

EXECUTIVE SUMMERY ON THE PROJECT

Assam Intra State Transmission System Enhancement Project

Assam Electricity Grid Corporation Limited

CHAPTER-1

INTRODUCTION

1.1 ABOUT THE ORGANISATION

1.1.1 **Assam Electricity Grid Corporation Limited (AEGCL)**, a successor company of **Assam State Electricity Board (ASEB)** came into existence in the year 2004 as a part of the reforms program in the power sector initiated by the Govt. of India. The Company was created out of the **Transmission and Transformation (T & T)** wing of ASEB to operate, maintain and develop the transmission system in the entire state of **Assam**.

1.1.2 Earlier as a part of **ASEB**, the **T & T** wing was created in the year 1978 to look after a large numbers of transmission projects taken up for construction at that time. Till that time the transmission system of ASEB was consist of few 66 kV lines and substations in Upper Assam area and a very small numbers of 132 kV lines and 132 kV substations in Lower Assam area. Both these 132 kV and 66 kV systems were operated in isolated mode at that time.

1.2 PRESENT SCENARIO

1.2.1 Since the creation of **Transmission and Transformation** wing under ASEB, the transmission system in Assam has grown substantially till the financial crunch came in 1990s. Situation continued to worsen until the reforms program in power sector was initiated in early 2000 and as apart of the same reform program ADB and Govt. of India provided funds for development power sector in Assam under the **Assam Power Sector Development Program**.

1.2.2 Under the **Trade Development Fund, Govt of Assam** and aforementioned **Assam Power Sector Development Program**, AEGCL has taken up the following works in transmission sector:

- First **One** number **400/220kV** substation near to State's capital.
- **First 220/33kV GIS substation** near to **Capital complex**.
- **Four** numbers of **new 220/132 kV substations** spreading all over Assam.
- **Twenty four** numbers of new **132/33kV** substations spreading all over Assam.
- **431** and **98** circuit KMs of **132 kV and 220 kV transmission lines** respectively.
- **Augmentation and Extension** of **19** nos. of existing 132 and 220 kV substations.
- Reactive compensation by way of **33 kV Bus Capacitors** totaling **205 MVAR** in 17 Grid Substations of AEGCL.
- Introduction of a new **SCADA** covering all substations of AEGCL.
- **Replacement** of aged and obsolete substation equipments, e.g. Circuit Breakers, Instrument Transformers, Relay & Control Panels and Protection Relays in various Grid Substations of AEGCL.
- Complete revamping of **Power Line Carrier Communication** system.
- Introduction of **Optical Fibre communication network** by replacing ground wire of existing transmission lines covering 44 numbers of EHV substations.

1.2.3 Though some schemes have been taken up during this period with Govt. funds and finance from other sources, the investment made under the **Assam Power Sector Development Program** was the single major investment in the Transmission sector. As this **Assam Power Sector Development**

Program along with the other schemes are now nearing completion, the situation in the transmission sector appears to be on the road of recovery. However, as the growth in power demand is a continuous process it is responsibility of the **AEGCL** to continue its efforts in developing the Transmission System in **Assam**.

1.2.4 ***Details of the Transmission System***

The detailed lists of existing **Substations** and **Transmission Lines** are furnished in **Exhibit-1.1** and **Exhibit-1.2** at the end of this Chapter respectively.

EXIHIBIT – 1.1

DETAILS OF EXISTING SUBSTATIONS

| SL NO | Name of Substation | Transformation Capacity, MVA | | | | | | |
|-------|-------------------------|------------------------------|-----------------|--------------|--------------|----------------------|-------------|--------------|
| | | 400/220 kV | 220/132 kV | 220/33 kV | 132/66 kV | 132/33 kV | 66/33 kV | 132/11 kV |
| I | II | III | IV | V | VI | VII | VIII | IX |
| 1 | Gauripur | | | | | 2x25 | | |
| 2 | Bilasipara | | | | | 2x25 | | |
| 3 | Gossaigaon | | | | | 2x16 | | |
| 4 | Dhaligaon | | | | | 2x25 | | |
| 5 | Salakati (BTPS) | | 1x100+1 x160 | | | 1x16 | | |
| 6 | Kokrajhar | | | | | 2x25 | | |
| 7 | Barnagar | | | | | 3x25 | | |
| 8 | Barpeta* | | | | | 2x25 | | |
| 9 | Nalbari | | | | | 1X16+1x40 | | |
| 10 | Rangia | | 2x100* | | | 2x25 | | |
| 11 | Kamalpur | | | | | 2x40 | | |
| 12 | Amingaon (Sishugram) | | | | | 2x31.5 +1x40 | | |
| 13 | Kamakhya | | | | | 2x40 | | |
| 14 | Sarusajai | | 3 X 100 | | | 3X31.5 | | |
| 15 | Kahilipara | | | | | 2X40+2X30+ 1X31.5 | | |
| 16 | Dispur | | | | | | | 2x16 |
| 17 | Jawaharnagar | | | 2x50 | | | | |
| 18 | Narangi | | | | | 2X25 | | |

| SL NO | Name of Substation | Transformation Capacity, MVA | | | | | | |
|-------|-----------------------|------------------------------|-----------------|--------------|--------------|--------------|-------------|--------------|
| | | 400/220 kV | 220/132 kV | 220/33 kV | 132/66 kV | 132/33 kV | 66/33 kV | 132/11 kV |
| I | II | III | IV | V | VI | VII | VIII | IX |
| 19 | Chandrapur | | | | | 1x16,1X30 | | |
| 20 | Sonapur | | 2x100 | | | 2x25 | | |
| 21 | Jagiroad | | | | | 2x25 | | |
| 22 | Boko | | 1x50+1x 100 | | | 2x40 | | |
| 23 | Sipajhar | | | | | 2x16 | | |
| 24 | Rowta | | | | | 2x25 | | |
| 25 | Dhekiajuli* | | | | | 2x25 | | |
| 26 | Depota | | | | | 2x31.5 | | |
| 27 | Balipara(I) | | | | | 1x16 | | |
| 28 | Sonabil | | 2x100 | | | | | |
| 29 | Gohpur | | | | | 2x25 | | |
| 30 | Biswanath Chariali | | | | | 2x40 | | |
| 31 | N.Lakhimpur | | | | | 2x25 | | |
| 32 | Majuli | | | | | 1 x 16.05 | | |
| 33 | Dhemaji | | | | | 2x16 | | |
| 34 | Samaguri | | 2x50 + 1x100 | | | 3x25 | | |
| 35 | Nagaon | | | | | 2x25 | | |
| 36 | Sankardevnagar | | | | | 2x25 | | |
| 37 | Diphu | | | | | 2x16 | 2 x 5 | |
| 38 | Bokajan | | | | | 2x16 | 3x5 | |
| 39 | Golaghat | | | | | 2x25 | | |
| 40 | Bokakhat | | | | | 2x16 | | |
| 41 | Mariani | | 2 x 100 | | 1 x 20 | 2x25 | | |

| SL NO | Name of Substation | Transformation Capacity, MVA | | | | | | |
|-------|--------------------|------------------------------|----------------|--------------|--------------|--------------------|-------------|--------------|
| | | 400/220 kV | 220/132 kV | 220/33 kV | 132/66 kV | 132/33 kV | 66/33 kV | 132/11 kV |
| I | II | III | IV | V | VI | VII | VIII | IX |
| 42 | Jorhat | | | | | 3x25 | | |
| 43 | Jorhat (West) | | | | | 2x40 | | |
| 44 | Nazira | | | | | 2x25 | 2x16 | |
| 45 | Sonari | | | | | 2x25 | | |
| 46 | Sibsagar | | | | | 2x16 | | |
| 47 | Moran | | | | | 2x16 | | |
| 48 | Dibrugarh | | | | | 2x31.5 | | |
| 49 | Behiating | | 2x100** | | | 2x40 | | |
| 50 | Tinsukia | | 2 x 100 | | 1x20 | 2x40 | 3x20 | |
| 51 | Margherita | | | | | 2x25 | | |
| 52 | Rupai | | | | | 2x25 | | |
| 53 | Bordubi | | | | | 2x25 | | |
| 54 | Namrup | | 2X50 | | 2x30 | 1x31.5 | | |
| 55 | Haflong | | | | | 2x10 | | |
| 56 | Umrangshu | | | | | 1x25+1x16 | | |
| 57 | Panchgram (new) | | | | | 2x25 | | |
| 58 | Pailapool | | | | | 1x10+1x16+ 1x25 | | |
| 59 | Hailakandi | | | | | 2x16 | | |
| 60 | Karimganji* | | | | | 2x25 | | |
| 61 | Dullavcherra | | | | | 1x10.5 + 1x16 | | |
| 62 | Srikona | | | | | 2X40 | | |
| 63 | Agia | | 1x50 +1x100 | | | 1x16+1x40 MVA | | |

| SL NO | Name of Substation | Transformation Capacity, MVA | | | | | | |
|-------|----------------------|------------------------------|---------------|--------------|--------------|---------------|-------------|--------------|
| | | 400/220 kV | 220/132 kV | 220/33 kV | 132/66 kV | 132/33 kV | 66/33 kV | 132/11 kV |
| I | II | III | IV | V | VI | VII | VIII | IX |
| 64 | Matia | | | | | 2x16 | | |
| 65 | Hatsingimari* | | | | | 2x16 | | |
| 66 | Jogighopa(APM) | | | | | 1x16 +1x12.5 | | |
| 67 | Azara (Kukurmara) | 2x315 | 2x50 | | | 1x25 | | |
| 68 | Azara* | | | | | 2x40 | | |
| 69 | Amingaon** | | 2x160 | | | | | |
| 70 | Chapakhowa** | | | | | 1x25 | | |
| 71 | Teok** | | | | | 2x31.5 | | |
| 72 | Sarupathar** | | | | | 2x25 | | |
| 73 | Silapathar** | | | | | 2x31.5 | | |
| 74 | Tezpur (New)** | | | | | 2x50 | | |
| 75 | Tangla** | | | | | 2x31.5 | | |
| 76 | Hajo** | | | | | 2x31.5 | | |
| 77 | Paltanbazar** | | | | | 2x50 | | |
| 78 | GMC** | | | | | 2x50 | | |
| | TOTAL | 630 | 2670 | 100 | 100 | 4053.5 | 107 | 32 |

