

Initial Environmental Examination

Project Number: 41614
August 2014

IND: Assam Power Sector Enhancement Investment Program – Tranche 4

Prepared by:
Assam Power Distribution Company Limited
Government of Assam

The initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

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CURRENCY EQUIVALENTS

(As of 15 August 2014)
Currency Unit – Indian Rupees (Rs)
Rs 1.00 = \$0.017
\$1.00 = Rs 60.20

ABBREVIATIONS

ADB	– Asian Development Bank
AEGCL	– Assam Electricity Grid Corporation Limited
AERC	– Assam Electricity Regulatory Commission
APGCL	– Assam Power Generation Corporation Limited
APDCL	– Assam Power Distribution Company Limited
APCB	– Assam Pollution Control Board
ASEB	– Assam State Electricity Board
CEA	– Central Electricity Authority
CPCB	– Central Pollution Control Board, Government of India
DC or D/C	– Double Circuit
DPR	– Detailed Project Report
EA	– Executing Agency
EARF	– Environmental Assessment and Review Framework
EHV	– Extra High Voltage
EIA	– Environmental Impact Assessment
EMoP	– Environmental Monitoring Plan
EMP	– Environmental Management Plan
ESMU	– Environment and Social Management Unit
GHG	– Greenhouse Gas
GoA	– Government of Assam
GoI	– Government of India
GSS	– Grid Sub-station
GRM	– Grievance Redress Mechanism
IA	– Implementing Agency
IEE	– Initial Environmental Examination
MFF	– Multitranchise Financing Facility
MOEF	– Ministry of Environment and Forests, Government of India
MSL	– Mean Sea Level
PIU	– Project Implementing Unit
PMU	– Project Management Unit
ROW	– Right of Way
RP	– Resettlement Plan
SC or S/C	– Single Circuit
SF ₆	– Sulphur Hexafluoride

WEIGHTS AND MEASURES

Ha. (hectare)	– 10,000 sq m = 2.47105 Acre
GW	– Gigawatt
km (kilometer)	– 1,000 meters
kV	– kilovolt (1,000 volts)
kW	– kilowatt (1,000 watts)
MVA	– Megavolt Ampere
MW	– Megawatt
MU	– Million Units

EXECUTIVE SUMMARY

1. The Government of Assam (GoA), through the Government of India (GoI, the Borrower) has requested the Asian Development Bank (ADB) for funding through the Multitranche Financing Facility (MFF) which was approved on 18 November 2009. This project will be the Tranche 4 from the MFF with an estimated total loan amount of \$50.2 million. APDCL will be the Executing Agency (EA) of Tranche 4.

2. The Tranche 4 project consists of the following outputs:

- **Output 1:** Enhanced capacity of sub-transmission system includes:
 - (a) augmentation of 6 transformers with addition of total capacity of 22.1 MVA;
 - (b) construction of 477 km of 33 kV lines (378.2 km for connecting new substations and 98.8 km for system strengthening), and
 - (c) construction of 33 kV railway/river crossing and 33 kV terminal bays.
- **Output 2:** Enhanced capacity of distribution system includes:
 - (a) construction of twenty (20) new 33/11kV substations of total capacity of 200 MVA;
 - (b) construction of 729.6 km of 11 kV lines and construction of 11 kV railway crossings;
 - (c) 31 km 11kV aerial bunch conductors (ABC) installed in high revenue urban sections to reduce commercial losses and improve safety.
- **Output 3:** Modernization of operation and maintenance (O&M) system including automated metering includes:
 - (a) introduction of quick response operation and maintenance (O&M) system by procuring well equipped maintenance and testing vehicles as well as the mobile emergency restoration units, and;
 - (b) Installation of Information Technology Modules for High Tension consumers.

3. As required by ADB's Safeguard Policy Statement 2009 (SPS 2009), an environmental assessment and review framework (EARF) was prepared for the MFF approved in 2009 to provide guidance on environmental screening, assessment, institutional arrangements, and procedures to be followed for the succeeding tranches in the MFF where components have not yet been fully defined and locations not yet identified. The EARF ensures that succeeding tranches comply with SPS 2009 and the applicable national laws and regulations.

4. According to SPS 2009, Tranche 4 is environment category B requiring an initial environmental examination (IEE). Following SPS 2009 and the EARF, an IEE was prepared for Tranche 4. Project details of components included in Tranche 4 were taken from the Detailed Project Report prepared by APDCL. Site visits were conducted between April 28, 2014 and May 22, 2014. Surveys were conducted at all 20 substations under Component A and some parts of 33 kV lines in Component B proposed by APDCL.

5. As assessed, the impacts are manageable and can be managed cost effectively. Environmental impacts are likely to result from the project development in Component A to Component C. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for subprojects have been specified to ensure minimal impacts. The detailed design will ensure inclusion of any environmental impacts that could not be specified or identified at this stage are taken into account and mitigated where necessary. Those impacts can be reduced through mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites.

6. The proposed project will have positive impacts and negative impacts to the existing environment as follows:

- Significant improvement of the quality and reliability of the electricity supply to the project affected area according to current demand is the main positive impact.
- A small amount of removal of trees for the substations and distribution lines is the main negative

impact which will be compensated based on established rates by APDCL.

- Pollution due to cut and fill operations, transportation of construction materials, disposal of debris, disturbance to the farming activities, nuisance from dust, noise, vehicle fumes, black smoke, vibration etc. due to construction activities at substation sites are the short term negative impacts.

7. The proposed project will improve operational efficiency and quality of power, voltages, reliability of the system and at the same time will reduce losses. Supply of power to both the local areas and tea gardens will boost economic development of the area by strengthening the power distribution infrastructure. Overall, the major environmental impacts associated with distribution projects are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices.

8. Potential adverse environment impacts associated with distribution lines has been avoided or minimised through careful route selection. Forests areas and thick vegetation areas as well as any major settlements are avoided wherever possible; however, route alignment passes through scrub-lands, cultivated fields, tea cultivations, etc. The lines will also pass through some degraded forest areas but is not adjacent to any national park or sanctuary. The alignments in this project have also avoided wetlands and geologically unstable areas, which can also pose foundation related problems. Mostly tea estate and government land will be used for all proposed substations but no land will be acquired for placing distribution lines on private land. However, physical damage to the crops, if any, during the construction phase will be compensated at the time of damage as per GoA norms. Associated impacts on agricultural land will be restricted to the construction phase and will be temporary in nature. Agricultural land will not be lost permanently at the base of the distribution pole. After construction, agricultural land within the distribution corridors can be used again for farming purposes.

9. Public consultations with the project affected communities, and stakeholders were conducted which focused on existing environmental conditions around the proposed project and the potential impacts that could happen due to project implementation.

1.0 INTRODUCTION

1. The Government of Assam (GoA), through the Government of India (GoI, the Borrower) has requested the Asian Development Bank (ADB) for a loan funding through the Multitranchise Financing Facility (MFF) which was approved on 18 November 2009. The Assam Electricity Grid Corporation Limited (AEGCL) and the Assam Power Distribution Company Limited (APDCL) are the Executing Agencies (EAs) for the MFF.¹ This project will be the Tranche 4 from the MFF with an estimated total amount of \$50 million.

2. GoA unbundled the former Assam State Electricity Board (ASEB) into three companies: Assam Power Generation Corporation Limited (APGCL), Assam Electricity Grid Corporation Limited (AEGCL), and Assam Power Distribution Company Limited (APDCL). The APDCL will be the Implementing Agency (IA) for Tranche 4. APDCL proposes to include the following components for Tranche 4:

- a. Physical works in the sub-transmission and distribution system such as additional 33/11 kV lines and substations to ensure that the system is adequate and reliable to meet the growth demand and the energy requirement.
 - Energy efficiency measures and loss reduction measures to be undertaken for reduction of both commercial as well as technical losses mainly at low tension (LT) level. Also, reduction of length of 11 kV lines which are the primary cause of technical losses.
 - For loss reduction, improvement in quality of power and stability of distribution grid of APDCL by providing segregated feeders to Tea Estates (T.E.) for maximum revenue generation.
- b. Introduction of Quick Response Operation and Maintenance (O&M) System in all Electrical Divisions and sub divisions of APDCL to ensure reliability and quality power with a view to increase revenue.
- c. Implementation of IT Modules to cover part of the high value consumers of major towns of Assam to improve revenue by reduction in commercial loss.
- d. Setting up of Independent Meter Testing Laboratory at Jorhat Engineering College.

3. The sub-transmission and distribution losses of APDCL were 27.4% & 27.04% for the year 2011-2012 and 2012-2013, respectively. This is quite high and measures for loss reduction have to be taken up. For reduction of losses as well as to make the network energy efficient, and to operate at optimum level, improvement of the sub-transmission network system to meet the projected load demand has to be given greater priority and can hardly be taken up on piece meal basis. Unless the voltage regulation of the 11 kV feeders is brought within limits, measures for reducing losses in the LT system will not produce the desired result. Therefore, system improvement measures should be taken up side by side with loss saving measures at LT level.

4. A computerized load flow study up to 11 kV bus of 33/11 kV has been carried out considering the load growth pattern. The studies indicate that to meet the load growth, an additional transformation capacity of 989.78 MVA at 33/11 kV level will be needed to meet the requirements by 2013-2014. Tranche 4 will consider a capacity addition of only 222.1 MVA. The remaining works are being taken up under different funding schemes.

1.1 Background

5. As required by ADB's Safeguard Policy Statement 2009 (SPS 2009), an environmental assessment and review framework (EARF) was prepared for the MFF approved in 2009 to provide guidance on environmental screening, assessment, institutional arrangements, and procedures to be followed for the succeeding tranches in the MFF where components have not yet been fully defined and locations not yet identified. The EARF ensures that succeeding tranches comply with SPS 2009 and the applicable national laws and regulations.

¹ The Assam State Electricity Board (ASEB) was legally dissolved in 2013. Subsequent to this action, AEGCL and APDCL were designated as EAs for the MFF.

6. According to SPS 2009, Tranche 4 is environment category B requiring an initial environmental examination (IEE). Following SPS 2009 and the EARF, an IEE was prepared for Tranche 4. As the EA for Tranche 4, APDCL is in charge of preparing the applicable environmental documentation, implementation and monitoring of Tranche 4 following the requirements of SPS 2009 and the approved EARF for the MFF.

1.2 Scope of Work and Methodology Adopted

7. The broad scope of the Environmental Assessment study is:

- i) To conduct field visits to collect data relevant to the study area and also collect secondary data from the DPR prepared by APDCL for ADB's consideration to establish the baseline environmental status of the study area;
- ii) To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed project;
- iii) To prepare a mitigation plan outlining the measures for protecting the environment including institutional arrangement and environmental monitoring;
- iv) To identify critical environmental attributes required to be monitored subsequent to the implementation of the proposed project;
- v) To carry out consultation with local people to identify the public perception of the project; and
- vi) To establish the Environment Monitoring Plan (EMoP) for the APDCL to submit environmental monitoring reports to ADB at regular intervals.

8. Detailed assessment of the baseline environment has been conducted at the site and the data for the IEE document has been taken from the DPR. Observations were made through transect walk at the proposed substation sites and some 33 kV lines between April 28, 2014 and May 22, 2014. The field studies were also supported by data collected from secondary sources such as Internet, forest atlas, published data from Gol documents, 2001 population census statistics data, as well as documents from APDCL, Assam Pollution Control Board (APCB), etc.

9. The IEE was prepared to assess potential impacts throughout the project's entire life cycle on the local environment and the adjoining communities. IEE designates a set of impact mitigation measures as well as monitoring programs for the project to pursue in order to ensure minimized adverse impacts on the environment and communities nearby. Public consultations were held with the project affected communities, stakeholders, and government officers of the project area. **Annexure 7** gives details of places and persons who attended these consultations.

1.3 Applicable Environmental Policies and other Legislations

10. The Ministry of Environment and Forests, Gol, vide its Notification No. S.O. 1533 dated 14-09-2006, reengineered the EIA process in India and also decentralized some powers and made provision to constitute the State Level Environment Impact Assessment Authority (SEIAA) and the State Level Expert Appraisal Committee (SEAC) for performing functions under the said notification. For the State of Assam, the SEIAA and SEAC were constituted in 2013. In addition, the Assam Pollution Control Board's guidelines for project proponents apply to all state projects.

11. Aside from SPS 2009, the project needs to comply with the requirements provided for by the Gol acts, rules, notifications, standards, and policies and other state level guidelines that apply to the project. The relevant regulations and other legislations are given in **Annexure 1**.

2.0 DESCRIPTION OF THE PROJECT

12. The Tranche 4 subprojects incorporate physical components in all the three Zones (incorporated in the DPR document). The Project adds capacity at Sub-transmission, distribution, metering, O&M and IT modules:

Output 1: Enhanced capacity of sub-transmission system includes:

- (a) augmentation of 6 transformers with addition of total capacity of 22.1 MVA;
- (b) construction of 477 km of 33 kV lines (378.2 km for connecting new substations and 98.8 km for system strengthening), and
- (c) construction of 33 kV railway/river crossing and 33 kV terminal bays.

Output 2: Enhanced capacity of distribution system includes:

- (a) construction of twenty (20) new 33/11kV substations of total capacity of 200 MVA (see **Table 1** for details);
- (b) construction of 729.6 km of 11 kV lines and construction of 11 kV railway crossings;
- (c) 31 km 11kV aerial bunch conductors (ABC) installed in high revenue urban sections to reduce commercial losses and improve safety.

Output 3: Modernization of operation and maintenance (O&M) system including automated metering includes:

- (a) introduction of quick response operation and maintenance (O&M) system by procuring well equipped maintenance and testing vehicles as well as the mobile emergency restoration units, and;
- (b) Installation of Information Technology Modules for High Tension consumers.

Table 1: Description of Segregated feeders & 33 kV substations for Tea Estates.

SNo	Name of the Electrical Circle	Name of the 33/11 KV Sub Station & Capacity	Length of 33 KV Line proposed	Length of 11 KV Line proposed	No. of Tea Estates to be covered.	Remarks
1	Tezpur	Borjuli, 2 x 5 MVA	20 km	42 km	6	-
2	Tezpur	Bindukuri, 2 x 2.5 MVA	16 km	21 km	3	-
3	Tezpur	Rakyshmari, 2x5 MVA	35 km	15 km	3	-
4	Tezpur	Borsola, 2X5 MVA	40 km	20 km	1	Substation is proposed for other major load also.
5	Tezpur	Bedeti, 2X5 MVA	16 km	15 km	1 & 3 Tea Factories	-
6	Tezpur	Singri, 2X5 MVA	24 km	10 km	3	Part of the town
7	Dibrugarh	Gharamara, 2X5 MVA	25 km	15 km	1	Substation is proposed for other major load also.
8	Dibrugarh	Namsung, 2X5 MVA	-	7 km	4	-
9	Sivasagar	Borhat, 2X5 MVA	15 km	18.6 km	7.	-
10	Sivasaga	Napuk, 2X5 MVA	3 km	16.5 km	5.	-
11	Golaghat	Dayang, 2X5 MVA	25 km	25 km	8	-
12	Golaghat	Naharbari, 2X5 MVA	25 km	26 km	7	-
13	Golaghat	Radhabari, 2X5MVA	26 km	25 km	2	7 Nos Industrial consumer
14	Tinsukia	Baghjan, 2X5 MVA	26 km	15 km	6	-
15	Tinsukia	Gangabari, 2X5 MVA	12 km	8 km	12	-
16	Tinsukia	Gelapukhuri, 2X5 MVA	10 km	7 km	2	-
17	Tinsukia	Mahakali, 2X5 MVA	10 km	7 km	4	-
18	Tinsukia	PAWOI, 2X5 MVA	4 km	8 km	2	-
19	Tinsukia	Philobari, 2X5 MVA	25 km	8 km	3	-
20	Tinsukia	Dhola, 2X5 MVA	21.35 km	8 km	4	-

13. **Annexure 2** gives additional details of the outputs.

2.1 Type of Project

14. The project implementation will lead to the development of distribution projects, which involve distribution of power and overall energy efficiency improvement. APDCL's distribution planning wing has identified a list of projects, based on the Master Planning exercise conducted by ADB in Tranche 3, which are critical for the overall development of the power system. Considering the requirements of power system with medium to long term, the prioritization of projects for the proposed loan has been undertaken based on the following principles for sequence of preference criteria for distribution projects:

- (i) Medium voltage network loss reduction and voltage improvement projects;
- (ii) 33/11 kV distribution feeders; and,
- (iii) 11 kV distribution network strengthening for voltage improvement.

2.2 Justification for the Project

15. The DPR covering Tranche 4 considers a capacity addition of 222.1 MVA (18.32% of total) out of the total requirements of 1212.10 MVA at the 33/11 kV level by 2013-2014. As such, only 18.32% of the above benefits as applicable are considered for Cost Benefit Analysis. A computerized load flow study up to the 11 kV bus of 33/11 kV substations has been carried out to optimize the system and to estimate the technical losses down to the 11 kV buses of 33/11 kV substation. The studies indicate a loss reduction of about 5.34% up to the level of 11 kV bus on the implementation of the total requirements by 2013-2014. In addition to the above, substantial benefits due to reduction of losses in 11 kV feeders and LT networks due to construction of new 33/11 kV and 11/0.4 kV substations are expected. The loss reduction will mainly take place due to reorientation or shortening of 11 kV and LT feeders as well as reduction of line loss in existing feeders due to construction of new substation.

16. Automatic Meter Reading (AMR) system shall cover 3,367 HT consumers in 67 project areas out of a total of approximately 12,000 HT consumers of APDCL. The HT consumer revenue adds up to 52% of the total APDCL revenue. Hence, to maximize the revenue collection it is suggested to cover the 8,500 HT consumers of APDCL through the above IT system for healthy and stable revenue of APDCL. Benefits from the project are highlighted below (inclusive of the benefits from the DPR):

- a) *Required enhancement of 33/11 kV transformation capacity by 2013-2014 equal to 1212.10 MVA*
- b) *Peak power loss without the new proposals (in 2013-2014) = 90 MW*
- c) *Peak power loss after implementation of complete project (in 2013-2014) = 51 MW*
- d) *Reduction in peak power loss after implementation of the project (in 2013-2014) = 39 MW*
- e) *Energy loss reduction per annum (in 2013-2014) = 53.39 million units (MU)*
- f) *Present Percentage loss without the new proposals = 20 %*
- g) *Percentage loss with new proposals (in 2013-2014) = 18 %*
- h) *Benefit due to above @ Rs 5.66 /unit Rs 6.36 crores*
- i) *Total benefit Rs 49.86 Crores*
- j) *Discount rate at 12%*
- k) *Net present Value (NPV) +109.85 l) Internal Rate of Return 18 %*
- m) *Pay back Period 4.14 years*

2.3 Location

17. The proposed sub-projects are located in different areas of Assam. **Table 2** indicates details of the proposed sub-project locations and the land ownership details for sub-stations.

Table 2: Different Locations of Proposed substation subprojects and ownership details

Sub-project	Village/Tehsil	District	Region	Area	Ownership
1 33/11kV Bindukuri	Tezpur & Ghara TE/Tezpur	Sonitpur	CAR	0.2 ha	Tezpur & Ghara TE
2 33/11kV Borjuli	Borjuli/Chariduar	Sonitpur	CAR	0.134 ha	Govt. Land
3 33/11kV Bedeti	Bihali TE/Bihali	Sonitpur	CAR	0.3 ha	Bihali TE
4 33/11kV Singri	Singri/Borsola	Sonitpur	CAR	0.268 ha	Govt. Land
5 33/11kV Rakhysmari	Rakhysmari/Dhekiajuli	Sonitpur	CAR	0.268 ha	Govt. land
6 33/11kV Borsola	Doom Dooma/Borsola	Sonitpur	CAR	0.268 ha	Govt. land
7 33/11kV Baghjan	Baghjan TE/Doom Dooma	Tinsukia	UAR	0.268 ha	Baghjan TE
8 33/11kV	1 No. Chottahapjan/1 No	Tinsukia	UAR	0.450 ha	Gangabari TE

	Sub-project	Village/Tehsil	District	Region	Area	Ownership
	Gangabari	Chottahapjan				
9	33/11kV Mahakali	Borjan/Borjan	Tinsukia	UAR	0.134 ha	Chandradhar Malakar
10	33/11kV Dholla	Dholla TE/Doom Dooma	Tinsukia	UAR	0.268 ha	Dholla TE
11	33/11kV Gelapukhuri	Gellepukhuri/Gellapukhuri	Tinsukia	UAR	0.134 ha	Shyamal Mhato, Chandrashekhar Mahato, Shrimati Shukheshwari Mahato
12	33/11kV Philobari	Philobari TE/Doom Dooma	Tinsukia	UAR	0.268 ha	Philobari TE
13	33/11kV Pawoi	Pawoi TE/Margherita	Tinsukia	UAR	0.132 ha	Pawoi TE
14	33/11kV Borhat	Borhat/Borhat	Shivsagar	UAR	0.162 ha	APDCL
15	33/11 kV Napuk	Mazgaon	Shivsagar	UAR	0.159 ha	Private Land
16	33/11kV Gharamara	Somuguri/Rajgarh Rangali	Dibrugarh	UAR	0.201 ha	Mrs. Suku Urang
17	33/11 kV Namsung	Namsung	Dibrugarh	UAR	0.201 ha	Private Land
18	33/11kV Radhabari	Radhabari TE/Bokakhat	Golaghat	UAR	0.258 ha	Radhabari TE
19	33/11kV Naharbari	Naharbari TE/Kowani	Golaghat	UAR	0.408 ha	Naharbari TE
20	33/11kV Dayang	Dayang TE	Golaghat	UAR	0.194 ha	Dayang TE

UAR: Upper Assam Region, CAR: Central Assam Region TE: Tea Estate

18. **Figure 1** provides general location map for all sub-projects. **Figure 2** to **Figure 5** provides locational maps that show the proposed distribution substation and line routes for the following sub-projects:

Table 3: Locational Maps of subprojects

Sub-Project	Figure
Power Map of Assam	Figure 1
Location of sub-projects in Tezpur Electrical Circle (Sonitpur District)	Figure 2
Location of sub-projects in Tinsukhia and Dibrugarh Electrical Circle	Figure 3
Location of sub-projects in Golaghat Electrical Circle	Figure 4
Location of sub-projects in Shivsagar Electrical Circle	Figure 5

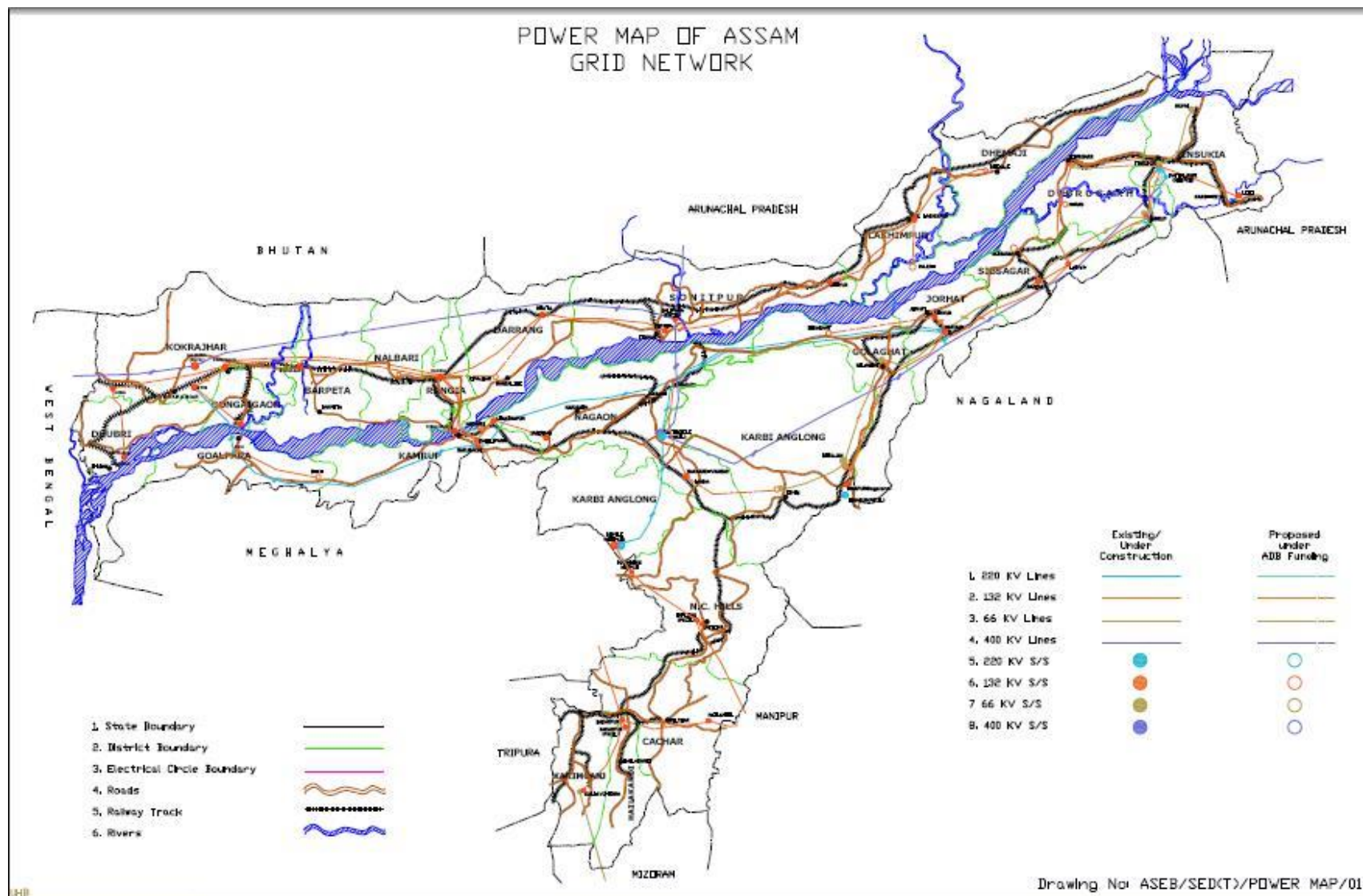


Figure 1: Power Map of Assam

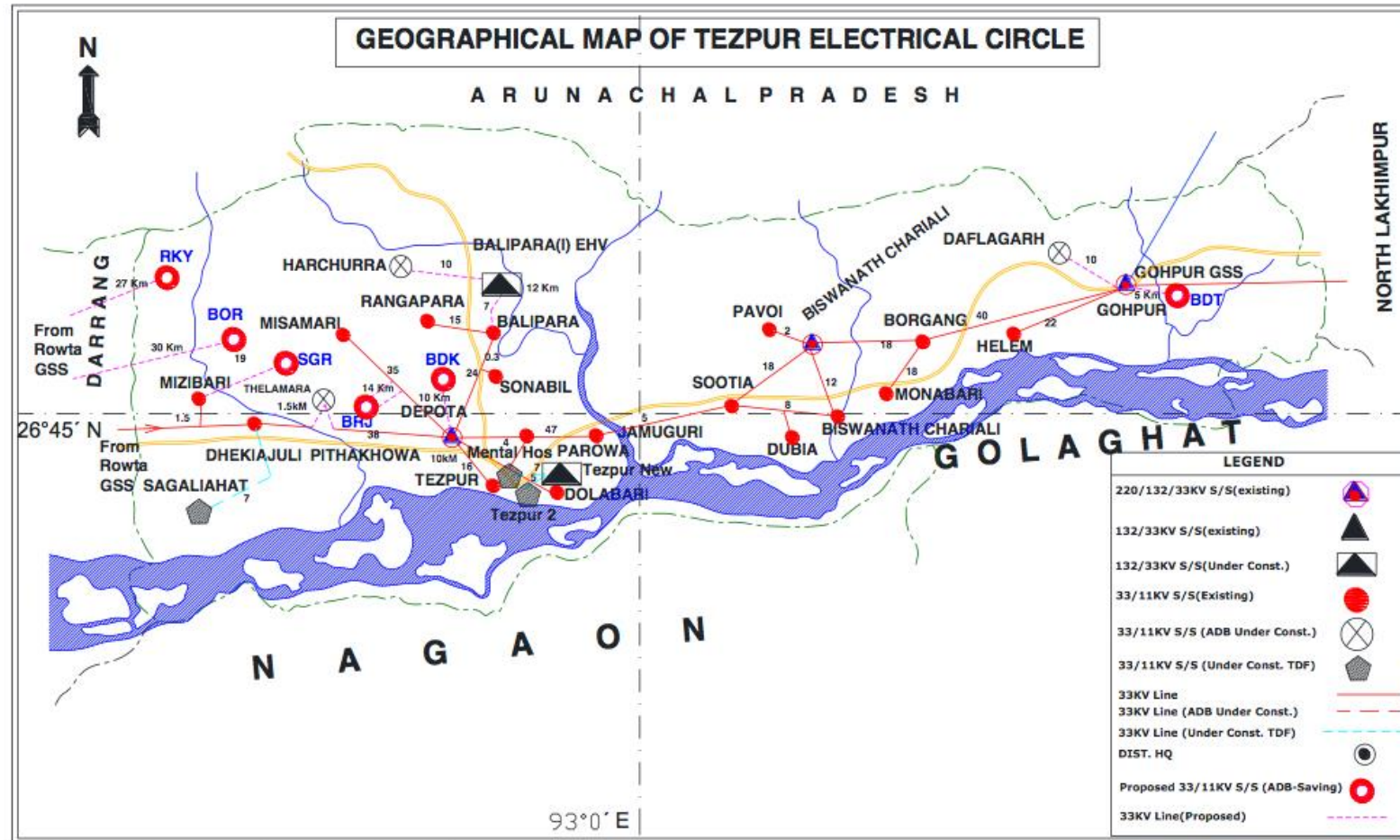


Figure 2: Location of sub-projects in Tezpur Electrical Circle (Sonitpur District)

LEGEND: Tezpur Electrical Circle

Borjuli S/s	BRJ
Bindukuri S/s	BDK
Rakyshmari S/s	RKY
Borsola S/s	BOR
Bedeti S/s	BDT
Singri S/s	SGR

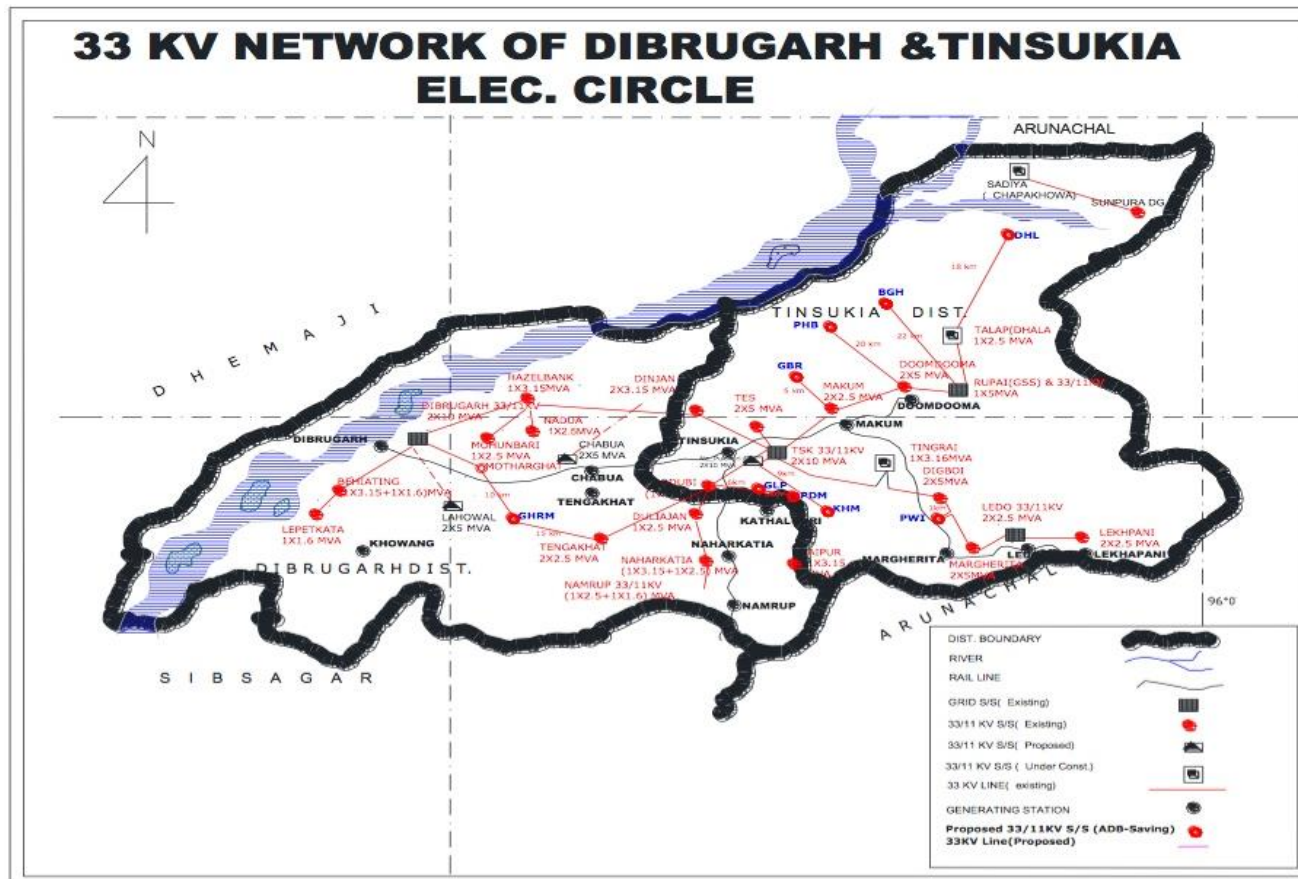


Figure 3: Location of sub-projects in Tinsukhia and Dibrugarh Electrical Circle

LEGEND: Tinsukia Electrical Circle

Baghjan S/s	BGH
Gangabari S/s	GBR
Gelapukhuri S/s	GLP
Mahakali S/s	MHK
Pawoi S/s	PWI
Philobari S/s	PHB
Dhola S/s	DHL

