TRANSMISSION SYSTEM PLANNING FOR ASSAM ELECTRICITY GRID CORPORATION LIMITED

"VISION 2047"

Assam Electricity Grid Corporation Limited

(State Transmission Utility)

Corporate Office: Bijulee Bhawan, 1st floor

Paltan Bazar, Guwahati – 781001

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ASSAM ELECRCITIY GRID CORPORATION LIMITED

"A STATE TRANSMISSION UTILITY"

Assam Electricity Grid Corporation Limited, is a vibrant growth oriented Public Sector Company registered under 'Company Act, 1956'. It was formed out of restructured Assam State Electricity Board (ASEB) in 2003 and was notified as the State Transmission Utility (STU). AEGCL operates with its headquarters at Bijulee Bhawan, Paltanbazar, Guwahati-1 and various filed offices and substations premises spread all across the state.

The Intra State Transmission system (IaSTS) of AEGCL has 82 numbers of substations (1 no. of 400kV, 14 nos. of 220kV and 66 nos. of 132kV) and many upcoming substations in progress.

AEGCL operates transmission lines and transformers at 400kV, 220kV and 132kV level with a total MVA capacity of 9339.5MVA and transmission lines of a total of 5270 circuit kilometer

The present transmission system of AEGCL can be summarized as below:

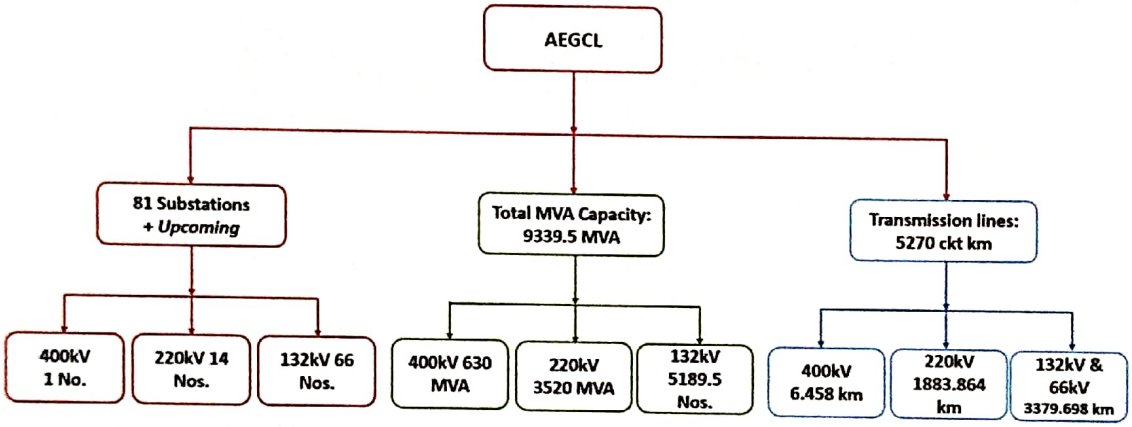

Fig 1: *Summary of Transmission elements of AEGCL*

The AIM of AEGCL as an STU has always been:

a. Maintain uninterrupted and reliable power transmission between power provider (Generating stations) and power consumers (distributions sub-stations)
b. Maintain Quality Power flow
c. Adapt with the change in technology and change in demand of power

AEGCL believes that

"Uninterrupted and reliable power supply is the backbone of an economy. Energy is the indispensable force that drives all economic activity – the greater the energy consumption, the more the economic activity, resulting in the emergence of growth. A steady growth in the economy is a prerequisite for any nation desirous of becoming a developed country"

The Power Scenario of Assam

The state of Assam is situated in the North-East of India and is the largest northeastern state in terms of population while second in terms of area. Assam covers an area of 78,438 km^2. The current estimated population of Assam is approximately 3.66 crores. The state is bordered by Bhutan and the state of Arunachal Pradesh in the north; Nagaland, Arunachal Pradesh, and Manipur to the east; Meghalaya, Tripura, Mizoram, and Bangladesh to the south; and West Bengal to the west.

