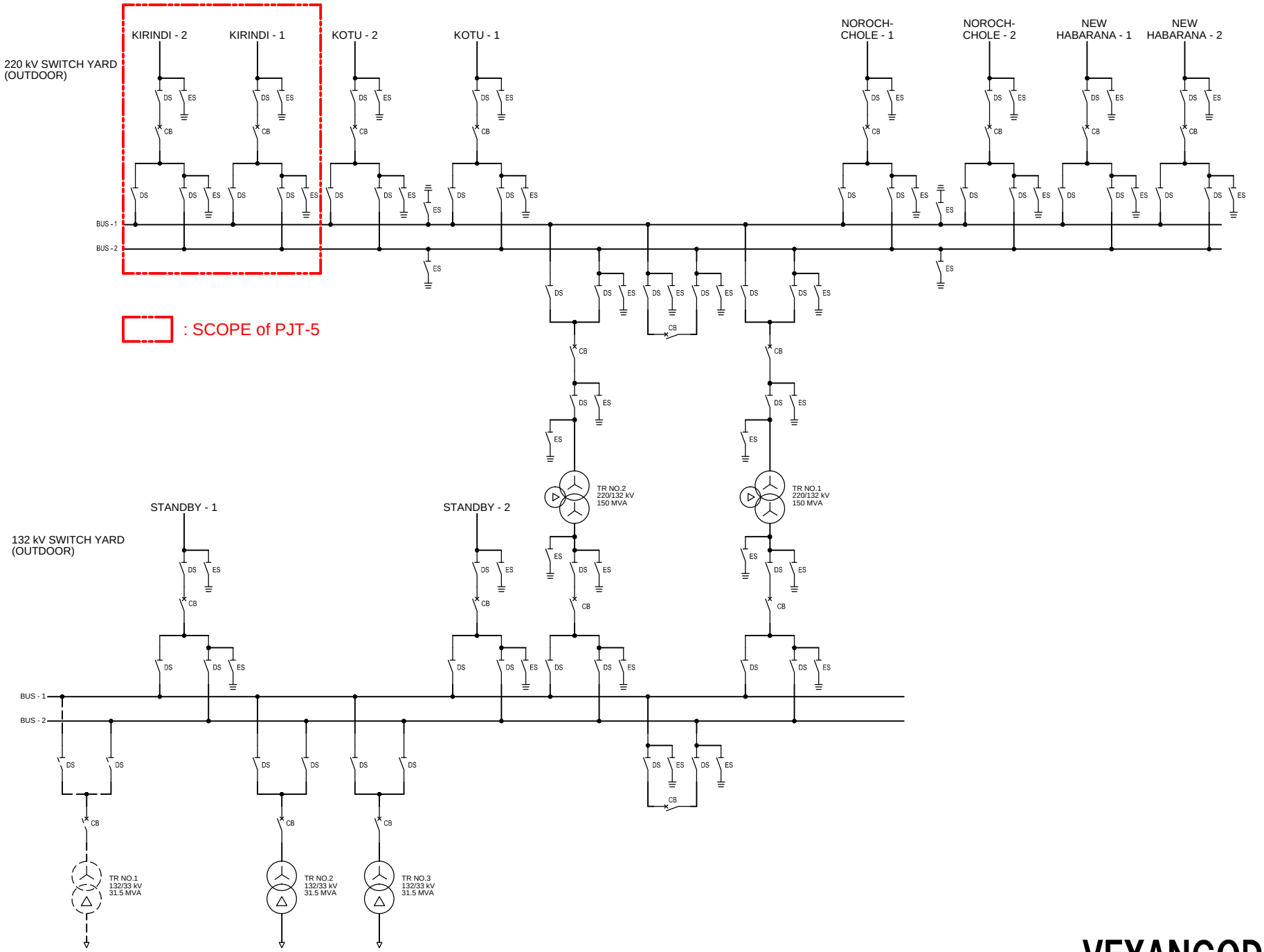


GROUND FLOOR

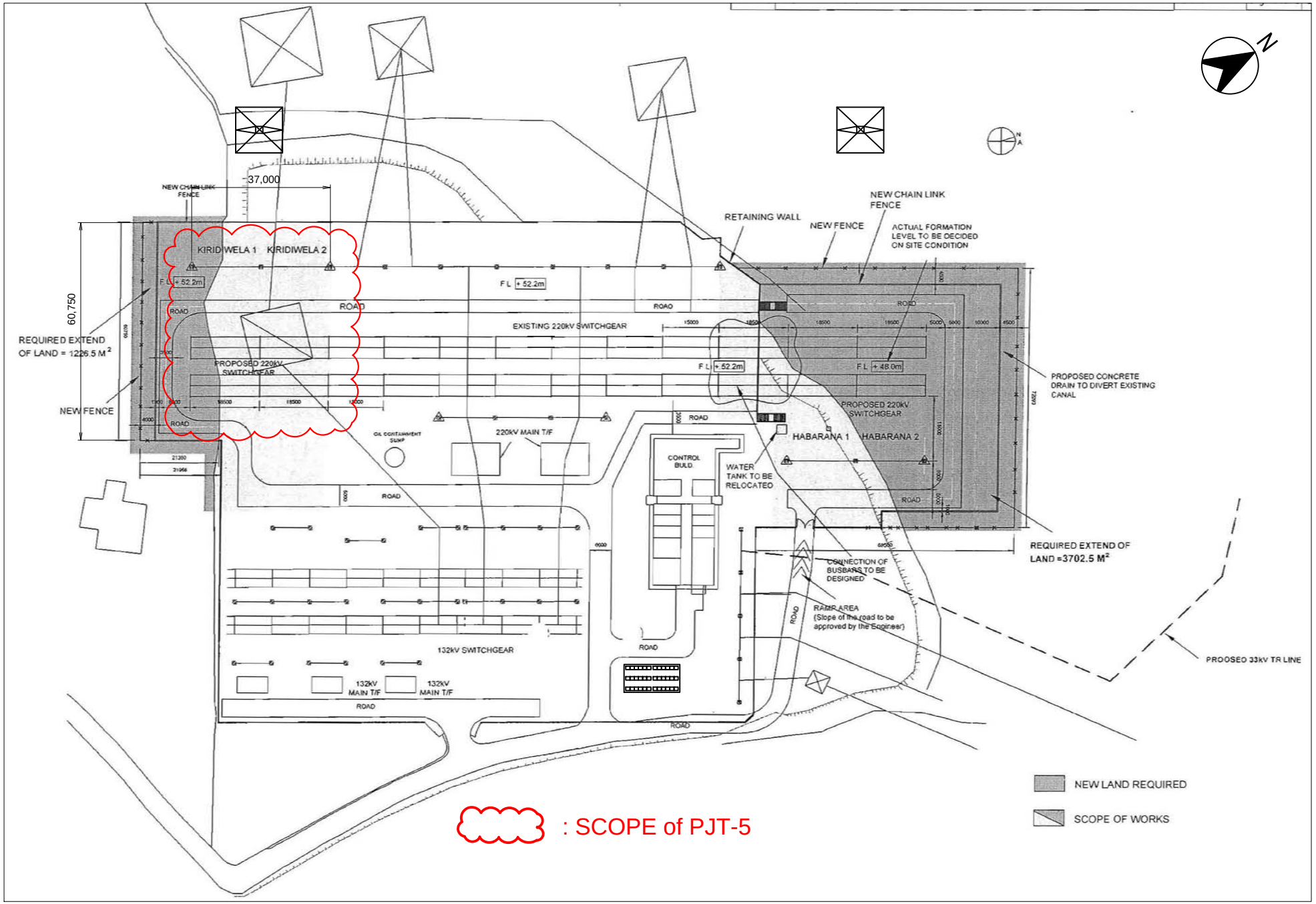


FIRST FLOOR

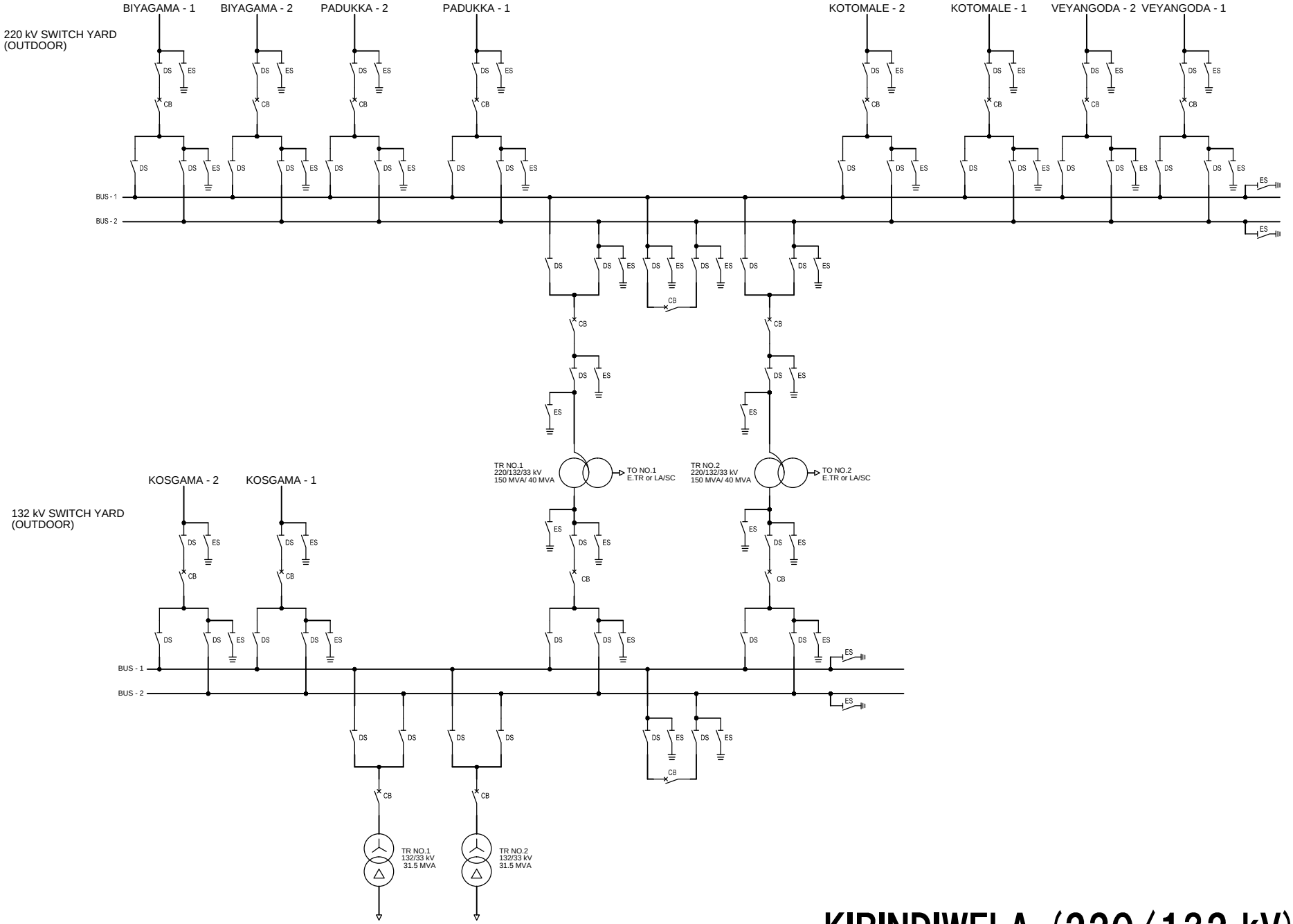
KAPPALTHURAI GS



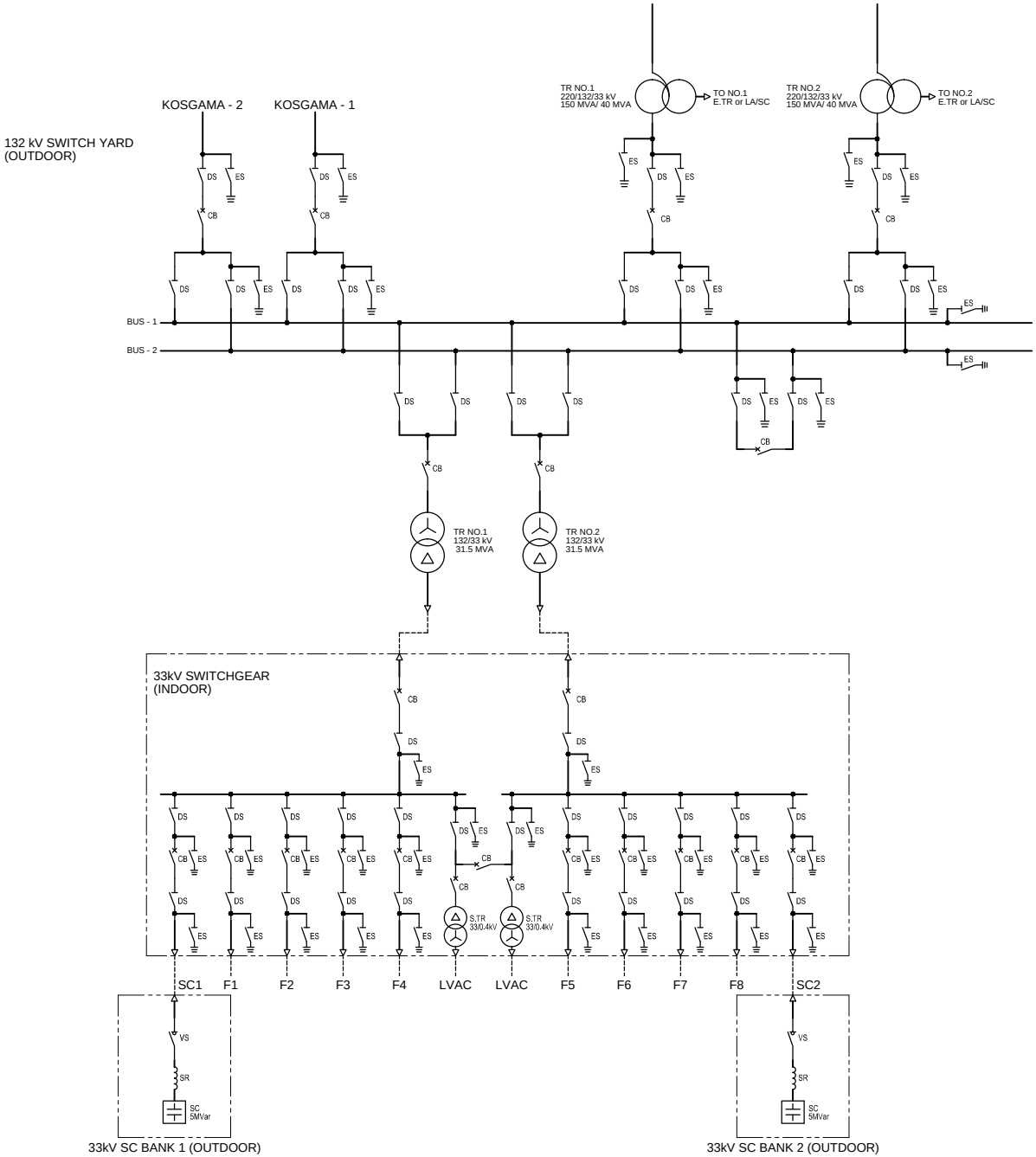
VEYANGODA GS



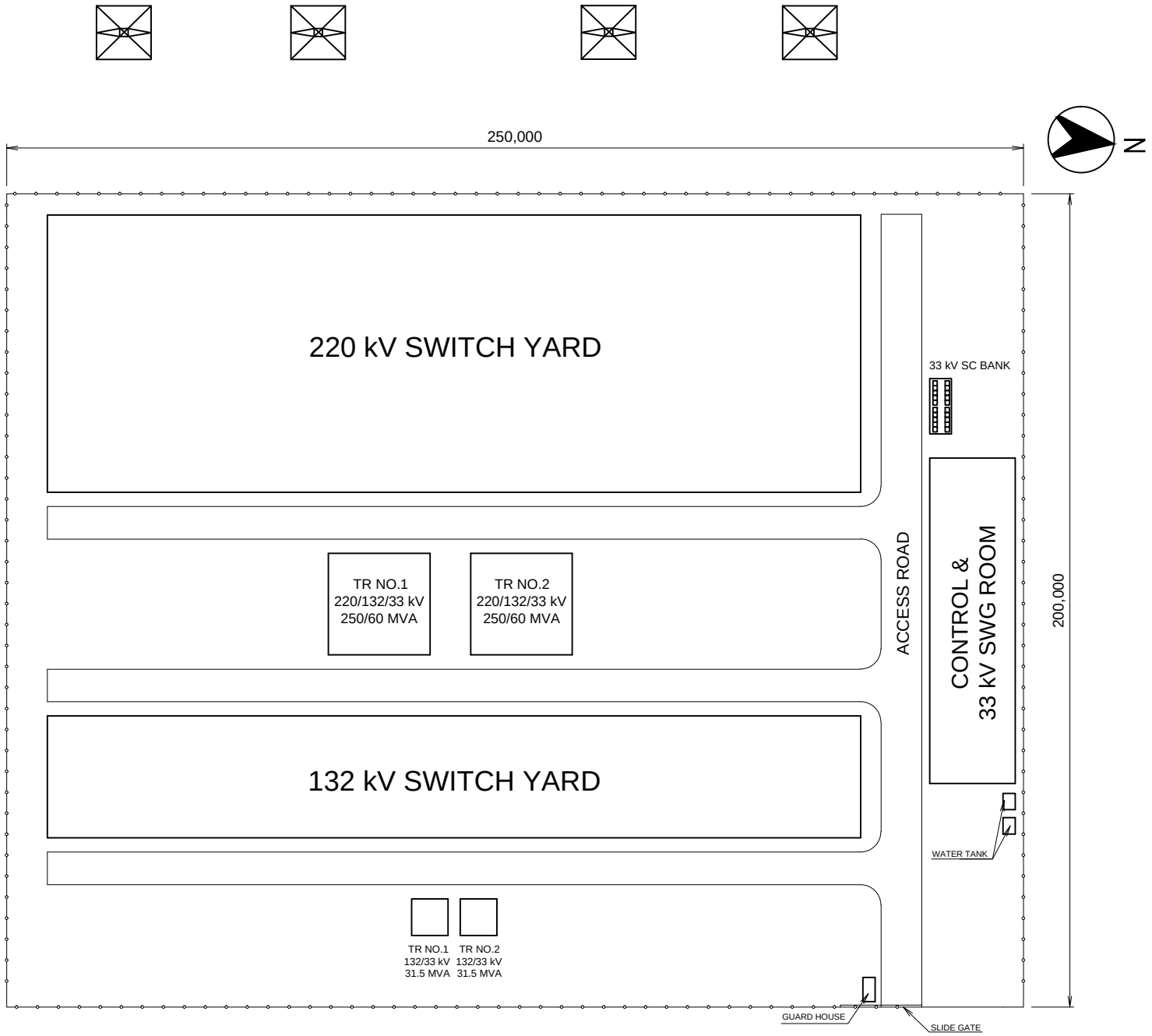
VEYANGODA GS



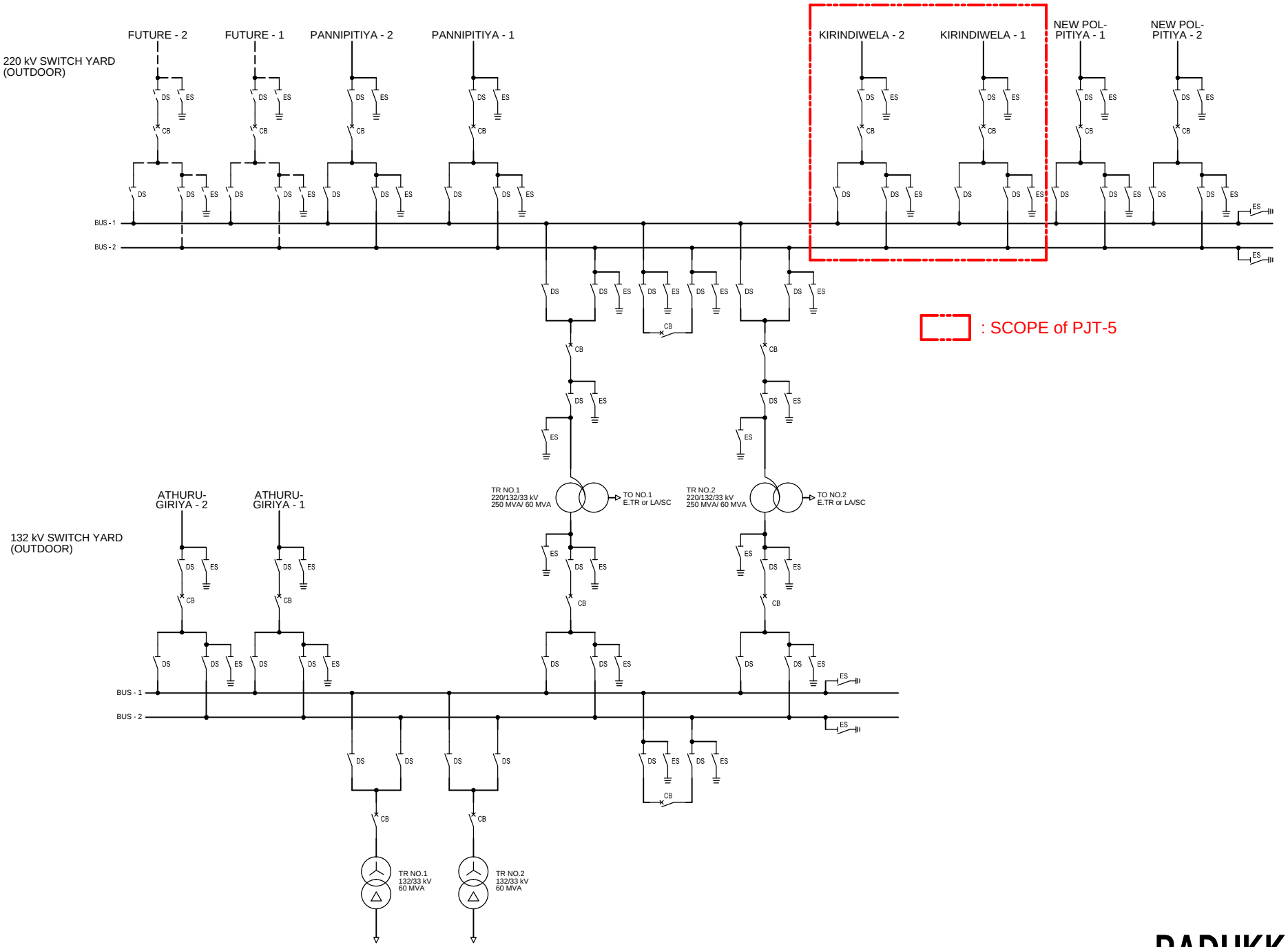
KIRINDIWELA (220/132 kV) GS



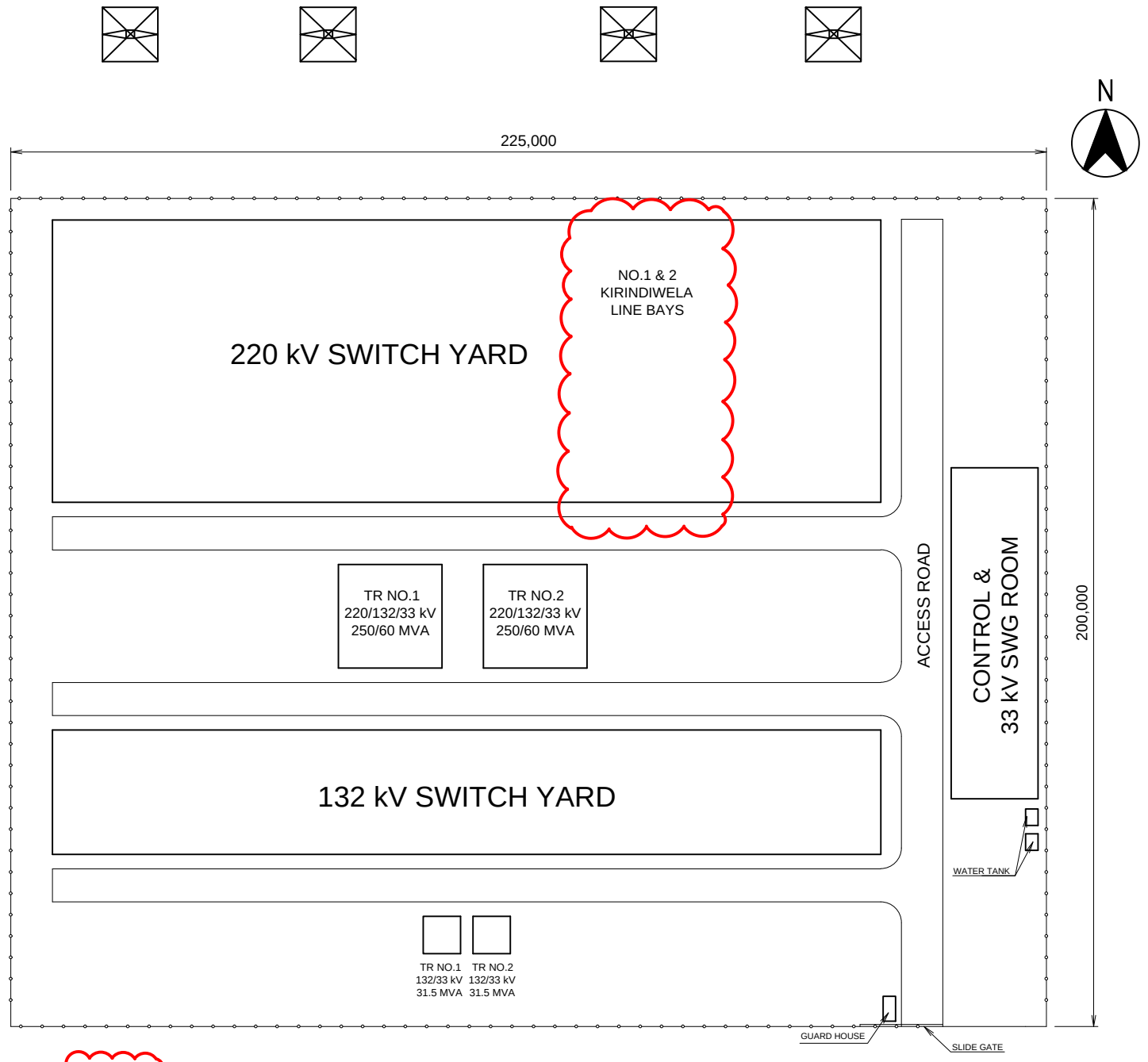
KIRINDIWELA (132/33 kV) GS



KIRINDIWELA GS

