



सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग-II

Power System Planning & Appraisal Division-II

सेवा मे / To

संलग्न सूची के अनुसार

As per list enclosed

विषय: पारेषण तंत्र पर पूर्वी क्षेत्र स्थायी समिति (ईआरएससीटी) की दूसरी बैठक की कार्यसूची।

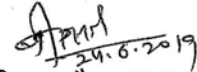
Subject: 2nd meeting of Eastern Region Standing Committee on Transmission (ERSCT) - Agenda.

महोदय(Sir)/महोदया(Madam),

The agenda of 2nd meeting of Eastern Region Standing Committee on Transmission (ERSCT) is now scheduled on **05th July, 2019** (Friday) at **Siliguri, West Bengal**. Exact time & venue of the meeting will be intimated shortly. The agenda for the meeting is enclosed herewith.

You are requested to kindly make it convenient to attend the meeting.

भवदीय/Yours faithfully,



(बी.एस. बैरवा/ B.S.Bairwa)

निदेशक / Director

List of addressee:

1. Member Secretary, Eastern Regional Power Committee, 14, Golf Club Road, Tollygange, Kolkata-700033. Tel. No. 033-24235199 Fax No.033-24171358	2. Managing Director, Bihar State Power Transmission Company, Vidyut Bhavan (4 th floor), Baily Road, Patna-800021. Tel. 0612-2504442 Fax No. 0612-2504557
3. Chairman-cum-Managing Director, Jharkhand Urja Sancharan Nigam Limited Engineering Building, H.E.C., Dhurwa, Ranchi-834004. Fax-0651-2400799	4. Chairman-cum-Managing Director, Orissa Power Transmission Corporation Ltd, Jan path, Bhubaneshwar-751022. Tel. No. 0674-2540098 Fax No.0674-2541904
5. Principal Chief Engineer cum Secretary, Power Department Government of Sikkim, Sikkim. Tel. No. 03592-2022440 Fax No.03592-202927	6. Managing Director, West Bengal State Electricity Transmission Company Ltd, Vidyut Bhavan (8 th Floor), A-block, Salt Lake City, Kolkata-700091. Tel. No. 033-23370206
7. Superintending Engineer, Electricity Department C/O Secretary (GA) Andaman and Nicobar Administration, Secretariat, Port Blair (AN)	8. Chief Operating Officer, Central Transmission Utility (CTU), Power Grid Corporation of India "Saudamini" Plot No. 2, Sector-29, Gurugram-122001 Tel. No. 0124-2571816 Fax No.0124-2571932
9. Director (System Operations), POSOCO B-9, Qutub Institutional Area, Katwaria Sarai, New Delhi-110016 Tel. No. 26852843 Fax No. 2626524525, 26536901	

Special Invitees:

1. Chairman-cum-Managing Director, Damodar Valley Corporation DVC Towers, VIP Road, Kolkata-700054.	2. Director (Technical), NTPC Limited, Engineering Office Complex, A-8, Sector 24, Noida. (For Agenda item No. 20-24)
3. Shri Yogesh Juneja Executive Vice President PFC Consulting Ltd. (PFCCL) Odisha Integrated Power Ltd. 1 st Floor, Urjanidhi, 1, Barakhamba lane, Connaught Place, New Delhi-110001 (For Agenda item No. 25)	

Agenda for 2nd meeting of Eastern Region Standing Committee on Transmission

1. Confirmation of the minutes of 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT).

- 1.1 The minutes of the 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT) held on 16th July 2018 at Kolkata were circulated vide CEA letter No. CEA-PS-12-15/2/2018-PSPA-II Division-Part(1) dated 19th September, 2018.
- 1.2 WBSETCL vide their letter No. CE/CPD/CEA/2450 dated 29.10.2018 has requested for amendment in item No. 17 of the Minutes of the meeting and a corrigendum was issued by CEA vide letter No. CEA-PS-12-15/2/2018-PSPA-II Division-Part(1) dated 06th June, 2019.
- 1.3 Members may confirm the minutes of 1st meeting of ERSCT and the corrigendum of the minutes.

Follow up issues of Previous Standing Committee Meetings

2. Termination of 400kV lines at Jeerat (WBSETCL) substation under the ERSS-XV and ERSS-XVIII schemes – Agenda by POWERGRID

- 2.1 Following 400kV lines are existing / under construction at 400/220kV substation of Jeerat (WBSETCL):

Existing:

- (i) Jeerat (WBSETCL) – Baharampur/Farakka 400kV S/c line of POWERGRID
- (ii) Jeerat (WBSETCL) – Rajarhat/Subhashgram 400kV S/c line of POWERGRID
- (iii) Jeerat (WBSETCL) – Barkeshwar (WBSETCL) 400kV S/c line of WBSETCL
- (iv) Jeerat (WBSETCL) – Kolaghat (WBSETCL) 400kV S/c line of WBSETCL

Under Construction:

- (v) LILO of Sagardighi – Subhashgram 400kV S/c line at Jeerat (WBSETCL) as a part of ERSS-XV by POWERGRID
 - (vi) Jeerat (New) – Jeerat (WBSETCL) 400kV D/c line (Quad) as a part of ERSS-XVIII being implemented under TBCB by POWERGRID Medinipur-Jeerat Transmission Ltd.
- 2.2 There was RoW problem for termination of new 400kV lines being implemented under ERSS-XV and ERSS-XVIII at Jeerat (WBSETCL) S/s. Accordingly, in the 19th meeting of SCPSPER, following was decided to resolve the issue:

- (i) Dismantling of dead end towers and termination of existing lines mentioned at 2.1 (i) to (iv) through GIS duct, at the existing 400kV Jeerat AIS S/s (WBSETCL) as ISTS.
 - (ii) The new lines mentioned at 2.1 (v) and (vi) can be directly terminated on separate double circuit towers at normal height (around 45 meters) to new GIS extension area.
 - (iii) Further, it was also acknowledged that implementation of LILO of Sagardighi-Subhasgram 400kV S/c line at Jeerat along with associated line bays shall get delayed due to addition of above mentioned GIS duct arrangement.
- 2.3 Since the work to be carried out under ISTS may not match the timeline of ERSS-XV & ERSS-XVIII schemes, it was requested to extend the completion of ERSS-XV & ERSS-XVIII schemes in the 1st meeting of ERSCT. Further, in the 1st ERSCT it was also decided that “after finalization of implementing agency for the work, a separate meeting in CEA with CTU, POWERGRID, WBSETCL and implementing agency will be held to discuss the extension of completion schedule of ERSS-XV & ERSS-XVIII schemes. Decision of the meeting will be put up before ERSCT for ratification.”
- 2.4 In the 2nd meeting of ECT held on 06-08-2018, POWERGRID has been entrusted with the works mentioned above at 2.2 (i) through RTM.
- 2.5 A meeting was held at CEA on 26-03-2019, wherein representative of CTU stated that for dismantling and termination of various lines of POWERGRID and WBSETCL through GIS duct, agreement was signed by POWERGRID with WBSETCL on 07-11-2017, i.e. WBSETCL is implementing the said works on POWERGRID’s behalf at its substation. The work has been awarded to JV of M/s Techno & M/s ABB in Nov’18 after approval of mode of implementation in the 2nd ECT meeting. The expected commissioning schedule of the GIS works is 15 months (i.e. Feb 2020) from award.
- 2.6 Members may approve revised completion schedule of ERSS-XV scheme as Feb 2020.
- 3. Replacement of existing SMT bus scheme with DM at 132kV level at Malda (POWERGRID) S/s in GIS along with new 132kV bays**
- 3.1 In the 1st meeting of ERSCT, replacement of existing Single Main & Transfer (SMT) scheme with Double Main (DM) scheme at 132kV level at Malda (POWERGRID) substation through GIS was agreed. It was also agreed to provide 2 no. of 132kV GIS line bays for Manikchak/Paranpur – Malda (POWERGRID) 132kV D/c line. These works were approved to be implemented as ISTS.
- 3.2 Above scheme was decided for implementation under RTM by POWERGRID in 3rd meeting of Empowered Committee on Transmission

held on 21-12-2018. The subject scheme is being implemented as ERSS-XXII.

3.3 As per information provided by WBSETCL, Malda (POWERGRID) – Manikchak/Paranpur 132kV D/c line is expected to be commissioned in Dec 2021.

3.4 Members may note.

4. Conversion of 50MVAR bus reactor at Farakka generation switchyard to switchable line reactor under ERSS-15 – Agenda by POWERGRID

4.1 In the 19th meeting of Standing Committee on Power System Planning of Eastern Region held on 01-09-2017 it was informed that one spare future bay has been selected for termination of one circuit of Farakka – Baharampur D/c line at 400kV bus at Farakka generation switchyard, however, due to non-availability of adjacent bay for termination of the other circuit it is proposed to terminate the second circuit in the existing 50MVAR bus reactor bay along with conversion of this reactor to switchable line reactor. This arrangement would result in connection of 50MVAR switchable line reactor in one circuit of Farakka – Baharampur 400kV D/c line at Farakka end to be utilised as bus reactor.

4.2 In the meeting, members agreed for conversion of 50MVAR (3x16.67) bus reactor at Farakka to switchable line reactor to be installed in one circuit of Farakka – Baharampur 400kV D/c line as ISTS. Subsequently, in the 2nd meeting of ECT it has been decided that the said works would be implemented by POWERGRID under RTM. Accordingly, as per ECT approval the scheme has already been implemented by POWERGRID under the ERSS-XV scheme.

4.3 Members may please note.

5. Interim connectivity to generation projects in ER through LILO arrangement

5.1 Numbers of generation projects were granted Connectivity / Long Term Access (LTA) with strengthening of transmission system. In few cases generation projects were to be commissioned ahead of the anticipated commissioning of the associated transmission system. In such cases, generation projects were given temporary connectivity through loop-in & loopout (LILO) of nearby transmission lines so as to enable them connect with the grid and commission their generation projects. The temporary connectivity through LILO was to be withdrawn after commissioning of the associated transmission system. Associated transmission system of some of such generation projects have been commissioned and their temporary connectivity through LILO has been disconnected; however, some are still connected through LILO arrangement.

- 5.2 CERC in its order dated 07-10-2015 on Petition No.112/TT/13 and dated 28-09-2016 in Petition no. 30/MP/2014 has directed that the interim (LILO) arrangement has to be removed.
- 5.3 The progress of dedicated transmission lines of IPPs in Eastern Region, which are connected through interim arrangement is summarized below:

Generation Project in ER connected through temporary LILO arrangement					
Sl. No.	Generation Project	IC (MW)	Present Connectivity through LILO	Final Connectivity Arrangement	Anticipated Completion Schedule (as per 1 st ERSCT)
1	Gati Infrastructure Ltd. (Chuzachen HEP)	2x55	LILO of Rangpo - Gangtok 132kV S/c line (<i>granted in Nov'07</i>)	Chuzachen - Rangpo 132kV D/c (with Zebra conductor)	Line completed. Project commissioned on interim arrangement. Line bays at Rangpo end are being implemented by E&PD, Govt. of Sikkim is expected by Sept'18 .
2	Sneha Kinetic Power Projects Pvt. Ltd. (Dikchu HEP)	2x48	LILO of one circuit of Teesta-III – Rangpo 400kV D/c line at Dikchu (<i>granted in Dec'14 by CERC</i>)	Dikchu – Dikchu Pool 132kV D/c	Separate meeting will be held with Sikkim Government at CEA.
3	Shiga Energy Pvt. Ltd. (Tashiding HEP)	2x48.5	LILO of one circuit of Rangpo-New Melli 220kV D/c line at Tashiding through Tashiding-New Melli 220kV D/c	Tashiding – Legship Pool 220kV D/c line	<ul style="list-style-type: none"> • Legship Pool S/s is expected by Dec, 19. • Representative of E&PD, Govt. of Sikkim stated that status of 2 no. 220kV line bays at New Melli would be intimated later.

- 5.4 E&P Dept., Govt. of Sikkim may provide status update on above matters.
- 6. Status of downstream 220kV or 132kV network by STUs from the various commissioned and under-construction ISTS substations**
- 6.1 Numbers of ISTS sub-stations have been commissioned and some are under construction for which the downstream system is being implemented by the STUs. Based on the information provided by the states, updated information on planned/under-construction downstream system is as follows:

A. Existing substations:

(a) Rajarhat 400/220kV S/s

- i. Rajarhat (POWERGRID) – New Town AA3 220kV D/c – Commissioned
- ii. Rajarhat (POWERGRID) – New Town AA2 220kV D/c – Dec '19
- iii. Rajarhat (POWERGRID) – Barasat/Jeerat 220kV D/c – Feb '19

(b) Subashgram 400/220kV S/s

- i. Subashgram (POWERGRID) – Baraipur 220kV D/c line – Mar'20

(c) Pandiabil 400/220kV S/s

- i. Pratapsasan (OPTCL) – Pandiabil (POWERGRID) 220kV D/c – Mar'19

(d) Bolangir 400/220kV S/s

- i. LILO of one ckt of Sadeipalli – Kesinga 220kV D/c at Bolangir – Mar'19

(e) Keonjhar 400/220kV S/s

- i. Keonjhar (POWERGRID) – Turumunga (OPTCL) 220kV D/c – Dec '19

(f) Daltonganj 400/220/132kV S/s

- i. Daltonganj (POWERGRID) – Latehar 220kV D/c – Apr'19
- ii. Daltonganj (POWERGRID) – Garhwa 220kV D/c – Mar'19
- iii. Daltonganj (POWERGRID) – Chatarpur/Lesliganj 132kV D/c – Oct'19

(g) Chaibasa 400/220kV S/s

- i. Chaibasa (POWERGRID) – Jadugoda (JUSNL) 220kV D/c – Nov'21

B. Under Construction substations:

(h) Sitamarhi 400/220/132kV S/s – Expected by Mar'21

- i. Sitamarhi (New) – Motipur (BSPTCL) 220kV D/c line
- ii. Sitamarhi (New) – Raxaul (New) 220kV D/c (Twin Moose) line
- iii. Sitamarhi (New) – Runni Saidpur 132kV D/c line
- iv. LILO of Benipatti – Pupri 132kV S/c at Sitamarhi (New)

(i) Saharsa 400/220/132kV S/s – Expected by Mar'21

- i. Saharsa (New) - Khagaria 220kV D/c line
- ii. Saharsa (New) - Begusarai 220kV D/c line
- iii. Saharsa (New) - Saharsa 132kV D/c line formed by LILO of Saharsa - Banmankhi and Saharsa - Uda Kishanganj 132kV S/c lines

(j) Chandauti 400/220/132kV S/s – Expected by Mar'21

- i. LILO of Gaya (POWERGRID) – Sonenagar 220kV D/c at Chandauti (New)
- ii. LILO of Chandauti (BSPTCL) – Rafiganj 132kV S/c at Chandauti (New)
- iii. LILO of Chandauti (BSPTCL) – Sonenagar 132kV S/c at Chandauti (New)

(k) Dhanbad 400/220kV S/s – Expected by Oct'20

- i. LILO of 220 kV Tenughat - Govindpur D/c line at Jainamore and Dhanbad

6.2 Members may provide the updated status.

7. Status of 400kV substations being implemented by STUs in ER under intra-state schemes

7.1 Following 400kV substations have been approved in the previous meetings under intra-state strengthening schemes in ER. Respective STUs are requested to update the expected commissioning schedule of the same:

(a) Bihar (to be implemented by BSPTCL/BGCL)

- (i) Naubatpur GIS: 400/220/132/33kV, 2x500MVA + 2x160MVA + 2x80MVA**

- (ii) **Bakhtiyarpur GIS:** 400/220/132kV, 2x500MVA + 2x160MVA
- (iii) **Jakkanpur GIS:** 400/220/132/33kV, 2x500MVA + 3x160MVA + 4x80MVA

(b) Odisha (to be implemented by OPTCL)

- (i) **Meramundali-B:** 400/220kV, 2x500MVA
- (ii) **Narendrapur (New):** 400/220kV, 2x500MVA
- (iii) **Khuntuni:** 400/220kV, 2x500MVA
- (iv) **Bhadrak:** 400/220kV, 2x500MVA
- (v) **Paradeep:** 400/220kV, 2x500MVA
- (vi) **Begunia:** 765/400kV, 2x1500MVA along with Angul-Begunia 765kV D/c line and LILO of Pandiabil – Narendrapur 400kV D/c line at Begunia
- (vii) **Narendrapur – Therubali – Jeypore** 400kV D/c line along with 400kV switching station at **Therubali** and 420kV, 1x125MVA bus reactor

(c) Jharkhand (to be implemented by JUSNL)

- (i) **Jarsidih:** 400/220kV, 2x500MVA
- (ii) **Chandil (New):** 400/220kV, 2x500MVA
- (iii) **Koderma:** 400/220kV, 2x500MVA
- (iv) **Mander:** 400/220kV, 2x500MVA
- (v) **Dumka (New):** 400/220kV, 2x500MVA

7.2 BSPTCL, OPTCL, and JUSNL may update on the matter.

New Transmission system proposals

8. Augmentation of transformation capacity at Muzaffarpur (POWERGRID) S/s – (Agenda by BSPTCL)

8.1 BSPTCL has informed that the load in Muzaffarpur area is growing very fast. The load demand in Muzaffarpur & adjoining areas is largely fed by Muzaffarpur (PG) with transformation capacity of 1x500+2x315 MVA. During peak hours following loading is being observed:

Present scenario:

Sl. NO.	Lines	Maximum Load (MW)
1	Muzaffarpur (PG)-MTPS (D/C)	420
2	Muzaffarpur (PG)-Hazipur (D/C)	296
3	Muzaffarpur (PG)-Dhalkebar (Nepal) (400kV Transmission Line charged at 220kV)	150

	Total	866
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Future scenario:

In future Amnor (Chappra) GSS(220/132/33 KV) will be connected to Muzaffarpur (PG) through 220 KV D/C lines as approved in 18th Standing Committee Meeting of CEA under 13th Plan. Further Amnor has been proposed to be connected to Digha (new) GSS (220/132/33 KV) at 220 KV level. BSPTCL has also proposed one 220/132/33 KV GSS at Garaul (Dist. Vaishali) under State Plan, approved in the Bihar cabinet, is getting source at 220 KV level with D/C from Muzaffarpur(PG). Both proposed GSSs (Digha and Garaul) are likely to be commissioned in March-2020. In future the loading pattern on 220kV line will be as follows:-

SI. NO.	Lines	Maximum Load (MW)
1	Muzaffarpur (PG)-MTPS (D/C)	80
2	Muzaffarpur (PG)-Hazipur (D/C)	250
3	Muzaffarpur (PG)-Amnor (BGCL) (D/C)	300
4	Muzaffarpur (PG)-Goraul (Proposed) (D/C)	200
Total		830

In present scenario itself, Muzaffarpur (PG) is not able to fulfill N-1 criteria and in case of outage of any power transformer, the situation will be critical.

In view of above facts, it is proposed that, either replacement of 2x315 MVA transformers by 2x500 MVA or addition of one 500 MVA transformer of Muzaffarpur (PG) may be considered under N-1 scheme to ensure uninterrupted power to Muzaffarpur and adjoining areas in the event of outage of any transformer. Moreover, if the generation at Kanti (MTPS) reduces, the power supply position at Muzaffarpur 220kV level further aggravates under N-1 of ICTs.

- 8.2 A meeting was held on 26.03.2019 at CEA, wherein Chief Engineer (PSPA-II) suggested that additional one no. of 500MVA ICT may be installed to meet the load under N-1 criteria. He informed that Muazaffarpur (PG)-Dhalkebar (Nepal) 400kV D/c line is being operated at 220kV and the power flow is around 240MW.
- 8.3 With regard to availability of space at Muzaffarpur S/s, CTU informed that space is available for new 400/220kV, 500MVA ICT. The 400kV ICT bay could be implemented as AIS, however, 220kV ICT bay needs to be implemented as GIS along with 220kV cable from ICT to GIS bay.
- 8.4 After deliberations, participants agreed for installation of new 400/220kV, 500MVA ICT at Muazaffarpur (PG) under ISTS.
- 8.5 Members may discuss.

9. Additional 400kV connectivity at 400/220/132kV Saharsa (new) S/s being implemented under ERSS-XXI through TBCB – (Agenda by BSPTCL)

- 9.1 BSPTCL has informed that the present connectivity of upcoming 400/220/132 kV Saharsa (New) GSS at 400 kV level is LILO of Patna (PG) - Kishanganj (PG) 400 kV D/C line and this work is being done by POWERGRID under TBCB route.
- 9.2 They have further stated that the Saharsa (New) GSS has to be fed from two reliable sources, whereas one of the feed i.e. Patna (PG) - Saharsa (New) 400 kV D/c line is having river crossing and tower failure may occur during floods. Therefore, to improve the reliability at 400 kV level, it is proposed to provide an additional source by making LILO of Darbhanga (DMTCL) - Kishanganj (PG) 400 kV D/C line at 400 kV Saharsa (New) S/S.
- 9.3 A meeting was held on 26.03.2018 at CEA, wherein Chief Engineer (PSP&A-II), CEA, and representative of CTU stated that Kishanganj (PG) - Saharsa(New) 400 kV D/c line with Quad moose conductor can meet the load of Saharsa (New) S/S , in case of tower failure of Patna (PG) – Saharsa (New) 400kV D/c line. Under worst case scenario, i.e. with only one circuit of Kishanganj (PG) - Saharsa(New) 400 kV line (with quad moose), the load of Saharsa (New) S/S would be met in the present condition. Based on operational experience, the alternatives may be discussed.
- 9.4 It was opined that N-1 criteria can only be considered while planning, whereas tower failure in river crossing cannot be considered as a general case in the studies. However, representative of BSPTCL insisted that the 2nd 400kV LILO line i.e. LILO of Kishanganj – Darbhanga may be considered at Saharsa to improved power supply reliability, as the Kishanganj – Patna line during the last two monsoon seasons has suffered prolonged outage due to tower collapse at various locations during flood.
- 9.5 Members may discuss.

10. Establishment of Goraul 220/132/33kV S/s and construction of Muzaffarpur (POWERGRID) – Goraul 220kV D/c by BSPTCL as intra state scheme – (Agenda by BSPTCL)

- 10.1 BSPTCL has informed that 220/132/33kV GSS of capacity 2x160+3x50 MVA has been decided to be constructed near Goraul block in Vaishali district. At present, load of Vaishali district is about 300 MW and many more PSSs under different schemes of Central government and under state plan are proposed/under construction. Due to new PSSs, load of Vaishali district is going to increase very rapidly. The upcoming/under construction PSSs are very far away from the existing GSS. In some cases existing PSSs are also far away from existing GSS. Moreover, existing GSS is already saturated and further there is no scope of augmentation due to space constraint. Under 13th plan, load flow study was done considering the load at higher side. The above-

proposed GSS is required, to distribute the load uniformly in the existing-GSS also. In the present scenario, the connectivity of PSS with existing GSS are as follows:

Existing Scenario					
Sl. No.	Name of GSS	Capacity of GSS	Name of 33/11 kV PSS	Capacity of PSS (MVA)	Distance between existing GSS to PSS
1	Jandaha	90 MVA	Goraul	15	45 Kms.
			Jandaha	15	05 Kms.
			Mahua	20	32 Kms.
			Patepur	15	30 Kms.
			Chehrakalan	15	45 Kms.
			Mahnar	20	15 Kms.
			Patori (Samaastipur)	15	20 Kms.
Total				115	
2	Vaishali	90 MVA	Vaishali	20	0 Kms.
			Lalganj	30	15 Kms.
			Dhanpura	20	26 Kms.
			Pateri Belsar	15	12 Kms.
			Bakhara	10	26 Kms.
			Paroo	20	19 Kms.
Total				115	

Proposed Scenario					
Sl. No.	Name of GSS	Capacity of GSS	Name of 33/11 kV PSS	Capacity of PSS (MVA)	Distance between existing GSS to PSS
1	Goraul	150 MVA	Chehrakalan	15	10 Kms.
			Goraul	15	03 Kms.
			Ismailpur (Proposed)	10	05 Kms.
			Dabhaich (Proposed)	10	20 Kms.
			Mahudahchatur (Proposed)	10	15 Kms.
			Mahua	20	15 Kms.
Total				80	

The above PSSs are distributed to existing + proposed GSSs as per their geographical position so that losses can be minimized. In addition to above, many more PSS are proposed, which will be connected with proposed / existing GSSs.

Connectivity:-

The connectivity of above Goraul, 220/132/33kV, 2x160MVA + 3x50MVA GSS at 220 kV and 132kV levels will be from:

- (i) Muzaffarpur (PG) - Goraul 220 kV D/c (Zebra conductor)

- (ii) Proposed GSS Tajpur to proposed GSS Goraul 220kV D/c (Zebra conductor).
- (iii) LILO of D/c Vaishali - Muzaffarpur 132 kV tr. line at proposed GSS Goraul.
- (iv) 132 KV D/C Mahanar GSS - Goraul proposed GSS

10.2 The proposed GSS is already approved in BSPTCL Board meeting & also in Bihar cabinet under state plan. The above would be implemented as intra-state scheme by BSPTCL

10.3 A meeting was held on 26.03.2019, wherein this proposal was discussed and agreed. With regard to availability of space at Muzaffarpur S/s, CTU informed that space is available for 2 no. 220kV GIS bays at Muzaffarpur for termination of Muzaffarpur-Goraul 220kV D/c line of BSPTCL.

10.4 Members may discuss.

11. New 220kV and 132kV infrastructure in Bihar under intra-state project. (Agenda by BSPTCL)

11.1 BSPTCL has informed that, under 13th plan, system studies were done and three nos. of 400 KV & three nos. of 220 KV sub-station were identified to cater to the enhanced load demand of BSPTCL. At present under different schemes of Central Government and State plan, near about 350 numbers of PSSs are under construction. Moreover it has also been decided to segregate the agriculture feeder. Due to that, the load demand on existing GSSs of 132/33kV level is increasing very rapidly. In this regard, BSPTCL is implementing two new 132kV GSSs as mentioned below:

Sl. no	Substation Name	Voltage levels & transformation capacity	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	Expected 33kV load demand (in MW)
1	Raghopur GSS	132/33 KV (3x50 MVA)	1. 220 kV Laukhi – Raghopur D/C, ACSR Zebra(charged on 132 kV): 48 km (tentative) 2. 220 kV Supaul – Raghopur D/C, ACSR Zebra(charged on 132 kV): 52 km (tentative)	90
2	Kerpa GSS	132/33 KV (3x50 MVA)	1. 132 kV Dehri – Kerpa S/C, ACSR Panther: 24 km 2. 132 kV Banjari – Kerpa S/C, ACSR Panther: 20 km	25

11.2 To cater to the increasing load demand, BSPTCL has proposed following additional new substations. The new GSSs have been developed after considering all the planned and under construction GSSs in system study.

Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	Expected 33kV load demand (in MW)
1	Digha (New) GIS	220/132/33 KV (2x200 + 2x80 MVA)	1. 220 kV Chapra(New) -Digha D/C, ACSR Zebra:	1. 132 kV Digha (New) – Digha (Old) D/C, XLPE Cable: 1 km 2. 132 kV Digha (New) – Board	170

Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	Expected 33kV load demand (in MW)
			80 km	Colony D/C, XLPE Cable: 7 km	
2	Tajpur GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Tajpur – Goraul D/C, ACSR Zebra: 60 km 2. 220 kV Samastipur (New) – Tajpur D/C, ACSR Zebra: 20 km	1. 132 kV Samastipur (Old) – Tajpur S/C, ACSR Panther: 25 km 2. 132 kV Dalsingsarai – Tajpur S/C, ACSR Panther: 27 km 3. 132 kV Sahapur Patori – Tajpur D/C, ACSR Panther: 40 km	50
3	Thakurganj GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Kishanganj (New) – Thakurganj D/C, ACSR Zebra: 50 km	1. 132 kV Thakurganj – Araria D/C, ACSR Panther: 80 km	40
4	Asthawan GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Biharsarifi-Asthawan D/C, ACSR Zebra: 20 km 2. 220 kV Sheikhpura (BGCL) – Asthawan D/C, ACSR Zebra: 15 km	1. 132 kV Asthawan – Rajgir S/C on D/C, ACSR Panther: 35 km 2. 132 kV Asthawan – Nalanda S/C on D/C, ACSR Panther: 25 km 3. 132 kV Asthawan – Barh S/C on D/C, ACSR Panther: 32 km	80
5	Board Colony GIS	132/33 KV (2x80 MVA)	-	1. 132 kV B Colony- Digha (New) D/C, XLPE Cable: 7 km	70
6	Palasi	132/33 KV (2x50 MVA)	-	1. 132 kV Forbisganj – Palasi S/C, ACSR Panther: 75 km 2. 132 kV Kishanganj – Palasi S/C, ACSR Panther: 53 km	50

11.3 A meeting was held on 26.03.2019(MoM is at **Annexure-I**) and after deliberations in the meeting, following was agreed as intra-state transmission scheme of BSPTCL.