Dibrugarh Electrical Circle

Gharamara S/s	GHRM
(Namsung) Padumoni S/s	PDM

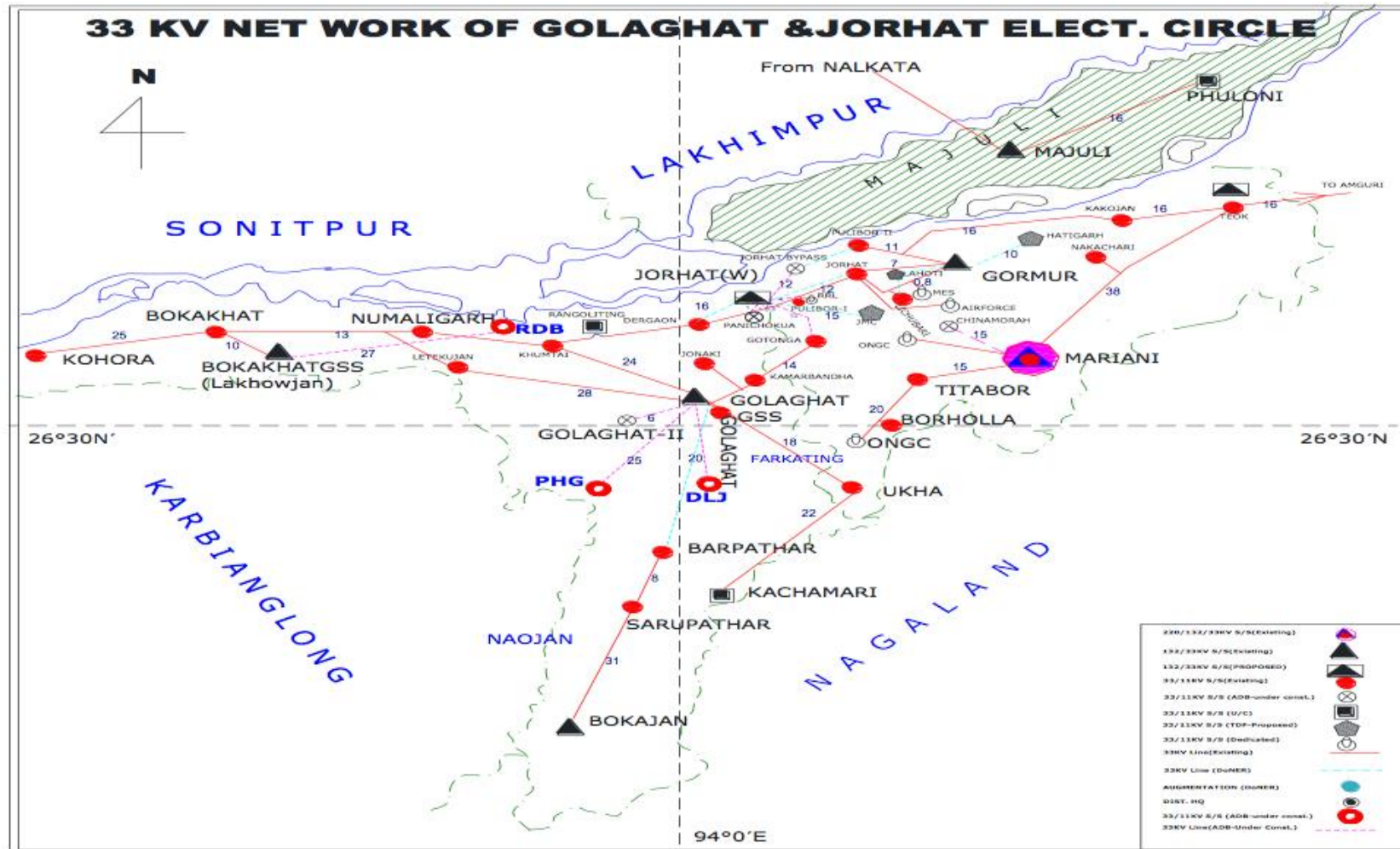


Figure 4: Location of sub-projects in Golaghat Electrical Circle

LEGEND: Golaghat Electrical Circle

Dayang (Doloujan S/s) DLJ
 Nahorbari (Pholongoni S/s) PHG
 Radhabari T.E. S/s RDB

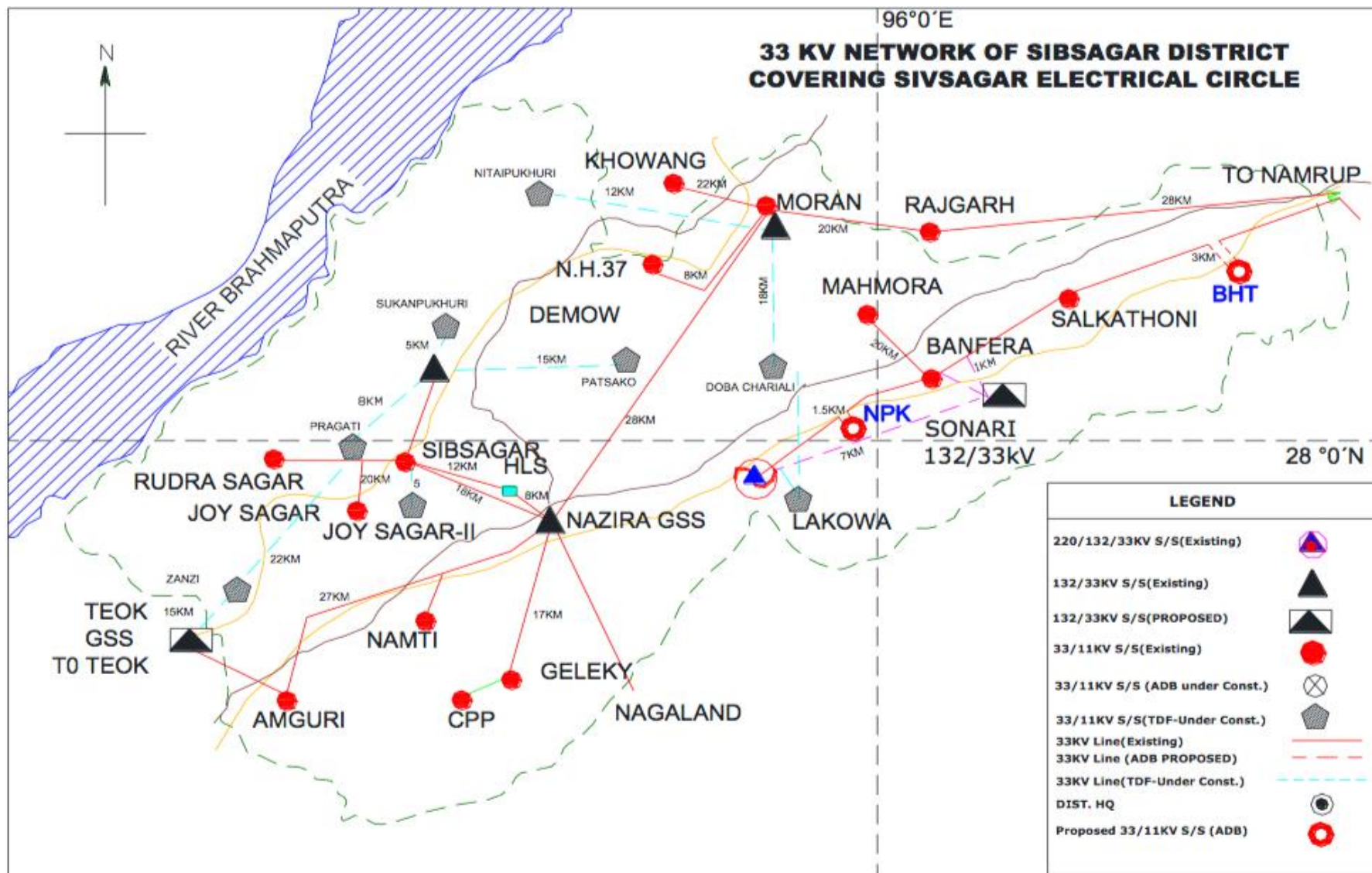


Figure 5: Location of sub-projects in Shivsagar Electrical Circle

LEGEND: Shivsagar Electrical Circle

Borhat S/s

BHT

Napuk S/s

NPK

2.4 Size and the Magnitude of the Operation

19. Tranche 4 will cover 20 new substations: six substations under Central Assam Zone and 14 substations under Upper Assam Zone.

Tezpur Electrical Circle (Sonitpur District)

1. Borjuli 33/11 kV substation (2 x 5 MVA)

Additional 33 kV Lines: 20 km 33 kV D/C line to be loop-in loop-out (LILO) between Depota Missamari line to Borjuli.

Additional 11 kV Lines: 4x11 kV feeders on PSC poles with a total length of 42 km.

20. This area is fed by the 11 kV feeder emanating from the 2x5 MVA Balipara substation. The 11 kV feeder from Balipara feeding this area has a length of 45 km and the end consumer has very poor voltage regulation. This line is feeding six Tea Estates as well as the rural areas. By segregating this feeder, its length will be shortened thereby reducing the line loss and maintenance of the feeder becoming easier resulting in better service and quality power supply to the consumers of the area and improvement of revenue.

2. Bindukuri 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 16 km 33 kV line from Depota GSS to Bindukuri.

Additional 11 kV Lines: 4x11 kV of feeders on PSC poles with a total length of 21 km.

21. This area is fed by the 11 kV feeder emanating from the 2x5 MVA Depota substation. The 11 kV feeder from Depota feeding this area has a length of 38 km and the end consumer has very poor voltage regulation. This line is feeding three important Tea Estates as well as the rural areas. By segregating this feeder, its length will be shortened thereby reducing the line loss and maintenance of the feeder becoming easier resulting in better service and quality power supply to the consumers of the area and enhanced revenue.

3. Rakyshmari 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 35 km 33 kV line from Rowta 132/33 kV substation to Rakyshmari.

Additional 11 kV Lines: 4x11 kV feeder on PSC poles. Total length is 15 km.

22. This area is fed by the 11 kV Tea feeder emanating from the 2x5 MVA Dhekiajuli substation. The 11 kV Tea feeder from Dhekiajuli feeding this area has a length of 90 km and the end consumers are getting low voltage. This line is feeding three important Tea Estates as well as rural area that have to pass through groves and others resulting to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and number of tripping of the feeder resulting to better service and quality power supply to the consumers of the area. The Dhekiajuli substation which has a present peak load of 8.5 MW with 72% loading will become overloaded by 2013. With the construction of the proposed substation, about 2.5 MW of load will be released from Dhekiajuli thus relieving the substation.

4. Borsola 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 40 km 33 kV line from Rowta 132/33 kV substation (S/S) to Borsola S/S.

Additional 11 kV Lines: 4x11 kV feeders on PSC poles on PSC poles. Total length is 20 km.

23. This area is fed by the 11 kV Tea feeder emanating from the 2x5 MVA Mizibari substation. The 11 kV Tea feeder from Mizibari feeding this area has a length of 195 km and the end consumer has very poor voltage regulation. This line is feeding one important Tea Estate as well as other consumers that have to pass through groves and others, leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and number of tripping of the feeder resulting in better service and quality power supply to the consumers of the area.

5. Bedeti 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 16 km 33 kV line from Gohpur 132/33 kV Sub Station to Bedeti S/S

Additional 11 kV Lines: 4x11 kV feeder on PSC poles on PSC poles. Total length is 15 km.

24. This area is fed by the 11 kV Bedeti feeder emanating from the 2x5 MVA Borgang substation. The 11 kV Bedeti feeder from Borgang feeding the area has a length of 25 km resulting in the end

consumer experiencing very poor voltage regulation. This line is feeding four important Tea Estates as well as other consumers. By segregating this feeder, its length will be shortened thereby reducing the line loss and easy maintainability of the feeder resulting in better service and quality power supply to the consumers of the area.

6. Singri 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 24 km 33 kV line from Mizibari 33 kV SS to Singri.

Additional 11 kV Lines: 4x11 kV feeder on PSC poles. Total length is 10 km.

25. This area is fed by the 11 kV feeder named "A" emanating from the 2x5 MVA Dhekiajuli substation. The 11 kV feeder "A" from Dhekiajuli feeding this area has a length of 65 km and the end consumer has very poor voltage regulation. This line is feeding three important Tea Estates as well as other consumers. By segregating this feeder, its length will be shortened thereby reducing the line loss and easy maintainability of the feeder resulting in better service and quality power supply to the consumers of the area.

UPPER ASSAM ZONE

Dibrugarh Electrical Circle

1. Gharamara 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 15 km from Namrup substation and 10 km from Tingkhong substation with GI STP and Terminal Equipments at Namrup substation and Tingkhong substation.

Additional 11 kV Lines: 15 km of associated 11 kV line.

26. This area is fed by the 11 kV Tamulbari feeder emanating from the 2x5 MVA Modarkhat substation. The 11 kV Tamulbari feeder from Modarkhat feeding this area has a length of 38 km and the end consumer has very poor voltage regulation. This line is feeding one important Tea Estate, other industrial activities as well as rural area. By segregating this feeder, its length will be shortened thereby reducing the line loss and easy maintenance of the feeder resulting in better service and quality power supply to the consumers of the area and enhanced revenue.

2. Namsung 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 10 km 33 kV line from Gelapukhuri to Namsung proposed 33/11 kV S/S

Additional 11 kV Lines: 3x11 kV Feeders on PSC poles to cover four Tea Estates. Total length is 7 km

27. This area is fed by the 11 kV Nakhrai feeder emanating from the 2X5 MVA Barguri substation and 11 kV Rangagara feeder emanating from 2X5 MVA Dinjan substation. The 11 kV Nakhrai feeder and 11 Rangagara Feeder feeding this area has a length of 45 km and the end consumer has very poor voltage regulation. This line is feeding four Tea Estates as well as other consumers having high demand causing poor voltage regulation. By segregating this feeder, its length will be shortened thereby reducing the line loss and provide better service and quality power supply to the consumers of the area.

Sivasagar Electrical Circle

1. Borhat 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: Terminal Equipment at Borhat S/S, 15 km 33 kV feeding line for Borhat to LILO of NTPS-Salkathoni Feeder.

Additional 11 kV Line: 18.6 km of associated 5x11 kV lines.

28. This area is fed by the 11 kV Borhat feeder emanating from the 2x5 MVA Salkathoni substation. The 11 kV Borhat feeder from Salkathoni feeding this area has a length of 102.64 km and the end consumer has very poor voltage regulation. This line is feeding seven important Tea Estates as well as rural area and has to pass through groves etc., leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and number of tripping of the feeder result in better service and quality power supply to the consumers of the area. The Salkathoni substation which has a present peak load of 8.5 MW with 72% loading has been overloaded in 2013, therefore with the construction of the proposed substation about 3.5 MW of load will be released from Salkathoni thus relieving the substation.

2. Napuk 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: Terminal Equipment at Borhat S/S, 3 km 33 kV, 1x Incoming & 1x Outgoing line.

Additional 11 kV Lines: 16.5 km of associated 4x11 kV lines.

29. This area is fed by the 11 kV Sonari Feeder-I emanating from the 1X5 and 1X10 MVA Banfera

substation. The 11 kV Sonari Feeder-I from Banfera feeding this area has a length of 107.01 km and the end consumer has very poor voltage regulation. This line is feeding five important Tea Estates and other consumers. Because of the length of the feeder, the feeder has high line loss and has frequent tripping and other maintenance problem. By segregating this feeder, its length will be shortened thereby reducing the line loss and number of tripping of the feeder result in better service and quality power supply to the consumers of the area specially the high value Tea gardens. The Banfera substation which has a present peak load of 12 MW will become overloaded by 2014-2015, therefore with the construction of the proposed substation about 3.84 MW of load will be released from Banfera thus relieving the substation.

Golaghat Electrical Circle

1. Dayang 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 25 km of 33 kV line from Golaghat GSS to Dayang S/S.

Additional 11 kV Lines: 25 km of associated 3x11 kV lines.

30. This area is fed by the 11 kV Furkating Feeder emanating from the 2X10 MVA Tetelitol substation. The 11 kV Furkating feeder from Tetelitol feeding this area has a length of 77 km and the end consumer has very poor voltage regulation. This line is feeding eight Tea Estates as well as rural area and has to pass through groves etc. leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and better maintenance of the feeder resulting in better service and quality power supply to the consumers of the area specially the high value Tea gardens. The Tetelitol substation which has a present peak load of 15 MW will become overloaded by 2014-2015, therefore with the construction of the proposed substation about 3.84 MW of load will be released from Banfera thus relieving the substation.

2. Nahorbari 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 25 km of 33 kV line from Golaghat (Tetelitol) GSS to Nahaorbari S/S.

Additional 11 kV Lines: 26 km of associated 3x11 kV lines.

31. This area is fed by the 11 kV Letekujan Feeder emanating from the 2X2.5 MVA Letekujan substation. The 11 kV Letekujan feeder from Letekujan feeding this area has a length of 45 km. This line is feeding seven Tea Estates as well as rural areas and has to pass through groves etc. leading to maintenance problem and reliability of the feeder during rainy season causing technical and commercial losses. By segregating this feeder, problem of maintenance could be overcome resulting in better service and quality power supply to the consumers of the area specially the high value Tea gardens. The Letekujan substation which has a present peak load of 3.8 MW will become overloaded by 2014-2015, therefore with the construction of the proposed substation about 2.2 MW of load will be released from Letekujan thus relieving the substation.

3. Radhabari T.E 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 26 km 33 kV line from from Lakhowjan GSS to Radhabari T.E.

Additional 11 kV Lines: 25 km of associated 4x11 kV lines.

32. This area is fed by the 11 kV Kamargaon Feeder emanating from the 2X5 MVA Numaligarh substation. The 11 kV Kamargaon feeder from Numaligarh feeding this area has a length of 37.5 km. This line is feeding seven Tea Estates as well as rural areas and has to pass through groves etc. leading to maintenance problem and reliability of the feeder during rainy season causing technical and commercial losses. By segregating this feeder, problem of maintenance could be overcome resulting in better service and quality power supply to the consumers of the area specially the high value Tea gardens. The Letekujan substation which has a present peak load of 3.8 MW will become overloaded by 2014-2015, therefore with the construction of the proposed substation about 2.2 MW of load will be released from Letekujan thus relieving the substation.

Tinsukia Electrical Circle

1. Baghjan 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 26 km 33 kV line from 66/11 kV Rupai GSS to Baghjan S/S.

Additional 11 kV Lines: 15 km of associated 3x11 kV lines to cover six tea estates.

33. This area is fed by the 11 kV Baghjan feeder emanating from the 4x5 MVA and 1X3.16 MVA Doomdoo substation. The 11 kV Baghjan feeder from Doomdoo feeding this area has a length of 130 km and the end consumer has very poor voltage regulation. This line is feeding six Tea Estates as well as rural areas and has to pass through groves etc. leading to frequent tripping and plunging the

entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and number of tripping of the feeder resulting in better service and quality power supply to the consumers of the area. The Doomdoo substation which has a present peak load of 18.5 MW with 72% loading was overloaded in 2013, therefore with the construction of the proposed substation about 5.62 MW of load will be released from Doomdoo thus relieving the substation.

2. Gangabari 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: Terminal Equipments at Gangabari S/S, 12 km 33 kV line from Makum 33/11 kV S/S to Gangabari with GI STP

Additional 11 kV Lines: 8 km for 4x11 kV Feeders on PSC poles to cover 12 Tea Estate Factories.

34. This area is fed by the 11 kV Hapajan feeder emanating from the 2X3.16 MVA Makum substation. The 11 kV Baghjan feeder from Makum feeding this area has a length of 130 km and the end consumer has very poor voltage regulation. This line is feeding six Tea Estates as well as rural areas and has to pass through groves etc. leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and number of tripping of the feeder resulting in better service and quality power supply to the consumers of the area. The Makum substation which has a present peak load of 5 MW with 72% loading will be overloaded by 2013, therefore with the construction of the proposed substation about 3.2 MW of load will be released from Makum thus relieving the substation.

3. Gelapukhuri 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: Terminal Equipment at Gelapukhuri S/S, 10 km 33 kV line from Barguri 33/11 kV S/S to Gelapukhuri with GI STP

Additional 11 kV Lines: 4x11 kV Feeders on PSC poles to cover 2 Tea Estates. Total length is 7 km

35. This area is fed by the 11 kV Supply feeder emanating from the 2X10 MVA and 1X5 MVA Tinsukia Supply substation. The 11 kV Supply feeder from Tinsukia Supply feeding this area has a length of 165 km and the end consumer has very poor voltage regulation. This line is feeding two Tea Estates as well as other consumers having high demand causing poor voltage regulation. By segregating this feeder, its length will be shortened thereby reducing the line loss and better service and quality power supply to the consumers of the area. The Tinsukia Supply substation which has a present peak load of 21.5 MW will be overloaded by 2013, therefore with the construction of the proposed substation about 3.85 MW of load will be released from Tinsukia Supply substation thus relieving the substation.

4. Mahakali 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 10 km 33 kV line from Napukhuri 33/11 kV S/S to Mahakali with steel tubular pole.

Additional 11 kV Lines: 3x11 kV Feeders on PSC poles to cover four Tea Estates. Total length is 7 km.

36. This area is fed by the 11 kV Deohal feeder emanating from the 2X20 MVA, 33/11 kV Tinsukia Grid substation. The 11 kV Deohal feeder from Tinsukia Grid substation feeding this area has a length of 120 km and the end consumer has very poor voltage regulation. This line is feeding two Tea Estates as well as rural areas and has to pass through groves etc. leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and better service and quality power supply to the consumers of the area.

5. Pawoi 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 4 km 33 kV line LILO at Tinsukia - Margherita line to Pawoi with steel tubular pole

Additional 11 kV Lines: 2x11 kV Feeders from Pawoi 2x5 MVA, 33/11 kV substation to cover two Tea Estates. Total length is 8 km.

37. This area is fed by the 11 kV Katetong feeder emanating from the 2x10 MVA Margherita substation. The 11 kV Garden feeder from Margherita feeding this area has a length of 120 km and the end consumer has very poor voltage regulation. This line is feeding two important Tea Estates as well as other consumers. By segregating this feeder, its length will be shortened thereby reducing the line loss and better service and quality power supply to the consumers of the area. The Margherita substation which has a present peak load of 12.43 MW will be overloaded by 2013, therefore with the construction of the proposed substation about 2.85 MW of load will be released from Margherita substation thus relieving the substation.

6. Philobari 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 25 km 33 kV line from Doomdooma 33/11 kV S/S to Philobari

Additional 11 kV Lines: 4x11 kV Feeders on PSC poles to cover three Tea Estates. Total length is 8 km.

38. This area is fed by the 11 kV Philobari feeder emanating from the 4x5 MVA and 1x3.16 MVA Doomdooma substation. The 11 kV Philobari feeder from Tinsukia Supply feeding this area has a length of 191 km and the end consumer has very poor voltage regulation. This line is feeding three Tea Estates as well as rural areas and has to pass through groves etc. leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and better service and quality power supply to the consumers of the area. The Doomdooma substation which has a present peak load of 18.5 MW will be overloaded by 2013, therefore with the construction of the proposed substation about 6.85 MW of load will be released from Doomdooma substation thus relieving the substation.

7. Dhola 33/11 kV substation (Capacity: 2 x 5 MVA)

Additional 33 kV Lines: 21.35 km 33 kV line from Talap 33/11 kV S/S to Dhola

Additional 11 kV Lines: 4x11 kV Feeders on PSC poles to cover four Tea Estates. Total length is 9 km.

39. This area is fed by the 11 kV Talap Dhola feeder emanating from the 2x5 MVA Rupai substation. The 11 kV Talap Dhola feeder from Rupai feeding this area has a length of 215 km and the end consumer has very poor voltage regulation. This line is feeding four Tea Estates as well as rural areas and has to pass through groves etc. leading to frequent tripping and plunging the entire area into darkness. By segregating this feeder, its length will be shortened thereby reducing the line loss and better service and quality power supply to the consumers of the area. The Rupai substation which has a present peak load of 7.5 MW will be overloaded by 2013, therefore with the construction of the proposed substation about 4.68 MW of load will be released from Rupai substation thus relieving the substation.

2.5 Implementation Plan

40. The proposed overall project implementation schedule is given in **Table 4**. The proposed project is scheduled for completion within 24 months from effective date of the project approval from ADB. Works such as land acquisition for new substations, survey and right of way works for sub-transmission lines and other preliminary works under counterpart funding are proposed to be taken up prior to the loan effective date to meet the time schedule.

Table 4: Overall Project Implementation Schedule

Activities/Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24
Design																							
Bidding Process																							
Award of work						LOI																	
Soil investigation and site survey by contractor																							
Civil Works- Foundation, buildings works																							
Supply of plant and equipment																							
Erection of Poles, Sustations																							
Stinging of cables, other works																							
Commissioning and test																							

NOTE - This schedule is tentative and will be finalised based on site as well as estimated schedule indicated by bidders for each sub-project.

3.0 DESCRIPTION OF ENVIRONMENT

3.1 Location of Assam

41. Situated between 90-96 degrees East Longitude and 24-28 degrees North Latitude, Assam is bordered in the North and East by the Kingdom of Bhutan and Arunachal Pradesh. Along the south lies Nagaland, Manipur and Mizoram. Meghalaya lies to the South-West, Bengal and Bangladesh to the West.² Assam has 27 districts and covers an area of 78,438 km². As of 2001, it has a population of 26.6 million. Assam is divided into three geographic zones namely: Lower Assam, Central Assam and Upper Assam. The major subprojects sites are scattered in thirteen districts covering all the three zones within the Brahmaputra Valley.

3.2 Physical Resources

3.2.1 Climate

42. With the 'Tropical Monsoon Rainforest Climate', Assam is a temperate region and experiences heavy rainfall and humidity. The cities are considered polluted due to significant urban development as well as emissions from vehicular movement and industrial establishments. The database of Central Pollution Control Board (CPCB) and the State Pollution Control Board (SPCB) are limited to major cities and some selected industrial areas. The major sources of pollution in the area are from vehicular movement on unpaved roads in the form of suspended particulate matter (SPM) and respirable particulate matter with particle size less than 10 µm (PM₁₀). Similarly, dust arising from ground or soil disturbances could be another source of air pollution. All the 13 districts within the project area have four distinct seasons: winter, summer, monsoon and autumn or post monsoon. Summers are hot (maximum temperature between 33°C and 44°C) and winters are comfortable (temperature range is: 10°C to 27°C). The monsoon season runs between May and October and the annual rainfall is more than 2,000 mm.

3.2.2 Topography

43. Majority of the areas in Assam State are floodplains of the Brahmaputra River and the altitude of the plain areas vary from as low as 50 m to as high as 600 m. The eastern plains have an altitude of about 600 m. Cachar plains in the southern part of the State have an altitude of about 50 m. Central and south central part of the state, comprising North Cachar Hills and Rengma Hills, have an altitude ranging from 300 m to 150 m. The western part of the State, comprising of North and South Brahmaputra Hills, have similar altitude range. Satellite images shows that the surface morphology is dominated by major river systems with numerous tributary rivers and streams, oxbow lakes, relict oxbow lakes and relict stream channels.

3.2.3 Geology Rock and Soil

44. The soils are mostly alluvial. The northern areas, which are nearer to the Brahmaputra River have new alluvium, while the southern areas or areas near the foothills have old alluvium. The areas with older alluvium are the best sites for the cultivation of tea. Accordingly, the areas with older alluvium are dotted with a large number of tea gardens. The entire area is under humid sub-tropical climate and it receives well-distributed rainfall from May to October. The process of leaching of soils in the undulating piedmont and hilly areas and stagnation and flooding in the areas with gentle slope are very prominent. As per taxonomical classification considering the aspects like soil depth, soil drainage, soil texture, areas of occurrence, slope condition, nature of the exposed surface, vulnerability to erosion and flooding - a taxonomical classification of the soils of Assam has been suggested by the National Bureau of Soil Survey and Land Use Planning (NBSS&LUP). As per this classification, the soils of Assam belong to 4 orders, 9 sub-orders, 15 great groups, 26 sub-groups and 83 family associations. In the context of Assam, it is observed that the Inceptisols are the dominant soils followed by Entisols, Aflisols and Utisols and these occupy respectively 41.4%, 33.6%, 11.3% and 5.6% of the total geographical area of the state (NBSS&LUP, 1993).

² Assam at a glance, Official Website of Assam, The Government of Assam, <http://assamgovt.nic.in/glance.asp>

3.2.4 Surface Water Resources

45. The Brahmaputra River Valley is approximately 1,000 km long in India with an average width of 10 km. The river flow is characterized by highly braided channel coupled with numerous sand bars or chars. During its course, the river receives many tributaries both from the north and the south. The tributaries from the north are Subanshiri and those from the south are Noa Dihing, Buridihing, Disang, Dikhow, and Kopili. CPCB monitors the surface water quality in India. Its latest publication has indicated that rivers constitute a length of 4,820 km in Assam and the total surface water bodies cover an area of 1,350 km². Out of these beels³, oxbow lakes and derelict water constitute 1,100 km² of surface area.

3.2.5 Groundwater Resources

46. Assam falls among the richest states in terms of potential ground water resources. The Brahmaputra valley, covering more than 70% of the total geographical area of the state, contains prolific aquifer system with water table at 5 m below ground surface. The Barak valley also has good potential for development of ground water. The recoverable recharge of ground water has been estimated at 2 million hectare meter per year.⁴ The lifting of ground water through dug wells, tube wells, shallow tube wells and deep tube wells for irrigation, domestic and industrial use is very common in the state.

3.2.6 Siesomology

47. The great Assam earthquake of 1897 ($8 < M < 8.1$) is the largest known Indian intraplate earthquake. It raised the northern edge of the Shillong Plateau by more than 10 m, resulting in the destruction of structures over much of the Plateau and surrounding areas, and causing widespread liquefaction and flooding in the Brahmaputra and Sylhet floodplains. Shaking intensity data for the earthquake are crucial for estimating future earthquake hazards in NE India and Bangladesh since similar earthquakes will no-doubt recur.

48. The entire Assam State has been placed under seismic Zone V, and therefore all districts in which the subprojects are located fall in Zone V that has highest potential for occurrence of severe earthquake. Therefore, all the project sites fall under seismic Zone V and covers areas liable to seismic intensity MM-IX⁵ and above. This is the most severe seismic zone and is referred to as Very High Damage Risk Zone. The project areas lie in Zone V, where the maximum intensity could reach (MSK)⁶ IX. It must be noted that Bureau of Indian Standards (BIS) estimates the hazard on previously known earthquakes. Since the earthquake database in India is still incomplete, especially with regards to earthquakes prior to the historical period (before 1800 A.D.), these zones offer a rough guide of the earthquake hazard in any particular region and need to be regularly updated.

3.3 Ecological Resources

3.3.1 Forest

Forest Area

49. The Recorded Forests Area (RFA) of Assam is 26, 748 km² (35% of the total geographical area). It includes Reserved Forests (RF) (312 RFs, 13,870 km², 52% of the RFA), Proposed Reserved Forests (145 PRFs, 3,103 km², 12% of the RFA), Protected Areas (3,925 km², 15% of the RFA) and Unclassed State Forests (5,865 km², 33% of the RFA).

Forest Cover

50. The forest cover in the state, based on interpretation of satellite data of November 2008-January 2009 is 27,673 km² which is 35.28% of the state's geographical area. In terms of forest canopy density classes, the state has 1,444 km² supporting very dense forest, 11,404 km² moderately dense forest and 14,825 km² open forest. District-wise forest-cover in different canopy density classes along with the changes compared to 2009 assessment are given in **Table 5**.

³ Fresh water body

⁴ Central Ground Water Board (1984), Ground Water Estimation Committee, Ministry of Irrigation.

⁵ Modified Mercalli Intensity Scale

⁶ Medvedev-Sponheuer-Karnik scale

Table 5: District Wise Forest Cover (Area in km²)

District	Geographical area	Very dense forest	Moderate dense forest	Open forest	Total	% Total of GA	Change	Scrub
Barpeta	3,245	35	179	183	397	12.23	-4	2
Bongaigaon	2,510	33	267	221	521	20.76	3	3
Cachar	3,786	81	975	1,180	2,236	59.06	5	18
Darrang	3,481	12	91	367	470	13.50	-16	2
Dhemaji	3,237	7	124	160	291	8.99	1	10
Dhubari	2,798	21	201	196	418	14.94	1	10
Dibrugarh	3,381	29	165	564	758	22.42	0	0
Goalpara	1,824	1	71	265	337	18.48	1	8
Golaghat	3,502	6	122	397	525	14.99	4	0
Hailakandi	1,327	13	373	400	786	59.23	0	5
Jorhat	2,851	2	113	498	613	21.50	3	0
Kamrup	4,345	68	612	753	1,433	32.98	1	26
Karbi Anglong"	10,434	566	3,819	3,554	7,939	76.09	-19	24
Karimganj	1,809	3	318	539	860	47.54	4	48
Kokrajhar	3,169	208	716	220	1,144	36.10	-19	2
Lakhimpur	2,277	4	118	171	293	12.87	5	6
Morigaon	1,704	6	41	86	133	7.81	1	4
North Cachar Hills	4,888	135	1,553	2,562	4,250	86.95	-6	1
Naogaon"	3,831	40	353	403	796	20.78	7	8
Nalbari	2,257	4	70	208	282	12.49	0	0
Shivsagar	2,668	8	144	543	695	26.05	2	1
Sonitpur	5,324	56	280	624	960	18.03	7	0
Tinsukia	3,790	106	699	731	1,536	40.53	0	4
Grand Total	78,438	1,444	11,404	14,825	27,673	35.28	-19	182

Source: India State of Forest Report 2011

51. **Figure 6** shows the forest cover map according to each district of Assam. The legend provides an overlay of electrical district proposed in **Figure 2 up to Figure 5** giving details of substation etc. for each district.