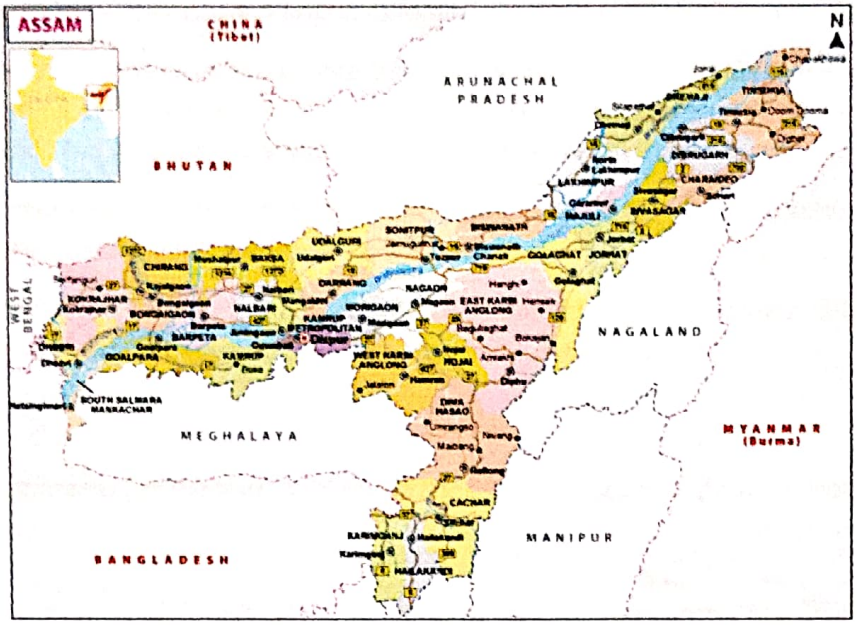

Fig 2: *Map of Assam* (Source: *Mapsofindia.com*)

The last recorded highest peak demand for Assam was observed at 2500 MW. The power is acquired from various sources as shown below:

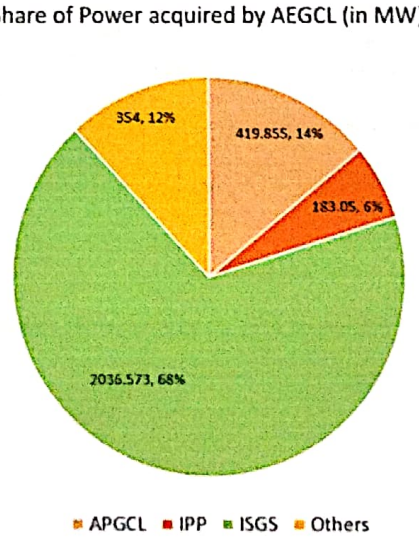

Fig 3: *Share of power from various sources (AEGCL)*

The peak demand has followed a rapidly increasing trend over the last decade. The infrastructure of AEGCL must be augmented and expanded to increase its power handling capacity and comply with the power requirement of the State.

Assam had rapidly evolved into a thriving hub from industry and infrastructure, boasting a total of 20 industrial estates, 3 industrial growth centres, 11 Integrated Infrastructure Development Depots, 17 Industrial areas, 12 growth centres, 8 mini-industrial estates, and other specialize zones for export promotion and food processing parks etc. The present industry and infrastructure scenario of Assam are attracting industries worldwide.

As per present development, an international highway corridor to Myanmar is under process of planning by the Government. Arunachal Pradesh having high potential in Hydro electric generation has a plan for evacuation of 24 GW or power by 2047.

AEGCL firmly believes to comply with the **Section 40. Of the Indian Electricity Act, 2003**, which states the Duties of transmission licensees as –

"To build, maintain and operate an efficient, co-ordinated, and economical inter-state transmission system or intra-state transmission system, as the case may be"

Assam Grid is connected to the National Grid via the following locations (transmission links):

Fig 4: *The connection links of AEGCL with the National Grid*

"Planning for the transmission system of Assam"

The planning was carried out strictly based on the following approaches:

a. Increase in the power handling capacity to meet the present and future forecasted demand of the state with a detailed logistical approach
b. Strict maintenance of redundancy in power system network
c. Emphasis on improvement of power quality
d. Adaptation and implementation of new age technologies and operation techniques in Power Systems to improve the overall control, monitoring and management of the system
e. Injection from RE (Renewable Energy) Generators and its effect on existing grid
f. Focus on Implementation of Green Energy

Work Flow for the Planning:

i. The trend of increase in load demand was studied for areas across the state. The areas were fixed based on power source and load centres