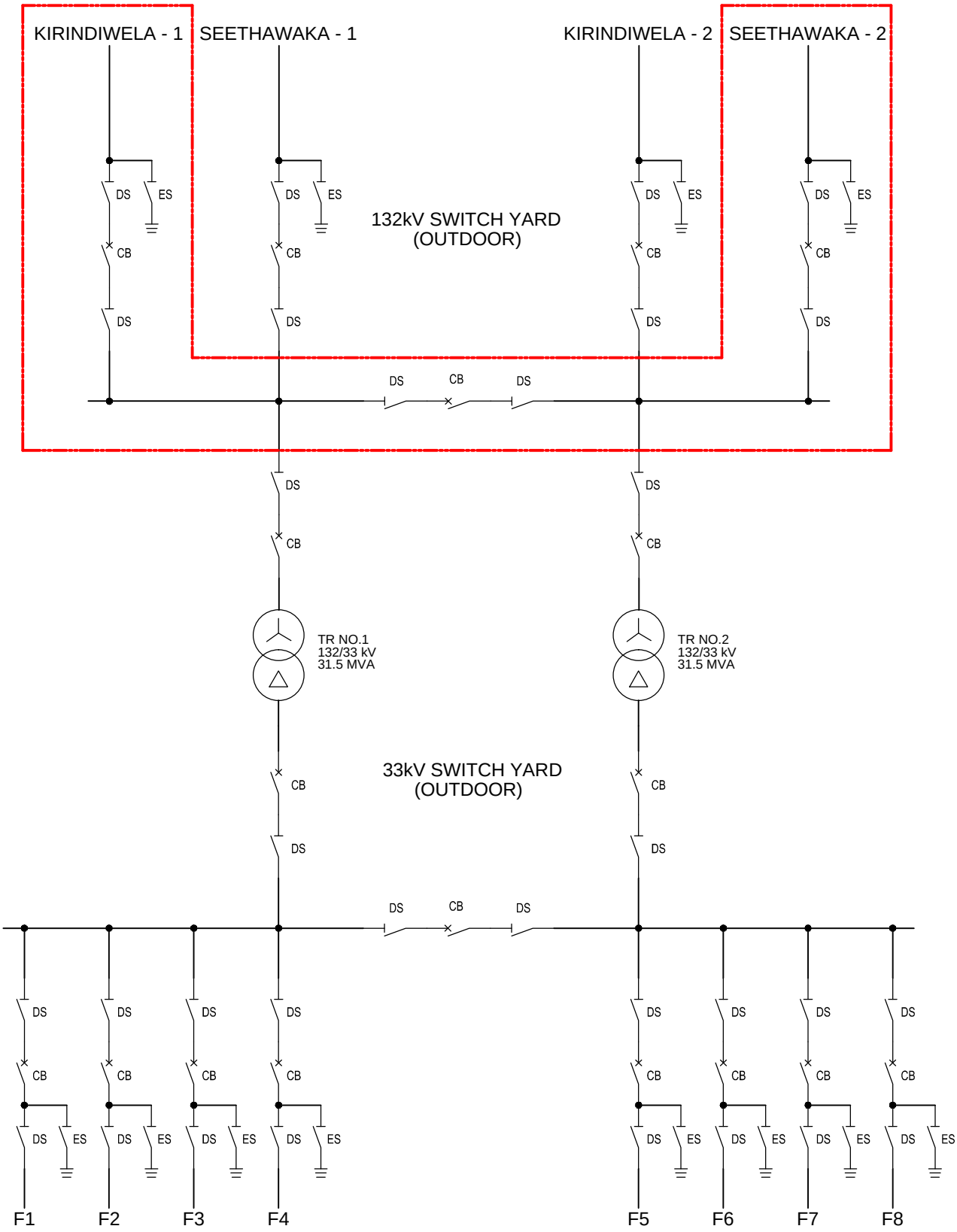

220 kV SWITCH YARD
(OUTDOOR)
FUTURE - 2
FUTURE - 1
PANNIPITIYA - 2
PANNIPITIYA - 1
KIRINDIWELA - 2
KIRINDIWELA - 1
NEW POL-
PITIYA - 1
NEW POL-
PITIYA - 2
BUS - 1
BUS - 2
DS
ES
CB
: SCOPE of PJT-5
TR NO.1
220/132/33 kV
250 MVA/ 60 MVA
TO NO.1
E.TR or LA/SC
TR NO.2
220/132/33 kV
250 MVA/ 60 MVA
TO NO.2
E.TR or LA/SC
132 kV SWITCH YARD
(OUTDOOR)
ATHURU-
GIRIYA - 2
ATHURU-
GIRIYA - 1
TR NO.1
132/33 kV
60 MVA
TR NO.2
132/33 kV
60 MVA