*
Under construction

**
Construction under North East Reason Power Sector Improvement Plan (NERPSIP)

EXHIBIT-1.2

EXISTING TRANSMISSION LINES

| SL. NO. | NAME | No. of Circuit | Route Length (KM) | Circuit KM | Type of Conductor |
|----------|--|----------------|-------------------|------------|-------------------|
| I | II | III | IV | V | VI |
| A | 400 KV Lines | | | | |
| 1 | LILO of Silchar (PG) – Bongaigaon (PG) | 2 | 3.6 | 7.2 | ACSR Twin Moose |
| | TOTAL | | 3.6 | 7.2 | |
| B | 220 KV Lines | | | | |
| 1 | Tinsukia-Namrup | 2 | 40 | 80 | AAAC 'ZEBRA' |
| 2 | Tinsukia-Kathalguri | 2 | 25 | 50 | ACSR 'ZEBRA' |
| 3 | Namrup - Mariani | 1 | 143 | 143 | ACSR 'ZEBRA' |
| 4 | Mariani-Samaguri-I | 1 | 168 | 168 | ACSR 'DEER' |
| 5 | Mariani-Samaguri-II | 1 | 169 | 169 | ACSR 'ZEBRA' |
| 6 | Samaguri-Sonapur | 1 | 110 | 110 | ACSR 'ZEBRA' |
| 7 | Sonapur - Sarusajai | 1 | 30 | 30 | ACSR 'ZEBRA' |
| 8 | Samaguri - Jawaharnagar | 1 | 123 | 123 | ACSR 'ZEBRA' |
| 9 | Jawaharnagar - Sarusajai | 1 | 6 | 6 | ACSR 'ZEBRA' |
| 10 | Balipara (P) - Sonabil | 2 | 40 | 88 | ACSR 'ZEBRA' |
| 11 | Sonabil - Samaguri | 2 | 30 | 60 | ACSR 'ZEBRA' |
| 12 | Longpi – Sonapur | 1 | 89 | 89 | ACSR 'ZEBRA' |
| 13 | Longpi-Sarusajai | 1 | 118 | 118 | ACSR 'ZEBRA' |
| 14 | Sarusajai-Azara | 2 | 23.74 | 47.48 | AAAC 'ZEBRA' |
| 15 | Azara - Agia | 1 | 107.26 | 107.26 | AAAC 'ZEBRA' |
| 16 | Azara - Boko | 1 | 37.9 | 37.9 | AAAC 'ZEBRA' |
| 17 | Boko-Agia | 1 | 70.26 | 70.26 | AAAC 'ZEBRA' |

| SL. NO. | NAME | No. of Circuit | Route Length (KM) | Circuit KM | Type of Conductor |
|----------|--------------------------------------|----------------|-------------------|---------------|-------------------|
| I | II | III | IV | V | VI |
| 18 | Agia-BTPS | 2 | 70 | 140 | AAAC 'ZEBRA' |
| 19 | BTPS – Rangia* | 2 | 153 | 306 | AAAC 'ZEBRA' |
| 20 | Tinsukia - Behiating | 2 | 55 | 110 | ACSR'ZEBRA' |
| 21 | Rangia - Amingaon | 2 | 40 | 80 | ACSR'ZEBRA' |
| | TOTAL | | 1648.16 | 2132.9 | |
| C | 132 KV Lines | | | | |
| 1 | BTPS (Salakathi)-Dhaligaon | 2 | 35 | 70 | ACSR 'PANTHER' |
| 2 | Dhaligaon-Gossaigaon | 1 | 62 | 62 | ACSR 'PANTHER' |
| 3 | Gossaigaon-Gauripur | 1 | 40 | 40 | ACSR 'PANTHER' |
| 4 | BTPS - Kokrajhar | 1 | 9,8 | 9.8 | AAAC 'PANTHER' |
| 5 | Kokrajhar – Bilasipara | 1 | 37.0 | 37.0 | AAAC 'PANTHER' |
| 6 | Bilasipara – Gauripur | 1 | 34 | 34 | AAAC 'PANTHER' |
| 7 | Dhaligaon-Barnagar | 1 | 55 | 55 | ACSR 'PANTHER' |
| 8 | Dhaligaon-APM | 1 | 37 | 37 | ACSR 'PANTHER' |
| 9 | BTPS - APM | 1 | 40 | 40 | AAAC 'PANTHER' |
| 10 | Dhaligaon-Nalbari | 1 | 115 | 115 | ACSR 'PANTHER' |
| 11 | Nalbari-Rangia | 1 | 25 | 25 | ACSR 'PANTHER' |
| 12 | Barnagar-Rangia | 1 | 75 | 75 | ACSR 'PANTHER' |
| 13 | LILO of Bornagar – Rangia at Barpeta | 2 | 20 | 40 | AAAC 'PANTHER' |
| 14 | Rangia - Kamalpur | 2 | 16 | 32 | ACSR 'PANTHER' |
| 15 | Kamalpur - Amingaon | 2 | 12 | 24 | |
| 16 | Amingaon-Kahilipara | 1 | 15 | 15 | ACSR 'PANTHER' |
| 17 | Rangia-Kahilipara | 1 | 50 | 50 | ACSR 'PANTHER' |
| 18 | CTPS-Dispur | 1 | 30 | 30 | ACSR 'PANTHER' |
| 19 | Dispur-Kahilipara | 1 | 6 | 6 | ACSR 'PANTHER' |

| SL. NO. | NAME | No. of Circuit | Route Length (KM) | Circuit KM | Type of Conductor |
|---------|----------------------------|----------------|-------------------|------------|-------------------|
| I | II | III | IV | V | VI |
| 20 | Kahilipara-Sarusajai-I | 2 | 3.5 | 7 | ACSR 'PANTHER' |
| 21 | Kahilipara-Sarusajai-II* | 2 | 3.5 | 7 | AAAC 'PANTHER' |
| 22 | CTPS-Narangji | 1 | 24 | 24 | ACSR 'PANTHER' |
| 23 | Narengi-Kahilipara | 1 | 12 | 12 | ACSR 'PANTHER' |
| 24 | CTPS-Jagiroad | 1 | 38.5 | 38.5 | ACSR 'PANTHER' |
| 25 | Jiribam-Pailapool | 1 | 15 | 15 | ACSR 'PANTHER' |
| 26 | Pailapool-Srikona | 1 | 32 | 32 | ACSR 'PANTHER' |
| 27 | Srikona-Panchgram(N) | 1 | 20 | 20 | ACSR 'PANTHER' |
| 28 | Panchgram(N)-Dullavcherra | 1 | 55 | 55 | ACSR 'PANTHER' |
| 29 | Mariani-LTPS | 1 | 70 | 70 | ACSR 'PANTHER' |
| 30 | LTPS-NTPS | 2 | 53 | 106 | ACSR 'PANTHER' |
| 31 | LTPS-Nazira | 2 | 22 | 44 | ACSR 'PANTHER' |
| 32 | Nazira-Jorhat** | 1 | 65 | 65 | AAAC 'PANTHER' |
| 33 | NTPS-Tinsukia | 1 | 40 | 40 | ACSR 'PANTHER' |
| 34 | Tinsukia-Ledo (Margherita) | 2 | 53 | 106 | ACSR 'PANTHER' |
| 35 | Tinsukia-Dibrugarh | 1 | 53 | 53 | ACSR 'PANTHER' |
| 36 | Dibrugarh-Moran | 1 | 52 | 52 | ACSR 'PANTHER' |
| 37 | Moran-LTPS | 1 | 22 | 22 | ACSR 'PANTHER' |
| 38 | Samaguri-Lanka | 1 | 61 | 61 | ACSR 'PANTHER' |
| 39 | Lanka-Diphu | 1 | 76 | 76 | AAAC 'PANTHER' |
| 40 | Mariani-Jorhat | 2 | 20 | 40 | ACSR 'PANTHER' |
| 41 | Rangia-Rowta | 1 | 80 | 80 | ACSR 'PANTHER' |
| 42 | Rangia-Sipajhar | 1 | 59 | 59 | AAAC 'PANTHER' |
| 43 | Sipajhar-Rowta | 1 | 58 | 58 | AAAC 'PANTHER' |
| 44 | Rowta-Depota-I | 1 | 72 | 72 | ACSR 'PANTHER' |

| SL. NO. | NAME | No. of Circuit | Route Length (KM) | Circuit KM | Type of Conductor |
|----------|-------------------------|----------------|-------------------|-------------|-------------------|
| I | II | III | IV | V | VI |
| 45 | Rowta-Depota-II | 1 | 72 | 72 | AAAC 'PANTHER' |
| 46 | Depota-B.Chariali | 1 | 70 | 70 | ACSR 'PANTHER' |
| 47 | Depota-Balipara(I) | 1 | 25 | 25 | ACSR 'PANTHER' |
| 48 | Balipara(I)-Balipara(P) | 1 | 14 | 14 | ACSR 'PANTHER' |
| 49 | Balipara(P)-Gohpur | 1 | 90 | 90 | ACSR 'PANTHER' |
| 50 | B.Chariali-Gohpur | 1 | 70 | 70 | ACSR 'PANTHER' |
| 51 | Gohpur-N.Lakhimpur | 2 | 80 | 160 | ACSR 'PANTHER' |
| 52 | N.Lakhimpur-Dhemaji | 1 | 63 | 63 | ACSR 'PANTHER' |
| 53 | N.Lakhimpur-Majuli | 1 | 59 | 59 | ACSR 'PANTHER' |
| 54 | Mariani-Golaghat | 1 | 44 | 44 | ACSR 'PANTHER' |
| 55 | Golaghat-Bokajan | 1 | 56 | 56 | ACSR 'PANTHER' |
| 56 | Bokajan-Dimapur | 1 | 21.5 | 21.5 | ACSR 'PANTHER' |
| 57 | Nazira-Sibsagar | 1 | 15 | 15 | AAAC 'PANTHER' |
| 58 | Jorhat-Bokakhat | 1 | 84 | 84 | AAAC 'PANTHER' |
| | TOTAL | | 2180 | 2897 | |
| | Single Circuit | | 1692 | 1813 | |
| | Double Circuit | | 510 | 1084 | |
| D | 66 KV Lines | | | | |
| 1 | Tinsukia-Namrup | 2 | 37 | 74 | ACSR 'WOLF' |
| 2 | Tinsukia-Doomdooma | 1 | 25 | 25 | ACSR 'WOLF' |
| 3 | Golaghat-Mariani | 2 | 40 | 80 | ACSR 'WOLF' |
| 4 | Bokajan-Golaghat | 1 | 64 | 64 | ACSR 'WOLF' |
| 5 | Bokajan-Diphu | 1 | 39 | 39 | ACSR 'WOLF' |
| 6 | Nazira-NTPS | 2 | 74 | 148 | ACSR 'WOLF' |
| 7 | Mariani-Nazira | 2 | 54 | 108 | ACSR 'WOLF' |

| SL. NO. | NAME | No. of Circuit | Route Length (KM) | Circuit KM | Type of Conductor |
|---------|-----------------------|----------------|-------------------|------------|-------------------|
| I | II | III | IV | V | VI |
| 8 | Dimapur-Bokajan | 1 | 16 | 16 | ACSR 'WOLF' |
| | TOTAL | | 349 | 554 | |
| | Single Circuit | | 144 | 144 | |
| | Double Circuit | | 205 | 410 | |

* Under construction (under TDF and other Program) and likely to be completed in near future.