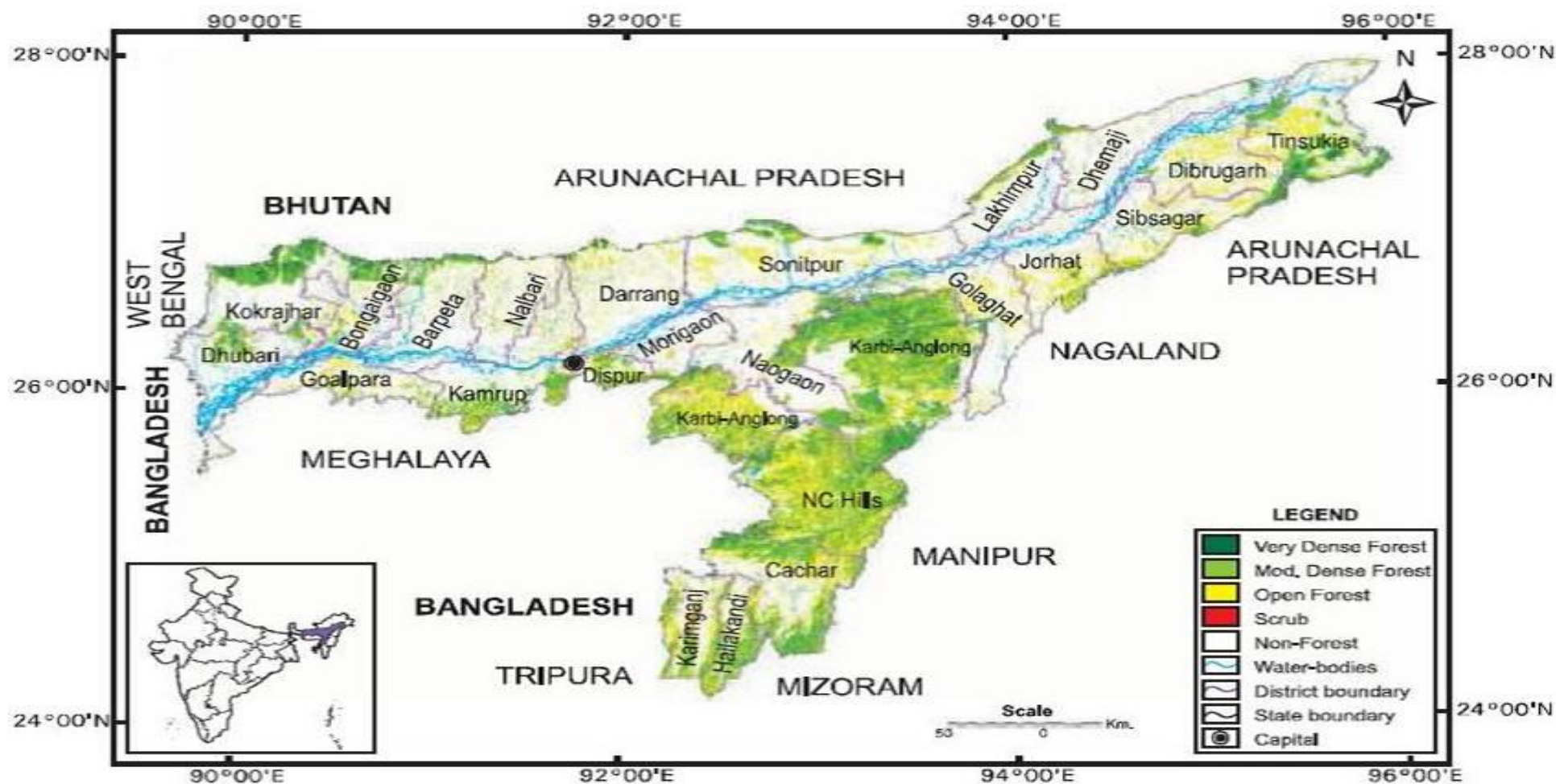


Figure 6: Forest Area of Assam

Legend:

No.	Reference District in Figure above	Electric Circle	Reference Figure	Total Substations
1	Sonitpur District	Tezpur Circle	Figure 2	6 substations
2	Dibrugarh District	Dibrugarh Circle	Figure 3	2 substations
3	Tinsukhia District	Tinsukhia Circle	Figure 3	7 substations
4	Golaghat District -	Golaghat Circle	Figure 4	3 substations
5	Shibsagar District	Shivsagar Circle	Figure 5	2 substations

Major Forest Types with list of major species:

52. In the “Revised Survey of Forest Types in India”, Champion and Seth⁷ categorized as many as 51 different forest types/sub types for the north-east region. However, broadly speaking the forests in Assam can be divided into the following types/sub-types:

53. Tropical Wet Evergreen Forests are found in the districts of Golaghat, Jorhat, Shivasagar, Tinsukia, Dibrugarh and in a narrow stretch in Lakhimpur and Dhemaji districts along foot hills. These forests also occur in the southern part of the State at lower elevations in Borail Range, and in Loharbund, Sonai, Longai and Dholia Reserve Forests in Cachar and Karimganj districts. Top canopy consists of *Dipterocarpus macrocarpus* (hollong), *Ailanthus integrifolia* (Borpat), *Altingia exelsa* (Jutuli), *Artocarpus chaplasi* (sam), etc. The middle canopy consists of *Mesua ferrea* (Nahar), *Michelia champaka* (Teeta chopra), etc. Third storey is bamboo, etc. Forests in Southern Assam have, however, top canopy consisting of *Dipterocarpus terbinatus* (Garjan), *Palanquium polyanthum* (Kurta), *Diospyros embryopteris* (Kendu), etc. Middle canopy has *Mesua ferrea* (Nahar), *Bischofia javanica* (Urium), *Podocarpus nerifolia* (Jiri), etc. The third storey has bamboo etc.

54. Tropical Semi Evergreen Forests have mostly medium sized trees with few large trees. Shrubs, lianas, climbers, orchids and ferns grow copiously. At the fringe, bamboos and canes occupy the space. Species association and frequency of their occurrence vary from forest to forest, but the ones commonly found are *Actinodaphnae obovata* (Petarichawa), *Aesculus* species (Ramanbih), *Artocarpus chaplasi* (Sam), *Albizia stipulata* (Siris), *Albizia procera* (Koroi), *Lagerstromia parviflora* (Sida), *Lagerstromia speciosa* (Ajar), *Anthocephalus chinensis* (Kadam), *Duabanga grandiflora* (Khakan), *Castanopsis* species (Hingori, Dhobahingori, Kanchan), *Dillenia indica* (Ou-tenga), *Bauhinia purpurea* (Kanchan), *Magnolia insignis* (Phulsopa), *M.griffithii* (Gahorisopa), *M.bailonii* (Khariksopa), *Terminalia belerica* (Bhomora), *T.chebula* (Silikha), *Terminalia myrocarpus* (Holok), *Pterospermum acerifolium* (Hati pulia), *Trewia nudiflora* (Bhelkor), etc.

55. Moist Deciduous Forests can further be described as Sal Forests and Mixed Deciduous Forests. Sal Forests occupy considerable forest area in the Central and Lower parts of the State in the Districts of Nagaon, Morigaon, Kamrup, parts of Nalbari and Barpeta, Darrang, Dhubri, Kokrajhar and Goalpara. In these forests, Sal grows in association with *Lagerstroemia* species (Jarul, Ajar), *Schima Wallichii* (Ghugra), *Stereospermum personatum* (Paruli), *Adina cordifolia* (Haldu), *Artocarpus* species (Sam), *Ficus* species (Bor, Dimoru, Dhupbor, Bot, Athabor, tengabor, Lotadioru, Khongaldimoru), *Bischofia javanica* (Uriam), *Gmelina arborea* (Gomari), *Michelia champaka* (Teeta champa), *Terminalia* species (Hilikha, Bhomora, Bahera), *Toona ciliata* (Poma), etc.

56. Moist Deciduous Mixed Forests occur at the foothills in Lakhimpur, Dhemaji, Karbi-Angong and N. C. Hills districts. Trees are mostly deciduous with sprinkling of few evergreen and semi-evergreen species. Important plant species growing in these forests include *Adina cordifolia* (Haldu), *Albizia* species (Siris, Kolasiris, Koroi, Sau), *Alstonia scholaris* (Satiana), *Artocarpus chaplasi* (Sam), *Careya arborea* (Kumbhi), *Dalbergia* species (Sissoo, Medelua), *Ficus* species (Bot, Bor, Dimoru), *Lagerstroemia* species (Jarul, Ajar), *Mallotus* species (Senduri, Joral, Dudhloti), etc. Bordering Moist Deciduous Forests in rain shadow areas are found forests, which have been referred to, as “Dry Forests” by Kanjilal. Important species include, *Aegle marmelos* (Bel), *Albizia* species (Siris), *Cassia fistula* (Sonaru), *Bombax ceiba* (Simul), *Alstonia scholaris* (Satiana), *Ficus bengalensis* (Bor), *Litsea* species (Loban, Bagnola, Mezankori, Honwalu, Digloti) *Melia azedarach* (Neem), *Moringa oleifera* (Sajana), *Oroxylum indicum* (Bhatgila), *Mallotus* species (Senduri), *Terminalia belerica*, *T.chebula*, etc.

⁷ A Revised Survey of the Forest Types of India, Harry G. Champion and S.K. Seth, Natraj, 2005, Reprint, xxviii, 404 p, tables, figs, ISBN : 8181580613

57. Sub-tropical Broad Leaf Hills forests and Sub-tropical Pine forests occur in the districts of Karbi-Anglong and N. C. Hills. Species commonly occurring are *Alseodaphne petiolaris* (Ban-hanwalu), *Antidesma bunius*, *Betula alnoides*, *Cleidon speciflorum* etc. Higher up pure stands of *Pinus kesiya* (Khasi-pine) are found, particularly in the Hamren sub-division in Karbi-Anglong district.

58. Grass land and Savannahs are grass dominated biomes and form the major part of vegetation in Kaziranga National Park, Orang N.P., Dibru-Saikhowa N.P., Pobitora, Sonai-Rupai, Laokhowa, Barnadi, Burachapori Wildlife Sanctuaries and some part in Manas National Park. Grasslands support important wildlife population in Assam. Important grasses are *Apluda mutica*, *Phragmatis karka*, *Sclerostachya fusca*, *Saccharum* species, *Arundodonax* etc. These species grow gregariously at the onset of monsoon and grow even up to 6 m-tall.

59. Littoral and Swamp forests have almost lost their identity because of biotic pressure on land. Presently, sedges and grasses form the largest component of vegetation. Important species include *Ageratum conyzoides*, *Alocasia* species, *Alpinia* species, *Amaranthus* species, *Bacopa* species, *Blumea* species, *Bombax* species, *Crotolaria* species, etc.

3.3.2 Flora and Fauna

60. Assam is part of the transitional zone between the Indian, Indo- Malayan and Indo- Chinese biographical regions. Favorable climate, topographic and edaphic factors support luxuriant growth of diverse plant communities and create varied habitats. The Wet Evergreen, Semi-Evergreen, Moist Deciduous, Wet Savannah and Riparian forest as well as extensive network of river systems and swamps, marshes and wetlands provide ideal conditions and suitable habitat for sustenance of wide variety of mammals, primates, reptiles, amphibians, fishes, mollusks, birds, butterflies, moths etc. having existence of one of the most diverse faunal population.

61. Assam provides the gateway for spread of both oriental and Palaearctic fauna to other parts of the country. Assam's mammalian diversity is represented by 193 species, which are widely distributed in this region. But of late some of the species like one horned rhinoceros, water buffalo, pigmy hog, swamp deer, golden langur, hoolock gibbon have their distribution limited to isolated pockets and protected areas. Out of 15 Indian primate species, 9 are found in Assam. Hoolock gibbon is the only ape found in India. The other primate species are golden langur, capped monkey, rhesus macaque, pigtail macaque, stump-tailed macaque, Assamese macaque, and slow Lorries. Golden langur or "Sonali Bandar" as it is known locally is confined between Sankosh river in the west; Manas in the east; Brahmaputra in the south and mountains in Bhutan in the north.

62. Species association and frequency of their occurrence vary from forest to forest, but the ones commonly found are Petarichawa (*Actinodaphne obovata*), Ramanbih (*Aesculus species*), Sam (*Artocarpus chama*), Siris, Sau, Koroi (*Albizia species*), Kadam (*Anthocephalus chinensis*), Khakan (*Duabanga grandiflora*), Hingori, Dhobahingori, Kanchan (*Castonopsis species*), Ou-tenga (*Dillenia indica*), Kanchan (*Bauhinia purpurea*), Jarul, Ajar, Sidha (*Lagerstroemia species*), Magnolia species (Phulsopa, Gahorisopa, Pansopa, Kharikasopa, Kathalsopa, Duleesopa), Sinduri, Joral, Dudhloti, Buritokan (*Mallotus species*), Teeta campa (*Michelia champaca*), Paharijam, Mokrajam, Berjamu, Kolajamu, Bogijamu, golapjamu (*Syzygium species*). Bolem, Ghugra (*Schima wallichii*), Hilikha, Bohera, Bhomora (*Terminalia species*) and Bhelkor (*Trewia nudiflora*).

3.3.3 Protected Areas

63. Assam has five National Parks and 18 Wildlife sanctuaries. Together they cover 3,925 km², which is nearly 5% of the total geographical area of the Assam State. **Table 6** gives details of national parks and the distances from each of the proposed substations.

64. As evident from the table, the substation sites are far away from these national parks. The erection and operation of proposed 33 kV and 11 kV distribution lines will not impact the bird population in these areas.

65. **Figure 7** shows the location of national parks and the wildlife sanctuaries in Assam state. The legend provides an overlay of electrical district proposed in **Figure 2 through Figure 5** giving details of substation etc. for each district.

Table 6: Details of National Parks in Assam and distances from Substations

SNo	Name	Area (in km ²)	Established	Notability	IUCN Category ⁸	Electrical Circle	Substation	Approximate Distance of village from boundary of National Park/Protected Area (in m)
1	Dibru-Saikhowa	340	1999		II	Tinsukia	Baghjan	10 km
						Tinsukia	Gangwari	16 km
						Tinsukia	Mahakali	27 km
						Tinsukia	Dholla	8 km
						Tinsukia	Gelapukhuri	10 km
						Tinsukia	Philobari	8 km
						Tinsukia	Pawoi	50 km
						ShivaSagar	Borhat	100 km
						ShivaSagar	Napuk	100 km
						Dibrugarh	Gharamara	50 km
						Dibrugarh	Namsung	50 km
2	Kaziranga	471.71	1905	Indian rhinoceros, UNESCO World Heritage Site	II	Golaghat	Radhabari	55 km
						Golaghat	Nahorbari	51 km
						Golaghat	Doyang	70 km
3	Manas	500	1990	UNESCO World Heritage Site	II			
4	Nameri	137.07	1978	Tiger project	II	Sontipur	Bindukuri	66 km
5	Orang	78.81	1999	Bird Sanctuary	II	Sontipur	Borjuli	40 km
						Sontipur	Bedeti	8 km
						Sontipur	Singri	10 km
						Sontipur	Rakhysmari	10 km
						Sontipur	Borsola	40 km

⁸ IUCN protected area management categories classify protected areas according to their management objectives. The categories are recognised by international bodies as the global standard for defining and recording protected areas. Category Ia: Strict Nature Reserve, Category Ib: Wilderness Area, Category II National Park, Category III Natural Monument or Feature, Category IV: Habitat/Species Management Area, Category V: Protected Landscape/ Seascape, Category VI: Protected area with sustainable use of natural resources

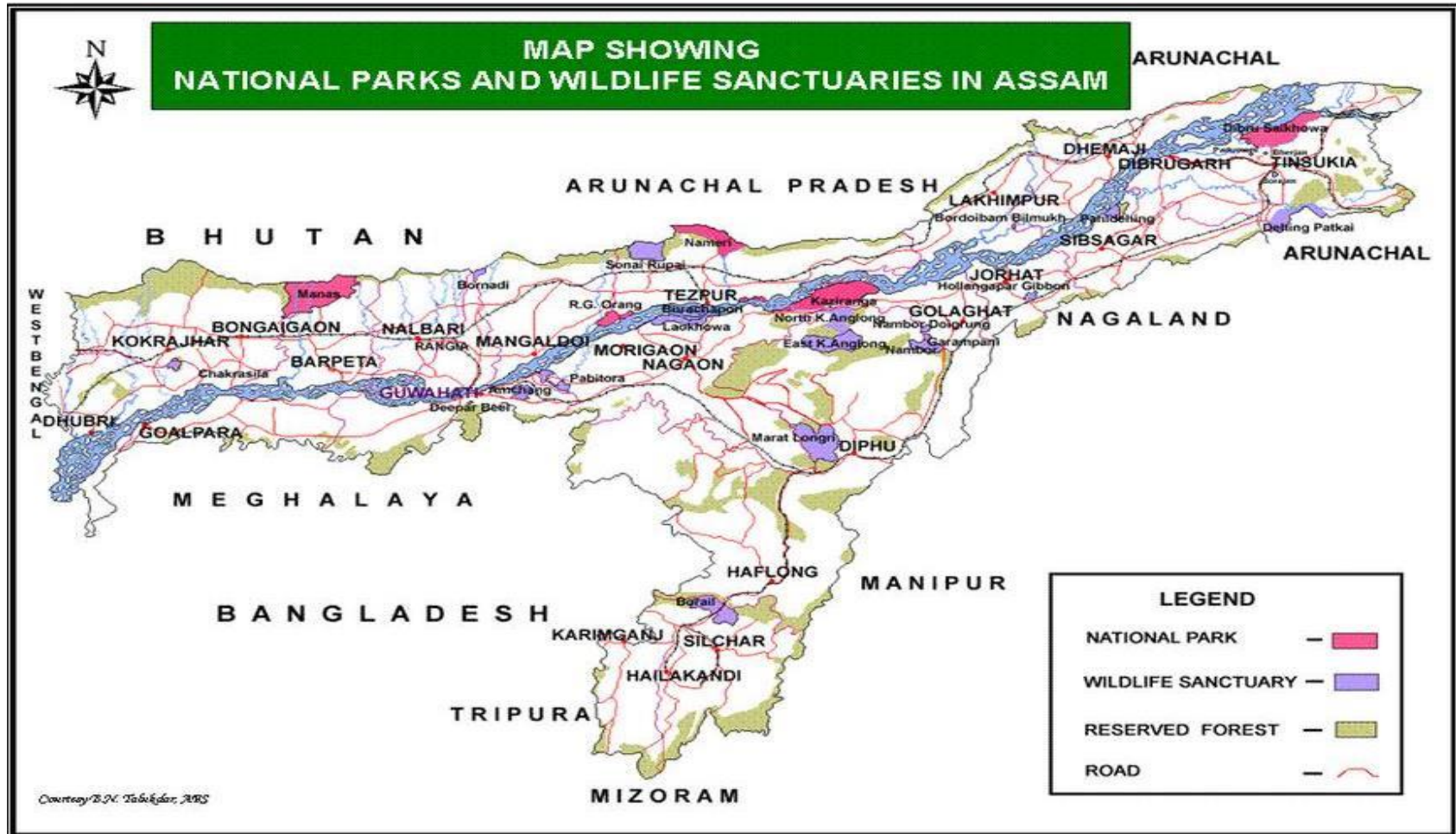


Figure 7: National Parks in Assam State

Legend:

No.	Reference District in Figure above	Electric Circle	Reference Figure	Total Substations
1	Sonitpur District	Tezpur Circle	Figure 2	6 substations
2	Dibrugarh District	Dibrugarh Circle	Figure 3	2 substations
3	Tinsukhia District	Tinsukhia Circle	Figure 3	7 substations
4	Golaghat District -	Golaghat Circle	Figure 4	3 substations
5	Shibsagar District	Shivsagar Circle	Figure 5	2 substations

3.3.4 National Parks and Sanctuaries

66. Dibru-Saikhowa National Park is a national wildlife park in Tinsukia, Assam, India, located at about 12 km north of Tinsukia town of Assam covering an area of 350 km². It lies between 27°30' N to 27°45' N latitude and 95°10' E to 95°45' E longitude at an average altitude of 118 m (ranging from 110 m-126 m). It is also a biosphere reserve. The park is bounded by the Brahmaputra and Lohit rivers in the north and Dibru River in the south. It is situated in Dibrugarh and Tinsukia district of Assam. It mainly consists of moist mixed semi-evergreen forests, moist mixed deciduous forests, canebrakes and grasslands. It is the largest salix swamp forest in northeast India.

67. The Kaziranga National Park harbours the world's largest population of Indian rhinoceros *Rhinoceros unicornis* (E), which has increased from a few dozen in 1908 (Gee, 1964) to some 1,080 in 1984 and 1,100 in 1988. Other mammals include capped langur *Presbytis pileata*, a small population of hoolock gibbon *Hylobates hoolock*, tiger *Panthera tigris* (E), leopard *P. pardus* (T), sloth bear *Melursus ursinus* (I), Indian elephant *Elephas maximus* (E) (523), Ganges dolphin *Platanista gangetica*, otter *Lutra lutra*, wild boar *Sus scrofa* (3,645), water buffalo *Bubalus arnee* (V) (677), gaur *Bos gaurus* (V) (30), sambar *Cervus unicolor* (358), swamp deer *C. duvauceli* (V) (756), hog deer *C. porcinus* (9,872) and Indian muntjac *Muntiacus muntjak*. There is a grey pelican *Pelecanus philippensis* rookery near Kaziranga Village. Other birds of interest include black-necked stork *Ephippiorhynchus asiaticus*, lesser adjutant stork *Leptoptilos javanicus*, Pallas's fish eagle *Haliaeetus leucoryphus*, grey-headed fish eagle *Ichthyophaga ichthyaeetus*, perhaps 25-30 Bengal florican *Houbaropsis bengalensis* (E), swamp partridge *Francolinus gularis*, grey peacock-pheasant *Polyplectron bicalcaratum*, great pied hornbill *Buceros bicornis*, green imperial pigeon *Ducula aenea*, silver-breasted broadbill *Serilophus lunatus* and Jerdon's bushchat *Saxicola jerdoni*. The avifauna comprises of over 300 species.

68. Nameri National Park is a national park located in the foothills of the Eastern Himalayas in the Sonitpur District of Assam, India, about 35 kilometers from Tezpur having a total area of 200 km². The vegetation type is semi-evergreen, moist deciduous forest with cane and bamboo brakes and narrow strips of open grassland along rivers. The forests are also rich in epiphytes, lianas, and creepers and clump-forming bamboo. This forest has over 600 species. Some notable species are *Gmelina arborea*, *Michelia champaca*, *Amari*, *Chukrasia tabularis*, *Ajar*, *Urium poma*, *Bhelou*, *Agaru*, *Rudraksha*, *Bonjolokia*, *Hatipolia akhakan*, *Terminalia myriocarpa*, *Mesua ferrca*. It also is home for Orchids like *Dendrobium*, *Cymbidium* and *Cypripedium reginae*. It is also an ideal habitat for a host of other animals including the tiger, Leopard, Sambar, dhole (the Asiatic wild dog), Pygmy Hog, Muntjac, Gaur, Wild Boar, Sloth Bear, Himalayan Black Bear, Capped Langur and Indian Giant Squirrel. Nameri is a bird watcher's paradise with over 300 species of birds. The white winged wood duck, Great Pied Hornbill, Wreathed Hornbill, Rufous Necked Hornbill, Black Stork, Ibis Bill, Blue-bearded Bee-eaters, Babblers, Plovers and many other birds make Nameri its home.

69. Orang National Park encompassing an area of 78.81 km² (or 30.43 mi²), lies on the north bank of the Brahmaputra river, delimited between 26.483°N 92.266°E and 26.666°N 92.45°E within the districts of Darrang and Sonitpur. Pachnoi River, Belsiri river and Dhansiri River border the park and join the Brahmaputra river. During the monsoon season, the park becomes a veritable flood plain with many streams overlapping each other. The whole park is encircled by inhabited villages thus subjecting it to biotic pressure. Apart from the Great Indian One-Horned Rhinoceros (68 nos at the last count), which is the dominant species of the national park, the other key species sharing the habitat are the Royal Bengal Tiger (*Panthera tigris tigris*), Asiatic elephant, Pygmy Hog, hog deer and wild boar. Some important species of the critically endangered and endangered category are the following. Pygmy Hog, a small wild pig, is Critically Endangered. Other mammals reported are the Blind Gangetic Dolphin, Indian Pangolin, Hog Deer (*Axis porcinus*), Rhesus Macaque, Bengal Porcupine, Indian Fox, Small Indian Civet, Otter, Leopard cat (*Prionailurus bengalensis*), Fishing cat (*Felis viverrina*) and Jungle Cat (*Felis chaus*). The park is home to a variety of migratory birds, water birds, predators, scavengers and game birds. 47 families of Anatidae, Accipitridae, Addenda and Ardeiae are found in the park with maximum number of

species. 222 species of birds have so far been recorded, some of which are: Spot-billed Pelican (*Pelicanus philippensis*), Great White Pelican, Black-necked Stork (*Ephippiorhynchus asiaticus*), Greater Adjutant Stork (*Leptoptilos dubius*), Lesser Adjutant Stork (*Leptoptilos javanicus*), Ruddy Shelduck (*Tadorna ferruginea*), Gadwall (*Anas strepera*), Brahminy Duck, Mallard (*Anas platyrhynchos*), Pintail (*Anas acuta*), Hornbills, Pallas's Fishing Eagle (*Haliaeetus leucoryphus*), King Fisher and Woodpecker, in addition to forest and grassland birds. Among reptiles, seven species of Turtle and Tortoise are found, out of which turtle varieties such as *Lissemys punctata*, *Kachuga tecta* are common. Among snakes, pythons and cobras are recorded here. Indian Rock Python, Black Krait, King Cobra, Cobra, Monitor Lizard are the reptiles found here. The park has rich vegetation of forests, natural forest, and non-aquatic grass/plants. The forest species found are *Bombax ceiba*, *Dalbergia sissoo*, *Sterculia villosa*, *Trewia nudiflora*, *Zizyphus jujuba* and *Litsaea polyantha*. Among the non-aquatic grassland species the prominent are *Phragmites karka*, *Arundo donax*, *Imperata cylindrica* and *Saccharum spp.* The aquatic grass/plants species found are: *Andropogon spp.*, *Ipomoea reptans*, *Enhydra fluctuans*, *Nymphaea spp.* and Water hyacinth.

70. Manas National Park is a National Park, UNESCO Natural World Heritage site, a Project Tiger Reserve, an Elephant Reserve and a Biosphere Reserve in Assam, India. The park is known for its rare and endangered endemic wildlife such as the Assam Roofed Turtle, Hispid Hare, Golden Langur and Pygmy Hog. Manas is famous for its population of the Wild water buffalo. A total of 543 plants species have been recorded from the core zone. Of these, 374 species are dicotyledons (including 89 trees), 139 species monocotyledons and 30 are Pteridophytes and Gymnosperms. The Park's common trees include *Aphanamixis polystachya*, *Anthocephalus chinensis*, *Syzygium cumini*, *Syzygium formosum*, *Syzygium oblatum*, *Bauhinia purpurea*, *Mallotus philippensis*, *Cinnamomum tamala*, *Actinodaphne obvata*, *Bombax ceiba*, *Sterculia villosa*, *Dillenia indica*, *Dillenia pentagyna*, *Careya arborea*, *Lagerstroemia parviflora*, *Lagerstroemia speciosa*, *Terminalia bellirica*, *Terminalia chebula*, *Trewia polycarpa*, *Gmelina arborea*, *Oroxylum indicum* and *Bridelia spp.* The grasslands are dominated by *Imperata cylindrica*, *Saccharum naranga*, *Phragmites karka*, *Arundo donax*, *Dillenia pentagyna*, *Phyllanthus emblica*, *Bombax ceiba*, and species of *Clerodendrum*, *Leea*, *Grewia*, *Premna* and *Mussaenda*. The fauna of the sanctuary include Asian Elephants, Indian Rhinoceros, Gaurs, Asian Water Buffaloes, Barasingha, Indian Tigers, Leopards, Clouded Leopards, Asian golden cat, Capped Langurs, Golden Langurs, Assamese Macaques, Slow Loris, Hoolock Gibbons, Smooth-coated Otters, Sloth Bears, Barking Deer, Hog Deer, Black Panther, Sambar Deer and Chital. The park is well known for its rare and endangered wildlife, which is not found anywhere else in the world like the Assam Roofed Turtle, Hispid Hare, Golden Langur and Pygmy Hog. Manas houses more than 450 species of birds. Manas have the largest population of endangered Bengal Florican. The major other birds includes Giant Hornbills, Jungle Fowls, Bulbuls, Brahminy Ducks, Kalij Pheasants, Egrets, Pelicans, Fishing Eagles, Serpent Eagles, Falcons, Scarlet Minivets, Bee-Eaters, Magpie Robins, Pied Hornbills, Grey Hornbills, Mergansers, Harriers, Ospreys and Herons.

3.4 Socio-Economic Environment

71. Assam has a good potential for tourism development due to its scenic beauty, rare flora and fauna, vast rolling plain, waterways and famous pilgrimage destinations.

3.5 Economic Development

3.5.1 Land use pattern

72. The population of the state is 31.17 million (Census 2011). Rural and urban population accounts for 85.92% and 14.08%, respectively. The population density is 397 persons per km². The livestock population of the state is 17.23 million (Livestock Census 2007). The Districtwise land utilisation pattern in the state is given in **Table 7**.

Table 7: Districtwise Land Utilisation Statistics (Area in hectare)

No.	District	Geographical Area	Forest	Area not available for cultivation	Permanent Pastures & Other Grazing Land	Land Under Miscellaneous Trees Groves etc.	Cultivable waste Land	Fallow land	Net Cropped Area	Gross Cropped Area	Area Sown more Than once	Cropping intensity
1	Baksa	200750	83019	36826	8931	824	420	3	66085	137955	71870	209%
2	Barpeta	267733	48013	39444	11932	3215	1290	1305	159311	264732	105421	166%
3	Bongaigaon	172529	44	64715	5157	1327	3900	9221	67635	104698	37063	155%
4	Cachar	378600	138409	89148	2600	17108	2037	12922	115386	160728	45342	139%
5	Chirang	197480	41037	18561	1371	995	1133	121	46767	89679	42912	192%
6	Darrang	185058	276	43182	4121	7653	3879	17763	103833	154137	50304	148%
7	Dhemaji	323700	59355	136963	15818	18112	17064	8882	67506	120243	52737	178%
8	Dhubri	166410	29155	78125	2079	2998	3872	16023	134349	172980	38631	129%
9	Dibrugarh	338100	23341	142488	6170	16883	7126	3276	139498	161031	21533	115%
10	Dima Hasao	488800	67277	393352	-	-	-	-	28171	56483	28312	201%
11	Goalpara	182400	29683	62265	3576	6751	675	559	80753	131800	51047	163%
12	Golaghat	350200	156905	51232	8314	8217	5801	4555	119046	184885	65839	155%
13	Hailakandi	132700	62420	14392	932	3716	275	558	50294	73246	22952	146%
14	Jorhat	285100	21904	110567	4406	9024	6686	12273	120240	177377	57137	148%
15	Kamrup (R)	348377	70885	31671	12305	12212	3225	1132	177254	181015	3761	102%
16	Kamrup(M)	62718	22140	30039	7895	10508	251	867	43317	48561	5244	112%
17	Karbi Anglong	1043400	319294	587707	-	-	-	-	126399	202564	76165	160%
18	Karimganj	180900	55995	38518	2710	5470	2100	72	76035	103474	27439	136%
19	Kokrajhar	316544	161195	43458	15031	2352	2065	2243	86556	179533	92977	207%
20	Lakhimpur	227700	29379	94361	4331	974	2030	3780	100169	206501	106332	206%
21	Morigaon	155100	13207	31704	8331	4189	960	8363	92011	126417	34406	137%
22	Nagaon	397300	88024	64540	5966	8968	3523	4383	235626	289212	53586	123%
23	Nalbari	100957	0	26325	1338	582	1107	3401	67730	113916	46186	168%
24	Sibsagar	266800	30465	56151	7330	20061	1820	7641	136822	146734	9912	107%
25	Sonitpur	528058	147843	194498	11902	6854	227	5833	165141	265397	100256	161%
26	Tinsukia	379000	131595	114883	3560	19786	1586	2876	104714	146916	42202	140%
27	Udalguri	167394	22400	30430	3862	7061	3579	112	99949	159311	59362	159%
Total		7843808	1853260	2625545	159968	195840	76631	128164	2810597	4159525	1348928	148%

Source: Statistical Handbook of Assam 2011⁹

⁹ http://www.agriassam.in/agriHorti_profile/Profile%20of%20Agri-Horti%20Sector%20of%20Assam-February%202013.pdf

3.5.2 Agriculture/Horticulture

73. The economy of Assam continues to be predominantly agrarian. The Agriculture sector in the State is providing employment to more than 50 percent of the rural people. The net cultivated area of the State is 28.11 lakh hectare (2009-2010) which is about 88 percent of the total land available for agricultural cultivation in the State. The contribution of Agriculture sector to the State Domestic Product was nearly 25 percent during 2010-2011. **Table 8** gives agricultural activity details for Assam.

Table 8: Area, Production & Productivity of crops during 2011-2012.

Sl. No.	Crop	Area (lakh ha.)	Production (lakh MT)	Productivity (Kg. per ha.)
1	Rice	25.45	50.45	1986
2	Wheat	0.40	0.49	1209
3	Maize	0.21	0.17	802
4	Other Cereals & Small Millets	0.04	0.02	511
5	Blackgram	0.54	0.30	556
6	Greengram	0.12	0.06	551
7	Lentil	0.23	0.12	523
8	Pea	0.21	0.14	641
9	Arahar	0.06	0.04	784
10	Gram	0.02	0.01	524
11	Other Pulses	0.15	0.09	606
12	Total Pulses	1.32	0.76	579
13	Total Foodgrains	27.42	51.89	1914
14	Rape & Mustard	2.48	1.39	559
15	Sesamum	0.12	0.08	674
16	Linseed	0.07	0.04	567
17	Castor	0.01	0.01	556
18	Niger	0.08	0.04	519
19	Total Oilseeds	2.76	1.56	565
20	Jute	0.66	1.09	1669
21	Mesta	0.05	0.05	1023
22	Sugarcane	0.28	10.53	37055
23	Fruits	1.36	17.14	12600
24	Spices	0.98	2.48	2535
25	Potato	0.98	6.83	6978
26	Vegetables	2.66	46.20	17368

Source: Statistical Handbook of Assam 2011¹⁰

3.5.3 Industries

75. The main industries in Assam are oil industry and tea industry. Majority of the population is agrarian. Of the agriculture-based industries, tea occupies an important place. Tea gardens in the State occupy an area of about 271,768 hectare. Assam has over 43,293 tea estates and contributes 15.6% of world's tea production and 55% of the country's tea output. **Table 9** gives details of tea industry in Assam.

Table 9: Tea Statistics of Assam and India

Year	No. of Tea Gardens		Area under Tea (in'000 hectare)		Total Tea Production (in 000 kg.)		Average yield(kg/ hectare.)	
	Assam	India	Assam	India	Assam	India	Assam	India
2001	40795	116659	269	510	453587	853923	1685	1675
2002	43272	127801	271	516	433327	838474	1601	1625
2003	43293	129027	272	520	434759	878129	1601	1690
2004	43293	129027	272	521	435649	892965	1603	1713
2005	49102	140712	301	556	487487	945974	1622	1703

¹⁰ http://www.agriassam.in/agriHorti_profile/Profile%20of%20Agri-Horti%20Sector%20of%20Assam-February%202013.pdf

Year	No. of Tea Gardens		Area under Tea (in'000 hectare)		Total Tea Production (in 000 kg.)		Average yield(kg/ hectare.)	
	Assam	India	Assam	India	Assam	India	Assam	India
2006	NA	NA	312	567	502041	981805	1610	1732
2007	NA	NA	321	578	511885	986427	1593	1705
2008(E)	NA	NA	322	578	487497	980818	1513	1693

(E) Area, Production and Average yield estimated and subject to revision.

Source: data from Economic Survey, Assam, 2011-2012 for Tea Board of India.

76. Assam is the first state in the country where oil was struck in 1889 at Digboi. Petroleum and petroleum products amount to a large share of the country's total output of petroleum and natural gas. The State has four oil refineries. Besides a public sector fertilizer factory at Namrup, the industries located in the State are sugar, jute, silk, paper, plywood manufacture, rice and oil milling. A polyester spinning mill has also been established at Kamrup district. **Table 10** gives details about selected industries in Assam.

Table 10: Production of Some Selected Industries

Item	Unit	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
1. Tea	000 tonnes	443	655	531	486	484	498
2. Wheat Flour -do-		207	220	202	837	848	1044
3. Coal -do-		628	956	1058	1101	1147	1203
4. Jute Textiles Tonnes		7903	5910	7227	9494	11249	12511
5. Crude Oil	000 tonnes	4724	4429	4426	4361	4673	4738
6. Cement -do-		341	251	175	213	446	644
7. Fertilizer	000 M. T.	203	222	308	346	313	338

Source: Economic Survey 2010-11¹¹, Tea: Tea Board of India. Minerals: Indian Bureau of Mines, Nagpur Others: Individual Industrial Units

3.6 Social and Cultural Development

3.6.1 Population

77. The population of Assam is 26.7 million as of 2001 census¹² and the population density is 3.4 persons per hectare (ha). There are 27 districts, which are large administrative units and the total villages in these districts are 26,247 villages. Literacy rate is 64.28% (as of 2001) and GDP per capita of the state was Rs 6,220 in 2001. Agriculture sector accounts for 40% of the GDP. The state had a livestock population of 16 million, which was 3.4% of the country's total. The economy is based primarily on agriculture, crude oil and natural gas production, and petrochemical exploration.