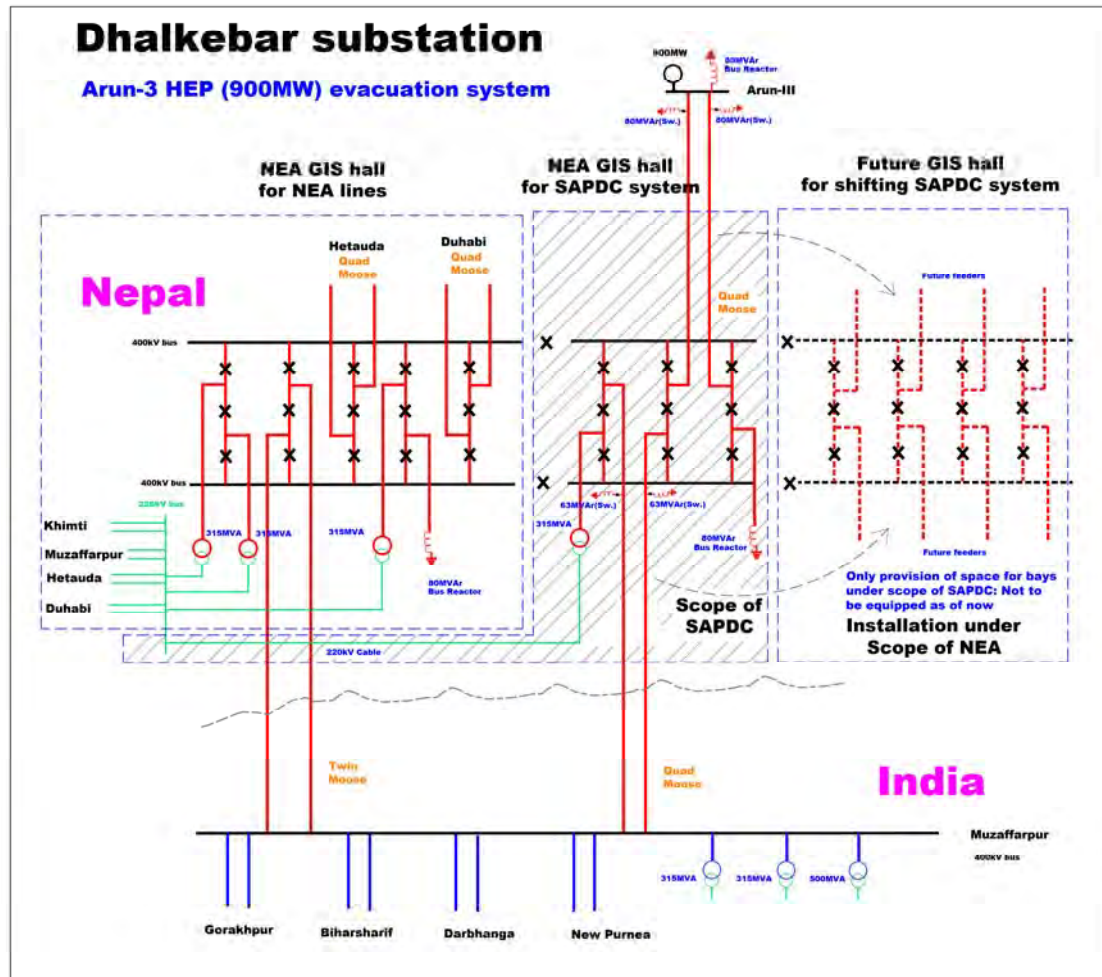
Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)
1	Digha (New) GIS	220/132/33 KV (2x200 + 2x80 MVA)	1. 220 kV Chapra(New) -Digha D/C, ACSR Zebra: 80 km <i>Note: BSPTCL would explore the possibility of 2nd 220kV feed to Digha for reliable power supply.</i>	1. 132 kV Digha (New) – Digha (Old) D/C, XLPE Cable: 1 km 2. 132 kV Digha (New) – Board Colony D/C, XLPE Cable: 7 km
2	Tajpur GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Tajpur – Goraul D/C, ACSR Zebra: 60 km 2. 220 kV Samastipur (New) – Tajpur D/C, ACSR Zebra: 20 km	1. 132 kV LILO of Samastipur (Old) – Dalsingsarai S/C line at Tajpur [Samastipur (Old) – Tajpur S/C, ACSR Panther: 25 km & Dalsingsarai – Tajpur S/C, ACSR Panther: 27 km] 2. 132 kV Sahapur Patori – Tajpur D/C, ACSR Panther: 40 km
3	Thakurganj	220/132/33 KV	1. 220 kV Kishanganj (New) –	1. 132 kV Thakurganj – Araria D/C,

Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)
	GSS	(2x160 + 3x50 MVA)	Thakurganj D/C, ACSR Zebra: 50 km	ACSR Panther: 80 km
4	Asthawan GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Biharsarif- Asthawan D/C, ACSR Zebra: 20 km 2. 220 kV Sheikhpura (BGCL) – Asthawan D/C, ACSR Zebra: 15 km	1. 132 kV Asthawan – Rajgir S/C on D/C, ACSR Panther: 35 km 2. 132 kV Asthawan – Nalanda S/C on D/C, ACSR Panther: 25 km 3. 132 kV Asthawan – Barh S/C on D/C, ACSR Panther: 32 km
5	Board Colony GIS	132/33 KV (2x80 MVA)	-	1. 132 kV B Colony- Digha (New) D/C, XLPE Cable: 7 km
6	Palasi	132/33 KV (2x50 MVA)	-	1. 132 kV LILO of Forbisganj – Kishanganj S/C line at Palasi [Forbisganj – Palasi S/C, ACSR Panther: 75 km & Kishanganj – Palasi S/C, ACSR Panther: 53 km] 2. 132kV LILO of Thakurganj – Araria D/C line

11.4 Members may discuss.

12. Transmission system for power evacuation from Arun-3 (900MW) HEP, Nepal of M/s SAPDC

12.1 M/s SJVN Arun-3 Power Development Company Pvt. Ltd. (SAPDC) is establishing a 900MW HEP in Nepal. The power from the hydro project is proposed to be evacuated through Arun-3 – Dhalkebar (Nepal) – Muzaffarpur (POWERGRID) 400kV D/c (Quad) line. As per Power Development Agreement (PDA) signed by M/s SAPDC with Nepal, they have to build the Nepalese portion of above mentioned transmission system. In the 4th meeting of JSC/JWG held on 13th-14th Feb 2017, it was decided that Nepalese portion of the transmission system may be implemented by M/s SAPDC as per PDA. The Indian portion of the cross-border line may be built by an Indian entity. The schematic of final system is given below:



12.2 In the meeting held at MoP on 27-03-2018 under chairpersonship of JS (Trans) it was decided that generation project developer will be bearing the wheeling charges of the Indian portion of the transmission line till any other projects seeks utilisation of the line.

12.3 In view of the above, members may approve construction of Indian portion of Dhalkebar (Nepal) – Muzaffarpur (POWERGRID) 400kV D/c (Quad) line along with 2 no. 400kV line bays at Muzaffarpur (POWERGRID). The charges for the said scope would be completely borne by M/s SAPDC. The decision regarding implementing agency for Indian portion of the cross-border line would be taken in the meeting of ECT.

13. LILO in Odisha portion of ISTS line for connecting M/s JSW Utkal Steel Ltd. – (Agenda by OPTCL)

13.1 OPTCL informed that JSW Utkal Steel Ltd. is setting up an integrated steel plant of 13.2 MTPA capacity and 30 MTPA grinding and beneficiation plant along with 300 KM slurry pipe line to transport iron ore from Joda to Jagatshingpur(at Integrated steel plant) at Odisha. To operate their grinding unit at Joda they have applied for 75 MW power at 220 KV level. Based on

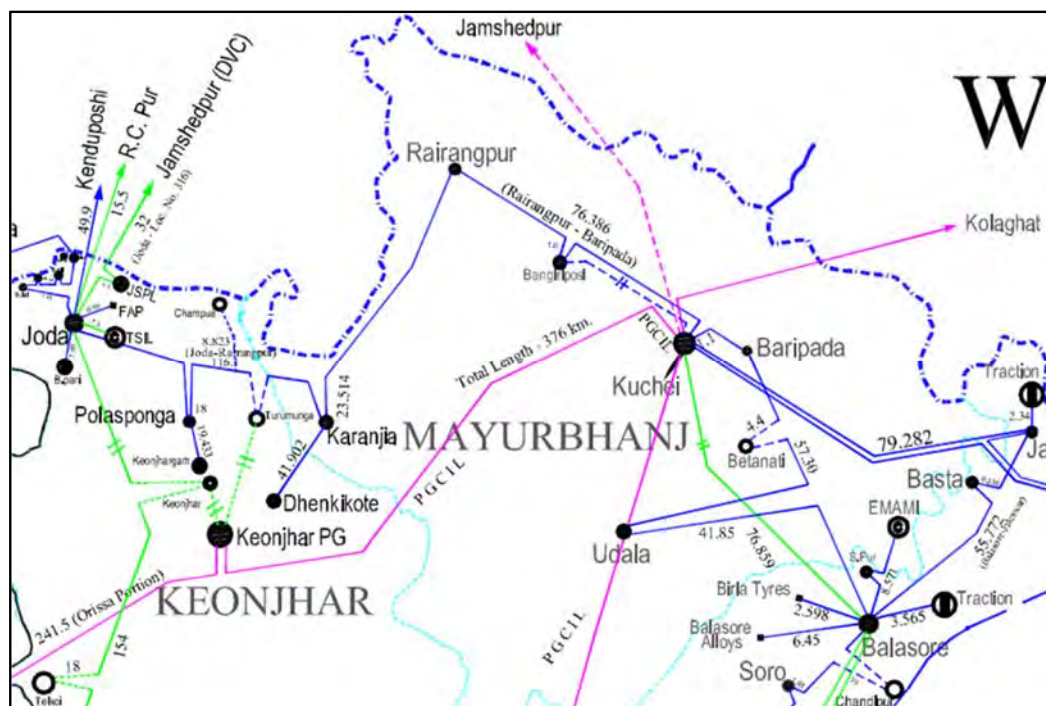
their application, OPTCL has conducted system study and proposed two(2) alternative LILO arrangements of interstate line. The LILO can be made either on Joda-JSPL-Jamsedpur line (including replacing the existing conductor with HTLS conductor from Joda Grid to JSPL) or in Joda-Ramchandrapur line. Location map is at **Annexure-II**

13.2 Members may discuss.

14. Implementation of one 132kV line bay at Baripada (POWERGRID) S/s by OPTCL – (Agenda by OPTCL)

14.1 OPTCL informed that OPTCL is having one no. of 132 kV Bay at Baripada (Kuchei). The Kuchei - Dhenkikote 132 kV S/C line is having LILO at Bangiriposi, Rairangpur and Karanjia. The loads of connected substation are Bangiriposi-8 MW, Rairangpur-28 MW, Karanjia-21 MW and Dhenkikote-10 MW. Thus the 132 kV S/C line is loaded up to 67 MW. In case of outage at Joda, the Polasponga load which is around 40 MW is catered through this line, causes breaching of thermal limit of the line. This matter was discussed during the 153rd OCC meeting held at Kolkata. In the meeting PGCIL informed that the space for the 132 Bay is available at Kuchei. Accordingly, OCC advised OPTCL to submit the proposal to CEA for discussion in the standing committee.

14.2 Hence, OPTCL has requested for allotment of a new 132 kV Bay at Kuchei to limit the line loading (Kuchei–Bangiriposi portion) as well as to meet the n-1 contingency. OPTCL plans to draw a new 132kV S/c line from Kuchei to Bangiriposi as intra-state scheme.



14.3 Nevertheless it may be noted that with commissioning of Keonjhar – Turumunga 220kV D/c line by OPTCL, the reliability of power supply scenario in the area would improve, as this will act as an alternate power source in case of outage at Joda.

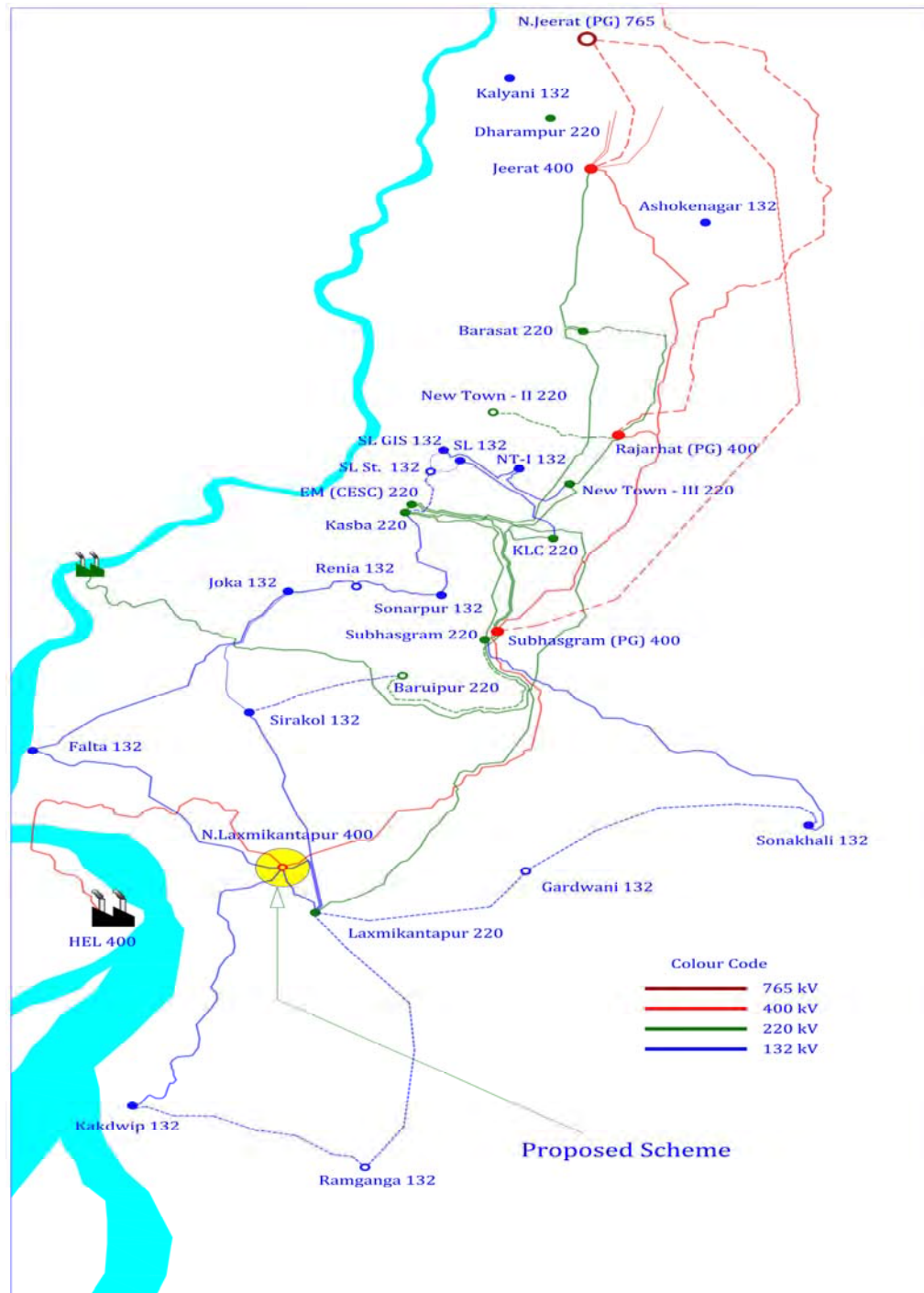
14.4 Members may discuss

15. Establishment of 400/132 kV GIS with 3x200 MVA ICTs by D/c LILO of HEL – Subhasgram (PG) 400 kV D/C line of CESC by WBSETCL.- (Agenda of WBSETCL)

15.1 Representative of WBSETCL has informed the following:

- (i) South 24 Parganas district is, indeed, a complex district, stretching from the Metropolitan Kolkata to the remote riverine villages up to the mouth of Bay of Bengal. Population density in the district is very high.
- (ii) The Sundarbans, the largest mangrove forests on earth, are spread over thirteen of the twenty-nine development blocks in the district. Due to its peculiar geographical location and the dictates of geography, the transmission network in this region was not well developed.
- (iii) Present maximum demand in the district is around 1010 MVA which is met from Subhasgram 400 kV sub-station of POWERGRID through Kasba 220 kV, Subhasgram 220 kV & Laxmikantapur 220 kV sub-stations. Installed capacity of Subhasgram 400 kV sub-station is 2x315+1x500 i.e. 1115 MVA (additional 2x315MVA i.e. 630MVA belongs to CESC). Again, Laxmikantapur 220 kV sub-station (maximum demand already recorded as 407 MVA) has only one 220 kV D/C incoming line from Subhasgram.
- (iv) WBSETCL is constructing one 220 kV GIS at Baruipur and it will be connected with Subhasgram 400 kV sub-station by a 220 kV D/C line. The sub-station is expected to be commissioned by March 2020.
- (v) Considering future load growth, another 400 kV sub-station in the district is urgently required for reliable power supply. In view of load demand of Laxmikantapur 220/132 kV ICTs, up-gradation of existing Laxmikantapur 220 kV sub-station to 400 kV GSS is ideal solution. But there is no available space for the up-gradation. WBSETCL is searching suitable land at nearby locations.
- (vi) In this backdrop, it may be noted that CESC was allowed to construct 400 kV D/C line from HEL to Subhasgram (PG) 400 kV sub-station with installation of 2x315 MVA ICTs at Subhasgram and 220 kV D/C line from Subhasgram to EM 220 kV sub-station of CESC for evacuation of power from HEL. It was decided in the Standing Committee Meeting on Power System Planning in Eastern Region held on 14/09/2009 at Bhubaneswar.

- (vii) The 400 kV D/C line passes through Laxmikantapur area in the southern part of 24 Paraganas (S) District. For development of transmission network in the southern part of the district, WBSETCL contemplated establishment of one 400/132 kV GIS near Laxmikantapur by D/C LILO of HEL – Subhasgram (PG) 400 kV D/C line.
- (viii) With the existing network, power is flowing through 400 kV line over Laxmikantapur to Subhasgram and again it is returned back at Laxmikantapur through 220 kV D/C line from Subhasgram to meet the demand. The 400 kV D/C line of CESC passes over the proposed location of new 400 kV GIS. Existing Laxmikantapur – Kakdwip 132 kV D/C and Laxmikantapur – Falta 132 kV D/C lines would be LILOed at the proposed 400/132 kV GIS.
- (ix) After development of the proposed network, existing transmission network would be utilised effectively. After meeting the demand of Laxmikantapur 220 kV sub-station, balance power will flow towards Subhasgram. Hence, transmission loss of the system will also be reduced and reliability of power supply will be improved.



- (x) The project will be executed by WBSETCL at its own cost. Commercial issues, if any may be settled at appropriate forum. Geographical transmission network map in and around Laxmikantapur and single line diagram of the existing network & proposed scheme is at **Annexure-III**.

15.2 Members may discuss.

16. Modification of construction of 220 kV D/C Barjora-Burdwan line of DVC – Agenda by DVC

- 16.1 DVC has informed that as per approved 12th plan, the 220 kV GIS infrastructure at Burdwan substation was proposed to be fed from 220 kV Barjora substation (via Panagarh) and 220 kV Kharagpur substation. The proposal was to make a 220 kV D/C ring at lower valley viz. Jamshedpur-Gola-Mejia TPS- Barjora- Panagarh- Burdwan- Kharagpur-Mosabani with a view to provide reliable power supply (Mosabani & Jamshedpur to be connected through 400 kV D/C line).
- 16.2 As the 220 KV Barjora substation is radially connected from Mejia TPS by a 220 kV D/C line, the above proposal is less reliable. Further, on implementation of original proposal, power towards 132 kV lower valley link i.e., Burdwan- Belmuri- Howrah- Kolaghat- KGP- Mosabani- Jamshedpur will mostly be fed through 220 kV Mejia TPS- Barjora- Panagarh- Burdwan link causing over-loading of MTPS- Barjora line. Situation aggravated after unit after unit retirement of DTPS Unit-3 supplying power towards Burdwan through 132 kV D/C DTPS- Burdwan line. It is also mentioned that the original proposal could not be taken up due to postponement of other associated projects.
- 16.3 Considering the above & for more reliability and stability of grid as well as to feed 220 kV GIS at Burdwan substation, some minor modification evolved after lot of deliberations i.e., instead of connecting 220 kV Burdwan substation with 220 kV Barjora substation, it was proposed that 220 kV Burdwan substation would be connected to 220 kV Parulia substation of DVC with a future provision of D/C LILLO at Panagarh. The DVC Grid map & above load flow study result is at **Annexure-IV**.
- 16.4 Members may discuss.
- 17. Connectivity/LTA/Evacuation System for OPGC 1b TPS(2x660MW) in Odisha – Agenda by OPGC**
- 17.1 Odisha Power Generation Corporation (OPGC) is constructing power project of 2x660MW (1b Valley U-3 & 4), out of which Unit-3 would be connected to STU system through OPGC-Lapanga 400kV D/c line (with twin moose conductor of 85 deg. C rating) and Unit-4 would be connected to ISTS through OPGC-Sundargarh 400kV D/c ISTS line (with triple snowbird conductor, under TBCB route). As the connectivities are separate for the two units, i.e. U-3 with STU and U-4 with ISTS, the system has been planned with a bus sectionaliser in generation switchyard, which would be normally kept open.
- 17.2 OPGC had taken connectivity and LTA for 660 MW (Unit-4) based on target region (200 MW for Northern Region, 200 MW for Western Region and 200 MW for Southern region).
- 17.3 Subsequently, OPGC has voluntarily relinquished the LTA granted to them but connectivity agreement with CTU still exists.

17.4 OPGC has explained the following consequences, which are lead to the relinquishment. The coal linkage for the project was cancelled due to coal blocks deallocation. Therefore, OPGC was compelled to purchase the coal from the state owned mining company (OCPL- Odisha Coal Private Limited). Odisha government while providing coal linkage from OCPL, allocated total power of Unit 3 & 4 (1320MW) to GRIDCO, Odisha for a period of 25 years. As per PPA, OPGC has to deliver this power to GRIDCO at their switchyard.

17.5 OPGC requested CEA to approve the proposal of operating the system under common bus mode i.e. by closing the bus sectionaliser between Unit-3 (connected to STU) and Unit-4 (connected to ISTS) for reliable, efficient, secure & stable grid.

17.6 In this connection, a meeting was held in CEA on 26.03.2019 (MoM is at **Annexure-V**), wherein following were concluded:

- (a) The proposal of OPGC/GRIDCO regarding closing of bus sectionaliser between U-3 (connected to STU) and U-4 (connected to ISTS) is feasible, but with compromise in N-1 reliability.
- (b) There is no constraint in evacuation of power from U-4 in the planned arrangement i.e. with sectionaliser kept as open.
- (c) OPGC U-4 is connected with ISTS and they may seek Long term/Short term open access in the ISTS for scheduling their power to Odisha, as per their PPA.
- (d) OPGC may approach CERC, if desired, for resolution of above technical/ commercial matters.

17.7 In response to the Minutes of meeting, BSPTCL vide their letter dated 21.05.2019 requested CEA that CEA should ensure that any change in the existing OPGC evacuation system arrangement should not financial burden BSPTCL.

17.8 Members may discuss.

18. Connectivity of newly constructed 220/132/33 kV (2x150+2x50) MVA Grid Substation Giridih of JUSNL through LILO of 220 kV Giridih (DVC)-Koderma (DVC) Transmission Line - Agenda by JUSNL

18.1 Presently Power to Giridih District of Jharkhand is fed through DVC network and is not sufficient to meet demand of Giridih and nearby area. In order to meet the power requirement of Giridih, Jamua and Sariya, JUSNL has completed the construction work of 220/132/33 kV (2x150+2x50) MVA Grid Substation Giridih (JUSNL), 132/33 kV GSS at Jamua and 132/33 kV GSS at Saria.

18.2 On the upstream, 220/132/33 kV Grid Substation Giridih(JUSNL) is to be connected to under-construction 220/132/33 kV GSS Jasidih through 220 KV

D/C Giridih-Jasidih transmission line and 220/132/33 kV GSS Jasidih will be connected to existing 220/132 kV GSS at Dumka(Madanpur) through under construction 220 kV D/C Dumka-Jasidih Transmission line. As an alternate source to 220/132/33 kV GSS Jasidih, Jasidih will be connected to proposed 400/220 kV GSS (TBCB mode) at Jasidih through 220 kV D/C transmission line.

18.3 The details of the present status of the above plan are as follows:

Sr. No.	Transmission Element	Present Status
1	220/132/33 kV Giridih GSS	Ready for commissioning.
2	220/132/33 kV Jasidih GSS	Work is in progress and expected to be completed by May 2019.
3	220 kV D/C Giridih- Jasidih Transmission line	Work awarded but progress is slow and delayed due to delay in forest clearance.
4	220 kV D/C Dumka (Madanpur)-Jasidih Transmission line	Work awarded but progress is slow and delayed due to delay in forest clearance.
5	400/220 kV GSS Jasidih along with associated transmission line.	Under TBCB. Bidding process is going on. It will take approx. 3 years for completion.

18.4 Till completion of 400/220 kV GSS Jasidih along with associated line upto 220/132 kV GSS Jasidih (which are under TBCB Scheme), the 220/132/33 kV GSS Giridih will remain on only one source i.e. 220/132 kV GSS Dumka, which receives power though 220 kV D/C Dumka — Maithon(PG) transmission line. The availability of power at Dumka will not be sufficient to meet the demand of Giridih, Jamua and Saria GSS in addition to Dumka region.

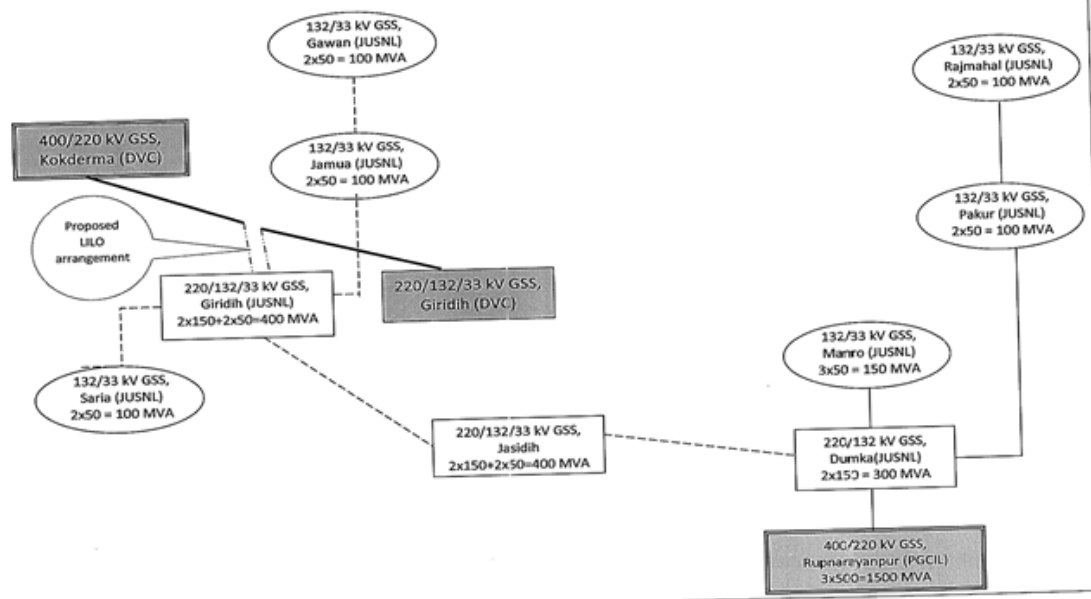
18.5 For early commissioning of 220/132/33 kV Grid Substation Giridih, JUSNL has explored one possibility and considered the same as the most suitable option of connectivity of Giridih GSS through LILO of 220 kV Giridih (DVC) — Koderma (DVC) Transmission Line at present (line diagram enclosed).

18.6 After completion of 220 kV D/C Giridih- Jasidih Transmission line and 220 kV D/C Dumka(Madanpur)- Jasidih Transmission line, this LILO will also act as an alternate source to 220/132/33 kV GSS Giridih.

18.7 Preliminary survey work for the above proposal has been carried out and the route length from existing tower No. KG-317 has been identified having length 19.30 Km with no involvement of forest and railway crossing.

18.8 After completion of this proposed LILO, commissioning of newly constructed 220/132/33 kV (2x150+2x50) MVA Grid Substation Giridih (JUSNL) can be done. Further after completion of downstream network of Giridih GSS, power may be extended to 132/33 kV GSS at Jamua and Saria of JUSNL and power crisis to Jamua, Tisri, Gawan, Deori, Rajdhanwar, Birni, Sariya, Bagodar, Pirtand, Dumri and nearby villages will be resolved.

Block diagram of load flow from GSS, Rupnarayanpur (PGCIL) and proposed LILo arrangement for GSS Giridih (JUSNL)



18.9 Members may discuss.

19. Operational feedback report of POSOCO

19.1 The latest operational feedback of Q4-FY 2018-19 of POSOCO has been reviewed wherein various operational constraints have been observed which need action by states. Only the issues which were still found to be persistent in future planning cases have been detailed below:

19.1.1 Durgapur (POWERGRID) – Parulia (DVC) 220kV D/c line

“Parulia (Durgapur) is a major load centre in DVC control area. Since inception it is planned to be fed from internal generation of DVC embedded at 220kV and 132 kV level. However, with decommissioning of DVC units (at Bokaro and CTPS) and low generation from internal plants particularly at Mejia and Waria, the load of Parulia and nearby area is practically met through importing large quantum of power from Durgapur substation of PG

through 220kV Durgapur(PG)-Parulia(DVC) D/C. This resulted in very high loading of above line and even crossed the N-1 security limit.”

It has been observed that the line said line is critically loaded in future time-frame also. Accordingly, the subject line may be reconducted by DVC. Even POSOCO has suggested this as one of the corrective measure.

Members may discuss.

19.1.2 High voltage at Angul and Sundargarh (Jharsuguda) substations at 765kV level

In the operational feedback report it has been observed that cumulatively the Angul – Sundargarh (Jharsuguda) ckt-1, 3, and 4 were kept out of service for about 1380 hrs. (ckt-4: 751hrs. 38min.; ckt-3: 521hrs. 28min.; ckt-1: 104hrs. 45min.). Further, POWERGRID site officials have informed that due to persistent overvoltage of the order of 780kV and above (maximum being upto 795kV) at Angul S/s, two CTs, one Circuit Breaker, and isolator have been damaged.

The main Bay B-Phase CT of 765kV Angul-Sundergarh Ckt-4 blasted at 14:28hrs on 24/04/2019 at Angul substation. This blasting of the CT further damaged the main Circuit breaker and isolators. Earlier also the tie CB of the same line was blasted on 03/04/2019 at Angul substation. After commissioning of 765kV Angul-Sundergarh ckt-3 and ckt-4 the bus voltages at Angul and Sundargarh substations is quite high even after keeping all the line and bus reactors in service.

Accordingly, it is proposed to install 765kV, 1x330MVA bus reactor at Angul (POWERGRID) S/s.

Members may discuss.