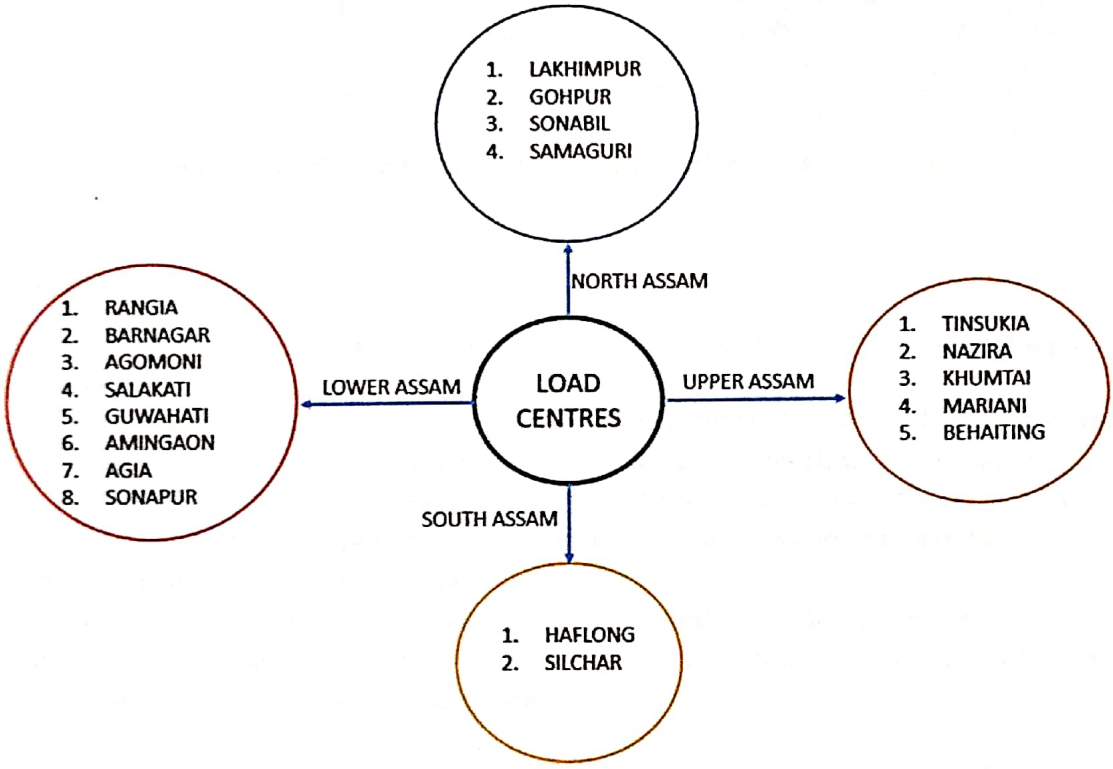

Fig 5: *Load centres of Assam (Region Wise)*

The increase in load has been considered by studying the following factors (2025 – 2047):

a. Increase in % increase in 33kV loads across the regions considered in *fig. 4*
b. Planning of Traction loads by Railways across the state
c. Increase in trend of Industrial load across the state