78. Rural population comprised 89% of the total population in Assam and 53% of the workforce is predominantly employed in the agriculture sector. About 40% of the total land area is cultivated. The main crops are tea (accounts for over 50% of total production in the country), bamboo, ginger, chilis, peas, rice, wheat and oil seeds. Assam has been ranked in 6th place in fruit and vegetable production in India. Despite the large contribution of agriculture in GDP, demand-supply gaps are noticeable and subsistence farming is prevalent. Mechanization of agricultural activities and energy supply to extract the groundwater for irrigation are limited. Average farm size is 1.27 ha.

79. Assam ranks 16th in the human resources development index based on the 2007-2008 values and the incidence of poverty in Assam is lower than the country's overall incidence of poverty. There is a huge rural-urban divide—about one out of five people in rural areas is likely to be below the poverty line, while in urban areas the incidence is one in 30.¹³ Assam has growth of income rates below the national average. The incidence of unemployment is increasing in the state.

3.6.2 Education

¹¹ http://planassam.info/Economic_Survey_Assam_2010-11/Economic%20Survey_Chapter-11_INDUSTRY,%20TRADE%20AND%20MINING.pdf

¹² Department of Environment and Forest, Government of Assam, Official website- <http://assamforest.in/>

¹³ India Human Development Report, 2011, Table 2.4. http://www.iamrindia.gov.in/ihdr_book.pdf.

80. **Table 11** gives details of educational institutions in Assam state.

Table 11: Education Statistics

Sno	Type of Institution	Number
1.	University	7
2.	Open University	1
3.	Institutions of National Importance	11
4.	College for General Education	
	Arts, Science and Commerce	348
5.	College for Professional Education	
	Agriculture & Forestry	2
	Engineering	9
	Law	22
	Veterinary	2
	Medical College (Homoeo/Ayurvedic/Dental/ Pharmacy/Nursing)	10
	Management Institution	6
6.	Schools for General Education	
	Higher Secondary	620
	High School	4,776
	Middle/Senior Basic	9,716
	Primary	30,499
	Pre-primary	199
7.	Institution for Professional Education (Under Graduate)	
	Polytechnic Institution	9
	Technical, Industrial Arts and Crafts Institution	32
8.	Teacher's Training Institution	
	Teacher's Training College	40
	Teacher's Training Schools	2
9.	Schools for Vocational Professional, special and other Education	
	Commerce	36
	Music and Dancing	43
	Arts and Crafts	26
	Junior Technical	6
	Handicapped	5
	Juvenile Delinquent (Jail School)	4

Source: Statistical Hand Book, Assam, 2007.

3.6.3 Infrastructure

81. The road network in Assam is extensive in terms of road density, that is, road length per thousand sq km. of all roads. District-wise length of roads according to different classes under PWD in Assam, 2010-2011 (in km.) is shown in **Table 12**. Although, the national highways in Assam have added more length in recent years but is not appended to this table as the distribution infrastructure is normally constructed adjoining local roads.

Table 12: District-wise length of Roads according to different classes under PWD in Assam, 2010-2011 (in km.)

No.	District	State Highway	Major District Road	Rural Road	Urban Road	Total
1.	Barpeta	158	171	875	31	1236
2.	Bongaigaon	41	16	708	36	801
3.	Cachar	107	165	748	42	1063
4.	Darrang	143	119	770	20	1051
5.	Dhemaji	45	42	1167	86	1339
6.	Dhubri	56	53	850	38	997
7.	Dibrugarh	155	163	1237	63	1618
8.	Goalpara	137	48	851	10	1047
9.	Golaghat	160	157	1342	33	1691
10.	Hailakandi	17	99	351	6	473
11.	Jorhat	162	89	1713	86	2051
12.	Kamrup	89	230	2444	457	3219
13.	Karbi-Anglong	337	561	3341	70	4309
14.	Karimganj	35	343	539	19	936
15.	Kokrajhar	61	131	762	16	970
16.	Lakhimpur	121	97	811	44	1074
17.	Morigaon	142	86	909	13	1150

18. Nagaon	297	327	2407	88	3118
19. Nalbari	119	45	779	22	965
20. Dima Hasao	380	199	1197	60	1836
21. Sivasagar	100	310	1573	40	2023
22. Sonitpur	55	402	2013	59	2528
23. Tinsukia	63	171	1005	52	1291
24. Baksa	97	43	791	0	931
25. Chirang	0	223	392	8	623
26. Udalguri	56	125	1269	9	1458
Total	3134	4413	30844	1409	39800

Source : Economic Survey 2000-11, Assam, (P.W.D. , Assam)

3.6.4 Health Environment

82. **Table 13** gives the health facilities in the districts of Assam.

Table 13: Public Health Infrastructure Assam

No	Type of Health Institution	Medical College	DH	SDCH	CHC	PHC	SC	Total No. of Health Institutions (Public)
1	Barpeta	1	1	1	6	50	264	323
2	Baksa	0	1	0	4	39	157	201
3	Bongaigaon	0	1	0	2	30	57	90
4	Cachar	1	1	0	1	30	270	303
5	Chirang	0	1	0	2	25	83	111
6	Darrang	0	1	0	4	30	170	205
7	Dhemaji	0	1	0	3	21	98	123
8	Dhubri	0	1	1	6	43	246	297
9	Dibrugarh	1	0	0	5	25	231	262
10	Goalpara	0	1	0	2	41	151	195
11	Golaghat	0	1	1	4	40	144	190
12	Hailakandi	0	1	0	2	12	105	120
13	Jorhat	1	0	2	4	42	144	193
14	Kamrup(Metro)	2	1	0	3	25	51	82
15	Kamrup	0	1	1	9	70	280	361
16	Karbi Anglong	0	1	1	5	47	152	206
17	Karimganj	0	1	0	2	27	221	251
18	Kokrajhar	0	1	1	4	45	159	210
19	Lakhimpur	0	1	1	5	28	156	191
20	Morigaon	0	1	0	2	33	123	159
21	Nagaon	0	1	0	11	74	357	443
22	Nalbari	0	1	0	7	45	121	174
23	Dima Hasao	0	1	0	2	11	65	79
24	Sivasagar	0	1	2	2	42	219	266
25	Sonitpur	0	1	2	3	53	274	333
26	Tinsukia	0	1	0	5	23	164	193
27	Udalguri	0	1	0	3	24	147	175
Assam		6	25	13	108	975	4609	5736

DH-District Hospital, PHC-Public Health Center, CHC-Civil Health Center, SDHC-Sub-Divisional Civil Hospital, SD – State Dispensary, SC-Sub center

Source: Data from National Health Mission, Assam, 2008 website¹⁴

3.7 Historical, Cultural and Archaeology Sites/Places

83. Sivasagar-Earlier known as "Rangpur", the historical city of Assam is situated 363 km east of Guwahati (The capital of Assam). Earlier, Sivasagar was the capital of the mighty Ahoms, who ruled Assam for more than six hundred years before the advent of the British. The most remarkable landscape of the town is the 200 year old Sivsagar tank.

84. On its banks are three temples-- the Shivadol, the Vishnudol and the Devidol-- all three built by Queen Madambika, wife of Siva Singha, in the year 1734. The Shivadol is believed to be the highest Siva Temple in India, having a height of 104 feet and a perimeter of 195 feet. The tank is situated in the heart of the town but the water level is above the level of the town.

¹⁴ http://www.nrhmassam.in/health_facilities.php

85. Joysagar, 5 km off the Sivasagar town, said to be biggest man made tank in the country, in an area over 318-acres. Sivasagar is also famous for 'Talatal Ghar', and 'Rang Ghar'. Rang Ghar amphitheatre was built by King Pramatta Singha. This two storied oval shaped pavilion is one of the largest of its kind in Asia. The main tourist attractions of Sivsagar district are Ranghar, Kareng Ghar & Talatal Ghar, Gargaon Palace, Charaideo, Joysagar Tank, Gaurisagar Tank and Temple, Rudrasagar Tank and Temple, Namdang Stone Bridge and Ajan Pir Dargah Sharif.

86. Charaideo - The first capital of the Ahom kings, built by Sukapha, the founder of the Ahom dynasty, is 28 km east of Sivasagar town. It is famous for the numerous Maidums or burial venues of Ahom kings and other members of the royal families. It resembles to some extent the pyramids of Egypt. Chariduar - Located at about 34 km north of Tezpur, Chariduar is famous for forest products exported to various parts of the State. During the 19th century, the rubber tapped at Chariduar yielded handsome revenue. A big old tank, named Boli Pukhuri, situated in Chariduar area is associated with the mythological Kings Boli and Banasur. Remnants of ancient stone temples, built between 11th to 12th centuries are found scattered in and around the area. Da-Parbatia - The oldest relics until now discovered are preserved in the village of Da-Parbatia about 5 km west of Tezpur. The stone door-frame preserved in the village is considered to be of 5th or 6th century. The ruins of the door-frame of Da-Pabatia are perhaps the finest and the oldest specimen of sculptural or iconoclastic art of Assam. The door-jumps having two goddesses, Ganga and Yamuna standing below with garlands in hands in artistic pose and elegance are decorated with beautiful ornamental foliage. The architecture of the stone door-frame is believed to be of the Gupta era.

87. Garampani -The most important hotspring is situated in Nambar forest reserve in Golaghat district in Upper Assam. The medicinal properties of water of hotspring are well known; it is 20 km from Golaghat town. Gargaon Palace - Gargaon, the principal town of Ahoms built by the king Suklenmung in 1540, lies 13 km east of Sivasagar town. At one time, it was the principal capital of the Ahom kings. The palace, known as Kareng is a seven-storied brick building and was built in 1762 by King Rajeswar Singha.

4.0 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 APDCL'S Approach for Route Selection

88. At the planning stage, one of the factors that governs the establishment of distribution lines is the least infringement of populated/forest/cultivated area and scarce land. Wherever such infringements are substantial, different alternative options are to be considered. During route alignment, all possible efforts are made to avoid the populated/forest/cultivated area infringement completely or to keep it to the barest minimum. Whenever it becomes unavoidable due to the geographical locations/terrain, mitigation costs involved towards avoidance needs to be worked out. While identifying the distribution system for a generation project or as a part of distribution grid, preliminary route selection is done by APDCL based on the interpretation and walk over surveys according to the maps/topographical maps of the area.

89. For selection of optimum route, the following points are taken into consideration:
- i. The route of the proposed 33/11 kV lines does not involve any uprooting habitation.
 - ii. Any monument of cultural or historical importance is not affected by the route of the distribution line.
 - iii. The proposed route of distribution line does not create any threat to the survival of any community with special reference to tribal community.
 - iv. The proposed route of distribution line does not affect any public utility services like playgrounds, schools, other establishments etc.
 - v. The route does not pass through any sanctuaries, protected park etc.
 - vi. The route does not infringe with area of natural resources.

4.2 Alternatives for Line Alignment

90. The subproject will put up new sub-stations for 33/11 kV transformers and feeders as well as auxiliary 33/0.4 kV transformer. The work will be carried out by setting up structures on poles and 5 meter (maximum) right-of-way (RoW) clearances for 33 kV distribution lines respectively.

91. For selection of optimum route, the following points are taken into consideration:
- i. As a principle, distribution alignments generally pass through all towns and villages, but the minimum RoW distance shall be kept safe distance away from any houses or structures. The RoW depends on the line voltage: the maximum RoW for 33 kV lines on forest land is 15 meters and minimum clearance between conductor and trees is 2.8 meters as per Forest Conservation Act (1980).
 - ii. Construction activities do not adversely affect the population living near the proposed lines and does not create any threat to the survival of any community with special reference to tribal community or any public utility services like playgrounds, schools, other establishments etc.
 - iii. Similarly, plantations/forests are avoided to the maximum extent possible. When it is not possible, a route is selected that causes minimum damage to existing plantation/forest resources.
 - iv. The Medium Voltage/Low Voltage (MV/LV) line route does not infringe with area of natural resources. Alignments are selected to avoid wetlands and unstable areas for both financial and environmental reasons.
 - v. The route of the MV/LV line does not affect any monument of cultural or historical importance.
 - vi. In addition, care is also taken to avoid/minimise protected parks/national parks, bird sanctuaries and any other forest area rich in wild life. Proper care shall be taken to avoid areas of high density of trees if the line passes through any forest reserve and appropriate approvals of Department of Forests.

92. In order to achieve this, APDCL has situated the substations and undertaken route selection for 33 kV lines in close consultation with representatives from tea garden estates, Forest Department, and the local community. Although under the national law, APDCL is entitled to the RoW, it considers alternative alignments during site selection, with minor alterations often added to

avoid environmentally sensitive areas and settlements at the implementation stage.

93. Keeping the above in mind, various alignments of lines were considered. All different alternatives were studied by the APDCL officials before the final alternative was proposed, which can be taken up for detailed survey and assessment of environmental and social impacts for proper construction management. **Annexure 3** gives the location analysis for each substation. **Annexure 4** gives an illustrative locational analysis of the proposed 20 substations. **Annexure 5** gives the summary details of the proposed 33 kV lines.

4.2.1 Reasons for the final selection

94. Considering the various reasons based on information in the Annexures 3, 4, and 5, the substation locations selected were found to be suitable as they involved lesser populated area, plantation/forest areas, and minimum RoW problems.

4.3 Environment Impacts and Mitigation Measures

95. The potential environmental impacts associated with the subprojects occur during the pre-construction and construction phases, which will typically involve:

- Removal of vegetation, including trees and crops for access roads.
- Excavation of sites for project facilities (if at all), including transport and disposal of excavated materials, erosion at construction sites, possible noise/dust pollution, and management of workers and waste.
- Spills of fuel and other lubricants at the construction site/workshop/repair site that may affect soils and water quality.
- Noise from construction equipment.
- Preservation of cultural sites and artifacts.

4.3.1 Environmental Impacts and Mitigation Measures Needed during the Design/Pre-Construction Phase

4.3.1.1 Route Selection

96. As per the Forests (Conservation) Act, 1980 and Rules 1981, all the power lines infringing upon the ecologically sensitive areas¹⁵ have to be approved by the Forest Department. Forests are avoided as far as possible while selecting the distribution line route. Where it is not possible to avoid forests, the routing of the lines in the forest area will be done in consultation with respective forest authorities to minimise damage to the forests and to ensure minimal impact on wildlife.

97. The natural terrestrial environment of the proposed project areas in Sonitpur, Jorhat, Sivasagar, Dibrugarh, and Tinsukia districts has already been significantly altered and disturbed by mankind for conversion into paddy fields, tea and other mixed cultivations, villages, semi-urban areas with infrastructure facilities such as roads, drains, homes and buildings etc. under various development projects. Therefore, besides cutting of some tea gardens for substations, the subproject will not cause any significant impacts to the existing environment nor will affect any environmentally significant areas.

98. The overhead conductor will not affect any of the sewerage/drainage system, and no streams will be disturbed. Apart from limited disturbance during construction for lines and substation, there will be no long-term effects on water quality.

99. Care has been taken that line routes will avoid wetlands and unstable areas especially the state gets a lot of rainfall. The routing of the lines is selected to avoid relocation of people and threats to common property resources. Engineering and biological measures will be taken to prevent soil erosion, impact on agricultural land at the substation site and en-route the line will only be restricted to the construction phase, and adequate compensation for any substation site as determined by the district authorities will be paid to the affected persons or tea estates.

¹⁵ Environmentally Sensitive Area (ESA) is a type of designation for an area, which needs special protection because of its landscape, wildlife or historical value.

100. Batteries and transformer oil will be disposed of through lead waste re-processors in accordance with the provisions of CPCB and compliance with these provisions will be reported to ADB through the biannual environmental monitoring reports. These hazardous materials will be stored at the substation site in secure places that have impermeable lined flooring which prevents oil and chemicals from leaching into the ground.

101. No land acquisition or resettlement is required for the distribution lines. Acquisition of land/purchase of land will be required from the surrounding communities for an approximate 0.2 ha to 0.4 ha plot of land required for 5 substations based on private owners, 10 from single owner (tea estates). Five substations are situated on government land. Total land requirements for the subprojects is given in **Table 14** below:

Table 14: Total land required for Tranche 4 subprojects

SNo	Project Component	Total Land Area in Ha	Private Land in Ha	Government/Forest land in Ha
Tezpur (Sonitpur) Circle				
1	Bindukuri	0.2 ha	0.2 ha (Tea estate)	-
2	Borjuli	0.134 ha	-	0.268 ha (Govt Land)
3	Bedeti	0.30 ha	0.3 ha (Tea estate)	-
4	Singri	0.268 ha	-	0.268 ha (Govt Land)
5	Rakhysmari	0.268 ha	-	0.268 ha (Govt Land)
6	Borsola	0.268 ha	-	0.268 ha (Govt Land)
Tinsukhia Circle				
7	Baghjan	0.268 ha	0.268 ha (Tea estate)	-
8	Gangwari	0.450 ha	0.450 ha (Tea estate)	-
9	Mahakali	0.134 ha	0.134 Private persons	-
10	Dholla	0.268 ha	0.268 ha (Tea estate)	-
11	Gelapukhuri	0.134 ha	0.134 ha (Private persons)	-
12	Philobari	0.268 ha	0.268 ha (Tea estate)	-
13	Pawoi	0.132 ha	0.132 ha (Tea estate)	-
Shivsagar Circle				
14	Borhat	0.162 ha	-	0.162 ha (APDCL land)
15	Napuk	0.159 ha	Private persons	-
Dibrugarh Circle				
16	Gharamara	0.201 ha	0.201 ha (Private persons)	-
17	Namsung	0.201 ha	Private persons	-
Golaghat Circle				
18	Radhabari	0.258 ha	0.258 (Tea estate)	-
19	Nahorbari	0.408 ha	0.408 (Tea estate)	-
20	Doyang	0.194 ha	0.194 (Tea estate)	-

102. No major sites of archaeological, cultural, or historic significance are present along the proposed alignment of the distribution lines and substations.

4.3.2 Environmental Impacts and Mitigation Measures Needed during Construction

103. Environmental impacts identified during construction are limited in size and are temporary. The scale of the works is relatively minor and the project areas proximity to the work force means that no construction camps are required for distribution lines, whereas for substation sites there will be very small labor camps comprising of up to 4-5 persons. Since these are situated in areas near hamlets, they may use amenities available at these places.

104. Fuel and other lubricants will need to be stored at the construction sites. Best industry practice will be required to ensure that accidental spills and discharge to the soil and aquatic environments are prevented. Any fuel (including drums and tanks, if any) will be placed at least 10 m away from waterways and no equipment is to be refueled within this distance.

105. Only trained personnel will undertake handling of fuel and lubricants. In addition, machinery will be properly maintained and waste oil and oil filters will be disposed of to meet best industry practice. This will be the contractor's responsibility.

106. At the completion of work, the contractor will be required to rehabilitate and clean up all the work sites. This includes repairing damage to pavements, roads, and drainage systems. All waste is to be removed from the sites. The contractor and the APDCL will be responsible for implementing this requirement.

107. The project may require some fruit/non-fruit trees to be removed during the construction activities. **Table 15** gives the list of trees to be felled for Tranche 4 subprojects. Approximately 50 fruit/nonfruit/plantation trees will be removed from substation sites and none from the RoW¹⁶ of the distribution lines. These include shading timber, plantation species as well as edible fruit species. The initial construction works along the alignment involving land clearance, cutting, filling, and leveling may cause loss of vegetation. This will be irreversible impact. Care has been taken to avoid the thick plantations/vegetation as far as possible and pole locations are selected at plain fields or alongside roads where the vegetation is thin. This will minimise the tree loss.

108. Normally, for compensatory reforestation or afforestation program if the line goes through a forest area where trees have to be cut, the Forest Department makes an inventory of trees to be cut and an area that is devoid of trees where afforestation can be done. APDCL will fund the afforestation program in the area selected for afforestation by the forest department.

109. Compensation will be paid to the tree owners in the private areas as per GoI norms. If any private trees have to be removed, the APDCL pays compensation to the owner. The amount varies according to the tree species, height and diameter, quality of the tree, etc. based on the market value of the tree.

Table 15: Total Number of Trees to be felled for Tranche 4 subprojects

Table 10: Total Number of Trees to be felled for Mainline & Sub-projects				
No	Sub-Project Details	Private Land		Forest Land
		Total number of fruit trees to be felled	Total number of Non fruit trees to be felled	Total number of forest trees to be felled
Tezpur (Sonitpur) Circle				
1	Bindukuri	0	0	0
2	Borjuli	0	0	0
3	Bedeti	0	0	0
4	Singri	0	0	0
5	Rakhysmari	0	0	0
6	Borsola	0	0	0
Tinsukhia Circle				
7	Baghjan	0	0	0
8	Gangwari	0	0	0
9	Mahakali	0	0	0
10	Dholla	0	1	0
11	Gelapukhuri	0	1	0
12	Philobari	0	0	0
13	Pawoi	0	0	0
Shivsagar Circle				
14	Borhat	0	0	0
15	Napuk	28	3	0
Dibrugarh Circle				
16	Gharamara	0	0	0
17	Namsung	0	12 (+ 11 small)	0
Golaghat Circle				
18	Radhabari	0	0	0
19	Nahorbari	1	1	0

¹⁶ The ROW is 5 m for the distribution line. Few scattered trees are found in the area but not necessary to cut down for the distribution line.

No	Sub-Project Details	Private Land		Forest Land
		Total number of fruit trees to be felled	Total number of Non fruit trees to be felled	Total number of forest trees to be felled
20	Doyang	0	0	0

110. No declared wildlife sanctuary and national parks are located near the project areas. These line routes have been demarcated avoiding all highly populated areas, and any possible ecological areas.¹⁷ However, noise, vibration, and emission from construction vehicles will occur during construction and pre-construction stages in temporary manner.

111. Distance from various sensitive receptors is given **Table 16**:

4.3.3 Environmental Impacts and Mitigation Measures Needed during Operation

112. Once sub-stations and lines are fully erected, fencing, and danger signs will be installed at each site that clearly identify and warn of the dangers of climbing into an operational substation. Signage meeting the IEEE¹⁸ standards will be placed on all overhead lines warning of electrical hazards. EPC contractor will advise the community about the location and associated dangers of the overhead feeder line.

113. Contamination of water on land/nearby water bodies by the transformer oil can occur during operation due to leakage or accident. Substation transformers are normally located within secure and impervious areas with a storage capacity of 100% spare oil. Also proper drainage facilities will be constructed during the construction stage to avoid overflow or contamination with natural flow paths especially during the rainy season. APDCL will maintain account of the usage of oil, using technical methods and procedures for oil monitoring mechanism, and will have mitigation plan for any oil spillage. Storage of bulk fuel should be on covered concrete pads away from the public and worker camp. Fuel storage areas and tanks must be clearly marked, protected and lighted.

114. Sulphur Hexafluoride (SF₆) based switch gear (circuit breakers) will be utilized in 33 kV substations; therefore SF₆ monitoring is recommended¹⁹. SF₆ is a non-toxic greenhouse gas used as a dielectric in circuit breakers, switch gear, and other electrical equipment. Very high grade sealing system and erection methodology is followed to keep the loss of SF₆ within 0.1% every year. SF₆ handling is part of contract technical specifications and required design, and routine test are done after manufacturing of the circuit breaker. SF₆ gas handling system for evacuation and storage is always used for the maintenance of the circuit breaker. SF₆ monitoring is recommended so that fugitive emissions can be estimated.

4.4 Environmental Management Plan

115. The environmental management plan (EMP) has been prepared for the sub-project that discusses the anticipated impacts, monitoring requirements, and development of mitigation measures with respect to the following stages: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Detailed, site-specific mitigation measures and monitoring plans were developed and will be implemented during the project implementation phase. The EMP is given in **Annexure 6** which identifies feasible and cost effective measures to be taken to mitigate potential environmental impacts including the roles and responsibilities for implementation.

116. A summary environmental impact matrix and the mitigation measures are given in **Table 17** below.

¹⁷ In case of any lines passing through Elephant Routes/Corridor (which may exist outside of protected areas) the minimum ground [vertical] clearance of 6.66 meters in plain areas and 9.1 meters in steeper terrains is to be maintained.

¹⁸ Institute of Electrical and Electronics Engineers.

¹⁹ Level of SF₆ leakage are covered by IEEE C37.122, which provides guidance for substations rated at 52 kV and higher. Monitoring of SF₆ is recommended for 33 kV substations, ~~but not mandatory~~.

Table 16: Approximate distance of Tranche-4 subprojects from sensitive receptors

S N o.	Name of Substation	Distance from project site to Schools	Distance from project site to Temple etc.	Distance from project site to Village	Approximate Distance of village from state boundary (in m)	Approximate Distance of village from boundary of any Reserve Forest (in m)	Approximate Distance of village from boundary of National Park/Protected Area (in m)	Population of Village	Distance from houses, other facilities	Health Facilities available in village	Type/Use of Land in village	Name of Crops (if any) in the area
1	2	3	4	5	6	7	8	9	10	11	12	13
	Sontipur	District										
1	Bindukuri	-	5 km	50 m	-	-	Nameri Tiger Project-66 km	2000	-	Mini Hospital	-	Tea
2	Borjuli	-	400 m	30 m	60 km	-	40 km from Oran National Park	2000	-	Sub Centre in the village	Agriculture	Tea, Paddy
3	Bedeti	-		50 m	20 km	-	8 km	3000	-	PHC -10 km Bedeti	-	Tea, Paddy
4	Singri	-	4 km	-	20 km	5 km	10 km	2500	-	Sub Center in the village	Agriculture	Paddy, mustard, Maize, vegetable
5	Rakhysmari	-	-	-	60 km	10 km	10 km	4500	-	Sub Center in the village	Agriculture	Tea, Paddy, Vegetable
6	Borsola	50 m	22 km	-	60-70 km	-	40 km	1500	-	PHC in the village	Agriculture	Paddy, Vegetable
	Tinsukia	District										
7	Baghjan	-	-	-	-	-	10 km from Dibru Saikhuwa NP	3000	30 m	Mini Hospital in T.E.	-	Tea, Paddy
8	Gangwari	-	-	2 km	40 km	22 km	16 km	7000	-	PHC -8 km	-	Tea, Paddy, Vegetable
9	Mahakali	-	10 km	100 m	2 km	3 km	27 km	1800	-	1 km PHC	-	Tea, Paddy
10	Dholla	-	2 km		2 km	-	8 km	4000	-	PHC in the Village	-	Tea, Paddy, Vegetable
11	Gelapukhuri	-	10 km	500 m	1 km	6 km	10 km	500	-	Sub centre in the village	-	Tea, Paddy
12	Philobari	-	100 m	-	15 km	7 km	8 km	1000	-	Sub Centre in the Village	-	Tea, Paddy, Vegetable

S N o.	Name of Substation	Distance from project site to Schools	Distance from project site to Temple etc.	Distance from project site to Village	Approximate Distance of village from state boundary (in m)	Approximate Distance of village from boundary of any Reserve Forest (in m)	Approximate Distance of village from boundary of National Park/Protected Area (in m)	Population of Village	Distance from houses, other facilities	Health Facilities available in village	Type/Use of Land in village	Name of Crops (if any) in the area
1	2	3	4	5	6	7	8	9	10	11	12	13
13	Pawoi	-	3 km	2 km	20 km	10 km	50 km	1500	10 m	Sub Center in the village	-	Paddy, Tea
	ShivaSagar	District										
14	Borhat	-	-	100 m	22 km	Dilli Forest - 8 km	100 km	4000	-	PHC in the village	-	Tea, Paddy, Beetle
15	Napuk	-	-	50 m	10 km	Singlo Forest -4 km	100 km	1200	2 houses within 30 m	PHC-2 km	Tea Garden	Paddy
	Dibrugarh	District										
16	Gharamara	-	-	50 m	4 km	Jaipur Rainforest- 20 km	50 km	1800	50 m	Sub center in the village	Agriculture	Tea, Paddy, Vegetable
17	Namsung	-	-	-	5 km	-	50 km	2000	50 m	PHC in the village	-	Tea, Paddy , Moong
	Golaghat	District										
18	Radhabari	-	12 km	-	25 km	12 km	Kaziranga NP 55 km	1986	-	Tea Garden mini Hospital	Agriculture	Paddy
19	Nahorbari	-	100 m	0 km	70 km	Bijoli Reserve forest -12 km	51 km	800	30 m	T E sub centre	Agriculture	Tea, Paddy
20	Doyang	100 m	500 m	0 km	Nagaland -50 km	Nambore Forest -40 km	70 km	5000	60 m	Garden Hospital	Agriculture	Tea, Paddy

Table 17: Environmental Impact Matrix

SI N ^o	Environmental Attribute	Potential Impacts	Nature of Impact	Magnitude of Impacts			Mitigation Measures	Implementation & Monitoring
				Low	Medium	High		
A. Physical Resources								
1.	Topography	Change in the surface features and present aesthetics due to the construction of the project.	Direct/Local/irreversible		X		The extent of surface soil disturbed will be minimal due to distribution poles.Any excess soil will be rammed at the pole base or shall be disposed ofat suitable location. Any loss of vegetation will be attended by APDCL as per existing Gol norms	
2.	Climate	No impacts on the climatic conditions	Direct/Local/irreversible	X			No measurable impact on the climatic conditions, hence no mitigation is required	
B. Environmental Resources								
1.	Air Quality	Project will have marginal impact on air quality during the construction period due to increase in the dust emission.	Direct/Local/reversible	X			Water sprinkling at construction site, limited bare soils, maintenance of vehicles etc.	During construction activity
2.	Noise	Noise due to general construction activities.	Direct/Local/reversible	X			Restriction of noise generating activities at night and use of personal protective equipment like ear plugs, mufflers etc.	During construction activity
		Noise arising from humming noise from transformers	Direct/Local/reversible	X			To maintain a safe distance or provide proper shielding near residential areas	During operational phase
3.	Surface and Ground Water quality	Runoff from the construction site	Direct/Local/reversible	X			Careful siting of poles and substations.	Before and during construction activity
		Domestic wastewater from construction sites	Direct/Local/reversible	X			During line and substation construction, domestic wastewater treatment may be done by digging small ditches for waste water and then covering it with top soil once the construction team moves to next location.	During construction and operation
4.	Soils and Geology	Soil erosion due to erection and clearing of vegetation in the RoW.	Direct/Local/reversible				Avoiding sites, which are prone to soil erosion. Leveling of construction sites.	During and after the construction activity
C. Ecological Resources								
1.	Terrestrial Ecology	Loss of vegetation	Direct/Local/irreversible		X		Location of substations and poles on non-cultivable land area. Selection of few access roads. Compensation for crop and trees (including plantation) to villagers. The tree planting for forest land converted to non-forest and trees felled will be done by the forest department and paid by APDCL.	Before the construction phase

SI N°	Environmental Attribute	Potential Impacts	Nature of Impact	Magnitude of Impacts			Mitigation Measures	Implementation & Monitoring
				Low	Medium	High		
2.	Terrestrial Fauna	Disturbance to the local fauna during construction	Direct/Local/reversible	X			Wildlife routes and their habitats have been avoided as far as possible during the route selection. Minimise encroachments, and indirect impacts.	Before and during construction phase
3.	Aquatic Ecology	Runoff water from construction site and labor camps.	Direct/Local/reversible	X			Ensure suitable setback for these temporary sites and ensure proper collection and treatment of waste water.	During construction and operational phase
3.	Aquatic Ecology	No significant impacts envisaged	Direct/Local/reversible		X		Appropriate setback for all construction and camp sites and proper disposal of wastewater waste to avoid polluting the river and streams. Care to avoid harming the aquatic ecology during construction of substations.	Before and during construction phase
D. Human Environment								
1.	Health and Safety	Fires, explosion and other accidents at the route alignment of MV line.	Direct/Local	X			Use of personal protective equipment during construction. By lopping of trees, fire hazards will be avoided during maintenance period. Regular inspection of lines for faults prone to accidents.	During construction and operation phase
		Exposure to electromagnetic (EM) fields	Direct/Local/continuous	X			Any electromagnetic fields that may be generated by the distribution lines and substations will be way below the international standards	Before and after the construction phase.
2.	Agriculture	Permanent and temporary loss of agriculture land due to pole erection	Direct/Local/reversible	X			Avoid prime agriculture land. Assessment of land required and compensation. Construction activity in the field/cultivation area after crop is harvested and thereafter crop will not be sowed at the site until construction is complete.	Before and during construction phase.
3.	Socio-economics	Beneficial impacts from rural and urban electrification. Job opportunities during construction phase	Direct/regional		X		Unskilled labor and indirect benefits. Overall economic growth of the region.	During operational phase
4.	Resettlement	Resettlement of the house falling along the RoW.	Direct/Local/reversible	X			Route alignment is selected in such a way that there is no involuntary resettlement issue.	Before the construction phase.
5.	Cultural sites	No archaeological, historical or cultural important sites are affected by the construction of the lines.	Direct/Local/reversible	X			No archaeological, historical or cultural important sites are affected, hence no mitigation required	During Design
6.	Traffic and Transportation	Traffic congestion due to movement of construction	Direct/Local/reversible	X			Avoid high density traffic areas, proper traffic signs at the construction site,	During construction phase

SI N°	Environmental Attribute	Potential Impacts	Nature of Impact	Magnitude of Impacts			Mitigation Measures	Implementation & Monitoring
				Low	Medium	High		
		vehicles					ensuring proper access roads	
7.	Solid Waste Generation	Probability of Surface and ground water pollution	indirect/Local/reversible	X			Minimisation, reuse and recycle whenever possible. Separated wooden and scrap will be collected and disposed of in compliance with applicable regulations and rules.	During construction and operation phase

5.0 INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PROGRAMME

5.1 Institutional Requirements

117. GoA chairs the Steering Committee for the MFF. The key institutions involved in project management and implementation, including the environmental assessment and review process for sub-projects, are the Project Management Unit (PMU), APDCL, and the Project Implementation Unit (PIU) as described below.

PMU

118. The PMU will be responsible for overseeing sub-project compliance with environmental and social safeguard requirements based on the EARF provisions that include: (i) sub-project selection taking into account environmental screening criteria; (ii) sub-project environmental assessments prepared in accordance with the requirements set out in the EARF; (iii) appropriate public consultations and disclosures; (iv) effective management of the grievance redress mechanism; and (v) EARF compliance reported in the environmental monitoring report. The PMU or its appointed technical consultants will conduct routine visual inspections of construction activities, including site pegging, vegetation clearance, earthworks, etc.

119. The Project Management Structure is shown in **Figure 8**. The PMU Director will be responsible for coordinating all external functions with ADB, Gol, DEA, GoA as well as to coordinate the internal functions. Deputy General Manager (DGM), PMU will coordinate Environment and Social/R&R reporting, Legal, Finance and Accounts, Procurement and Contracts, and other functions under the direction of Director PMU. The APDCL PIU shall work under the guidance of the DGM PMU.