20. Scheme for limiting of fault current level at 400kV level at Farakka generation switchyard

20.1 The three phase fault level at Farakka TPS (NTPC) at 400kV bus is found to be exceeding the designed short time current rating of equipment (i.e. 40kA). In the present time-frame, the fault level is observed to be about 53kA (assuming split is operational at Maithon, Biharsharif, Durgapur, and Kahalgaon). Moreover, the fault level of Farakka generation switchyard in 2022-23 time-frame is expected to be about 54.5kA.

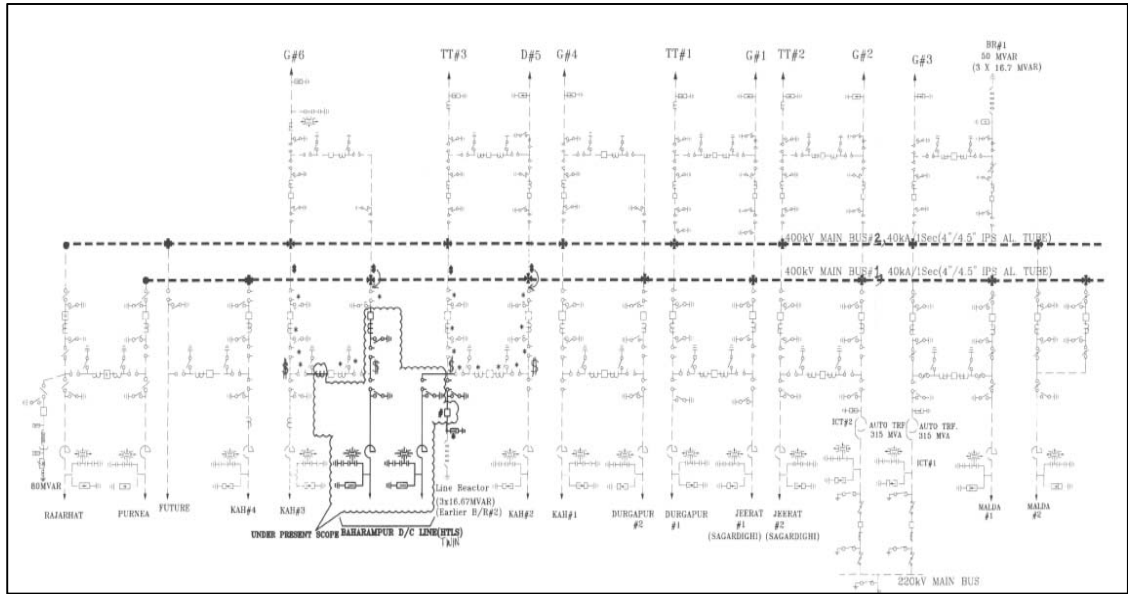
20.2 The matter was discussed in a meeting held at CEA on 26-03-2019 (Minutes of meeting is at **Annexure-I**). In the meeting, CTU had proposed for splitting the 400kV Farakka bus using series reactor. With the proposed bus splitting arrangement and a series reactor of 12ohm between the bus sections, it was observed that maximum angular difference between the two sections is

about 4-5 degrees. Representative of NTPC informed that auxiliary power supply for Farakka STPP is designed to derive station and backup power supply for plant auxiliaries from 400kV switchyard through 3 nos. Tie transformers (125MVA, 125MVA and 100MVA). Tie transformer#1 and 2 are fed from 400kV Bus#1 and Tie Transformer#3 is fed from 400kV bus#2. For Farakka STPP stage-1, 2 and 3, there is interconnection between the respective Tie transformers at 33kV, 11/6.6kV and 0.415kV levels. 2x100% / 3x50% redundant feeding configuration is provided at each load centre with two sources fed from different Tie transformers such that there is no loss of plant auxiliaries in case of outage of any one tie transformer. This provision has been kept by design in order to ensure reliability of supply to auxiliaries and avoid loss of generation on outage of Tie Transformer. In case of splitting the 400kV Farakka bus using series reactor arrangement, the phase angle difference between same voltage level buses would be more than 5 degree. Due to this, auxiliary power supply changeover may not take place or heavy circulating currents would flow, which may further trip some of the circuit breakers.

- 20.3 After system study, NTPC informed that even with 2.5 deg. angle between FSTPP split buses and around 50% loadings of the tie transformer, angular difference at 33kV level is more than 6 deg. which may result in blocking of changeover considering equipment safety. It is also pertinent to highlight here that as per load flow studies with paralleling at 415Volts level, high recirculating currents are observed in the LT system during paralleling which lead to overloading of the transformer and subsequent tripping of the incoming LT transformer. Changeover from one source to second source is not possible under this condition.
- 20.4 In view of the above, it was decided that alternate solutions to limit fault current at Farakka would be studied.
- 20.5 Accordingly, in view non feasibility of either bus splitting or installation of series reactor at Farakka generation switchyard, following alternatives involving physically bypassing of 400kV D/c lines outside the generation switchyard have been studied:
- (a) Bypassing Kahalgaon ckt-1 & ckt-2 and Durgapur D/c (about 250km)
 - (b) Bypassing Kahalgaon ckt-3 & ckt-4 and Durgapur D/c (about 250km)
 - (c) Bypassing Kahalgaon ckt-3 & ckt-4 and Sagardighi D/c (about 160km)

Case	Fault current at Farakka	Fault current at Sagardighi
(a)	44.16kA	41.85kA
(b)	41.76kA	41.13kA
(c)	43.16kA	41.64kA

20.6 SLD of Farakka generation switchyard is given below:



20.7 From the above, it may be observed that alternative-(b) is the most suitable alternative as the 3-phase short circuit current reaches the lowest value. Only shortcoming of this alternative is Kahalgaon ckt-3 & ckt-4 lines (95km) are designed to operate till 85°C, whereas Durgapur lines (150km) are designed to operate till 75°C, which would result in underutilisation of Kahalgaon-Farakka section of resultant Kahalgaon-Durgapur line. Fault current contribution by elements connected at Farakka after line bypassing is given below:

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS NOT APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

AT BUS 444019 [FARAKKA 400.00] AREA 4 *** FAULTED BUS IS: 444019 [FARAKKA 400.00] *** 0 LEVELS AWAY ***

PRE FAULT (KV L-G) VA:/230.94/-0.00
 POST FAULT (KV L-G) V+:/0.00/0.00 VA:/0.00/0.00 VB:/0.00/0.00 VC:/0.00/0.00
 THEVENIN IMPEDANCE, X/R (PU) Z+:/0.003457/86.685, 17.26679
 THEVENIN IMPEDANCE, X/R (OHM) Z+:/5.531/86.685, 17.26679

X-----	FROM	X AREA	CKT	I/Z	THREE PHASE FAULT-----X											
					/I+/	AN(I+)	/IA/	AN(IA)	/IB/	AN(IB)	/IC/	AN(IC)	/Z+/	AN(Z+)	APP	X/R
SYNCHRONOUS MACHINE	1	AMP/OHM	906.4	-90.00	906.4	-90.00	906.4	-90.00	906.4	150.00	906.4	30.00				
SYNCHRONOUS MACHINE	2	AMP/OHM	906.4	-90.00	906.4	-90.00	906.4	-90.00	906.4	150.00	906.4	30.00				
SYNCHRONOUS MACHINE	3	AMP/OHM	906.4	-90.00	906.4	-90.00	906.4	-90.00	906.4	150.00	906.4	30.00				
SYNCHRONOUS MACHINE	4	AMP/OHM	2307.0	-90.00	2307.0	-90.00	2307.0	-90.00	2307.0	150.00	2307.0	30.00				
SYNCHRONOUS MACHINE	5	AMP/OHM	2307.0	-90.00	2307.0	-90.00	2307.0	-90.00	2307.0	150.00	2307.0	30.00				
SYNCHRONOUS MACHINE	6	AMP/OHM	2307.0	-90.00	2307.0	-90.00	2307.0	-90.00	2307.0	150.00	2307.0	30.00				
414410 [KAHALGAON-A 400.00]	4	1	AMP/OHM	3232.4	-85.81	3232.4	-85.81	3232.4	154.19	3232.4	34.19	29.357	84.653	10.68333		
414410 [KAHALGAON-A 400.00]	4	2	AMP/OHM	3232.4	-85.81	3232.4	-85.81	3232.4	154.19	3232.4	34.19	29.357	84.653	10.68333		
414471 [PURNEA-NW-P0400.00]	4	1	AMP/OHM	3733.1	-86.45	3733.1	-86.45	3733.1	153.55	3733.1	33.55	38.251	86.042	14.45455		
432019 [FARAKKA 220.00]	4	1	AMP/OHM	483.1	-82.43	483.1	-82.43	483.1	157.57	483.1	37.57	19.206	89.9541250.0001			
432019 [FARAKKA 220.00]	4	2	AMP/OHM	483.1	-82.43	483.1	-82.43	483.1	157.57	483.1	37.57	19.206	89.9541250.0001			
444007 [RAJARHAT 400.00]	4	1	AMP/OHM	1744.6	-85.81	1744.6	-85.81	1744.6	154.19	1744.6	34.19	83.334	84.871	11.14393		
444010 [SAGARDIGHI_4400.00]	4	1	AMP/OHM	4175.3	-86.12	4175.3	-86.12	4175.3	153.88	4175.3	33.88	22.334	84.871	11.14023		
444010 [SAGARDIGHI_4400.00]	4	2	AMP/OHM	4175.3	-86.12	4175.3	-86.12	4175.3	153.88	4175.3	33.88	22.334	84.871	11.14023		
444021 [MALDA 400.00]	4	1	AMP/OHM	2556.0	-84.10	2556.0	-84.10	2556.0	155.90	2556.0	35.90	13.288	84.653	10.68346		
444021 [MALDA 400.00]	4	2	AMP/OHM	2556.0	-84.10	2556.0	-84.10	2556.0	155.90	2556.0	35.90	13.288	84.653	10.68346		
444101 [BEHRAMPUR 400.00]	4	1	AMP/OHM	2885.4	-86.37	2885.4	-86.37	2885.4	153.63	2885.4	33.63	24.716	84.651	10.68055		
444101 [BEHRAMPUR 400.00]	4	2	AMP/OHM	2885.4	-86.37	2885.4	-86.37	2885.4	153.63	2885.4	33.63	24.716	84.651	10.68055		
INITIAL SYM. S.C. CURRENT(I**k)(RMS) AMP			41757.2	-86.69	41757.2	-86.69	41757.2	153.31	41757.2	33.31	24.716	84.651	10.68055			

20.8 Nevertheless, it may be noted from above that with 41.76kA fault level, most of the Circuit Breakers (CB) at Farakka switchyard are expected to experience fault current less than 40kA as the contribution from each of

elements is mostly greater than 1.76kA, except contribution from 3x200MW generators, 2x315MVA ICTs and a few transmission line.

20.9 Members may discuss.

21. Modification in transmission system required for LTA from Darlipalli (2x800MW), NTPC

21.1 Following LTAs have been granted from Darlipalli (2x800MW) generation project of NTPC Ltd.:

(a) Applicant: NTPC Ltd.

LTA quantum: 793.25MW (Bihar-154.13MW; West Bengal-283.75MW; Jharkhand-102.11MW; Sikkim-15.29MW; Unallocated-237.98MW)

(b) Applicant: GRIDCO Ltd.

LTA quantum: 748MW (Odisha)

21.2 Following transmission system has been indicated as LTA system for above mentioned applicants:

- (a) Darlipalli – Jharsuguda (Sundargarh) 765kV D/c line.
- (b) Angul – Jharsuguda (Sundargarh) – Dharamjaygarh 765kV D/c (2nd) line.
- (c) Jharsuguda (Sundargarh) – Raipur Pool 765kV D/c line.
- (d) LILO of both circuits of Rourkela – Raigarh 400kV D/c (2nd line) at Jharsuguda (Sundargarh).
- (e) Addition of 2x1500MVA, 765/400kV ICT at Jharsuguda (Sundargarh).
- (f) Addition of 2x1500MVA, 765/400kV ICT at Angul.
- (g) Split bus arrangement at 400kV and 765kV buses in Angul substation.
- (h) Split bus arrangement at 400kV and 765kV buses in Jharsuguda (Sundargarh) substation.

21.3 The “Common Transmission System for Phase-2 generation projects in Odisha” was reviewed in the 19th meeting of Standing Committee on Power System Planning for ER held on 01-09-2017, wherein the elements mentioned at (f) and (g) above were deleted from scope of works. Accordingly, it is proposed to revise the transmission system for LTA from Darlipalli (2x800MW) generation project granted to above mentioned two no. of applicants. The revised transmission system for LTA would be:

- (a) Darlipalli – Jharsuguda (Sundargarh) 765kV D/c line.
- (b) Angul – Jharsuguda (Sundargarh) – Dharamjaygarh 765kV D/c (2nd) line.
- (c) Jharsuguda (Sundargarh) – Raipur Pool 765kV D/c line.

- (d) LILO of both circuits of Rourkela – Raigarh 400kV D/c (2nd line) at Jharsuguda (Sundargarh).
- (e) Addition of 2x1500MVA, 765/400kV ICT at Jharsuguda (Sundargarh).
- (f) Split bus arrangement at 400kV and 765kV buses in Jharsuguda (Sundargarh) substation.

21.4 Members may approve.

22. Modification in transmission system associated with North Karanpura (3x660MW) generation project of NTPC

22.1 The evacuation system for North Karanpura (3x660MW) generation project of NTPC is under implementation through TBCB route by M/s NKTL (subsidiary of Adani). The scope of works inter alia includes construction of following two transmission lines:

- (a) North Karanpura – Gaya 400kV D/c (Quad) line
- (b) North Karanpura – Chandwa 400kV D/c (Quad) line

22.2 In a meeting held at CEA on 23-04-2019(MoM is at **Annexure-VI**), wherein the status of above mentioned transmission system was reviewed and following was agreed.

- i. Revised scope of the project:
 - a. NKSTPP- Common point would be 13 km multi circuit 400kV line (quad moose conductor).
 - b. Common point – Chandwa would be 25 km 400kV D/c line(quad moose conductor)..
 - c. Common point – Gaya would be 98 km 400kV D/c line(quad moose conductor).
 - d. New 400kV Dhanbad Substation.
 - e. 1.2 km D/c LILO of Ranchi-Maithon 400kV D/c line.
- ii. NKSTPP-Chandwa 400kV D/c line would be completed in 14 months, i.e. by June 2020 and NKSTPP-Gaya 400kV D/c line would be completed in 23 months, i.e. by March 2021. New 400kV Dhanbad S/s with 1.2 km D/c LILO of Ranchi-Maithon 400kV D/c line would be completed in about 18 months, i.e. by October 2020.
- iii. Representative of NKTL agreed for the above time lines subject to getting forest clearance for NKSTPP-Chandwa 400kV D/c line within 200 days and for NKSTPP-Gaya 400kV D/c line within 300 days.

22.3 Members may discuss & agree the revised scope of NKTL.

23. Advance intimation for alternate transmission system for Rammam-III (3X40MW) project – (Agenda by NTPC)

- 23.1 NTPC has informed that Rammam-III (3X40 MW) hydro project is being constructed on river Rammam in Darjeeling district of West Bengal. MOU in this regard was signed between NTPC and WBSEB. TEC for the project was granted by CEA on 12th Sep 2006 and revalidated on 1st Aug 2013. 73% of Power generated from the project has been allocated to WB and 12% to Sikkim by MOP on 31st Jan 2011, 15% of power is yet to be allocated.
- 23.2 As per terms and conditions of MOU, following transmission system was to be developed by WBSEB/WBSETCL.
- (a) 132kV D/c Rammam III-New Jalpaiguri
 - (b) LILO of 132kV Rammam-II HEP- North Bengal University line at Rammam III.
- 23.3 Construction work for project has already started and first unit of project is scheduled to be synchronized by Dec 2021 and subsequent units by Jan and Feb 2022. In spite of regular follow up with WBSEB/ WBSETCL, construction work on associated transmission is yet to start.
- 23.4 In view of above, NTPC has requested for exploring alternate evacuation scheme for the project.

23.5 Members may discuss.

24. Proposal for 132/33 kV sub-station at Nabinagar

- 24.1 BSPTCL has informed that, one 132/33 kV GSS of capacity 3x50 MVA has been decided to be constructed at Nabinagar, Dist. Aurangabad whose connectivity at 132 kV level has been proposed as LILO of 132kV Sonenagar - Rihanad ckt 1.
- 24.2 A meeting was held on 26.03.2019 at CEA, wherein it was decided that instead of said LILO, new 132/33kV S/s at Nabinagar may be feed radially from Nabinagar-II generation project (line length: about 15km) as requisite transformation capacity is available in the 400/132kV, 2x200MVA ICTs at the generation switchyard.
- 24.3 BSPTCL stated that the above would be implemented by BSPTCL as intra-state scheme.

24.4 Members may discuss.

25. Transmission system for power evacuation of Odisha Integrated Power Ltd. (Odisha UMPP-4000MW) for Connectivity and LTA applications – Agenda by POWERGRID

- 25.1 The 4000MW Connectivity and LTA applications for Odisha UMPP submitted by Odisha Integrated Power Ltd. (OIPL), wholly owned subsidiary of PFCCCL, are pending since long (June'14) on account of non-firming of generation project implementation. In this regard, it is to mention that CERC vide

Amendment dated 17-02-2016 has directed CTU not to hold any application in abeyance and process them within the timeline prescribed in Regulation 7 of the Connectivity Regulations.

25.2 In the 19th SCM of ER held on 01-09-2017, the following transmission system was finalized for Odisha-UMPP:

- a) Split bus arrangement at Odisha UMPP (3x660MW in Section-A and 3x660MW in Section-B)
- b) LILO of Sundargarh-A – Dharamjaygarh 765kV D/c line at Odisha UMPP-A
- c) Odisha UMPP-B – Sundargarh-B 765kV D/c line
- d) Ranchi (New) – Gaya 765kV D/c line

Note: It was also decided to provide OPGW connectivity to Odisha UMPP-A, 150km of OPGW (24 fibre) and associated communication equipment is to be installed on 765kV D/C Sundergarh-A – Dharamjaygarh line and respective terminal substations respectively by POWERGRID.

25.3 M/s OIPL in their Connectivity and LTA applications, had not clarified the unit size of the generation project and has left the decision of choosing unit size to the successful bidder. Subsequently, M/s OIPL vide email dated 13-03-2018 informed the unit size as 5x800MW.

25.4 Further, M/s OIPL had also not submitted the Ministry of Power's allocation letter. M/s OIPL vide letter dated 17-11-2017 has provided a letter of MoP in which the tentative allocation agreed in the meetings held on 10-07-2006 and 19-09-2006 is mentioned.

25.5 M/s OIPL vide its email dated 17-05-2019 has informed that the start date of connectivity and LTA may be considered as Unit-1: 01-04-2025 and each subsequent unit at an interval of 6 months thereafter.

25.6 As the evacuation system was planned considering 6x660MW units with split bus arrangement at the UMPP bus (3x660MW in Section-A and 3x660MW in Section-B), revised studies for 2023-24 timeframe was carried out with 5x800MW capacity for Odisha UMPP and discussed in the 1st meeting of ERSCT. In meeting it was decided to review the transmission system proposed for Odisha UMPP by CEA, CTU, OPTCL and OIPL.

25.7 Accordingly, a meeting was held at CEA on 26-03-2019. No representative of M/s OIPL was present in the meeting. Revised system studies were carried out 2024 time-frame, with 5x800MW capacity for Odisha UMPP and without Ranchi-Gaya 765kV D/c line. It was observed that there are no constraints in power evacuation from Odisha UMPP. Accordingly, following evacuation system is proposed for Odisha UMPP for grant of Connectivity and LTA:

Transmission System for Connectivity:

- Split bus arrangement at Odisha UMPP with 3x800MW in Section-A and 2x800MW in Section-B. For connectivity of 5x800MW, bus sectionaliser should be kept closed.
- Odisha UMPP-B – Sundargarh-B 765kV D/c line

Transmission System for LTA

- Split bus arrangement at Odisha UMPP with 3x800MW in Section-A and 2x800MW in Section-B. The bus sectionaliser should be kept normally open.
- Odisha UMPP-B – Sundargarh-B 765kV D/c line
- LILO of both circuits of Sundargarh-A – Dharamjaygarh 765kV D/c line at Odisha UMPP-A

Note:

- (a) *Generation voltage to be stepped-up to 765kV*
- (b) *Switchgears to be designed for short time current rating of 50kA (or higher) for 1sec*

25.8 Further, it is required to provide OPGW connectivity to Odisha UMPP-A. Accordingly, 150km of OPGW (24 fibre) and associated communication equipment is to be installed on 765kV D/C Sundergarh-A – Dharamjaygarh line and respective terminal substations.

25.9 M/s OIPL vide its email dated 17-05-2019 has informed that the start date of connectivity and LTA may be considered as Unit-1: 01-04-2025 and each subsequent unit at an interval of 6 months thereafter. Accordingly, as requested by M/s OIPL, it is proposed to grant Connectivity and LTA to M/s OIPL for its 4000MW (5x800MW) UMPP project at Bhedabahal, Odisha w.e.f 01-04-2025 (LTA for 25 years from 01-04-2025). Upon grant of Connectivity and LTA, OIPL/beneficiaries need to sign requisite agreements within specified timelines for taking up the evacuation system for implementation, failing which the Connectivity and LTA intimations shall be liable for closure/cancellation.

25.10 Members may discuss.

File No. CEA-PS-12-15/2/2018-PSPA-II Division



भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग-II

Power System Planning & Appraisal Division-II

To

As per List Enclosed.

Subject: Minutes of Meeting on follow-up actions of 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT) and other issues.

महोदय(Sir)/महोदया(Madam),

A Meeting on follow-up actions of 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT) and other issues was held on 26.03.2019 at CEA, New Delhi. Minutes of the meeting are enclosed herewith.

भवदीय/Yours faithfully,

उम रवि भोगी
01/05/2019
(यू एम रवि भोगी / U.M.Rao Bhogi)
उप निदेशक / Deputy Director

List of addressee:

<p>1. Member Secretary, Eastern Regional Power Committee, 14, Golf Club Road, Tollygange, Kolkata-700033. Tel. No. 033-24235199 Fax No.033-24171358</p>	<p>2. Managing Director, Bihar State Power Transmission Company, Vidyut Bhavan (4th floor), Baily Road, Patna-800021. Tel. 0612-2504442 Fax No. 0612-2504557</p>
<p>3. Chairman-cum-Managing Director, Jharkhand Urja Sancharan Nigam Limited Engineering Building, H.E.C., Dhurwa, Ranchi-834004.</p>	<p>4. Chairman-cum-Managing Director, Orissa Power Transmission Corporation Ltd, Jan path, Bhubaneshwar-751022. Tel. No. 0674-2540098 Fax No.0674-2541904</p>
<p>5. Managing Director, West Bengal State Electricity Transmission Company Ltd, Vidyut Bhavan (8th Floor), A-block, Salt Lake City, Kolkata-700091. Tel. No. 033-23370206</p>	<p>6. Principal Chief Engineer cum Secretary, Power Department Government of Sikkim, Sikkim. Tel. No. 03592-2022440 Fax No.03592-202927</p>
<p>7. Chief Operating Officer, Central Transmission Utility (CTU), Power Grid Corporation of India "Saudamini" Plot No. 2, Sector-29, Gurugram-122001</p>	<p>8. Director (Technical), NTPC Limited, Engineering Office Complex, A-8, Sector 24, Noida.</p>
<p>9. Shri Yogesh Juneja Executive Vice President PFC Consulting Ltd. (PFCCL) Odisha Integrated Power Ltd. 1st Floor, Urjanidhi, 1, Barakhamba lane, Connaught Place, New Delhi- 110001</p>	

Minutes of Meeting on follow-up actions of 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT) and other issues held on 26.03.2019 at CEA, New Delhi.

List of participants are enclosed at **Annexure-I**.

Chief Engineer (PSP&A-II), CEA welcomed the participants and took up the agenda for discussion. The agenda wise deliberations are given below under respective agenda items:

1. Limiting fault current level at 400kV bus at Farakka TPS (NTPC)

1.1 Representative of CTU informed that three phase fault level at Farakka TPS (NTPC) at 400 kV bus is found to be exceeding the designed short time current rating of equipment (i.e. 40 kA). Presently, the fault level is about 46kA. Moreover, the fault level of Farakka generation switchyard in 2021-22 time-frame is expected to be about 57.5kA. Therefore, CTU had proposed for splitting the 400kV Farakka bus using series reactor arrangement, in a meeting held on 13.06.2017 at CEA, New Delhi. The following were decided in the meeting.

- (i) Keeping in view the present fault level of 46kA at Farakka substation, it was opined that initially only Durgapur – Farakka (150km) 400kV D/c and Farakka – Kahalgaon (95km) 400kV 1st D/c (ckt-1 & 2) lines may be bypassed outside the switchyard so as to form Durgapur – Kahalgaon 400kV D/c line by POWERGRID. With above modified arrangement the fault level at Farakka in present time-frame reduces to about 35kA (provided Kahalgaon 400kV bus is split by NTPC as planned, otherwise the fault level at Farakka substation would be about 36.5kA).
- (ii) CTU would study the maximum voltage and angle difference between the 400 kV bus sections of Farakka-A and Farakka-B with series reactor and share the study results with NTPC and CEA.
- (iii) NTPC would study the proposal of series reactor in detail and submit their comments/observations, if any.
- (iv) Based on Comments/study results mentioned at (ii) & (iii) above, the proposal of bus splitting and installation and implementation of series reactor at Farakka Generating station would be reviewed in a special meeting at CEA along with NTPC and POWERGRID.

1.2 Representative of CTU further informed that, in the 19th Standing Committee Meeting on Power System Planning of ER (SCMPSP-ER) held on 01.09.2017, it was decided that Durgapur – Farakka (150 km) 400 kV D/c and Farakka – Kahalgaon (95 km) 400 kV 1st D/c (ckt-1 & 2) lines would be bypassed outside the Farakka switchyard so as to form Durgapur – Kahalgaon 400 kV D/c line which would limit fault level at Farakka generation switchyard. He stated that this has not been implemented, as this is not a permanent solution to limit the fault current. As decided in the meeting held on 13.06.2017, CTU has studied the case and stated that the maximum angle difference between the two

sections is about 4-5 degrees. The report is enclosed at **Annexure-II**. CTU reiterated the proposal of splitting the 400kV Farakka bus using series reactor arrangement.

1.3 In the meeting, Representative of NTPC stated that:

- (i) Auxiliary power supply for Farakka STPP is designed to derive Station and backup power supply for plant auxiliaries from 400kV switchyard through 3 nos. Tie transformers (125MVA, 125MVA and 100MVA). Tie transformer#1 and 2 are fed from 400kV Bus#1 and Tie Transformer#3 is fed from 400kV bus#2. For Farakka STPP stage-1, 2 and 3, there is interconnection between the respective Tie transformers at 33kV, 11/6.6kV and 0.415kV levels.
- (ii) 2x100% / 3x50% redundant feeding configuration is provided at each load centre with two sources fed from different Tie transformers such that there is no loss of plant auxiliaries in case of outage of any one tie transformer. This provision has been kept by design in order to ensure reliability of supply to auxiliaries and avoid loss of generation on outage of Tie Transformer.
- (iii) In case of splitting the 400kV Farakka bus using series reactor arrangement, the phase angle difference between same voltage level buses would be more than 5 degree. Due to this, auxiliary power supply changeover may not take place or heavy circulating currents would flow, which may further trip some of the circuit breakers.

1.4 Chief Engineer (PSPA-II) requested NTPC to determine the maximum voltage angle difference at various voltage levels under normal conditions.

1.5 Representative of NTPC informed that a study has been carried out for power flow for Farakka STPP station supply system in order to ascertain prevailing load angle at various Voltage levels. The details of the study is given below:

- (i) An input difference of 2.5 Degrees has been considered between FSTPP-A and FSTPP-B bus after installation of series reactor for this study. Typical load angles at various buses considering around 60MVA loading for the Running Tie Transformer (50% of actual rating) are indicated in table below:

Voltage level	Angle at Bus-A (incoming bus)	Angle at Bus-B (running bus)
400 kV	0.00 Deg	-2.5 Deg
33 kV	0.00 Deg	-6.39 Deg
11/6.6 kV MV Aux. Level	0.00 Deg	-11.52 Deg
0.415 kV LT Aux. Level	0.00 Deg	-15.12 Deg

- (ii) As evident, even with 2.5 Deg angle between FSTPP split buses and around 50 percent loadings of the tie transformer, angular difference at 33kV level is more than 6 degrees which may result in blocking of changeover considering equipment safety. Load flow simulations indicating above are attached (**Annexure-III**).

(iii) It is also pertinent to highlight here that as per load flow studies with paralleling at 415Volts level (**Annexure- IV**), high recirculating currents are observed in the LT system during paralleling which lead to overloading of the transformer and subsequent tripping of the incoming LT transformer. Changeover from one source to second source is not possible under this condition.

1.6 After the deliberations, it was decided that CTU would study alternate solutions to limit fault current at Farakka 400kV Bus.

2. Transmission system for power evacuation of Odisha Integrated Power Ltd. (Odisha UMPP-4000MW).

2.1 Representative of CTU informed that transmission system for evacuation of power from Odisha UMPP was proposed in 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT) held on 16.07.2018. In the meeting, it was decided that CEA, CTU, OPTCL and OIPL may jointly study the evacuation system of Odisha UMPP, keeping in view the scheduled commissioning of Odisha UMPP of 2024 and the issues raised on proposed transmission elements. CTU has studied the evacuation system without 765kV Ranchi-Gaya D/c line and found that there is no constraint in power evacuation. Accordingly, CTU proposed following revised evacuation system:

Transmission System for Connectivity:

- Split bus arrangement at Odisha UMPP with 3x800MW in Section-A and 2x800MW in Section-B. For connectivity of 5x800MW, bus sectionaliser should be kept closed.
- Odisha UMPP-B – Sundargarh-B 765kV D/c line

Transmission System for LTA

- Split bus arrangement at Odisha UMPP with 3x800MW in Section-A and 2x800MW in Section-B. The bus sectionaliser should be kept normally open.
- Odisha UMPP-B – Sundargarh-B 765kV D/c line
- LILO of both circuits of Sundargarh-A – Dharamjaygarh 765kV D/c line at Odisha UMPP-A

Note:

- (a) *Generation voltage to be stepped-up to 765kV*
- (b) *Switchgears to be designed for short time current rating of 50kA (or higher) for 1sec*

2.2 No representative from Odisha Integrated Power Ltd. (OIPL) (wholly owned subsidiary of PFCCL) was present in the meeting.