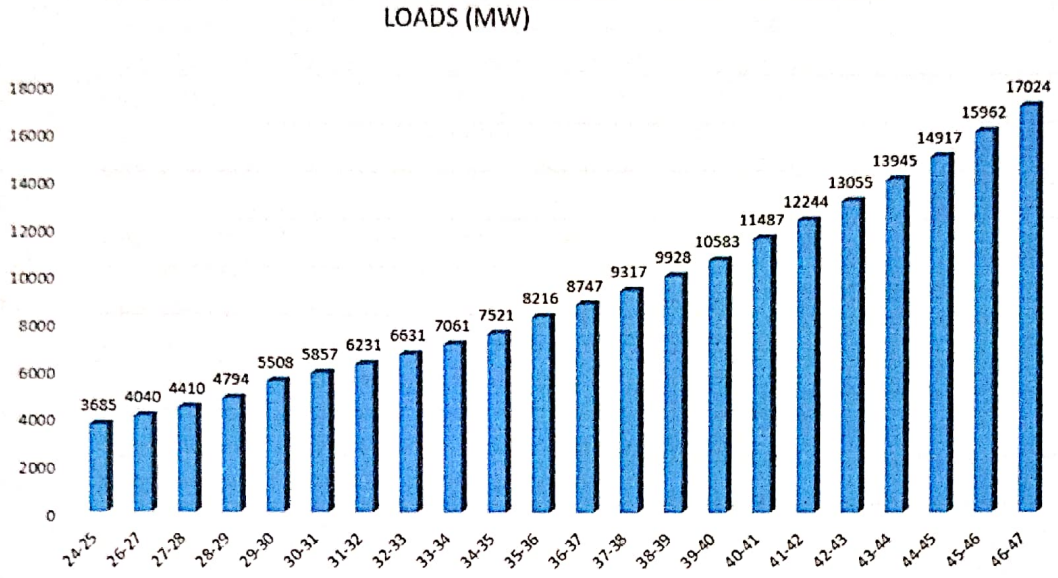

Fig 6: *Trend of increase in 33kV Load from (2024 – 2047) in Assam*

ii. The final workflow in the planning is as below:

a. Studying the overloading of the power transformers and loss of (n-1) redundancy over the years under study
b. Studying the overloading of transmission lines at 400kV, 220kV and 132kV Level and checking the loss of redundancy in transmission links connecting critical load points
c. Introduction of new substations and transmission links (intra and inter-utility) at 400kV, 220kV and 132kV levels to strengthen the transmission system of State
d. Reactive Power Management in the area
e. Environmentally friendly methods of system enhancement or augmentation
f. Creation of Central Control Centre and Asset Management centre to increase the overall efficiency of system operation

SUMMARY OF PROPOSALS

Proposed Upgradation of Existing Voltage Level of Substations and Construction of New Substations across the State of Assam

SN	SUBSTATION	REMARKS
1	Upgradation of 220/132/33kV Agia GSS to 400/220/132/33kV GSS	
2	Upgradation of 220/132/33kV Sarusajai GSS to 400/220/132/33kV GSS	
3	Upgradation of 132/33kV Kahilipara GSS to 220/132/33kV GSS	
4	Upgradation of 132/33kV Chandrapur GSS to 220/132/33kV GSS	
5	Upgradation of 132/33kV Barpeta GSS to 220/132/33kV GSS	
6	Upgradation of 132/33kV APM GSS to 220/132/33kV GSS	
7	Upgradation of 132/33kV Umranghsu GSS to 220/132/33kV GSS	
8	Upgradation of 220/132/33kV Samaguri GSS to 400/220/132/33kV GSS	
9	Upgradation of 132/33kV Chapakhowa GSS to 220/132/33kV GSS	
10	Upgradation of 132/33kV Gohpur GSS to 220/132/33kV GSS	
11	Upgradation of 132/33kV Nazira GSS to 220/132/33kV GSS	
12	Upgradation of 132/33kV Bokakhat GSS to 220/132/33kV GSS	
13	Upgradation of 132/33kV Jonai GSS to 220/132/33kV GSS	
14	Upgradation of 132/33kV Rowta to 400/220/132/33kV Rowta GSS	
15	Upgradation of 132/33kV Rupai GSS to 220/132/33kV GSS	
16	Construction of 220/132/33kV Kalaigaon GSS	
17	Construction of 220/132/33kV Baksa GSS	
18	Construction of 220/132/33kV Bajali GSS	
19	Construction of 220/132/33kV Dhubri GSS	
20	Construction of 220/132/33kV Bogribari GSS	
21	Construction of 220/132/33kV Abhayapuri GSS	
22	Construction of 220/132/33kV Bijni GSS	
23	Construction of 220/132/33kV Doulachal GSS	
24	Construction of 220/132/33kV Chamata GSS	
25	Construction of 220/132/33kV Barka GSS	
26	Construction of 220/33kV Bezera GSS	
27	Construction of 400/220/132/33kV Dullavcherra GSS	
28	Construction of 220/132/33kV Patharkandi GSS	
29	Construction of 220/132/33kV Kaliganj GSS	
30	Construction of 220/132/33kV Silcoorie GSS	
31	Construction of 220/132/33kV Baskandi GSS	
32	Construction of 400/220/132/33kV Naharkatia GSS	
33	Construction of 220/132/33kV Simen Chapori GSS	
34	Construction of 220/132/33kV Pulibor GSS	
35	Construction of 132/33kV Gaurisagar GSS	
36	Construction of 132/33kV Geleki GSS	
37	Construction of 132/33kV Sapekhati GSS	
38	Construction of 132/33kV Bamunbari GSS	
39	Construction of 132/33kV Modertoli GSS	
40	Construction of 132/33kV Baithalangshu GSS	
41	Construction of 132/33kV Dokmoka GSS	
42	Construction of 132/33kV Goreswar GSS	