120. PMU has designated one Assistant General Manager (AGM) in charge of Environment and Social Management Unit (ESMU) who has oversight responsibilities for monitoring all sub-projects in areas such as Environment, R&R and Social safeguards. To assist ESMU in these specialist functions, APDCL will hire appropriate Environment and Social Consultants at PIU level, as deemed necessary to assist ESMU in day-to-day coordination and reporting for various subproject activities.

121. The duties of the ESMU will include at a minimum: (i) oversight of field offices and construction contractors for monitoring and implementing mitigation measures; (ii) liaising with the field offices and contractors and seeking their help to solve the environment-related issues of subproject implementation; and (iii) preparation of environmental monitoring reports every 6 months (as required by ADB). ESMU will coordinate with PIU for monitoring as well as designing appropriate mitigation measures to address environmental and social issues

APDCL/PIU

122. The PMU shall implement the ADB loan at the corporate level and the PMU will be supported for implementation activities through the APDCL field offices/ Project Implementing Unit (PIU). The PIU/field offices of APDCL will assume primary responsibility for the environmental assessment as well as implementation of EMPs through contractors or third party consultants in consultation with ESMU. The PIU/Project Head will be assisted by the ESMU. APDCL will be responsible for implementing internal monitoring systems for EMP implementation, and will forward semi-annual environmental monitoring reports to the Government of Assam and ADB. The reports will cover EMP implementation with attention to compliance and any needed corrective actions. On-going consultation measures will be incorporated in the EMP.

123. The PIU/field offices of APDCL will have overall responsibility to manage the site

activities. For management of EMPs, APDCL will conduct overall coordination, preparation, planning, implementation, and financing of all field level activities. Keeping in view the need to enhance the planning implementation, environment and social safeguard skills at the PIU level. PIU staff shall be sent for capacity building training programs periodically by ADB and others in consultation with ESMU. These trainings will be identified by PMU in consultation with ADB.

Consultants, Construction Contractors, Equipment Suppliers, and Other Service Providers

124. APDCL will ensure that contractors for each sub-project are engaged in regular EMP monitoring and implementation. The construction contractor will have primary responsibility for environmental and social management, and worker health and safety at sub-project construction sites under their control. They will be required to adhere to all national and state level environmental, health, and safety (EHS) guidelines and implement relevant sub-project environmental and social management measures in the IEE and EMP documents prior to and during construction.

Asian Development Bank

125. ADB will review the IEE for Tranche 4 prior to ADB Board consideration, the semi-annual environmental monitoring reports submitted by the EAs during project implementation; and officially disclose environmental safeguards documents on its web site in accordance with SPS 2009 and the Public Communications Policy 2011.

126. Further details on agencies responsible for EMP implementation activities are shown in **Table 18**.

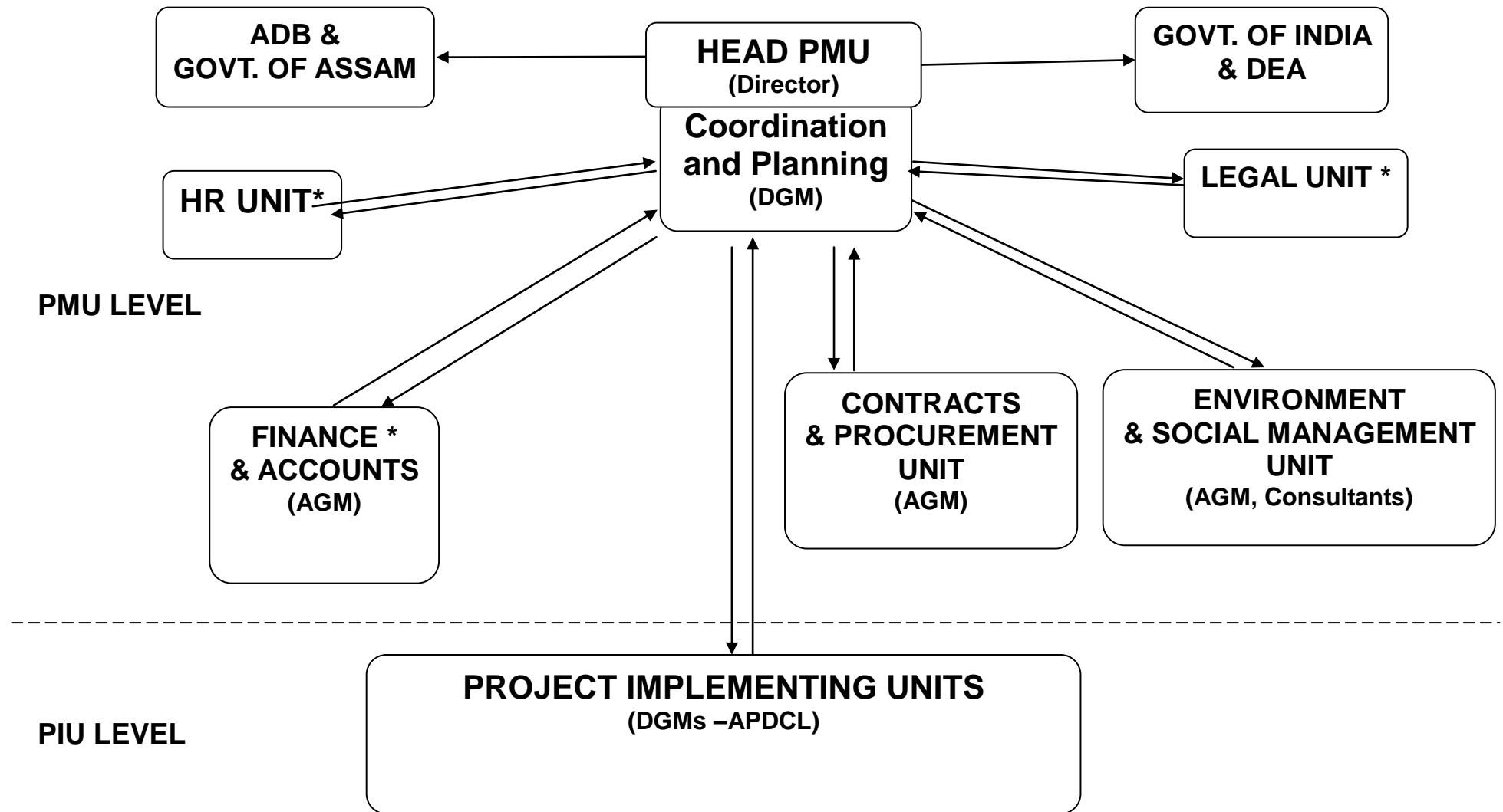
Table 18: Institutional Roles and Responsibilities for EMP Implementation Activities

Activity	Responsible Agency
<u>Project Initiation Stage</u>	
Assign field offices for each subproject	APDCL
Clearances/approvals from relevant GoI/GoA agencies- forest, roads, rivers, railways, telecom etc.	APDCL/ESMU
Disclosure of project IEE/EMP details on APDCL website	PMU/ESMU/APDCL
Conducting discussions/meetings/workshops with APs and other stakeholders	PMU/ESMU/APDCL
Updating of EMP mitigation measures, if needed, based on discussions with stakeholders	PMU/ESMU
<u>EMP Implementation Stage</u>	
Meetings at community/household level with APs	Field Office/ESMU/Contractor
Implementation of proposed EMP mitigation measures	Field Office/ESMU/Contractor
Consultations with APs during EMP implementation	Field Office/ESMU/Contractor
Grievances Redress	PMU/ ESMU/ District Authorities/ Council Administration
Internal monitoring	PMU/ESMU
External monitoring*	External Experts

AP-Affected PersonsEMP-Environmental Management Plan; PMU- Project Management Unit; ESMU- Environmental and Social Management Unit

*Note –External monitoring only required when projects are noticed to have significant adverse environmental impacts.

Figure 8: Project Management Structure



* HR, Finance and Audit as well as Legal departments do not interact with ESMU on day-to-day basis. Most interaction is with Contracts and Procurement Unit, PMU and PIUs. The entire structure is shown to provide overall linkages between various PMU functions and ESMU.

5.2 Environmental Monitoring Plan (EMoP)

127. The mitigation measures require monitoring of environmental attributes both during construction and operational phase of the project by the APDCL. During the construction and operation phase of this project, the designated Environment Officer of the APDCL shall conduct regular monitoring of the environmental aspects specified in the EMP. During the construction phase, the contractor will ensure that activities like digging of foundations and auxiliary equipment, handling of earthworks, construction of new building etc. is done properly to have minimum impact. The Project Head/DGM-in-Charge of the project shall have the overall responsibility of its monitoring.

128. The field office of APDCL and (its EPC contractors) will adhere and comply with all measures and procedures identified in the EMP. The plans, endorsed by the APDCL and GoA, will be monitored in accordance to ADB Safeguard Policy 2009 requirements. Mitigation measures related to construction as specified in the EMP will be incorporated into civil works contracts, and their implementation will be primarily the responsibility of the contractors. In addition, contractors will be requested to submit monthly progress reports on the implementation of EMP measures. The APDCL in turn will be report to ADB on progress achieved against the EMP activities and milestones on a semi-annual basis. Progress reports will include a description of implementable activities and their status; identify the responsible party (ies) involved in their implementation; and provide project management schedules and timeframes for doing so, along with their associated costs.

129. As part of the EMP, to ensure that project would not be generating a negative impact to the overall environment quality, an EMoP will be prepared. The monitoring activities of the project include site supervision, verification of permits, monitoring of water quality, soil, noise and air. Monitoring of the quality of water, soil, air and noise during the construction stage is the responsibility of the contractor. Field office, APDCL will supervise the contractor. Monitoring report will be prepared once in six months with the corrective action plan for the problem areas, if any. A sample Environment Monitoring Report is attached as **Annexure 6**, which will be required to be submitted semi-annually by APDCL to ADB. This annexure gives the sample report to be prepared by the EPC and gives the parameters to be monitored and their frequency of monitoring during construction and operation of substation sites.

130. The field office will be responsible for internal monitoring of the EMP implementation, and will forward semi-annual environmental monitoring reports to the PMU with details of activities and progress made during EMP implementation. The PMU will submit semi-annual environmental monitoring reports to ADB. APDCL will be responsible for implementing internal monitoring systems for EMP implementation, and will forward semi-annual progress reports to the Government and ADB. The reports will cover EMP implementation with attention to compliance and any needed corrective actions. On-going consultation measures will be incorporated in the EMP.

5.3 Critical Environmental Review Criteria

(i) Loss of irreplaceable resources

131. The distribution project will not involve any large-scale excavation and land acquisition and a small number of trees inside the substation premises will be cut. The EMP includes compensation for the loss by minimising the impact of loss of vegetation, if any, as per existing norms of GoA and MoEF. Thus, there will be no net "Biodiversity Loss" for the distribution project implementation as a whole.

(ii) Accelerated use of resources for short-term gains

132. The project will not use any natural resources occurring in the area during construction, operation and maintenance phases. The construction material such as concrete

mixers, diesel generators, panels, panel mounts, steel, cement etc. shall come from factories while the excavated soil shall be used for backfilling to restore the surface. Thus the project shall not cause any accelerated use of resources for short-term gains.

(iii) **Endangering of species**

133. No endangered species of flora and fauna exist in the project area, as well as in the affected forest thus there seems to be no possibility of endangering/causing extinction of any species.

(iv) **Promoting undesirable rural-to urban migration**

134. The project will not cause any loss of land holdings that normally trigger migration. It also does not involve acquisition of any private land holdings. Hence, there is no possibility of any migration.

(v) **Increase in affluent/poor income gap**

135. The project will increase availability and reliability of power in Assam state. It is well known that power is a key input to the economic development of any area. Experience indicates that economic development leads to generation of more jobs, which in turn should raise the living standards of poor. Thus the project is expected to contribute in reduction of affluent/poor income gap by providing opportunities for employment and rural based economic activities.

5.4 Environmental Management Plan Budget Costs

136. The main benefits of the environmental mitigation plan are (i) ensuring that environmental standards are met during design, construction, and operation of the project; (ii) providing offsets to negate project impacts especially ecological impacts. Without such expenditures, the project might generate significant environmental impacts, causing the biophysical environment in the area to deteriorate and indirectly depressing the economies of local communities.

137. In order to comply with the environmental protection measures as suggested in the above sections, the management has made a budgetary provision for Environmental Protection and Safety measures. The costs towards environmental mitigation measures are given in **Table 19**. It is estimated that 1% of the total project costs would be included as the EMP costs – both one time and recurring. The cost components include items such as cost towards implementation of EMP (contractor's scope), EMP implementation and monitoring, green belt development, training for HIV/AIDS prevention, and independent audit.

Table 19: Summary of Estimated Costs for EMP Implementation

Activity	Units	Unit cost in \$	Total Cost in \$.	Total Cost in Rs Lakhs
1 Cost of EMP (Contractors Cost)				
a. Civil works		n/a	100,000	
b. Utilities and sewage		n/a	30,000	
c. Drainage controls		n/a	30,000	
e. Site access controls		n/a	40,000	
f. Fire safety and suppression		n/a	40,000	
Contingency (10 %)			24,000	
Total Cost towards EMP (Contractors cost)			264,000	160 lakhs
2 Implementation Monitoring				
a. Test of Air Pollution Environmental parameters	lump sum		65,000	
b. Environmental Training	lump sum	-	15,000	
c. Consultant Services (remuneration)	18 p-m	5,000	80,000	
d. Consultant Services (per diem)	Per month	3,450	55,200	
e. Consultant Services (transportation)	Per month	1,875	30,000	
f. Field Visit by ESMU to site	Per month	2,500	20,000	
g. Report/Communication	Lump sum	-	5,000	
Contingency (10 %)			27,020	
Total - Implementation Monitoring			297,220	180 lakhs

^a Estimated costs are indicative only for expected implementation effort as per assumptions and have been depicted for Tranche 4 (Costs are based on Tranche 1).

Assumptions:

1. Design and construction costs: route survey @ 100% of DPR estimate; civil works @ 33% of DPR estimate; utilities and sewage @ 33% of DPR estimate; drainage controls @ 100% of DPR estimate; site access controls @ 50% of DPR estimate; fire safety & suppression @ 100% of DPR estimates. Total = 0.9% of total project cost.
2. Air and noise sampling/testing at substations @ Rs 5000 per sample and Rs 3000 per sample. Air and water sampling at construction camps @ Rs 5000/per sample and Rs 5000/per sample respectively. Total of 60 samples each (of air, noise, and water) x 4 events. Testing frequency proposed at commencement of construction, and every 6 months afterward for the following 18 months, for a total of 4 testing events.
3. Environmental monitoring and compliance training for ESMC personnel estimated at 2 person-months domestic consultants @\$5000/month + \$5000 associated costs (travel, per diem, document preparation, seminar rooms, etc.)
4. Consultant services for total of 4 person-months per monitoring event x 4 events spread over initial 18 month implementation period; domestic consulting @ \$5000/p-m
5. ESMU Staff to conduct field inspections; 2 people x 4 months during the 18 month project period; 8 pm @ \$2500/p-m
6. Total environmental services = 15% of design and construction cost = 0.14% of total project cost
7. USD 1 = INR 60

Source: ADB staff and consultants estimates.

6.0 GRIEVANCE REDRESS MECHANISM

6.1 Awareness of Stakeholders

138. During public consultation sessions of the IEE study, the discussions with groups and individuals were conducted to make them aware of the proposed project. Thus, the project-affected community residing beside the proposed distribution line has gained a reasonable knowledge about the potential grievances, which will arise in the future.

139. A community awareness programme will be conducted one month prior to construction by the Project Implementation Unit (PIU) of APDCL regarding the scope of the project, procedure of construction activities, utility of resources, identified impacts and mitigation measures. These awareness programmes will help the community to resolve problems and clarify their distrusts related to the proposed project at initial stage.

140. The community will be informed about the Grievance Redress Mechanism (GRM), procedure for making complaints, including the place and the responsible person to contact for any grievance.

6.2 Grievance Redress Mechanism (GRM)

141. APDCL does not have any specific Environment or Social Safeguards Policy regarding generation/distribution subprojects currently. SPS 2009 requires APDCL to establish a Grievance Redress Mechanism (GRM) having suitable grievance redress procedure to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the subproject's environmental performance. The grievance mechanism will be scaled to the risks and adverse impacts on environment due the subproject type, size, type of area (sensitive area) and impacts. It should address affected people's concerns and complaints promptly, using a transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. This GRM will consist of a Grievance Redress Committee (GRC) headed by the Project Head. The committee will consist of the following as listed in **Table 15**.

Table 15: Constitution of Grievance Redress Committee

1	Project Head, APDCL
2	Sub District Magistrate/District Revenue Officer or their nominee
3	Representative of local Panchayat/Council
4	Representative Women representative of village/council
5	Representative of EPC* contractor
6	AGM of Environment and Social Management Unit (ESMU) at PMU or nominee

* (EPC) - Engineering, Procurement and Construction Contractor

AGM=Assistant General Manager

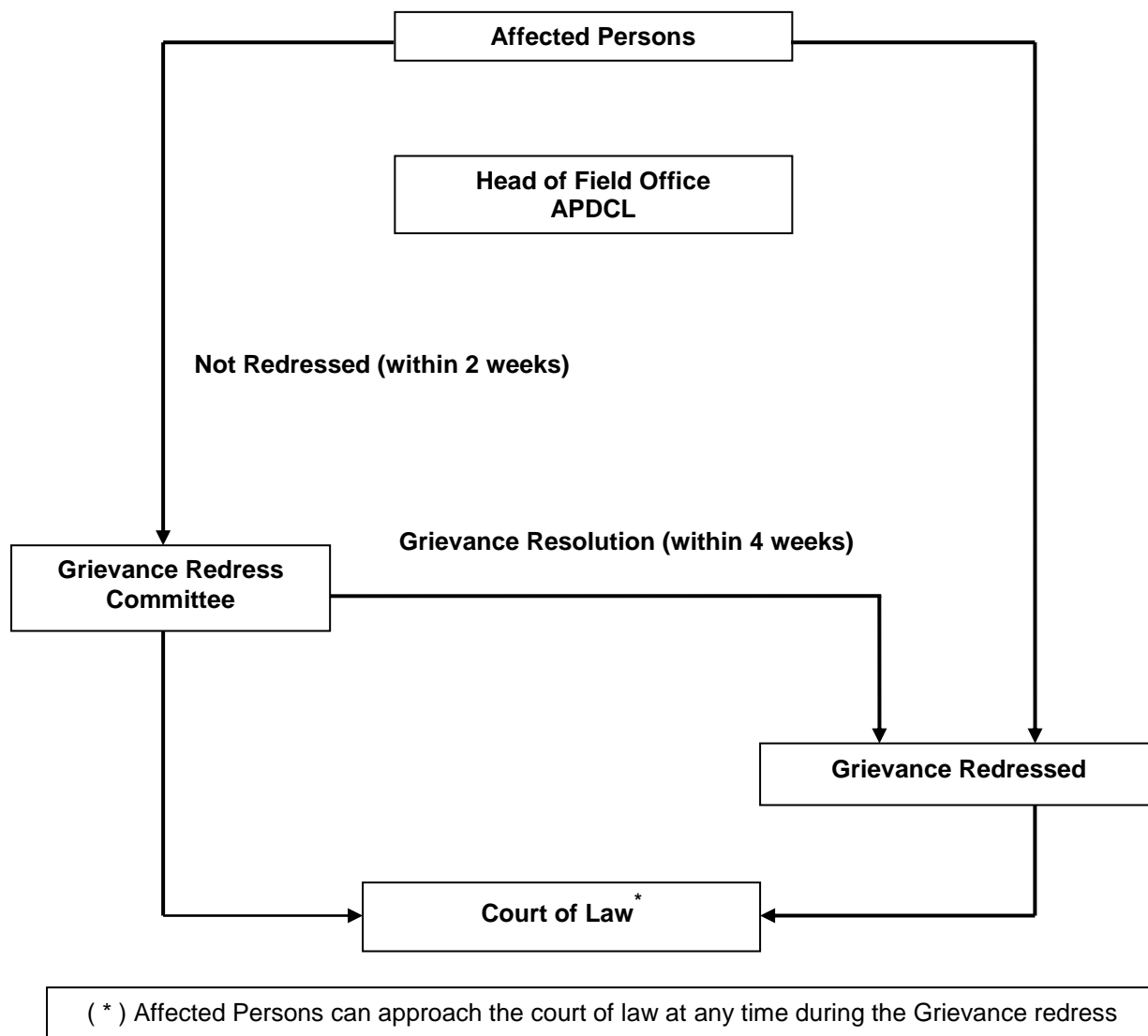
142. GRM will provide an effective approach for resolution of complaints and issues of the affected person/community. Project Management Unit (PMU) shall formulate procedures for implementing the GRM, while the PIU shall undertake GRM's initiatives that include procedures of taking/recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders etc. paying particular attention to the impacts on vulnerable groups.

143. Grievances of affected persons (APs) will first be brought to the attention of the Project head of the PIU. Grievances not redressed by the PIU will be brought to the Grievance Redress Committee (GRC) set up to monitor subproject Implementation for each subproject affected area. The GRC will determine the merit of each grievance, and resolve grievances within two weeks of receiving the complaint. The proposed mechanism does not impede access to the country's judicial or administrative remedies. The AP has the right to refer the grievances to appropriate courts of law if not satisfied with the redress at any stage of the

process.

144. The PIU will keep records of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were affected, and final outcome. The flow chart showing Grievance Redress Mechanism is presented in **Figure 9**.

Figure 9: Flow chart showing Grievance Redress Mechanism



7.0 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1 Information Disclosure

145. APDCL will submit to ADB the following documents for disclosure on ADB's website:

- (i) the final IEE;
- (ii) a new or updated IEE and corrective action plan prepared during subproject implementation, if any; and
- (iii) the environmental monitoring reports.

146. APDCL will provide relevant environmental information, including information from the above documents in a timely manner, in an accessible place and in a form and local language(s) understandable to affected people and other stakeholders in accordance with the ADB SPS 2009 and Public Communications Policy 2011.

147. IEE results will also be communicated to the local community before commencement of construction through their posting on the website of APDCL as well as providing a mechanism for the receipt of comments.

7.2 Consultation and Participation

148. APDCL will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Consultation process undertaken under the directions of the ESMU (i) will begin in the subproject preparation stage and will be carried out on an on-going basis throughout the subproject cycle (ii) will provide timely disclosure of relevant information that is understandable and readily accessible to groups and individuals, and specially women; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) will be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) shall enable the incorporation of all relevant views of affected people and other stakeholders into decision making, such as subproject design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues. Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results will be documented and reflected in the environmental assessment report.

7.3 Public Consultation

149. Public consultations were conducted in project-affected area between April 28 - May 22, 2014. The community aired their opinions freely on the project, its impact, and suggestions for mitigating adverse impacts. People participated in voluntary public consultation sessions to express their views about the proposed project.

150. No major environmental issues were raised during the consultation process. Local people are waiting eagerly for the implementation to start so they could receive better power and hoped that some employment may be generated. A summary of public consultations is attached in **Table 16**.

Table 16: Summary of Public Consultation

Issues Discussed	People's views and perceptions
General Perception about Project	Across the communities, majority was aware of the proposed lines and substations being set up in the area. Some communities were not aware about it before and came to know about the project during the consultation. Some others have heard it but not sure about the details of the project components. Almost all the people were positive and supportive towards the proposed project.

Issues Discussed	People's views and perceptions
Support of local people for proposed project	All people across communities expressed their full support during implementation of the project, as the project has been perceived to be great potential for the people of the area. People also hoped that the project would help to address their electricity problem such as low voltage and irregular power supply. They believed that such projects would contribute to Government of India's effort towards rural electrification. They also hoped that the new projects would contribute to provide employment to local unemployed youth. Most of the communities expressed that there should be no adverse impact due to the project on their cultivations, and safety.
Critical issue and concern by the local people for the project	Most of the communities expressed that there were no critical issues regarding the project. However, few people raised issues/concerns that included (a) fear of losing the stadium land for construction of sub-station; (b) fear of not receiving reasonable compensation for the affected assets like agricultural land (d) apprehension that they will lose portion of agricultural land as the land size is very small. Therefore, they shared that all these concerned should be taken care by the engineering team while finalizing the design.
Project site selection criteria	The community held the view that the project should avoid/minimize harm to residences, plantations, cultivations, religious and other places of community importance such as schools play grounds, community gathering places etc. Some of them suggested that line alignment should not be over the stadium or play ground. Few felt that sub-stations should be located at community land or Gram Panchayat land instead of individual land. Necessary precautions must be taken to ensure safety of people during project construction.
Employment potential in the project	Across the communities, majority felt that the project will provide employment opportunities to local unemployed people. Some of them requested that they should be involved not only in unskilled labour job but also in the supervisory work. They complained that the construction work is generally handed over to contractors who would bring their own labour force from outside. They hoped that instead of hiring people from outside the local people should be given employment. Some others felt that better distribution lines under the project will ensure proper and regular power and as a result small and medium scale business can be started in the area.
Socio economic standing: land use, cropping pattern	The major sources of livelihood for the communities were agriculture, wage labour in the tea garden, and small tea business. Most of the communities practised one time cropping in a year, mainly paddy and vegetable cultivation. The average land holding size was reported to be between 5 to 10 bigha.
Source of drinking water	The main sources of drinking water were hand pump and water supply through PHE department. In some villages the water supply was also available to individual households. The other sources of drinking water were ring well and bore well but these were few in number. Some of the households reported that they experience shortage of water during the summer season for drinking purposes and other human consumption. In other times, availability of water was good as the water table remained high due to the effect of a number of rivers that pass near to the area. However, in few villages people complained about the taste of the drinking water due to high iron content in the water
Negative impact on food grain, availability /land use	In general, the communities did not see any adverse impact on food/grain availability. However, there was apprehension that if electricity poles were installed in between the paddy fields or other cultivable land, it would reduce the cultivable area of the farmers.
Will project cause widespread imbalance by cutting fruit and commercial trees in the locality	Communities were not able to give a precise answer to this question as they did not visualize the exact extent to which the trees would be cut-down. Almost all of them did not foresee any imbalance coming out of the project. However, they held that if valuable commercial trees e.g. fruit trees, timber trees will be uprooted in significant numbers it would drastically affect the livelihoods of families who are dependent on those trees.
Will project cause health and safety issues	Most of the communities did not foresee any health or safety issues from the distribution line. Very few communities expressed their fears of increasing risks to their lives from lightening when they have to live closer to electricity lines.. Few had the apprehension that installing poles in the stadium land (near one substation land) would raise safety issues particularly for people who come to play in the stadium.
Protected areas	No protected areas were observed within the communities consulted. However, there were reserved forests, and protected forests at a distance of more than 3 kilometers of the habitation. There was a historical Shiv Temple located inside the Tea Estate.
Will project setting change migration pattern of animals	None of the communities consulted were conscious of the presence of any migrant birds or animals in their localities. They therefore did not foresee any impacts on animals, birds or their habitats.
Migration pattern	Majority of the villages reported outward migration to big cities in search of work. The popular destinations of migration were Bangalore for security guard and helper jobs and Gujarat, Maharashtra, Hyderabad for factory jobs. In some villages it was observed that mainly the young generation especially the boys have migrated to big cities for work opportunities. In few villages there was migration to Manipur and Arunachal Pradesh.
Perceived benefits	Across the communities majority of them viewed that the proposed project would benefit the

Issues Discussed	People's views and perceptions
from project	country as a whole. Some people believed that the upcoming project would contribute to minimize the prevailing energy crisis such as load shedding, and low voltage in the region. For some it will increase the rate of rural electrification and provide impetus to open small and medium business units in the area. At community level, the people hoped that project will address the problems of low voltage, and irregular power supply to the households.
Perceived loss	It is temporary in nature due to loss of crops and trees and can be compensated by APDCL.

151. **Annexure 7** gives the names of all participants of the public consultation conducted by the team. Annexure 7 also indicates a summary of village wise public consultations conducted during the field survey of project villages. The transcript of these discussions will help APDCL and the EPC contractor conduct a proper needs assessment to ensure the issues raised by people are addressed appropriately.

8.0 FINDINGS AND RECOMMENDATIONS

152. Impacts are manageable and can be managed cost effectively. Environmental impacts are likely to result from the construction activity from sub-station and distribution lines; negative impacts during operations will be minimal and not readily quantifiable. Mitigation and monitoring measures and review/assessment procedures have been specified to ensure that minimal impacts take place. The detailed design by the EPC contractor will ensure the inclusion of any such environmental impacts that could not be specified or identified at this stage are taken into account and mitigated where necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction site, or through the careful selection of substation sites and route alignments.

153. The proposed project will have numerous positive impacts and negative impacts to the existing environment as follows:

- Significant improvement in the quality and reliability of the electricity supply to the project affected area according to current demand is the main positive impact.
- There will be a mutually agreed purchase of substation land from Tea Estates and small cumulative removal of trees for the substations, which is the main negative impact to the proposed project area.
- In addition, electricity supply will help agricultural activities, students and public, increase land value, create lot of income generating activities, enhance safety at night and increase mobility during night.
- Small level of environment pollution due to transportation of construction materials, disposal of debris, nuisance from dust, noise, etc. due to construction activities inside the substation areas will not impact the community in the adjoining area, as these are very short term and localized impacts.

154. EMP has been prepared. One round of public consultation was conducted at the 20 substation sites and adjoining villages. The results indicate broad support for the project based on perceived economic and social benefits. Most impacts are expected to occur during the construction phase and are considered to be of temporary nature.

155. GRM will be implemented by APDCL to address any complaints/issues during project implementation.

156. No endangered or protected species of flora or fauna are reported at the subproject sites. Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts, along with their associated costs. Adverse impacts if noticed during implementation will be mitigated using appropriate design and management measures.

9.0 CONCLUSIONS

157. In accordance with the ADB's Safeguard Policy Statement 2009, the proposed distribution project is categorised as "Category B" requiring an IEE. Distribution projects require land only for substations but do not require land for laying the distribution lines. Forests areas and thick vegetation areas are avoided wherever possible; however, route alignment passes through scrublands, cultivated paddy fields, tea cultivations, etc. The lines will also pass through degraded forest areas but avoided any national park or sanctuary, wetlands and geologically unstable areas, which can also pose foundation related problems. Land will only be purchased for substation but no land will be required for placing distribution poles on private land thereby avoiding any relocation of project affected people.

158. Construction activities will cause minimal environmental impacts which are temporary in nature. The EMP and the EMoP have been prepared for the project and responsibilities for implementation assigned. The anticipated environmental impacts can be easily mitigated through implementation of EMP.

159. Overall, the environmental impacts associated with distribution project are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices. Benefits far outweigh negative impacts: the proposed project will improve operational efficiency and quality of power, reliability of the system and at the same time will reduce losses. Supply of power to the region will boost economic development of the area by strengthening the power distribution infrastructure.

ANNEXURES

Annexure 1: Summary of National, Local, Other Applicable Environmental Laws, Regulations, and Standards

Environmental Regulatory and Policy Framework Selection

1. Government of India, (GoI), State Governments, State Pollution Control Boards and ADB's SPS 2009 policies and procedures apply to all projects. Category A may apply to projects located in environmentally sensitive areas²⁰. For each major investment component, an Environment and Social Impact Assessment (ESIA) will be prepared by APDCL following ADB's Safeguard Policy Statement, 2009, Environmental Assessment Guidelines, 2003 and applicable National environmental laws and regulations. Based on these ESIA reports, the environmental management plan (EMP) and a corresponding budget will be prepared for each project.

National/Local Government Environment Classification

2. Under the GoI's Environment Impact Assessment (EIA) Notification 2009, the environmental classification of projects is determined by Ministry of Forest and Environment (MoEF), GoI and there are two possible outcomes:

- **Category A:** A subproject is classified as Category A if it is likely to have significant negative impacts and is thus one of the types of project listed in this category in the EIA Notification. Such projects require EIA, plus Environmental Clearance (EC) from MoEF; and
- **Category B:** A subproject is classified as Category B if it is likely to have fewer negative impacts and is listed in this category in the EIA Notification. These projects require EC from the State Environment Impact Assessment Authority (SEIAA), who classify the project as B1 (requiring EIA) or B2 (not requiring EIA), depending on the level of potential impacts. Projects classified as B2 require no further study.

3. As per EIA Act 2009, the General Condition notes that "Any project or activity specified in Category 'B' will be treated as Category 'A', if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972; (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time; (iii) Eco-sensitive areas, as notified under section 3 of the Environment (Protection) Act, 1986, such as Mahabaleshwar, Pangani, Matheran, Panchmarhi, Dhanu, Doon valley, and (iv) inter-State boundaries and international boundaries".

Policy, Legal, And Administrative Framework

4. The major acts and rules which are relevant to the subproject activities are: The Electricity Act (1910) and its Amendments (2004) and (2007) and the Electricity Rule (1956) and its Amendments (2000); The Indian Telegraphic Act (1885) and its Amendments (2003); The Environment Protection Act (1986); The Forest Act (1980) and Land Acquisition Act, 1894 and its Amendments (1984). Some of the policies of high relevance are: The National Rehabilitation and Resettlement Policy (2007), and The National Environment Policy (2006). Table A1.1 gives an illustrative list.

Table A1.1: Indian Regulations Applicable for Power Sector projects

S.No.	Name of Regulation	Applicability	Remark
ENVIRONMENTAL REGULATIONS			

²⁰ Environmentally-sensitive areas include National Parks, Wildlife Sanctuaries, Bio-reserve zones, Eco Sensitive Zones, or wetlands as declared by GoI and areas declared as heritage sites. Environment and wildlife Department's approval is required for right-of-way and sites located in reserved forests, wildlife preserves, national parks, and other designated sensitive areas.