2.3 After deliberations, it was decided that the proposed evacuation system for Odisha UMPP would be taken up in the forthcoming ERSCT.

3. Augmentation of Muzaffarpur (PG) 400/220 kV GSS in Bihar.

- 3.1 Representative of BSPTCL stated that the load in Muzaffarpur area is growing very fast. The load demand in Muzaffarpur & adjoining areas is largely fed by Muzaffarpur (PG) with transformation capacity of 1x500+2x315 MVA. During peak hours following loading is being observed:

Present scenario:

Sl. NO.	Lines	Maximum Load (MW)
1	Muzaffarpur (PG)-MTPS (D/C)	420
2	Muzaffarpur (PG)-Hazipur (D/C)	296
3	Muzaffarpur (PG)-Dhalkebar (Nepal) (400kV Transmission Line charged at 220kV)	150
	Total	866

Future scenario:

In future Amnor (Chappra) GSS(220/132/33 KV) will be connected to Muzaffarpur (PG) through 220 KV D/C lines as approved in 18th Standing Committee Meeting of CEA under 13th Plan. Further Amnor has been proposed to be connected to Digha (new) GSS (220/132/33 KV) at 220 KV level. BSPTCL has also proposed one 220/132/33 KV GSS at Garaul (Dist. Vaishali) under State Plan, approved in the Bihar cabinet, is getting source at 220 KV level with D/C from Muzaffarpur(PG). Both proposed GSSs (Digha and Garaul) are likely to be commissioned in March-2020. In future the loading pattern on 220kV line will be as follows:-

Sl. NO.	Lines	Maximum Load (MW)
1	Muzaffarpur (PG)-MTPS (D/C)	80
2	Muzaffarpur (PG)-Hazipur (D/C)	250
3	Muzaffarpur (PG)-Amnor (BGCL) (D/C)	300
4	Muzaffarpur (PG)-Goraul (Proposed) (D/C)	200
	Total	830

In present scenario itself, Muzaffarpur (PG) is not able to fulfill N-1 criteria and in case of outage of any power transformer, the situation will be critical.

In view of above facts, it is proposed that, either replacement of 2x315 MVA transformers by 2x500 MVA or addition of one 500 MVA transformer of Muzaffarpur (PG) may be considered under N-1 scheme to ensure uninterrupted power to Muzaffarpur and adjoining areas in the event of outage of any transformer. Moreover, if the generation at Kanti (MTPS) reduces, the power supply position at Muzaffarpur 220kV level further aggravates under N-1 of ICTs.

- 3.2 Chief Engineer (PSPA-II) stated that Muzaffarpur (PG)-Dhalkebar (Nepal) 400kV D/c line is being operated at 220kV and the power flow is around 240MW. He suggested that additional one no. of 500MVA ICT may be installed to meet the load under N-1 criteria.

- 3.3 With regard to availability of space at Muzaffarpur S/s, CTU informed that space is available for new 400/220kV, 500MVA ICT. The 400kV ICT bay could be implemented as AIS, however, 220kV ICT bay needs to be implemented as GIS along with 220kV cable from ICT to GIS bay.
- 3.4 After deliberations, it was decided to take up the matter regarding installing new 400/220kV, 500MVA ICT at Muazaffarpur (PG) in the forthcoming meeting of ERSCT for approval from constituents.
- 4. Examination of additional 400kV connectivity at 400/220/132kV Saharsa (new) GSS being implemented under TBCB in Bihar.**
- 4.1 Representative of BSPTCL stated that the present connectivity of upcoming 400/220/132 kV Saharsa (New) GSS at 400 kV level is LILO of Patna (PG) - Kishanganj (PG) 400 kV D/C line and this work is being done by POWERGRID under TBCB route.
- 4.2 He further stated that the Saharsa (New) GSS has to be fed from two reliable sources, whereas one of the feed i.e. Patna (PG) - Saharsa (New) 400 kV D/c line is having river crossing and tower failure may occur during floods. Therefore, to improve the reliability at 400 kV level, it is proposed to provide an additional source by making LILO of Darbhanga (DMTCL) - Kishanganj (PG) 400 kV D/C line at 400 kV Saharsa (New) S/S.
- 4.3 Chief Engineer (PSP&A-II), CEA, and representative of CTU stated that Kishanganj (PG) - Saharsa(New) 400 kV D/c line with Quad moose conductor can meet the load of Saharsa (New) S/S , in case of tower failure of Patna (PG) – Saharsa (New) 400kV D/c line. Under worst case scenario, i.e. with only one circuit of Kisanganj (PG) - Saharsa(New) 400 kV line (with quad moose), the load of Saharsa (New) S/S would be met in the present condition. Based on operational experience, the alternatives may be discussed.
- 4.4 It was opined that N-1 criteria can only be considered while planning, whereas tower failure in river crossing cannot be considered as a general case in the studies. However, representative of BSPTCL insisted that the 2nd 400kV LILO line i.e. LILO of Kishanganj – Darbhanga may be considered at Saharsa to improved power supply reliability, as the Kishanganj – Patna line during the last two monsoon seasons has suffered prolonged outage due to tower collapse at various locations during flood.
- 4.5 After deliberations, it is decided to take up the issue to the fourth coming ERSCT.
- 5. Proposal for connectivity of 220/132/33kV GSS Goraul in Bihar to Muzaffarpur (PG) 400/220 kV GSS.**
- 5.1 Representative of BSPTCL stated that 220/132/33kV GSS of capacity 2x160+3x50 MVA has been decided to be constructed near Goraul block in Vaishali district. At present, load of Vaishali district is about 300 MW and many more PSSs under different schemes of Central government and under state plan are proposed/under construction. Due to new PSSs, load of Vaishali

district is going to increase very rapidly. The upcoming/under construction PSSs are very far away from the existing GSS. In some cases existing PSSs are also far away from existing GSS. Moreover, existing GSS is already saturated and further there is no scope of augmentation due to space constraint. Under 13th plan, load flow study was done considering the load at higher side. The above-proposed GSS is required, to distribute the load uniformly in the existing-GSS also. In the present scenario, the connectivity of PSS with existing GSS are as follows:

Existing Scenario					
Sl. No.	Name of GSS	Capacity of GSS	Name of 33/11 kV PSS	Capacity of PSS (MVA)	Distance between existing GSS to PSS
1	Jandaha	90 MVA	Goraul	15	45 Kms.
			Jandaha	15	05 Kms.
			Mahua	20	32 Kms.
			Patepur	15	30 Kms.
			Chehrakalan	15	45 Kms.
			Mahnar	20	15 Kms.
			Patori (Samaastipur)	15	20 Kms.
Total				115	
2	Vaishali	90 MVA	Vaishali	20	0 Kms.
			Lalganj	30	15 Kms.
			Dhanpura	20	26 Kms.
			Pateri Belsar	15	12 Kms.
			Bakhara	10	26 Kms.
			Paroo	20	19 Kms.
Total				115	

Proposed Scenario					
Sl. No.	Name of GSS	Capacity of GSS	Name of 33/11 kV PSS	Capacity of PSS (MVA)	Distance between existing GSS to PSS
1	Goraul	150 MVA	Chehrakalan	15	10 Kms.
			Goraul	15	03 Kms.
			Ismailpur (Proposed)	10	05 Kms.
			Dabhaich (Proposed)	10	20 Kms.
			Mahudahchatur (Proposed)	10	15 Kms.
			Mahua	20	15 Kms.
Total				80	

The above PSSs are distributed to existing + proposed GSSs as per their geographical position so that losses can be minimized. In addition to above, many more PSS are proposed, which will be connected with proposed / existing GSSs.

Connectivity:-

The connectivity of above Goraul, 220/132/33kV, 2x160MVA + 3x50MVA GSS at 220 kV and 132kV levels will be from:

- (i) Muzaffarpur (PG) - Goraul 220 kV D/c (Zebra conductor)
- (ii) Proposed GSS Tajpur to proposed GSS Goraul 220kV D/c (Zebra conductor).
- (iii) LILO of D/c Vaishali - Muzaffarpur 132 kV tr. line at proposed GSS Goraul.
- (iv) 132 KV D/C Mahanar GSS - Goraul proposed GSS

The proposed GSS is already approved in BSPTCL Board meeting & also in Bihar cabinet under state plan.

- 5.2 With regard to availability of space at Muzaffarpur S/s, CTU informed that space is available for 2 no. 220kV GIS bays at Muzaffarpur for termination of Muzaffarpur-Goraul 220kV D/c line of BSPTCL.
- 5.3 After deliberations, it is decided to take up the agenda in the forthcoming ERSCT meeting for approval.

6. New 220kV and 132kV infrastructure in Bihar under intra-state project.

- 6.1 Representative of BSPTCL stated that under 13th plan, system studies were done and three nos. of 400 KV & three nos. of 220 KV sub-station were identified to cater to the enhanced load demand of BSPTCL. At present under different schemes of Central Government and State plan, near about 350 numbers of PSSs are under construction. Moreover it has also been decided to segregate the agriculture feeder. Due to that, the load demand on existing GSSs of 132/33kV level is increasing very rapidly. In this regard, BSPTCL is implementing two new 132kV GSSs as mentioned below:

Sl. no	Substation Name	Voltage levels & transformation capacity	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	Expected 33kV load demand (in MW)
1	Raghopur GSS	132/33 KV (3x50 MVA)	1. 220 kV Laukhi – Raghopur D/C, ACSR Zebra(charged on 132 kV): 48 km (tentative) 2. 220 kV Supaul – Raghopur D/C, ACSR Zebra(charged on 132 kV): 52 km (tentative)	90
2	Kerpa GSS	132/33 KV (3x50 MVA)	1. 132 kV Dehri – Kerpa S/C, ACSR Panther: 24 km 2. 132 kV Banjari – Kerpa S/C, ACSR Panther: 20 km	25

- 6.2 To cater to the increasing load demand, BSPTCL has proposed additional new substations and the details are given at **Annexure-V** and the brief is given below. The new GSSs have been developed after considering all the planned and under construction GSSs in system study.

Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	Expected 33kV load demand (in MW)
1	Digha (New) GIS	220/132/33 KV (2x200 + 2x80 MVA)	1. 220 kV Chapra(New) -Digha D/C, ACSR Zebra: 80 km	1. 132 kV Digha (New) – Digha (Old) D/C, XLPE Cable: 1 km 2. 132 kV Digha (New) – Board Colony D/C, XLPE Cable: 7 km	170

Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	Expected 33kV load demand (in MW)
2	Tajpur GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Tajpur – Goraul D/C, ACSR Zebra: 60 km 2. 220 kV Samastipur (New) – Tajpur D/C, ACSR Zebra: 20 km	1. 132 kV Samastipur (Old) – Tajpur S/C, ACSR Panther: 25 km 2. 132 kV Dalsingsarai – Tajpur S/C, ACSR Panther: 27 km 3. 132 kV Sahapur Patori – Tajpur D/C, ACSR Panther: 40 km	50
3	Thakurganj GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Kishanganj (New) – Thakurganj D/C, ACSR Zebra: 50 km	1. 132 kV Thakurganj – Araria D/C, ACSR Panther: 80 km	40
4	Asthawan GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Biharsarif-Asthawan D/C, ACSR Zebra: 20 km 2. 220 kV Sheikhpura (BGCL) – Asthawan D/C, ACSR Zebra: 15 km	1. 132 kV Asthawan – Rajgir S/C on D/C, ACSR Panther: 35 km 2. 132 kV Asthawan – Nalanda S/C on D/C, ACSR Panther: 25 km 3. 132 kV Asthawan – Barh S/C on D/C, ACSR Panther: 32 km	80
5	Board Colony GIS	132/33 KV (2x80 MVA)	-	1. 132 kV B Colony- Digha (New) D/C, XLPE Cable: 7 km	70
6	Palasi	132/33 KV (2x50 MVA)	-	1. 132 kV Forbisganj – Palasi S/C, ACSR Panther: 75 km 2. 132 kV Kishanganj – Palasi S/C, ACSR Panther: 53 km	50

6.3 CTU has studied the proposals of BSPTCL and the load flow is given at **Annexure-VI**. Following are observations of CTU on the proposal of BSPTCL:

- (i) **Digha 220kV S/s:** About 240 MW power drawl is expected (170 MW Digha + 70 MW B.Colony) from this substation. Therefore, only one 220 kV D/c feed from Chappra may not be sufficient and this is unreliable due to river crossing of this line section and it may lead to major power disruption in case of tower outage. Thus, it is suggested that an additional 220 kV feed may be provided to Digha. The nearest substation on other side of river is Hazipur. It is understood that Digha cannot be connected from southern side, due to RoW issues. Accordingly, load flow considering Digha-Hazipur and Digha-Chappra 220kV D/c lines is given in the study.

132 kV D/c line between Digha (New) and Digha (Old) cannot be kept normally closed, as this results in power flow from Digha (Old) to Digha (New) of the order of 190MW. This overloads downstream Khagaul-Digha and Bihta-Digha 132 kV S/c lines.

- (ii) **Thakurganj 220kV S/s:** The substation may be fed from Kishanganj (POWERGRID) instead of Kishanganj (BSPTCL) 220kV. Further, the 132 kV line from Thakurganj may be terminated at Palasi, instead of Araria.
- (iii) **Jakkanpur/Mithapur/Karbigaiya:** Due to deletion of Sipara-Karbigaiya 132kV (HLTS) D/c line, constraints are observed in power supply to said three substations under N-1 condition. Accordingly, additional feed to meet demand of about 550 MW (290 MW-Jakkanpur; 190 MW-Mithapur

& 65 MW-Karbigaiya) may be planned, as the three substations are being fed through three 132kV lines (HTLS) only. Feasibility of Jakkanpur (New)-Jakkanpur(Old) or Jakkanpur(New)-Mithapur 132 kV D/c line may be explored by BSPTCL.

(iv) List of 132 kV lines found to be overloaded under N-1 criteria is at **Annexure-VII**.

6.4 CTU has studied the proposals of BSPTCL with the above proposed changes and the load flow is given at **Annexure-VIII**

6.5 In regard to Digha S/s, BSTPCL mentioned that they would explore the possibility of providing 2nd 220kV feed to Digha in future as there is space constraint at Hazipur.

6.6 Regarding Thakurganj S/s, BSPTCL informed that all four Kishanganj (POWERGRID) – Kishanganj (BSPTCL) 220kV circuits are of AL-59 conductors, each having maximum capacity of 1000 ampere (380MVA per circuit). Therefore, connection with Kishanganj (POWERGRID) may not be required. Further, in regard to 132kV Thakurganj-Araria line, BSPTCL informed that demand of Araria is going to increase upto 60MW in future. Moreover, Araria and Palasi are politically sensitive areas. As such, both Araria and Palasi GSSs require 2nd sources for better reliability. Therefore, LILO of 132 kV Thakurganj – Araria D/C at Palasi may be considered.

6.7 With regard to additional drawl lines at 132kV level from 400kV or 220kV substations in Jakkanpur/Mithapur/Karbigaiya areas, BSPTCL agreed to explore the feasibility and space at Mithapur 132kV GSS.

6.8 It was decided that BSPTCL would review the balance observations of CTU mentioned above.

6.9 Further, CEA made following observations on BSPTCL's proposal:

(a) LILO of 132kV Samastipur- Dalsingsarai S/c line at Tajpur GSS: It was suggested that instead of 132KV Samastipur- Dalsingsarai S/C line LILO at Tajpur, Begusarai- Samastipur 132 KV S/C line be LILO at Dalsingasari GSS.

In this regard BSPTCL mentioned that 132 kV Begusarai – Samatipur (Old) is used to feed power to Gangwara 132 kV GSS via Transfer Bus of Samatipur (Old) GSS as there are only two 220 kV bays at Darbhanga (220kV) GSS. Further, LILO of Begusarai- Samastipur 132 KV S/C at Dalsingasari GSS is not possible due to space constraints at Dalsingasari GSS. Therefore, LILO of 132 KV Samastipur- Dalsingsarai S/C line at Tajpur GSS may be considered.

(b) Asthawan-Rajgir 132kV D/c line: It was suggested to defer implementation of this line.

In this regard BSPTCL mentioned that, there is limited power flow from Barhi (DVC). Moreover, 132kV Barhi – Rajgir/ Nalanda D/C, being very old transmission line, is not a reliable source. Further, Rajgir is an important

GSS as well as tourist place and Nalanda International University is situated at Nalanda district. Hence, the connectivity of 132 kV Asthawan – Rajgir & 132kV Asthawan – Nalanda may be approved.

6.10 After deliberations, it was decided that the below mentioned intra-state transmission system strengthening in Bihar would be taken up for approval in the forthcoming ERSCT meeting.

Sl. no	Substation Name	Voltage levels & transformation capacity	220kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)	132kV lines (S/c or D/c or S/c on D/c; conductor type; length in km)
1	Digha (New) GIS	220/132/33 KV (2x200 + 2x80 MVA)	1. 220 kV Chapra(New) -Digha D/C, ACSR Zebra: 80 km <i>Note: BSPTCL would explore the possibility of 2nd 220kV feed to Digha for reliable power supply.</i>	1. 132 kV Digha (New) – Digha (Old) D/C, XLPE Cable: 1 km 2. 132 kV Digha (New) – Board Colony D/C, XLPE Cable: 7 km
2	Tajpur GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Tajpur – Goraul D/C, ACSR Zebra: 60 km 2. 220 kV Samastipur (New) – Tajpur D/C, ACSR Zebra: 20 km	1. 132 kV LILO of Samastipur (Old) – Dalsingsarai S/C line at Tajpur [Samastipur (Old) – Tajpur S/C, ACSR Panther: 25 km & Dalsingsarai – Tajpur S/C, ACSR Panther: 27 km] 2. 132 kV Sahapur Patori – Tajpur D/C, ACSR Panther: 40 km
3	Thakurganj GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Kishanganj (New) – Thakurganj D/C, ACSR Zebra: 50 km	1. 132 kV Thakurganj – Araria D/C, ACSR Panther: 80 km
4	Asthawan GSS	220/132/33 KV (2x160 + 3x50 MVA)	1. 220 kV Biharsarif- Asthawan D/C, ACSR Zebra: 20 km 2. 220 kV Sheikhpura (BGCL) – Asthawan D/C, ACSR Zebra: 15 km	1. 132 kV Asthawan – Rajgir S/C on D/C, ACSR Panther: 35 km 2. 132 kV Asthawan – Nalanda S/C on D/C, ACSR Panther: 25 km 3. 132 kV Asthawan – Barh S/C on D/C, ACSR Panther: 32 km
5	Board Colony GIS	132/33 KV (2x80 MVA)	-	1. 132 kV B Colony- Digha (New) D/C, XLPE Cable: 7 km
6	Palasi	132/33 KV (2x50 MVA)	-	1. 132 kV LILO of Forbisganj – Kishanganj S/C line at Palasi [Forbisganj – Palasi S/C, ACSR Panther: 75 km & Kishanganj – Palasi S/C, ACSR Panther: 53 km] 2. 132kV LILO of Thakurganj – Araria D/C line

7. Proposal for 132/33 kV sub-station at Nabinagar

7.1 Representative of BSPTCL stated that, one 132/33 kV GSS of capacity 3x50 MVA has been decided to be constructed at Nabinagar, Dist. Aurangabad whose connectivity at 132 kV level has been proposed as LILO of 132kV Sonenagar - Rihanad ckt 1. After deliberations it was decided that instead of said LILO, new 132/33kV S/s at Nabinagar may be feed radially from Nabinagar-II generation project (line length: about 15km) as requisite transformation capacity is available in the 400/132kV ICTs at the generation switchyard.

7.2 After deliberations, it is decided to take up the issue to the forthcoming ERSCT meeting.

8. Extension of completion schedule of ERSS-XV & ERSS-XVIII schemes considering Jeerat Gas Insulated Line works.

8.1 Representative of CTU informed that following 400kV lines are existing / under construction at 400/220kV substation of Jeerat (WBSETCL):

Existing:

- (i) Jeerat (WBSETCL) – Baharampur/Farakka 400kV S/c line of POWERGRID
- (ii) Jeerat (WBSETCL) – Rajarhat/Subhashgram 400kV S/c line of POWERGRID
- (iii) Jeerat (WBSETCL) – Barkeshwar (WBSETCL) 400kV S/c line of WBSETCL
- (iv) Jeerat (WBSETCL) – Kolaghat (WBSETCL) 400kV S/c line of WBSETCL

Under Construction:

- (v) LILO of Sagardighi – Subhashgram 400kV S/c line at Jeerat (WBSETCL) as a part of ERSS-XV by POWERGRID
 - (vi) Jeerat (New) – Jeerat (WBSETCL) 400kV D/c line (Quad) as a part of ERSS-XVIII being implemented under TBCB by POWERGRID Medinipur-Jeerat Transmission Ltd.
- 8.2 He stated that there was problem for termination of new 400kV lines being implemented under ERSS-XV and ERSS-XVIII at Jeerat (WBSETCL) S/s. In the 19th meeting of SCPSPER, following was decided to resolve the issue:
- (i) Dismantling of dead end towers and termination of existing lines mentioned at 8.1 (i) to (iv) through GIS duct, at the existing 400kV Jeerat AIS S/s (WBSETCL) as ISTS.
 - (ii) The new lines mentioned at 8.1 (v) and (vi) can be directly terminated on separate double circuit towers at normal height (around 45 meters) to new GIS extension area.
 - (iii) Further, it was also acknowledged that implementation of LILO of Sagardighi-Subhasgram 400kV S/c line at Jeerat along with associated line bays shall get delayed due to addition of above mentioned GIS duct arrangement.
- 8.3** Representative of CTU stated that since the work to be carried out under ISTS may not match the timeline of ERSS-XV & ERSS-XVIII schemes, it was requested to extend the completion of ERSS-XV & ERSS-XVIII schemes in the 1st meeting of ERSCT. Further, in the 1st ERSCT it was also decided that “after finalization of implementing agency for the work, a separate meeting in CEA with CTU, POWERGRID, WBSETCL and implementing agency will be held to discuss the extension of completion schedule of ERSS-XV & ERSS-XVIII schemes. Decision of the meeting will be put up before ERSCT for ratification.”
- 8.4** In the 2nd meeting of ECT held on 06-08-2018, POWERGRID has been entrusted with the works mentioned above at 8.2 (i) through RTM.

- 8.5** Representative of CTU informed that for dismantling and termination of various lines of POWERGRID and WBSETCL through GIS duct, agreement was signed with WBSETCL on 07-11-2017, i.e. WBSETCL is implementing the said works on POWERGRID's behalf at its substation. The work has been awarded to JV of M/s Techno & M/s ABB in Nov'18 after approval of mode of implementation in the 2nd ECT meeting. The expected commissioning schedule of the GIS works is 15 months (i.e. Feb 2020) from award.
- 8.6** After deliberations, it is decided to take up the matter in the forthcoming ERSCT meeting regarding revision in completion schedule of ERSS-XV scheme as Feb 2020.

Annexure-I

List of participants of Meeting on follow-up actions of 1st meeting of Eastern Region Standing Committee on Transmission (ERSCT) and other issues held on 26.03.2019 at CEA, New Delhi.

Sl. No.	Name	Designation	Organization
1	Pardeep Jindal	CE (PSP&A-II)	CEA
2	Ishan Sharan	Director (PSP&A-II)	CEA
3	U M Rao	Dy. Director (PSP&A-II)	CEA
4	Ashok Pal	CGM (CTU-Plg)	POWERGRID
5	Manish Ranjan Keshari	Dy. Manager(CTU-Plg)	POWERGRID
6	Subhash Thakur	Addl. GM	NTPC
7	Abhishek Khanna	Manager	NTPC
8	Ravi S Prasad	ESE	BSPTCL
9	Abhishek Kumar	EEE/P&E	BSPTCL
10	P. K. Mishra	CGM	OPTCL
11	C.R. Mishra	DGM	OPTCL
12	A K Benarajee	AGM	OPTCL

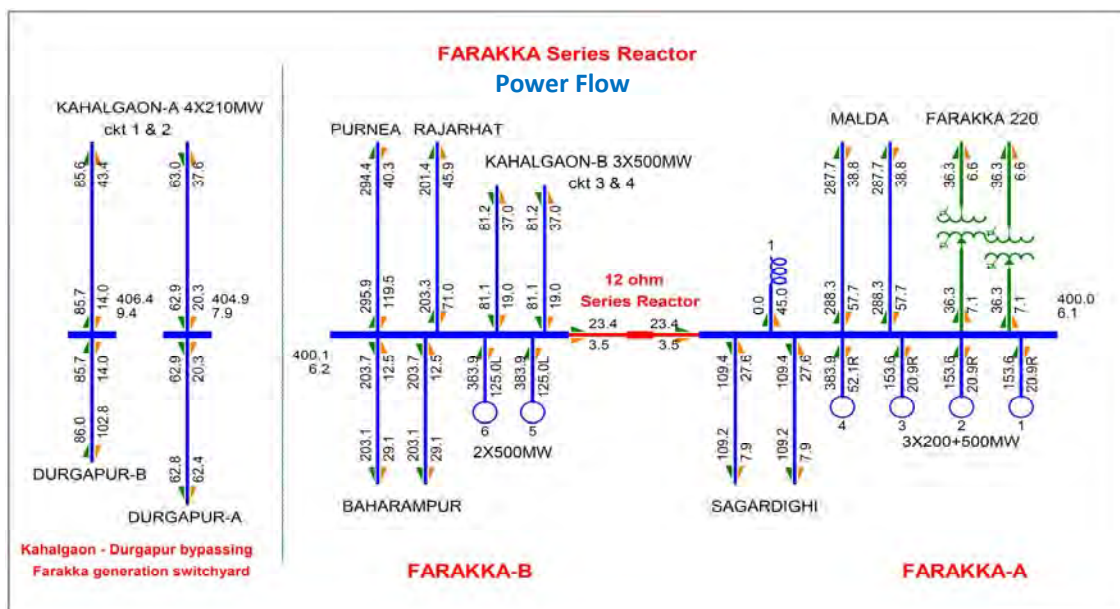
Annexure-II

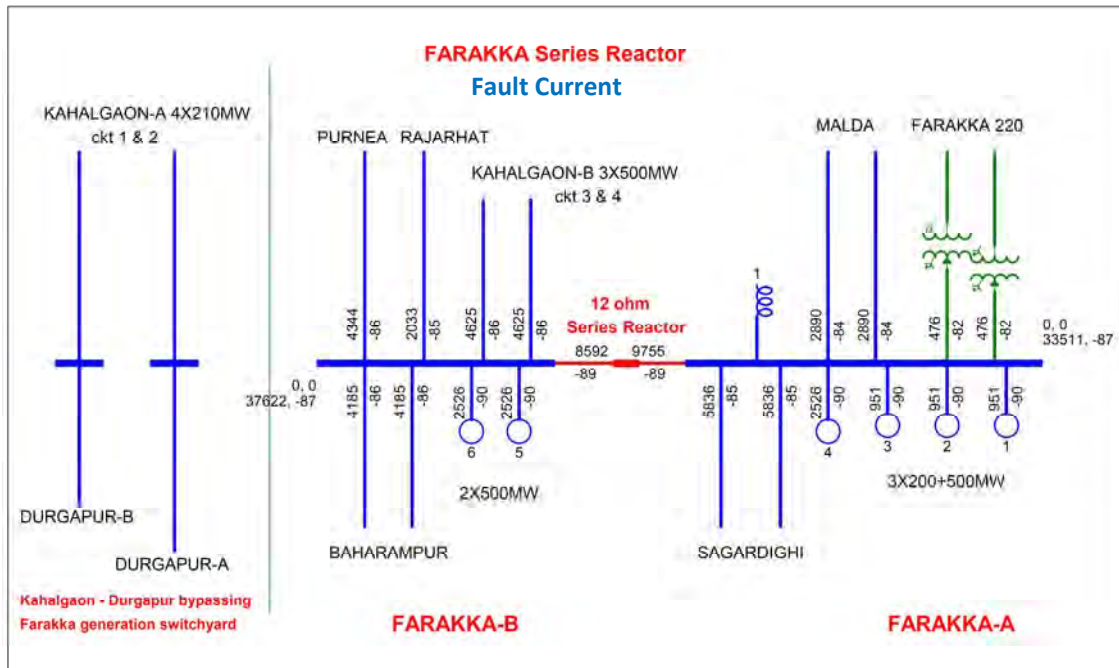
Study results on limiting fault current level at 400kV bus at Farakka TPS (NTPC)

A meeting held on 13.06.2017 at CEA regarding limiting fault current level at 400kV bus at Farakka TPS (NTPC) wherein it was decided that following activities have to be undertaken by CTU and NTPC respectively:

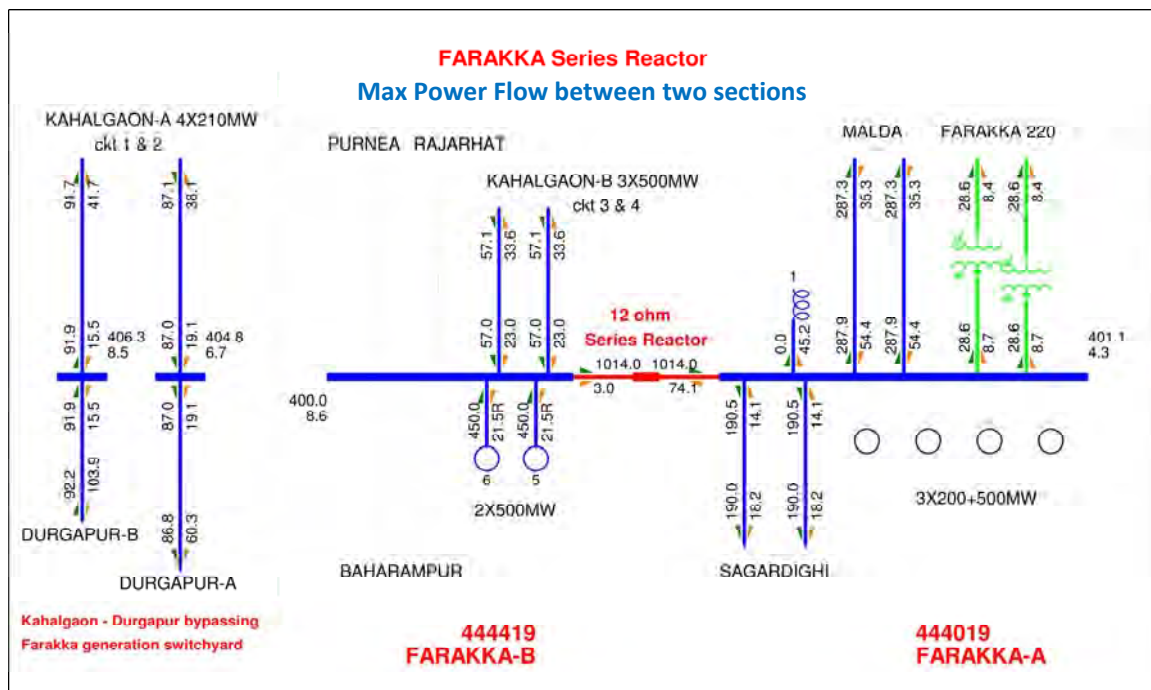
1. CTU would study for the maximum voltage and angle difference between the 400 kV bus sections between of Farakka-A and Farakka-B after installation of series reactor and the report would be shared with NTPC and CEA.
2. NTPC would study the proposal of series reactor in detail and submit their comments/observations

The three phase fault level at Farakka TPS (NTPC) at 400kV bus is expected to be about 57.5kA in 2021-22 timeframe. In the meeting held at CEA, a bus splitting scheme was discussed. The power flow and fault level considering this arrangement is given below:





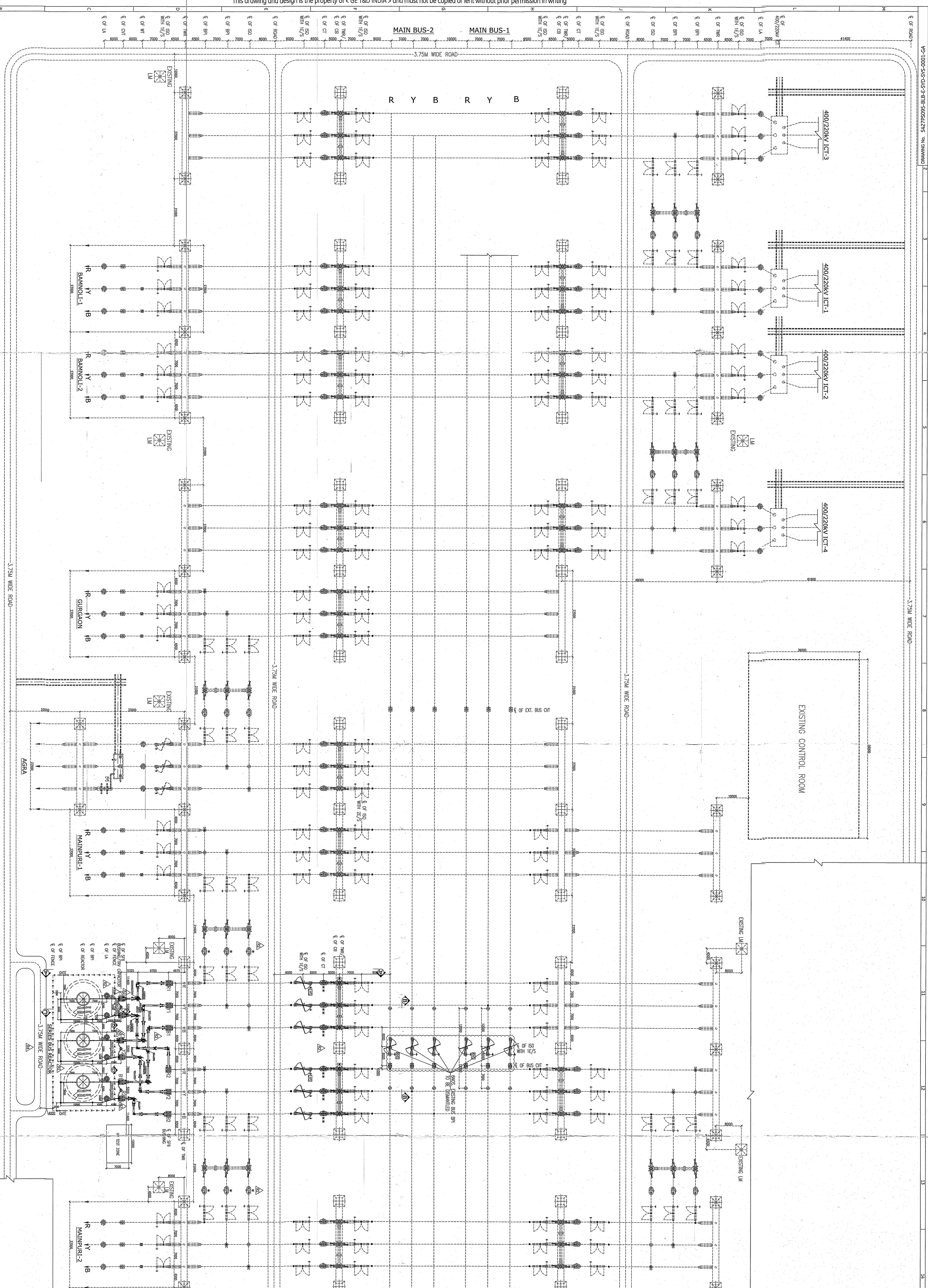
In normal scenario, the power flow between the two sections of Farakka bus is very low (under 100MW). However, worst case has been simulated by switching off the outgoing feeders of section-B and incoming feeders of section-A so that maximum power flow on the series reactor can be simulated. The maximum power flow and the angle of two sections is shown below:



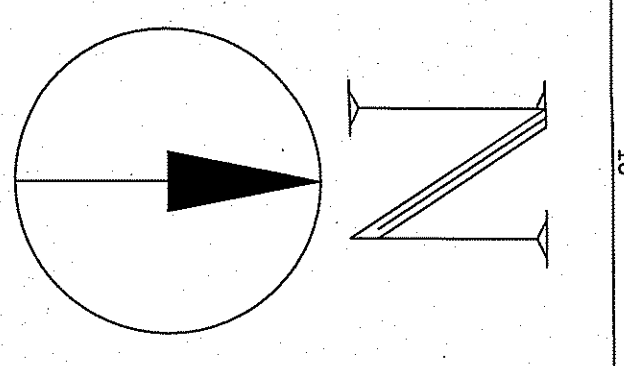
It may be observed that with a power flow of about 1000MW, the maximum angle difference between the two sections is about 4-5 degrees. Further, there is no

appreciable difference in the bus voltage of the two sections. In regard to space availability of the series reactor at Farakka S/s, it is to mention that recently proposal for 12 ohm series reactor at Ballabgarh and Mandola has been approved and they are under implementation. The General Arrangement and Layout of these two substations are attached.

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EXISTING CONTROL ROOM



BILL OF QUANTITY - 400KV GIS EQUIPMENTS

S.NO.	SYMBOL	DESCRIPTION	QUANTITY
1	□	400V, 1150A, 40kV, 100% IEC, 3-PHASE CIRCUIT BREAKER WITHOUT OLEFIN RESISTOR	02
2	□	400V, 1150A, 40kV, 100% IEC, 3-PHASE CIRCUIT BREAKER WITH OLEFIN RESISTOR	01
3	⊕	400V, 2000A, 40kV, 1-PHASE CURRENT TRANSFORMER	06
4	⊕	400V, 4000A, 1-PHASE CURRENT TRANSFORMER	06
5	⊕	400V, 200A, 1-PHASE, LIGHTNING ARRESTOR	06
6	⊕	400V, 10 20MVA, 2000A, 144kV, 100% IEC, 1-PHASE AIR CORE, 60% FOR THE SERIES BUS REACTOR INCLUDING TRY OPERATOR BASED ON STUDY REQUIREMENTS	03
7	⊕	400KV BUS POST INSULATOR	09
8	⊕	400KV/1150A TRY OPERATOR (150T) FOR BUS REACTOR	03

SYSTEM PARAMETERS (TABLE-3)

S.No.	DESCRIPTION	UNIT	VALUE
1.	SYSTEM OPERATING VOLTAGE	400KV	400KV
2.	MAX OPERATING VOLTAGE OF THE SYSTEM (KV)	420KV	420KV
3.	FAULT FREQUENCY	50Hz	50Hz
4.	NO. OF PHASES	3	3
5.	FAULT RESOLUTION LEVELS	1.1500kV	1.1500kV
6.	NO. OF BUSES	12	12
7.	NO. OF BUSES WITH 400KV BUS	12	12
8.	NO. OF BUSES WITH 220KV BUS	0	0
9.	NO. OF BUSES WITH 110KV BUS	0	0
10.	NO. OF BUSES WITH 33KV BUS	0	0

SWITCHBOARD CONDUCTOR DETAILS

DESCRIPTION	400KV
EQUIPMENT INTERCONNECTION	4" IPS AL. TUBE (0.150mm, O.D. 38mm)
MAIN BUS	4" IPS AL. TUBE
JACK BUS	108mm DIA. GI WIRE
BRANCHING	108mm DIA. GI WIRE

400KV MINIMUM AIR CLEARANCE TABLE

S.No.	DESCRIPTION	MINIMUM AIR CLEARANCE (mm)
1	FOR CONDUCTOR-CONDUCTOR	4000mm
2	FOR ROD-CONDUCTOR	4200mm
3	PHASE TO EARTH	3500mm
4	GROUND CLEARANCE	8000mm

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
3. F. REQUIRED ELECTRICAL CLEARANCES AS PER IEC/IEEE SPECIFICATIONS ARE NOT SHOWN AT THE POINTS WHERE THE CLEARANCES ARE NOT SPECIFIED. THE CONTRACTOR SHALL VERIFY THE CLEARANCES AT ALL POINTS AND SHALL REPORT TO THE ENGINEER IN CHARGE.
4. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
5. KEY 'C' MARKED WITH 'C' SHALL BE INSTALLED AT EXISTING 'C' MARKED WITH 'C'.

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DATE: 15 SEP 2011

BY: [Signature]

FOR: [Signature]

LEGENDS:-

PRESENT SCOPE

FUTURE/EXISTING

--- FENCE

REVISIONS

NO.	DATE	DESCRIPTION
01	15/09/11	ISSUED FOR TENDER
02	15/09/11	ISSUED FOR TENDER
03	15/09/11	ISSUED FOR TENDER
04	15/09/11	ISSUED FOR TENDER
05	15/09/11	ISSUED FOR TENDER
06	15/09/11	ISSUED FOR TENDER
07	15/09/11	ISSUED FOR TENDER
08	15/09/11	ISSUED FOR TENDER
09	15/09/11	ISSUED FOR TENDER
10	15/09/11	ISSUED FOR TENDER
11	15/09/11	ISSUED FOR TENDER
12	15/09/11	ISSUED FOR TENDER
13	15/09/11	ISSUED FOR TENDER
14	15/09/11	ISSUED FOR TENDER
15	15/09/11	ISSUED FOR TENDER
16	15/09/11	ISSUED FOR TENDER
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20	15/09/11	ISSUED FOR TENDER
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22	15/09/11	ISSUED FOR TENDER
23	15/09/11	ISSUED FOR TENDER
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28	15/09/11	ISSUED FOR TENDER
29	15/09/11	ISSUED FOR TENDER
30	15/09/11	ISSUED FOR TENDER
31	15/09/11	ISSUED FOR TENDER
32	15/09/11	ISSUED FOR TENDER
33	15/09/11	ISSUED FOR TENDER
34	15/09/11	ISSUED FOR TENDER
35	15/09/11	ISSUED FOR TENDER

PROJECT INFORMATION

CLIENT: [Name]

PROJECT: [Name]

DESIGNER: [Name]

CHECKER: [Name]

DATE: [Date]

SCALE: [Scale]

PROJECT NO: [Number]

DRAWING NO: [Number]

REVISION NO: [Number]

DATE: [Date]

SCALE: [Scale]

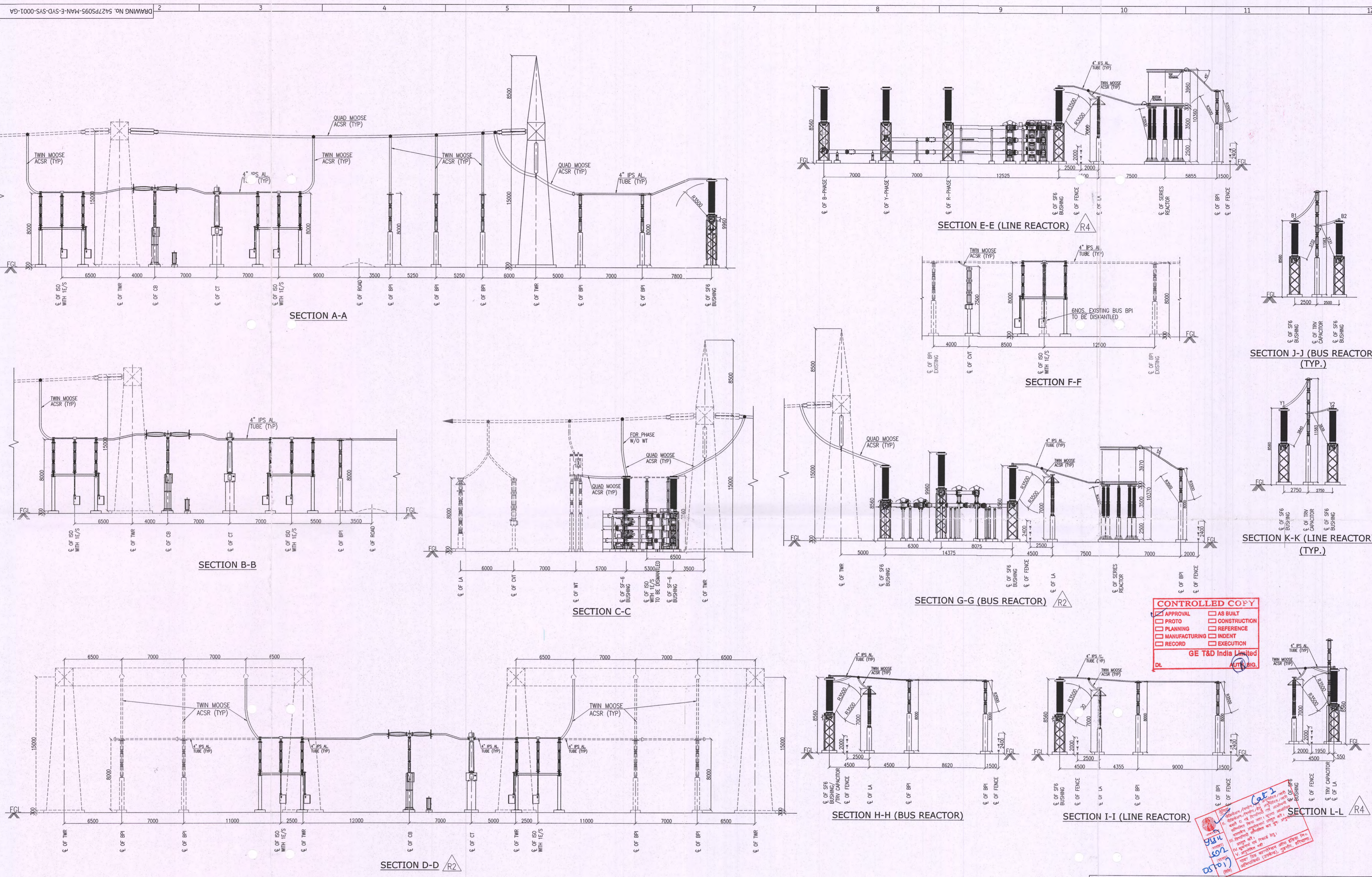
PROJECT NO: [Number]

DRAWING NO: [Number]

REVISION NO: [Number]

DATE: [Date]

SCALE: [Scale]



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<input checked="" type="checkbox"/> APPROVAL	<input type="checkbox"/> AS BUILT
<input type="checkbox"/> PROTO	<input type="checkbox"/> CONSTRUCTION
<input type="checkbox"/> PLANNING	<input type="checkbox"/> REFERENCE
<input type="checkbox"/> MANUFACTURING	<input type="checkbox"/> INCIDENT
<input type="checkbox"/> RECORD	<input type="checkbox"/> EXECUTION

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26/07/17
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26/07/17
26/07/17

GD53A000268 (REV-3) 5427PS095-MAN-E-SYD-SYS-0001-GA (Rev-R0) Sh-001	GIS LAYOUT PLAN & SECTION FOR 400/220KV MANDOLA S/S EXT. 400KV ELECTRICAL LAYOUT PLAN FOR 400/220KV MANDOLA S/S EXT.
REFERENCE NO.	DESCRIPTION

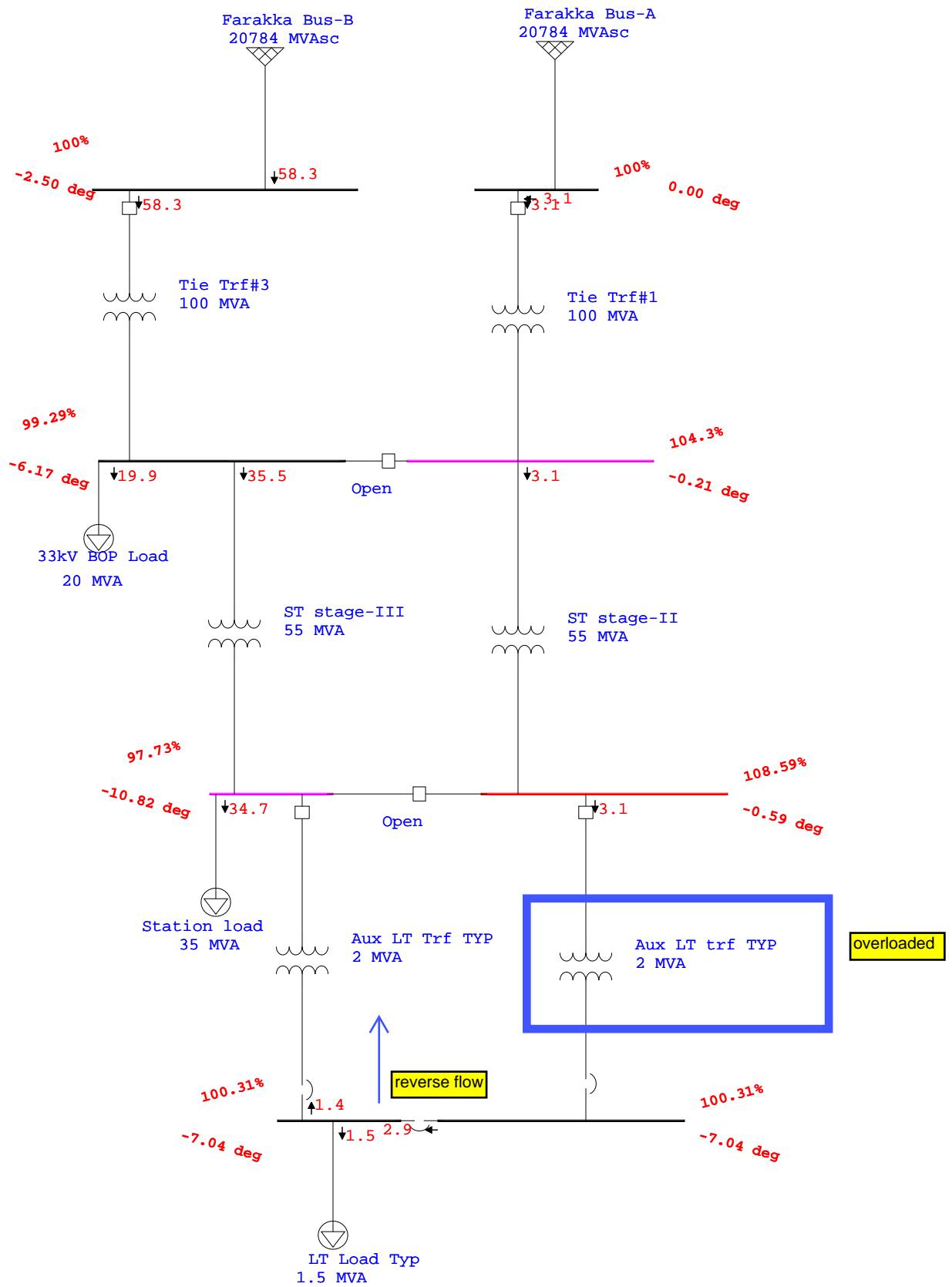
LEGENDS:-

— PRESENT SCOPE
- - - FUTURE/EXISTING

NOTES
1. ALL DIMENSIONS ARE IN MM.

R4	REVISED AS PER CUSTOMER COMMENTS	R4							
R3	REVISED AS PER CUSTOMER COMMENTS	R3							
R2	REVISED AS PER CUSTOMER COMMENTS	R2							
R1	REVISED AS PER CUSTOMER COMMENTS	R1							
R0	FIRST ISSUE	R0							
REV.No.	DESCRIPTION	DATE	DRAWN	REVIEW	ELE	CIVIL	MECH.	APPROVED	STATUS

CLIENT:	UPR Uttar Pradesh GOVERNMENT OF UTTAR PRADESH INDIA	2nd FLOOR, PLOT No.-2 SECTOR-29 GURGAON-122 001 (HARYANA)
PROJECT:	SERIES REACTOR PACKAGE (INCLUDING ASSOCIATED BAYS) AT 400V BALLABHGARH & MANDALA SUB-STATION ASSOCIATED WITH PROVISION OF SERIES BUS REACTOR IN NORTHERN.	
CONTRACTOR:	GE T&D INDIA LTD. (FORMERLY ALSTOM T&D INDIA LTD) A-7, SECTOR-65, NOIDA - 201301 UTTAR PRADESH (INDIA)	
LOA No.:	CC-CS/739-NR1/RT-3331/3/G8/NOA-I/6925 DATED: 26.08.2016	
TITLE:	400KV ELECTRICAL LAYOUT SECTION FOR 400/220KV MANDOLA S/S EXTENSION (SERIES BUS & LINE REACTOR)	
A1	DRAWING No.	TOTAL SH. 002
	5427PS095-MAN-E-SYD-SYS-0001-GA	SH.No. 002
		SCALE 1:200
		REV. R4



Annexure-V

North Bihar

1. 220/132/33 kV Goraul (District-Vaishali).
2. 220/132/33 kV Tajpur (District-Samastipur).
3. 220/132/33 kV Thakurganj (District-Kishanganj).
4. 132/33 kV Palasi (District-Araria).

South Bihar

1. 220/132/33 kV Digha (New) GIS (District-Patna).
2. 220/132/33 kV Ashthawan (District-Nalanda).
3. 132/33 kV Board Colony GIS (District-Patna).

North Bihar

A. 220/132/33 kV Goraul (District-Vaishali)

1. Grid Voltage level - 220/132/33 kV Goraul
 2. Transformation capacity - 2x160 + 3x50 MVA
- Following parameters has been considered during load flow:-
1. Load on Goraul GSS is 65 MW.
 2. Connectivity at 220 kV level :-
 - i. 220 kV D/c Muzaffarpur (PG) – Goraul GSS - 20 Kms.
 - ii. 220 kV D/c Goraul – Tajpur (Proposed) GSS - 60 Kms.
 3. Connectivity at 132 kV level :-
 - i. LILO of 132 kV D/c Vaishali – Muzaffarpur Tr. Line at Goraul
 - a) 132/33 kV D/c Vaishali – Goraul GSS - 30 Kms.
 - b) 132/33 kV D/c Muzaffarpur – Goraul GSS - 42 Kms.
 - ii. 132 kV D/c 132/33 kV Mahnar – Goraul GSS - 35 Kms.
- **Type of Conductor & Tower :-**
1. For 220 kV Tr. line, Conductor – ACSR Zebra & Tower – DCDS.
 2. For 132 kV Tr. line, Conductor – ACSR Panther & Tower – DCDS.
- **Benefits :-**
1. 132/33 kV Vaishali GSS offloaded by 20 MW.
 2. 132/33 kV Hajipur GSS offloaded by 30 MW.
 3. Improve the Power reliability & Quality power will be available.
 4. Provide second source to 132 kV GSS.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
1. Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification.
 2. It is also being proposed for 2nd circuit stringing from Jandaha GSS to Mahnar GSS as such at present single circuit stringing may be done to Mahnar GSS to proposed GSS Goraul with DCSS tower. In future, if the load will increase then 2nd circuit may be stringed.

B. 220/132/33 kV Tajpur (District-Samastipur)

1. Grid Voltage level - 220/132/33 kV Tajpur
 2. Transformation capacity - 2x160 + 3x50 MVA
- Following parameters has been considered during load flow:-
1. Load on Tajpur GSS is 50 MW.
 2. Connectivity at 220 kV level :-
 - i. 220 kV D/c Samastipur (New) – Tajpur GSS - 20 Kms.
 - ii. 220 kV D/c Goraul (Proposed) – Tajpur GSS - 60 Kms.
 3. Connectivity at 132 kV level :-
 - i. LILO of 132 kV S/c Samastipur (Old) – Dalsinghsarai Tr. Line at Tajpur
 - A. 132/33 kV S/c Samastipur (Old) – Tajpur GSS - 27 Kms.
 - B. 132/33 kV S/c Dalsinghsarai – Tajpur GSS - 25 Kms.
 - ii. 132 kV D/c Sahpur Patori – Tajpur GSS - 40 Kms.
- **Type of Conductor & Tower :-**
1. For 220 kV Tr. line, Conductor – ACSR Zebra & Tower – DCDS.
 2. For 132 kV Tr. line, Conductor – ACSR Panther & Tower – SCSS & DCDS.
- **Benefits :-**
1. 132/33 kV Samastipur (Old) GSS offloaded by 25 MW.
 2. Improve the Power reliability & Quality power will be available.
 3. Provide second source to 132 kV GSS.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
1. Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification.
 2. It is also being proposed for 2nd circuit stringing from Sahpur Patori GSS to Samastipur (New) GSS as such at present single circuit stringing may be done to Sahpur Patori GSS to proposed GSS Tajpur with DCSS tower. In future, if the load will increase then 2nd circuit may be stringed

C. 220/132/33 kV Thakurganj (District-Kishanganj)

1. Grid Voltage level - 220/132/33 kV Thakurganj
 2. Transformation capacity - 2x160+3x50 MVA
- Following parameters has been considered during load flow:-
1. Load on Thakurganj GSS is 40 MW.
 2. Connectivity at 220 kV level :-
 - i. 220 kV D/c Kishanganj (New) – Thakurganj GSS - 50 Kms.
 3. Connectivity at 132 kV level :-
 - i. 132 kV D/c Thakurganj (New) – Araria GSS -80 Kms
- **Type of Conductor & Tower :-**
1. For 220 kV Tr. line, Conductor – ACSR Zebra & Tower – DCDS.
 2. For 132 kV Tr. line, Conductor – ACSR Panther & Tower – DCDS
- **Benefits :-**
1. 132/33 kV Kishanganj (Old) GSS offloaded by 40 MW.
 2. Improve the Power reliability & Quality power will be available.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
1. Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification.

D. 132/33 kV Palasi (District-Araria)

1. Grid Voltage level - 132/33 kV Palasi
 2. Transformation capacity - 2x50 MVA
- Following parameters has been considered during load flow:-
1. Load on Palasi GSS is 50 MW.
 2. Connectivity at 132 kV level :-
 - i. LILO of one of the circuit of 132 kV F/c Forbisganj – Kishanganj (Old) Tr. Line at Palasi
 - a. 132/33 kV S/c Forbisganj – Palasi GSS - 75 Kms.
 - b. 132/33 kV S/c Kishanganj (Old) – Palasi GSS - 53 Kms.
- **Type of Conductor & Tower :-**
1. For 132 kV Tr. line, Conductor – ACSR Panther & Tower – DCDS
- **Benefits :-**
1. 132/33 kV Forbisganj GSS offloaded by 25 MW.
 2. 4 nos. of new PSS under DDGJY/IDPS will be connected.
 3. Improve the Power reliability & Quality power will be available.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification.

South Bihar

A. 220/132/33 kV Digha (New) GIS (District-Patna)

- | | | |
|----------------------------|---|-------------------------------|
| 1. Grid Voltage level | - | 220/132/33 kV Digha (New) GIS |
| 2. Transformation capacity | - | 2x200 + 2x80 MVA |
- Following parameters has been considered during load flow:-
1. Load on Digha (New) GIS is 100 MW.
 2. Connectivity at 220 kV level :-
 - i. 220 kV D/c Chapra (New) Amnour – Digha (New) GIS - 96 Kms.
 3. Connectivity at 132 kV level :-
 - i. 132/33 kV D/c Digha (Old) – Digha (New) GIS - 01 Km.
 - ii. 132/33 kV D/c Board Colony – Digha (New) GIS - 07 Kms.
- **Type of Conductor & Tower :-**
1. For 220 kV Tr. line, Conductor – ACSR Zebra & Tower – DCDS.
 2. For 132 kV Tr. line, Conductor – ACSR Panther/ XLPE Cable & Tower –.
- **Benefits :-**
1. 132/33 kV Jakkanpur GSS offloaded by 60 MW.
 2. Improve the Power reliability & Quality power will be available.
 3. Provide second source to 132 kV GSS.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
1. Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification.