43	Construction of 132/33kV Salbari GSS

Table 1: *Proposed Upgradation of Voltage level and construction of new Substations*

Proposed construction of new Transmission links (Intra and Inter-State) across the State of Assam

SN	TRANSMISSION LINKS
1	400kV Agia – Eastern/Northern Indian Grid (D/C link)
2	400kV Barnagar – 400kV Rangia – 400kV Sarusajai – 400kV Agia – 400kV Barnagar (D/C link)
3	400kV Barnagar – 400kV Rowta – 400kV Balipara (D/C link)
4	220kV Rowta – 220kV Kalaigaon – 220kV New Rangia – 220kV Baksa – 220kV Bajali – 220kV Barnagar (ISTS) (D/C link)
5	220kV Kalaigaon – 220kV Bezera – 220kV Barka
6	220kV Gossaigaon (Agomoni) – 220kV Dhubri – 220kV Bogribari – 220kV APM – 220kV Abhayapuri – 220kV Dhaligaon – 220kV Bijni – 220kV Barnagar – 220kV Barpeta – 220kV Doulachal – 220kV Amingaon (D/C link)
7	220kV Agia – 220kV APM (D/C link)
8	220kV Doulachal – 220kV Chamata (D/C link)
9	220kV Amingaon – 220kV Panjabari – 220kV Kahilipara – 220kV Sarusajai (D/C link)
10	220kV New Sonapur – 220kV Chandrapur – 220kV Panjabari (D/C link) 220kV Sarusajai – 220kV New Sonapur – 220kV KLHEP (D/C link)
11	220kV Samaguri – Sarusajai (S/C link)
12	220kV Samaguri – Balipara & 220kV Samaguri – Misa (D/C link)
13	220kV Dullavcherra – 220kV Patharkandi – 220kV Kaliganj – 220kV Silcoorie – 220kV Dullavcherra (D/C link)
14	220kV Silcoorie – 220kV Baskandi – (220kV Gird of Manipur Transmission System) (D/C link)
15	220kV Shankardev Nagar – 220kV Umranghsu – 220kV Khleirihat (D/C link)
16	220kV Khumtai – 220kV Forkating – 220kV Bokajan (D/C link)
17	220kV NTPS – 220kV New Nazira – 220kV Pulibor (D/C link)
18	220kV Naharkatia – 220kV Rupai – 220kV Chapakhowa – 220kV Namsai (D/C link)
19	220kV Rowta – 220kV Sonabil (D/C link)
20	220kV Gogamukh – 220kV Simen Chapori – 220kV Behaiting (D/C link)
21	220kV Jonai – 220kV Simen Chapori (D/C link)
22	220kV Khumtai – 220kV New Gohpur (D/C link)
23	220kV Sonabil – 220kV New Gohpur – 220kV Bihpuria (D/C link)
25	132kV Depota – 132kV Bihuguri – 132kV Dhekiajuli (D/C link)
26	132kV Goreswar – 132kV Kalaigaon – 132kV Sipajhar And 132kV Kalaigaon – 132kV Tangla (D/C link)
27	132kV Baksa – 132kV Salbari (D/C link)
28	132kV Bajali – 132kV Nathkuchi (D/C link)
29	132kV Amayapur – 132kV Chamata (D/C link)
30	132kV Pulibor – 132kV Dergaon – 132kV New Bokakhat – 132kV Bokakhat (Old) (D/C link)
31	132kV New Nazira – 132kV Gaurisagar – 132kV Teok – 132kV Geleki – 132kV New Nazira (D/C link)
32	132kV Naharkatia – 132kV Bamunbari – 132kV Sapekhati – 132kV NTPS (D/C link)