PADUKKA GS



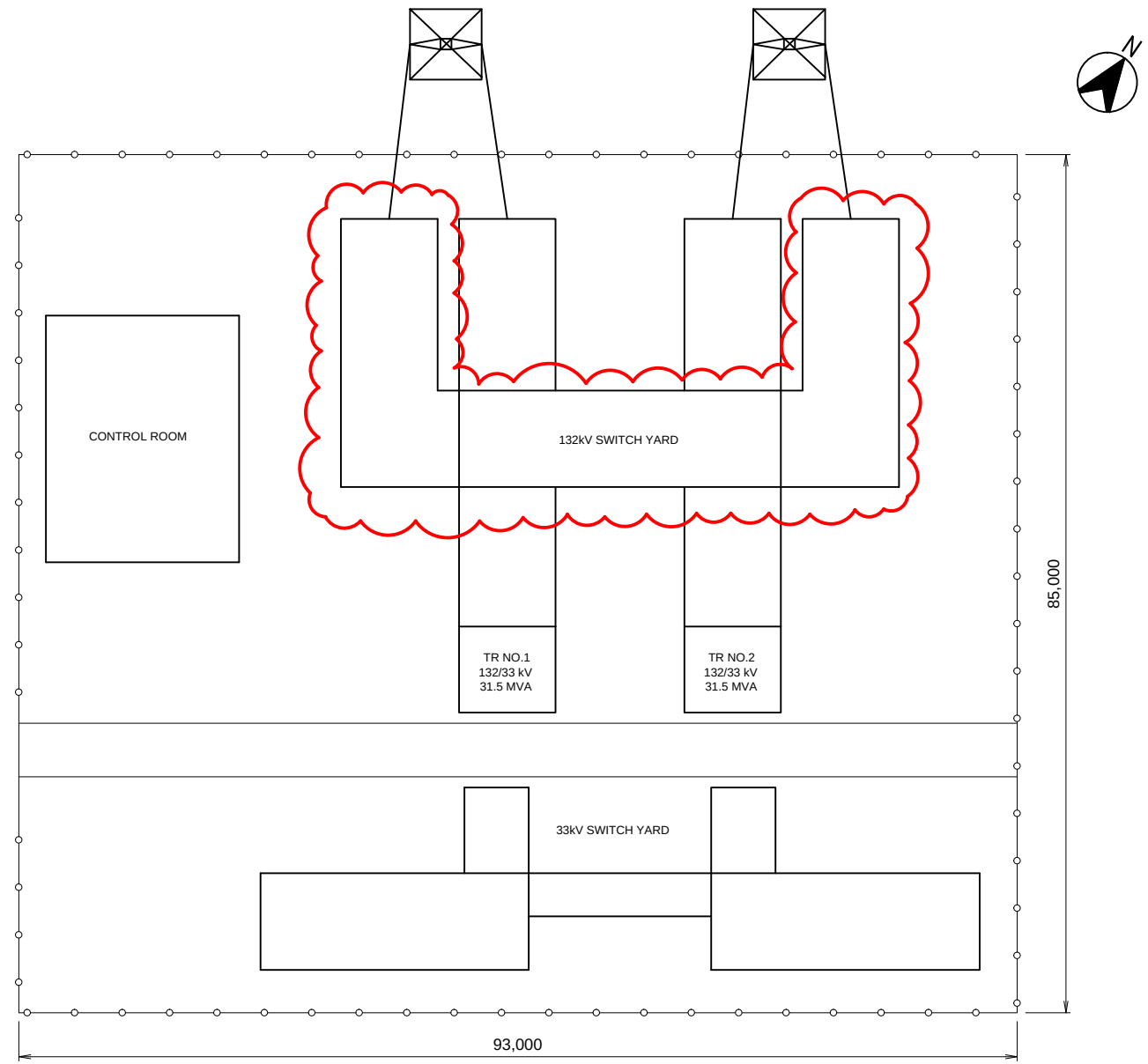
: SCOPE of PJT-5

PADUKKA GS

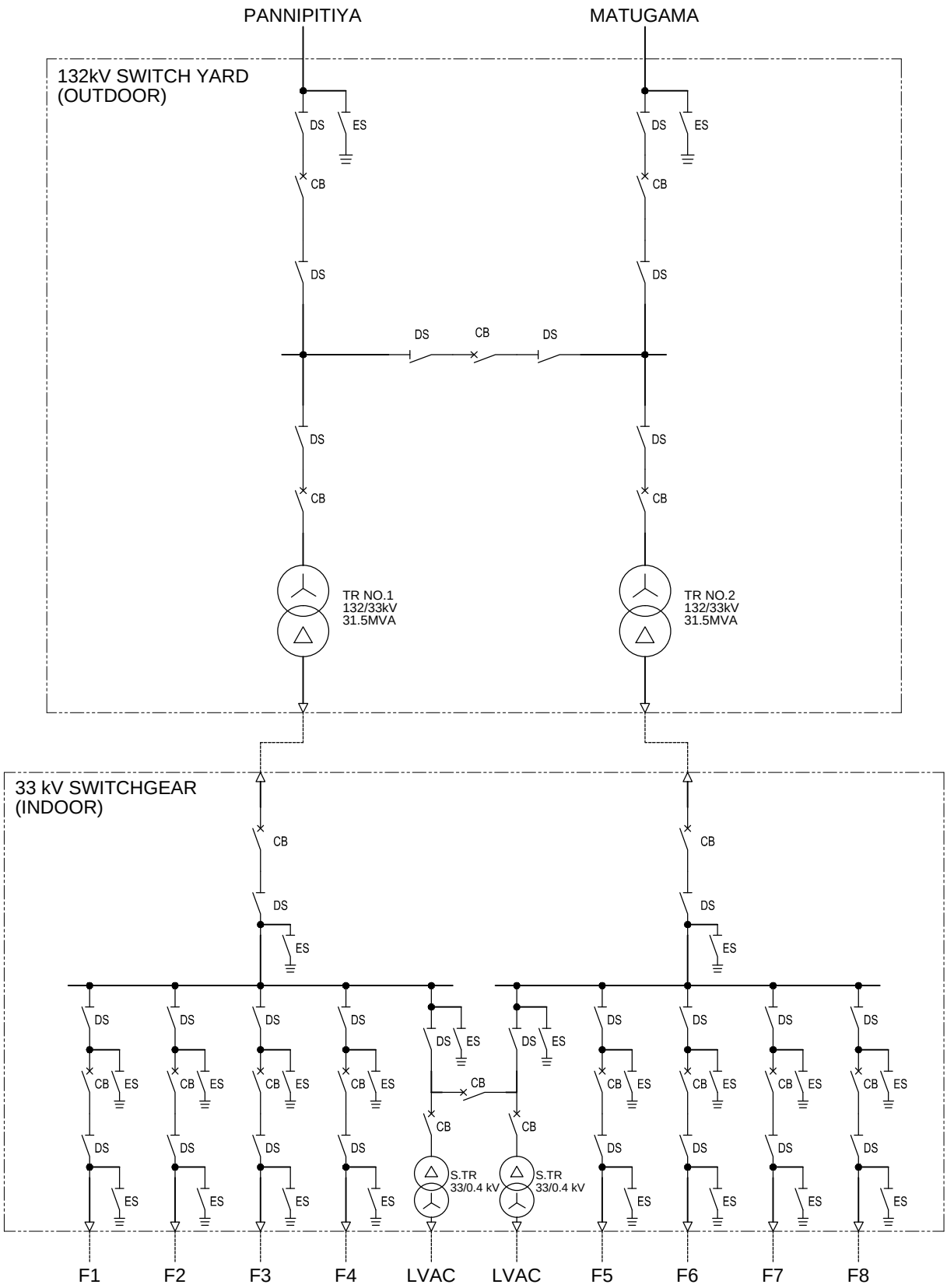


: SCOPE of PJT-5

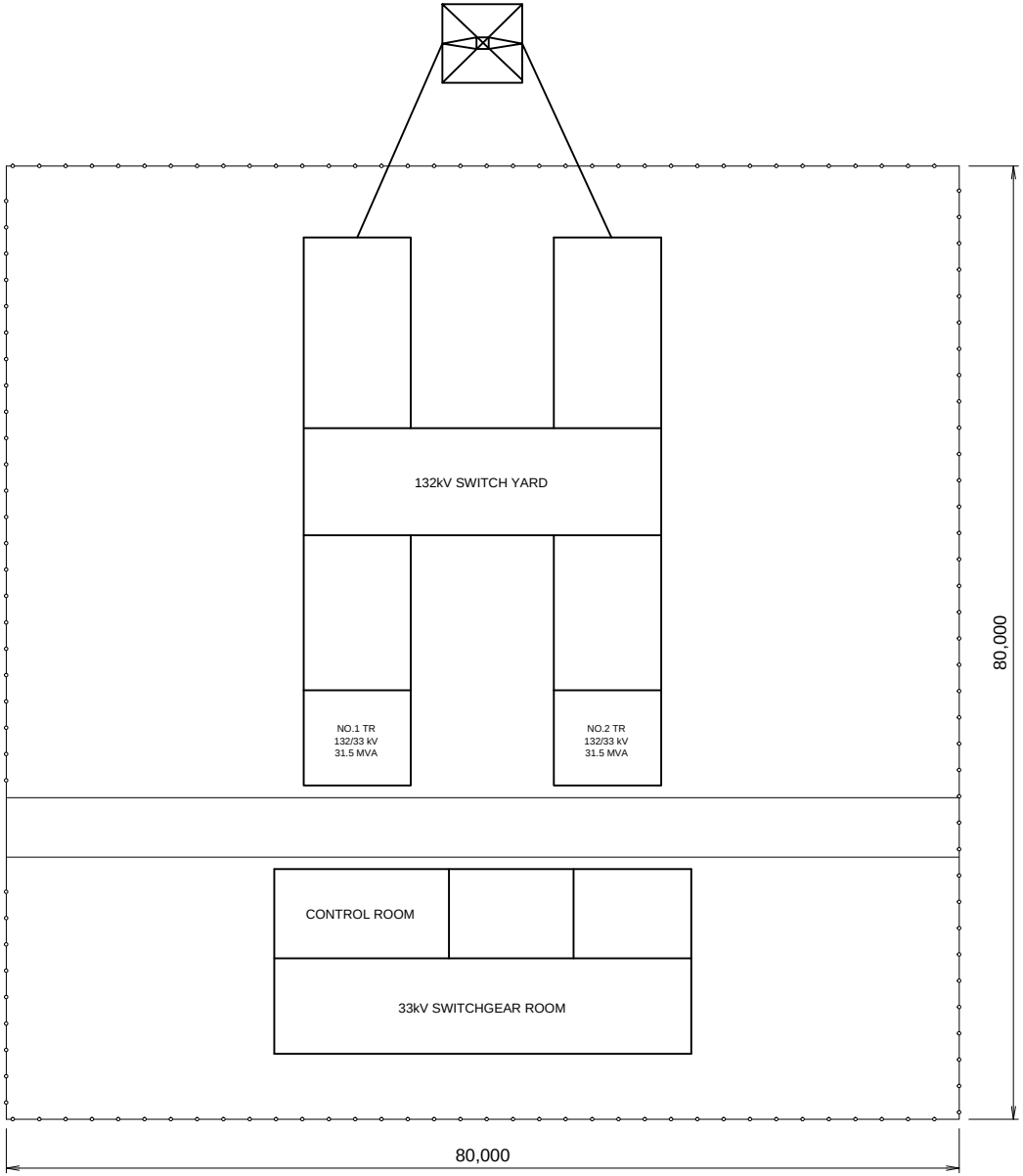
KOSGAMA GS


N
CONTROL ROOM
132kV SWITCH YARD
TR NO.1
132/33 kV
31.5 MVA
TR NO.2
132/33 kV
31.5 MVA
33kV SWITCH YARD
85,000
93,000
: SCOPE of PJT-5

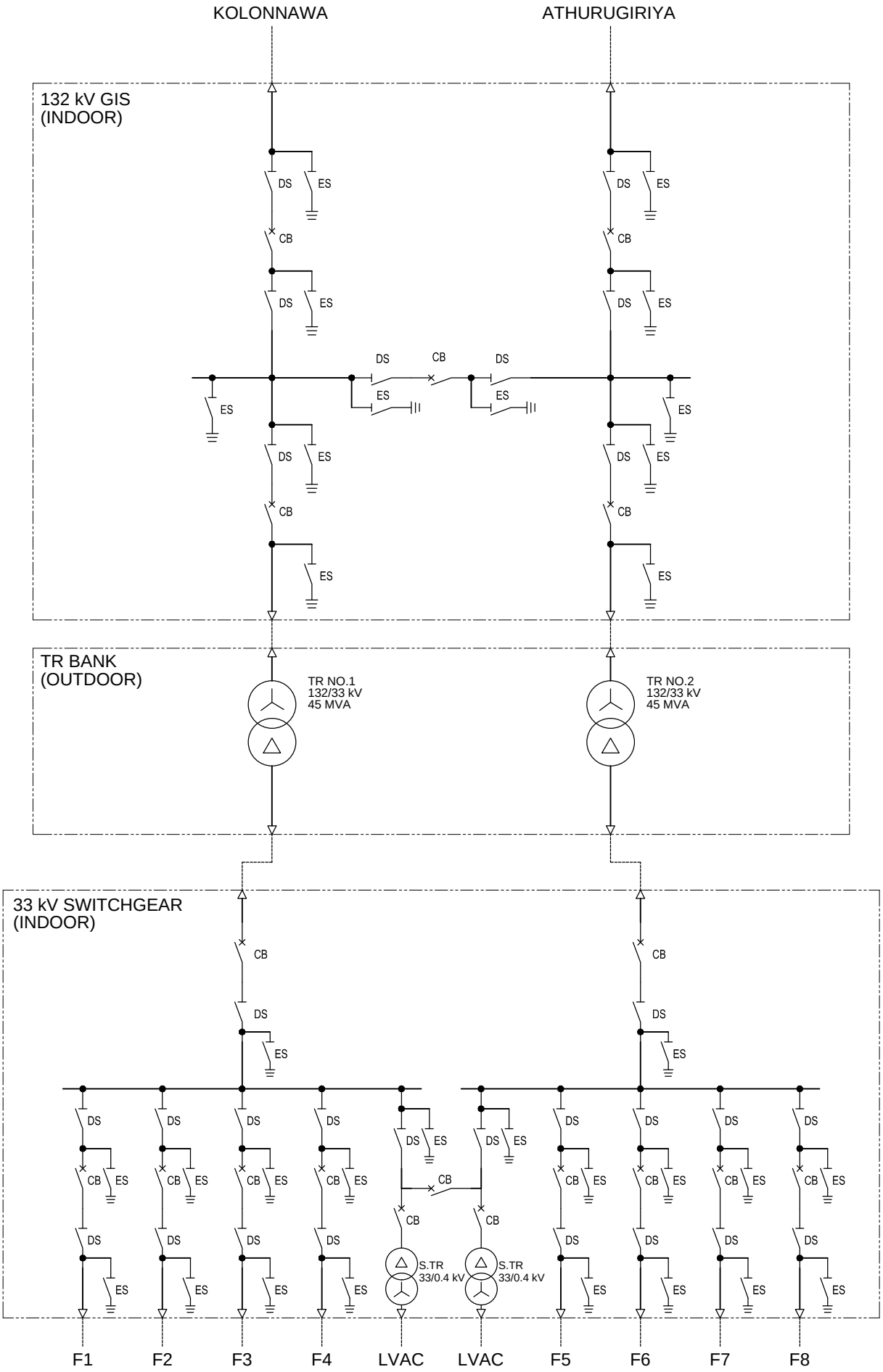
KOSGAMA GS


PANNIPITIYA
MATUGAMA
132kV SWITCH YARD
(OUTDOOR)
DS
ES
CB
TR NO.1
132/33kV
31.5MVA
TR NO.2
132/33kV
31.5MVA
33 kV SWITCHGEAR
(INDOOR)
S.TR
33/0.4 kV
F1
F2
F3
F4
LVAC
LVAC
F5
F6
F7
F8