B. 220/132/33 kV Ashthawan (District-Nalanda)

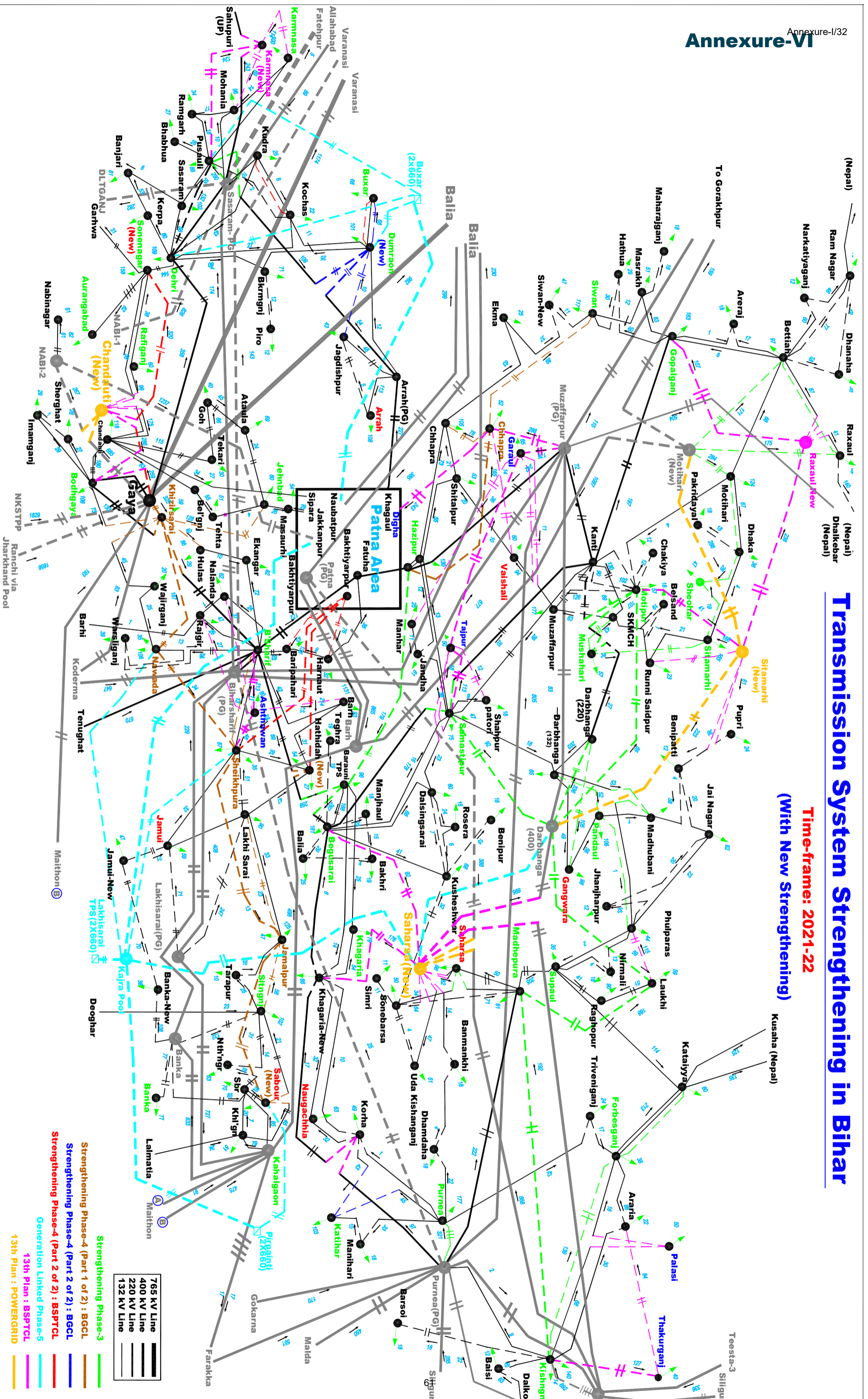
1. Grid Voltage level - 220/132/33 kV Ashthawan
 2. Transformation capacity - 2x160 + 3x50 MVA
- Following parameters has been considered during load flow:-
1. Load on Ashthawan GSS is 80 MW.
 2. Connectivity at 220 kV level :-
 - i. 220 kV D/c Biharshariff (BSPTCL) – Ashthawan GSS - 20 Kms.
 - ii. 220 kV D/c Sheikhpura (BGCL) GIS – Ashthawan GSS - 15 Kms.
 3. Connectivity at 132 kV level :-
 - i. 132/33 kV S/c Nalanda – Ashthawan GSS - 25 Kms.
 - ii. 132/33 kV S/c Rajgir – Ashthawan GSS - 35 Kms.
 - iii. 132/33 kV S/c Barh – Ashthawan GSS - 32 Kms.
- **Type of Conductor & Tower :-**
1. For 220 kV Tr. line, Conductor – ACSR Zebra & Tower – DCDS.
 2. For 132 kV Tr. line, Conductor – ACSR Panther & Tower – DCSS.
- **Benefits :-**
1. 132/33 kV Baripahari GSS offloaded by 20 MW.
 2. Improve the Power reliability & Quality power will be available.
 3. Provide second source to 132 kV GSS.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
1. Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification.
 2. It is also being proposed that at present single circuit stringing may be done in between Nalanda – Ashthawan GSS, Rajgir – Ashthawan GSS and Barh – Ashthawan GSS with DCSS tower. In future, if the load will increase then 2nd circuit may be stringed.

C. 132/33 kV Board Colony GIS (District-Patna)

1. Grid Voltage level - 132/33 kV
 2. Transformation capacity - 2x580 MVA
- Following parameters has been considered during load flow:-
1. Load on Board Colony GIS is 80 MW.
 2. Connectivity at 132 kV level :-
 - i. 132/33 kV S/c Board Colony – Digha (New) GIS - 07 Kms
- **Type of Conductor & Tower :-**
1. For 132 kV Tr. line, Conductor – XLPE Cable
- **Benefits :-**
1. Improve the Power reliability & Quality power will be available.
- **Load flow study:-**
Report enclosed.
- **Remarks:-**
Distance between Grids S/s and load on proposed Grid S/s is tentative subject to verification

Transmission System Strengthening in Bihar

Time-frame: 2021-22
(With New Strengthening)



765 kV Line	400 kV Line	220 kV Line	132 kV Line
-------------	-------------	-------------	-------------

- Strengthening Phase-3
- Strengthening Phase-4 (Part 1 of 2) : BGCL
- Strengthening Phase-4 (Part 2 of 2) : BSPTCL
- Strengthening Phase-4 (Part 2 of 2) : BSPTCL
- Generation Linked Phase-5
- 13th Plan : BSPTCL
- 13th Plan : POWERGRID

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E TUE, MAR 19 2019 14:57
 OUTPUT FOR ZONE 41 [BIHAR]
 SUBSYSTEM LOADING CHECK (INCLUDED: LINES) (EXCLUDED: BREAKERS AND SWITCHES; TRANSFORMERS)
 CURRENT LOADINGS ABOVE 70.0 % OF RATING SET B:

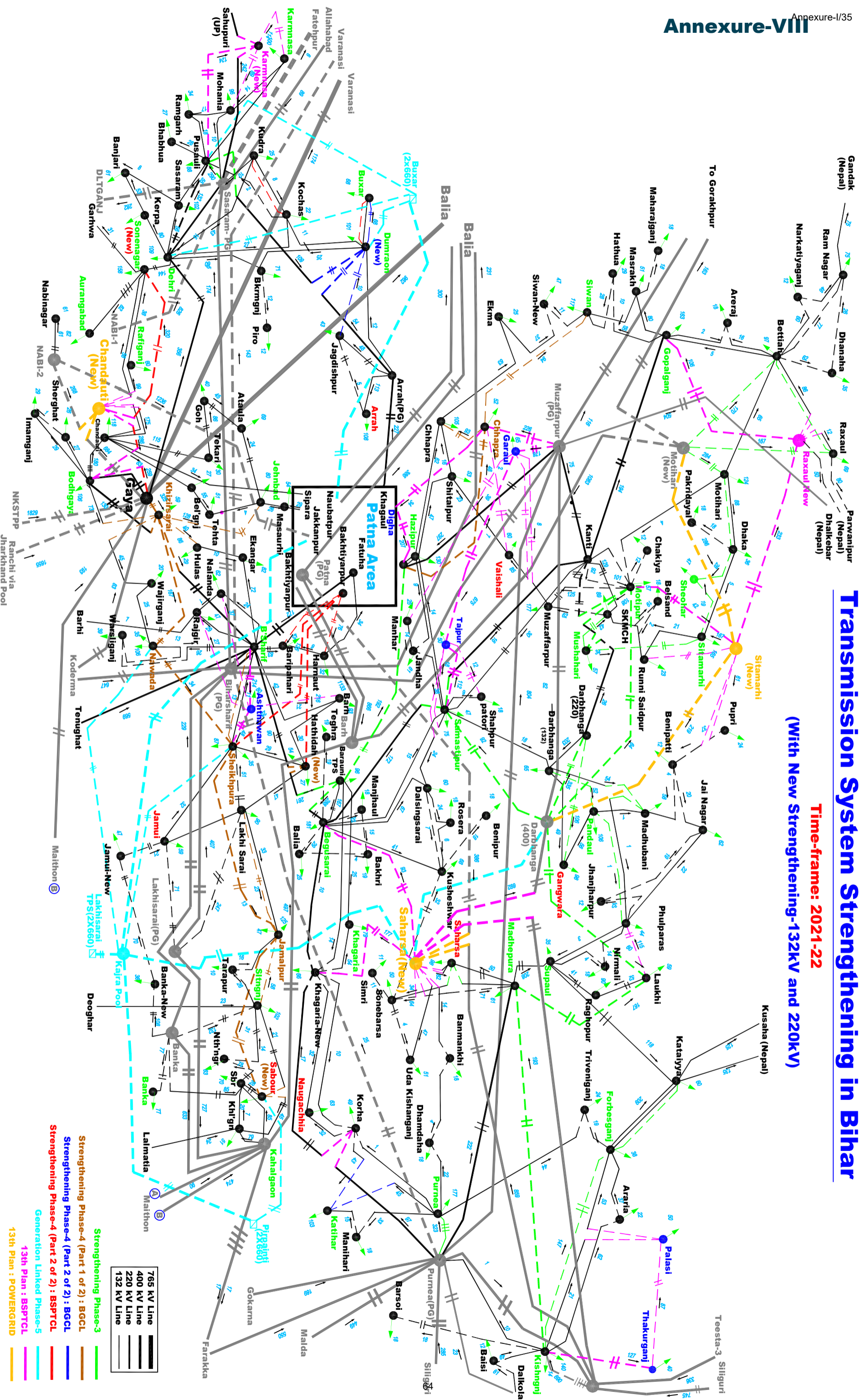
X----- FROM BUS -----X		X----- TO BUS -----X									
BUS#	X-- NAME --X	BASKV	AREA	BUS#	X-- NAME --X	BASKV	AREA	CKT	LOADING	RATING	PERCENT
411007	JAKKANPUR	132.00	4	411135	JAKKANPUR-NW	132.00*	4	1	191.2	240.0	79.7
411007	JAKKANPUR	132.00	4	411135	JAKKANPUR-NW	132.00*	4	2	191.2	240.0	79.7
<ul style="list-style-type: none"> • Due to deletion of Sipara-Karbigaiya 132kV (HLTS) D/c. Additional feed to meet demand of about 550MW (290-Jakkanpur; 190-Mithapur & 65-Karbigaiya) may be planned, as the three substations are being fed through three 132kV lines (HTLS). N-1 or N-1-1 could lead sever power supply constraint. 											
411009	DEHRI	132.00	4	411253	KERPA	132.00*	4	1	81.8	84.0	97.4
<ul style="list-style-type: none"> • BSPTCL may check and plan. Overloading under N-1 of Dehri - Sasaram 132kV. 											
411010	KAHALGN-BSEB	132.00	4	411189	KAHALGAON-B	132.00*	4	1	81.5	84.0	97.0
411185	SABOUR	132.00	4	411189	KAHALGAON-B	132.00*	4	1	88.5	84.0	105.3
<ul style="list-style-type: none"> • BSPTCL may check and plan. Overloading on one line under N-1 of other 132kV line. 											
411031	SONENAGAR	132.00	4	411184	CHANDAUTI NW	132.00*	4	1	62.9	84.0	74.9
411032	RAFIGANJ	132.00	4	411184	CHANDAUTI NW	132.00*	4	1	100.3	84.0	119.4
<ul style="list-style-type: none"> • BSPTCL may check and plan. Overloading on one line under N-1 of other 132kV line. 											
411035	PUSAULI BSPT	132.00	4	411109	SASARAM-BSEB	132.00*	4	1	58.8	84.0	70.0
<ul style="list-style-type: none"> • BSPTCL may check and plan. Overloading under N-1 of Dehri - Sasaram 132kV line. 											
411036	RAMNAGAR	132.00	4	411053	BETIAH	132.00*	4	1	81.2	84.0	96.7
411052	DHANAHA	132.00	4	411053	BETIAH	132.00*	4	1	65.6	84.0	78.1
411053	BETIAH	132.00	4	411173	NARKATIYAGAN	132.00*	4	1	61.3	84.0	73.0
<ul style="list-style-type: none"> • BSPTCL may check and plan. Overloading on one line under N-1 of other 132kV line. 											
411045	ARRAH	132.00	4	411046	ARRAH-PG	132.00*	4	1	112.3	84.0	133.6
<ul style="list-style-type: none"> • BSPTCL may check and plan. Base case overloading. 											
411068	GOPALGANJ	132.00*	4	411130	MASHRAKH	132.00	4	1	81.2	84.0	96.6
<ul style="list-style-type: none"> • Overload under N-1 of Gopalganj-Hathua 132kV line 											

Following 132kV D/c lines are observed to be overloaded under N-1 of parallel circuit. Some lines are overloaded in base case itself. Base case loading are shown below. BSPTCL may review and plan accordingly.

411070	MOTIHARI-NEW	132.00*	4	411101	RAXAUL	132.00	4	1	86.8	84.0	103.3
411070	MOTIHARI-NEW	132.00*	4	411101	RAXAUL	132.00	4	2	86.8	84.0	103.3
411001	KANTI	132.00	4	411181	SKMCH	132.00*	4	1	66.0	84.0	78.6
411001	KANTI	132.00	4	411181	SKMCH	132.00*	4	2	66.0	84.0	78.6
411009	DEHRI	132.00	4	411031	SONENAGAR	132.00*	4	1	74.6	84.0	88.8
411009	DEHRI	132.00	4	411031	SONENAGAR	132.00*	4	2	74.6	84.0	88.8
411013	KARAMNASA	132.00	4	411015	KARAMNASA NW	132.00*	4	1	59.8	84.0	71.2
411013	KARAMNASA	132.00	4	411015	KARAMNASA NW	132.00*	4	2	59.8	84.0	71.2
411053	BETIAH	132.00	4	411070	MOTIHARI-NEW	132.00*	4	1	89.5	84.0	106.5
411053	BETIAH	132.00	4	411070	MOTIHARI-NEW	132.00*	4	2	89.5	84.0	106.5
411064	LAKHISRA-PG	132.00*	4	411072	LAKISAR-BSEB	132.00	4	1	123.9	160.0	77.4
411064	LAKHISRA-PG	132.00*	4	411072	LAKISAR-BSEB	132.00	4	2	123.9	160.0	77.4
411014	BEGUSRAI	132.00*	4	411025	BARAUNI	132.00	4	1	85.5	84.0	101.8
411014	BEGUSRAI	132.00*	4	411025	BARAUNI	132.00	4	2	85.5	84.0	101.8
411042	MADHEPURA	132.00*	4	411182	SUPAUL	132.00	4	1	105.6	84.0	125.7
411042	MADHEPURA	132.00*	4	411182	SUPAUL	132.00	4	2	105.6	84.0	125.7
411080	KISH-NW-BSEB	132.00*	4	411083	FORBESGANJ	132.00	4	1	74.7	84.0	88.9
411080	KISH-NW-BSEB	132.00*	4	411083	FORBESGANJ	132.00	4	2	74.7	84.0	88.9
411083	FORBESGANJ	132.00	4	411084	KATAIYYA	132.00*	4	1	72.2	84.0	86.0
411083	FORBESGANJ	132.00	4	411084	KATAIYYA	132.00*	4	2	81.3	84.0	96.8
411083	FORBESGANJ	132.00	4	411084	KATAIYYA	132.00*	4	3	72.2	84.0	86.0
411084	KATAIYYA	132.00*	4	411182	SUPAUL	132.00	4	1	67.0	84.0	79.8
411084	KATAIYYA	132.00*	4	411182	SUPAUL	132.00	4	2	67.0	84.0	79.8
411114	MOTIPUR	132.00	4	411180	MUZAFFARPUR	132.00*	4	1	64.0	84.0	76.2
411114	MOTIPUR	132.00	4	411180	MUZAFFARPUR	132.00*	4	2	64.0	84.0	76.2
411127	TEKARI	132.00	4	411177	CHANDAUTI	132.00*	4	1	58.9	84.0	70.1
411127	TEKARI	132.00	4	411177	CHANDAUTI	132.00*	4	2	58.9	84.0	70.1
411177	CHANDAUTI	132.00	4	411184	CHANDAUTI NW	132.00*	4	1	97.6	84.0	116.2
411177	CHANDAUTI	132.00	4	411184	CHANDAUTI NW	132.00*	4	2	79.1	84.0	94.1

Transmission System Strengthening in Bihar

Time-frame: 2021-22
(With New Strengthening-132kV and 220kV)

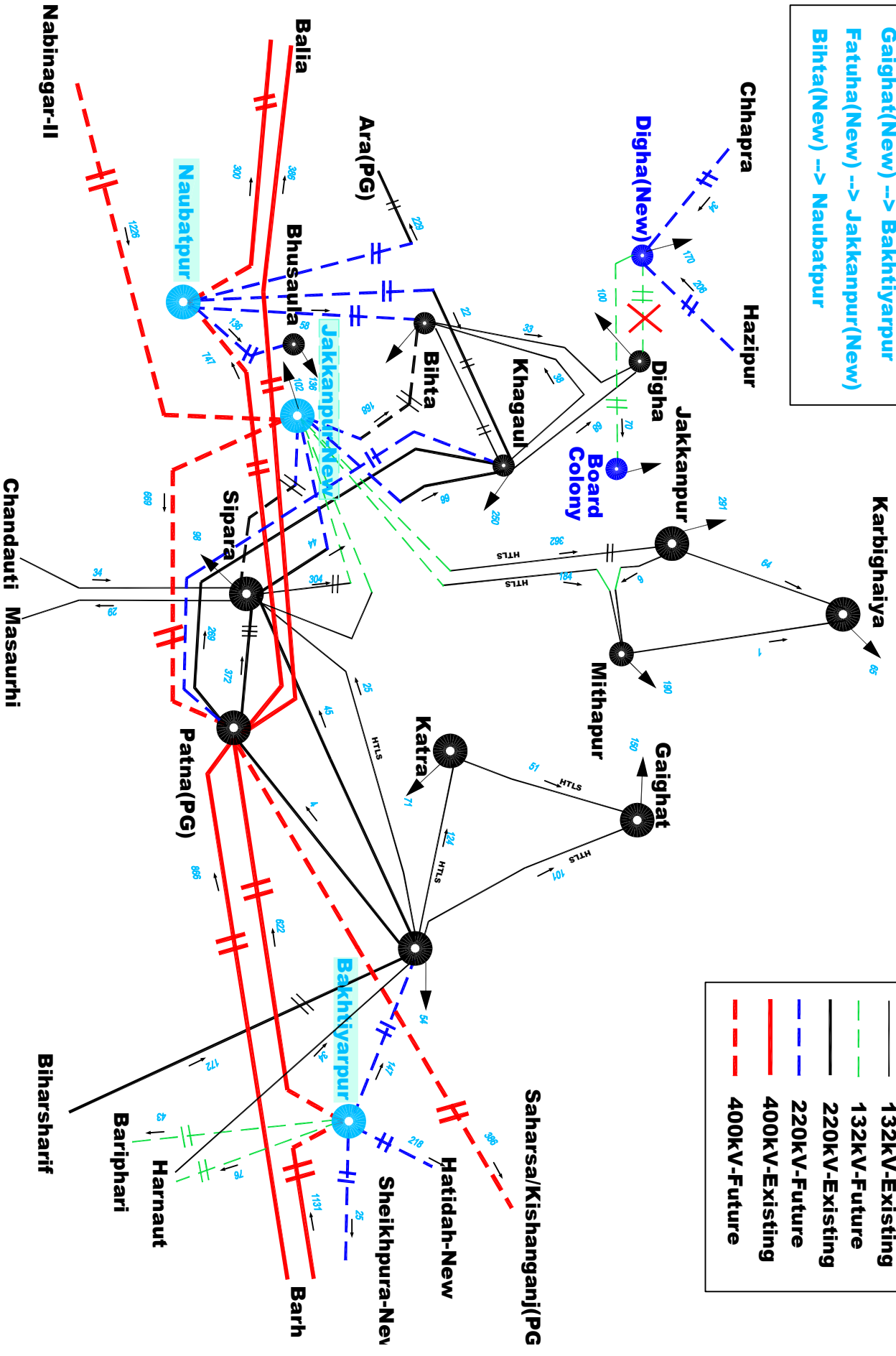


Transmission System Strengthening in Bihar System

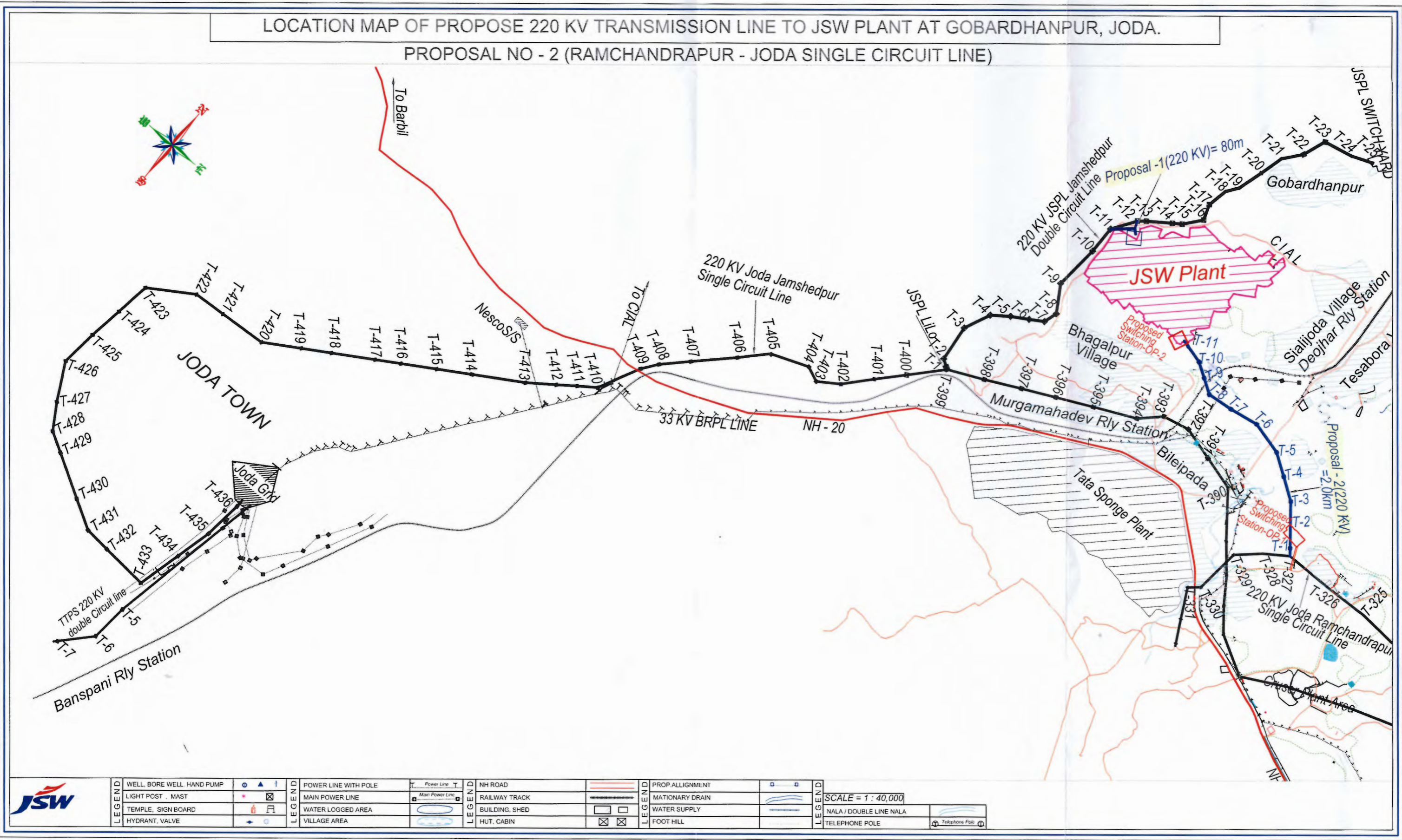
New 400kV S/S
(Patna area: 2021-22)
(With New Strengthening)

Gaighat(New) --> Bakhtiyarpur
 Fatuha(New) --> Jakkampur(New)
 Bihata(New) --> Naubatpur

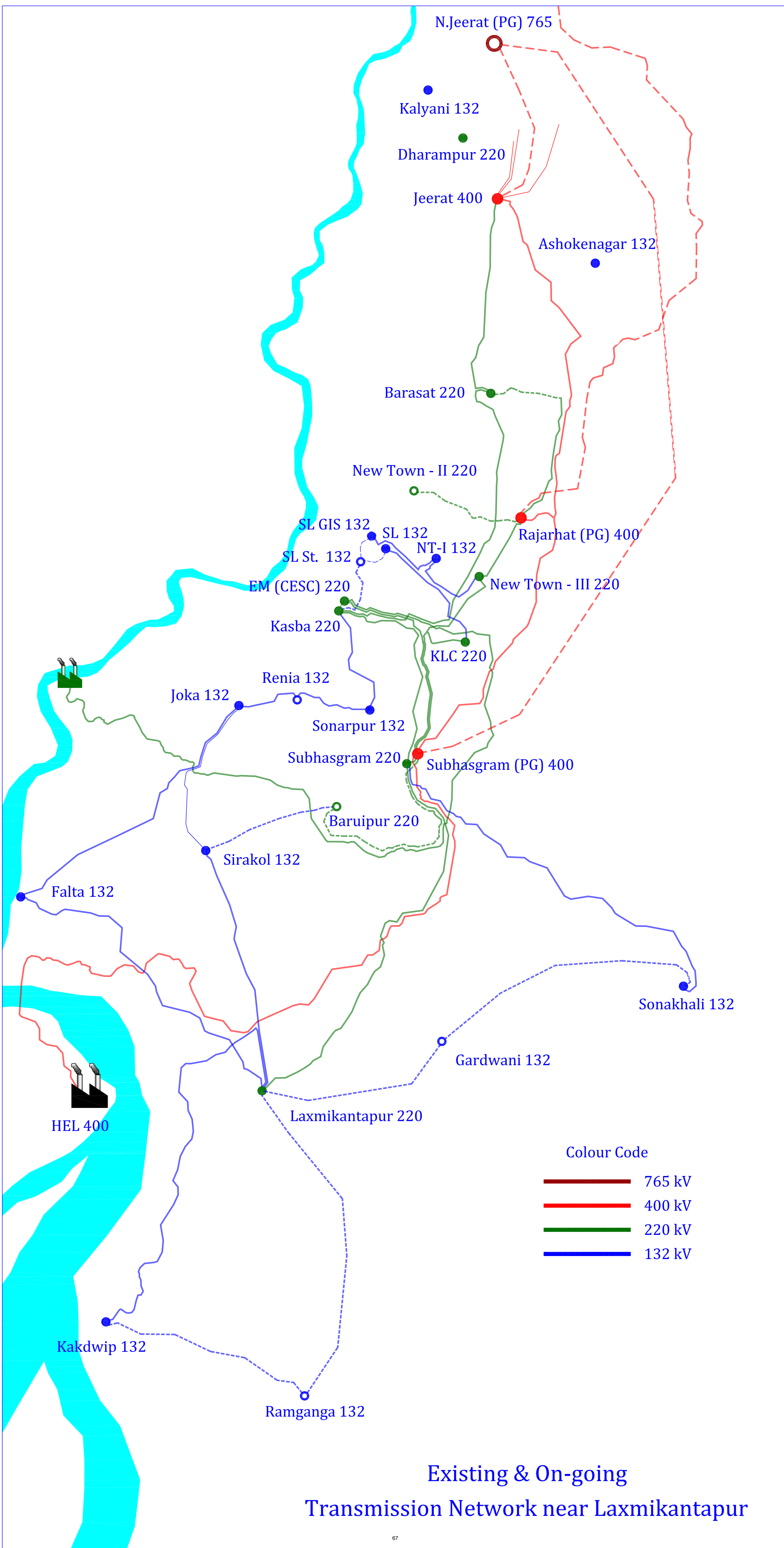
LEGEND	
— (Black solid line)	132kV-Existing
- - - (Green dashed line)	132kV-Future
— (Black solid line)	220kV-Existing
- - - (Blue dashed line)	220kV-Future
— (Red solid line)	400kV-Existing
- - - (Red dashed line)	400kV-Future