Table 2: *Proposed construction of new Transmission links*

PROPOSED IMPROVEMENT OF PRESENT TRANSMISSION SYSTEM

SN	PROPOSAL	REMARKS
1	Construction of Monopole transmission links using existing Right of Way Ownership	Ease of work and ample use of resources
2	Installation of HTLS conductors at critical locations across the state depending upon the trends in increase in loading over the years e.g. 220kV New Rangia – Amingaon line is prone to be overloaded in next 10 years. The existing conductor should be replaced with HTLS conductor in due course of time to promote system reliability	
3	Augmentation of Transformer MVA across AEGCL periodically with respect to increase in trend of load to safeguard overloading of transformers and promoting (n-1) redundancy in the system	Improvement in System reliability
4	Reactive power management of the transmission system by studying the trend of load on regular basis. (Installation of capacitor banks at load centres)	Improvement in voltage profile and Quality of Power
5	Construction of "Sub-Remote Control and Asset Management Centres" at four locations of AEGCL "Lower Assam, Middle Assam, Upper Assam and South Assam" and a "Central Remote Control and Asset Management Centre"	Improvement in efficiency, judicious use of manpower and resources together with improvement of control, handling, and monitoring of the whole network
6	Introduction of new-age technologies in AEGCL "Digital Substations, Green energy based electrical equipment etc."	Keeping up to date with technological development across the world
7	Introduction of transmission links at 132kV level from the proposed/augmented substations as in **Table 2** with the existing 132kV substations in AEGCL	Improvement in load flow management of the network

Table 3: *Proposed improvement of Present Transmission System*

DETAILED PROPOSAL FROM VISION 2047

Proposed Substation Voltage Level Augmentation and construction of new Transmission links in Lower Assam Transmission System

The following proposals are constructed based on Load flow studies, considering n-1 redundancy of system, and studying the effect on voltage and loss of redundancy across the 400kV, 220kV and 132kV networks (*study based on increase in trend of 33kV loads*)

PART A

SN	PROPOSAL	REMARKS
1	220/132/33kV Agia GSS to be upgraded to 400/220/132/33kV GSS. The 400kV Link to Agia is to be connected to Eastern/Northern India (separate route other than the route through chicken neck near West Bengal)	To prevent overloading of 220kV Salakati – Salakati (PG) D/C lines in 2035-36
2	The 400kV Link D/C across the Lower Assam Area is planned as 400kV Barnagar – 400kV Rangia – 400kV Sarusajai – 400kV Agia – 400kV Barnagar Upgradation of 220/132/33kV Sonapur GSS to 400/220/132/33kV GSS	Improvement of voltage profile and safeguarding of redundancy
3	A D/C link of 400kV Barnagar – 400kV Rowta – 400kV Balipara. (Double circuit quad moose conductor)	To meet the load requirement of Dhekiajuli – Rowta – Depota area and reduce loading at Sonabil GSS
4	A D/C link from 220kV Rowta – 220kV Kalaigaon - New Rangia – 220kV Baksa – 220kV Bajali – 220kV Barnagar (ISTS)	Improve in load profile of Lower Assam Region
6	A D/C link from 220kV Kalaigaon – 220/33kV Bezera – 220/132/33kV Barka	Redundancy in the Industrial area of Sishugram
7	A D/C link from 220kV Gossaigaon (New Agomoni) – 220kV Dhubri – 220kV Bogribari – 220kV APM – 220kV Abhayapuri – 220kV Dhaligaon – 220kV Bijni - 220kV Barnagar (AS) – 220kV Barpeta – 220kV Doulachal – 220kV Amingaon A D/C link from 220kV Doulachal – 220/132/33kV Chamata A D/C link from 220kV Agia – 220kV APM	Improvement in load handling capacity of Lower Assam Region and promoting redundancy
8	A D/C link from 220kV Amingaon – 220kV Panjabari – 220kV Kahilipara – 220kV Sarusajai	Improvement in system configuration

		of Guwahati Capital Area
	A D/C link from 220kV New Sonapur – 220kV Chandrapur – 220kV Panjabari Upgradation of 132/33kV Chandrapur GSS to 220/132/33kV GSS Upgradation of 132/33kV Kahilipara GSS to 220/132/33kV GSS. Existing transmission towers between Sarusajai – Kahilipara are of 220kV construction complaint. The same towers would be used for the same Installation of HTLS conductor for 220kV New Rangia – Amingaon D/C line	
9	220kV Samaguri – Sonapur – Sarusajai to be bypassed at 220kV Sonapur (Old) and the new link formed will be 220kV Samaguri – Sarusajai	Improvement in system configuration
10	A LILO of 220kV Sarusajai – KLHEP D/C line to be established at 220kV New Sonapur	Improvement in System Configuration
11	A D/C link from 132kV Baksa – 132kV Salbari A D/C link from 132kV Bajali – 132kV Nathkuchi	Improvement in system configuration
12	A D/C link from 132kV Sipajhar – 132kV Kalaigaon – 132kV Tangla A D/C link from 132kV Kalaigaon - Goreswar	Improvement in system configuration
13	A D/C link from 132kV Baksa – 132kV Salbari	Improvement in system configuration
14	A D/C link from 132kV Bajali – 132kV Nathkuchi	Improvement in system configuration