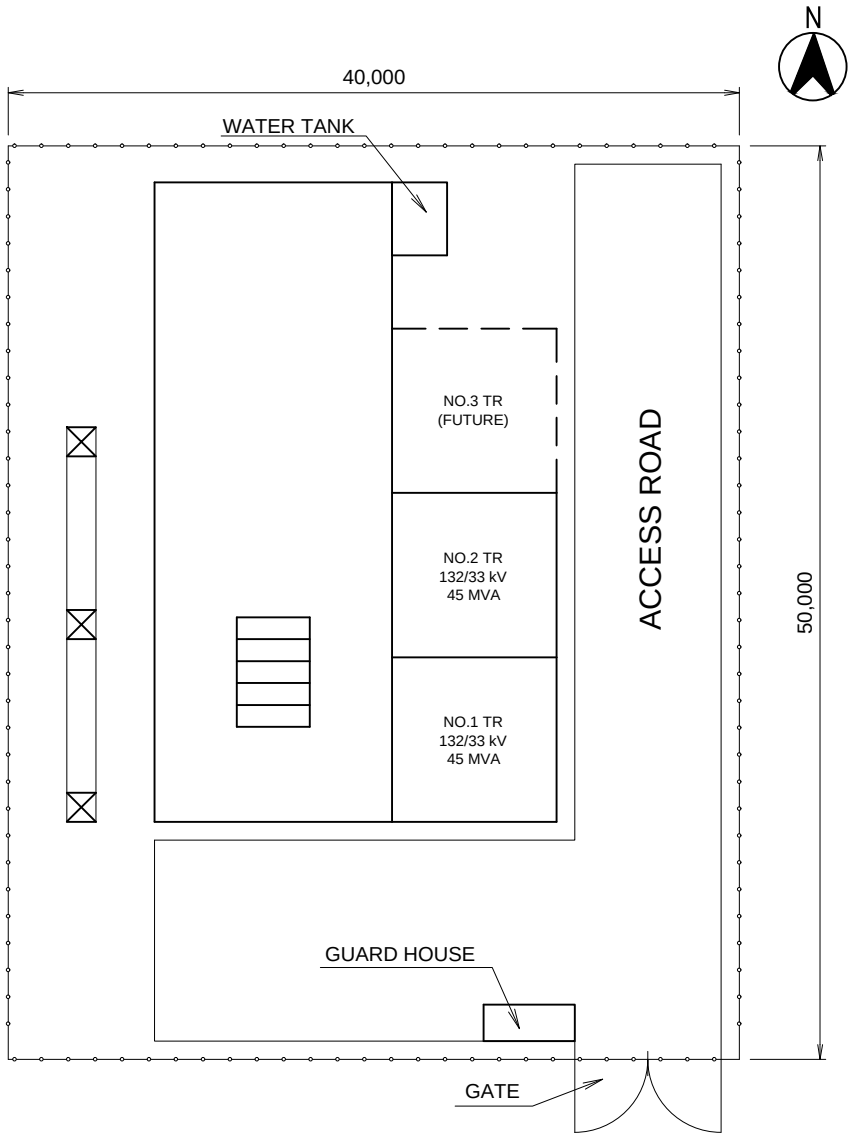
KALUTARA GS


132kV SWITCH YARD
NO.1 TR
132/33 kV
31.5 MVA
NO.2 TR
132/33 kV
31.5 MVA
CONTROL ROOM
33kV SWITCHGEAR ROOM
80,000
80,000

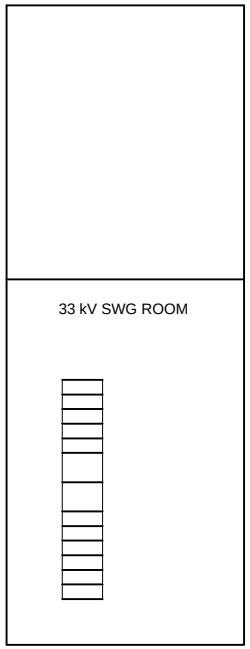
KALUTARA GS



BATTARAMULLA GS

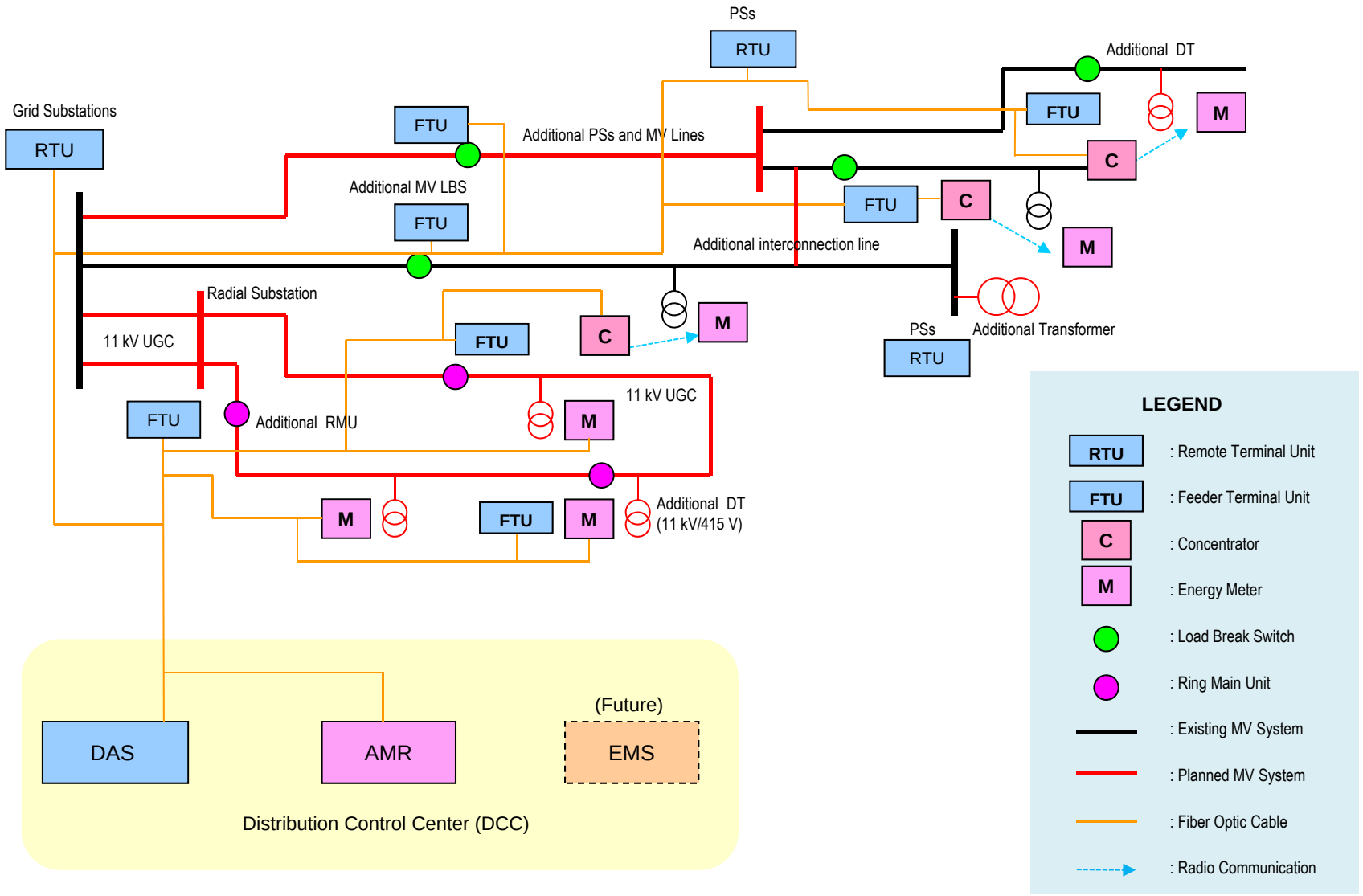


GROUND FLOOR



FIRST FLOOR

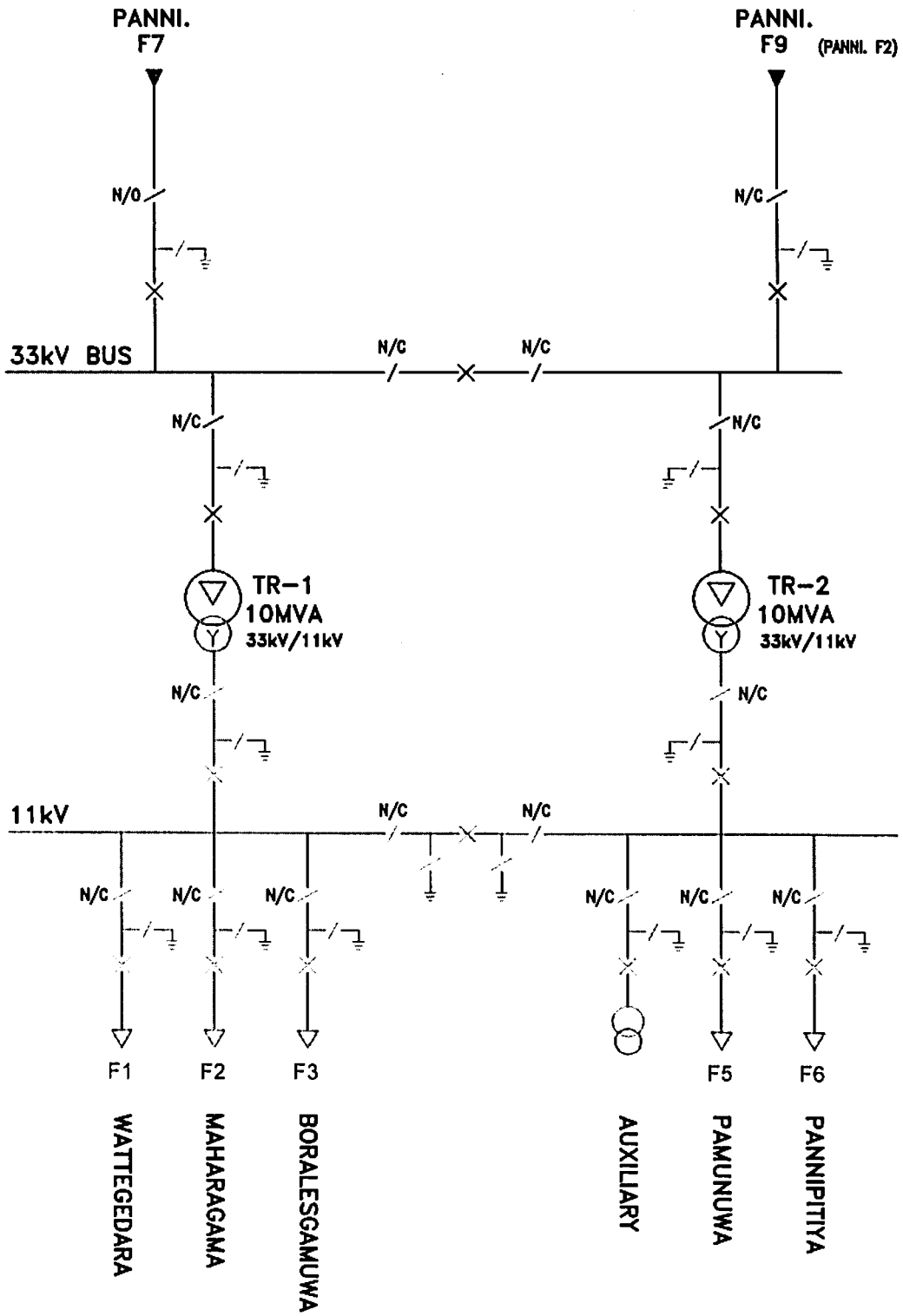
BATTARAMULLA GS



Note: 11 kV underground cable system is for Package-4 and 5

Typical Distribution Network Development

CONNECTION DIAGRAM OF MAHARAGAMA PRIMARY SUBSTATION



Attachment 4-1-1 Environmental Checklist for the Colombo City Transmission Development (PJT-1 with Distribution Development Package-1) (1/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)N (b)N (c)N (d)N	(a) The project is not a prescribed project under the National Environment Act of Sri Lanka. However, a permit has to be obtained from the Coast Conservation Dept. (CCD) for few components such as the construction of a grid substation located at Port which is within the coastal zone. As the GS facility is going to replace the existing workshop building which was constructed for the workers involved in the expansion of the Colombo Port, there will be no new serious impacts caused to the coast conservation, and thus a remote possibility of an EIA requirement during the process of obtaining the said permit. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) CEB has made discussions with major stakeholder organizations including the Ports Authority and CCD. Approximately 400 m2 of private land will be acquired for one of newly constructed grid substations (Sub-M). CEB has been negotiating with the owner (corporate) to acquire the land for free in lieu of provision of large-scale connection, and it will take long time for the acquisition procedure. (b) Transmission and distribution lines are designed to be underground cable so that there is no adverse impact anticipated.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts. CEB has made all efforts, wherever it was possible to en-route the line through residential areas, to keep the minimum involvement and adopt shortest possible route.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) Cable laying requires shallow soil excavation and has short construction time. Also most of laying work to be in paved areas such as roads. Therefore possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) The project site is located in developed area in the heart of Colombo city.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) Only shallow excavation is required for cable work, therefore no such risk. (b) do (c) Waste water discharge associated with the construction of grid substations may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-1 Environmental Checklist for the Colombo City Transmission Development (PJT-1 with Distribution Development Package-1) (2/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) No involuntary resettlement caused by the project. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) Y (b) N (c) N (d) N	(a) Increased risk of accidents is anticipated as heavy traffic is constantly expected in Colombo city during day time. Construction and extension work can be shared during night time or weekends while city traffic is less. (b) As the construction activities will take place in the economic capital of the country, there will be no possibility of influx of outside labourers. (c) it is the underground cable that is to be extended in the project. So that radio interference is not likely anticipated. (d) do
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) In the unlikely case such sites are encountered in project areas, adequate measures will be taken in accordance with the Antiquities Ordinance.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the transmission and distribution lines will be laid underground so that there is no extended disturbance in the landscape. Grid substations are three-storied, which will not affect the city landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts. (b) There is no ethnic minorities or indigenous people admitted in Colombo.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-1 Environmental Checklist for the Colombo City Transmission Development (PJT-1 with Distribution Development Package-1) (3/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) Y	(a) It is anticipated that there will be air pollution such as exhaust fumes, waste water discharge, dust emission, noise and vibration during construction period. CEB will instruct contractors to select better construction teqniques and advanced machinery in order to minimize such pollution, noise and vibration. CEB also will instruct to shift working hours in order to minimize social impact. (b) Impact to natural ecosystems negligible (c) Increased risk of accidents will be associated as heavy traffic is constantly expected in Colombo city during day time. Construction at night and weekend shift can be considered not to disturb the city traffic. Information on construction schedule should be disclosed for local community and traffic police to be well aware and ready, and mitigate risks of traffic accidents. Installation of 'keep out' boards and warning tapes where construction works are done will help passers-by to avoid possibility of site accidents.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period, such as transformer oil spillage, safety & health and excessive noise at GS. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity as shown in the above 5(1)(a). (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-2 Environmental Checklist for the Construction of Kappalturai 132/33 kV GS (PJT-2) (4/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)N (b)N (c)N (d)N	(a) The project is not a prescribed project under the National Environment Act of Sri Lanka. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) CEB has already acquired the land for the construction of the substation. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) Possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) An economic zone and an industrial estate for small and medium industries are planned in Kappalthurai. This project goes with the area development to sustain their operation.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) It is a flat land and there will be no such risk as slope failures or landslides. (b) do (c) Waste water discharge associated with the construction of grid substation may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-2 Environmental Checklist for the Construction of Kappalturai 132/33 kV GS (PJT-2) (5/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) No involuntary resettlement caused by the project. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) N (b) Y (c) N (d) Y	(a) There is no adverse impact ancitipated that affects the living conditions of inhabitants. (b) Temporary influx of outside labourers during the construction period may increase the risk of sexual transmitted diseases incidents in the project area. The extent of the impact is unknown at this stage. (c) The transmission line will be extended for 1km only, and it will pass the paddy field. So that radio interference is not likely anticipated. (d) 30m width of ROW and damages caused by the erection of towers will be compensated based on the requirement stipulated in the Electricity Act.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no local archeological, historical, cultural, and religious heritage admitted in the project area. In the unlikely case such sites are encountered in project areas, adequate measures will be taken in accordance with the Antiquities Ordinance.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the transmission line will be overlaid but its length remains 1km so that there is no extended disturbance in the landscape. The grid substation is three-storied, which will not affect the city landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts are anticipated. (b) do
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-2 Environmental Checklist for the Construction of Kappalturai 132/33 kV GS (PJT-2) (6/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) N/A	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems is neglegible (c) Impact to social environment is negligible.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period, such as transformer oil spillage, safety & health and excessive noise at GS. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity as shown in the above 5(1)(a). (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-3 Environmental Checklist for the Construction of Grid Substations surrounding Colombo City including Kerawalapitiya 220/33 kV GS (PJT-3), Kalutara 132/33 kV GS (PJT-7), and Battaramulla 132/33 kV GS (PJT-8) (7/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)N/A (b)N/A (c)N/A (d)N/A	(a) The project is not a prescribed project under the National Environment Act of Sri Lanka. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) PJT-3: CEB already reclaimed the land adjacent to the Kerawalapitiya Combined Cycle Power Station. PJT-7: Not yet. PJT-8: Not yet. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) N	(a) PJT-3: CEB already reclaimed the land adjacent to the Kerawalapitiya Combined Cycle Power Station. PJT-7: CEB already identified a vacant land suitable for substation construction. PJT-8: ditto.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) Possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) No
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N/A (b) N (c) N	(a) PJT-3: The project is for construction of a grid station only. PJT-7: It is a flat land so that there is no slope failure or landslide anticipated. PJT-8: It is a flat land so that there is no slope failure or landslide anticipated. (b) do (c) Waste water discharge associated with the construction of grid substation may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-3 Environmental Checklist for the Construction of Grid Substations surrounding Colombo City including Kerawalapitiya 220/33 kV GS (PJT-3), Kalutara 132/33 kV GS (PJT-7), and Battaramulla 132/33 kV GS (PJT-8) (8/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) No involuntary resettlement caused by the project. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) PJT-3: There is no adverse impact ancitipated that affects the living conditions of surrounding inhabitants. PJT-7: There may be certain impacts caused by erection of towers and extension of TL to affect the livelihood means of local residents such as standing crops and others. PJT-8: There is not likely adverse impact caused by the project. (b) PJT-3: The extent of the impact caused by temporary influx of outside labourers during the construction period will stay minimum as the project site is within the Colombo metropolitan area. PJT-7: The extent of the impact caused by temporary influx of outside labourers during the construction period will stay minimum as the project site is within the urban area. PJT-8: ditto. (c) PJT-3: There is no TL developed in the project. PJT-7: CEB will choose TL route sufficiently away from local settlements so that serious radio interference will not occur to them. PJT-8: There is no TL extended in the project so that radio interference will not occur. (d) PJT-3: There is no TL developed in the project. PJT-7: 30m width of ROW for 132kV TL and damages caused by the erection of towers will be compensated based on the requirement stipulated in the Electricity Act. PJT-8: There is no TL extended in the project.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N/A	(a) There is no local archeological, historical, cultural, and religious heritage admitted in the project area.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N/A	(a) PJT-3: The grid substation is three-storied, which will not affect the city landscape. PJT-7: The transmission line will be overlaid in the urban area so that there is no extended disturbance in the city landscape. The grid substation is three-storied, which will not affect the city landscape either. PJT-8: The grid substation is three-storied, which will not affect the city landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts are anticipated. (b) do

Attachment 4-1-3 Environmental Checklist for the Construction of Grid Substations surrounding Colombo City including Kerawalapitiya 220/33 kV GS (PJT-3), Kalutara 132/33 kV GS (PJT-7), and Battaramulla 132/33 kV GS (PJT-8) (9/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) N/A	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems is neglegible (c) Impact to social environment is negligible.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period, such as transformer oil spillage, safety & health and excessive noise at GS. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N/A	(a) Not applicable

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-4 Environmental Checklist for the Construction of Veyangoda - Kirindiwela - Padukka 220 kV TL (PJT-5) (10/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The project is one of the prescribed projects under the National Environment Act of Sri Lanka so that IEE is required, based on which CEA will assess if EIA is required. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) CEB has made discussions with major stakeholder organizations when deciding the project scope. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts, and CEB has already identified a vacant land suitable for substation construction.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) Y	(a) There is a possibility of soil erosion during erecting towers. Waste water discharge associated with the construction of towers is anticipated. However the impact is temporary and anticipated to be minor.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) Y	(a) Horagolla National Park is located within 500m along the Veyangoda-Padukka transmission line route. However the extent to which the project causes impact to the fauna and flora of the national park is anticipated minimum.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) Y (c) N/A (d) Y (e) N/A (f) N/A	(a) Not applicable. (b) Horagolla National Park is located within 500m along the Veyangoda-Padukka transmission line route. However the extent to which the project causes impact to the fauna and flora of the national park is anticipated minimum. (c) Not applicable. (d) Migration routes of birds habitating in the Horagolla National Park will be confirmed in IEE and counter measures will be examined accordingly. (e) do (f) The Project is located in the developed area in Colombo District and Gampaha District.
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) Tower locations will be slected on the flat lands so that there will be no such risk as slope failures or landslides. (b) do (c) Waste water discharge associated with the construction of switching substation may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-4 Environmental Checklist for the Construction of Veyangoda - Kirindiwela - Padukka 220 kV TL (PJT-5) (11/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N/A (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) No involuntary resettlement caused by the project. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) Y (b) N (c) N (d) N	(a) Increased risk of accidents is anticipated in Gampaha District where population density is high. Construction and extension work can be shared during night time or weekends while city traffic is less. (b) As the construction activities will take place in the economic capital of the country, there will be no possibility of influx of outside labourers. (c) CEB will choose TL route sufficiently away from local settlements so that serious radio interference is not likely anciticipated. (d) do
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) In the unlikely case such sites are encountered in project areas, adequate measures will be taken in accordance with the Antiquities Ordinance.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the transmission lines will be overlaid in the urban area so that there is no extended disturbance in the landscape. Grid substations are three-storied, which will not affect the city landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts. (b) There is no ethnic minorities or indigenous people admitted in Colombo.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-4 Environmental Checklist for the Construction of Veyangoda - Kirindiwela - Padukka 220 kV TL (PJT-5) (12/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) N/A	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems will stay minimum. (c) There may be adverse impact caused by erection of towers and extension of TL to affect the living conditions of inhabitants. 30m width of ROW for 132kV TL, 35m ROW for 220kV TL, and damages caused by the erection of towers will be compensated based on the requirement stipulated in the Electricity Act.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period, such as transformer oil spillage, safety & health and excessive noise at GS. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-5 Environmental Checklist for the Distribution Development for North Western Province of Region 1 (Package 2) (13/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) The project is not one of the prescribed projects under the National Environment Act of Sri Lanka so that IEE/EIA is not required. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) CEB has not made discussions with major stakeholder organizations. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) Y	(a) Possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) Y	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) Y (c) N/A (d) Y (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) No
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) It is a flat land and there will be no such risk as slope failures or landslides. (b) do (c) Waste water discharge associated with the construction of primary substation may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-5 Environmental Checklist for the Distribution Development for North Western Province of Region 1 (Package 2) (14/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) Land acquisition maybe required for primary substations. However, resettlement is not anticipated as the scale stays small. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) N (b) Y (c) N (d) Y	(a) There is no adverse impact ancitipated that affects the living conditions of inhabitants. (b) As the construction activities will take place in urban area, there will be no possibility of influx of outside labourers. (c) The distribution line will not cause radio interference. (d) Wayleaves for the distribution line will be compensated based on the requirement stipulated in the Electricity Act.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	**(a) Y**	(a) There is an archaeological site: Yapahuwa, located in the Mahawa Divisional Secretariat which is a prominent place in history. The project is unlikely to cause adverse impact to it as none of project components should be too close to it with guidance of the Department of Archeology. Adequate measures will be taken in accordance with the Antiquities Ordinance.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the distribution lines will not disturb the urban landscape. Primary substations are lower-storied, which will not affect the urban landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts. (b) There is no ethnic minorities or indigenous people living in the project sites.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-5 Environmental Checklist for the Distribution Development for North Western Province of Region 1 (Package 2) (15/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) Y	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems will stay minimum. (c) Wayleaves for the distribution line will be compensated based on the requirement stipulated in the Electricity Act.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-6 Distribution Development for Western Province North of Region 2 (Package 3) (16/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) The project is not one of the prescribed projects under the National Environment Act of Sri Lanka so that IEE/EIA is not required. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) CEB has not made discussions with major stakeholder organizations. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) Y	(a) Possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) Y	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) Y (c) N/A (d) Y (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) No
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) It is a flat land and there will be no such risk as slope failures or landslides. (b) do (c) Waste water discharge associated with the construction of primary substation may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-6 Distribution Development for Western Province North of Region 2 (Package 3) (17/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) Land acquisition maybe required for primary substations. However, resettlement is not anticipated as the scale stays small. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) N (b) Y (c) N (d) Y	(a) There is no adverse impact ancitipated that affects the living conditions of inhabitants. (b) As the construction activities will take place in urban area, there will be no possibility of influx of outside labourers. (c) The distribution line will not cause radio interference. (d) Wayleaves for the distribution line will be compensated based on the requirement stipulated in the Electricity Act.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is an archaeological site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the distribution lines will not disturb the urban landscape. Primary substations are lower-storied, which will not affect the urban landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts. (b) There is no ethnic minorities or indigenous people living in the project sites.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-6 Distribution Development for Western Province North of Region 2 (Package 3) (18/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) Y	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems will stay minimum. (c) Wayleaves for the distribution line will be compensated based on the requirement stipulated in the Electricity Act. The project will be taken place in urban area so that certain interruption to residential activities and tourism industry might be expected. In order not to disturb the traffic system in the project sites where population density is high, extension work can be shifted to night time or weekends. Information disclosure well in advance on the construction schedule will also work well.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-7 Distribution Development for Western Province South-2 of Region 3 (Package 4) (19/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) The project is not one of the prescribed projects under the National Environment Act of Sri Lanka so that IEE/EIA is not required. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) CEB has not made discussions with major stakeholder organizations. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) Cable laying requires shallow soil excavation and has short construction time. Also most of laying work to be in paved areas such as roads. Therefore possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) Y	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) Y (c) N/A (d) Y (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) No
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) Only shallow excavation is required for cable work, therefore no such risk. (b) do (c) Waste water discharge associated with the construction of grid substations may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-7 Distribution Development for Western Province South-2 of Region 3 (Package 4) (20/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) Land acquisition maybe required for primary substations. However, resettlement is not anticipated as the scale stays small. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) N (b) Y (c) N (d) Y	(a) Increased risk of accidents is anticipated as heavy traffic is constantly expected during day time. Construction and extension work can be shared during night time or weekends while city traffic is less. (b) As the construction activities will take place in urban area, there will be no possibility of influx of outside labourers. (c) The overhead distribution line will not cause radio interference, and underground cable either. (d) Wayleaves for the overhead distribution line will be compensated based on the requirement stipulated in the Electricity Act.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is an archaeological site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the overhead distribution lines will not disturb the urban landscape, and underground cable either. Primary substations are lower-storied, which will not affect the urban landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts. (b) There is no ethnic minorities or indigenous people living in the project sites.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-7 Distribution Development for Western Province South-2 of Region 3 (Package 4) (21/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) Y	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems will stay minimum. (c) Wayleaves for the distribution line will be compensated based on the requirement stipulated in the Electricity Act. The project will be taken place in urban area so that certain interruption to residential activities and tourism industry might be expected. In order not to disturb the traffic system in the project sites where population density is high, extension work can be shifted to night time or weekends. Information disclosure well in advance on the construction schedule will also work well.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Attachment 4-1-8 Distribution Development for Western Province South-1 of Region 4 (Package 5) (22/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N/A (b) N/A (c) N/A (d) N/A	(a) The project is not one of the prescribed projects under the National Environment Act of Sri Lanka so that IEE/EIA is not required. (b) do (c) do (d) do
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) CEB has not made discussions with major stakeholder organizations. (b) No.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Multiple alternatives were examined in order to avoid or minimize adverse impacts.
2 Pollution Control	(1) Water Quality	(a) Is there any possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If the water quality degradation is anticipated, are adequate measures considered?	(a) N	(a) Cable laying requires shallow soil excavation and has short construction time. Also most of laying work to be in paved areas such as roads. Therefore possibility of soil erosion is negligible.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) Y	(a) There is no protected areas in the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife and livestock? (e) Is there any possibility that the project will cause the negative impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (f) In cases where the project site is located in undeveloped areas, is there any possibility that the new development will result in extensive loss of natural environments?	(a) N/A (b) Y (c) N/A (d) Y (e) N/A (f) N/A	(a) There is no forest or other ecologically vulnerable area in and around the project site. (b) do (c) do (d) do (e) do (f) No
3 Natural Environment	(3) Topography and Geology	(a) Is there any soft ground on the route of power transmission and distribution lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (b) Is there any possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) N	(a) Only shallow excavation is required for cable work, therefore no such risk. (b) do (c) Waste water discharge associated with the construction of grid substations may cause soil contamination. However, the impact is temporary and anticipated to be minor. CEB will strictly monitor all construction activities to avoid water contamination due to oil spill, disposal of solid wastes, spoils, construction material and waste water.