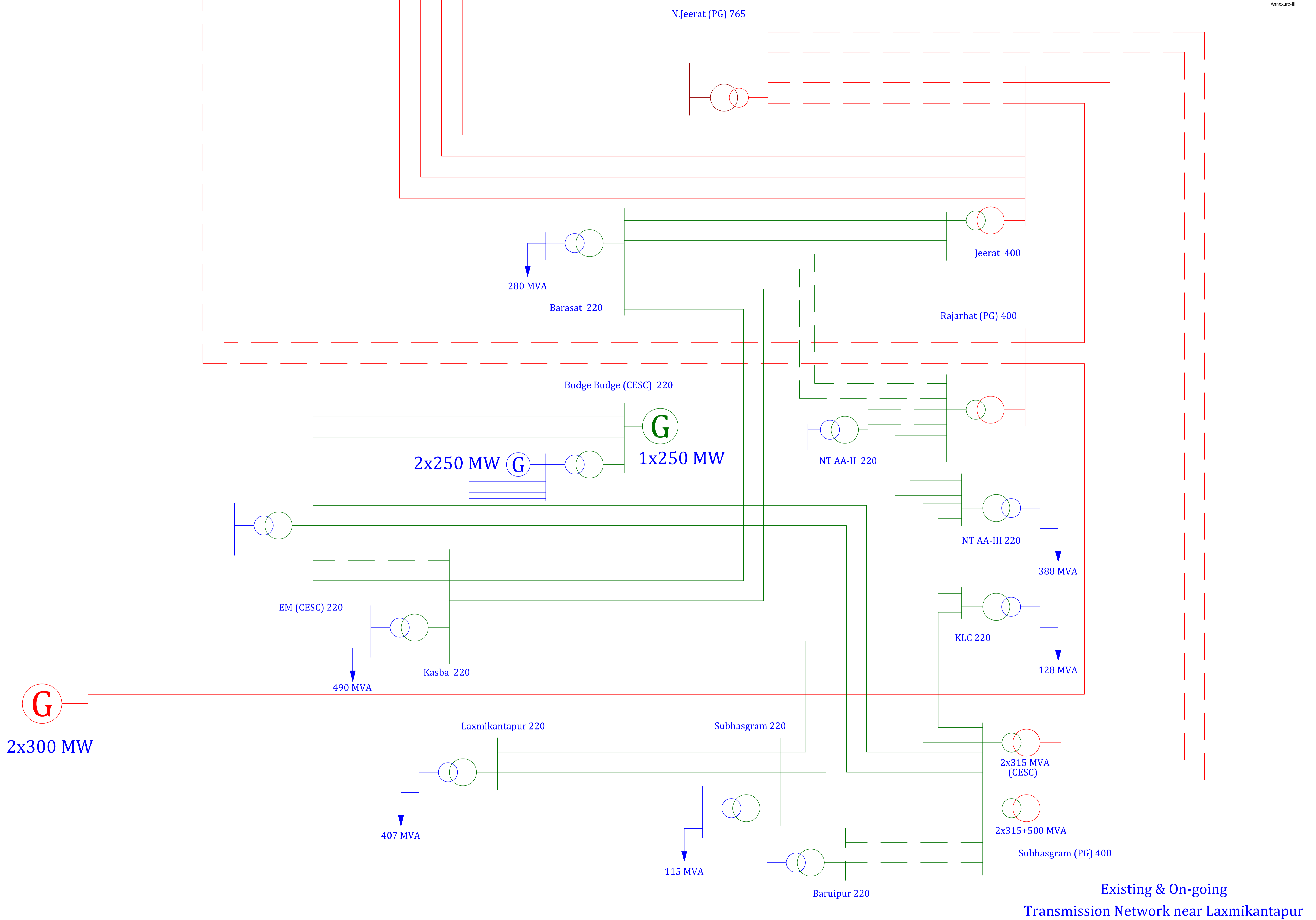


LOCATION MAP OF PROPOSE 220 KV TRANSMISSION LINE TO JSW PLANT AT GOBARDHANPUR, JODA.
 PROPOSAL NO - 2 (RAMCHANDRAPUR - JODA SINGLE CIRCUIT LINE)

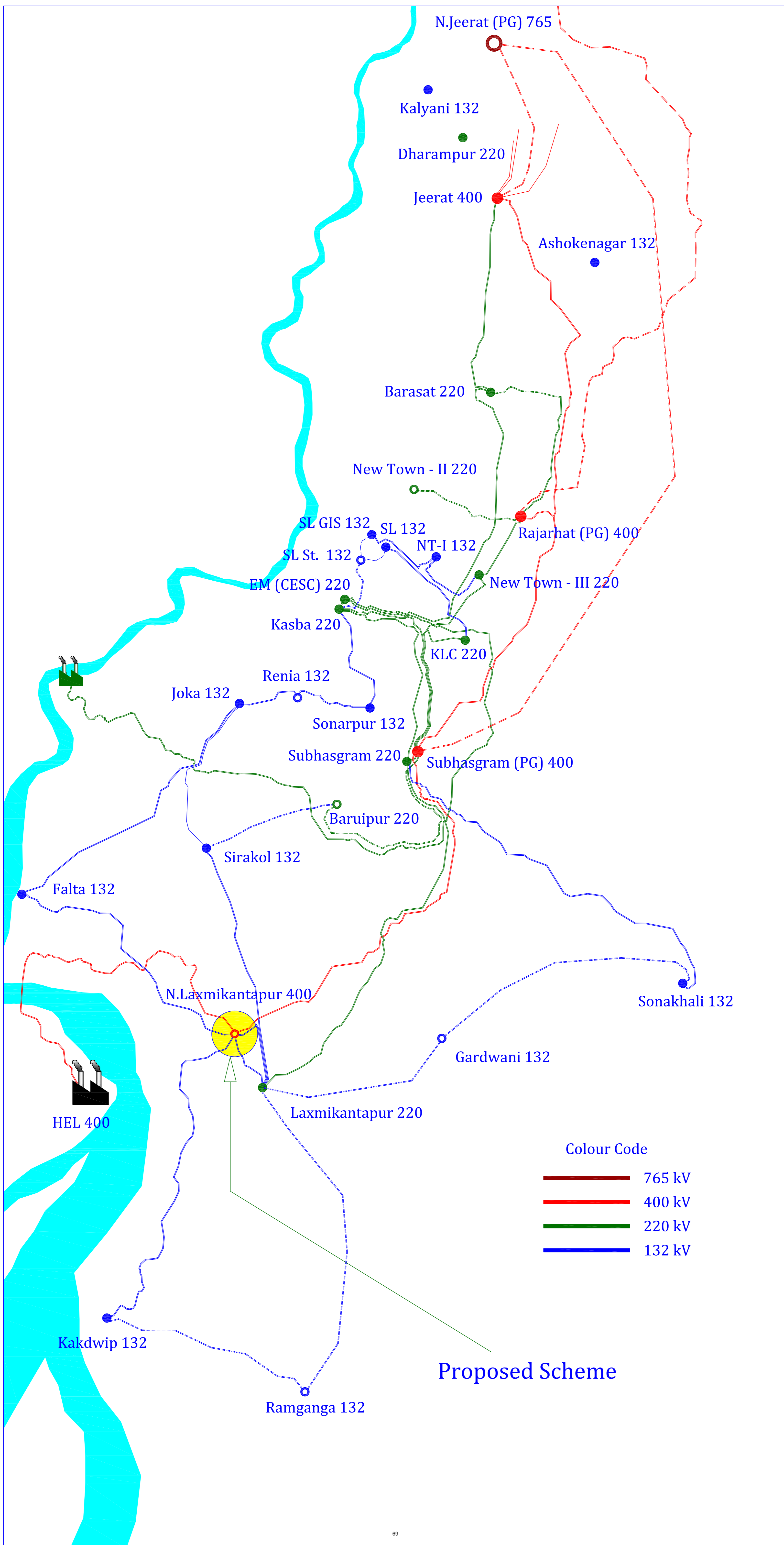


LEGEND	WELL, BORE WELL, HAND PUMP	POWER LINE WITH POLE	NH ROAD	PROP. ALIGNMENT	SCALE = 1 : 40,000
	LIGHT POST, MAST	MAIN POWER LINE	RAILWAY TRACK	MATIONARY DRAIN	NALA / DOUBLE LINE NALA
	TEMPLE, SIGN BOARD	WATER LOGGED AREA	BUILDING, SHED	WATER SUPPLY	TELEPHONE POLE
	HYDRANT, VALVE	VILLAGE AREA	HUT, CABIN	FOOT HILL	

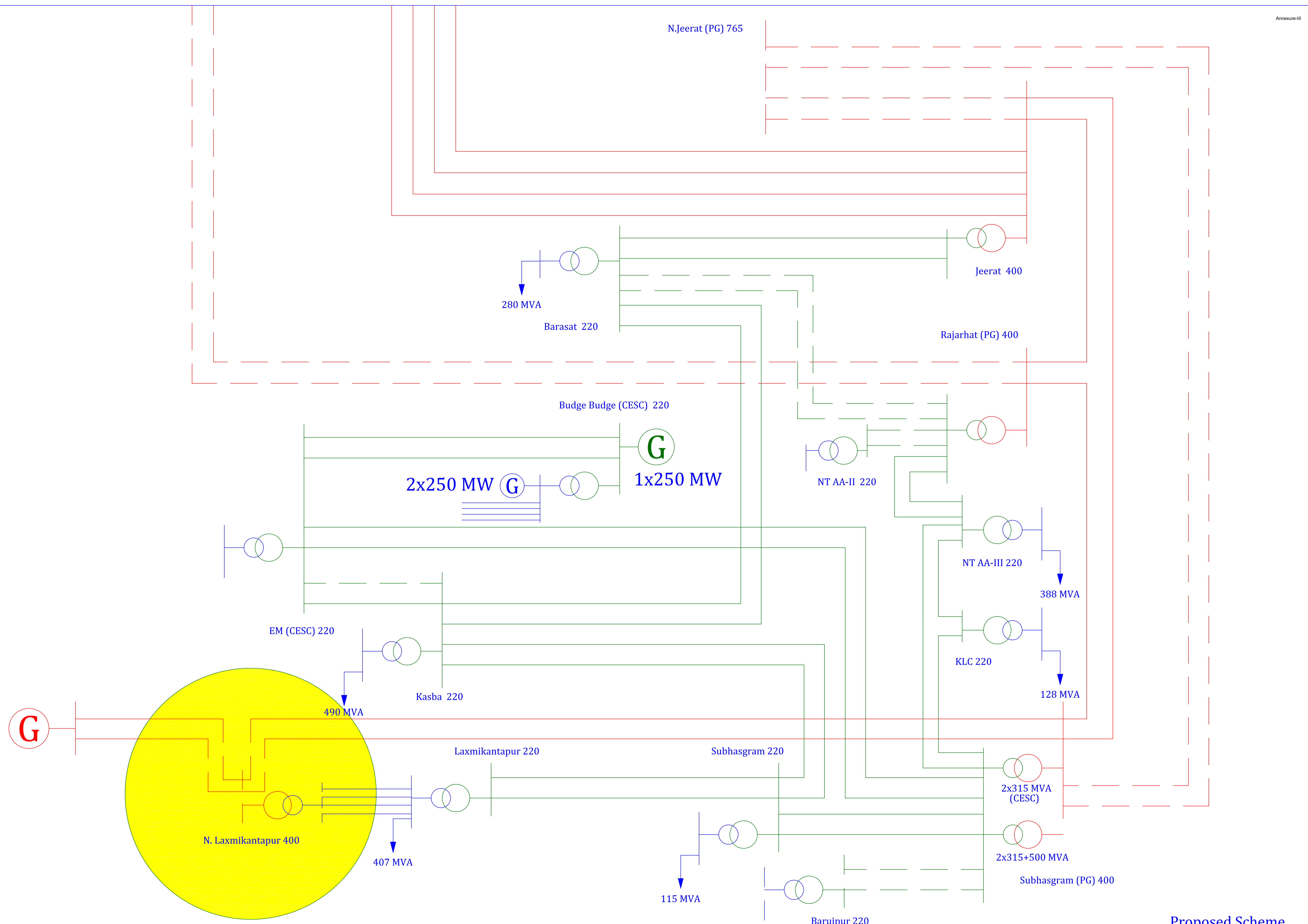




Existing & On-going
Transmission Network near Laxmikantapur

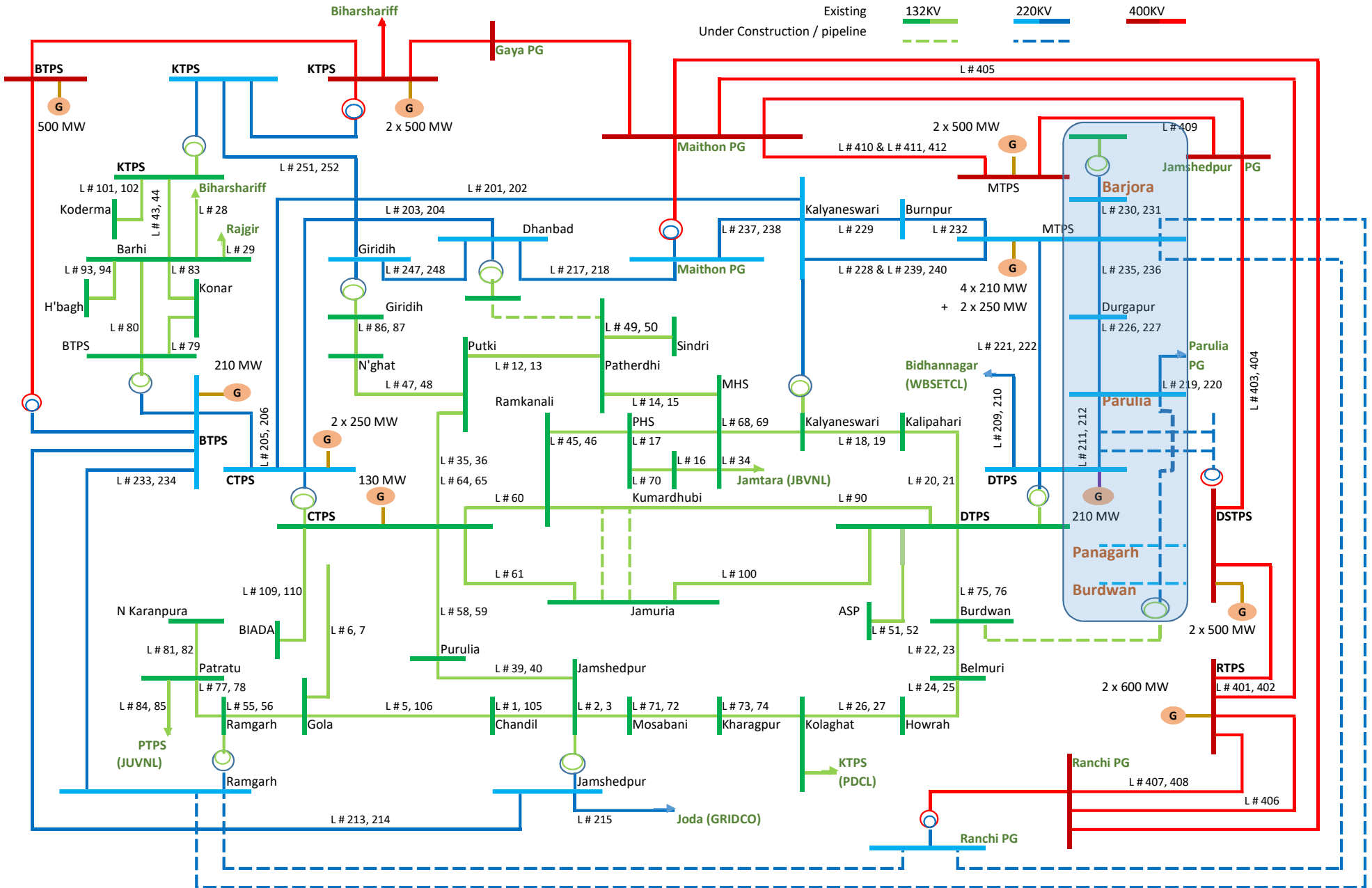


N.Jeerat (PG) 765



Proposed Scheme

DAMODAR VALLEY CORPORATION - GRID CONNECTIVITY



Load Flow (indicating relevant Bus)

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E										SUN, APR 21 2019		9:35							
ALL INDIA PEAK WR FEB 2019 25 OCT 2018										RATING		%MVA FOR TRANSFORMERS							
										SET B		% I FOR NON-TRANSFORMER BRANCHES							
BUS 232000	DTPS2	220.00	CKT	MW	MVAR	MVA	%	1.0099PU	9.68	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232000
								222.17KV			MW	MVAR	2003	DVC			2031	DVC	
TO 231000	DTPS1	132.00	1	112.8	17.3	114.2	60	0.9540RG			0.20	11.91	2003	DVC			2031	DVC	
TO 231000	DTPS1	132.00	2	112.8	17.3	114.2	60	0.9540RG			0.20	11.91	2003	DVC			2031	DVC	
TO 231000	DTPS1	132.00	3	112.8	17.3	114.2	60	0.9540RG			0.20	11.91	2003	DVC			2031	DVC	
TO 232001	MTPS2	220.00	1	-61.4	-49.3	78.8	37				0.35	2.07	2003	DVC			2031	DVC	
TO 232001	MTPS2	220.00	2	-61.4	-49.3	78.8	37				0.35	2.07	2003	DVC			2031	DVC	
TO 232014	DSTPS2	220.00	1	-223.9	27.1	225.5	107				0.61	3.49	2003	DVC			2031	DVC	
TO 232014	DSTPS2	220.00	2	-223.9	27.1	225.5	107				0.61	3.49	2003	DVC			2031	DVC	
TO 262005	BDNNGR2	220.00	1	116.0	-3.7	116.1	48				0.20	0.95	2005	WB			2052	S_BNG	
TO 262005	BDNNGR2	220.00	2	116.0	-3.7	116.1	48				0.20	0.95	2005	WB			2052	S_BNG	
BUS 232001	MTPS2	220.00	CKT	MW	MVAR	MVA	%	1.0300PU	10.73	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232001
	FROM GENERATION			798.0	232.6R	831.2	78	226.60KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				58.4	14.6	60.2													
TO 232000	DTPS2	220.00	1	61.7	45.2	76.5	36				0.35	2.07	2003	DVC			2031	DVC	
TO 232000	DTPS2	220.00	2	61.7	45.2	76.5	36				0.35	2.07	2003	DVC			2031	DVC	
TO 232003	BARJORA2	220.00	1	78.6	18.9	80.8	38				0.15	0.85	2003	DVC			2031	DVC	
TO 232003	BARJORA2	220.00	2	78.6	18.9	80.8	38				0.15	0.85	2003	DVC			2031	DVC	
TO 232004	BURNPUR2	220.00	1	111.3	10.6	111.8	52				1.07	5.71	2003	DVC			2031	DVC	
TO 232005	DURGAPUR2	220.00	1	53.4	37.9	65.5	31				0.21	1.10	2003	DVC			2031	DVC	
TO 232005	DURGAPUR2	220.00	2	53.4	37.9	65.5	31				0.21	1.10	2003	DVC			2031	DVC	
TO 242003	KLYN2	220.00	1	80.3	1.1	80.3	37				0.75	4.00	2003	DVC			2031	DVC	
TO 242003	KLYN2	220.00	2	80.3	1.1	80.3	37				0.75	4.00	2003	DVC			2031	DVC	
TO 242003	KLYN2	220.00	3	80.3	1.1	80.3	37				0.75	4.00	2003	DVC			2031	DVC	
BUS 232002	PARULIA2	220.00	CKT	MW	MVAR	MVA	%	1.0143PU	10.22	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232002
								223.14KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				153.7	38.5	158.4													
TO 232005	DURGAPUR2	220.00	1	14.0	-27.0	30.4	14				0.02	0.11	2003	DVC			2031	DVC	
TO 232005	DURGAPUR2	220.00	2	14.0	-27.0	30.4	14				0.02	0.11	2003	DVC			2031	DVC	
TO 232014	DSTPS2	220.00	1	-40.9	32.3	52.1	25				0.06	0.37	2003	DVC			2031	DVC	
TO 232014	DSTPS2	220.00	2	-40.9	32.3	52.1	25				0.06	0.37	2003	DVC			2031	DVC	
TO 232017	BURDWAN2	220.00	1	78.7	1.6	78.7	37				0.82	4.71	2003	DVC			2031	DVC	
TO 232017	BURDWAN2	220.00	2	78.7	1.6	78.7	37				0.82	4.71	2003	DVC			2031	DVC	
TO 232098	TAMLA_DSP	220.00	1	0.0	-0.9	0.9	0				0.00	0.00	2003	DVC			2031	DVC	
TO 232098	TAMLA_DSP	220.00	2	0.0	-0.9	0.9	0				0.00	0.00	2003	DVC			2031	DVC	
TO 232098	TAMLA_DSP	220.00	3	0.0	-0.9	0.9	0				0.00	0.00	2003	DVC			2031	DVC	
TO 262028	PARULIA	220.00	1	-128.7	-24.9	131.1	62				0.03	0.13	2055	ER_ISTS_WB			2052	S_BNG	
TO 262028	PARULIA	220.00	2	-128.7	-24.9	131.1	62				0.03	0.13	2055	ER_ISTS_WB			2052	S_BNG	
BUS 232005	DURGAPUR2	220.00	CKT	MW	MVAR	MVA	%	1.0174PU	10.08	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232005
								223.83KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				134.4	33.7	138.6													
TO 232001	MTPS2	220.00	1	-53.2	-41.5	67.5	32				0.21	1.10	2003	DVC			2031	DVC	
TO 232001	MTPS2	220.00	2	-53.2	-41.5	67.5	32				0.21	1.10	2003	DVC			2031	DVC	
TO 232002	PARULIA2	220.00	1	-14.0	24.7	28.4	13				0.02	0.11	2003	DVC			2031	DVC	
TO 232002	PARULIA2	220.00	2	-14.0	24.7	28.4	13				0.02	0.11	2003	DVC			2031	DVC	

BUS 232014	DSTPS2	220.00	CKT	MW	MVAR	MVA	% 1.0108PU	10.58	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232014
							222.37KV			MW	MVAR	2003	DVC					
TO 232000	DTPS2	220.00	1	224.5	-24.9	225.9	107			0.61	3.49	2003	DVC			2031	DVC	
TO 232000	DTPS2	220.00	2	224.5	-24.9	225.9	107			0.61	3.49	2003	DVC			2031	DVC	
TO 232002	PARULIA2	220.00	1	41.0	-34.3	53.4	25			0.06	0.37	2003	DVC			2031	DVC	
TO 232002	PARULIA2	220.00	2	41.0	-34.3	53.4	25			0.06	0.37	2003	DVC			2031	DVC	
TO 234001	DSTPS4	400.00	1	-265.5	59.2	272.0	1.0000UN			1.88	28.67	2003	DVC			2031	DVC	
TO 234001	DSTPS4	400.00	2	-265.5	59.2	272.0	1.0000UN			1.88	28.67	2003	DVC			2031	DVC	
BUS 242001	CTPS2	220.00	CKT	MW	MVAR	MVA	% 1.0000PU	4.11	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242001
	FROM GENERATION			456.0	10.1R	456.1	78 220.00KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				160.1	40.1	165.0												
TO 241002	CTPS1	132.00	1	118.4	43.3	126.1	70 0.9409LO			0.54	13.36	2003	DVC			2031	DVC	
TO 241002	CTPS1	132.00	2	118.4	43.3	126.1	70 0.9409LO			0.54	13.36	2003	DVC			2031	DVC	
TO 241002	CTPS1	132.00	3	118.4	43.3	126.1	70 0.9409LO			0.54	13.36	2003	DVC			2031	DVC	
TO 242000	BTPS2	220.00	1	9.3	-55.9	56.7	27			0.14	0.78	2003	DVC			2031	DVC	
TO 242000	BTPS2	220.00	2	9.3	-55.9	56.7	27			0.14	0.78	2003	DVC			2031	DVC	
TO 242004	DHANBAD2	220.00	1	-39.0	-24.0	45.8	22			0.14	0.73	2003	DVC			2031	DVC	
TO 242004	DHANBAD2	220.00	2	-39.0	-24.0	45.8	22			0.14	0.73	2003	DVC			2031	DVC	
BUS 242003	KLYN2	220.00	CKT	MW	MVAR	MVA	% 1.0172PU	7.91	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242003
							223.79KV			MW	MVAR	2003	DVC			2031	DVC	
TO 232001	MTPS2	220.00	1	-79.5	-8.9	80.0	38			0.75	4.00	2003	DVC			2031	DVC	
TO 232001	MTPS2	220.00	2	-79.5	-8.9	80.0	38			0.75	4.00	2003	DVC			2031	DVC	
TO 232001	MTPS2	220.00	3	-79.5	-8.9	80.0	38			0.75	4.00	2003	DVC			2031	DVC	
TO 232004	BURNPUR2	220.00	2	6.2	12.1	13.6	6			0.01	0.04	2003	DVC			2031	DVC	
TO 241009	KLYNS1	132.00	1	149.2	56.2	159.4	100 0.9409LO			1.04	19.88	2003	DVC			2031	DVC	
TO 241009	KLYNS1	132.00	2	149.2	56.2	159.4	100 0.9409LO			1.04	19.88	2003	DVC			2031	DVC	
TO 241009	KLYNS1	132.00	3	145.2	54.9	155.3	97 0.9409LO			0.99	19.36	2003	DVC			2031	DVC	
TO 242009	MAITHON PG2	220.00	1	-105.6	-76.5	130.4	62			0.19	1.02	2053	ER_ISTS_DVC			2031	DVC	
TO 242009	MAITHON PG2	220.00	2	-105.6	-76.5	130.4	62			0.19	1.02	2053	ER_ISTS_DVC			2031	DVC	
BUS 242004	DHANBAD2	220.00	CKT	MW	MVAR	MVA	% 1.0106PU	4.86	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242004
							222.34KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				88.3	22.1	91.1												
TO 232089	ELECTRO STL	220.00	1	0.0	-11.9	11.9	6			0.00	0.01	2003	DVC			2031	DVC	
TO 232089	ELECTRO STL	220.00	2	0.0	-11.9	11.9	6			0.00	0.01	2003	DVC			2031	DVC	
TO 241030	DHNABD_1	132.00	1	0.0	-0.0	0.0	0 0.9409RG			0.00	0.00	2003	DVC			2031	DVC	
TO 241030	DHNABD_1	132.00	2	0.0	-0.0	0.0	0 0.9409RG			0.00	0.00	2003	DVC			2031	DVC	
TO 242001	CTPS2	220.00	1	39.2	18.2	43.2	21			0.14	0.73	2003	DVC			2031	DVC	
TO 242001	CTPS2	220.00	2	39.2	18.2	43.2	21			0.14	0.73	2003	DVC			2031	DVC	
TO 242005	GIRDHI2	220.00	1	58.7	-14.9	60.6	29			0.24	1.30	2003	DVC			2031	DVC	
TO 242005	GIRDHI2	220.00	2	58.7	-14.9	60.6	29			0.24	1.30	2003	DVC			2031	DVC	
TO 242009	MAITHON PG2	220.00	1	-142.1	-2.5	142.1	68			1.58	8.45	2053	ER_ISTS_DVC			2031	DVC	
TO 242009	MAITHON PG2	220.00	2	-142.1	-2.5	142.1	68			1.58	8.45	2053	ER_ISTS_DVC			2031	DVC	
BUS 242009	MAITHON PG2	220.00	CKT	MW	MVAR	MVA	% 1.0231PU	8.23	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242009
							225.09KV			MW	MVAR	2053	ER_ISTS_DVC			2031	DVC	
TO 222008	DUMKA NEW	220.00	1	55.1	13.6	56.8	26			0.34	1.95	2002	JHARKHAND			2021	JHARKHAND	
TO 222008	DUMKA NEW	220.00	2	55.1	13.6	56.8	26			0.34	1.95	2002	JHARKHAND			2021	JHARKHAND	
TO 242003	KLYN2	220.00	1	105.8	76.4	130.5	61			0.19	1.02	2003	DVC			2031	DVC	
TO 242003	KLYN2	220.00	2	105.8	76.4	130.5	61			0.19	1.02	2003	DVC			2031	DVC	
TO 242004	DHANBAD2	220.00	1	143.7	3.3	143.7	68			1.58	8.45	2003	DVC			2031	DVC	
TO 242004	DHANBAD2	220.00	2	143.7	3.3	143.7	68			1.58	8.45	2003	DVC			2031	DVC	
TO 244003	MAITHON PG4	400.00	1	-304.6	-93.3	318.6	64 1.0000UN			1.21	24.23	2053	ER_ISTS_DVC			2031	DVC	