S.No.	Name of Regulation	Applicability	Remark
1	National Green Tribunal Act, 2010	Yes	
2	The Environment (Protection) Act; 1986 and Environment (Protection) Rules 1986 and amendments	Yes	Umbrella Act to the Air, Water and Noise Acts Situating within 10km of interstate boundary
3	EIA Notification 2006 - Environmental Clearance and Public Consultation	Yes	
4	Environmental Statement as per Rule 14 to the Environment (Protection) Rules, 1992	Yes	
5	The Hazardous Waste (Management, Handling and Trans-boundary Movements) rules, 2008	Yes	
6	Batteries (Management and Handling) Rules, 2001 and further amendments	Yes	
7	Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005	No	
8	Forests (Conservation) Act, 1980 and Rules 1981	Yes	
9	The Wildlife (Protection) Act, 1972	Yes	
10	The Biodiversity Act, 2002	Yes	
11	The Air (Prevention and Control of Pollution) Act, 1981 Including Rules 1982 and 1983	Yes	
12	Noise Pollution (Regulation and Control) Rules, 2000 and the Noise Pollution (Regulation and Control) (Amendment) Rules, 2010	Yes	
13	The Water (Prevention and Control of Pollution), Act, 1974 including Rules, 1975 (as amended up to 1988)	Yes	
14	The Water (Prevention and Control of Pollution), Cess Act, 1977 including Rules 1978 and 1991	Yes	
15	The Indian Forest Act 1927	Yes	
16	The National Environmental Appellate Authority Act, 1997	Yes	
17	The Bio-medical Waste (Management and Handling) Rules, 1998	Yes	
SOCIAL REGULATIONS (REGULATIONS RELATED TO LAND AND LABOUR)			
1	The Land Acquisition Act, 1894 and 1984 amendments	Yes	When Governmental Land is used for project
2	The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & rules 2007	Yes	In case project location is situated on Tribal land
3	The Provision of the Panchayats (Extension to the Scheduled Areas) Act, 1996	Yes	
4	The Indian Telegraph Act, 1885	No	Only if APDCL has to setup its own power evacuation corridor
5	Indian Treasure Trove Act, 1878 (as modified upto September 1949)	Yes	
6	The Antiquities and Art Treasures Act, 1972	Yes	
7	The Child Labour (Prohibition and Regulation) Act, 1986	Yes	
8	The Bonded Labour (Abolition) Act 1976	Yes	
9	The Trade Union Act, 1926	No	
10	Minimum Wages Act, 1948	Yes	
11	Workmen's Compensation Act, 1923	Yes	ESI Act or Workmen Compensation Act applicable to APDCL
12	The Contract Labour (Regulation & Abolition) Act, 1970 and Rules	Yes	
13	The E.P.F. and Miscellaneous Provisions act, 1952	Yes	
14	Factories Act 1948	Maybe	In-case APDCL more than ten full time employees during the operations phase of the project
15	ESI Act, 1948 (Employees State Insurance Act, 1948)	Yes	ESI Act or Workmen Compensation Act applicable to APDCL
16	Payment of Gratuity Act, 1972	Yes	
17	Employers' Liability Act No. 24 of 1938	Yes	
18	Building and Other Construction Workers Act 1996	Yes	Key legislations providing guidelines for onsite labour and worker management and welfare

S.No.	Name of Regulation	Applicability	Remark
19	Interstate Migrant Workers Act 1979	Yes	In case workers and labourers working at the project sites are migrants from other states
20	State Specific Shops and Establishment Act	Yes	
OCCUPATIONAL HEALTH AND SAFETY			
1	The Indian Factories Act, 1948 and State Rules	Maybe	Reason same as above
2	The Shops and Establishment Act and State Rules	Yes	
3	The Petroleum Act, 1934 and the Petroleum Rules	Yes	
4	Gas Cylinder Rules and Static and Mobile Pressure Vessels (Unfired) Rules, 1981	Yes	
5	Central Electricity Authority (Safety Requirements for Operation, Construction and Maintenance of Electric Plants and Electrical Lines) Regulations 2008	Yes	
6	CGWA Notification No.21-4/Guidelines/CGWA/2009-832 dated 14th October 2009	Yes	
7	Indian Electricity Act	Yes	

Clearance under the Forest (Conservation) Act 1980

5. The Forest Act provides guidance on the right-of-way (ROW) and tree cutting. Where routing of distribution lines through the forest areas cannot be avoided, these should be aligned in such a way that it involves the least amount of tree cutting. The maximum width of ROW for transmission lines on forestland is given in Table A1.2. Below each conductor, a width clearance of 3 meters (m) would be permitted for the movement of tension stringing equipment. The trees on such strips would have to be felled but after stringing work is completed, the natural vegetation will be allowed to regenerate. Felling/pollarding/pruning of trees will be done with the permission of the local forest officer whenever necessary to maintain the electrical clearance. One outer strip shall be left clear to permit maintenance of the power line.

Table A1.2 Description of Right-of-Way of distribution lines in Forest Areas

Voltage, kV	Width of ROW, meter
11	7
33	15
Source: IS 5613 and MoEF Guidelines	

6. In line with the national goal, GoA manages their forest resources pursuant to the Forest Act, which provides for the mechanism to protect its rich forests, biodiversity and natural heritage and resources. The Act permits only unavoidable use of forestland for various development purposes. The Forest Act is regulatory in nature and not prohibitory, and provides a built-in mitigation process for cases where forest access is unavoidable.

7. Relevant Acts of Government of Assam

- a. Assam Ancient Monuments and Records Act, 1959.
- b. Assam Forest Regulation, 1891 (Assam Regulation 7 of 1891) as applied vide Meghalaya Forest Regulation (Application & Amendment) Act, 1973 (Meghalaya Act 9 of 1973)
- c. Assam National Park Act, 1968
- d. Assam Land and Revenue Regulation, 1886
- e. Assam Irrigation Act, 1983
- f. Assam Fishery Rules, 1953
- g. Assam Forest Policy, 2004
- h. Assam Government's Guidelines for Compensatory Afforestation, 2000
- i. Assam Panchayat Act, 1994
- j. Assam Khadi and Village Industries Board Act, 1955
- k. Assam Forest Protection Force Act 1986
- l. Assam Cooperative Agriculture and Rural Development Act 1960.

8. Apart from the above-mentioned regulations, the Government of India has also structured a number of policies that are relevant to APDCL's initiatives. The key policies have been provided in Table A1.3.

Table A1.3: Indian Policies related to Projects

SNo.	Name of Regulation	Applicability	Remark
ENVIRONMENT, FOREST & LAND RELATED POLICIES			
1	National Forest Policy, 1988	Yes	
2	National Environmental Policy 2006	Yes	
3	Wildlife Conservation Strategy 2002	Yes	
4	National Policy for Resettlement and Rehabilitation 2007	Yes	

Asian Development Bank's Safeguards Policies

At an initial stage of identifying an investment, the Corporate EHS will apply the following ADB's Prohibited Investment Activities List (described below). If the investment involves a prohibited activity, APDCL will not consider the investment.

ADB Prohibited Investment Activities List (PIAL)

The following type of projects does not qualify for Asian Development Bank financing:

- (i) production or activities involving harmful or exploitative forms of forced labour²¹ or child labour²²;
- (ii) production of or trade in any product or activity deemed illegal under host country laws or regulations or international conventions and agreements or subject to international phase outs or bans, such as (a) pharmaceuticals²³, pesticides, and herbicides²⁴, (b) ozone-depleting substances²⁵, (c) polychlorinated biphenyls²⁶ and other hazardous chemicals²⁷, (d) wildlife or wildlife products regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora²⁸, and (e) trans-boundary trade in waste or waste products²⁹;
- (iii) production of or trade in weapons and munitions, including paramilitary materials;
- (iv) production of or trade in alcoholic beverages, excluding beer and wine³⁰;
- (v) production of or trade in tobacco;
- (vi) gambling, casinos, and equivalent enterprises;
- (vii) production of or trade in radioactive materials³¹, including nuclear reactors and components thereof;
- (viii) production of, trade in, or use of unbonded asbestos fibers³²;

²¹ Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty

²² Child labor means the employment of children whose age is below the host country's statutory minimum age of employment or employment of children in contravention of International Labor Organization Convention No. 138 "Minimum Age Convention" (www.ilo.org).

²³ A list of pharmaceutical products subject to phaseouts or bans is available at <http://www.who.int>.

²⁴ A list of pesticides and herbicides subject to phaseouts or bans is available at <http://www.pic.int>.

²⁵ A list of the chemical compounds that react with and deplete stratospheric ozone resulting in the widely publicized ozone holes is listed in the Montreal Protocol, together with target reduction and phaseout dates. Information is available at <http://www.unep.org/ozone/montreal.shtml>.

²⁶ A group of highly toxic chemicals, polychlorinated biphenyls are likely to be found in oil-filled electrical transformers, capacitors, and switchgear dating from 1950 to 1985.

²⁷ A list of hazardous chemicals is available at <http://www.pic.int>.

²⁸ A list is available at <http://www.cites.org>.

²⁹ As defined by the Basel Convention; see <http://www.basel.int>.

³⁰ This does not apply to investee companies who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to an investee company's primary operations.

³¹ This does not apply to the purchase of medical equipment, quality control (measurement) equipment, and any equipment for which ADB considers the radioactive source to be trivial and adequately shielded.

³² This does not apply to the purchase and use of bonded asbestos cement sheeting where the asbestos content is less than 20%.

- (ix) commercial logging operations or the purchase of logging equipment for use in primary tropical moist forests or old-growth forests; and
- (x) marine and coastal fishing practices, such as large-scale pelagic drift net fishing and fine mesh net fishing, harmful to vulnerable and protected species in large numbers and damaging to marine biodiversity and habitats.

Asian Development Bank's Environment Classification

The ADB's Safeguard Policy Statement (SPS), 2009 is applicable to all projects. These projects can be categorized as A, B, r C, or FI. Table A1.4 below provides a list of categorisation of the activities related to Environment, Involuntary Resettlement, and Indigenous Peoples Safeguards, as per ADB's Safeguard Policy Statement 2009. Requirements:

Table A1.4: Environment and Social Safeguards Categorization: Definition

Category	Environment	Involuntary Resettlement	Indigenous Peoples ³³
A — Significant	Investments that anticipate significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works.	Investments where 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating).	Investments that are expected to significantly affect the dignity, human rights, livelihood systems, or culture of Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as an ancestral domain or asset.
B — Less Significant	Investments with potential adverse impacts that are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be more readily designed than for Category A investments.	Investments with involuntary resettlement impacts that are not deemed significant.	Investments that are likely to have limited impacts on Indigenous Peoples.
C — Minimal or no impact	Investments that have minimal or no adverse environmental impacts.	Investments with no involuntary resettlement impacts.	Investments that are not expected to have impacts on Indigenous Peoples.
FI — Financial Intermediation	Investment of ADB funds through financial intermediaries (FI)		

³³ The significance of impacts on Indigenous Peoples is determined by assessing (i) the magnitude of impact in terms of (a) customary rights of use and access to land and natural resources; (b) socioeconomic status; (c) cultural and communal integrity; (d) health, education, livelihood, and social security status; and (e) the recognition of indigenous knowledge; and (ii) the level of vulnerability of the affected Indigenous Peoples community.

Annexure 2: Project Component Details³⁴

Component A: Summary of items - Segregated feeders & sub-stations for Tea Estates.

Sl. No	Name of the Electrical Circle	Name Of The 33/11 kV Sub-Station & Capacity	Length of 33 KV Line proposed	Length of 11 KV Line proposed	No. of Tea Estates to be covered.	Remarks
1	Tezpur	Borjuli, 2 X 5 Mva	20 km	42 km	6 Nos.	-
2	-do-	Bindukuri, 2 X 2.5 Mva	16 km	21 km	3 Nos.	-
3	-do-	Rakyshmari, 2x5 mva	35 km	15 km	3 Nos.	-
4	-do-	Borsola , 2x5 mva	40 km	20 km	1 No.	Sub-station is proposed for other major load also.
5	-do-	Bedeti, 2x5 mva	16 km	15 km	1 No. & 3 Nos Tea Factories	-
6	-do-	Singri, 2x5 mva	24 km	10 km	3 Nos.	Part of the town
7	Dibrugarh	Gharamara, 2x5 Mva	25 km	15 km	1 No	Sub-station is proposed for other major load also.
8	- do -	Namsung (Ex Padumoni), 2x5 Mva	Nil	7 km	4 Nos	-
9	Sivasagar	Borhat, 2x5 mva	15 km	18.6 km	7 Nos.	-
10	- do -	Napuk, 2x5 mva	3 km	16.5 km	5 Nos.	-
11	Golaghat	Doyang (Doloujan), 2x5 mva	25 km	25 km	8 Nos.	-
12	- do -	Nahorbari (Ex-Pholongoni), 2x5mva	25 km	26 km	7 Nos.	-
13	- do -	Radhabari, 2x5mva	26 km	25 km	2 Nos	7 Nos Industrial consumer
14	Tinsukia	Baghjan, 2x5 Mva	26 km	15 km	6 Nos	-
15	- do -	Gangabari, 2x5 Mva	12 km	8 km	12 Nos	-
16	- do -	Gelapukhuri, 2x5 Mva	10 km	7 km	2 Nos	-
17	- do -	Mahakali, 2x5 Mva	10 km	7 km	4 Nos	-
18	- do -	Pawoi, 2x5 Mva	388.35 4 km	8 km	2 Nos	-
19	- do -	Philobari, 2x5 Mva	25 km	8 km	3 Nos	-
20	- do -	Dhola, 2x5 Mva	21.35 km	8 km	4 Nos	-

Component B: AUGMENTATIONS OF EXISTING SUBSTATION

B.1 A capacity augmentation of **22.10 MVA** has been proposed in addition to the 20 new substations.

B.2 Proposals under LOWER ASSAM ZONE

Rangia Electrical Circle

1. Kamalpur 33/11 kV substation from 2x2.5MVA to 2x5MVA: Existing 2x2.5MVA Transformers are to be replaced with new 2x5MVA Transformers.

³⁴ The main text presents the project components in terms of outputs, which is a requirement for the ADB project design and monitoring framework. This annexure presents the same proposed physical investments in terms of components as described in the Detailed Project Report.

B.3 Proposals under CENTRAL ASSAM ZONE

Tezpur Electrical Circle

1. Jamuguri 33/11 kV substation from 2x3.15MVA to 2x5MVA: Existing 2x3.15MVA

North Lakhimpur Electrical Circle

1. Chilapathar 33/11 kV substation from 1x2.5MVA to 1x5MVA: Existing 1x2.5MVA Transformer is to be replaced with 1x5MVA Transformer.

B.4 Proposals under UPPER ASSAM ZONE

Sivasagar Electrical Circle

1. Galeky 33/11 kV substation from 2x2.5MVA to 2x5MVA: Existing 2x2.5MVA Transformers are to be replaced with 2x5MVA Transformers.

2. Namti 33/11 kV substation from 1x2.5 + 1x1.6 MVA to 1x 2.5 MVA + 1x5 MVA: Existing 1x2.5 MVA + 1x1.6 MVA Transformers are to be replaced with to 1x 2.5 MVA + 1x5 MVA Transformers.

Dibrugarh Electrical circle

1. Rajgarh 33/11 KV substation from 1X2.5 MVA + 1 X 5MVA to 2 X 5 MVA with provision for terminal equipment of Namrup - Rajgarh Line

Component C: 33 kV LINES FOR SYSTEM STRENGTHENING

C.1 Proposals under LOWER ASSAM ZONE

1. New 33 kV lines required: 33.8 km

Mangoldoi Electrical Circle

- i) Renovation of Rowta GSS - Kasubil 33 kV line from Mohanpur Village to Ambagaon Chowk of Rowta GSS to Ksubil. Length is 9.4 km
- ii) Renovation of Udalguri - Kasubil 33 kV line from Gulma to Kasubil S/S . Length is 24 km
- iii) Construction of 33 kV interconnection line between 33 kV Rowta - Kasubill line and 33 kV Udalguri - Kasubill line with of AAAC wolf(40 mtr span) 25 km 33 kV line with PSC pole with GI channel, cross arms, bracing angles etc. Length is 0.4 km

33 kV Railway Crossings and River Crossings

- i) Strengthening of river crossing span at Ghola river in between line at 33 kV Rowta - Kasubill line with rail pole.

C.2 Proposals under CENTRAL ASSAM ZONE

1. Additional New 33 kV lines required: 20km

- i) New 20 km 33 kV feeder from B. Chariali 132/33 kV Grid substation to Monabari 33/11 kV substation without river crossing.

C.3 Proposals under UPPER ASSAM ZONE

1. New 33 kV lines required: 45 km

Dibrugarh Electrical Circle

- i) 33 kV S/C feeder from Namrup to Rajgarh.

33 kV Railway Crossings and River Crossings

¼ Sibsagar Electrical Circle

- i) Construction of one Railway Track Crossing for 33 KV S/C Line from 132/33 KV Gargaon GSS to New 33/11 KV Bihubar substation

Golghat Electrical Circle:

- ii) Construction of one 33 kV Railway track crossing in the 33 kV line from Golaghat(Tetelitol) GSS to Doloujan 2X5 MVA, 33/11 kV Sub Station
- iii) Construction of one 33 kV D/C River crossing with High Rise Pole (24.1 M) at Dhansiri river in the 33 kV line from Golaghat(Tetelitol) GSS to Doloujan 33/11 kV substation.

Tinsukia Electrical Circle:

- iv) Construction of one 33 kV Railway track crossing in the 33 kV line from 66/33 kV, Rupai GSS to Baghjan 2x5 MVA, 33/11 kV substation.

Component C: NEW DISTRIBUTION LINES FOR SYSTEM STRENGTHENING

C.1 For normal development 411.5 km of 11 kV lines have been proposed. As per the preliminary survey from the field sub divisions, no right of way issue or forest clearance issue is likely to be involved in the routes.

C.2 Proposals under LOWER ASSAM ZONE

The following new 11 kV lines are required.

1. New 11 kV lines: 25 km

Bongaigaon Electrical Circle: 4 km

- i) New 1 km 11 kV line at Bongaigaon town from Birjhora 33/11 kV substation.
- ii) New 1 km 11 kV line from Chapraguri to Dhaligaon.
- iii) New 1 km 11 kV feeder for Bongaigaon Industrial Estate (New Bongaigaon).
- iv) New 1 km 11 kV line at Chitka – Rabhapara.

Barpeta Electrical Circle: 21 km

- v) New 11 km 11 kV line along with terminal equipment at 33/11 kV Bhakatpara substation.
- vi) New 5 km 11 kV line along with terminal equipment at 33/11 kV Barpeta Road substation to Barpeta Road Bazar.
- vii) New 5 km 11 kV line from Howly substation to Howly Bazar.

C.3 Proposals under CENTRAL ASSAM ZONE

The following new 11 kV lines are required.

1. New 11 kV lines: 26 km

Tezpur Electrical Circle:

- i) New 13 km 11 kV feeder from Bargang substation to Bedeti (For separation of Tea Industry from RGGVY feeder).
- ii) New 5 km 11 kV feeder from Circuit House Tiniali to Panibharal (For separation of town feeder from RGGVY feeder).
- iii) New 8 km 11 kV feeder from Sootea 33/11 kV substation to Monai (For separation of Tea Industry).

C.4 Proposals under UPPER ASSAM ZONE

The following new 11 kV lines are required.

1. New 11 kV lines: 360.5 km

Sivasagar Electrical Circle:

- i) New 2.5 km Mathura Tea feeder from New 33/11 kV Maibela substation.
- ii) New 14 km Lakuwa Tea feeder from New 33/11 kV Maibela substation.
- iii) New 4 km Galeky to Sivbari TE Feeder feeding 3 tea Estates from Galekay substation
- iv) New 10 km Maduri Tea Feeder from 33/11 kV Namti substation

Golaghat Electrical Circle:

- v) New 19 km Tea feeder from Leteku 33/11 kV Sub Station to Bukial, Bijulee & RTS T.E.
- vi) New 20 km 11 kV Tea feeder from Leteku 33/11 kV Sub Station to Letekujan, Morongi, Dhanshree, NR Tea & Tanay Tea T.E.
- vii) New 20 km Tea feeder from Leteku 33/11 kV Sub Station to Dholaguri T.E., Sanjeev Tea Factory & Luhit Tea Factory.
- viii) New 24 km Tea feeder from Kamarbandha 33/11 kV Sub Station to Maheema, Borjan & Chakiting T.E.
- ix) New 28 km Tea feeder from Barpathar 33/11 kV Sub Station to Pavajan, Bhagawan, Digholihola, Rengma, Tsangpul & Dhanshree T.E.
- x) New 12 km Tea feeder from Bokakhat 33/11 kV Sub Station to Difoloo & Naharjan T.E.
- xi) New 11 km Tea feeder from Kohora 33/11 kV Sub Station to Methoni & Hatikhuli T.E.
- xii) New 5 kms Tea Feeder from Usha 33/11 kV Sub Station to Usha T.E.
- xiii) New 15 km Tea feeders to Halmira, North Goronga & Hautely T.E. from Golaghat -II, 2X 5 MVA, 33/11 kV substation (proposed under ADB, Tranche -3).

Dibrugarh Electrical Circle:

- xiv) New 30 km feeders (2 feeders of 15 km each) for 17 Tea Estates under Rajgarh substation.
- xv) New 14 km feeders (2 feeders of 7 km each) for 4 Tea Estates under Hazelbank substation.
- xvi) New 10 km feeder for 5 Tea Estates under Beheating substation.

Jorhat Electrical Circle:

- xvii) New 3 km feeder from 33/11 kV Gatanga S/S to Gatanga Tea Estate. xviii) New 10 km feeder from 33/11 kV Gatanga S/S to Sangsowa Tea Estate. xix) New 12 km feeder from 33/11 kV Gatanga S/S to Panbari Tea Estate. xx) New 5 km feeder from 33/11 kV Pulibor S/S to Lahpohia Tea Estate. xxi) New 7 km feeder from 33/11 kV Pulibor S/S to Indo Assam Tea Estate. xxii) New 6 km feeder from 33/11 kV Pulibor S/S to Purnimati Tea Estate. xxiii) New 5 km feeder from 33/11 kV Pulibor S/S to Soruchorai Tea Estate. xxiv) New 4 km feeder from 33/11 kV Borholla S/S to Borholla Tea Estate.
- xxv) New 7 km feeder for Dholi Tea Estate and Bokaholla Tea Estate including 0.6 km composite line from 33/11 kV Titabor S/S.
- xxvi) New 12 km feeder from 33/11 kV Nakachari S/S to Kakajan Tea Estate.

Tinsukia Electrical Circle:

- xxvii) New 19 km feeder from Tengpani 33/11 kV S/S to feed 4 Nos Tea Estate. xxviii) New 6 km feeder from Makum 33/11 kV S/S to feed 4 Nos Tea Estate.
- xxix) New 8 km feeder from Makum 33/11 kV S/S to Tila to feed 5 Nos Tea Estate. xxx) New 12 km feeder from Chabua 33/11 kV S/S to feed 2 Nos Tea Estate
- xxxi) New 6 km feeder from Lidu 33/11 kV S/S to Tirap feed to feed Coal India Ltd 2 Nos Tea Estate

2. 11 kV Railway Crossings**Sivasagar Electrical Circle:**

- i) Railway Track Crossing for 11 kV Lakuwa Tea Feeder from New 33/11 kV Maibela substation.
- ii) Railway Track Crossing for 11 kV Muktabari Tea feeder from New 33/11 kV Borhat substation.
- iii) Railway Track Crossing for 11 kV Poitakhat - Sundar Feeder from 33/11 kV Borhat substation.

Golaghat Electrical Circle:

- iv) 3 Nos. 11 kV Railway track crossing in the 3 Nos. 11 kV line from Doloujan 2X5 MVA, 33/11 kV substation.
- v) One No. of 11 kV Railway track crossing in the Doria T.E. 11 kV feeder from Radhabari T.E 2X5 MVA, 33/11 kV substation.

Tinsukia Electrical Circle

- vi) One No. 11 kV Railway track crossing in the 11 kV feeder from Gangabari 2X5 MVA, 33/11 kV Sub Station
- vii) One No. 11 kV Railway track crossing in the 11 kV feeder from Mahakali 2X5 MVA, 33/11 kV Sub Station
- viii) One No. 11 kV Railway track crossing in the 11 kV feeder from Pawoi 2X5 MVA, 33/11 kV Sub Station

Component C.5 Improvement of 33/11 kV substation and 33 kV lines.

The following substations have been taken up for improvement/renovation works, as per the requisition of the sub divisions.

Proposals under LOWER ASSAM ZONE**Kokrajhar Electrical Circle: Civil Works:**

- i) Repairing of Control Room Building including footpath at Basugaon 33/11 kV substation.
- ii) Raising of low site by earthfilling at back site of Control Room Building at Basugaon 33/11 kV substation.
- iii) Switchyard fencing by PCC wall (below G.L) due to raising of height at Ambagan 33/11 kV substation complex at Dhubri.
- iv) Construction of boundary wall (damage portion) including earth filling at West side of Control Room Building at Gauripur 33/11 kV substation.
- v) Construction of boundary wall at South side of Ambagan 33/11 kV substation, APDCL Dhubri.
- vi) Supply & Spreading of 32 mm river gravel at 33/11 kV switchyard area at Ambagan, Dhubri.
- vii) Raising of low structure foundation by brick due to earth filling inside switchyard at Ambagan 33/11 kV substation complex at Dhubri.
- viii) Construction of Ramp (side and back) of switchyard fencing at Ambagan 33/11 kV substation complex at Dhubri.
- ix) Construction of steel gates (front & back) of switchyard fencing at Ambagan 33/11 kV substation complex at Dhubri.
- x) Raising of low side by earth filling inside switchyard area at Ambagan.
- xi) Construction of outlet new drain in front and south side of CB at Ambagan 33/11 kV substation complex, APDCL Dhubri.
- xii) Reconstruction of the damage boundary wall of 33/11 kV substation at Agomani. xiii) Reconstruction of damage boundary wall at 33/11 kV substation at Bilasipara. xiv) Painting of switchyard fencing at Dhubri

Bongaigaon Electrical Circle: Civil Works:

- i) Providing internal and external water supply, Deep tube well at Bhalukdubi 33/11 kV substation.
- ii) Providing internal and external water supply, Deep tube well at Mornoi 33/11 kV substation.
- iii) Repairing of Control Room Building including electrification work at Balijana 33/11 kV substation.
- iv) Civil works of Bhalukdubi 33/11 kV substation including internal electrification.

Mangaldoi Electrical Circle: Electrical Works:

- i) 9-unit 11 kV indoor VCB at Kharupetia 33/11 kV substation.
- ii) Construction of Switching facility for interconnection of Rowta - Kasubill line and Udalguri - Kasubill Line

Guwahati Electrical Circle I: Civil Works:

- i) Construction of Internal Boundary Wall at Zoo Road 33/11 kV substation.
- ii) Construction of PCC base on stone soiling at Zoo Road 33/11 kV substation.
- iii) Construction of Boundary Wall in the western side of Zoo Road 33/11 kV substation. iv) Renovation of Control Room Building at Sonapur 33/11 kV substation.
- v) Providing boundary wall and gate at Garbhanga 33/11 kV substation.
- vi) Construction of approach road with repairing & renovation of Control Room Building at Paltan Bazar 33/11 kV

Substation.

vii) Construction of boundary wall including repairing & renovation of old damaged wall around Paltan Bazar 33/11 kV substation Switchyard.

Proposals under CENTRAL ASSAM ZONE

Tezpur Electrical Circle: Civil Works:

- i) Construction of well foundation with hum pipe for 33 kV Bargang-Monabari feeder river crossing.
- ii) Construction of boundary wall at Bargang 33/11 kV substation.
- iii) Construction of boundary wall at Pavo 33/11 kV substation.
- iv) Construction of boundary wall at Chariali 33/11 kV substation.

Nagaon Electrical Circle: Electrical Works:

- i) R&M of Kathiatoli 33/11 kV substation under Hojai Electrical Division. ii) R&M of Kampur 33/11 kV substation under Hojai Electrical Division.
- iii) R&M of Burapahar 33/11 kV substation under Nagaon Electrical Division. iv) R&M of Moloibari 33/11 kV substation under Morigaon Electrical Division.

N Lakhimpur Electrical Circle: Civil Works:

- i) Water supply and construction of water filter for Narayanpur 33/11 kV substation. ii) Water supply and construction of water filter for Jonai 33/11 kV substation.

Cachar Electrical Circle: Civil Works:

- i) Construction of (Remaining portion) of retaining wall along with boundary fencing by the West, South & North side of Malini Beel 33/11 kV substation.
- ii) Earth filling (Remaining portion) within Malini Beel 33/11 kV substation.
- iii) Construction of approach road and cement concreting over the open space of switchyard for easy movement of machinery at Malini beel 33/11 kV substation.
- iv) Construction of heavy duty iron gate of Malini Beel 33/11 kV substation. v) Construction of boundary wall around the Srikona 33/11 kV substation.
- vi) Renovation of boundary wall of divisional store as well as boundary fencing of switchyard of Meharpur 33/11 kV substation.
- vii) Repairing of CC road and WBM road of Udharbond 33/11 kV substation.
- viii) Repairing of Control Room Building of Udharbond 33/11 kV substation.
- ix) Construction of approach road from PWD road to switchyard of Kalain 33/11 kV substation.
- x) Construction of approach road of Katigora 33/11 kV substation. xi) Switchyard gravelling of Katigora 33/11 kV substation.
- xii) Earth work in switchyard of Katigora 33/11 kV substation.
- xiii) Construction of boundary wall of Katigora 33/11 kV substation.
- xiv) Construction of approach road to Control Room Building at Katigarha 33/11 kV substation.
- xv) Earth filling at Katigarh 33/11 kV substation area.

Electrical Works

- i) Replacement of cable of Pailapool 33/11 kV substation.

Proposals under UPPER ASSAM ZONE

Dibrugarh Electrical Circle:

Civil Works:

- i) Construction of approach road to the newly upgraded Bordubi 33/11 kV substation.
- ii) Construction of boundary wall for upgraded Bordubi 33/11 kV substation.
- iii) Renovation/repairing of old Control Room Building at Bordubi 33/11 kV substation.
- iv) Earth filling for upgrade Tengakhat 33/11 kV substation under Dibrugarh Electrical Circle.

Tinsukia Electrical Circle: Civil Works:

- i) Repairing of Control Room Building at Makum 33/11 kV substation.
- ii) Construction of boundary wall for upgraded Makum 33/11 kV substation.
- iii) Construction of approach road to the newly upgraded Makum 33/11 kV substation.
- iv) Repairing of Control Room Building at Chabua 33/11 kV substation.
- v) Construction of approach road to the newly upgraded Chabua 33/11 kV substation.
- vi) Construction of boundary wall for upgraded Dinjan 33/11 kV substation.
- vii) Construction of boundary wall for upgraded Magherita 33/11 kV substation.
- viii) Construction of boundary wall for upgraded Doomdooma 33/11 kV substation.
- ix) Construction of approach road to the newly upgraded Tinsukia 33/11 kV substation.
- x) Construction of approach road to the newly upgraded Digboi 33/11 kV substation.

Electrical Works:

- i) 33 kV Outdoor VCB for Transformer at Parbotria, Borguri, Chabua and Dinjan 33/11 kV substation.

ii) Battery Charger with Battery Bank at Chabua and Borsola 33/11 kV substation.

Jorhat Electrical Circle: Civil Works:

i) Repairing of Control Room Building at Bokakhat 33/11 kV substation. ii) Construction of boundary wall at Kamarbandha 33/11 kV substation. iii) Construction of security fencing at Kamarbandha 33/11 kV substation.

Sivasagar Electrical Circle: Civil Works:

i) Construction of boundary wall at Dimow 33/11 kV substation. ii) Construction of boundary wall at Geleki 33/11 kV substation. iii) Construction of approach road to Geleki 33/11 kV substation. iv) Construction of boundary wall at Sonari 33/11 kV substation. v) Construction of approach road to Sonari 33/11 kV substation. vi) Construction of boundary wall at Phukan Nagar 33/11 kV substation. vii) Construction of approach road to Phukan nagar 33/11 kV substation.

Electrical

i) Replacement of Transformer Breaker at Namti Chari Ali 33/11 kV substation.
 ii) Replacement of Gaurisagar 33 kV feeder Breaker under Phukon Nagar 33/11 kV substation.
 iii) For commissioning of 33 kV Transformer Bay under Geleky 33/11 kV substation.
 iv) For replacement of 33 kV PT under Salkathoni 33/11 kV substation.
 v) For commissioning of Transformer Bay under Nazira 33/11 kV substation.
 vi) Existing 2 km line upgrade required for LTPS-Sonari line.
 vii) Existing 2 km line upgrade required for LTPS-Salkatoni line

Dibrugarh Electrical Circle: Electrical

viii) Equipment required at 33/11 kV Hazelbank substation. ix) Equipment required at 33/11 kV Beheating substation.

Component D: Facilities to support smooth operation of the system

Component D.1: CONSTRUCTION OF NEW 11 kV LINE WITH ABC

It is proposed to construct **26 km** of new 11 kV ABC in the Upper Assam zone in the following locations

i) New **5km** of AB Cable on the 11 KV line (Total 9 km) from Galeky to Sivbari TE feeder for feeding 3 Tea Estates.
 ii) New **5km** of AB Cable on the 11 KV line (Total 15 km) Maduri Tea Feeder from 33/11 KV Namti substation.
 iii) New **6km** 11 kV lines with AB Cable in the alignment of 3 Nos. 11 kV feeders from Dayang, 2X5 MVA, 33/11 kV Sub Station.
 iv) New **6km** 11 kV lines with AB Cable in the alignment of 3 Nos 11 kV feeders from Nahorbari, 2X5 MVA, 33/11 kV Sub Station.
 v) New **4km** 11 kV lines with AB Cable in the alignment of 4 Nos 11 kV feeders from Radhabari T.E., 2X5 MVA, 33/11 kV Sub Station.

Component D.2: CONVERSION OF EXISTING 11 kV LINES TO 11 kV ABC

G.1 It is proposed to convert existing **4.95 km** of overhead 11 kV lines to 11 kV ABC in Guwahati-1 circle.

i) Conversion of **2.75 km** 11 kV line with AB Cable from Lalungaon Chowk to Katakipara.
 ii) Conversion of **2.2 km** 11 kV line with AB Cable at Jowaharnagar to Patharkuchi.

Component D.3: QUICK RESPONSE OPERATION & MAINTENANCE SYSTEM

The Electrical Subdivisions of APDCL has to cover a vast geographical area consisting of difficult terrain and far-flung rural areas and average sq. km. covered by a sub-division in non-metro areas is around 400 - 500 Sq. km. Moreover, Assam has normally a long spell of monsoon causing regular line faults in its distribution system. To rectify the line faults of the system, the maintenance force of the subdivisions with limited resources has to face a daunting task to maintain un-interrupted power supply to its valued consumers. Majority of the subdivisions do not have any modern gadgets as well as vehicle to make a quick response for rectification of these faults.

The down time in interior areas normally exceeds 4 to 5 hours. To increase the reliability of the system as well as to reduce the down time to less than one hour, it is proposed to provide state of the art, well equipped maintenance vehicles for all 157 nos. of Subdivisions and 4 Divisions, under APDCL for round the clock operation and maintenance of the sub transmission and distribution network of the entire state of Assam.

The maintenance vehicle proposed shall be of two type viz., a) Pick up Van b) Mini Truck

a) The Pick Up Van will be of closed type and shall be fully equipped with Megger, Oil Testing kit, Portable Filter Machine, Generator, a Tong Tester, Flood Lights, a mobile set for communication, tools, general spares and consumables. The vehicle will be utilized as a testing van also and will be provided against the Division, so as to take care of multiple subdivisions under its administrative control.

b) The Mini Truck shall be fully equipped with a Telescopic Ladder, Power Saw, primary tool kits, general spares (insulators, power conductors, fuses, nuts & bolts etc.), mobile set for communication, tools and consumables. Each Sub-division will be provided with two trucks each for round the clock O&M work for quick response for fault

rectification and restoration.

The requirement of vehicle for this purpose is as under.