Table 4: *PART A of detailed proposals*

Proposed Substation Voltage Level Augmentation and construction of new Transmission links in Central Assam Transmission System

PART B

SN	PROPOSAL	REMARKS
1	220/132/33kV Samaguri GSS to be upgraded to 400/220/132/33kV GSS. A D/C link from 400kV Samaguri – Balipara A D/C link from 400kV Samaguri – Misa	Improvement in system configuration
2	A 400kV D/C link from 400kV Bokajan (Upcoming) – 400kV Dullavcherra 400kV Dullavcherra to be connected to Southern Part of NER (proposed via Tripura)	For a future scope of Power import from Bangladesh via 400kV network
3	A D/C link from 220kV Dullavcherra – 220kV Patharkandi – 220kV Kaliganj – 220kV Silcoorie – 220kV Dullavcherra Upgradation of 132/33kV Silcoorie to 220/132/33kV Silcoorie GSS A D/C link from 220kV Silcoorie – 220kV Baskandi – (to be connected with a 220kV system at Manipur)	Improvement in system configuration
4	A D/C link from 220kV SD Nagar – 220kV Umrangshu – 220kV Khleirihat	Improvement in system configuration
5	A D/C link from 220kV Rowta – 220kV Sonabil	Improvement in system configuration
6	A D/C link from 132kV Depota – 132kV Bihuguri – 132kV Dhekiajuli	Improvement in system configuration
7	A D/C link from 132kV Shankardev Nagar – 132kV Dokmoka	Improvement in system configuration
8	A D/C link between 220kV Rowta (New) – 220kV Sonabil	Improvement in system configuration
9	A D/C link from 132kV Tangla – 132kV Kalaigaon – 132kV Sipajhar A D/C link from 132kV Goreswar – 132kV Kalaigaon	Improvement in system configuration

Table 5: *PART B of detailed proposals*

Proposed Substation Voltage Level Augmentation and construction of new Transmission links in Upper Assam Transmission System

PART C

SN	PROPOSAL	REMARKS
1	A D/C link from 132kV Pulibor – 132kV Dergaon – 132kV Bokakhat (New) – 132kV Bokakhat (Old)	Improvement in system configuration
2	A D/C link from 132kV New Nazira - 132kV Gaurisagar – 132kV Teok – 132kV Geleki – 132kV New Nazira	Improvement in system configuration
3	A D/C link from 132kV Naharkatia – 132kV Bamunbari – 132kV Sapekhati – 132kV NTPS	Improvement in system configuration
4	A D/C link from 132kV Modertoli – 132kV Baithalangshu	Improvement in system configuration
5	A D/C link from 220kV Bus of Khumtai – 220kV New Gohpur A D/C link to be established from 220kV Sonabil – 220kV New Gohpur – 220kV Bihpuria	Improvement in system configuration
6	A D/C link from 220kV Gogamukh – 220kV Simen Chapori – 220kV Behaiting 132/33kV Jonai GSS to be upgraded to 220/132/33kV GSS A D/C link from 132kV Simen Chapori - Jonai	Improvement in system configuration
7	A D/C link from a 220kV buses of 220kV Khumtai – 220kV Forkating – 220kV Bokajan	Improvement in system configuration
8	A D/C link from 220kV NTPS – 220kV New Nazira – 220kV Pulibor	Improvement in system configuration
9	Upgradation of 132/33kV Chapakhowa GSS to 220/132/33kV GSS and establishing a D/C link from 220kV Namsai – 220kV Chapakhowa – 220kV Rupai – 220kV Naharkatia	Improvement in system configuration and creation of path for evacuation of power from Arunachal Pradesh
10	Introduction of 400/220/132/33kV Naharkatia GSS or upgradation of 220/132/33kV Tinsukia GSS to 400/220/132/33kV GSS	Improvement of system configuration, evacuation of power from Arunachal Pradesh

Table 6: *PART C of detailed proposals*