CHAPTER-2

NEW PROPOSALS

3.1 INTRODUCTION

- 3.1.1 The new proposals, specifically the new substations, augmentations of existing ones and new transmission lines included in this **Project Report** are broadly based on power system studies carried out in the year 2013-14 by **M/S PRDC** under the ongoing **Assam Power Sector Development Program**. However, few changes are made to the original studies carried out by **M/S PRDC** to take care of changed priority and requirements due to changing scenario and new development during the intervening period of original study and the time of preparation of this **Project Report**.
- 3.1.2 A fresh Power System Studies has been carried out broadly following the guidelines brought by **Central Electricity Authority** of India in the '**Manual on Transmission Planning Criteria**' and as described in the previous **Chapter** with all the necessary changes to the original studies. The results of these fresh studies have been furnished in **Chapter-6** of this **Project Report**.

3.2 BASIS OF NEW PROPOSALS

- 3.2.1 In the original Power System Studies as referred to in Clause 3.1.1, **M/S PRDC** was asked to carry out the studies considering peak demand of **3000 MW**. As the demand of **1827 MW** is going to closely tally with the peak demand forecasted in **Eighteenth Electric Power Survey** report published by the **Central Electricity Authority of India**. The **Nineteenth Electric Power Survey** report published by the **Central Electricity Authority of India** in the month of January'17, forecast peak demand of Assam to the tune of **2713 MW** by the **FY 2021-22**. AEGCL has conducted one load Flow study for peak power demand of **3030 MW by the FY 2021-22**, which is close to 19th EPS forecast. Higher side Peak Demand is considered based on the Industrial Policy of Government of Assam, e.g. Gazette Notification of industrial belt on both sides of NH 31 & NH 37, creation of Industrial Growth Centre in various Districts of Assam. The proposals covered under this **Project Report** are based on the studies carried out for that demand only.
- 3.2.2 Peak Demands and Energy for the last two years and the forecasted demands and energy for the year **2021-2022** as recorded in the **Nineteenth Electric Power Survey** report are reproduced below.

| YEAR* | PEAK DEMAND (MW) | | ENERGY (MU) | |
|-----------|------------------|------|-------------|------|
| | REQUIREMENT | MET | REQUIREMENT | MET |
| 2015-2016 | 1670 | 1564 | 8257 | 7136 |
| 2016-2017 | 1780 | 1625 | 8997 | 8356 |
| 2017-2018 | 1906 | 1758 | 10189 | 9168 |
| 2021-2022 | 2713 | | 14051 | |

*Year is from April to March.

3.3 TRANSFORMATION CAPACITY

- 3.3.1 Whenever loading of transformers in an existing substation is found to exceed 60%, augmentation of transformer capacity of the substation or creation of a new substation nearby is proposed. Creation of a

new substation is considered only when (i) new load center is coming up some distance away and/or (ii) the substation in question is feeding power to a large area or (iii) the substation in question is already saturated or nearing saturation in terms of capacity or space.

3.4 NEW SUBSTATIONS

3.4.1 Altogether **24** new substations are proposed under this **Project Report**. A brief introduction to these new substations is presented below.

i) **400/220kV, 2x500 MVA GIS Substation at RANGIA**

It may be noted that the demand in North Bank districts of Assam are increasing because of rapid Industrial Growth, particularly in the Kamrup District. The Government of Assam has already notified as Industrial Belt from Amingaon (Kamrup Rural) to Tihu (Nalbari District), 500 meters of bothsides of NH 31, land will be reserved for industries only. In the NERPSIP, construction of one 220/132kV substation (2x160MVA) is going on, which will be radially feed from Rangia. Again, there is only one 220kV link between NTPC Bongaigaon and Rangia 220kV. As such to cater reliable power, AEGCL proposes one 400kV substation by LILO of both circuit of 400kV Balipara – Bongaigaon line, so that 220/132kV Amingaon and existing Rangia 220 kV substation can be feed from the proposed new 400kV/220kV (2x500 MVA) substation at Rangia. In our 24x7 PFA scheme, we have already proposed Rangia 400 kV Substation, as AEGCL requests the Standing Committee on Power System Planning for approval on LILO of both circuit of 400kV D/C (Quad Moose) line at Rangia and construction of Rangia 400/220kV substation by AEGCL.

In the 7th SCM of NER, headed by the Central Electricity Authority, has already approved establishment of Rangia 400/220kV, 2x500 MVA substation through LILO of both circuits.

ii) **400/220kV, 2x500 MVA GIS Substation at SONAPUR**

Presently Guwahati City's Peak Power demand to the tune of 350 MW is fed from 400/220kV Azara (2x315 MVA) substation situated in the Western part of the City. To mitigate contingency at Azara 400kV substation, one 400kV (2x500 MVA) substation at Sonapur is proposed with a LILO of Silchar (PGCIL) – Byrnihat (Meghalaya) 400kV twin moose line. Existing Sonapur substation is well connected with 220kV and 132kV system, thus in the event of any outage on Azara 400/220kV substation, the capital city of Assam, Guwahati City can draw power of it's total requirement from the proposed Sonapur 400 kV substation. It may further be noted that various works on Guwahati Smart City are taking momentum.

iii) **220/132 kV, 2x160MVA; 132/33kV, 2x50 MVA GIS Substation at Agamoni:**

Presently, the Dhuburi, Kokrajhar, Bongaigaon, Sirang, Barpeta & Nalbari Districts are fed from Salakati 220/132 kV substation and which is connected to Eastern Region through PGCIL Bongaigaon 400/220kV substation. The Salakati 220/132kV substation is connected to NTPC's BTPS (2x250 MW) through two numbers 220 kV line. PGCIL Bongaigaon substation is connected to two numbers of double circuit 400kV lines and one 220 kV Birpara (West Bengal) – Bongaigaon double circuit line. Bongaigaon PGCIL substation is well connected with rest of the large generators of NER.

In the event of any contingency at Salekathi 220/132kV substation, afore mentioned six Lower Assam districts had to face either out of power or partial power depending on nature of outage of transmission element at Salekathi.

To resolve this chronic issues, one 220/132kV substation is proposed at Gossaigaon (Agamoni) with one circuit LILO of Birpara (WB) – Bongaigaon 220kV double circuit line and one new

132/33kV substation at Agamoni which is to be connected from LILO of Gossaigaon - Gauripur S/C (AEGCL-Existing) Line. Further, as this substation will be connected mainly to Eastern Region, so bus fault at Bongaigaon PGCIL's substation shall not have any impact on the presently feeding districts from Salekathi substation.

iv) **2x160 MVA, 220/132kV; 2x50 MVA, 132/33kV KHUMTAI GIS S/S:**

As observed from the load flow studies for the Peak load 3000 MW, it is observed that for a single contingency of Kathalguri Generating Station - Misa (PGCIL) 220kV link or for outage of Kathalguri Generators, the entire Upper Assam shall have to face acute power shortage. Moreover, all the 220kV link lines from substations mainly Misa (PGCIL) and Samaguri substations of Central Assam are loaded to more than 100%, as such system security is at stake. Further, the entire Upper Assam will be deprived of the upcoming hydel substations in Arunachal Pradesh as the only evacuation station is Misa (PGCIL) 400/220kV substation. On the otherhand, entire Upper Assam has only four numbers of 220kV substation viz, Tinsukia, Behiating, Namrup and Mariani and these substations are taking care of eighteen numbers of 132/33kV substations, as such for a single contingency on 220kV bus, entire Upper Assam is to face severe load curtailment. Hence, at Khumtai, 220/132kV transformation system is proposed to take care of 132kV substations like Gormur, Jorhat (West), Bokakhat, Golaghat & Bokajan substation, further this substation will act as back-up to existing Mariani 220/132kV substation.

v) **220/132 kV, 2x160 MVA Shankardeb Nagar GIS SS:**

The location has already one 2x25MVA, 132/33kV substation, which is fed from Samaguri 220kV EHV substation through one double circuit 132kV line. Assam Power Generation Company Ltd has already finalized for setting-up of one 110 MW hydro power generating station at Lower Kopili, which is approximately 50 KM south west side. Power evacuation plan for Lower Kopili HEP is already finalized through 220kV transmission system. As per Indian Electricity Act, it is the responsibility of State Transmission Utility to evacuate power from State owned generator, accordingly AEGCL proposed to set-up 220kV system at the nearest Shankardeb Nagar EHV substation.

Further, it is proposed to extend connectivity in 220 kV with CTU's FROM 220 kV Misa substation through double circuit line with a length of 25 KM. This proposal was already approved by Standing Committee as well as by North East Region Power Committee.