Attachment 4-1-8 Distribution Development for Western Province South-1 of Region 4 (Package 5) (23/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) There is no resettlement anticipated. (b) do (c) do (d) do (e) do (f) do (g) do (h) do (i) do (j) do
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (c) Is there any possibility that installation of structures, such as power line towers will cause a radio interference? If any significant radio interference is anticipated, are adequate measures considered? (d) Are the compensations for transmission wires given in accordance with the domestic law?	(a) N (b) Y (c) N (d) Y	(a) Increased risk of accidents is anticipated as heavy traffic is constantly expected during day time. Extension work can be shared during night time or weekends while city traffic is less. (b) As the construction activities will take place in the outskirts of Colombo and tourist area, there will be no possibility of influx of outside labourers. (c) The underground cable will not cause radio interference. (d) N/A.
4 Social Environment	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is an archaeological site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) the underground cable will not disturb the urban landscape.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) No such social impacts. (b) There is no ethnic minorities or indigenous people living in the project sites.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) CEB is obedient to the labor legislations and conditions in Sri Lanka. (b) do (c) do (d) do

Attachment 4-1-8 Distribution Development for Western Province South-1 of Region 4 (Package 5) (24/24)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) N/A (c) Y	(a) It is anticipated that there will be air pollution such as exhaust, waste water discharge, dust emission, noise and vibration during construction period. However, the impact is temporary and anticipated to be minor. CEB will examine measures to minimize them and strictly monitor them. (b) Impact to natural ecosystems will stay minimum. (c) The project will be taken place in the outskirts of Colombo city and tourism area so that certain interruption to residential activities and tourism industry might be expected. In order not to disturb the traffic system in the project sites where population density is high, extension work can be shifted to night time or weekends. Information disclosure well in advance on the construction schedule will also work well.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) Most of the anticipated impacts are caused during construction period. CEB will develop a monitoring program for the relevant items. CEB also will keep monitoring the specific items throughout the operation period. (b) Noise, vibrations, turbid water, dust, exhaust gases, wastes, soil contamination. Methods and frequencies are based on the requirements from the National Environmental Regulations. (c) It is the Project Manager of the PMU who will be responsible for monitoring. In case there is no environmental officer allocated at PMU, other engineers will be mandated to keep monitoring the environmental parameters. It will be reflected in the admin and remuneration budget. (d) Monitoring report will be attached (or inserted) in the Quarterly Project Progress Report for donor's evaluation. Methods and frequencies are based on the requirements from the National Environmental Regulations. There is no requirement from the Ministry of Power and Energy to report.
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Road checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(a) Y	(a) Air pollution such as exhaust fumes is anticipated during construction period although the impact is temporary and anticipated to be minor. All precautionary steps will be taken to minimize air pollution during the construction activity (b) Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Waste generated at substations will be well managed and disposed appropriately in accordance with the environmental legislations and technical guidelines issued by CEA to prevent water quality degradation or soil contamination in the surrounding areas. (c) Noises and vibration is anticipated although the impact is temporary and anticipated to be minor. Its attribute will be monitored to minimize the noise emission due to construction activities and ground vibration due to blasting and compacting activities.
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

MONITORING FORM

PROJECT TITLE:

(Remarks) Please indicate to which project this monitoring form is applied.

QUARTER: **MONTH&YEAR:**

(Remarks) The latest results of the below monitoring items shall be submitted to the lenders as part of Quarterly Progress Report throughout the construction phase.

MONITORING POINT 1:

MONITORING POINT 2:

(Remarks) Measurement points will be: **i) at one place per electric line under construction, and ii) at grid substation (or primary substation) under construction.** Total number of measurement points therefore depend on the construction progress. Please print sufficient numbers of this form to collect all required information at all monitoring points.

1. RESPONSE / ACTIONS TO COMMENTS AND GUIDANCE FROM GOVERNMENT AUTHORITIES AND THE PUBLIC

Monitoring Item	Area / Organization	Date	Monitoring Results during Report Period
Number and contents of formal comments made by the public			
Number and contents of responces from Government agencies			

(Remarks) Please attach additional sheets for detail information if required.

2. POLLUTION

- WATER QUALITY (Effluent / Wastewater / Ambient Water Quality)

Item	Method	Frequency	Measurement Date & Month	Unit	Measured Value (Mean)	Measured Value (Max.)	Sri Lanka Standards*	Standards for Contract	Referred International Standards
SS (Suspended Solid)	Field sampling	Quarterly		mg/l			50 for inland surface waters 150 for marine coastal areas		-
Oil	Field sampling	Quarterly		mg/l			10 for inland surface waters 20 for marine coastal areas		-

(Remarks) National Environmental (Protection and Quality) Regulations

(Other remarks) Please attach additional sheets if required.

- AIR QUALITY (Ambient Air Quality)

Item	Method	Frequency*	Measurement Date & Month	Unit	Measured Value (Mean)	Measured Value (Max.)	Sri Lanka Standards**	Standards for Contract	Referred International Standards
SPM (Suspended Particulate Matter) incl. dust	Hi-volume samling & Gravimetric	Quarterly		mg/m3			Annual 0.10 24hrs: 0.30 8hrs: 0.35 3hrs: 0.45 1hr: 0.50		PM10 20μg/m3/year 50μg/m3/24hrs

(Remarks) 1. Frequency is subject to increase / decrease depending on the intensity of impact found in the previous result.
2. National Environmental (Ambient Air Quality) Regulations

(Other remarks) Please attach additional sheets if required.

- NOISE

Item	Method	Frequency	Measurement Date & Month	Unit	Measured Value (Mean)	Measured Value (Max.)	Sri Lanka Standards*	Standards for Contract	Referred International Standards
Noise Level	Measurement	Monthly		dB(A)			day time: 75 night time: 50		day time: 110 night time: 70
	Measurement			dB(A)			day time: 75 night time: 50		day time: 110 night time: 70
	Measurement			dB(A)			day time: 75 night time: 50		day time: 110 night time: 70

(Remarks) National Environmental (Noise Control) Regulations

(Other remarks) Please attach additional sheets if required.

- VIBRATION

Item	Method	Frequency	Measurement Date & Month	Unit	Measured Value (Mean)	Measured Value (Max.)	Sri Lanka Standards*	Standards for Contract	Referred International Standards
Vibration Level	Measurement	Monthly					N/A		-
	Measurement						N/A		-
	Measurement						N/A		-

(Remarks) There has been no official standard stipulated by CEA.

(Other remarks) Please attach additional sheets if required.

- SOIL CONDITION

Item	Method	Frequency*	Measurement Date & Month	Monitoring Results during Report Period	Measures to be Taken
	Physical observation	bi-weekly			
	Physical observation	bi-weekly			
	Physical observation	bi-weekly			
	Physical observation	bi-weekly			
	Physical observation	bi-weekly			
	Physical observation	bi-weekly			
	Physical observation	bi-weekly			
(Remarks) Please attach additional sheets for bi-weekly re		bi-weekly			

(Other remarks) Please attach additional sheets if required.

- SOLID WASTE

Item	Method	Frequency	Measurement Date & Month	Monitoring Results during Report Period	Measures to be Taken
	Physical observation	Quarterly			

(Remarks) Please attach additional sheets if required.

3. NATURAL ENVIRONMENT

N/A

4. SOCIAL ENVIRONMENT

- WORKING CONDITION, SAFETY AND HEALTH

Item	Method	Frequency	Measurement Date & Month	Monitoring Results during Report Period	Measures to be Taken
	Physical observation	Quarterly			

(Remarks) Please attach additional sheets if required.

- TRAFFIC VOLUME (applied to UGC extention work only. Not applied to construction of grid substations)

Item	Method	Frequency*	Measurement Date & Month	Unit	Measured Value (Mean)	Measured Value (Max.)	Measures to be Taken
Traffic Volume		Weekly					

(Remarks) Please attach additional sheets for weekly reports if required.

(Other remarks) Please attach additional sheets if required.

- ACCIDENTS

Item	Method	Frequency*	Measurement Date & Month	Unit	Measured Value (Mean)	Measured Value (Max.)	Measures to be Taken
No of accidents by increased traffic*		Weekly					
No of accidents by construction work		Weekly					

(Remarks) 1. Please attach additional sheets for weekly reports if required.

2. No of accidents by increased traffic will be applied only to UGC extention work. Not applied to construction of grid substations.

(Other remarks) Please attach additional sheets if required.

Attachment 5-1 (1) Economic Cost Estimation of PJT 1

Colombo City Transmission Development Project

(million LKR)

Cost Item	Distribution											
	2015			2016			2017			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	1255.9	250.9	1506.8	14353.2	2867.6	17220.8	2332.4	466.0	2798.4	17941.5	3584.5	21526.0
Grid Substations	478.1	57.2	535.3	5464.1	654.0	6118.1	887.9	106.3	994.2	6830.2	817.5	7647.7
Material	478.1	49.0	527.1	5464.1	559.8	6024.0	887.9	91.0	978.9	6830.2	699.8	7530.0
Labor		8.2	8.2		94.2	94.2		15.3	15.3		117.7	117.7
TL and Distribution Cables	733.9	193.7	927.6	8387.4	2213.6	10601.0	1363.0	359.7	1722.7	10484.3	2767.0	13251.2
Material	733.9	184.2	918.1	8387.4	2105.6	10493.0	1363.0	342.2	1705.1	10484.3	2632.0	13116.3
Labor		9.4	9.4		108.0	108.0		17.5	17.5		134.9	134.9
Vehicles	43.9		43.9	501.7		501.7	81.5		81.5	627.1		627.1
Material	43.9		43.9	501.7		501.7	81.5		81.5	627.1		627.1
Labor												
Price Escalation	26.4	10.0	36.4	609.2	234.0	843.2	150.0	58.2	208.2	785.6	302.2	1087.8
Sub-total 1	1282.3	260.9	1543.2	14962.4	3101.6	18064.0	2482.4	524.2	3006.6	18727.1	3886.7	22613.8
Physical Contingencies	64.1	13.0	77.2	748.1	155.1	903.2	124.1	26.2	150.3	936.4	194.3	1130.7
Sub-total 2 (Total Cost)	1346.4	274.0	1620.4	15710.5	3256.6	18967.2	2606.6	550.4	3156.9	19663.5	4081.0	23744.5
Administrative cost		148.1	148.1		1728.2	1728.2		286.7	286.7		2163.0	2163.0
Total Before Levies	1346.4	422.1	1768.5	15710.5	4984.8	20695.3	2606.6	837.1	3443.7	19663.5	6244.0	25907.5
Levies		53.9	53.9		628.4	628.4		104.3	104.3		786.5	786.5
Grand Total	1346.4	476.0	1822.4	15710.5	5613.2	21323.7	2606.6	941.4	3547.9	19663.5	7030.5	26694.0
Financial Cost	1320.0	465.9	1785.9	15101.4	5379.2	20480.6	2456.5	883.2	3339.7	18877.9	6728.3	25606.2
Economic Cost	1320.0	386.7	1706.8	15101.4	4460.7	19562.0	2456.5	731.7	3188.2	18877.9	5579.1	24457.0

(Note)

Price escalation:			
For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-1 (2) Economic Cost Estimation of PJT 2

Construction of Kappalthurai 132/33 kV GS with related TL

(million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	109.9	13.5	123.4	1256.1	154.3	1410.4	204.1	25.1	229.2	1570.1	192.9	1763.0
Transmission Line	4.1	0.8	5.0	47.2	9.4	56.6	7.7	1.5	9.2	59.0	11.7	70.7
Material	4.1	0.7	4.8	47.2	7.5	54.7	7.7	1.2	8.9	59.0	9.4	68.4
Labor		0.2	0.2		1.9	1.9		0.3	0.3		2.3	2.3
Substations	105.8	12.7	118.5	1208.9	144.9	1353.8	196.4	23.5	220.0	1511.1	181.1	1692.2
Material	105.8	10.7	116.4	1208.9	121.9	1330.7	196.4	19.8	216.2	1511.1	152.3	1663.4
Labor		2.0	2.0		23.0	23.0		3.7	3.7		28.8	28.8
Price Escalation	2.3	0.5	2.8	53.3	12.6	65.9	13.1	3.1	16.3	68.7	16.3	85.0
Sub-total 1	112.2	14.0	126.3	1309.4	166.9	1476.3	217.2	28.2	245.4	1638.8	209.1	1848.0
Physical Contingencies	5.6	0.7	6.3	65.5	8.3	73.8	10.9	1.4	12.3	81.9	10.5	92.4
Sub-total 2 (Total Cost)	117.8	14.7	132.6	1374.9	175.2	1550.1	228.1	29.6	257.7	1720.8	219.6	1940.4
Administrative cost		13.0	13.0		151.2	151.2		25.1	25.1		189.3	189.3
Total Before Levies	117.8	27.7	145.5	1374.9	326.5	1701.3	228.1	54.7	282.8	1720.8	408.9	2129.7
Levies		4.7	4.7		55.0	55.0		9.1	9.1		68.8	68.8
Grand Total	117.8	32.4	150.2	1374.9	381.5	1756.3	228.1	63.8	291.9	1720.8	477.7	2198.5
Financial Cost	115.5	31.9	147.4	1321.5	368.9	1690.4	215.0	60.7	275.7	1652.0	461.4	2113.5
Economic Cost	115.5	25.9	141.4	1321.5	299.1	1620.6	215.0	49.2	264.1	1652.0	374.1	2026.2

(Note)

Price escalation:			
For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-1 (3) Economic Cost Estimation of PJT 3, 7 and 8

Construction of Grid Substations surrounding Colombo City (million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	272.3	45.5	317.8	3111.8	520.2	3632.0	505.7	84.5	590.2	3889.74	650.27	4540.01
Estimated base cost for construction 3	77.4	13.2	90.6	884.9	150.5	1035.3	143.8	24.4	168.2	1106.1	188.1	1294.2
Transmission Line	77.4	13.2	90.6	884.9	150.5	1035.3	143.8	24.4	168.2	1106.1	188.1	1294.2
Material	77.4	11.0	88.5	884.9	126.0	1010.9	143.8	20.5	164.3	1106.1	157.5	1263.6
Labor		2.1	2.1		24.5	24.5		4.0	4.0		30.6	30.6
Estimated base cost for construction 7	88.7	14.8	103.5	1014.0	169.2	1183.2	164.8	27.5	192.3	1267.5	211.5	1479.0
Transmission Line	12.4	2.5	14.9	141.6	28.2	169.8	23.0	4.6	27.6	177.0	35.2	212.2
Material	12.4	2.0	14.4	141.6	22.6	164.2	23.0	3.7	26.7	177.0	28.2	205.2
Labor		0.5	0.5		5.6	5.6		0.9	0.9		7.0	7.0
Substations	62.2	13.1	75.3	711.0	150.1	861.1	115.5	24.4	139.9	888.8	187.6	1076.4
Material	62.2	11.1	73.3	711.0	126.7	837.7	115.5	20.6	136.1	888.8	158.3	1047.1
Labor		2.1	2.1		23.5	23.5		3.8	3.8		29.3	29.3
Estimated base cost for construction 8	82.5	13.6	96.1	943.2	155.1	1098.3	153.3	25.2	178.5	1179.0	193.9	1372.9
Transmission Line	6.2	1.2	7.4	70.8	14.1	84.9	11.5	2.3	13.8	88.5	17.6	106.1
Material	6.2	1.0	7.2	70.8	11.3	82.1	11.5	1.8	13.3	88.5	14.1	102.6
Labor		0.2	0.2		2.8	2.8		0.5	0.5		3.5	3.5
Substations	81.6	12.3	93.9	932.6	141.0	1073.6	151.5	22.9	174.5	1165.8	176.2	1342.0
Material	81.6	10.3	91.9	932.6	117.5	1050.2	151.5	19.1	170.6	1165.8	146.9	1312.7
Labor		2.1	2.1		23.5	23.5		3.8	3.8		29.3	29.3
Price Escalation	5.0	1.7	6.7	116.3	39.5	155.8	28.7	9.8	38.5	150.0	51.0	201.0
Sub-total 1	244.9	44.0	288.9	2857.3	523.3	3380.6	474.1	88.4	562.5	3576.2	655.8	4232.0
Physical Contingencies	12.2	2.2	14.4	142.9	26.2	169.0	23.7	4.4	28.1	178.8	32.8	211.6
Sub-total 2 (Total Cost)	257.1	46.2	303.3	3000.1	549.5	3549.6	497.8	92.9	590.6	3755.0	688.6	4443.6
Administrative cost		28.3	28.3		330.0	330.0		54.8	54.8		413.0	413.0
Total Before Levies	257.1	74.5	331.6	3000.1	879.5	3879.6	497.8	147.6	645.4	3755.0	1101.6	4856.6
Levies		10.3	10.3		120.0	120.0		19.9	19.9		150.2	150.2
Grand Total	257.1	84.8	341.9	3000.1	999.5	3999.6	497.8	167.5	665.3	3755.0	1251.8	5006.8
Financial Cost	252.1	83.1	335.2	2883.8	960.0	3843.8	469.1	157.7	626.8	3605.0	1200.9	4805.8
Economic Cost	252.1	64.7	316.8	2883.8	747.4	3631.2	469.1	122.7	591.8	3605.0	934.9	4539.9

(Note)

Price escalation:				Income Tax of Labor	4.0%	According to the Personal Income Tax Law
For FC Portion:	2.1%		JICA			by Ministry of Finance and Planning Sri Lanka
For LC Portion:	4.0%		JICA	Standard conversion	0.9	JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA	factor (SCF):		
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA			
Levies (LC):	4.0%	of FC of Total before levies	CEB			

Attachment 5-1 (4) Economic Cost Estimation of PJT 5

Construction of Veyangoda - Kirindiwela - Padukka 220 kV TL

(million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	356.8	61.6	418.4	4078.1	703.4	4781.5	662.7	114.3	777.0	5097.6	879.3	5976.9
Transmission Line	175.5	39.7	215.1	2005.2	453.5	2458.7	325.8	73.7	399.5	2506.5	566.9	3073.4
Material	175.5	31.8	207.2	2005.2	363.2	2368.4	325.8	59.0	384.9	2506.5	454.0	2960.5
Labor		7.9	7.9		90.4	90.4		14.7	14.7		112.9	112.9
Substations	181.4	21.9	203.2	2072.9	249.9	2322.8	336.8	40.6	377.5	2591.1	312.4	2903.5
Material	181.4	18.3	199.6	2072.9	208.6	2281.5	336.8	33.9	370.7	2591.1	260.8	2851.9
Labor		3.6	3.6		41.3	41.3		6.7	6.7		51.6	51.6
Price Escalation	7.5	2.5	10.0	173.1	57.4	230.5	42.6	14.3	56.9	223.2	74.1	297.3
Sub-total 1	364.3	64.0	428.3	4251.1	760.8	5012.0	705.3	128.6	833.9	5320.8	953.4	6274.2
Physical Contingencies	18.2	3.2	21.4	212.6	38.0	250.6	35.3	6.4	41.7	266.0	47.7	313.7
Sub-total 2 (Total Cost)	382.5	67.2	449.8	4463.7	798.9	5262.6	740.6	135.0	875.6	5586.8	1001.1	6587.9
Administrative cost		42.1	42.1		491.0	491.0		81.5	81.5		614.6	614.6
Total Before Levies	382.5	109.3	491.8	4463.7	1289.9	5753.6	740.6	216.5	957.1	5586.8	1615.7	7202.5
Levies		15.3	15.3		178.5	178.5		29.6	29.6		223.5	223.5
Grand Total	382.5	124.6	507.1	4463.7	1468.4	5932.1	740.6	246.1	986.7	5586.8	1839.1	7426.0
Financial Cost	375.0	122.1	497.2	4290.6	1411.0	5701.7	698.0	231.8	929.8	5363.6	1765.0	7128.6
Economic Cost	375.0	101.0	476.1	4290.6	1166.2	5456.9	698.0	191.4	889.4	5363.6	1458.7	6822.3

(Note)

Price escalation:			
For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-1 (5) Economic Cost Estimation of Distribution Project Package 2

Distribution Project for North Western Province of Region 1

(million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	323.2	45.8	369.0	3,693.6	523.2	4,216.8	600.2	85.0	685.2	4,617.0	654.0	5,271.0
North Western Province of Region 1	323.2	45.8	369.0	3,693.6	523.2	4,216.8	600.2	85.0	685.2	4,617.0	654.0	5,271.0
Material	323.2	36.6	359.8	3,693.6	418.6	4,112.2	600.2	68.0	668.2	4,617.0	523.2	5,140.2
Labor		9.2	9.2		104.6	104.6		17.0	17.0		130.8	130.8
Price Escalation	6.8	1.8	8.6	156.8	42.7	199.5	38.6	10.6	49.2	202.2	55.1	257.3
Sub-total 1	330.0	47.6	377.6	3,850.4	565.9	4,416.3	638.8	95.6	734.5	4,819.2	709.1	5,528.3
Physical Contingencies	16.5	2.4	18.9	192.5	28.3	220.8	31.9	4.8	36.7	241.0	35.5	276.4
Sub-total 2 (Total Cost)	346.5	50.0	396.5	4,042.9	594.2	4,637.1	670.8	100.4	771.2	5,060.1	744.6	5,804.7
Administrative cost		38.1	38.1		444.7	444.7		73.8	73.8		556.6	556.6
Total Before Levies	346.5	88.1	434.6	4,042.9	1,038.9	5,081.8	670.8	174.2	845.0	5,060.1	1,301.2	6,361.3
Levies		13.9	13.9		161.7	161.7		26.8	26.8		202.4	202.4
Grand Total	346.5	102.0	448.4	4,042.9	1,200.6	5,243.5	670.8	201.0	871.8	5,060.1	1,503.6	6,563.7
Financial Cost	339.7	100.1	439.8	3,886.1	1,157.9	5,044.0	632.2	190.4	822.6	4,858.0	1,448.5	6,306.4
Economic Cost	339.7	82.0	421.7	3,886.1	947.3	4,833.5	632.2	155.6	787.8	4,858.0	1,185.0	6,042.9