Region	Quick response for testing & restoration	Quick response for fault detection & restoration & DTR repairs
Lower Assam	17	122
Central Assam	17	120
Upper Assam	11	72

Component E: IT MODULES TO COVER HT CONSUMERS OF APDCL (8500 CONSUMERS)

RAPDRP (Restructured Accelerated Power Development and Reforms Programme) has been taken up by Gol through Power Finance Corporation all across India. Financial assistance under this project is provided to all Govt. power distribution utilities/power departments. State of Assam is also a part of this project with a total of 67 towns eligible for financial assistance.

The new IT system which is under implementation shall cover the following functionalities:

- a) Energy Accounting / Auditing and establishment of Customer care
 - b) Meter Data Acquisition (MDAS) (Automatic Meter Reading (AMR) Systems)
 - c) Energy Audit
 - d) New Connection
 - e) Disconnection & Dismantling
 - f) GIS based customer Indexing and asset mapping g) GIS based integrated network analysis module
 - h) Centralized Customer Care Services
 - i) Management Information System (MIS)
 - j) Web Self Service
 - k) Identity and Access Management system
 - l) Asset Management and Maintenance Management m) Metering, Billing and Collections (MBC)
- AMR system shall cover 8500 nos. of HT consumers in 67 project areas out of a total of approximately 12,000 HT consumers of APDCL

The advantage and benefits of AMR system:

- i) Meter readings are collected automatically without any human intervention and hence human error is completely eliminated.
- ii) Meter Readings are automatically entered in the billing software to generate bills.
- iii) Quick collection of meter reading resulting in timely billing of consumers.
- iv) Monitoring of the meter status is possible at various locations.
- v) All historical, tamper data is available for study at various locations.
- vi) Meter data can be polled on a half hourly basis when required.
- vii) Savings due to the reduction in the number of officials involved for collection of meter reading.
- viii) Faulty metering equipment can be detected and rectified quickly.
- ix) Any tamper attempt of meters can be detected from remote site quickly from the meter data available.
- x) Implementation of AMR system would enable APDCL accurate billing of HT consumers.
- xi) Overall revenue would increase and tampering of meters can be restricted /prevented by remotely monitoring the meters.
- xii) HT consumer revenue is about 50 % of the total APDCL's revenue collection and hence there would be a significant improvement in revenue collection after implementation of the AMR system.
- xiii) Since Metering Billing Collection (MBC) system and other billing infrastructure is available in HT Consumer billing office under the RAPDRP Projects no further investment is required for infrastructure enhancement in these offices.

Annexure 3: Locational Analysis for substations

S No	Description	Tinsukia Circle						
		Gangabari	Gelapukhuri	Mahakali (Borjaan)	Pawoi	Philobari	Baghjan	Dholla
1	Land Details							
1.1.a	Area of land	1 Bigha	1 Bigha	1 Bigha	1 Bigha	1 Bigha	1 Bigha	1 Bigha
1.b	Slope/Plain Land	Plain	Pain	Plain Land	Plain	Plain	Plain	Plain
1.c	Approximate Amount of land cutting required	-	-	-	-	-	-	-
2.	Owner Ship of land (Private / Forest/ Other Govt. Department/ Other)	Private	Private	Private	Government	Private	Private	Private
3.	Private land (in ha.)							
	(i) Agriculture :- a) Irrigated b) Non – irrigated	-	-	-	-	-	-	-
	(ii) Non - Agriculture/ Private Waste land / barren.	-	-	-	-	-	-	-
	(iii) House or Building: a) Residential b) Non – Residential	-	-	-	-	-	-	-
4.	Distance from Nearest (With name)							
4.a	River (Name/Distance)	Goijaan -22 km	Brahmaputra- 6 km	Tingrai- 3 km	Buridhing -10 km	Moila-6 km	Brahmaputra-5 km	Brahmaputra-10 km
4.b	Highway	Makom -7 km	NH-37 -1 km	SH- 2 km	NH-38- 10 mtr		NH-37- 22 km	NH-37- 2 km
4.c	Forest Area		Dheisaikhowa Reserve forest-6 km Dhelakhat-3 km	Mahakali Reserve forest-3 km	Patkai Reserve Forest-10 km	Tarinai Forest -7 km	Dibru Saikhowa National park -6 km	Dibrusaikwa National Park -6 km
4.d	Village / town	Pucca Road	Tinsukia -5 km	Tinsukia -8 km	Margrita- 6 km Digboi- 4 km	DoomDuma-20 km	DoomDuma – 20 km	Doomdooma-20 km
4.e	Market/Area of Economic Activity	2 km NH-37– 20 mtr	Tea labor, Govt., Cultivation	Tea Garden labor	60 % Tea Labour	Tea Garden Labor	Labor work	Tea labor/ Cultivation
5.	Road accessibility	30 mtr	Mud road, NH- 37- 1Km	Mud road-1 km	Pucca Road	Puca road- 200 mtr	Pucca Road	Pucca road NH- 37 -2 km
6.	EHV Line Passing Near By (Distance)	30 mtr	1 km		2 km	25 km	26 km	22 km
7.	HT line Passing Near By		1 km		400 mtr	50 mtr	300 mtr	50 mtr
8.	No. of Forest Trees :- a) Trees to be felled b) Trees to be lopped	-	-	-	-	-	-	-
9.	No. of private trees							
	(i) Fruit Trees: a) Trees to be felled b) Trees to be lopped	-	-	-	-	-	-	-
	(ii) Non - Fruit Trees: a) Trees to be felled b) Trees to be lopped	-	1	-	-	-	-	1
10.	Distance from mountainous area	-	-	-	-	-	-	-
11.	Distance from cultivated area	10 mtr	10 mtr	-	-	-	-	10 mtr

S No	Description	Tinsukia Circle						
		Gangabari	Gelapukhuri	Mahakali (Borjaan)	Pawoi	Philobari	Baghjan	Dholla
12.	Altitude of substation	-	-	-	-	-	-	-
13.	Nearest distance from airport/national& international boundaries	40 km Arunachal Pradesh boundary	-	-	Arunachal -20 km	Arunachal Pradesh-15 km	-	-
14.	Distance from nearest religious or archaeological sites	-	King of mutak dynasty-10 km Rangagarh	Titinga Temple 10 km	Ketijong Temple-3 km	Baliababa Than 100 mtr	-	Ithen temple -2 km

S No	Description	Tezpur Circle					
		Borjuli	Bindukuri	Bedeti	Borsola	Rakhyshmari	Singri
1	Land Details						
1.1.a	Area of land	2 Bigha	2 Bigha	1 Bigha	2 Bigha	2 bigha	2 Bigha
1.b	Slope/Plain Land	Plain	Plain	Plain	Plain	Plain	Plain
1.c	Approximate Amount of land cutting required						
2.	Owner Ship of land (Private / Forest/ Other Govt. Department/ Other)	Private	Private	Private	Govt.	Govt.	Govt.
3.	Private land (in ha.)						
	(i) Agriculture :- a) Irrigated b)Non – irrigated	-	-	-	-	-	-
	(ii) Non - Agriculture/ Private Waste land / barren.	-	-	-	-	-	-
	(iii) House or Building: c) Residential d) Non – Residential	-	30 mtr	-	20 mtr hospital vaterinery School- 50 mtr	-	-
4.	Distance from Nearest (With name)				Waste land		
4.a	River (Name/Distance)	-	Bindukuri -3Km	Boroi -3Km	Brahmaputra- 15 km	Sapoi – 2 km	Brahmaputra- 7 km
4.b	Highway	-	-	-	NH-15- 7Km	NH-15 – 15 km	NH-15 – 20 km
4.c	Forest Area	-	Nameri Tiger Project-66 km	Behali -8Km	Orang – 40 km	Sunairupai- 10Km	Singri – 5 km
4.d	Village / town	-	Tejpur-15 km	Biswanath Chairali -30 km	Dhakijuli-25 km	Dhakiajuli – 22 km	Dakhiajuli- 20 km
4.e	Market/Area of Economic Activity	-	Tea Garden Labor	Tea Garden Labor	Agriculture	Agriculture	Agriculture
5.	Road accessibility	-	Mud Road	Mud road	15 mtr	15 mtr puca road	Mud road
6.	EHV Line Passing Near By (Distance)	-	0.5 km	2 km	20 km	18 km	100 mtr
7.	HT line Passing Near By	-	300 mtr	60 mtr	400mtr	200 mtr	50 mtr
8.	No. of Forest Trees :- c)Trees to be felled d) Trees to be lopped	-	-	-	-	-	-
9.	No. of private trees	-	-	-	-	-	-
	(iii) Fruit Trees: c)Trees to be felled d) Trees to be lopped	-	-	-	-	-	-
	(iv) Non - Fruit Trees: c)Trees to be felled d) Trees to be lopped	-	-	-	-	-	-

S No	Description	Tezpur Circle					
		Borjuli	Bindukuri	Bedeti	Borsola	Rakhyshmari	Singri
10.	Distance from mountainous area	-	-	-	-	-	-
11.	Distance from cultivated area	-	30 mtr tea garden	50 mtr	20 mtr	50 mtr	-
12.	Altitude of substation	-	-	-	Arunachal -60-70 km	-	-
13.	Nearest distance from airport/national& international boundaries	-	-	Arunachal -20 km	-	-	Arunachal - 65Km
14.	Distance from nearest religious or archaeological sites	-	Haleshwar Temple- 5 km	-	Old Gupteshwar Temple -22 km	-	Gupteswar Temple-4 km

S No	Description	Golaghat Circle			Dibrugarh Circle		Shivsagar Circle	
		Radhabari	Dayang (ex-Padumani)	Naharbari (ex-Pholongoni)	Gharamara	Namsung	Borhat	Napuk
1	Land Details							
1.1.a	Area of land	2 Bigha	2 Bigha	2 Bigha	4 Bigha	1.5 Bigha	1 Bigha	1 Bigha
1.b	Slope/Plain Land	Plain	Partially Plain	Plain	Plain	Partially Plain	Plain	Plain Land
1.c	Approximate Amount of land cutting required	-	-	Minor land levelling	-	-	-	
2.	Owner Ship of land (Private / Forest/ Other Govt. Department/ Other)	Private	Private	Private	Private	Private	Government	Private
3.	Private land (in ha.)	-	-	-	-	-	-	-
	(i) Agriculture :- a) Irrigated b) Non – irrigated	-	-	-	Agriculture/ Paddy	-	-	-
	(ii) Non - Agriculture/ Private Waste land / barren.	-	-	Fallow land 2 ha	-	-	-	-
	(iii) House or Building: e) Residential f) Non – Residential	-	-	-	50 mtr	-	-	2 houses
4.	Distance from Nearest (With name)							
4.a	River (Name/Distance)	Dhansri -12 km	Doyang -6 km	Dhansree- 12 km Degroon -5 km	Disang – 5 km	Devkali	Tiok – 38Km	Towkak -5 km
4.b	Highway	NH-37 – 2 km	NH-39- 22 km	NH-39 km	NH-50 km, SH-4Km	-	NH-52 – 17 km	Dhodar ali -8Km
4.c	Forest Area	Numligarh -12 km	Nambore forest -40 km	Bljuli forest -12 km	Jaipur Rain Forest – 20 km	-	Dilli forest – 8 km	Singlo forest -4 km
4.d	Village / town	Bokakhat -33 km Mohra -3 km	Doyang TE	Nahorbar (under kowani village)	50 mtr	Jaypur -12 km	Sonari -40 km Namrup – 21 km	Sonari 16 km
4.e	Market/Area of Economic Activity	Tea Garden Labor	Oating -7 km	Golaghat- 20 km	Nwharkartia – 15 km	Tea Labor	Service	Agriculture/ service
5.	Road accessibility	Mud road	Pingsy road -3 km	NH-39 -50 mtr	100 mtr		Pucca Road	Puca Road
6.	EHV Line Passing Near By (Distance)	2 km	2 km	20 km	3 km		40 km	12 km
7.	HT line Passing Near By	5 km	2 km	50 mtr	100 mtr		30 mtr	30 mtr
8.	No. of Forest Trees :- e) Trees to be felled f) Trees to be lopped	-	-	-	-	-	-	-
9.	No. of private trees	-	-	2	-	-	-	
	(v) Fruit Trees:	-	-	1	-	-	-	28

S No	Description	Golaghat Circle			Dibrugarh Circle		Shivsagar Circle	
		Radhabari	Dayang (ex-Padumani)	Naharbari (ex-Pholongoni)	Gharamara	Namsung	Borhat	Napuk
	e) Trees to be felled f) Trees to be lopped							30
	(vi) Non - Fruit Trees: e) Trees to be felled f) Trees to be lopped	-	7	-	-	12 (+11 small)	-	- 3
10.	Distance from mountainous area	1 km, 5 km from elephant corridor	7	2 km	-	-	-	-
11.	Distance from cultivated area	Tea garden -20 mtr	500 Mts	150 mtr				
12.	Altitude of substation	-	-	-	-	-	-	-
13.	Nearest distance from airport/national& international boundaries	55 km – Jorhat Arunachal Pradesh boundary -25 km	Jorhat -70 km Nagaland -50 km	Jorhat -65 km Nagaland -70 km	Arunachal -30 km Dibrugarh -75 km	Arunachal -5 km	Arunachal -22 km	Nagaland -10 km
14.	Distance from nearest religious or archaeological sites	Nikulbari-12 km	Church – 500 mtr	Shiv Temple-100 mtr	Temple -100 mtr Mosque – 300 mtr	-	-	Charaidew Maidam -8 km

Summary Details of Distribution Substations

Sl. No.	Name of the Sub Station	Capacity of substation	Name of the Village / Town	Name of the Tehsil	Name of the District	Is the land for substation already identified/finalized or not	Total Land Area Required for Sub Station (Heactre)	Ownership of Land (Govt/ Private/ Community)	Type of Land (Agricultural, Residential, commercial, forest, others)	Status of Land Acquisition (Whether already acquired or to be acquired)	No of Affected Households/Owners/ (in case of Private land)	Number of affected Indigenous Peoples Household or Owners (If any)
TEZPUR ELECTRICAL CIRCLE DISTRICT: SONITPUR												
1	33/11 kV Bindukuri	2x5 MVA	Tezpur & Ghara TE	Tezpur	Sonitpur	Identified	0.20	M/S Tezpur & Ghara TE	Tea & Agricultural	To be acquired	Nil	Nil
2	33 /11 kV, Borjuli	2x5 MVA	Borjuli	Borjuli/Chariduwar	Sonitpur	Identified	0.134	Govt	Govt Land	To be acquired	Nil	Nil
3	33/11 kV Bedeti	2x5 MVA	Bihali TE	Bihali	Sonitpur	Identified	0.30	M/S Bihali TE	TE	To be acquired	Nil	Nil
4	33/11 kV Singri	2x5 MVA	Singri	Borsola	Sonitpur	Identified	0.268	Govt Land	Govt Land	To be acquired	Nil	Nil
5	33/11 kV Rakhyshmari	2x5 MVA	Rakhyshmari	Dhekiajuli	Sonitpur	Identified	0.268	Govt Land	Govt Land	To be acquired	Nil	Nil
6	33/11 kV Borsola	2x5 MVA	Doom dooma	Borsola	Sonitpur	Identified	0.268	Govt Land	Govt Land	To be acquired	Nil	Nil
TINSUKIA ELECTRICAL CIRCLE DISTRICT: TINSUKIA												
1	33 /11 kV,Baghjan	2x5 MVA	Baghjan TE	Doom Dooma	Tinsukia	Identified	0.268	Private	Tea Garden	To be acquired	1	1
2	33/11 kV Gangabari	2x5 MVA	1 No. Chotta hapjan	1 No. Chotta hapjan	Tinsukia	Identified	0.45	Private	Residential (Tea lab. Qr.)	To be acquired	2	Nil
3	33 /11 kV, Mahakali	2x5 MVA	Borjan Village (part)	Borjan Village	Tinsukia	Identified	0.134	Private	Agriculture	To be acquired	1	1
4	33 /11 kV, Dholla	2x5 MVA	Dholla TE	Doom Dooma	Tinsukia	Identified	0.268	Private	Tea Garden	To be acquired	1	1
5	33 /11 kV, Gelapukhuri	2x5 MVA	Gelapukhuri Village	Gelapukhuri Village	Tinsukia	Identified	0.134	Private	Agriculture	To be acquired	3	3
6	33 /11 kV, Philobari	2x5 MVA	Philobari TE	Doom Dooma	Tinsukia	Identified	0.268	Private	Tea Garden	To be acquired	1	1
7	33 /11 kV, Pawoi	2x5 MVA	Pawoi	Margherita	Tinsukia	Identified	0.132	Private	Agriculture	To be acquired	Nil	Nil
GOLAGHAT ELECTRICAL CIRCLE DISTRICT: GOLAGHAT												
1	33/11 kV Radhabari	2x5 MVA	Radhabari	Bokakhat	Golaghat	Almost finalised	0.258	Private	Tea Garden Land	To be acquired	Nil	Nil
2	33/11 kV Pholongoni	2x5 MVA	Murphulon	Morangi	Golaghat	Almost finalised	0.258	Private	Tea Agriculture	To be acquired	Nil	Nil
3	33/11 kV Dolojan	2x5 MVA	Oating TE	Golaghat	Golaghat	Identified	0.194	Private	Tea Agriculture	To be acquired	Nil	Nil
SIBSAGAR ELECTRICAL CIRCLE DISTRICT: SIBSAGAR												
1	33 /11 kV, Borhat	2x5 MVA	Borhat Village	Borhat	Sibsagar	APDCL own land	162 SQ. M	APDCL own land	Nil	Own land	Nil	Nil
2	33/11 kV Napuk	2x5 MVA	Bowlipukhuri Habi gaon	Dhupabor	Sibsagar	Identified	0.159	Private	Nil	To be acquired	Nil	Nil

Sl. No.	Name of the Sub Station	Capacity of substation	Name of the Village / Town	Name of the Tehsil	Name of the District	Is the land for substation already identified/finalized or not	Total Land Area Required for Sub Station (Heactre)	Ownership of Land (Govt/ Private/ Community)	Type of Land (Agricultural, Residential, commercial, forest, others)	Status of Land Acquisition (Whether already acquired or to be acquired)	No of Affected Households/Owners/ (in case of Private land)	Number of affected Indigenous Peoples Household or Owners (If any)
DIBRUGARH ELECTRICAL CIRCLE DISTRICT: DIBRUGARH												
1	33 /11 kV, Gharamara	2x5 MVA	Rajgarh Rangali	Rajghar	Dibrugarh	Identified	0.201	Private	Agriculture	To be acquired	2	2
2	33/11 kV Namsung	2x5 MVA	Namsung	Joypur	Dibrugarh	Identified	0.201	Private	Nil	To be acquired	Nil	Nil

Annexure 4: Summary Details of Distribution Lines

Sl. No.	Name of the Sub-Project Components (33 kv Lines_From - To)	Line Length (km)- 33 kV	Right of Way (meters)- 33 kV	Approximate Number of Poles (33 kV)	Approximate Area of each pole- 33 kV (square meter)	Number of Villages Covered	Names of the Villages Covered	Number of Tehsils Covered	Number of Districts Covered	Names of Districts Covered	General Profile of the line (Cropping pattern/Tea Estate/Forest etc)	Whether Alignment is Final or Not	Remarks
TEZPUR ELECTRICAL CIRCLE DISTRICT: SONITPUR													
1	Rowta Grid S/S to Proposed Rakhysmari 33/11 KV S/S via Mijibari 33/11 KV S/S	34	34000	480	1Sq M	58	Sopai baligaon, Hugrajuli, No.3 Rowmari Gaon, No.2 Sopai nalbari, No. 1 Shyamaguri Bagan, No.2 Shyamaguri Bagan, No.1 Dibrudarrang, N.1 Panbari, Mazgaon pather, Ashunmoni Pather, Rakyashmari, Bholaguri Pather, Prajabari gaon, Hugrajuli gaon, Narengkhaiti Bangali, Narengkhaiti Kachari, No.3 Hugrajuli Bagan, Oshumari, No.1 Chariali, No. 2 Chariali, No.1 Chapoi bagan, No.1 tinkhoria bagan, etc etc.	1	2	Sonitpur & Udalguri(BTAD)	TE & Agricultural	Not Final	
2	Tapping from proposed 33 kV Rakhysmari line at Mijibari to Borchola	15	15000	210	1Sq M	36	Palash Pather Gaon, Bhalukdhara, Ratanjuli, Bogoribari Gaon, Chirajuli, Bandoijaroni, Chirajuli pather, Rangagara No. 1 & 2 Natun Chirajuli No.1 & 2, Nambogoribari, Pirakata, Pirakata No.2, Lulukai, Ghoramara, Pirakata Kchari, No. 1 Chitalmari, Singri Bengali, Singri Nepali, etc etc.	1	2	Sonitpur	TE & Agricultural	Not Final	
3	Borsola to Singri	20	20000	250	1 Sq M	45	Palash Pather Gaon, Bhalukdhara, Ratanjuli, Bogoribari Gaon, Chirajuli, Bandoijaroni, Chirajuli pather, Rangagara No. 1 & 2 Natun Chirajuli No. 1 & 2 Nambogoribari, Pirakata, Pirakata No.2, Lulukai, Ghoramara, Pirakata Kchari, No. 1 Chitalmari, Singri etc etc	1	2	Sonitpur	TE & Agricultural	Not Final	
4	33 KV line from N.H 52 (Near Goroimari to proposed S/S	2.5	nil	35 Nos Steel Tubular pole	1 Sq M	1	Sitabasti	1	1	Sonitpur	TE	Final	
5	33 KV Missamari forest feeder to proposed 33/11 KV S/S Borjuli	8	nil	160	1 Sq M	15	Borjuli, Phulguri, Bahumari, Gorokhia etc etc.	3	1	Sonitpur	TE	Final	
6	Gohpur Borgang feeder	1.8	nil	32	1Sq M	16	1. Nasbar,2. Buroighat,3. Lal pukhuri,4. Bihmari I,Bihmari II,Bihmari III,5. Bongaon f.c I,Bongaon F.c II,6. Kulaguri,7. Sialmari,8. Modhupur,9. Boralimara I, Boralimara II 10.	1	1	Sonitpur	TE & Agricultural	Final	

Sl. No.	Name of the Sub-Project Components (33 kv Lines_From - To)	Line Length (km)- 33 kV	Right of Way (meters)- 33 kV	Approximate Number of Poles (33 kV)	Approximate Area of each pole- 33 kV (square meter)	Number of Villages Covered	Names of the Villages Covered	Number of Tehsils Covered	Number of Districts Covered	Names of Districts Covered	General Profile of the line (Cropping pattern/Tea Estate/Forest etc)	Whether Alignment is Final or Not	Remarks
							Hatimara, 11. Sereliapothar, 12. Serelia, 13. Urang bosti.						
TINSUKIA ELECTRICAL CIRCLE DISTRICT: TINSUKIA													
1	33/11 KV Makum S/S to Proposed 33/11 KV Gangabari S/S	12.00	50	360	1 Sq. mtr	5	Betjan, Berekuri, Choto Hapjan TE, Hapjan Vill, Gangabari	1	1	Tinsukia	TE	Initial Stage	
2	33/11 KV Borguri S/S to Proposed 33/11 KV Gellapukhuri S/S	10.00	50	300	1 Sq. mtr	7	Balupara, Gelapukhuri, Gelapukhuri TE, Nakharai, Simaltal, Borguri, Janamukh	1	1	Tinsukia	TE	Initial Stage	
3	33/11 KV Naupukhuri S/S to Proposed 33/11 KV Mohakali S/S	10.00	50	300	1 Sq. mtr	5	Zinja Basti, Chottotingrai TE, Bahadur Chariali, Mohakali Granth, Borjan	1	1	Tinsukia	TE	Initial Stage	
4	33kvTinsukia-Margherita to proposed 33/11 kV Pawoi s/s	4.00	50	120	1 Sq. mtr	1	Pawoi	1	1	Tinsukia	TE	Final	
5	33/11 kV Borsola S/s to 33/11 kV Philobari S/s	25	1000	750	1 Sq. M	6	Bhitor Rongdoi Mising Gaon, Buka pathar, Sikorajan, Agmguri, Hulong Gutibar, Bijulibon	2	1	Tinsukia	TE	Final	
6	66/33 kV Rupai GSS to 33/11 kV Baghjan	26	3000	780	1 Sq. M	7	Deamooli, Digholtarang, Bandorkhaiti, Holokhuwa, Dohotia, Kordo iguri, Rupai Gaon	2	1	Tinsukia	TE	Final	
7	33 kV Talap S/S to 33/11 kV Dholla	22	1000	641	1 Sq. M	6	Ahom Gaon, Dangori, Bormura Miripathar, Hakhaiti, Khari Gaon, Aroimuri Gaon etc.	2	1	Tinsukia	TE	Final	
SIBSAGAR ELECTRICAL CIRCLE DISTRICT: SIBSAGAR													
1	132 KV GRID TO PROPOSED BORHAT S/S	42 km (appx)	20 km (appx)	1092	1Sq M	30	atal pathar, hulungamara, charaipung, doboluhabi, medelajanborboruakhat, bhuyan khat, bhesewpathar, gorkush habi, chutiakari, pub nalbari, paitakhat, teokia, nogakota	5	1	Sibsagar	TE	Not Final	
2	132 KV Sonari GSS to Proposed Napuk S/S	22 km (appx)	22 km (appx)	660	1Sq M	19	Joboka TE, Banfera Grant, Dakhin Sonari, Thukubil, Sonalipam, Gwalapather, Kherbari, Sonari TE, Napuk TE, Napuk IB, Napuk Gaon, Sufry, Abhoipur, Rangapathar, Maibela 101 No Grant, Gelgeli, Mathurapur, Kabarsthan, Mazgaon	1	1	Sibsagar	TE	Not Final	

Annexure 5: Environment Management Plan (EMP)

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Pre-construction						
Temporary use of lands	Impact to the existing environment	Selection of lands adhering to local laws and regulations and in close consultation with LAs Construction facilities should be placed at least 10 m away from water bodies, natural flow paths, important ecological habitats and residential areas	Water and air quality	Air quality Standards and CPCB water quality standards	APDCL Contractor	Detailed design
Substation location and design	Noise generation Exposure to noise, Nuisance to neighbouring properties	Substation designed to ensure noise will not be a nuisance.	Expected noise emissions based on substation design, noise levels	Noise control regulations. Noise levels to be specified in tender documents	APDCL	Detailed design
	Disturbance to the adjacent lands and the people due to cut and fill operations	Maintain adequate clearance, construction of retaining structures, minimise cut and fill operations adjoining to the dwellings	Proximity to houses and other structures	Setback distances to nearest houses – as per ROW norm of 5 m	APDCL	Detailed design
Location of poles and line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Location of distribution poles and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses -	APDCL	Part of line sighting survey and detailed alignment survey and design
	Impact on water bodies / land/ residences	Consideration of site location at where they could be located to avoid water bodies or agricultural land as much as possible. Careful site selection to avoid existing settlements	Site location away from water bodies, line alignment selection (distance to dwelling, water and/or agricultural land)	Consultation with local authorities and land owners, CPCB water quality standards	APDCL	Part of detailed project sighting and survey and design
Equipment specifications and design parameters	Release of chemicals and harmful gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment.	Compliance with National Environmental Act	Banned under NEA	APDCL	Detailed design
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection Minimise the need by using existing poles and RoW wherever possible	Floral and faunal habitats loss	Environmental Conservation Act	APDCL	Detailed design
Encroachment into forest areas	Trees to be cut for distribution line	Avoid trees to be cut by careful site and alignment selection. Minimise the RoW wherever possible Afforestation to be done in coordination with forest department	Loss of trees in the alignment	Forest Conservation Act	APDCL	Detailed design
Involuntary resettlement or land acquisition	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land	Public complaints	Rates stipulated in the Resettlement plan/ Frame work	APDCL	Prior to construction phase

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
				for the project		
Encroachment into farmland	Loss of agricultural productivity	Use existing poles wherever possible	Pole location and line alignment selection	Consultation with local authorities and design engineers	APDCL	Part of detailed alignment survey and design
		Avoid sighting new towers/poles on farmland wherever possible	Design of			
		Farmers compensated for any permanent loss of productive land trees that need to be trimmed or removed along RoW.	Implementation of Crop and tree compensation (based on affected area)			
			Statutory approvals for tree trimming /removal			
Interference with drainage patterns/Irrigation channels	Temporary flooding hazards/loss of agricultural production	Appropriate sighting of poles to avoid channel interference	Site location and line alignment selection	Consultation with local authorities and design engineers	APDCL	Detailed alignment survey and design
Explosions/Fire	Hazards to life	Design of substations to include modern fire control systems/firewalls.	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications	APDCL	Part of detailed substation layout and design /drawings
		Provision of fire fighting equipment to be located close to transformers, power generation equipment.				
Construction						
Removal or disturbance to other public utilities	Public inconvenient	Advance notice to the public about the time and the duration of the utility disruption	Disruption other commercial and public activities / Public complaints	Technical specification	APDCL	Throughout the construction period
		Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities				
		Restore the utilities immediately to overcome public inconvenience				
Acquisition of paddy fields and other lands	Loss of agricultural productivity	Avoid farming season wherever possible for the project activities.	Land area of agriculture loss	Regular monitoring compliance with regulations	APDCL, Contractor through contract provisions	Throughout the construction period
		Ensure existing irrigation facilities are maintained in working condition	Usage of existing utilities			
		Protect /preserve topsoil and reinstate after construction completed	Status of facilities (earthwork in m ³)			
		Repair /reinstate damaged bunds etc after construction completed	Implementation of Crop compensation (amount paid, dates, etc.)			
		Compensation for temporary loss in agricultural production				
Temporary	Loss of power supply to	Advance notice to the public about the time	Houses and	Regular monitoring	Contractor	Throughout the

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
outage of the electricity	the local community when distribution lines crossing the new line are switched off	and the duration of the utility disruption Restore the utilities immediately to overcome public inconvenient.	commercial premises of power disruption	during the period of strengthening the conductors	APDCL	construction period
Equipment layout and installation	Noise and vibrations	Selection of construction techniques and machinery to minimise ground disturbance.	Construction techniques and machinery	Minimal ground disturbance	APDCL, Contractor through contract provisions	Construction period
Substation construction	Loss of soil	Fill for the substation foundations obtained by creating or improving local drain system.	Borrow area sighting (area of site in m ² and estimated volume in m ³)	Laws and regulations of respective LAs	APDCL, Contractor through contract provisions	Construction period
	Water pollution	Construction activities involving significant ground disturbance (i.e. substation land forming) not undertaken during the monsoon season.	Seasonal start and finish of major earthworks	Timing of major disturbance activities - prior to start of construction activities	APDCL, Contractor through contract provisions	Construction period
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise, [dB(a)])	Daytime construction only	APDCL, Contractor through contract provisions	Construction period
	Nuisance to wildlife if the line route construction crosses migratory path	Complete restriction of construction work for two months before and after the known period of migration by the animals	Timing of Construction	No construction for two months	APDCL, Contractor	Construction period
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise, [dB(a)])	Daytime construction only	APDCL, Contractor through contract provisions	Construction period
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities	APDCL, Contractor through contract provisions	Construction period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Any excess material will only be used as fill material offsite when the owner's agreement has been obtained and with the disposal site restored in a manner that prevents erosion and does not block any drainage path	Location and amount (m ³) of fill disposal Soil disposal locations and volume (m ³)	Appropriate fill disposal and dispersal locations	APDCL, Contractor through contract provisions	Construction period
Air Pollution	Loose dust might blow in the area causing dusty conditions	Dampening of dust by sprinkling of water within the work area and stack the loose soil and contain it with covers if required.	Soil stacking locations, access roads, pole locations, substation	Air Quality Standards	APDCL, Contractor through	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
			site		contract provisions	
Wood/vegetation harvesting, cut and fill operations	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment.	Illegal wood /vegetation harvesting (area in m ² , number of incidents reported)	Complaints by local people or other evidence of illegal harvesting	APDCL, Contractor through contract provisions	Construction period
	Effect on fauna	Prevent his work force from disturbing to the flora, fauna including hunting of animal and fishing in water bodies	Habitat loss	Fauna and flora protection Act.	APDCL/ DWC/ DoF	Construction period
		Proper awareness programme regarding conservation of flora, fauna including ground vegetation to all drivers, operators and other workers				
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m ²)	Forest Conservation Act. Clearance strictly limited to target vegetation	APDCL, Contractor through contract provisions	Construction period
	Soil erosion and surface runoff	Construction in erosion and flood-prone areas should be restricted to the dry season Treat clearing and filling areas against flow acceleration and construction work should be carefully designed to minimise obstruction or destruction to natural drainage	Soil erosion	Visual inspection (Turbidity and sedimentation)	APDCL, Contractor through contract provisions	Construction period
Mechanised construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained.	Construction equipment - estimated noise levels and operating schedules	Technical specifications, safety regulations, Noise control regulations of CPCB	APDCL, Contractor through contract provisions	Construction period
	Noise, vibration, equipment wear and tear	Proper maintenance and turning off equipment not in use.				
Construction of roads for accessibility	Increase in airborne dust particles	Existing roads and tracks used for construction and maintenance access to the site wherever possible.	Access roads, routes (length and width of new access roads to be constructed)	Use of established roads wherever possible	APDCL, Contractor through contract provisions	Construction period
	Increased land requirement for temporary accessibility	New access ways restricted to a single carriageway width within the RoW.		Access restricted to single carriageway width within RoW		
Transportation and storage of materials	Nuisance to the general public	Transport loading and unloading of construction materials should not cause nuisance to the people by way of noise, vibration and dust	Water and air quality	Laws and regulations of respective states National Emission	APDCL/ CPCB	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		Avoid storage of construction materials beside the road, around water bodies, residential or public sensitive locations		Standards and CPCB water quality standards		
		Construction materials should be stored in covered areas to ensure protection from dust, emissions and such materials should be bundled in environment friendly and nuisance free manner				
Trimming/ cutting of trees within RoW	Fire hazards Loss of vegetation and deforestation	Trees allowed growing up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations. Trees that can survive pruning to comply should be pruned instead of cleared. Felled trees and other cleared or pruned vegetation to be disposed of as authorised by the statutory bodies.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres) Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m ²)	Forest Conservation Act Presence of target species in RoW following vegetation clearance.	APDCL, Contractor through contract provisions	Construction period
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum setback requirements for construction camps from water bodies, reserved areas etc. Contractor to prepare and implement a health and safety plan. Contractor to arrange for health and safety awareness programmes	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness)	Health and safety regulations	APDCL (Contractor through contract provisions)	Construction period
Nuisance to nearby properties	Losses to neighbouring land uses/ values	Contract clauses specifying careful construction practices. Use existing access ways as much as possible. Productive land will be reinstated following completion of construction Compensation will be paid for loss of production, if any.	Contract clauses Design basis and layout Reinstatement of land status (area affected, m ²) Implementation of Tree/Crop compensation (amount paid)	Incorporating good construction management, design engineering practices Consultation with affected parties immediately after completion of construction and after the first harvest	APDCL (Contractor through contract provisions)	Construction period

Operation and Maintenance Phase

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Electric shock	Death or injury to the workers and public	Security fences around substation Establishment of warning signs Careful design using appropriate technologies to minimise hazards	Proper maintenance of fences and sign boards Usage of appropriate technologies (lost work days due to illness and injuries)	Periodic maintenance Number of programmes and percent of staff /workers covered	APDCL	Throughout the operation
Noise generation	Nuisance to the community around the site	Provision of noise barriers	Noise level	Noise level [db (A)]- Once a year	APDCL	Throughout the operation
SF6 Gas levels	Leakage of SF6	Monitoring of SF ₆ gas from Electrical Substations	Measurement using hand held devices	0.1%-0.5% as per design	APDCL	Throughout operation
Maintenance of Distribution line	Exposure to electromagnetic interference	Distribution line to comply with the design parameters of electromagnetic interference from cables	Required ground clearance (metres)	Ground clearance as per APDCL norms	APDCL	Throughout the operation
Substation maintenance	Exposure to electromagnetic interference	Substation design to comply with the parameters of electromagnetic interference from instruments within floor area	EMF measurement, instrumentation	Technical specifications	APDCL	Throughout the operation
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious bundled areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	Substation bounding ("as-built" diagrams)	Bounding capacity and permeability	APDCL	Throughout the operation

LAs = Local Authorities

Annexure 6: Environment Monitoring Report

A6.1 Illustrative Contents of Environment Monitoring Report Compliance Status & Monitoring Report of Environment Safeguards

Period:

Submitted by:

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Abbreviations

Distt.	District
C/o	Construction of
Ha.	Hectare (10,000 sq. m.)
Dept.	Department
AP's	Affected Persons
GRC	Grievance Redressal Committee
MOEF	Ministry of Forest and Environment
FCA	Forest Conservation Act
GOI	Govt of India
IE Act	Indian Electricity Act

Project Information

A.1. General

I	Name of Project	
II	Loan Number	
II	Name of Monitoring/Reporting Agency and address	
III	Monitoring Period (Season/month)	
IV	Report No.	
V	Report for the period	
VI	Date of reporting	

A.2. Subproject details

	List of sub-projects	Name of the PIU
I		
II		
III		
IV		
V		
VI		

A.3. Overall Project Progress, Agreed Milestones and Implementation Schedules

[illegible]

B.1: Compliance Status with National/State/Local Statutory Environmental Requirements and international standards

S No	Legal Requirements/Acts/Rules/Guidelines	Applicable Attributes	Compliance Status
1	The Water (Prevention and Control of Pollution) Act, 1974 as amended;	Water Pollution	
2	The Air (Prevention and Control of Pollution) Act, 1981	Air Pollution	
3	The Environment (Protection) Act, 1986	Construction Practices	
4	The Environment Impact Assessment Notification, 1994 as amended	EMP monitoring	
5	The Hazardous Wastes (Management and Handling) Rules, 1989 as amended	Transformer Oil	
6	The Ozone Depleting Substances (Regulation and Control) Rules, 2000		
7	The Batteries (Management and Handling) Rules, 2001 as amended	Batteries	
8	The Indian Forest Act, 1927 as amended	Reserve Forest areas, Right of way	
9	The Wild Life (Protection) Act, 1972 as amended	Critical habitats, if any	
10	The Biological Diversity Act, 2002	Wetland, if any	
11	The Forest (Conservation) Act, 1980 as amended	Construction work in forest areas	
12	The National Environmental Policy, 2006 of Govt	Construction Practices	
13	Other State Level Acts	Compensation	
14	Other International levels conventions and treaties	Biodiversity, GHG emissions	

B.2: General Implementation Status

B.2.1. Forest Clearance

SNo.	Measures/ stipulation	Compliance Status
I	Sub-Project #	
1	Right of Way/ land required	
2	Clearance from trees	
3	Forest area and Nos. of trees.	
4	Damage to forest	
5	Wild life sanctuaries	

B.2.2. Fulfillment of commitments made during Public Hearing/Consultation

S.No.	Query/Apprehension	Commitment	Compliance Statement
I	Sub-project #		
1	Compensation for crop	As per EPC contractor bid	
2	Compensation for land damages	As per EPC contractor bid	
3	Compensation for trees, drainage, pathways, channels for waterway.	Restoration after erection	

B.2.3. ADB stipulations/ safeguarding measures on Environment.