With 220 kV system, Shankardeb Nagar will act as redundant to existing Samaguri 220/132/33 kV substation, as of now, for any contingencies at 220 kV system of Samaguri substation, three important districts of Central Assam Zone, viz. Nagaon, Hojai & Karbi Along, have to face out of power state.

vi) **220/33 kV, 2x100 MVA BORAGAON GIS SS:**

As stated earlier, the development of Guwahati city is moving on the fast track in all directions and rapid commercial activities and industrialization are taking place on the greater Guwahati. Presently, load of greater Guwahati or so to say Kamrup Metro District is feeding from Sarusajai 220/132 kV, 3x100 MVA & Jawaharnagar 220/33kV, 2x50 MVA substation where Jawaharnagar substation is taking care of only a portion of eastern part of the City and Sarusajai is taking care of rest of the parts of Guwahati. Recent pass, the Sarusajai substation is connected with 220kV D/C lines from 400/220/132kV, 2 x 315 MVA substation. As mentioned above, Sarusajai is the most critical substation for Guwahati City, as any type of single contingency leads to either severe load shedding of the entire city or black out of the City inspite of having adequate capacities at

220kV level at Azara 400kV substation. As said above, present peak demand of Guwahati City is 250 MW with rapid annual growth of more than 10% and it is expected that by end of 13th Plan, the peak demand will be around 500 MW. So, to cater the rising growth one new 220/33kV, 2 x 100 MVA substation is proposed at the south-western part of the City i.e. at Boragaon, which will play most vital role for the only International Airport of the State, the famous Guwahati University and lots of others educational institutions of national repute. The secondary voltage level of the proposed substation is considered at 33kV because of non-availability right of way of EHV transmission lines i.e. next higher 132kV level.

vii) **220/33 kV, 2x100 MVA PANJABARI GIS SS**

Panjabari is situated in North-East side of Guwahati City. As said in the proposal iii) above, 220/33kV GIS substation is proposed to cater the growing demand of Guwahati City. Several Commercial activities are going on including Hotel industries. Presently this part of the City is partly fed by age old Chandrapur 132/33kV substation located fifteen kilometers from this area and other one is Narengi 132/33kV substations which is also operating on above its full capacities. However, both these feeding substations are to be depend on the lone 220/132kV substation of the City i.e. Sarusajai EHV Grid substation. The 220kV Samaguri – Jawaharnagar and Sonapur – Sarusajai 220 kV lines are enrouting in the same structures near to proposed substation location, which will eliminate the ROW issue of drawal of EHV line in such a thickly populated locations. Further, the type of substation must be of GIS only because of required land scarcity. The proposed substation will achieved more than 40% of its proposed capacities.

viii) **220/33 kV, 2x100 MVA JHAKHALABANDHA GIS SS**

Jakhalabandha is located under Koliabar Administrative Subdivision of Nagaon District. Kaliabor Subdivision is comprising of township like Jakhalabandha, Silghat, Misa. Naltali under Koliabor is an industrial growth centre and Industry Department of Govt. of Assam has an Industrial Estate. While, Misa has large Army Base Station with its Defence Research Center. Presently, power is fed from Samaguri EHV substation through 4/5 numbers of 33kV lines of average length of more than 35 KM route length with 7/8 numbers of 33/11kV sub-transmission substations. 220/33kV substation was proposed during 11th Plan period and accorded approval from the Central Electricity Authority, but due to non availability of required fund this project cannot be taken-up. It is mention worthy that this was a Phase-II proposal of North East Region Power System Improvement Plan and which was supposed to start at the 11th Plan Period, but the execution of Phase-I proposal under NERPSIP was delayed for a prolonged period, nevertheless, works under Phase-I got started with target year of completion by 2018-19. Thus, funding of this project is at bleak under NERPSIP. Inordinate delay in arranging fund for this project results in unreliable power with poor quality power distribution to the entire Koliabor Sub-Divisional area, where requirement of power is more than 20 MW presently. While proposing the Jakhalabandha substation, associated transmission lines are considered by liloing to the extent of 10 KM of the existing one 220kV Samaguri – Mariani line.

ix) **220/33 kV, 2x100 MVA BIHPURIA (Narayanpur) GIS SS**

Bihpuria (N 27.02346, E 91.824904) is in west side of District Headquarter North Lakhimpur, of North Lakhimpur District. The nearest 132kV substation in east side is Nalkata 132/33kV SS at about 40 KM and Gohpur 132/33kV in west side at 38 KM far.

AEGCL has planned to form a 220 kV ring network in the Brahmaputra Valley of Assam, and as a part of this AEGCL has planned to cover the North Bank of Assam by drawing one 220kV from Sonabil 220/132kV substation to extreme North i.e. Silapathar, where Silapathar will be connected to Dibrugarh (Behiating) 220/132/33kV substation. The length of 220kV line from

Sonabil to Silapathar will be 255 KM, where 55km of the line i.e. from Sonabil to Biswanath Chariali is already completed. Bihpuria will be the mid point of the Sonabil -Silapathar 220kV line. Again, Bihpuria and adjoining Narayanpur, Harmoti and Laluk are facing chronic irregularities in power. Presently it is proposed to feed power to this area through 220/33kV system and later on 220/132kV system will be put to take care of the existing 132kV system. Further, upper part of North Bank is mainly dependent on 132kV system, that too radially feed from Sonapur & Biswanath Chariali substation, thus for any contingencies in Biswanath Chariali – Gohpur section, the North Lakhimpur, Dhemaji and World's largest River Island Majuli (Heritage Center of Assam) suffer total out of power state.

This substation was already been approved by the Central Electricity Authority under North East Region Power System Improvement Plan (NERPSIP) in 2008, but due to paucity of adequate fund, the same cannot be implemented.

x) 132/33 kV, 2x50 MVA DHING AIS Substation:

Dhing is located in the north west side of Nagaon District of Assam at 26.47 °N and 92.47°E and is the riverine area of Brahmaputra River, rich in paddy and jute cultivation. Dhing is the commercial hub for agro based products of Assam. Power to Dhing is fed from Nagaon 132/33kV by single 33kV line of more than 30KM of length and peak load recorded was 12 MW in last summer. Under Rural Electrification scheme, almost all the villages are in the process of electrification and expected to be completed by 2019. Presently, the Dhing area are facing acute power problems like frequent interruption, un-reliable, and above all poor voltage profile.

One 132/33kV substation is proposed by connecting one circuit from existing Nagaon substation to assure quality as well reliable power to the area covered by Dhing, Laokhowa and Rupahi town of Nagaon District.

xi) 132/33 kV, 2x50 MVA Ghungur (Silchar-2) GIS SS:

Silchar city is located in South Assam and is the gateway for the North Eastern States like Manipur, Mizoram & Tripura. Silchar city is the business hub for south Assam as well as educational with Central University (Assam University), Regional Engineering College (NIT Silchar), Silchar Medical College besides various higher educational institutions. Power requirement of Silchar City is more than 70 MW and is catered through a single EHV substation, Srikona with 2x40 MVA transformer capacity. For any exigencies of the lone grid substation, Silchar has to face worse state like complete blackout.

Keeping in view of increasing load density, in the Ghungur area of the Silchar City one 2x50 MVA, 132/11kV Gas insulated Substation with 132kV Under Ground Cable transmission line from Srikona EHV substation is proposed and is expecting the new substation will be able to cater the load growth as well as improve power quality.

xii) 132/33 kV, 2x50 MVA TITABOR GIS SS:

Titabor town is located at 26.60 °N, 94.20 °E. Titabor is the Sub-Divisional head quarter of Jorhat District of Assam. Under Titabor Revenue Circle, there are 162 revenue villages comprising more than 2.0 lakhs of population. From district headquarter Jorhat, it 20 KM and nearest EHV substation Mariani is at distance of 22KM. Though there are some Tea Gardens at Titabor, but the area is famous for quality production of rice in the state. Besides tea industries, there are some medium to small scale industries as well. Presently, power is fed from Mariani EHV substation at 33kV level. Present peak power demand of Titabor is 14 MW.

To accommodate the growth demand in power, one gas insulated 132/33kV substation is proposed with one no. double circuit transmission line from Mariani 220/132/66/33 kV substation.

xiii) 132/33 kV, 2x50 MVA ZOO ROAD GIS SS :

Zoo Road area is comprises of Guwahati City's prime localities like Madgharia, Narkalbari, Ambikagirinagar, Anil Nagar, Tarun Nagar, Northern part Ganeshguri, North side of GS road stretch from Bhangagarh to Ganeshguri, where most of the large commercial building, mall, corporate office of the city's are exists. For catering power Assam Distribution Company has five 33/11kV substations with transformation capacity of more than 80 MVA and required power is feeding through 33kV single circuit lines emanating from Narengi & Kahilipara 132/33kV substations. In addition to above, there are some high value commercial connections at 33kV system. Peak demand of this area is more than 30 MW. To meet the city's growing demand of power, one 132/11kV substation with 132kV underground cable line from GMC 132kV substation is proposed which will improve reliability as well as quality power in the localities.

xiv) 220/33 kV, 2x50 MVA Chhaygaon GIS SS:

Chhaygaon is located in the South Bank of Kamrup District (Rural) at a distance of 50 KM west from Guwahati City. The Department of Industry, GoA has established three industrial sectors, where several industries have already been started production. In an around Chhaygaon area, several large industrial houses are also bying plots to set-up factories. Presently, Chhaygaon Industrial areas are fed from Boko 220/132/33kV substation by two numbers dedicated 33kV lines and one from Kukurmara EHV substation. Load demand is recorded more than 40 MW. As the location of Chhaygaon is outskirts of the Guwahati City, it is expected that there will be massive load growth in this area, and accordingly one 220/33kV substation is proposed which is to be connected from LILO of Kukurmara-Boko line.

xv) 132/33 kV, 2x50 MVA, Kumarikata AIS Substation

Kumarikata (26.73 N, 91.55 E) is located in Tamulpur Revenue Circle of Baska District of Bodoland Territorial Autonomous Development Council near to Samdrup Jongkhar, Sub-Divisional Head Quarter of Bhutan. The famous Bhutan boarder commercial centre Darranga Mela is only 5.0 KM from Kumarikata. It is about 35KM from Nalbari District Head Quarter, Nalbari. Demography of the area is such that majority belongs to Tea tribes, Plain tribes, Schedule cast and a few belongs to cast Hindu & Muslims. Kumarikata is the business hub, particularly for agricultural products like rice, jute, bamboo products and poultry etc. Power is fed from Rangia through one 45KM long 33kV line to meet the demand of around 8.0 MW. Massive Rural Electrifications are going on the villages located in Kumarikata area, as such it is expected that there will be a requirement power demand more than 12.0 MW. To facilitate reliable and quality power, 132/33kV substation alongwith one 132kV line from Nalbari EHV Substation to Kumarikata is proposed.

xvi) 132/33kV, 2x50 MVA BUHRIGAON AIS SUBSTATION.

Buhrigaon is under Darang District and is situated at about 23KM South East of District Head Quarter Mangaldoi. Department of Industry, Government of Assam has established one Integrated Infrastructure Development Centre for promotion of Industries, and in addition to that

another Industrial Centre is developing at Buhrigaon. Buhrigaon is under Dalgaon Revenue Circle. Dalgaon Revenue Circle is famous for jute, paddy and vegetables production, besides three numbers of Tea Estates.

To enhance reliability of power and as a part of vital infrastructure to promote industrial growth as well as to meet the growth from new electrifications under Rural Electrification Scheme, AEGCL proposed to construct 132/33kV substation by LILOfing 132kV Sipajhar – Rowta line.

xvii) 132/33kV, 2x50 MVA, CHABUA AIS SUBSTATION.