(Note)

Price escalation:

For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-1 (6) Economic Cost Estimation of Distribution Project Package 3

Distribution Project for Western Province North of Region 2

(million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	453.7	81.3	535.1	5185.6	929.6	6115.2	842.7	151.1	993.7	6482.0	1162.0	7644.0
Western Province North of Region 2	453.7	81.3	535.1	5185.6	929.6	6115.2	842.7	151.1	993.7	6482.0	1162.0	7644.0
Material	453.7	65.1	518.8	5185.6	743.7	5929.3	842.7	120.8	963.5	6482.0	929.6	7411.6
Labor		16.3	16.3		185.9	185.9		30.2	30.2		232.4	232.4
Price Escalation	9.5	3.3	12.8	220.1	75.9	295.9	54.2	18.9	73.1	283.8	98.0	381.8
Sub-total 1	463.3	84.6	547.9	5405.7	1005.5	6411.1	896.9	169.9	1066.8	6765.8	1260.0	8025.8
Physical Contingencies	23.2	4.2	27.4	270.3	50.3	320.6	44.8	8.5	53.3	338.3	63.0	401.3
Sub-total 2 (Total Cost)	486.4	88.8	575.3	5676.0	1055.7	6731.7	941.7	178.4	1120.1	7104.1	1323.0	8427.1
Administrative cost		53.5	53.5		624.4	624.4		103.6	103.6		781.5	781.5
Total Before Levies	486.4	142.3	628.8	5676.0	1680.1	7356.1	941.7	282.0	1223.7	7104.1	2104.4	9208.5
Levies		19.5	19.5		227.0	227.0		37.7	37.7		284.2	284.2
Grand Total	486.4	161.8	648.2	5676.0	1907.1	7583.1	941.7	319.7	1261.4	7104.1	2388.6	9492.7
Financial Cost	476.9	158.5	635.4	5455.9	1831.3	7287.2	887.5	300.8	1188.3	6820.3	2290.6	9110.9
Economic Cost	476.9	131.5	608.4	5455.9	1517.4	6973.3	887.5	249.0	1136.5	6820.3	1897.9	8718.2

(Note)

Price escalation:			
For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-1 (7) Economic Cost Estimation of Distribution Project Package 4

Distribution Project for Western Province South-2 of Region 3

(million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	468.0	108.3	576.3	5,348.8	1,237.6	6,586.4	869.2	201.1	1,070.3	6,686.0	1,547.0	8,233.0
Western Province South-2 of Region 3	468.0	108.3	576.3	5,348.8	1,237.6	6,586.4	869.2	201.1	1,070.3	6,686.0	1,547.0	8,233.0
Material	468.0	86.6	554.7	5,348.8	990.1	6,338.9	869.2	160.9	1,030.1	6,686.0	1,237.6	7,923.6
Labor		21.7	21.7		247.5	247.5		40.2	40.2		309.4	309.4
Price Escalation	9.8	4.3	14.2	227.0	101.0	328.0	55.9	25.1	81.0	292.8	130.4	423.2
Sub-total 1	477.8	112.6	590.5	5,575.8	1,338.6	6,914.4	925.1	226.2	1,151.3	6,978.8	1,677.4	8,656.2
Physical Contingencies	23.9	5.6	29.5	278.8	66.9	345.7	46.3	11.3	57.6	348.9	83.9	432.8
Sub-total 2 (Total Cost)	501.7	118.3	620.0	5,854.6	1,405.5	7,260.1	971.4	237.5	1,208.9	7,327.7	1,761.3	9,089.0
Administrative cost		55.2	55.2		644.0	644.0		106.8	106.8		806.0	806.0
Total Before Levies	501.7	173.4	675.2	5,854.6	2,049.5	7,904.1	971.4	344.4	1,315.7	7,327.7	2,567.3	9,895.0
Levies		20.1	20.1		234.2	234.2		38.9	38.9		293.1	293.1
Grand Total	501.7	193.5	695.3	5,854.6	2,283.7	8,138.3	971.4	383.2	1,354.6	7,327.7	2,860.5	10,188.1
Financial Cost	491.9	189.2	681.1	5,627.6	2,182.7	7,810.3	915.4	358.1	1,273.6	7,034.9	2,730.0	9,765.0
Economic Cost	491.9	159.0	650.9	5,627.6	1,832.9	7,460.5	915.4	300.4	1,215.9	7,034.9	2,292.4	9,327.3

(Note)

Price escalation:

For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-1 (8) Economic Cost Estimation of Distribution Project Package 5

Distribution Project for Western Province South-1 of Region 4

(million LKR)

Cost Item	Distribution											
	2013			2014			2015			Total		
	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total	FC	LC	Sub-total
Estimated base cost for construction	307.7	52.4	360.0	3516.0	598.4	4114.4	571.4	97.2	668.6	4395.0	748.0	5143.0
Western Province South-1 of Region 4	307.7	52.4	360.0	3516.0	598.4	4114.4	571.4	97.2	668.6	4395.0	748.0	5143.0
Material	307.7	41.9	349.5	3516.0	478.7	3994.7	571.4	77.8	649.1	4395.0	598.4	4993.4
Labor		10.5	10.5		119.7	119.7		19.4	19.4		149.6	149.6
Price Escalation	6.5	2.1	8.6	149.2	48.8	198.1	36.8	12.1	48.9	192.4	63.1	255.5
Sub-total 1	314.1	54.5	368.6	3665.2	647.2	4312.5	608.1	109.4	717.5	4587.4	811.1	5398.5
Physical Contingencies	15.7	2.7	18.4	183.3	32.4	215.6	30.4	5.5	35.9	229.4	40.6	269.9
Sub-total 2 (Total Cost)	329.8	57.2	387.0	3848.5	679.6	4528.1	638.5	114.9	753.4	4816.8	851.6	5668.4
Administrative cost		36.3	36.3		423.3	423.3		70.2	70.2		529.8	529.8
Total Before Levies	329.8	93.5	423.3	3848.5	1102.9	4951.4	638.5	185.1	823.6	4816.8	1381.5	6198.3
Levies		13.2	13.2		153.9	153.9		25.5	25.5		192.7	192.7
Grand Total	329.8	106.6	436.5	3848.5	1256.9	5105.3	638.5	210.6	849.1	4816.8	1574.1	6391.0
Financial Cost	323.4	104.6	427.9	3699.3	1208.0	4907.3	601.8	198.5	800.2	4624.4	1511.1	6135.4
Economic Cost	323.4	86.5	409.8	3699.3	998.2	4697.5	601.8	163.8	765.6	4624.4	1248.5	5872.9

(Note)

Price escalation:			
For FC Portion:	2.1%		JICA
For LC Portion:	4.0%		JICA
Physical Contingencies (FC and LC)	5.0%	of Sub total 1	JICA
Administrative Cost (LC):	11.0%	of FC of Sub total 2	JICA
Levies (LC):	4.0%	of FC of Total before levies	CEB
Income Tax of Labor	4.0%		According to the Personal Income Tax Law by Ministry of Finance and Planning Sri Lanka
Standard conversion factor (SCF):	0.9		JICA

Attachment 5-2 (1) EIRR Calculation of PJT-1

Colombo City Transmission Development

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	1,320.0	386.7	17.7	1,724.4	0.0	0.0	0.0	0.0	-1,724.4	2241.7	-2241.7
2	2014	15,101.4	4,460.7	220.0	19,782.1	0.0	0.0	0.0	0.0	-19,782.1	25716.7	-25716.7
3	2015	2,456.5	731.7	252.9	3,441.1	293.1	20.9	4,351.0	4,664.9	1,223.8	4473.4	191.5
4	2016			252.9	252.9	296.4	21.1	4,405.2	4,722.7	4,469.8	328.8	4393.9
5	2017			252.9	252.9	299.8	21.3	4,460.2	4,781.4	4,528.5	328.8	4452.6
6	2018			252.9	252.9	303.3	21.6	4,516.0	4,840.9	4,588.0	328.8	4512.1
7	2019			252.9	252.9	306.8	21.8	4,572.6	4,901.2	4,648.3	328.8	4572.5
8	2020			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
9	2021			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
10	2022			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
11	2023			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
12	2024			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
13	2025			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
14	2026			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
15	2027			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
16	2028			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
17	2029			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
18	2030			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
19	2031			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
20	2032			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
21	2033			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
22	2034			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
23	2035			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
24	2036			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
25	2037			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
26	2038			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
27	2039			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
28	2040			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
29	2041			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
30	2042			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
31	2043			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
32	2044			252.9	252.9	310.3	22.1	4,630.1	4,962.5	4,709.6	328.8	4633.7
Total		18,877.9	5,579.1	7,824.7	32,281.7	9,256.9	658.7	138,056.7	147,972.4	115,690.7	41966.2	106006.2
Net present value (NPV):					21,724.8				34,438.0		28,242	
Economic internal rate of return (EIRR):										18.63%		14.68%
B/C ratio:										1.59		1.22

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (2) EIRR Calculation of PJT-2

Construction of Kappalthurai 132/33 kV GS with related TL

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	115.5	24.6	1.4	141.5	0.0	0.0	0.0	0.0	-141.5	184.0	-184.0
2	2014	1,321.5	284.3	17.5	1,623.3	0.0	0.0	0.0	0.0	-1,623.3	2110.3	-2110.3
3	2015	215.0	46.8	20.1	281.9	44.0	3.1	162.7	209.9	-72.0	366.5	-156.6
4	2016			20.1	20.1	47.2	3.4	174.5	225.0	204.9	26.1	198.9
5	2017			20.1	20.1	47.7	3.4	176.4	227.5	207.4	26.1	201.3
6	2018			20.1	20.1	52.5	3.7	194.1	250.3	230.2	26.1	224.2
7	2019			20.1	20.1	59.5	4.2	219.9	283.7	263.6	26.1	257.5
8	2020			20.1	20.1	62.4	4.4	230.8	297.6	277.5	26.1	271.5
9	2021			20.1	20.1	68.8	4.9	254.2	327.9	307.8	26.1	301.8
10	2022			20.1	20.1	74.9	5.3	276.8	357.0	336.9	26.1	330.9
11	2023			20.1	20.1	93.0	6.6	343.8	443.5	423.4	26.1	417.3
12	2024			20.1	20.1	113.7	8.1	420.2	541.9	521.8	26.1	515.8
13	2025			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
14	2026			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
15	2027			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
16	2028			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
17	2029			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
18	2030			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
19	2031			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
20	2032			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
21	2033			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
22	2034			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
23	2035			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
24	2036			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
25	2037			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
26	2038			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
27	2039			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
28	2040			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
29	2041			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
30	2042			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
31	2043			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
32	2044			20.1	20.1	137.6	9.8	508.9	656.3	636.2	26.1	630.2
Total		1,652.0	355.7	621.9	2,629.6	3,416.5	243.1	12,630.9	16,290.5	13,660.9	3418.5	12872.0
Net present value (NPV):					1,778.2				2,879.7		2,312	
Economic internal rate of return (EIRR):										16.59%		13.37%
B/C ratio:										1.62		1.25

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (3) EIRR Calculation of PJT-3, 7, and 8

Construction of Grid Substation surounding Colombo City

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	252.2	64.7	3.1	320.0	0.0	0.0	0.0	0.0	-320.0	416.0	-416.0
2	2014	2885.1	747.6	39.4	3672.1	0.0	0.0	0.0	0.0	-3672.1	4773.7	-4773.7
3	2015	469.3	122.7	45.4	637.4	15.5	1.1	250.2	266.8	-370.6	828.6	-561.9
4	2016			45.4	45.4	13.3	0.9	235.3	249.5	204.1	59.0	190.5
5	2017			45.4	45.4	21.5	1.5	368.9	391.9	346.5	59.0	332.9
6	2018			45.4	45.4	25.3	1.8	429.7	456.8	411.4	59.0	397.8
7	2019			45.4	45.4	29.9	2.1	498.1	530.2	484.8	59.0	471.2
8	2020			45.4	45.4	31.0	2.2	520.1	553.3	507.9	59.0	494.3
9	2021			45.4	45.4	76.2	5.4	1245.0	1326.6	1281.2	59.0	1267.6
10	2022			45.4	45.4	83.2	5.9	1333.4	1422.4	1377.0	59.0	1363.4
11	2023			45.4	45.4	92.7	6.6	1461.3	1560.6	1515.2	59.0	1501.6
12	2024			45.4	45.4	105.3	7.5	1635.6	1748.4	1703.0	59.0	1689.4
13	2025			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
14	2026			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
15	2027			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
16	2028			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
17	2029			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
18	2030			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
19	2031			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
20	2032			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
21	2033			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
22	2034			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
23	2035			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
24	2036			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
25	2037			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
26	2038			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
27	2039			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
28	2040			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
29	2041			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
30	2042			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
31	2043			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
32	2044			45.4	45.4	118.9	8.5	1810.4	1937.8	1892.4	59.0	1878.8
Total		3606.6	935.0	1404.5	5946.1	2872.2	204.4	44186.5	47263.0	41316.9	7729.9	39533.1
Net present value (NPV):					4,021.9				7,757.2		5228.4	
Economic internal rate of return (EIRR):										17.94%		14.95%
B/C ratio:										1.93		1.48

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (4) EIRR Calculation of PJT-5

Construction of Veyangoda-Kirindiwela-Padukka 220 kV TL

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	375.0	101.0	4.8	480.8	0.0	0.0	0.0	0.0	-480.8	625.0	-625.0
2	2014	4,290.6	1,166.2	59.4	5,516.2	0.0	0.0	0.0	0.0	-5,516.2	7171.1	-7171.1
3	2015	698.0	191.4	68.3	957.7	84.7	6.0	411.1	501.8	-455.9	1245.0	-743.2
4	2016			68.3	68.3	106.6	7.6	517.3	631.5	563.2	88.8	542.7
5	2017			68.3	68.3	132.3	9.4	641.9	783.6	715.3	88.8	694.8
6	2018			68.3	68.3	166.9	11.9	810.0	988.8	920.5	88.8	900.0
7	2019			68.3	68.3	210.5	15.0	1,021.6	1,247.2	1,178.9	88.8	1158.4
8	2020			68.3	68.3	262.5	18.7	1,273.6	1,554.7	1,486.4	88.8	1465.9
9	2021			68.3	68.3	263.0	18.7	1,276.3	1,558.0	1,489.7	88.8	1469.2
10	2022			68.3	68.3	267.4	19.0	1,297.3	1,583.7	1,515.4	88.8	1494.9
11	2023			68.3	68.3	283.0	20.1	1,373.1	1,676.3	1,608.0	88.8	1587.5
12	2024			68.3	68.3	284.0	20.2	1,378.1	1,682.4	1,614.1	88.8	1593.6
13	2025			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
14	2026			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
15	2027			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
16	2028			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
17	2029			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
18	2030			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
19	2031			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
20	2032			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
21	2033			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
22	2034			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
23	2035			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
24	2036			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
25	2037			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
26	2038			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
27	2039			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
28	2040			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
29	2041			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
30	2042			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
31	2043			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
32	2044			68.3	68.3	286.5	20.4	1,390.1	1,696.9	1,628.6	88.8	1608.2
Total		5,363.6	1,458.6	2,113.2	8,935.4	7,790.5	554.3	37,802.0	46,146.8	37,211.4	11616.0	34530.8
Net present value (NPV):					6,042.5				9,094.1		7,855	
Economic internal rate of return (EIRR):										16.11%		13.59%
B/C ratio:										1.51		1.16

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (5) EIRR Calculation of Distribution Package-2

Distribution Project for North Western Province of Region 1

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	339.7	82.0	10.5	432.2	0.0	0.0	0.0	0.0	-432.2	561.8	-561.8
2	2014	3,886.1	947.3	131.3	4,964.7	0.0	0.0	0.0	0.0	-4,964.7	6454.1	-6454.1
3	2015	632.2	155.6	151.1	938.9	213.2	15.2	738.8	967.1	28.3	1220.5	-253.4
4	2016			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
5	2017			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
6	2018			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
7	2019			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
8	2020			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
9	2021			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
10	2022			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
11	2023			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
12	2024			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
13	2025			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
14	2026			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
15	2027			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
16	2028			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
17	2029			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
18	2030			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
19	2031			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
20	2032			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
21	2033			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
22	2034			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
23	2035			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
24	2036			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
25	2037			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
26	2038			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
27	2039			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
28	2040			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
29	2041			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
30	2042			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
31	2043			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
32	2044			151.1	151.1	213.2	15.2	738.8	967.1	816.0	196.4	770.7
Total		4,858.0	1,184.9	4,674.8	10,717.7	6,394.8	455.0	22,163.9	29,013.7	18,296.1	13933.0	15080.8
Net present value (NPV):					6,061.0				6,824.1		7,879	
Economic internal rate of return (EIRR):										12.92%		8.87%
B/C ratio:										1.13		0.87

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (6) EIRR Calculation of Distribution Package-3

Distribution Project for Western Province North of Region 2

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	476.9	131.5	15.2	623.6	0.0	0.0	0.0	0.0	-623.6	810.7	-810.7
2	2014	5,455.9	1,517.4	189.5	7,162.8	0.0	0.0	0.0	0.0	-7,162.8	9311.6	-9311.6
3	2015	887.5	249.0	217.9	1,354.4	265.2	18.9	1,470.8	1,754.9	400.5	1760.7	-5.8
4	2016			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
5	2017			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
6	2018			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
7	2019			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
8	2020			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
9	2021			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
10	2022			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
11	2023			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
12	2024			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
13	2025			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
14	2026			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
15	2027			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
16	2028			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
17	2029			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
18	2030			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
19	2031			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
20	2032			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
21	2033			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
22	2034			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
23	2035			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
24	2036			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
25	2037			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
26	2038			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
27	2039			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
28	2040			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
29	2041			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
30	2042			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
31	2043			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
32	2044			217.9	217.9	265.2	18.9	1,470.8	1,754.9	1,537.0	283.3	1471.7
Total		6,820.3	1,897.9	6,741.7	15,459.9	7,956.9	566.2	44,125.1	52,648.2	37,188.3	20097.9	32550.3
Net present value (NPV):					8,743.8				12,383.0		11,367	
Economic internal rate of return (EIRR):										17.19%		12.37%
B/C ratio:										1.42		1.09

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (7) EIRR Calculation of Distribution Package-4