SNo.	Product Activity/Stage	Parameter to be monitored	Compliance Status
I	Sub-Project #		
	Construction		
1	Archeological site/ monument safety	Chance find	
2	Public places, schools, ponds, airport, railway etc.	Distance as per GOI norms	
3	Safeguard against critically endangered Flora and fauna.	Avoid	
4	Rain and Flood prone area.	Avoid	

B.2.4 Record of complaints (regarding environment safeguard measures) and their resolution

Sr.No	Complainant Name and address	Date of receipt	Subject/Issue	Date of resolution	Remarks
I	Sub-Project #				

B.2.5. Staffing, Institutional Arrangements and Grievance Redress

S.No.	Parameters	Commitment	Compliance Statement
1	Numbers of Staff deputed/employed for environment safeguards	One each at PMU and PIU	
2	PMU/PIU established as per proposed institutional mechanism	Date	
3	GRC formation	Date	
4	Grievance Redress Mechanism followed	Proper record	

B.2.6. Other measures:

I	Sub-Project #

B2.7 Annexures

I	Sub-Project #

B.3: Status Of Implementation Of Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)

B3.1. Environment Management Plan and Status on Implementation

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
Pre-Construction								
Temporary use of lands	Impact to the existing environment	Selection of lands adhering to local laws and regulations and in close consultation with LAs Contraction facilities should be placed at least 10 m away from water bodies, natural flow paths, important ecological habitats and residential areas	Water and air quality	CPCB Air quality and water quality standards				
Substation location and design	Noise generation	Substation designed to ensure noise will not be a nuisance.	Expected noise emissions based on substation design, noise levels	Noise control regulations. Noise levels to be specified in tender documents				
	Exposure to noise, Nuisance to neighbouring properties Disturbance to the adjacent lands and the people due to cut and fill operations	Maintain adequate clearance, construction of retaining structures, minimise cut and fill operations adjoining to the dwellings	Proximity to houses and other structures	Setback distances to nearest houses – as per ROW norm of 5 m				
Location of poles and line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Location of distribution poles and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses -				
	Impact on water bodies / land/ residences	Consideration of site location at where they could be located to avoid water bodies or agricultural land as much as possible.	Site location away from water bodies, line alignment selection	Consultation with local authorities and land owners, CPCB water				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
		Careful site selection to avoid existing settlements	(distance to dwelling, water and/or agricultural land)	quality standards				
Equipment specifications and design parameters	Release of chemicals and harmful gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment.	Compliance with National Environmental Act	Banned under NEA				
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection Minimise the need by using existing poles and RoW wherever possible	Floral and faunal habitats loss	Environmental Conservation Act				
Encroachment into forest areas	Trees to be cut for distribution line	Avoid trees to be cut by careful site and alignment selection. Minimise the RoW wherever possible Afforestation to be done in coordination with forest department	Loss of trees in the alignment	Forest Conservation Act				
Involuntary resettlement or land acquisition	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land	Public complaints	Rates stipulated in the Resettlement plan/ Frame work for the project				
Encroachment into farmland	Loss of agricultural productivity	Use existing poles wherever possible Avoid sighting new poles on farmland wherever Farmers compensated for any permanent loss of productive land trees that need to be trimmed or removed along RoW.	Pole location and line alignment selection Design of Implementation of Crop and tree compensation (based on affected area)	Consultation with local authorities and design engineers				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
			Statutory approvals for tree trimming /removal					
Interference with drainage patterns/Irrigation channels	Temporary flooding hazards/loss of agricultural production	Appropriate sighting of poles to avoid channel interference	Site location and line alignment selection	Consultation with local authorities and design engineers				
Explosions/Fire	Hazards to life	Design of substations to include modern fire control systems/firewalls. Provision of fire fighting equipment to be located close to transformers, power generation equipment.	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications				
Construction								
Removal or disturbance to other public utilities	Public inconvenient	Advance notice to the public about the time and the duration of the utility disruption Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities Restore the utilities immediately to overcome public inconvenient	Disruption other commercial and public activities / Public complaints	Technical specification				
Acquisition of paddy fields and other lands	Loss of agricultural productivity	Avoid farming season wherever possible for the project activities. Ensure existing irrigation facilities are maintained in working condition Protect /preserve topsoil and reinstate after construction completed	Land area of agriculture loss Usage of existing utilities Status of facilities (earthwork in m ³)	Regular monitoring compliance with regulations				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
		Repair /reinstate damaged bunds etc after construction completed	Implementation of Crop compensation (amount paid, dates, etc.)					
		Compensation for temporary loss in agricultural production						
Temporary outage of the electricity	Loss of power supply to the local community when distribution lines crossing the new line are switched off	Advance notice to the public about the time and the duration of the utility disruption Restore the utilities immediately to overcome public inconvenient.	Houses and commercial premises of power disruption	Regular monitoring during the period of strengthening the conductors				
Equipment layout and installation	Noise and vibrations	Selection of construction techniques and machinery to minimise ground disturbance.	Construction techniques and machinery	Minimal ground disturbance				
Substation construction	Loss of soil	Fill for the substation foundations obtained by creating or improving local drain system.	Borrow area sighting (area of site in m ² and estimated volume in m ³)	Laws and regulations of respective LAs				
	Water pollution	Construction activities involving significant ground disturbance (i.e. substation land forming) not undertaken during the monsoon season.	Seasonal start and finish of major earthworks (pH, BOD/COD, Suspended solids, other)	Timing of major disturbance activities - prior to start of construction activities				
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(a)])	Daytime construction only				
	Nuisance to wild-life if the line route construction crosses	Complete restriction of construction work for two months before and after the known period of migration by the animals	Timing of Construction	No construction for two months				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
	migratory path							
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(a)])	Daytime construction only				
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities				
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Any excess material will only be used as fill material offsite when the owner's agreement has been obtained and with the disposal site restored in a manner that prevents erosion and does not block any drainage path	Location and amount (m ³) of fill disposal Soil disposal locations and volume (m ³)	Appropriate fill disposal and dispersal locations				
Air Pollution	Loose dust might blow in the area causing dusty conditions	Damping of dust by sprinkling of water within the work area and stack the loose soil and contain it with covers if required.	Soil stacking locations, access roads, Pole locations, substation site	Air Quality Standards				
Wood/ vegetation harvesting, cut and fill operations	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment.	Illegal wood /vegetation harvesting (area in m ² , number of incidents reported)	Complaints by local people or other evidence of illegal harvesting				
	Effect on fauna	Prevent his work force from disturbing to the flora, fauna including hunting of animal and fishing in water bodies Proper awareness programme regarding conservation of flora, fauna including ground vegetation to all drivers, operators and	Habitat loss	Fauna and flora protection Act.				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
Site clearance	Vegetation	other workers Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m ²)	Forest Conservation Act. Clearance strictly limited to target vegetation				
	Soil erosion and surface runoff	Construction in erosion and flood-prone areas should be restricted to the dry season Treat clearing and filling areas against flow acceleration and construction work should be carefully designed to minimise obstruction or destruction to natural drainage	Soil erosion	Visual inspection (Turbidity and sedimentation)				
Mechanised construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained. Proper maintenance and turning off equipment not in use.	Construction equipment - estimated noise emissions and operating schedules	Technical specifications, safety regulations, Noise control regulations of CPCB				
	Noise, vibration, equipment wear and tear							
Construction of roads for accessibility	Increase in airborne dust particles	Existing roads and tracks used for construction and maintenance access to the site wherever possible.	Access roads, routes (length and width of new access roads to be constructed)	Use of established roads wherever possible				
	Increased land requirement for temporary accessibility	New access ways restricted to a single carriageway width within the RoW.		Access restricted to single carriageway width within RoW				
Transportation and storage of materials	Nuisance to the general public	Transport loading and unloading of construction materials should not cause	Water and air quality	Laws and regulations of respective				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
		<p>nuisance to the people by way of noise, vibration and dust</p> <p>Avoid storage of construction materials beside the road, around water bodies, residential or public sensitive locations</p> <p>Construction materials should be stored in covered areas to ensure protection from dust, emissions and such materials should be bundled in environment friendly and nuisance free manner</p>		<p>states National Emission Standards and CPCB water quality standards</p>				
Trimming/cutting of trees within RoW	<p>Fire hazards</p> <p>Loss of vegetation and deforestation</p>	<p>Trees allowed to grow up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations.</p> <p>Trees that can survive pruning to comply should be pruned instead of cleared.</p> <p>Felled trees and other cleared or pruned vegetation to be disposed of as authorised by the statutory bodies.</p>	<p>Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres)</p> <p>Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m²)</p>	<p>Forest Conservation Act</p> <p>Presence of target species in RoW following vegetation clearance.</p>				
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum setback requirements for construction camps from water bodies, reserved areas etc.	Contract clauses (number of incidents and total lost-work days caused	Health and safety regulations				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
		Contractor to prepare and implement a health and safety plan.	by injuries and sickness)					
		Contractor to arrange for health and safety awareness programmes						
Nuisance to nearby properties	Losses to neighbouring land uses/values	Contract clauses specifying careful construction practices.	Contract clauses	Incorporating good				
		Use existing access ways as much as possible.	Design basis and layout	construction management, design				
		Productive land will be reinstated following completion of construction	Reinstatement of land status (area affected, m ²)	engineering practices				
		Compensation will be paid for loss of production, if any.	Implementation of Tree/Crop compensation (amount paid)	Consultation with affected parties immediately after completion of construction and after the first harvest				
Operation and Maintenance								
Electric shock	Death or injury to the workers and public	Security fences around substation	Proper maintenance of fences and sign boards	Periodic maintenance				
		Establishment of warning signs		Number of programmes and percent of staff /workers covered				
		Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (lost work days due to illness and injuries)					
Noise generation	Nuisance to the community around the site	Provision of noise barriers	Noise level	Noise level (db)- Once a year				
SF6 Gas levels	Leakage of SF6	Monitoring of SF ₆ gas from Electrical Substations	Measurement using hand held devices	0.1%-0.5% as per design				
Maintenance of	Exposure to	Distribution line to comply	Required	Ground				

Project Activity	Potential Environmental Impact	Mitigation Action	Parameters to be Monitored	Standards	Duration/Frequency	Institutional responsibilities	Cost or budget allocations	Implementation Schedule
Distribution line	electromagnetic interference	with the design parameters of electromagnetic interference from cables	ground clearance (metres)	clearance as per APDCL norms				
Substation maintenance	Exposure to electromagnetic interference	Substation design to comply with the parameters of electromagnetic interference from instruments within floor area	EMF measurement, instrumentation	Technical specifications				
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious bundled areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	Substation bounding ("as-built" diagrams)	Bounding capacity and permeability				

LAs= Local Authorities

B.3.2 Environment Monitoring Plan and Status on Implementation

Environmental component	Project stage	Parameters to be monitored ^a	Sampling Location	Monitoring Frequency	Regulatory Standards for parameter	Agency responsible for implementation	Agency responsible for supervision	Cost of Budget allocation
1.Air Quality	A. Pre construction stage (The project once assigned to contractor)	Visible dust	Inside and outside (0.5 km) of the proposed substation	One time	Spot check using field portable instruments National Air quality standards of CPCB [PM10 or PM2.5] Spot check using field portable instruments			
	B. Construction Stage	Visible dust, use of water sprays for dust suppression	Inside and outside (0.5 km) of the proposed substation	One time	National Air quality standards of CPCB [PM10 or PM2.5] Spot check using field portable instruments			
	C. Operation Stage	Visible dust, use of water sprays for dust suppression	Inside and outside (0.5 km) of the proposed substation	Once in 2 years	National Air quality standards of CPCB			

Environmental component	Project stage	Parameters to be monitored ^a	Sampling Location	Monitoring Frequency	Regulatory Standards for parameter	Agency responsible for implementation	Agency responsible for supervision	Cost of Budget allocation
					[PM10 or PM2.5]			
2. Water Quality	A. Pre construction stage (The project once assigned to contractor)	EA and contractors to document water source and wastewater treatment design	Nearest wells (2 wells) around the substation	One time	National water quality standards of CPCB			
	B. Construction Stage	EA and contractors to document water source and wastewater treatment system installed pH, BOD, Oil & grease	Nearest wells (2 wells) around the substation	One time	National water quality standards of CPCB			
	C. Operation Stage	Water source and wastewater treatment	Nearest wells (2 wells) around the substation	Once in 2 years	National water quality standards of CPCB			
3. Noise/ Vibration	A. Pre construction stage (The project once assigned to contractor)	Noise level [dB(A)]	Inside and outside of the proposed substation	One time	CPCB standards for Noise and vibrations [ADB: 55 dB(A) at site boundary]			
	B. Construction Stage	Noise level [dB(A)]	Inside and outside of the proposed substation	One time	CPCB standards for Noise and vibrations			
	C. Operation Stage	Noise level [dB(A)]	Inside and outside of the proposed substation	Once in 2 years	CPCB standards for Noise and vibrations			
4. Soil	A. Pre construction stage (The project after assign to contractor)	Visible spills and/or soil staining, Oil & grease	2 locations) of the proposed substation	One time	Technical specifications			
	B. Construction Stage	Visible spills and/or soil staining, Oil & grease	2 locations) of the proposed substation	One time	Technical specifications			
	C. Operation Stage	Visible spills and/or soil staining, Oil & grease	2 locations) of the proposed substation	Once in 2 years	Technical specifications			

ESMU –Environment & Social Management Unit of PMU

Abbreviations:

PM₁₀ - Particulate Matter <10 µm; ;

BOD - Biological Oxygen Demand;

NAAQS - National Ambient Air Quality Standards;

NWQS - National water Quality Standards;

Notes: ^a Air emissions will be limited to dust and construction vehicle emissions during construction; other primary air pollutant monitoring is not deemed necessary. Wastewater will be limited to domestic/sanitary discharge during construction and operation; if groundwater is used by substations there could be some impact on water availability in nearby wells used for community water supplies. Potential soil contamination will be limited to fuel and lubricating oil spills during construction and possible mineral oil spills from transformers during operations.

Annexure 7: Public Consultation

Table A7.1: Summary Details of Public Consultations

S.No	1	2	3	4	5	6
Sub- Station	Gangawari Sub-Station	Baghjan Sub Station	Borhat Sub Station	Borjuli Sub Station	Bedeti Sub- Station	Dholla Sub-Station
Location	2 No Chota Hapjan Gaon	Baghjan TE	Borhat Habi Gaon	Borjuli	Boralimara	Dholla TE
Number of Participants	1	10	8	10	9	8
Awareness of the people and their likely support to the project.	People get awareness after the consultation and give support to the project	People get awareness during the consultation and give support to the project	People aware of the project and give support to the project	People got awareness during the consultation and likely to give support to the project	Not aware about the project before consultation	Department of electricity held meeting with local people several times from last 2-3 yrs
Any critical issue or concern by the local people regarding the project especially related to environment.	No critical issue	No critical issue	No critical issue	No critical issue	Stadium land should not be taken for sub-station	No critical issue
Ethnic Minorities, Scheduled Tribe Population, if any.	No	Not in this locality out of tea estate	No		No	No
Any Displacement required.	Not required	Not required	Not required	Not required	Not required	Not required
Loss of community life like any Market Places or community activities to be affected.	No loss of community life and market places	No loss of community life and market places	No loss of community life and market places		No loss of community life and market places	No loss of community life and market places
Protected areas (national park, protected forest, religiously sensitive sites, historical or archaeological sites), if any.	Reserve Forest – Guijan -26Km	National Park- Dibru Saikhowa – 6 km	Protected Forest – Dilli – 8 km		Protected forest - Behali -8Km	National Park- Dibru Saikhowa – 6 km
Will the project siting adversely impact the water or soil resource in the locality.	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality

[illegible]

S.No	7	8	9	10	11	12	13	14
Sub- Station	Doyang TE	Borsola Sub Station	Gelapukhuri Sub Station	Napuk Sub-Station	Nahorbari TE Sub Station	Singri Sub Station	Philobari Sub Station	Pawoi Sub-Station
Location	Doyang TE	DumDuma	Gelapukhuri	Majgaon	Kowani	Nutun Singri	Philobari TE	Pawoi TE
Number of Participants	10	8	3	10	8	7	7	6
Awareness of the people and their likely support to the project.	Only TE authority aware about the proposed project but people TE have positive attitude and ready to support without any condition	Aware about the project, it is the old and major demand by the local village people and give full support to the project	People get aware at the time of consultation and give support to the project	People get awareness after the consultation and give support to the project	Well aware authority already discussed with local people about the project full support by the local people	People aware of the project and give support to project	People aware of the project at the time of consultation	Not aware before the consultation official contact only day before yesterday for land
Any critical issue or concern by the local people regarding the project especially related to environment.	No critical issue	No critical issue	No critical issue	No critical issue	No critical issue	People want project should not affect the play ground area and construction should be done 100 mtr from the play ground	No critical issue	No critical issue
Ethnic Minorities, Scheduled Tribe Population, if any.	No	ST – Boro – 2 household	No	No	No	ST- Boro – 100 HH	No	Buddhist -15%
Any Displacement required.	Not required	Not required	Not required	Yes required	Not required	Not required	Not required	Not required
Loss of community life like any Market Places or community activities to be affected.	No loss of community life and market places	Vet nary hospital will be affected	No loss of community life and market places	No loss of community life and market places	No loss of community life and market places	No loss of community life and market places	No loss of community life and market places	No loss of community life and market places
Protected areas (national park, protected forest, religiously sensitive sites,	Kaziranga national park – 80 km, Nambore protected forest – 50 km	National Park – 40 km – Orang, Protected Forest – Borsola Forest – 7 km	National park – Dibru Saikhowa – 6 km, Reserve Forest – Dhela khat – 3Km	Singlo forest - 4Km	Kaziranga national park – 50 km, Nambor forest – 12 km, Hot water kund – 15 km	Singri Forest – 5 km	Forest – Tarinai -6 km	National Park – Dibru Saikhuwa – 60 km, Reserve Forest – 1. Ketetong - 3Km, Pawoi Forest -4 km

S.No	7	8	9	10	11	12	13	14
Sub- Station	Doyang TE	Borsola Sub Station	Gelapukhuri Sub Station	Napuk Sub-Station	Nahorbari TE Sub Station	Singri Sub Station	Philobari Sub Station	Pawoi Sub-Station
Location	Doyang TE	DumDuma	Gelapukhuri	Majgaon	Kowani	Nutun Singri	Philobari TE	Pawoi TE
Number of Participants	10	8	3	10	8	7	7	6
historical or archaeological sites), if any.								
Will the project siting adversely impact the water or soil resource in the locality.	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality	No the project did not siting any adverse impact on water or soil resource in the locality
Will the project affected by flooding near the site.	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site
Will the project cause health and safety issues in the area.	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area
Will there be likely involvement of local people in the implementation of the project?	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people
Any Other Issues you may feel to share:(Demand of power, whether they welcome the project, will there be cooperation from the local community during the implementation, security measures, etc.)	Near the proposed site there is baalwadi (AWC) and approach road is very congested, needs to widen up. APDCL should use safety major properly	Yes demand of regular power supply and will give full cooperation during the implementation	1. Yes demand of power supply for 24 hrs, 2. Water for drinking and irrigation, Yes cooperation from the local community during the implementation	1. Yes demand of power, 2. Needs puca road in the village, full cooperation during the implementation	Regular and proper power supply in and around the TE area and Kowani village	Yes demand of power supply and will give cooperation during the implementation	1. Yes demand of regular power supply, 2. Need transportation facility for 24 hrs, 3. Needs improvement in health facility, Yes cooperation from the local community during the implementation	1. Yes demand of power, 2. Needs better education facilities, 3. Better jobs, Yes cooperation from the local community during the implementation
Grievance system	No grievance system	No grievance system followed	No grievance system followed in the area	No grievance system followed	Management welfare office look after the	No grievance system followed	No grievance system followed in	No grievance system followed

S.No	15	16	17	18	19	20
Sub- Station	Namsang Sub Station	Radhabari Sub-Station	Rakhysmari Sub Station	Gharamara Sub Station	Bindukuri	Mahakali
Location	Puberun	Radhabari TE	Rakhysmari	Samoguri	Tezpur & Gogra TE	Borjan
Number of Participants	8	11	7	6	8	8
in the locality.						
Will the project affected by flooding near the site.	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site	No the project did not affected by the flooding near the site
Will the project cause health and safety issues in the area.	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area	No the project did not cause any health and safety issues in the area
Will there be likely involvement of local people in the implementation of the project?	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people	Yes involvement of local people
Any Other Issues you may feel to share:(Demand of power, whether they welcome the project, will there be cooperation from the local community during the implementation, security measures, etc.)	1. Yes demand of regular power supply, 2. Needs road in the village, 3. Needs water for drinking, 4. Needs high school in the village, full cooperation during the implementation	Yes demand of power and give full cooperation during the implementation	Yes demand of power and will give cooperation during the implementation of project	Want proper and regular power supply for domestic and irrigation purposes	1. Yes demand of electricity for whole village only few household having electricity, 2. 24 hrs power supply needed, 3. Needs middle and high school in the village, Yes cooperation from the local community during the implementation	1. Yes Demand of power, 2. Needs water for drinking and irrigation, 3. Sanitation facilities needed, 4. Labor Work during the implementation of project, Yes cooperation from the local community during the implementation
Grievance system currently being followed in the area.	No grievance system followed in the area	No grievance system followed in the area	No grievance system followed in the area	No any grievance committee or system developed by the officials	No grievance system followed in the area	No grievance system followed in the area

Table A7.2: VILLAGE WISE LIST OF PARTICIPANTS

SNo	Name of the Participants	Male/Female	Occupation
1	Substaton Name:	Mahakali	
	Name of the Village:	Borjaan	
	Name of the District:	Tinsukhia	
	Number of Participants:	8	
1	Naresh Gwala		Retired
2	Sarat Tanti		Labor
3	Mangaloo Tanti		Labor
4	Ganga ram		Labor
5	Praveen Muora		Labor
6	Babita Majhi		Housewife
7	Astami Majhi		Housewife
8	Aditya Panika		Plumber
2	Substaton Name:	Borsola	
	Name of the Village:	Dum Dooma	
	Name of the District:	Sonitpur	
	Number of Participants:	8	
1	Konika Das		Housewife
2	Sheela Saikia		Housewife
3	Jaymati Saikia		Housewife
4	Jagdish Saikia		Teacher
5	Bharat Haloi		Business
6	Elima Das		Housewife
7	Kuldeep Kakti		Service
8	Pranjal Das		Student
3	Substaton Name:	Borjoli	
	Name of the Village:	Borjoli	
	Name of the District:	Sonitpur	
	Number of Participants:	10	
1	Sukara Karmakar		President ACMS
2	Amar Kerketta		Sardar / Garden
3	Amit Tanti		Service T.G.
4	Deepak Bighal		Service T.G.
5	Elena Runda		Housewife
6	Kamla Tanti		Tea Garden Labour
7	Lalita Dighal		Tea Garden Labour
8	Alisa Tanti		Tea Garden Labour
9	Pinki Degal		Tea Garden Labour
10	Sushela Singh		Tea Garden Labour
4	Substaton Name:	Dholla	
	Name of the Village:	Dholla TE	
	Name of the District:	Tinsukhia	
	Number of Participants:	8	
1	Apurba Deka		Business
2	Pankaj Agarwal		Business
3	Arun Modi		Business
4	Gini Modi		Housewife
5	Ranjeet Sanohtal		Business
6	Bihil Gohain		Worker
7	Alka Singh		Housewife
8	Biraj samal		Business
5	Substaton Name:	Gelapukhuri	
	Name of the Village:	Gelapukhuri	
	Name of the District:	Tinsukhia	
	Number of Participants:	3	
1	Anil Rajkhowa		Government service
2	Rashel Gohain		Business
3	Duler Rajwanshi		Labor
6	Substaton Name:	Singri	
	Name of the Village:	Nutun Singri	

SNo	Name of the Participants	Male/Female	Occupation
	Name of the District: Sonitpur		
	Number of Participants: 7		
1	Ganesh Newar		Agriculture
2	Damwar acharya		Agriculture
3	Manchandra Das		Agriculture
4	Charilal Sapkata		Service
5	Dilip Das		Agriculture
6	Purna Singh Das		GP member
7	Tika Chetri		Aganwadi Worker
	Substaton Name: Philobari		
	Name of the Village: Doom Duma.		
	Name of the District: Tinsukhia		
7	Number of Participants: 7		
1	Kongkonj Goswami		Cultivator
2	Rubul Borah		Business
3	Rajesh sahu		Cultivator
4	Kuleswar Phukan		Business
5	Jyotismita Gayan		Housewife
6	Bonita Gogoi		House wife
7	Ele Boruah		Housewife
	Substaton Name: Napuk		
	Name of the Village: Majgaon		
	Name of the District: Shivsagar		
8	Number of Participants: 10		
1	Syam Kumar Yadav		Member Gram Panchyat
2	Llyakat Ali		Service
3	Dandi Gogoi		Gram Buddha
4	Munim Gogoi		Business
5	Rosy Hazarika		Teacher
6	Tajmin Rehman		Housewife
7	Poresh Gogoi		Service
8	Arfan Ali		Business
9	Praveen Naik		Ward Member
10	Atizul Islam		Business
	Substaton Name: Pawoi		
	Name of the Village: Margherita		
	Name of the District: Tinsukhia		
9	Number of Participants: 6		
1	Umashankar Tanti		President GP
2	Rohit Deep		Student
3	Lumgnous Ekka		Service
4	Bulan Sungmai		Service
5	Govbin Tanti		Student
6	Monohar Deep		Student
	Substaton Name: Radhabari		
	Name of the Village: Bokakhat		
	Name of the District: Golaghat		
10	Number of Participants: 11		
1	Deepak orang		Secretary ACMS
2	Rajkumar Turi		Worker
3	Achintya Saikia		Manager T.E.
4	Arup Dutta		Asst. M.D.
5	Mohesh Rajput		Head Assistant
6	Jitendra Gwala		President ACMS
7	Rakhi Karmakar		T.E. worker
8	Anita Bhuiyan		T.E. worker
9	Arunawati Turi		T.E. worker
10	Deepali Gwala		T.E. worker
11	Sumitra Turi		T.E. worker
	Substaton Name: Gharamara		
	Name of the Village: Somugarh/Rajgarh/Rangali		
	Name of the District: Dibrugarh		
11	Number of Participants: 6		

SNo	Name of the Participants	Male/Female	Occupation
1	Tapan Saikia		Agriculture
2	Ashish Bokatial		Bagan
3	Suwala Bokatial		Housewife
4	Hari priya Bokatial		Housewife
5	Ruman Phukan		Service
6	Pallav Bokatial		Business
Substaton Name: Rakhyshmari			
Name of the Village: Dhekiajuli			
Name of the District: Sonitpur			
12	Number of Participants:	7	
1	Bibha Singh		Housewife
2	Geeta Sah		Housewife
3	Jatin gill		Agriculture
4	Jogeshwar Saikia		Business
5	Pratap Rajput		Agriculture
6	Abdul Salem		Agriculture
7	Pranjal Deha		Agriculture
Substaton Name: Bindukuri			
Name of the Village: Tejpur and Gogra TE			
Name of the District: Sonitpur			
13	Number of Participants:	7	
1	Padmakant Bakti		President Labor Union
2	Gunadhar Ghatwar		GP Member
3	Soma Mallar		Tea Estate worker
4	Kalesh Bhengra		Labor
5	Babloo Bakti		Labor
6	Ravi Bhakti		Worker
7	Bal Ram Bhakti		Labor
Substaton Name: Gangabari			
Name of the Village: Chottahapjan			
Name of the District: Tinsukhia			
14	Number of Participants:	1	
1.	Md. Samad Ali		Service
Substaton Name: Namsung			
Name of the Village: Puberun			
Name of the District: Dibrugarh			
15	Number of Participants:	8	
1.	Manohar lal Mirdha		Vice President GP
2.	Deven Ray Ghatwar		Labor
3	Agrashen Chik		Labor
4	Balveer Singh		Labor
5	Ramesh Keot		Labor
6	Ranjeet Naik		Labor
7	Ramu Gwala		R.K. mission
8	Balram Gorah		Labor
Substaton Name: Borhat			
Name of the Village: Borhat Habi Gaon			
Name of the District: Shivsagar			
16	Number of Participants:	8	
1	Biraj Gogoi		Social Worker
2	Govind Gogoi		Gram Buddha
3	Debojit Gogoi		Teacher
4	Rajan Bora		Teacher
5	Sekharjit Gogoi		Social worker
6	Udayan Baruh		Business
7	Muna Dev		Worker
8	Rajiv Gogoi		Worker
Substaton Name: Bagjaan			
Name of the Village: Bagjaan TE			
Name of the District: Tinsukhia			
17	Number of Participants:	10	
1	Darshan Tandiya		Contractor

SNo	Name of the Participants	Male/Female	Occupation
2	Adhir Dey		Service
3	Arun Sonar		T.E. worker
4	Ramesh Nag		Ward Member
5	Himachal mahanand		Unemployed
6	Kranti Bagh		Anganwadi worker
7	Reena Bagh		Ward Member
8	Deepak Bagh		Unemployed
9	Danish Wahlong		Service
10	Diganta Gogoi		Employee
Substaton Name: Nahorbari			
Name of the Village: Nahorbari TE			
Name of the District: Golaghat			
18	Number of Participants:	8	
1	Shakeel Rafique		Manager
2	C.P. Borah		JM APDCL
3	K. Borah		SDO APDCL
4	Surjeet Mirdha		Tea Garden Labor
5	Sibakant Keot		Tea Garden Labor
6	Deepu Keot		Tea Garden Labor
7	Gajan Mura		Tea Garden Labor
8	Ganesh Senapati		Tea Garden Labor
Substaton Name: Doyang			
Name of the Village: Doyang TE			
Name of the District: Golaghat			
19	Number of Participants:	10	
1	Naveen Sawra		Business
2	Ambeswar Borah		Agriculture
3	Papul Borah		Agriculture
4	Mridul Phukan		Service
5	Shivasis Phukan		Student
6	Shailendra Dutta		Business
7	Manju Dutta		Business
8	Aroop Das		Business
9	Vidhyut Das		Hotel
10	Braham Pujar		Tea Garden Labor
Substaton Name: Bedeti			
Name of the Village: Bourlimara			
Name of the District: Sonitpur			
20	Number of Participants:	9	
1	Kishore Dutta Ray		Business
2	Jiten Bora		Business
3	Pyara Singh		Tea Garden service
4	Bikas Barua		Tea Garden service
5	L. Kurmi		Tea Garden service
6	Deepak Sharma		Social worker
7	Sulav Hazarika		Business
8	Ratan Barua		Teacher
9	Dilip Barua		Business

Annexure 8: Photographs of selected locations



A. Teipur and Gogra Tea Estate substation land



B. Rakhashmari substation



C. Proposed Singari substation



D. Phillobari substation



E. Typical Line Routes adjoining road sides



F. A typical tea estate



G. Public Consultation



H. Public Consultation



I. Proposed distribution lines routes through tea estates (near Phillobari)



J. Proposed distribution line route through estate/plantation (near Gelapokhri)