Chabua is a Revenue located in Dibrugarh and bordering to Tinsukia district. Chabua is famous for tea plantation as the East India Company had started first commercial tea plantation estate in the 1840. Chabua is the second largest Air Force Base Station in NER. Geospatial location of Chabua is 27.48 °N, 95.18 °E, distance from district head quarter, Dibrugarh is 20.0 KM while the distance from Tinsukia, the second largest commercial city of Assam is 22.0 KM. There are more than sixty Tea Estates in Chabua and nearby Dinjan & Panitola area. Though there is huge requirement of power by the Tea Industries, but due to lack of reliability, the Tea Estates are to depend on their captive generation only. To bring the tea industries in to power network, one 132/33kV substation is proposed with a short LILOfing line by LILOfing the Tinsukia – Dibrugarh 132kV Transmission line.

xviii) 132/33kV, 2x50 MVA MORIGAON AIS SUBSTATION

Morigaon is the district head quarter of Morigaon District. Most backward district of the Country. District demography constitutes mainly Plain tribes (Tiwa, Lalung etc) and Schedule cast. Population of the district is more than 12.0 lakhs. Power requirement is 14.0 MW and is primarily fed from Baghjap (Jagiroad) 132/33kV substation, which is located in the border of Kamrup district at a distance of 15.0 KM. One more EHV substation (Khaloigaon) is again located at Nagon district boarder that too at distance 27.0 KM. The district headquarter is getting un-reliable as well as poor quality power.

Massive village electrification is going on under Rural Electrification Scheme and it is expected that power demand of Morigaon will be 25MW by the Year 2021-22. AEGCL proposed one 132/33kV substation at Morigaon with a LILOfing of one circuit of proposed Jagiroad-Khaloigaon 132kV D/C line.

xix) 220/33kV, 2x50 MVA NAGAON-2 GIS SUBSTATION.

Nagaon-2 substation is proposed at Nagaon District Headquarter, Nagaon City. Peak power demand of the Nagaon City is around 40 MW and is fed from Samaguri EHV substation at distance of 22.0 KM. The other EHV substation which is known as Nagaon (Khaloigaon) 132/33kV substation is basically located at 18.0 KM west of the city. The city is facing acute voltage problem in addition to poor reliability. The city is expanding in all directions and to cater the load growth of the city, one Gas Insulated EHV substation is proposed with one double circuit 132kV line from Samaguri 220/132 kV substation.

xx) 132/33kV, 2x50 MVA AMAYAPUR AIS SUBSTATION

Amayapur is located in west of Nalbari District. It is 12.0KM from district headquarter, Nalbari, Bogrihati and its adjoining area Chamata, Mukalmua, Marowa and Barbhag are famous for cottage industries and which brings fame to Nalbari District as Number one district of Assam for cottage industries. Power is fed to this area through the 33/11kV substations Chamata, Marowa, Mukalmua etc. and 33kV feeders from Nalbari EHV substation. Because of poor reliability and lack of quality power, the cottage industries are not able to produce products as per capacities.

To eliminate this paranoid issue of power, one 132/33kV substation is proposed with one double circuit 132kV line from ongoing Hajo 132/33 kV substation.

xxi) 132/33kV, 2x50 MVA, LUMDING GIS SUBSTATION:

Lumding is located in Hojai District of Assam. Lumding is famous for NF Railway's important junction as well Divisional Headquarter. Lumding is again a commercial centre for the Karbi Along Hill Districts. Presently, power is fed from through 33kV line emanating from Shankardeb Nagar 132/33kV substation. Present peak demand is more than 16 MW and is expected to be more than 25 MW by the year 2021-22. To enhance reliability as well as quality of power, one 132/33kV substation is proposed by making LILO of Shankardeb Nagar-Diphu 132kV S/C line.

xxii) 132/33kV, 2x50 MVA, DHUPDHARA AIS SUBSTATION:

Dhupdhara (N25.972444, E91.079043), is a township of Goalpara district of Assam. It is 25 KM from Boko 220/132/33kV Substation and 50 KM from nearest Matia 132/33kV substation. Dhupdhara and nearby Rangjuli is famous for horticultural and paddy production, but without proper irrigation system. Presently, entire area is facing on reliable and quality power, as such, even after having enormous potential on agro based industries, no such industries are coming up due to lack of reliable power. The Government of Assam propose one Industrial Park at Rangjuli. Peak Load of Dhupdhara by FY 2021-22 is estimated as 20 MW.

xxiii) 132/33kV, 2x50 MVA, SERFANGURI AIS SUBSTATION:

Serfanguri is in the district of Kokrajhar under Bodoland Territorial Administrative Council (BTAD). GPS location is N 26.547894, E 90.169366 and situated at 25 KM from nearest Kokrajhar 132/33kV substation. Demographically, the majority of the are belongs to Plain Tribes i.e. Bodo. Livelihood is basically dependent on agriculture. The BTAD has developed one Industrial Park and load requirement will be around 40 MW. As such for the FY 2021-22, 15 MW is considered.

xxiv) 220/132kV, 2x160MVA ROWTA GIS SUBSTATION:

Rowta is in the district of Udalguri under Bodoland Territorial Administrative Council (BTAD) connected with NH15. Demographically, the majority of the area belongs to Plain Tribes i.e. Bodo and agriculturally developed area. Considering the load growth it is proposed to construct a new 220/132KV, 2X160MVA S/S at Rowta which is to be connected from New Rangia GSS.

3.5 AUGMENTATIONS AND EXTENSION OF EXISTING SUBSTATIONS

3.5.1 Based on peak demand of the year **2021-22** and requirement of Power for All by FY 2019-2020 and to limit the loadings of transformers in substations, transformation capacities of the following substations are proposed to be augmented by addition of new transformers or by replacing old transformers by new higher capacity transformers:

- 1) **Narengi**, 132/33 kV Substation:
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.
- 2) **Bornagar**, 132/33kV Substation
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.
- 3) **Moran**, 132/33 kV Substation:
New 2x50 MVA 132/33 kV in place of old 2x16 MVA transformers.
- 4) **Gauripur**, 132/33kV Substation:
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.

- 5) **Dibrugarh**, 132/33kV Substation:
New 2x50 MVA 132/33 kV in place of old 2x31.5 MVA transformers.
- 6) **Depota**, 132/33kV Substation:
New 2x50 MVA 132/33 kV in place of old 2x31.5 MVA transformers.
- 7) **Kahilipara**, 132/33kV Substation:
New 3x50 MVA 132/33 kV in place of old 1x31.5 + 2x30 MVA transformers.
- 8) **Rangia**, 132/33kV Substation:
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.
- 9) **Golaghat**, 132/33kV Substation
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.
- 10) **Shankardeb Nagar**, 132/33kV Substation
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.
- 11) **Kukurmara**, 132/33 kV Substation:
New 2x50 MVA 132/33 kV in place of old 1x25+ 1x16 MVA transformers.
- 12) **Panchgram**, 132/33kV Substation.
New 2x50 MVA 132/33 kV in place of old 2x25 MVA transformers.
- 13) **Boko**, 220/132 kV Substation:
New 1X100MVA+1x160 MVA 220/132 kV in place of old 1x50 MVA transformers.
- 14) **Agia**, 220/132 kV Substation:
New 1x160 MVA 220/132 kV in place of old 1x50 MVA transformers..

3.6 Augmentaion of Switching Scheme

- 3.6.1 To agument the existing switching scheme in the critical substation, it is proposed to convert the present Air Insulated Type substation to Gas Insulated Substation for the following EHV substations.
 - 1) **Gohpur 132/33kV** Air insulated substation with single bus switching scheme is critical to entire North Bank districts of Assam. This substation is well connected for evacuation of power from Ranganadi HEP (Arunachal Pradesh) and presently it will again be connected directly to Biswanath Charali HVDC substation. As such to keep the switching scheme flexible, conversion is proposed from AIS to GIS.

3.7 Capacity Augmentaion of Transmission Lines.

- 3.7.1 Capacity augmentation of existing overloaded/critical 220kV & 132kV transmission lines by Re-conductoring through new generation of high capacity conductors i.e. High Temperature Low Sag (HTLS) for the following transmission lines.
 - 1) **BTPS (Salekathi) – Dhaligaon** 132kV D/C Line
 - 2) **Kukurmara (Azara) – Sarusajai** 220kV D/C line.
 - 3) **Gossaigaon – Gauripur**, 132kV S/C line.

3.8 COMMUNICATION (Fiber Optics, OPGW)

- 3.8.1 For all new transmission lines earth wire will be in the form of Optical Fibre Ground wire and the communication as well as tele protection of lines shall be established and to SLDC through these Optical Fibers.

CHAPTER-2

PLANNING OF PHASE WISE EXECUTION

The project is divided into two phases. In the first phase AEGCL will execute construction of 10 nos. substation along with its associated transmission lines and bay extension, Augmentation of transformation capacity, Conversion of Air Insulated Substation (AIS) to Gas Insulated Substation (GIS), Installation of Optical Ground Wire (OPGW), Augmentation of Transmission Lines (Re-conductoring by HTLS) and Institutional capacity building measures in AEGCL and the balance work i.e. Construction of 14 nos. substation along with transmission lines and associated bays will be done in the second phase which is expected to be commence within one year from the commencement of the first phase.

The planning of phase wise execution of the projects are as under:

1. SUBSTATIONS AND ASSOCIATED TRANSMISSION LINE:

| SL NO | SCOPE OF WORK | ROUTE LENGTH/ LOAD (CKM/MW) | Implementation phase |
|-------|--|-----------------------------|----------------------|
| 1 | Establishment of new 220/132 kV (2 X 160 MVA) and 132/33 kV (2 X 50 MVA) S/s at Khumtai | | Phase 1 |
| | 220 kV: | | |
| | LILO of Mariani-Samaguri (AEGCL-Existing) S/C Line 1 at Khumtai (AEGCL-New) - Samaguri (AEGCL-Existing) - S/C Line | 6 kM | |
| | LILO of Mariani-Samaguri (AEGCL-Existing) S/C Line 2 at Khumtai (AEGCL-New) - Samaguri (AEGCL-Existing) - S/C Line | 5 kM | |
| | 132 kV: | | |
| | LILO of Jorhat (W)-Bokakhat (AEGCL-Existing) at Khumtai (AEGCL-New) S/C Line | 5 kM | |
| | Khumtai (AEGCL-New) - Sarupathar (AEGCL-Existing) S/C Line | 60 kM | |
| 2 | Establishment of new 220/33 kV (2 X 100 MVA) S/s at Bihpuria | | |
| | 220 kV: | | |

| SL NO | SCOPE OF WORK | ROUTE LENGTH/ LOAD (CKM/MW) | Implementation phase |
|-------|---|-----------------------------|----------------------|
| | 220KV Bihpuria (AEGCL-New) - Sonabil (AEGCL-Existing) D/C Line ** actual route length is 123 km. 55km line is completed by AEGCL from Sonabil end . Remaining 78 km is to be completed under this project | 78km | Phase 1 |
| 3 | Establishment of new 220/33 kV (2 X 100 MVA) GIS Substation at Jakhlabandha | | Phase 1 |
| | 220KV: | | |
| | LILO of 220kv Samaguri-Mariani line 1 (AEGCL-Existing) at Jakhlabandha(AEGCL-New) S/C line | 10KM | |
| 4 | *Establishment of new 220/33 kV (2 X 100 MVA) GIS Substation at Chhaygaon | | Phase 1 |
| | *220 kV: | | |
| | LILO of 220kv Azara – Boko (AEGCL-Existing) line at Chayygaon | 3 kM | |
| 5 | Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Burhigaon | | Phase 1 |
| | 132 kV: | | |
| | LILO of Rowta-Sipajhar (AEGCL-Existing) S/C Line at Burhigaon (AEGCL-New) | 15 kM | |
| 6 | *Establishment of new 220/33 kV (2 X 100 MVA) GIS Substation at Nagaon-2 | | Phase 1 |
| | 220 kV: | | |
| | LILO of Samaguri (AEGCL- Existing) –Sarusajai (AEGCL-Existing) 220kV D/C Line at Nagaon-2 (AEGCL-New) | 1 kM | |
| 7 | Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Lumding | | Phase 2 |
| | 132 kV: | | |
| | LILO of Shakardevnagar (AEGCL- Existing) S/C Line - Diphu (AEGCL-Existing) S/C Line at Lumding (AEGCL-New) | 10 kM | |
| 8 | Establishment of new 220/132 kV (2 X 160 MVA) | | |

| SL NO | SCOPE OF WORK | ROUTE LENGTH/LOAD (CKM/MW) | Implementation phase |
|-------|--|----------------------------|----------------------|
| | Substation at Rowta | | Phase 2 |
| | 220 kV: | | |
| | Rowta (AEGCL- New) - Rangia (AEGCL-Existing) D/C Line | 80 kM | |
| 9 | Establishment of new 400/220 kV (2 X 500 MVA) Substation at Rangia | | Phase 1 |
| | 400 kV: | | |
| | LILO of 1 ckt of Balipara (PGCIL)-Bongaigaon (PGCIL) Line at Rangia (AEGCL-New) | 21 kM | |
| | 220 kV: | | |
| | LILO of 1 ckt of Rangia - Amingaon (Existing-AEGCL) Line at Rangia (AEGCL-New) | 10 kM | |
| | Rangia (AEGCL-Existing) - Rowta (AEGCL-New) D/C Line | 80 kM | |
| 10 | Establishment of new 400/220 kV (2 X 500 MVA) Substation at Sonapur | | Phase 1 |
| | 400 kV: | | |
| | LILO of 1 ckt of Silchar (PGCIL)-Byrnihat (Meghalaya) Line at Sonapur (AEGCL-New) | 25 kM | |
| 11 | *Establishment of new 220/132 kV (2 X 160 MVA) GIS at Agomoni | | Phase 1 |
| | 220 kV: | | |
| | *LILO of both ckt of Alipurduar (PGCIL) - Bongaigaon (PGCIL) D/C line at Agomoni(AEGCL-New) | 3 kM | Phase 2 |
| | *Establishment of new 132/33 kV (2 X 50 MVA) AIS Substation at Agamoni | | |
| | 132 kV: | | |
| | LILO of Gossaigaon - Gauripur S/C (AEGCL-Existing) Line at Agamoni (AEGCL- New) | 10 kM | |

| SL NO | SCOPE OF WORK | ROUTE LENGTH/ LOAD (CKM/MW) | Implementation phase |
|-------|--|-----------------------------|----------------------|
| 12 | Establishment of new 220/132 kV (2 X 160 MVA) GIS Substation at Shankardevnagar | | Phase 1 |
| | 220 kV: | | |
| | Shankardevnagar (AEGCL-New) - Misa (AEGCL-Existing) D/C Line | 25 kM | |
| | Shankardevnagar (AEGCL-New) - LKHEP (APGCL) D/C Line- (Other Source) | 50 kM | |
| 13 | Establishment of new 220/33 kV (2 X 100 MVA) GIS Substation at Boragaon (Jalukbari) | | Phase 2 |
| | 220 kV: | | |
| | Boragaon (Jalukbari) (AEGCL-New) - Kukurmara (AEGCL-Existing) D/C Line | 21 kM | |
| 14 | Establishment of new 220/33 kV (2 X 100 MVA) GIS Substation at Panjabari | | Phase 2 |
| | 220 kV: | | |
| | LILO of Sonapur-Sarusajai (AEGCL-Existing) -S/C Line at Panjabari (AEGCL- New) | 3 kM | |
| 15 | *Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Zoo Road | | Phase 2 |
| | 132 kV: | | |
| | Zoo Road (AEGCL-New) - GMC (AEGCL-Existing) S/C Line | 8 kM | |
| 16 | Establishment of new 132/33 kV (2 X 50 MVA) Substation at Serfanguri | | Phase 2 |
| | 132 kV: | | |
| | Serfanguri (AEGCL- New) - Kokrajhar (AEGCL-Existing) D/C Line | 18 kM | |
| 17 | Establishment of new 132/33 kV (2 X 50 MVA) Substation at Dhing | | Phase 2 |
| | 132 kV: | | |
| | Dhing (AEGCL- New) - Nagaon (AEGCL- Existing) - S/C | 35 kM | |

| SL NO | SCOPE OF WORK | ROUTE LENGTH/ LOAD (CKM/MW) | Implementation phase |
|-------|---|-----------------------------|----------------------|
| | Line | | |
| 18 | *Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Ghungur (Silchar-2) | | Phase 2 |
| | 132 kV: | | |
| | Ghungur (AEGCL- New) - Srikona (AEGCL- Existing) - S/C Line | 10 kM | |
| 19 | Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Titabor | | Phase 2 |
| | 132 kV: | | |
| | Titabor (AEGCL-New) - Mariani (AEGCL-Existing) D/C Line | 20 kM | |
| 20 | Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Kumarikata | | Phase 2 |
| | 132 kV: | | |
| | Kumarikata (AEGCL-New) - Nalbari (AEGCL-Existing) S/C Line on D/C Tower | 40 kM | |
| 21 | Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Chabua | | Phase 2 |
| | 132 kV: | | |
| | LILO of Tinsukia (AEGCL-Existing) -Dibrugarh (AEGCL-Existing) S/C Line | 8 kM | |
| 22 | Establishment of new 132/33 kV (2 X50 MVA) AIS Substation at Morigaon | | Phase 2 |
| | 132 kV: | | |
| | Baghjhap(Existing)-Morigaon(New) D/C Line. | 20km | |
| 23 | Establishment of new 132/33 kV (2 X 50 MVA) AIS Substation at Amayapur | | Phase 2 |
| | 132 kV: | | |
| | Amayapur (AEGCL- New) - Hajo (AEGCL-Existing) D/C Line | 25 kM | |

| SL NO | SCOPE OF WORK | ROUTE LENGTH/ LOAD (CKM/MW) | Implementation phase |
|-------|--|-----------------------------|----------------------|
| 24 | Establishment of new 132/33 kV (2 X 50 MVA) AIS at Dhupdhara | | Phase 2 |
| | 132 kV: | | |
| | Dhupdhra (AEGCL- New) - Boko (AEGCL-Existing) D/C Line | 25 kM | |

2. AUGMENTATION OF TRANSFORMER CAPACITY:

| SL. NO. | Name of Substation | Implementation phase |
|---------|--|-----------------------|
| | <u>PRIORITY-I SUBSTATIONS</u> | |
| 1.01 | Narengi: 2x50 MVA, in place of 2x25 MVA, 132kV | <u>Phase 1</u> |
| 1.02 | Bornagar: 2x50 MVA, in place of 2x25 MVA, 132/33kV | |
| 1.03 | Moran: 2x50 MVA, in place of 2x16 MVA, 132/33kV | |
| 1.04 | Gauripur: 2x50 MVA, in place of 2x25 MVA, 132/33kV | |
| 1.05 | Dibrugarh: 2x50 MVA, in place of 2x31.5 MVA, 132/33kV | |
| 1.06 | Depota: 2x50 MVA, in place of 2x31.5 MVA, 132/33kV | |
| 1.08 | Kahilipara: 3x50 MVA, in place of 2x31.5 MVA & 1x30 MVA, 132/33kV | |
| 1.09 | Rangia: 2x50 MVA, in place of 2x25 MVA, 132/33kV | |
| 1.11 | Golaghat: 2x50 MVA, in place of 2x25 MVA, 132/33kV | |
| 1.13 | Sankardeb Nagar: 2x50 MVA, in place of 2x25MVA, 132/33kV | |
| 1.15 | Kukurmara: 2x50 MVA, in place of 1x25MVA +1x16 MVA, 132/33kV | |
| 1.16 | Panchgram: 2x50 MVA, in place of 2x25MVA, 132/33kV | |
| 1.2 | Boko: 1x160 +1x100 MVA, in place of 1x50 +1x100 MVA, 220/132kV | |
| 1.21 | Agia: 1x160 +1x100 MVA, in place of 1x50 +1x100 MVA, 220/132kV | |

3. AUGMENTATION OF TRANSMISSION LINE (RESTRINGING BY HTLS)

| SI No | Name of Line | CKM | Implementation phase |
|-------|--|-----|----------------------|
| 1 | 2 | | |
| 1 | TRANSMISSION LINES | | |
| 1.01 | BTPS (Salekati) – Dhaligaon 132kV D/C line | 76 | Phase 1 |
| 1.02 | Kukurmara – Sarusajai 220kV D/C line | 48 | |

| SI No | Name of Line | CKM | Implementation phase |
|-------|--------------------------------------|------------|----------------------|
| *1.03 | Gossaigaon – Gauripur 132kV S/C line | 62 | |
| | TOTAL | 186 | |