Distribution Project for Western Province South-2 of Region 3

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	491.9	159.0	16.3	667.2	0.0	0.0	0.0	0.0	-667.2	867.4	-867.4
2	2014	5,627.6	1,832.9	202.8	7,663.3	0.0	0.0	0.0	0.0	-7,663.3	9962.3	-9962.3
3	2015	915.4	300.4	233.2	1,449.0	208.8	14.9	1,736.6	1,960.2	511.2	1883.7	76.5
4	2016			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
5	2017			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
6	2018			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
7	2019			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
8	2020			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
9	2021			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
10	2022			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
11	2023			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
12	2024			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
13	2025			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
14	2026			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
15	2027			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
16	2028			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
17	2029			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
18	2030			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
19	2031			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
20	2032			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
21	2033			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
22	2034			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
23	2035			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
24	2036			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
25	2037			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
26	2038			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
27	2039			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
28	2040			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
29	2041			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
30	2042			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
31	2043			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
32	2044			233.2	233.2	208.8	14.9	1,736.6	1,960.2	1,727.0	303.2	1657.0
Total		7,034.9	2,292.3	7,215.1	16,542.3	6,263.0	445.6	52,097.5	58,806.2	42,263.9	21505.0	37301.2
Net present value (NPV):					9,355.3				13,831.4		12,162	
Economic internal rate of return (EIRR):										18.09%		13.09%
B/C ratio:										1.48		1.14

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

Attachment 5-2 (8) EIRR Calculation of Distribution Package-5

Distribution Project for Western Province South-1 of Region 4

No of Year	Year	Cost (million LKR)				Benefit (million LKR)						
		Construction cost		O&M cost	Total cost (A)	Due to energy cost savings	Due to CO2 reduction	Due to loss-reduction	Total benefit (B)	Cash Balance (B-A)	Total Cost +30% (C)	Cash Balance (B-C)
		FC	LC									
1	2013	323.4	86.5	10.2	420.1	0.0	0.0	0.0	0.0	-420.1	546.1	-546.1
2	2014	3,699.3	998.2	127.6	4,825.1	0.0	0.0	0.0	0.0	-4,825.1	6272.6	-6272.6
3	2015	601.8	163.8	146.7	912.3	96.7	6.9	670.1	773.6	-138.6	1185.9	-412.3
4	2016			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
5	2017			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
6	2018			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
7	2019			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
8	2020			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
9	2021			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
10	2022			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
11	2023			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
12	2024			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
13	2025			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
14	2026			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
15	2027			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
16	2028			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
17	2029			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
18	2030			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
19	2031			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
20	2032			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
21	2033			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
22	2034			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
23	2035			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
24	2036			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
25	2037			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
26	2038			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
27	2039			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
28	2040			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
29	2041			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
30	2042			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
31	2043			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
32	2044			146.7	146.7	96.7	6.9	670.1	773.6	626.9	190.7	582.9
Total		4,624.4	1,248.5	4,538.8	10,411.7	2,900.0	206.3	20,102.3	23,208.6	12,797.0	13535.2	9673.5
Net present value (NPV):					5,889.5				5,458.7		7,656	
Economic internal rate of return (EIRR):										9.85%		6.28%
B/C ratio:										0.93		0.71

(Note)

Discount rate	11.0%		
O&M cost	1.0%	of Total PJ cost (Transmission)	
	2.5%	of Total PJ cost (Distribution)	
Generation Cost	13.07	LKR/kWh	CEB
Price Per GWh	0.93	LKR m/GWh	CEB / IEA
Value of Energy	604	LKR/kWh	CEB / Central Bank

ANNEX

CANDIDATE PROJECTS

IN LONG-TERM DEVELOPMENT PLAN

ANNEX CANDIDATE PROJECTS IN LONG-TERM DEVELOPMENT PLAN

1. Introduction

Initially, the Survey Team was provided with the list of priority projects for Japan's Load Aid in the light of requests to the Japanese Government as shown in Table 1-1. Among them, some of which have not been nominated in shortlist resubmitted by CEB. However there are some transmission projects which can be regarded as important and feasible, especially for No. 3, 4, and 8 projects listed in the table. These projects had not been finally selected in shortlist, but are to be summarized in this Annex for future study.

Table 1-1 Initial Shortlist for Japan's Loan Aid (as of July 2012)

No.	Sub-projects	Base Costs (MUS$)
1	Colombo City Transmission Development	135
2	Distribution Losses Reduction Programme	60
3	Polpitiya – Habarana 132 kV TL Project	40
4	Rehabilitation of Kiribathkumbura 132/33 kV GS	6
5	Construction of Veyangoda – Thulhiriya 132 kV TL	9
6	Construction of Veyangoda – Padukka 220 kV TL	17
7	Construction of Kirindiwela 220/132 kV SwS and 132/33 kV GS and Krindiwela – Kosgama 132kV TL	20
8	Construction of Kotmale – New Polpitiya 220 kV TL	12
9	Construction of Chemmuni 132/33 kV GS	10
10	Construction of Kerawalapitiya 220/33 kV GS	10
11	Construction of Kappalturai 132/33 kV GS	8
12	Construction Kalutara 132/33 kV GS	8
	Total	335

(Source: CEB Transmission Planning)

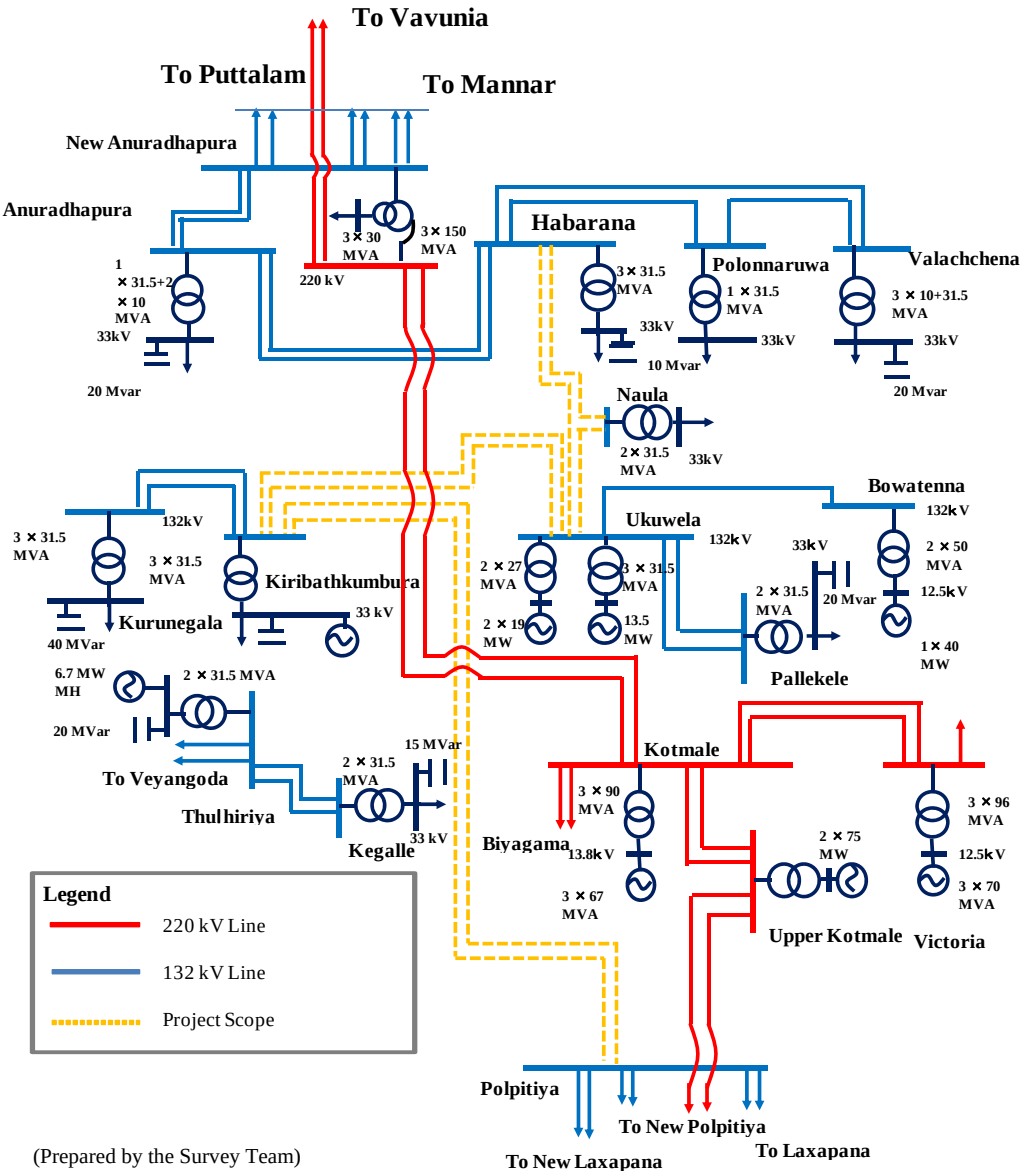
2. Candidate Transmission Projects

2.1 Reconstruction of Polpitiya – Habarana 132 kV TL

(1) Objective

The existing double-circuit 132 kV transmission line from Polpitiya to Habarana via Kiribathkumbura, Ukuwela GSs are Lynx conductors with maximum design temperature of 54°C with day time rating of 45 MVA. These transmission lines transmit bulk power generated at Laxapana Hydro Power Complex, Ukuwela and Bowatenna HPPs to the North, North Central and Eastern Provinces. These lines are more than 40 years old and the present conditions of the lines are poor. Furthermore, two new GSs at Naula and Pallekelle are to be connected to the same transmission line by the end 2013. Expansions to the existing GSs at Ukuwela, Habarana and Kurunegala are underway and are to be completed by the end of 2013. Many areas in Central and North Central Provinces depend on this transmission line for power supply and the importance of the transmission line is increasing. In system operations, System Control Centre faces difficulties in meeting the demand in the aforementioned GSs at times when Ukuwela and/or Bowatenna PPs are not in operation. This transmission line has been identified as a serious bottleneck in system operation and it needs to be reconstructed as soon as possible.

Figure 2-1 shows current transmission network related to the Polpitiya – Habarana 132 kV Transmission Line Project.



(Prepared by the Survey Team)

Figure 2-1 Transmission Network related to Polpitiya – Habarana 132 kV TL

This project implemented to improve the stability and reliability of the transmission system and to meet the growing demand by means of reconstructing the transmission lines via the replacement of the old conductors by ACSR Zebra designed with a 75°C maximum operation temperature. Meanwhile, the transmission line is associated with the Ukuwela and Upper Kotmale HPPs which are rehabilitated under Japan's Loan Aid. The line runs near Upper Kotmale HPP and is connected directly to Ukuwela HPP and transmits the generated power from these plants.

In Long-term Transmission Development Plan 2011 -2020, CEB has scheduled completion of the project in 2014.

(2) Scope of the Project

1) Reconstruction of Polpitiya - Kiribathkumbura 132 kV TL (Zebra, 2-cct., 52 km)

2) Reconstruction of Kiribathkumbura - Ukuwela 132 kV TL (Zebra, 2-cct., 30 km)
3) Reconstruction of Ukuwela - Habarana 132 kV TL (Zebra, 2-cct., 82 km)
4) Removal of the existing transmission line (Lynx, 2-cct, 164 km)

(3) Base Costs

Table 2-1 shows the project cost estimated by the Transmission Planning of CEB, which has adapted Zebra conductor. The estimated total project cost (base cost) is LKR 2,562.8 million (FC) and LKR 1,458.1 million (LC).

Table 2-1 Project Cost of Polpitiya - Habarana TL Reconstruction (with Zebra Conductors)

Scope	km	Unit Cost (MLKR)		Total Cost (MLKR)	
		FC	LC	FC	LC
1) 132 kV Polpitiya – Kiribathkumbura TL Zebra 2 cct. 52 km	52	16.18	8.44	841.12	438.92
2) 132 kV Kiribathkumbura – Ukuwela TL Zebra 2 cct. 30 km	30	16.18	8.44	485.26	253.23
3) Ukuwela –Habarana 132 kV TL Zebra 2 cct. 82 km	82	16.18	8.44	1,326.38	692.15
4) Removal of existing transmission line, Lynx 2 cct. 164 km	164	0.00	0.45	0.00	73.80
Total 1)～4)				2,652.76	1,458.10
Grand Total					4,110.86

(Source: CEB Transmission Planning)

Table 2-2 shows the revised project cost estimated by the Survey Team, which has adapted LL-ACSR conductors. The estimated total project cost is LKR 5,200.8 million (FC) and LKR 1,041.7 million (LC), which is equivalent to JPY 3,732.0 million in total.

Table 2-2 Project Cost of Polpitiya - Habarana TL Reconstruction adapting LL-ACSR conductors

Scope	km	Unit Cost (MLKR)		Total Cost (MLKR)	
		FC	LC	FC	LC
1) 132 kV Polpitiya – Kiribathkumbura TL LL-ACSR/AS 2 cct. 52 km	52	31.71	5.87	1,649.04	305.45
2) 132 kV Kiribathkumbura – Ukuwela TL LL-ACSR/AS 2 cct. 30 km	30	31.71	5.87	951.37	176.22
3) Ukuwela –Habarana 132 kV TL LL-ACSR 2 cct. 82 km	82	31.71	5.87	2,600.41	481.67
4) Removal of existing transmission line, Lynx 2 cct. 164 km	164	0.00	0.48	0.00	78.31
Total 1)～4)				5,200.82	1,041.65
Grand Total					6,242.47

(Prepared by the Survey Team)

(4) Transmission Loss Reduction studied by CEB

According to the proposal provided by CEB, transmission losses in four cases are calculated as shown in Table 2-3.

Table 2-3 Loss Calculation of Polpitiya-Habarana TL by CEB

	loss reduction (MW)			
Scenarios	Night Thermal	Night Hydro	Day Thermal	Day Hydro
Existing132 kV TL with Lynx	73	68	41	41
Proposed 132 kV TL with Zebra	70	65	40	40
Loss Reduction Value (MW)	3	3	1	1
Loss Reduction Ratio (%)	4.1	4.4	2.4	2.4

(Source: CEB Transmission Planning)

The result shows that the loss reduction ratio, brought by the reconstruction of the transmission line with Zebra, will approximately be 4.4 % at the night peak with hydro generation case.

(5) Transmission Line Route

Figure 2-2 shows Polpitiya – Habarana 132 kV transmission line route.

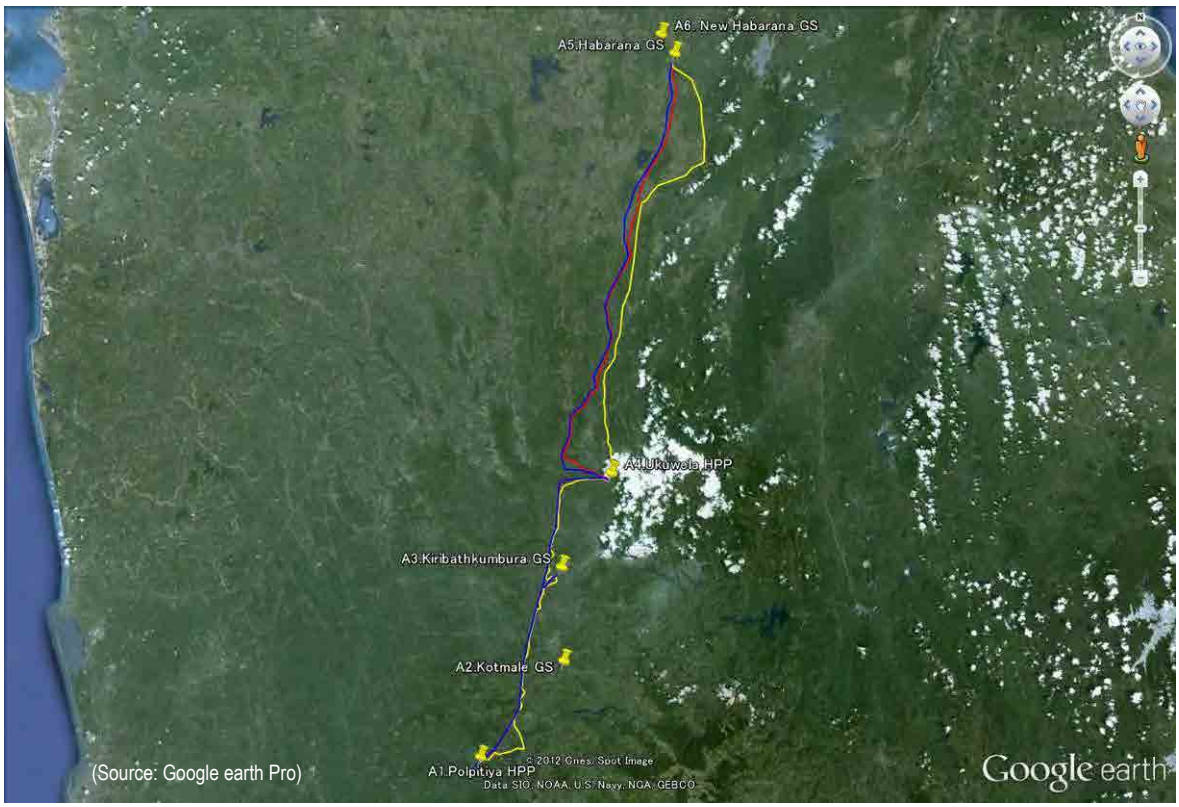


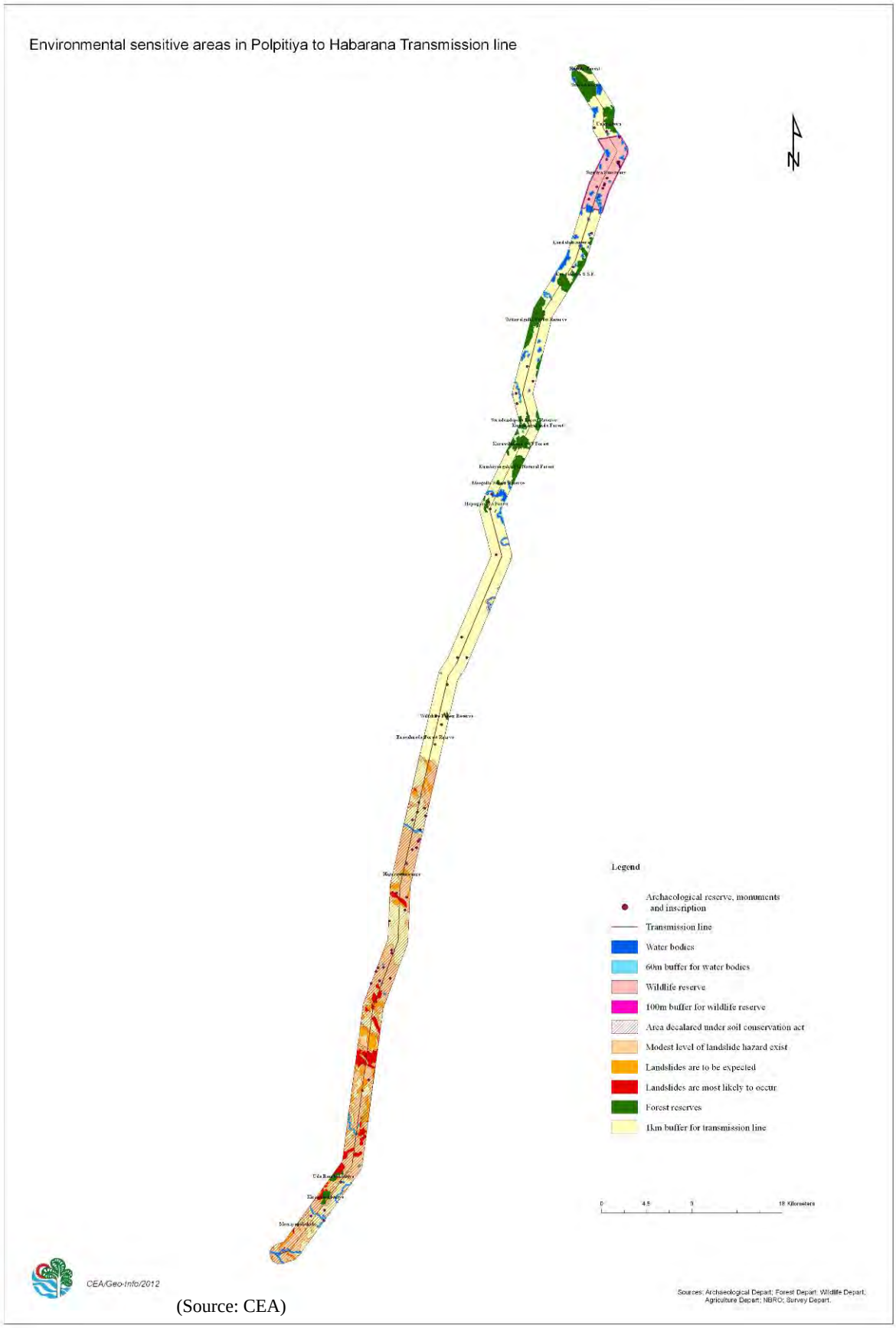
Figure 2-2 Polpitiya – Habarana 132 kV TL Route

Blue lines show the existing line route, and red lines show planned route, which is assumed to set the route offsetting about 50 m away from the existing line. However, there are lots of historic ruins monuments and houses as well as a World Heritages such as Sigiria. Therefore, in planning the route, it is inevitable to study alternative routes to prevent obstacles as shown in yellow lines which are proposed by the Survey Team through preliminary study.