4. BAY EXTENSION:

| SL. NO. | Name of Substation | Implementation Phase |
|---------|---|----------------------|
| | <u>PRIORITY-I SUBSTATIONS</u> | |
| 1.01 | Azara: Two 220 kV line bay for Azara-Boragaon 220 kV Line | Phase 1 |
| 1.02 | Mariani: Two 132 kV line bay for Mariani-Titabor 132 kV Line | |
| 1.03 | Srikona: One 132 kV line bay for Srikona-Ghungur 132 kV UG Cable Line | |
| 1.05 | Nagaon: One Bay for Nagaon – Dhing 132kV S/C Line | |
| 1.08 | Sarupathar: Two 132 kV line bays for Khumtai-Sarupathar 132 kV D/C Line | |
| 1.09 | GMC: One 132 kV GIS line bay for GMC-Zooroad 132 kV UG Cable S/C Line | |
| 1.10 | Nalbari: One 132 kV line bay for Nalbari-Kumarikata 132 kV S/C Line | |
| 1.14 | Hajo: Two 132 kV line bays for Hajo-Amayapur 132 kV D/C Line | |
| 1.15 | Boko: Two 132 kV line bays for Boko-Dhupdhara 132 kV D/C Line | |
| 1.16 | Kokrajhar: Two 132 kV line bays for Kokrajhar-Serfanguri 132 kV D/C Line | |

5. REPLACEMENT OF GROUND WIRE TO OPGW:

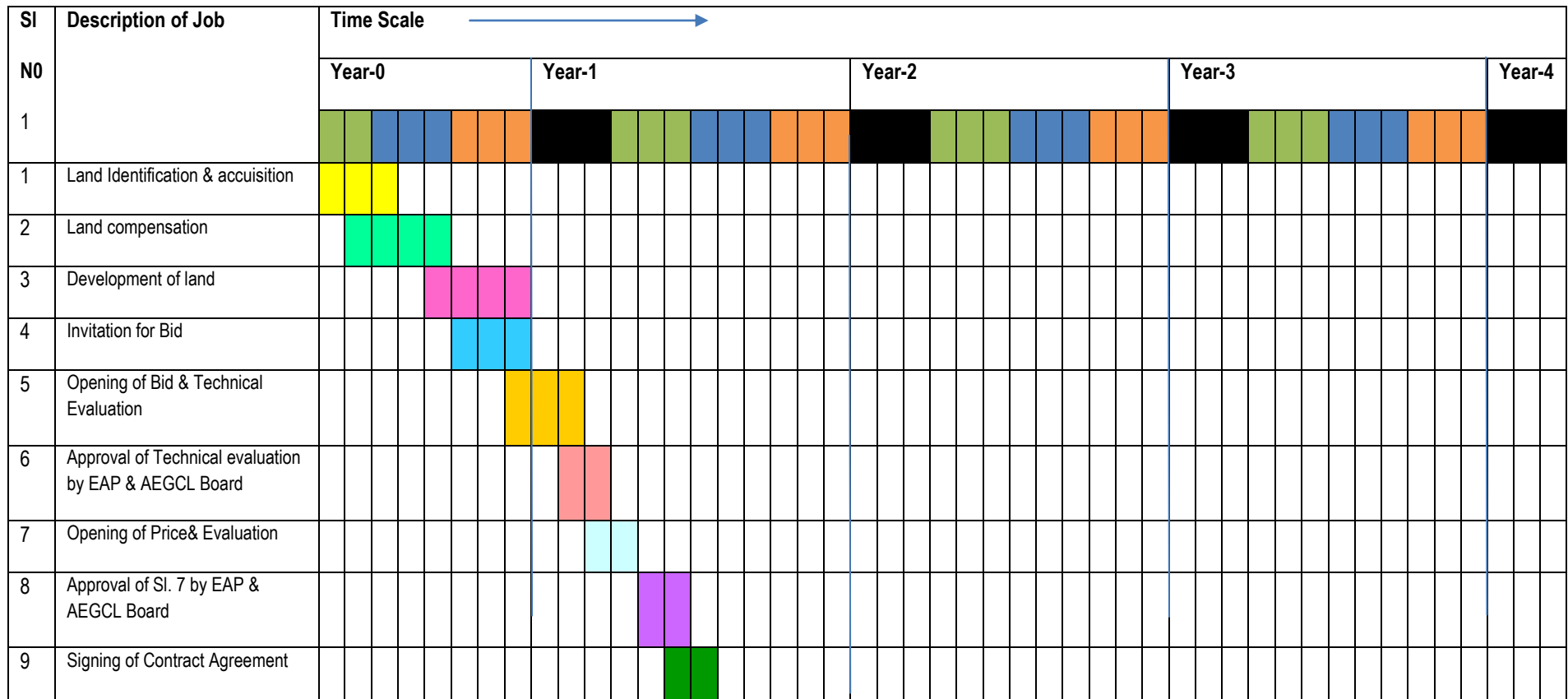
| SL. NO. | Name of Links | Implementation Phase |
|---------|--|----------------------|
| 1 | Fiber Optics on balance transmission lines of AEGCL, 615 kMs | Phase 1 |
| 2 | Fiber Optics on Station Equipments at 18 numbers of Substation (LS). | |

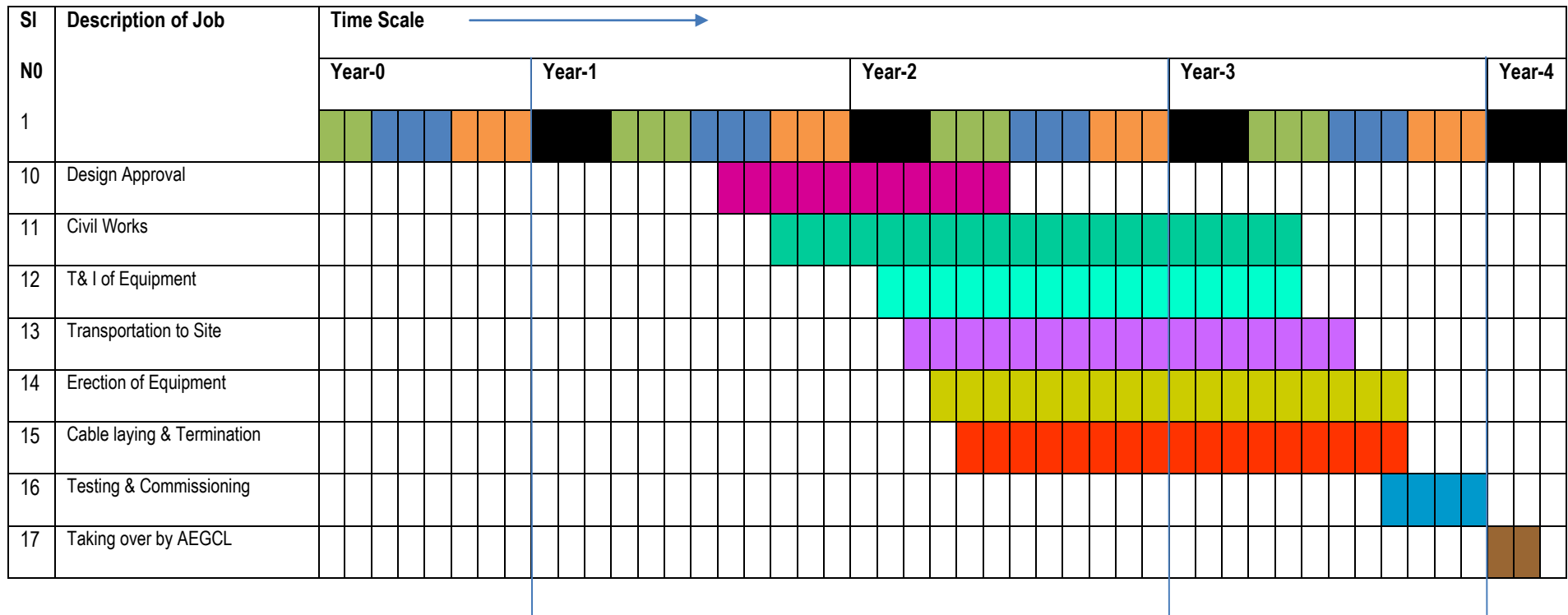
6. CONVERSION OF AIS SUBSTATION TO GIS SUBSATTION: ONE NO. (GOHPUR GSS) ----- Phase 1

CHAPTER-4

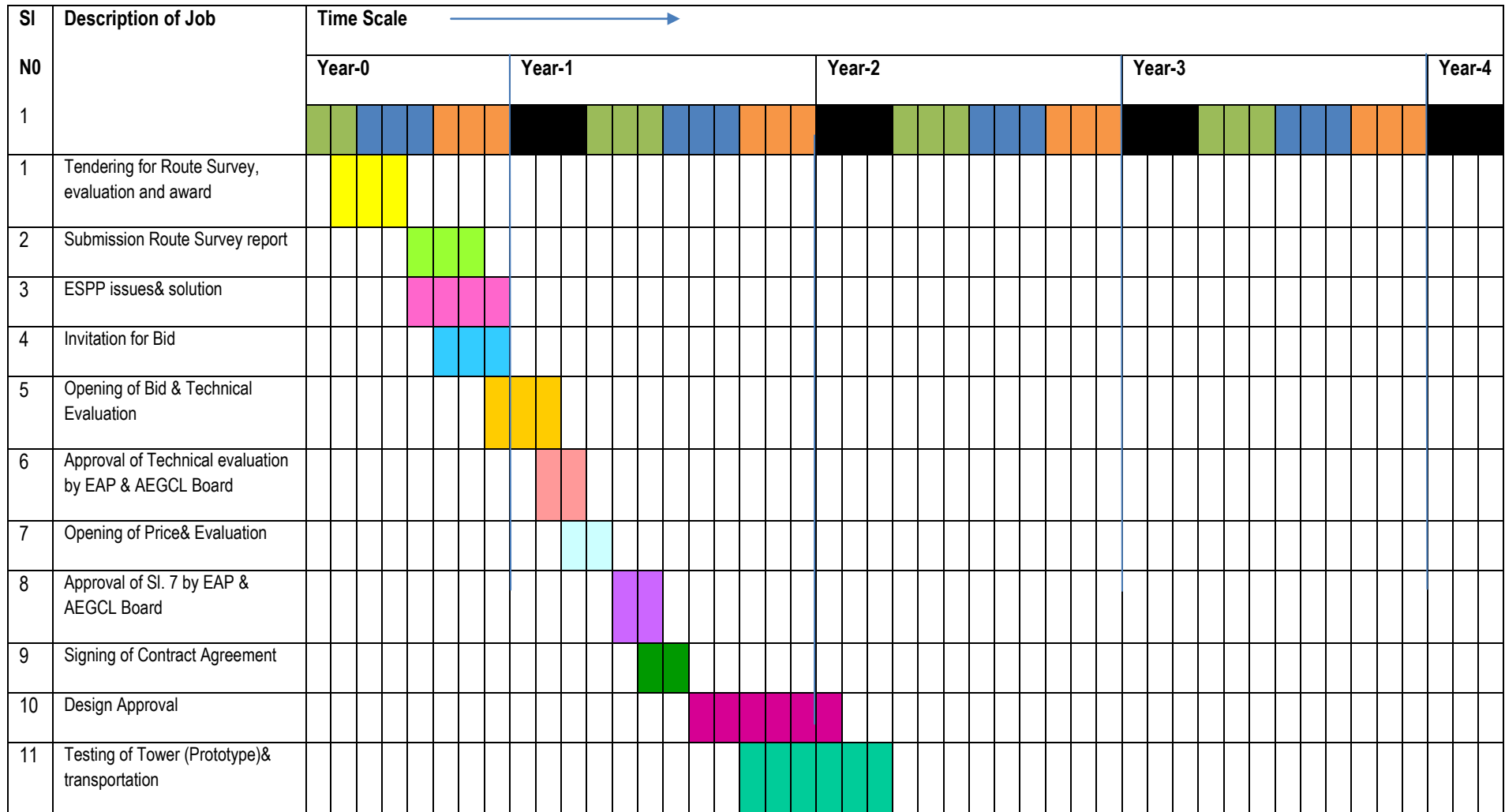
PROJECT IMPLEMENTATION SCHEDULE:



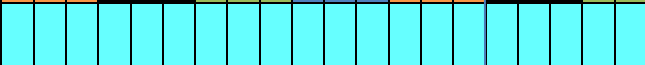
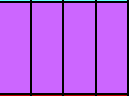
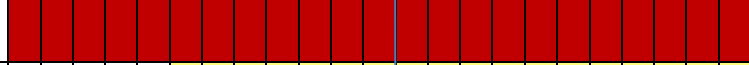
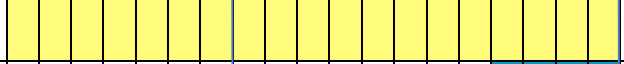


BAR CHART FOR CONSTRUCTION OF NEW 400/220, 220/132, 220/33, 132/33, 132/11 KV SUBSTATIONS





BAR CHART FOR CONSTRUCTION OF NEW 400kV, 220kV, 132 kV TRANSMISSION LINE



| SI | Description of Job | Time Scale  | | | | |
|----|--|---|--------|---|---|---|
| | | Year-0 | Year-1 | Year-2 | Year-3 | Year-4 |
| 1 | |  | | | | |
| 12 | Foundation work for tower | | |  | | |
| 13 | Testing of conductor, accessories etc & transportation | | |  | | |
| 14 | Erection of Tower | | |  | | |
| 15 | Stringing of conductors | | |  | | |
| 16 | Testing & Commissioning | | | |  | |
| 17 | Taking over by AEGCL | | | | |  |

BAR CHART FOR CAPACITY AUGMENTATION OF EXISTING SUBSTATION

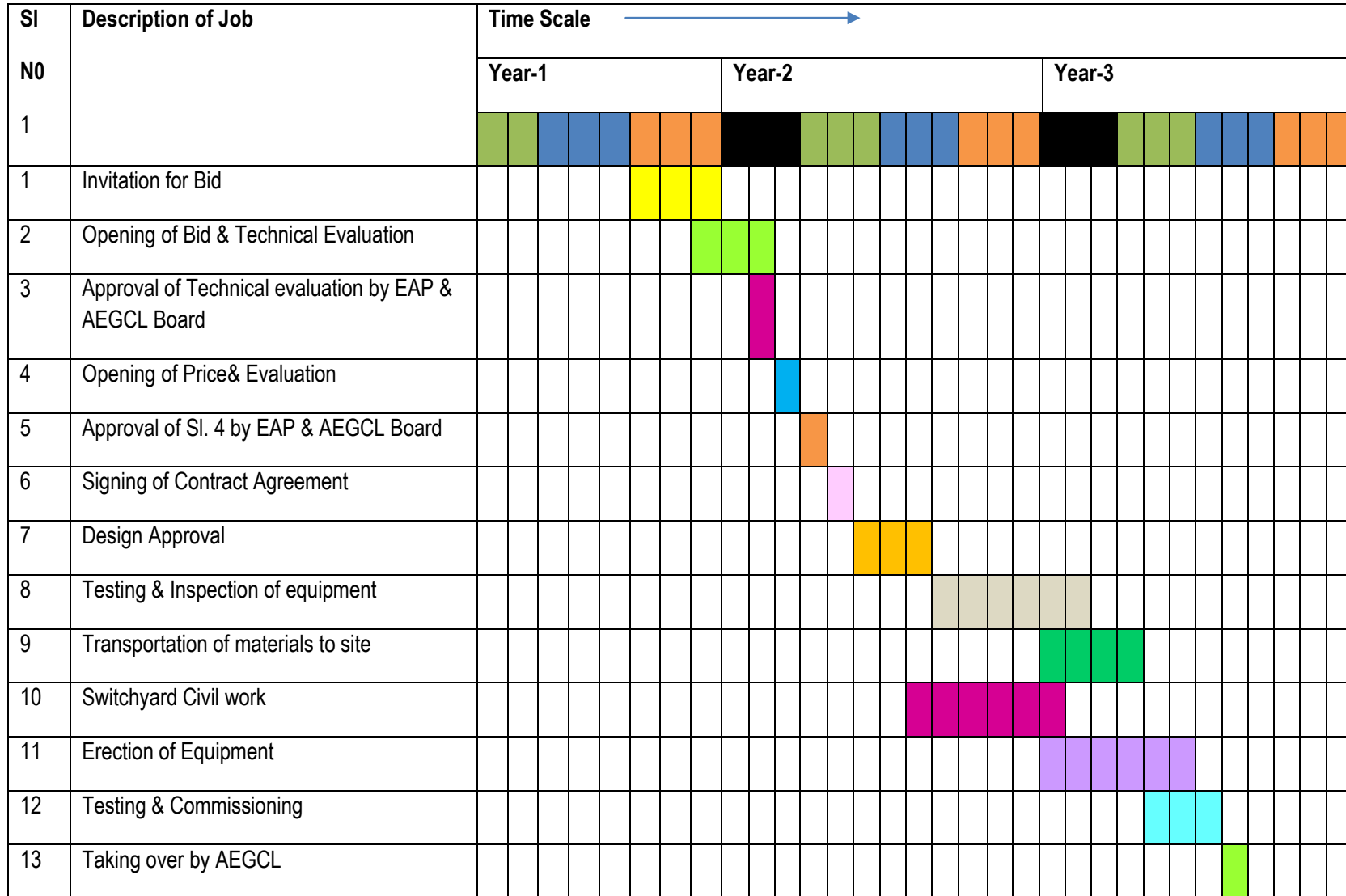


EXHIBIT - 4.13

BAR CHART FOR CAPACITY AUGMENTATION OF EXISTING TRANSMISSION LINE

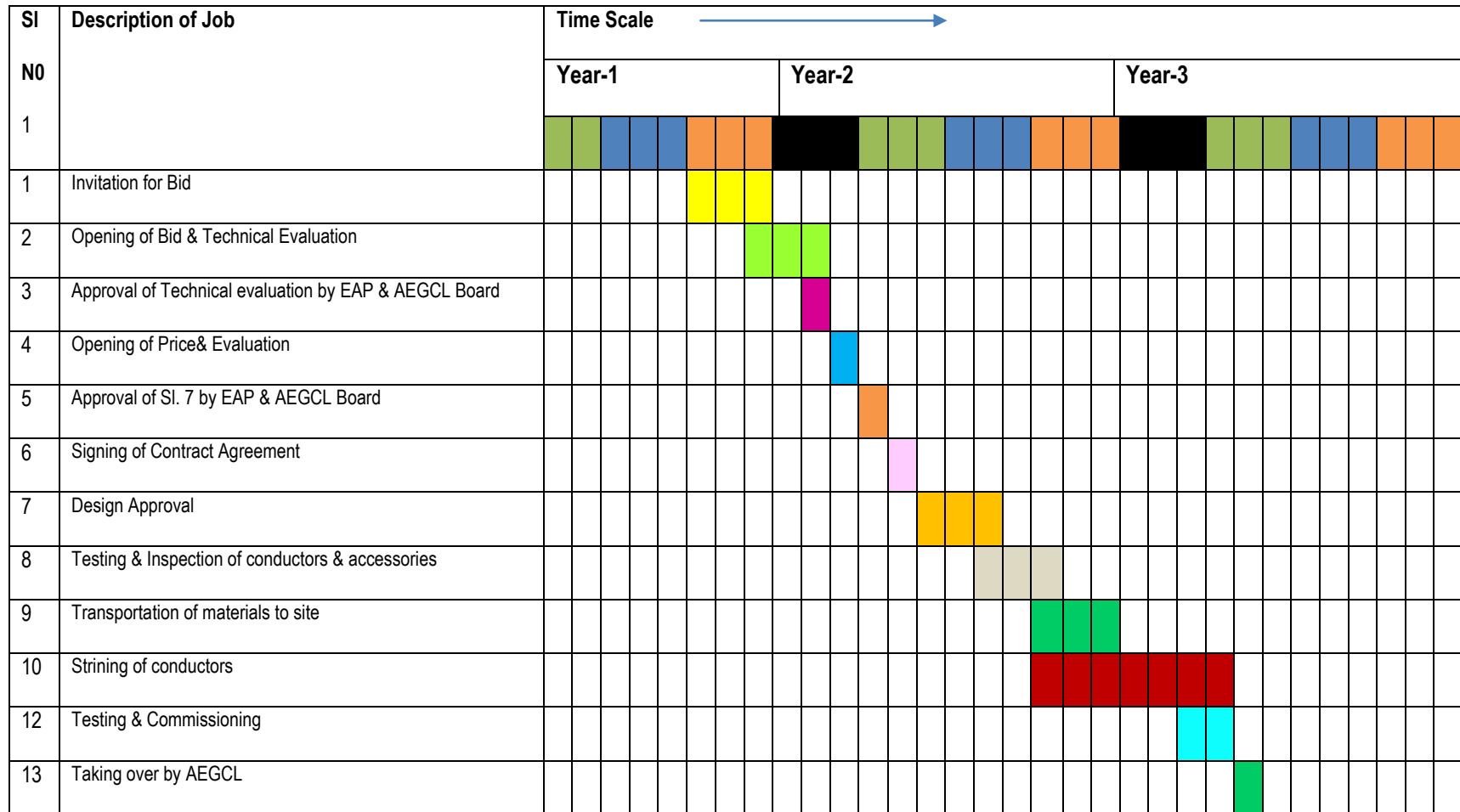


EXHIBIT - 4.14

BAR CHART FOR INSTALLATION OF COMUNICATION SYSTEM (FIBER OPTICS)