The Transmission Design and Environment Branch of CEB is studying optimized transmission route so that the route could avoid obstacles and minimize route distance.

(6) Environmental and Social Considerations

The Survey Team has collected GIS maps from CEA indicating the land use along with the existing transmission lines between Polpitiya and Habarana for 164 km which was extended over 40 years ago (see Figure 2-3). The hilly area between Nuwara Eliya and Kandy Districts is declared as the environmental sensitive area by the Soil Conservation Department and landslides are expected to occur at any time in rainy season. Between Kandy and Polonnaruwa Districts there are archaeological ruins and forest reserves, and there is a world cultural heritage up close to Habarana.



(Source: CEA)

Figure 2-3 Land Use along with the Existing TL between Polpitiya – Habarana

CEB is carefully planning new transmission route to avoid cultural heritages, archaeological ruins,

forest reserves, and settlements. Installation of overhead transmission lines with a length exceeding 10 km and voltage above 50 kV is one of the prescribed projects in NEA, and thus CEB is required to undertake an IEE/EIA if they wish to implement this project.

Table 2-4 shows provisional scoping results based on relevant legislation of Sri Lanka, JICA Guidelines, and information gathered from CEA. Further site survey and consultation with relevant departments will be necessary for feasibility study.

Table 2-4 Possible Impacts to Reconstruction of Polpitiya- Habarana 132kV TL Project

No	Impact Item	Rating		Brief Description
		Design/ Construction Stage	Operation Stage	
Pollution				
1	Air Pollution	B-	D	<construction phase> Air pollution such as exhaust fumes from earthmoving equipment as well as construction vehicles associated with the tower and substation construction is anticipated. However, the impact is temporary and anticipated to be minor. <operation phase> N/A
2	Water Pollution	B-	D	<construction phase> Waste water discharge associated with the construction of towers and substations is anticipated. However, the impact is temporary and anticipated to be minor. <operation phase> N/A
3	Waste generation and disposal of construction debris	B-/C	B-	<construction phase> Generation of materials resulting from construction activities and generation of litter due to the presence of the project employees and contractors are expected. Vegetation waste resulting from forest clearance is anticipated as well. Through the IEE, information on local waste treatment needs to be collected. The extent of the impact is unknown at this stage. <operation phase> Waste generated at substations have to be well managed and disposed appropriately in order not to cause water quality degradation or soil contamination in the surrounding areas.
4	Dust emission	B-	D	<construction phase> Dust emissions associated with the construction of towers and substations is anticipated. However, the impact is temporary and anticipated to be minor. <operation phase> N/A
5	Soil contamination	B-	D	<construction phase> Waste water discharge associated with the construction of towers and substations may cause soil contamination. However, the impact is temporary and anticipated to be minor. <operation phase> N/A
6	Noise and vibration	B-	D	<construction phase> Noises and vibration associated with the construction of towers and substations is anticipated. However, the impact is temporary and anticipated to be minor. <operation phase> N/A
7	Accidents, injury or sickness of residents nearby or workers	B-/C	B-/C	<construction phase> Increased risk of accidents associated with the construction of towers and substations is expected. Through the IEE, the information on population density needs to be collected. The extent of the impact is unknown at this stage. <operation phase> With mitigation measures such as installation of "keep out" boards at each transmission tower, impacts could be avoided. Day-to-day safety management is essential.
Natural Environment				
8	Disturbance to protected areas, wild life and biodiversity	B-/C	B-/C	<construction phase> The TL route is designed to avoid national protected areas. In conducting the site survey, information on a habitat of endangered species and protected areas needs to be collected. The extent of the impact is unknown at this stage. <operation phase> Migratory birds may be affected if there is not a mitigation measure. Via appropriate monitoring and mitigation measures, such impacts should be minimized.
9	Clearing of forest	B-/C	D	<construction phase> Some impacts cannot be avoided when construction of towers and substations and extension of transmission lines are taken place. Although the TL route is designed to avoid forest reserves and TOF (trees outside forests) and the anticipated impacts are minor, detailed information on the land use within the project area needs to be collected through the IEE. <operation phase> N/A
10	Soil erosion	B-/C	D	<construction phase> Although the TL route is designed not to pass the environmental sensitive areas and the anticipated impacts are minor, detail information on the land use within the project area needs to be collected through the IEE.

No	Impact Item	Rating		Brief Description
				<operation phase> N/A
11	Disturbance to groundwater	C	D	<construction phase> The information on water use in the project area needs to be collected through the IEE. The extent of the impact is unknown at this stage. <operation phase> N/A
Social Environment				
12	Resettlement	B-/C	C	<construction phase> The TL route is designed to avoid settlement areas. It however needs to be reviewed thoroughly and if necessary re-aligned based on information to be collected through the IEE. The extent of the impact is unknown at this stage. <operation phase> Depending on the TL route, resettlement is to be avoided.
13	Losses of livelihood means	B-/C	D	<construction phase> Some residential activity interruption is expected due to the construction of towers and substations and extension of transmission lines. Temporary losses of livelihood means are anticipated during the construction period. The extent of the impact is unknown at this stage and further information is to be collected through the IEE. <operation phase> N/A
14	Deterioration of local economy	C-	B-/C	<construction phase> Temporary losses of livelihood means are anticipated during the construction period. The extent of the impact is unknown at this stage and further information is to be collected. <operation phase> Communication line interference via an electrostatic induced current is expected. With appropriate monitoring and mitigation measures such as the installation of additional antennas the impact is to be minimized.
15	Disturbance to water usage	B-	D	<construction phase> When a large amount of surface water is used during the construction phase, some impact is to be expected. <operation phase> N/A
16	Loss of historical, cultural and archaeological properties and heritages	A-/C	A-/C	<construction phase> Depending on the TL route, severe impact is expected. Based on information to be collected through the IEE, the TL route needs to be reviewed and if necessary, re-aligned in order to avoid those areas. The extent of the impact is unknown at this stage. <operation phase> ditto
17	Disturbance to social infrastructures and services	B-	D	<construction phase> Some social infrastructure disturbance is expected due to the construction of towers and substations. However, the impact will be temporary and anticipated to be minor. <operation phase> N/A
18	Destruction of landscape	A-/C	A-/C	<construction phase> Depending on the TL route, severe impact is expected. Based on information to be collected through the IEE, the TL route needs to be reviewed and if necessary, re-aligned in order to avoid destruction of landscape. The extent of the impact is unknown at this stage. <operation phase> ditto
19	Disturbance to poor people	C	D	<construction phase> Through conducting the IEE, information about where peoples' needs are vulnerable must to be collected. The extent of the impact is unknown at this stage. <operation phase> N/A
20	Disturbance to ethnic and indigenous people	D	D	<construction phase> There are no ethnic and indigenous people admitted in the TL route. <operation phase> ditto
21	Infectious diseases such as HIV/AIDS	B-/C	D	<construction phase> Temporary influx of migrant labor during the construction period increases the risk of sexual transmitted diseases incidents in the project area. Through conducting the IEE, information on infectious diseases needs to be collected. The extent of the impact is unknown at this stage. <operation phase> N/A

(Prepared by the Survey Team)

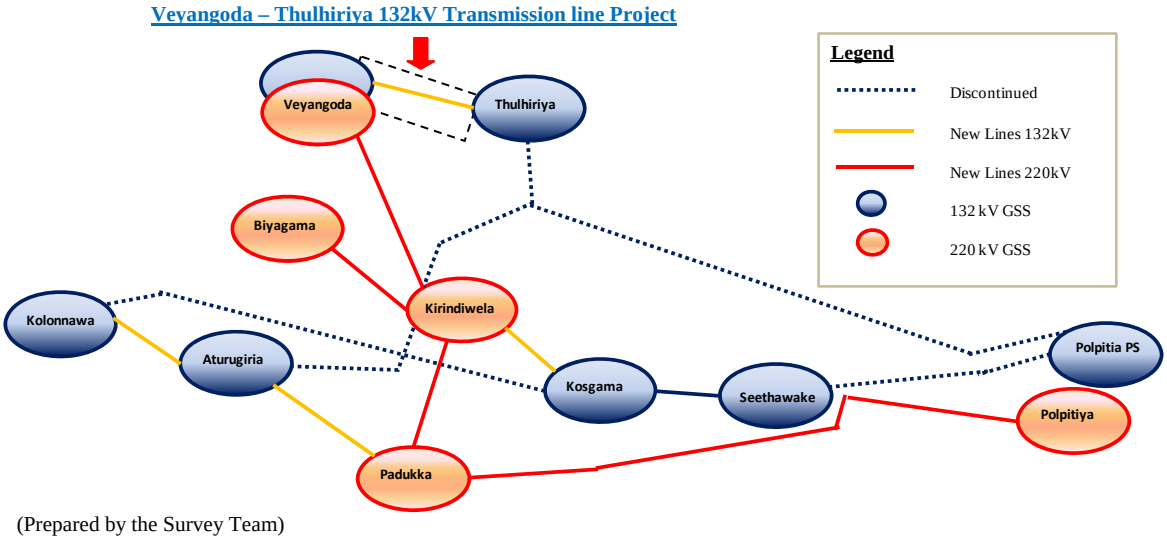
Legend: A+/-: Significant positive / negative impact is expected., B+/-: Positive / negative impact is expected to some extent., C+/-: Extent of positive / negative impact is unknown (a further examination is needed, and the impact could be clarified as the study progresses), and D: No impact is expected

2.2 Construction of Veyangoda – Thulhiriya 132 kV TL

(1) Objective

At present, Thulhiriya GS is supplied by the Kolonnawa - Polpitiya 132 kV transmission line, which was constructed in 1959. Rehabilitation works to the existing 132 kV transmission lines between Kolonnawa and Polpitiya have been proposed in the Long-term Transmission Development Plan 2011-2020 to overcome problems related to capacity limitation of 132 kV Polpitiya - Kolonnawa TL and

Kotmale - Biyagama 220 kV TL. As part of this development, Veyangoda- Thulhiriya 132 kV line with 28 km Zebra conductor is proposed not only to be implemented to supply power to Thulhiriya GS but also to enhance network reliability. Figure 2-4 shows planned transmission network around the project.



(Prepared by the Survey Team)

Figure 2-4 Planned Transmission Network around Veyangoda – Thulhiliya TL

(2) Scope of the Project

- Construction of 132 kV Thulhiriya – Veyangoda double-circuit TL, Zebra, 28 km

(3) Base Cost

Table 2-5 shows the project cost estimated by the CEB Transmission Planning, which has adapted Zebra conductors. The estimated total project cost (base cost) is LKR 460.9 million (FC) and LKR 265.4 million (LC).

Table 2-5 Cost of Veyangoda – Thulhiriya 132 kV TL Project with Zebra conductors

Scope	Q'ty	Unit Cost (MLKR)		Total Cost (MLKR)	
		FC	LC	FC	LC
1) Veyangoda – Thulhiriya 132 kV, Zebra double-circuit line	28 km	16.46	9.48	460.9	265.4
			Total (FC+LC)		726.3

(Source: CEB Transmission Planning)

Table 2-6 shows the revised project cost estimated by the Survey Team, which has adapted LL-ACSR conductors. The estimated total project cost is LKR 897.9 million (FC) and LKR 164.9 million (LC), which is equivalent to JPY 629.63 million in total.

Table 2-6 Revised Cost of Veyangoda – Thulhiriya 132 kV TL Project with LL-ACSR conductors

Description	Q'ty	Unit Cost (MLKR)		Total Cost (MLKR)	
		FC	LC	FC	LC
1) Veyangoda – Thulhiriya 132 kV, LL-ACSR double-circuit line	28 km	31.71	5.87	887.95	164.47
2) Removal of Existing 132 kV TL, ACSR Lynx at Thulhiriya GS	1 lot	0	0.48	0	0.48
			Total1)～2)	897.95	164.95
			Total (FC+LC)		1,052.90

(Prepared by the Survey Team)

(4) Effect of Loss Reduction studied by CEB

It has been observed that Thulhiriya GS is fed from Kolonnawa side during thermal maximum night peak scenario and from Polpitiya side during hydro maximum night peak scenario. Transmission losses incurred on the system when supplying Thulhiriya and Kegalle loads in two scenarios with and without the proposed Veyangoda - Thulhiriya 132 kV line are depicted in Table 2-7

Table 2-7 Loss Calculation of Veyangoda – Thulhiriya 132 kV TL Project by CEB

Scenarios	Transmission Losses (MW)	
	Night Thermal	Night Hydro
Without 132 kV Veyangoda – Thulhiriya Transmission line	3.4	2.8
With 132 kV Veyangoda – Thulhiriya Transmission line	0.6	0.6
Loss Reduction Value(MW)	2.8	2.2
Loss Reduction Ratio (%)	82.4	78.6

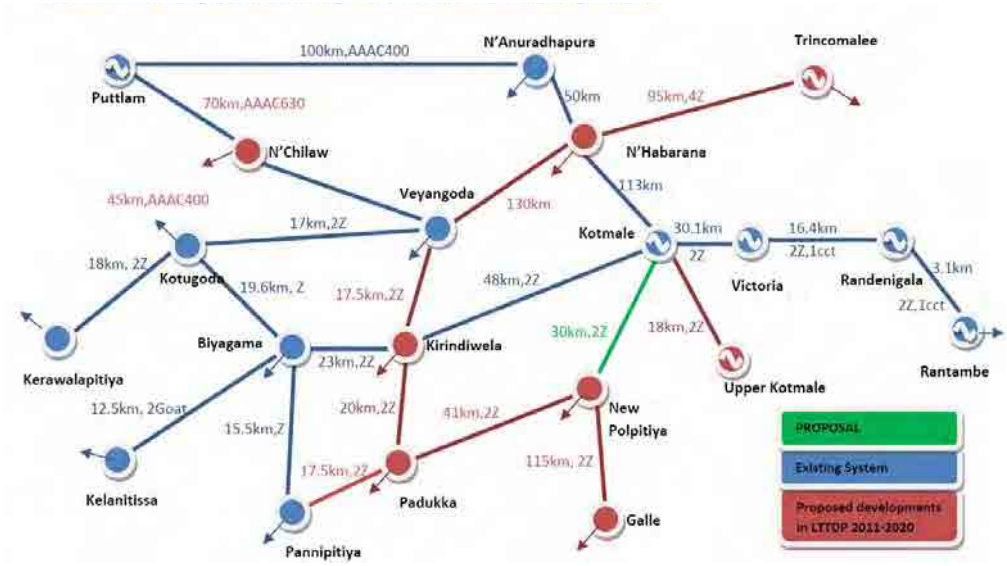
(Source: CEB Transmission Planning)

2.3 Construction of Kotmale – New Polpitiya 220 kV TL

(1) Objective

At present, power transmission from Mahaweli Complex to the load center in Colombo is facilitated by Kotmale – Biyagama 220 kV double-circuit transmission line. This line is the backbone of the present 220 kV network. Outage of the double-circuit line could lead to a major power system failure since power system has been designed for single contingency condition. This project provides an alternative path to transmit power generated from Mahaweli Complex to the load center via New Polpitiya and Padukka GSs. It will improve the reliability of the system.

Electricity demand in Southern Province is increasing at a rate of 9.2 % per annum. Therefore, to provide quality and reliable power supply, 220 kV network needs to be extended to the Southern Province in the future. The Long-term Transmission Development Plan 2011 - 2020 proposes a 220 kV transmission connection to New Galle from New Polpitiya to strengthen the southern grid. Kotmale - New Polpitiya 220 kV transmission line is a part of this development as shown in Figure 2-5.



(Source: CEB Transmission Planning)

Figure 2-5 Planned Network Development in Southern Region

(2) Scope of the Project

1) Construction of 220 kV Kotmale – New Polpitiya, 2 x Zebra, 30 km, double-circuit TL
2) Construction of 2 x 220 kV one-and-half breaker busbar line bays at Kotmale HPP

(3) Estimated Base Cost

Table 2-8 shows the project cost estimated by the CEB Transmission Planning. The estimated total project cost (base cost) is 1,120 MLKR (FC) and 455 MLKR (LC).

Table 2-8 Cost for Kotmale – New Polpitiya 220 kV TL Project adapting ACSR Conductors

Description	Q'ty	Unit Cost (MLKR)		Total Cost (MLKR)	
		FC	LC	FC	LC
1) Kotmale – New Polpitiya 220 kV, 2 x Zebra double circuit TL	30 km	33	15	982	445
2) 2x220 kV one-and-half breaker busbar line bays at Kotmale PP	2 units	69	5	138	11
			Total 1)～2)	1,120	455
			Total (FC+LC)		1,575

(Source: CEB Transmission Planning)

Table 2-9 shows the project cost estimated by the Survey Team, which has adapted LL-ACSR conductor. The estimated total project cost is LKR 1,920.6 million (FC) and LKR 371.3 million (LC), which is equivalent to JPY 2,292.0 million in total.

Table 2-9 Cost for Kotmale – New Polpitiya 220 kV TL Project adapting LL-ACSR Conductor

Description	Q'ty	Unit Cost (MLKR)		Total Cost (MLKR)	
		FC	LC	FC	LC
1) Kotmale – New Polpitiya 220 kV, 2 x LL-ACSR double circuit TL	30 km	58.36	12.19	1,750.69	365.76
2) 2x220 kV one-and-half breaker busbar line bays at Kotmale PP	2 units	84.97	2.78	169.94	5.56
			Total 1)～2)	1,920.63	371.32
			Total (FC+LC)		2,291.95

(Prepared by the Survey Team)

(4) Effect of Loss Reduction studied by CEB

According to CEB, transmission losses between Kotmale GS– New Polpitiya GS in four cases of 2015 and 2020 are calculated in Table 2-10.

Table 2-10 Loss Calculations in 2015 and 2020

Scenario	Transmission Losses in 2015 (MW)				Transmission Losses in 2020 (MW)			
	Night Thermal	Night Hydro	Day Thermal	Day Hydro	Night Thermal	Night Hydro	Day Thermal	Day Hydro
Without Kotmale–New Polpitiya	74.83	72.42	43.46	43.93	94.63	100.50	76.17	62.94
With Kotmale–New Polpitiya	73.24	70.16	40.75	43.66	89.08	95.74	73.10	63.70
Loss Reduction Value	1.59	2.26	2.71	0.27	5.55	4.76	3.07	0.76
Loss Reduction Ratio (%)	2.1	3.4	6.2	0.6	5.9	4.7	4.0	1.2

(Source: CEB Transmission Planning)