TO 244003 MAITHON PG4	400.00	3	-304.6	-93.3	318.6	64	1.0000UN		1.21	24.23	2053	ER_ISTS_DVC	2031	DVC				
BUS 244003 MAITHON PG4	400.00	CKT	MW	MVAR	MVA	%	0.9900PU 396.01KV	12.22	X---	LOSSES	---	X---	AREA	-----X	X---	ZONE	-----X	244003
TO SWITCHED SHUNT			0.0	155.6	155.6					MW	MVAR	2053	ER_ISTS_DVC	2031	DVC			
TO 214001 KHALGAON_B	400.00	T1	-57.1	-30.6	64.8	7			0.12	1.30	2102	KHSTPP	2012	BIHAR_S				
TO 214005 GAYA4	400.00	Q1	196.6	-100.9	221.0	13			1.06	18.24	2051	ER_ISTS_BIH	2001	ER_BOUNDARY				
TO 214005 GAYA4	400.00	Q2	196.6	-100.9	221.0	13			1.06	18.24	2051	ER_ISTS_BIH	2001	ER_BOUNDARY				
TO 234002 MTPS_B4	400.00	T2	-457.4	-41.5	459.3	55			2.39	26.65	2003	DVC	2031	DVC				
TO 234002 MTPS_B4	400.00	T3	-457.4	-41.4	459.3	55			2.40	26.65	2003	DVC	2031	DVC				
TO 242009 MAITHON PG2	220.00	1	305.8	117.6	327.6	66	0.9409RG		1.21	24.23	2053	ER_ISTS_DVC	2031	DVC				
TO 242009 MAITHON PG2	220.00	3	305.8	117.6	327.6	66	0.9409RG		1.21	24.23	2053	ER_ISTS_DVC	2031	DVC				
TO 244004 JAMSHEDPUR4	400.00	T1	-32.9	-75.5	82.3	10			0.06	0.60	2053	ER_ISTS_DVC	2031	DVC				
BUS 262028 PARULIA	220.00	CKT	MW	MVAR	MVA	%	1.0147PU 223.24KV	10.28	X---	LOSSES	---	X---	AREA	-----X	X---	ZONE	-----X	262028
TO 232002 PARULIA2	220.00	1	128.7	24.9	131.1	62			0.03	0.13	2003	DVC	2031	DVC				
TO 232002 PARULIA2	220.00	2	128.7	24.9	131.1	62			0.03	0.13	2003	DVC	2031	DVC				
TO 264009 PARULIA_B	400.00	1	-29.8	-62.3	69.1	22	1.0000UN		0.09	1.81	2055	ER_ISTS_WB	2052	S_BNG				
TO 264032 PARULIA_A	400.00	3	-227.6	12.5	227.9	72	1.0000UN		1.01	19.66	2055	ER_ISTS_WB	2052	S_BNG				
BUS 264009 PARULIA_B	400.00	CKT	MW	MVAR	MVA	%	1.0133PU 405.32KV	10.84	X---	LOSSES	---	X---	AREA	-----X	X---	ZONE	-----X	264009
TO SWITCHED SHUNT			0.0	232.8	232.8					MW	MVAR	2055	ER_ISTS_WB	2052	S_BNG			
TO 244004 JAMSHEDPUR4	400.00	T1	-93.7	-4.7	93.8	11			0.35	3.74	2053	ER_ISTS_DVC	2031	DVC				
TO 262028 PARULIA	220.00	1	29.9	64.1	70.8	22	0.9750RG		0.09	1.81	2055	ER_ISTS_WB	2052	S_BNG				
TO 264003 SAGAR4	400.00	T1	-46.2	-55.8	72.4	8			0.05	0.57	2005	WB	2052	S_BNG				
TO 264003 SAGAR4	400.00	T2	-46.2	-55.8	72.4	8			0.05	0.57	2005	WB	2052	S_BNG				
TO 264006 BDNNGR4	400.00	T1	146.0	-98.9	176.4	20			0.06	0.63	2005	WB	2052	S_BNG				
TO 264006 BDNNGR4	400.00	T2	146.0	-98.9	176.4	20			0.06	0.63	2005	WB	2052	S_BNG				
TO 264008 FARAKKA	400.00	T1	-135.8	17.2	136.9	15			0.57	6.11	2101	FSTPP	2052	S_BNG				
BUS 264032 PARULIA_A	400.00	CKT	MW	MVAR	MVA	%	0.9927PU 397.09KV	15.22	X---	LOSSES	---	X---	AREA	-----X	X---	ZONE	-----X	264032
TO SWITCHED SHUNT			0.0	156.4	156.4					MW	MVAR	2055	ER_ISTS_WB	2052	S_BNG			
TO 244006 MAITHON B	400.00	T1	-176.5	-41.8	181.4	21			0.42	4.72	2053	ER_ISTS_DVC	2031	DVC				
TO 244006 MAITHON B	400.00	T2	-176.5	-41.8	181.4	21			0.42	4.72	2053	ER_ISTS_DVC	2031	DVC				
TO 262028 PARULIA	220.00	3	228.6	7.1	228.7	73	0.9750RG		1.01	19.66	2055	ER_ISTS_WB	2052	S_BNG				
TO 264008 FARAKKA	400.00	T2	124.4	-80.0	147.9	17			0.46	4.90	2101	FSTPP	2052	S_BNG				

Load Flow (Full DVC portion)

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E										SUN, APR 21 2019		9:45										
ALL INDIA PEAK WR FEB 2019 25 OCT 2018										RATING		%MVA FOR TRANSFORMERS										
										SET B		% I FOR NON-TRANSFORMER BRANCHES										
OUTPUT FOR ZONE 2031 [DVC]																						
BUS 231000	DTPS1	132.00	CKT	MW	MVAR	MVA	%	1.0458PU	3.70	X---	LOSSES	---	X----	AREA	-----	X	X----	ZONE	-----	X	231000	
								138.04KV			MW	MVAR	2003	DVC			2031	DVC				
TO LOAD-PQ				46.2	11.6	47.6																
TO 231006	BURDWAN1	132.00	1	9.8	-1.3	9.9	11				0.06	0.14	2003	DVC			2031	DVC				
TO 231006	BURDWAN1	132.00	2	9.8	-1.3	9.9	11				0.06	0.14	2003	DVC			2031	DVC				
TO 231008	KALIPAHARI1	132.00	1	45.6	-2.4	45.7	52				0.70	1.68	2003	DVC			2031	DVC				
TO 231008	KALIPAHARI1	132.00	2	45.6	-2.4	45.7	52				0.70	1.68	2003	DVC			2031	DVC				
TO 231009	ASP1	132.00	1	15.1	3.5	15.5	18				0.01	0.02	2003	DVC			2031	DVC				
TO 231009	ASP1	132.00	2	15.1	3.5	15.5	18				0.01	0.02	2003	DVC			2031	DVC				
TO 231081	JAMURIA1	132.00	1	104.1	7.9	104.4	119				3.06	7.93	2003	DVC			2031	DVC				
TO 232000	DTPS2	220.00	1	-112.6	-5.3	112.7	59	1.0000UN			0.20	11.91	2003	DVC			2031	DVC				
TO 232000	DTPS2	220.00	2	-112.6	-5.3	112.7	59	1.0000UN			0.20	11.91	2003	DVC			2031	DVC				
TO 232000	DTPS2	220.00	3	-112.6	-5.3	112.7	59	1.0000UN			0.20	11.91	2003	DVC			2031	DVC				
TO 241012	RAMKANALI1	132.00	2	46.4	-3.1	46.5	53				1.21	2.88	2003	DVC			2031	DVC				
BUS 231001	PURULIA1	132.00	CKT	MW	MVAR	MVA	%	1.0194PU	-3.23	X---	LOSSES	---	X----	AREA	-----	X	X----	ZONE	-----	X	231001	
								134.56KV			MW	MVAR	2003	DVC			2031	DVC				
TO LOAD-PQ				13.9	3.5	14.3																
TO 241002	CTPS1	132.00	1	-18.7	2.2	18.8	22				0.20	0.47	2003	DVC			2031	DVC				
TO 241002	CTPS1	132.00	2	-18.7	2.2	18.8	22				0.20	0.47	2003	DVC			2031	DVC				
TO 241005	JAMSHEDPUR1	132.00	1	11.8	-3.9	12.4	14				0.11	0.25	2003	DVC			2031	DVC				
TO 241005	JAMSHEDPUR1	132.00	2	11.8	-3.9	12.4	14				0.11	0.25	2003	DVC			2031	DVC				
BUS 231002	KHARGPUR1	132.00	CKT	MW	MVAR	MVA	%	1.0120PU	-4.25	X---	LOSSES	---	X----	AREA	-----	X	X----	ZONE	-----	X	231002	
								133.59KV			MW	MVAR	2003	DVC			2031	DVC				
TO 231003 KOLAGHAT1				132.00	1	-14.2	0.9	14.3	17			0.14	0.34	2003	DVC			2031	DVC			
TO 231003	KOLAGHAT1	132.00	2	-14.2	0.9	14.3	17				0.14	0.34	2003	DVC			2031	DVC				
TO 241011	MOSABANI1	132.00	1	14.2	-0.9	14.3	17				0.18	0.42	2003	DVC			2031	DVC				
TO 241011	MOSABANI1	132.00	2	14.2	-0.9	14.3	17				0.18	0.42	2003	DVC			2031	DVC				
BUS 231003	KOLAGHAT1	132.00	CKT	MW	MVAR	MVA	%	1.0175PU	-2.84	X---	LOSSES	---	X----	AREA	-----	X	X----	ZONE	-----	X	231003	
								134.30KV			MW	MVAR	2003	DVC			2031	DVC				
TO LOAD-PQ				4.7	1.2	4.9																
TO 231002	KHARGPUR1	132.00	1	14.4	-4.5	15.0	18				0.14	0.34	2003	DVC			2031	DVC				
TO 231002	KHARGPUR1	132.00	2	14.4	-4.5	15.0	18				0.14	0.34	2003	DVC			2031	DVC				
TO 231004	HOWRAH1	132.00	1	-16.7	3.9	17.2	20				0.17	0.41	2003	DVC			2031	DVC				
TO 231004	HOWRAH1	132.00	2	-16.7	3.9	17.2	20				0.17	0.41	2003	DVC			2031	DVC				
BUS 231004	HOWRAH1	132.00	CKT	MW	MVAR	MVA	%	1.0199PU	-1.38	X---	LOSSES	---	X----	AREA	-----	X	X----	ZONE	-----	X	231004	
								134.62KV			MW	MVAR	2003	DVC			2031	DVC				
TO LOAD-PQ				21.8	5.5	22.5																
TO 231003	KOLAGHAT1	132.00	1	16.9	-6.7	18.2	21				0.17	0.41	2003	DVC			2031	DVC				
TO 231003	KOLAGHAT1	132.00	2	16.9	-6.7	18.2	21				0.17	0.41	2003	DVC			2031	DVC				
TO 231005	BELMURI1	132.00	1	-27.8	4.0	28.1	33				0.37	0.88	2003	DVC			2031	DVC				
TO 231005	BELMURI1	132.00	2	-27.8	4.0	28.1	33				0.37	0.88	2003	DVC			2031	DVC				
BUS 231005	BELMURI1	132.00	CKT	MW	MVAR	MVA	%	1.0275PU	0.50	X---	LOSSES	---	X----	AREA	-----	X	X----	ZONE	-----	X	231005	
								135.63KV			MW	MVAR	2003	DVC			2031	DVC				

									222.17KV		MW	MVAR	2003	DVC		2031	DVC			
TO	231000	DTPS1	132.00	1	112.8	17.3	114.2	60	0.9540RG		0.20	11.91	2003	DVC		2031	DVC			
TO	231000	DTPS1	132.00	2	112.8	17.3	114.2	60	0.9540RG		0.20	11.91	2003	DVC		2031	DVC			
TO	231000	DTPS1	132.00	3	112.8	17.3	114.2	60	0.9540RG		0.20	11.91	2003	DVC		2031	DVC			
TO	232001	MTPS2	220.00	1	-61.4	-49.3	78.8	37			0.35	2.07	2003	DVC		2031	DVC			
TO	232001	MTPS2	220.00	2	-61.4	-49.3	78.8	37			0.35	2.07	2003	DVC		2031	DVC			
TO	232014	DSTPS2	220.00	1	-223.9	27.1	225.5	107			0.61	3.49	2003	DVC		2031	DVC			
TO	232014	DSTPS2	220.00	2	-223.9	27.1	225.5	107			0.61	3.49	2003	DVC		2031	DVC			
TO	262005	BDNNGR2	220.00	1	116.0	-3.7	116.1	48			0.20	0.95	2005	WB		2052	S_BNG			
TO	262005	BDNNGR2	220.00	2	116.0	-3.7	116.1	48			0.20	0.95	2005	WB		2052	S_BNG			
BUS	232001	MTPS2	220.00	CKT																
		FROM GENERATION			MW	MVAR	MVA	%	1.0300PU	10.73	X---	LOSSES	---	X----	AREA	-----X	X----	ZONE	-----X	232001
		TO LOAD-PQ			798.0	232.6R	831.2	78	226.60KV			MW	MVAR	2003	DVC					
TO	232000	DTPS2	220.00	1	61.7	45.2	76.5	36			0.35	2.07	2003	DVC		2031	DVC			
TO	232000	DTPS2	220.00	2	61.7	45.2	76.5	36			0.35	2.07	2003	DVC		2031	DVC			
TO	232003	BARJORA2	220.00	1	78.6	18.9	80.8	38			0.15	0.85	2003	DVC		2031	DVC			
TO	232003	BARJORA2	220.00	2	78.6	18.9	80.8	38			0.15	0.85	2003	DVC		2031	DVC			
TO	232004	BURNPUR2	220.00	1	111.3	10.6	111.8	52			1.07	5.71	2003	DVC		2031	DVC			
TO	232005	DURGAPUR2	220.00	1	53.4	37.9	65.5	31			0.21	1.10	2003	DVC		2031	DVC			
TO	232005	DURGAPUR2	220.00	2	53.4	37.9	65.5	31			0.21	1.10	2003	DVC		2031	DVC			
TO	242003	KLYN2	220.00	1	80.3	1.1	80.3	37			0.75	4.00	2003	DVC		2031	DVC			
TO	242003	KLYN2	220.00	2	80.3	1.1	80.3	37			0.75	4.00	2003	DVC		2031	DVC			
TO	242003	KLYN2	220.00	3	80.3	1.1	80.3	37			0.75	4.00	2003	DVC		2031	DVC			
BUS	232002	PARULIA2	220.00	CKT																
		TO LOAD-PQ			MW	MVAR	MVA	%	1.0143PU	10.22	X---	LOSSES	---	X----	AREA	-----X	X----	ZONE	-----X	232002
		TO 232005 DURGAPUR2			153.7	38.5	158.4		223.14KV			MW	MVAR	2003	DVC					
TO	232005	DURGAPUR2	220.00	1	14.0	-27.0	30.4	14			0.02	0.11	2003	DVC		2031	DVC			
TO	232005	DURGAPUR2	220.00	2	14.0	-27.0	30.4	14			0.02	0.11	2003	DVC		2031	DVC			
TO	232014	DSTPS2	220.00	1	-40.9	32.3	52.1	25			0.06	0.37	2003	DVC		2031	DVC			
TO	232014	DSTPS2	220.00	2	-40.9	32.3	52.1	25			0.06	0.37	2003	DVC		2031	DVC			
TO	232017	BURDWAN2	220.00	1	78.7	1.6	78.7	37			0.82	4.71	2003	DVC		2031	DVC			
TO	232017	BURDWAN2	220.00	2	78.7	1.6	78.7	37			0.82	4.71	2003	DVC		2031	DVC			
TO	232098	TAMLA_DSP	220.00	1	0.0	-0.9	0.9	0			0.00	0.00	2003	DVC		2031	DVC			
TO	232098	TAMLA_DSP	220.00	2	0.0	-0.9	0.9	0			0.00	0.00	2003	DVC		2031	DVC			
TO	232098	TAMLA_DSP	220.00	3	0.0	-0.9	0.9	0			0.00	0.00	2003	DVC		2031	DVC			
TO	262028	PARULIA	220.00	1	-128.7	-24.9	131.1	62			0.03	0.13	2055	ER_ISTS_WB		2052	S_BNG			
TO	262028	PARULIA	220.00	2	-128.7	-24.9	131.1	62			0.03	0.13	2055	ER_ISTS_WB		2052	S_BNG			
BUS	232003	BARJORA2	220.00	CKT																
		TO LOAD-PQ			MW	MVAR	MVA	%	1.0255PU	10.18	X---	LOSSES	---	X----	AREA	-----X	X----	ZONE	-----X	232003
		TO 231011 BARJORA 1			92.8	23.3	95.7		225.62KV			MW	MVAR	2003	DVC					
TO	231011	BARJORA 1	132.00	1	32.0	8.9	33.3	18	0.9801RG		0.03	0.96	2003	DVC		2031	DVC			
TO	231011	BARJORA 1	132.00	2	32.0	8.9	33.3	18	0.9801RG		0.03	0.96	2003	DVC		2031	DVC			
TO	232001	MTPS2	220.00	1	-78.4	-20.6	81.1	38			0.15	0.85	2003	DVC		2031	DVC			
TO	232001	MTPS2	220.00	2	-78.4	-20.6	81.1	38			0.15	0.85	2003	DVC		2031	DVC			
BUS	232004	BURNPUR2	220.00	CKT																
		TO LOAD-PQ			MW	MVAR	MVA	%	1.0146PU	7.88	X---	LOSSES	---	X----	AREA	-----X	X----	ZONE	-----X	232004
		TO 232001 MTPS2			116.4	29.2	120.0		223.20KV			MW	MVAR	2003	DVC					
TO	232001	MTPS2	220.00	1	-110.2	-13.5	111.0	53			1.07	5.71	2003	DVC		2031	DVC			
TO	232099	IISCO	220.00	1	0.0	-0.2	0.2	0			0.00	0.00	2003	DVC		2031	DVC			
TO	232099	IISCO	220.00	2	0.0	-0.2	0.2	0			0.00	0.00	2003	DVC		2031	DVC			
TO	242003	KLYN2	220.00	2	-6.2	-15.3	16.5	8			0.01	0.04	2003	DVC		2031	DVC			

BUS	TO	FROM	TYPE	MW	MVAR	MVA	%	LOSSES	LOSSES	AREA	AREA	ZONE	ZONE					
BUS 232005	DURGAPUR2	220.00	CKT	MW	MVAR	MVA	% 1.0174PU 223.83KV	10.08	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232005
	TO LOAD-PQ			134.4	33.7	138.6												
	TO 232001	MTPS2	220.00	1	-53.2	-41.5	67.5	32	0.21	1.10	2003	DVC			2031	DVC		
	TO 232001	MTPS2	220.00	2	-53.2	-41.5	67.5	32	0.21	1.10	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	1	-14.0	24.7	28.4	13	0.02	0.11	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	2	-14.0	24.7	28.4	13	0.02	0.11	2003	DVC			2031	DVC		
BUS 232014	DSTPS2	220.00	CKT	MW	MVAR	MVA	% 1.0108PU 222.37KV	10.58	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232014
	TO 232000	DTPS2	220.00	1	224.5	-24.9	225.9	107	0.61	3.49	2003	DVC			2031	DVC		
	TO 232000	DTPS2	220.00	2	224.5	-24.9	225.9	107	0.61	3.49	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	1	41.0	-34.3	53.4	25	0.06	0.37	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	2	41.0	-34.3	53.4	25	0.06	0.37	2003	DVC			2031	DVC		
	TO 234001	DSTPS4	400.00	1	-265.5	59.2	272.0	1.0000UN	1.88	28.67	2003	DVC			2031	DVC		
	TO 234001	DSTPS4	400.00	2	-265.5	59.2	272.0	1.0000UN	1.88	28.67	2003	DVC			2031	DVC		
BUS 232017	BURDWAN2	220.00	CKT	MW	MVAR	MVA	% 0.9991PU 219.79KV	6.85	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232017
	TO 231006	BURDWAN1	132.00	1	77.9	10.4	78.6	41	0.10	5.39	2003	DVC			2031	DVC		
	TO 231006	BURDWAN1	132.00	2	77.9	10.4	78.6	41	0.10	5.39	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	1	-77.9	-10.4	78.6	38	0.82	4.71	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	2	-77.9	-10.4	78.6	38	0.82	4.71	2003	DVC			2031	DVC		
BUS 232089	ELECTRO STL	220.00	CKT	MW	MVAR	MVA	% 1.0126PU 222.78KV	4.85	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232089
	TO 242004	DHANBAD2	220.00	1	0.0	-0.0	0.0	0	0.00	0.01	2003	DVC			2031	DVC		
	TO 242004	DHANBAD2	220.00	2	0.0	-0.0	0.0	0	0.00	0.01	2003	DVC			2031	DVC		
BUS 232098	TAMLA_DSP	220.00	CKT	MW	MVAR	MVA	% 1.0143PU 223.14KV	10.22	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232098
	TO 232002	PARULIA2	220.00	1	-0.0	0.0	0.0	0	0.00	0.00	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	2	-0.0	0.0	0.0	0	0.00	0.00	2003	DVC			2031	DVC		
	TO 232002	PARULIA2	220.00	3	-0.0	0.0	0.0	0	0.00	0.00	2003	DVC			2031	DVC		
BUS 232099	IISCO	220.00	CKT	MW	MVAR	MVA	% 1.0146PU 223.20KV	7.88	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	232099
	TO 232004	BURNPUR2	220.00	1	0.0	-0.0	0.0	0	0.00	0.00	2003	DVC			2031	DVC		
	TO 232004	BURNPUR2	220.00	2	0.0	-0.0	0.0	0	0.00	0.00	2003	DVC			2031	DVC		
BUS 234000	RTPS4	400.00	CKT	MW	MVAR	MVA	% 1.0010PU 400.38KV	16.75	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	234000
	FROM GENERATION			400.0	-180.0L	438.6	57	400.38KV										
	TO SWITCHED SHUNT			0.0	90.9	90.9												
	TO 224004	RANCHI_4	400.00	Q2	128.1	-91.9	157.7	9	0.25	4.33	2052	ER_ISTS_JHA	2001	ER_BOUNDARY				
	TO 224004	RANCHI_4	400.00	Q3	128.1	-91.9	157.7	9	0.25	4.33	2052	ER_ISTS_JHA	2001	ER_BOUNDARY				
	TO 224004	RANCHI_4	400.00	T1	96.6	-72.8	120.9	14	0.30	3.28	2052	ER_ISTS_JHA	2001	ER_BOUNDARY				
	TO 234001	DSTPS4	400.00	T1	16.9	-13.1	21.4	2	0.00	0.04	2003	DVC			2031	DVC		
	TO 234001	DSTPS4	400.00	T2	16.9	-13.1	21.4	2	0.00	0.04	2003	DVC			2031	DVC		
	TO 244006	MAITHON B	400.00	T1	13.4	11.9	17.9	2	0.01	0.07	2053	ER_ISTS_DVC	2031	DVC				
BUS 234001	DSTPS4	400.00	CKT	MW	MVAR	MVA	% 1.0000PU 400.00KV	16.63	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	234001
	FROM GENERATION			950.0	-232.4R	978.0	83	400.00KV										
	TO 232014	DSTPS2	220.00	1	267.4	-30.3	269.1	1.0000RG	1.88	28.67	2003	DVC			2031	DVC		
	TO 232014	DSTPS2	220.00	2	267.4	-30.3	269.1	1.0000RG	1.88	28.67	2003	DVC			2031	DVC		
	TO 234000	RTPS4	400.00	T1	-16.9	-25.4	30.5	3	0.00	0.04	2003	DVC			2031	DVC		
	TO 234000	RTPS4	400.00	T2	-16.9	-25.4	30.5	3	0.00	0.04	2003	DVC			2031	DVC		

TO 244004	JAMSHEDPUR4	400.00	T1	224.4	-60.5	232.4	27		1.43	15.24	2053	ER_ISTS_DVC	2031	DVC					
TO 244004	JAMSHEDPUR4	400.00	T2	224.4	-60.5	232.4	27		1.43	15.24	2053	ER_ISTS_DVC	2031	DVC					
BUS 234002	MTPS_B4	400.00	CKT	MW	MVAR	MVA	% 1.0000PU	15.50	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	234002	
FROM GENERATION				950.0	5.3R	950.0	81	400.00KV		MW	MVAR	2003	DVC		2031	DVC			
TO 244003	MAITHON PG4	400.00	T2	459.8	35.2	461.1	54		2.39	26.65	2053	ER_ISTS_DVC	2031	DVC					
TO 244003	MAITHON PG4	400.00	T3	459.8	35.1	461.1	54		2.40	26.65	2053	ER_ISTS_DVC	2031	DVC					
TO 244004	JAMSHEDPUR4	400.00	T1	148.8	-60.8	160.8	18		0.67	7.18	2053	ER_ISTS_DVC	2031	DVC					
TO 244006	MAITHON B	400.00	T1	-118.4	-4.2	118.5	14		0.22	2.49	2053	ER_ISTS_DVC	2031	DVC					
BUS 241000	BARHI1	132.00	CKT	MW	MVAR	MVA	% 1.0472PU	-0.35	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241000	
							138.23KV			MW	MVAR	2003	DVC		2031	DVC			
TO LOAD-PQ				34.9	8.8	36.0													
TO 211093	RAJGIR	132.00	1	16.2	6.8	17.6	20		0.45	1.07	2001	BIHAR			2012	BIHAR_S			
TO 211217	RAJGIR T	132.00	1	17.7	9.4	20.1	23		0.49	1.16	2001	BIHAR			2012	BIHAR_S			
TO 241001	BTPS1	132.00	1	-15.6	5.2	16.5	19		0.21	0.49	2003	DVC			2031	DVC			
TO 241017	KONAR1	132.00	1	-10.4	5.9	11.9	14		0.09	0.20	2003	DVC			2031	DVC			
TO 241018	KTPP1	132.00	1	-50.6	-24.9	56.4	64		1.03	2.44	2003	DVC			2031	DVC			
TO 241018	KTPP1	132.00	2	-50.6	-24.9	56.4	64		1.03	2.44	2003	DVC			2031	DVC			
TO 241019	HAZARIBAGH1	132.00	1	29.2	6.9	30.0	34		0.08	0.20	2003	DVC			2031	DVC			
TO 241019	HAZARIBAGH1	132.00	2	29.2	6.9	30.0	34		0.08	0.20	2003	DVC			2031	DVC			
BUS 241001	BTPS1	132.00	CKT	MW	MVAR	MVA	% 1.0461PU	1.40	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241001	
							138.09KV			MW	MVAR	2003	DVC		2031	DVC			
TO LOAD-PQ				51.7	12.9	53.2													
TO 241000	BARHI1	132.00	1	15.8	-9.2	18.3	21		0.21	0.49	2003	DVC			2031	DVC			
TO 241017	KONAR1	132.00	1	30.3	-6.2	30.9	35		0.17	0.40	2003	DVC			2031	DVC			
TO 242000	BTPS2	220.00	1	-48.9	1.2	48.9	27	1.0000UN	0.10	2.07	2003	DVC			2031	DVC			
TO 242000	BTPS2	220.00	2	-48.9	1.2	48.9	27	1.0000UN	0.10	2.07	2003	DVC			2031	DVC			
BUS 241002	CTPS1	132.00	CKT	MW	MVAR	MVA	% 1.0252PU	-1.72	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241002	
							135.32KV			MW	MVAR	2003	DVC		2031	DVC			
TO LOAD-PQ				117.1	29.3	120.7													
TO 231001	PURULIA1	132.00	1	18.9	-4.9	19.6	23		0.20	0.47	2003	DVC			2031	DVC			
TO 231001	PURULIA1	132.00	2	18.9	-4.9	19.6	23		0.20	0.47	2003	DVC			2031	DVC			
TO 231081	JAMURIA1	132.00	2	-11.8	17.4	21.0	24		0.20	0.48	2003	DVC			2031	DVC			
TO 241003	GOLA1	132.00	1	33.3	-2.2	33.4	39		0.53	1.64	2003	DVC			2031	DVC			
TO 241003	GOLA1	132.00	2	33.3	-2.2	33.4	39		0.53	1.64	2003	DVC			2031	DVC			
TO 241012	RAMKANALI1	132.00	1	-16.7	7.4	18.3	21		0.23	0.54	2003	DVC			2031	DVC			
TO 241015	PUTKI 1	132.00	1	31.0	10.9	32.8	38		0.25	0.59	2003	DVC			2031	DVC			
TO 241015	PUTKI 1	132.00	2	31.0	10.9	32.8	38		0.25	0.59	2003	DVC			2031	DVC			
TO 241015	PUTKI 1	132.00	3	31.0	10.9	32.8	38		0.25	0.59	2003	DVC			2031	DVC			
TO 241015	PUTKI 1	132.00	4	31.0	10.9	32.8	38		0.25	0.59	2003	DVC			2031	DVC			
TO 241024	RAJABAR	132.00	1	0.0	-0.2	0.2	0		0.00	0.00	2003	DVC			2031	DVC			
TO 241024	RAJABAR	132.00	2	0.0	-0.2	0.2	0		0.00	0.00	2003	DVC			2031	DVC			
TO 241091	BIADA	132.00	1	18.3	3.5	18.6	22		0.07	0.18	2003	DVC			2031	DVC			
TO 241091	BIADA	132.00	2	18.3	3.5	18.6	22		0.07	0.18	2003	DVC			2031	DVC			
TO 242001	CTPS2	220.00	1	-117.9	-29.9	121.6	68	1.0000UN	0.54	13.36	2003	DVC			2031	DVC			
TO 242001	CTPS2	220.00	2	-117.9	-29.9	121.6	68	1.0000UN	0.54	13.36	2003	DVC			2031	DVC			
TO 242001	CTPS2	220.00	3	-117.9	-29.9	121.6	68	1.0000UN	0.54	13.36	2003	DVC			2031	DVC			
BUS 241003	GOLA1	132.00	CKT	MW	MVAR	MVA	% 1.0111PU	-4.60	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241003	
							133.47KV			MW	MVAR	2003	DVC		2031	DVC			
TO LOAD-PQ				47.7	12.0	49.2													
TO 241002	CTPS1	132.00	1	-32.8	0.6	32.8	39		0.53	1.64	2003	DVC			2031	DVC			
TO 241002	CTPS1	132.00	2	-32.8	0.6	32.8	39		0.53	1.64	2003	DVC			2031	DVC			

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TO 241004	CHANDIL1	132.00	1	6.7	-2.8	7.3	9			0.03	0.08	2003	DVC	2031	DVC			
TO 241004	CHANDIL1	132.00	2	18.2	-4.2	18.7	22			0.04	0.23	2003	DVC	2031	DVC			
TO 241013	RAMGARH1	132.00	1	-3.5	-3.1	4.7	6			0.00	0.01	2003	DVC	2031	DVC			
TO 241013	RAMGARH1	132.00	2	-3.5	-3.1	4.7	6			0.00	0.01	2003	DVC	2031	DVC			
BUS 241004	CHANDIL1	132.00	CKT	MW	MVAR	MVA	% 1.0073PU	-5.31	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241004
							132.97KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				50.2	12.6	51.8												
TO 241003	GOLA1	132.00	1	-6.7	-1.4	6.8	8			0.03	0.08	2003	DVC	2031	DVC			
TO 241003	GOLA1	132.00	2	-18.2	-8.1	19.9	23			0.04	0.23	2003	DVC	2031	DVC			
TO 241005	JAMSHEDPUR1	132.00	1	-12.7	-1.6	12.8	15			0.08	0.18	2003	DVC	2031	DVC			
TO 241005	JAMSHEDPUR1	132.00	2	-12.7	-1.6	12.8	15			0.08	0.18	2003	DVC	2031	DVC			
BUS 241005	JAMSHEDPUR1	132.00	CKT	MW	MVAR	MVA	% 1.0138PU	-4.50	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241005
							133.82KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				120.1	30.1	123.8												
TO 231001	PURULIA1	132.00	1	-11.7	-0.2	11.7	14			0.11	0.25	2003	DVC	2031	DVC			
TO 231001	PURULIA1	132.00	2	-11.7	-0.2	11.7	14			0.11	0.25	2003	DVC	2031	DVC			
TO 241004	CHANDIL1	132.00	1	12.8	-0.9	12.8	15			0.08	0.18	2003	DVC	2031	DVC			
TO 241004	CHANDIL1	132.00	2	12.8	-0.9	12.8	15			0.08	0.18	2003	DVC	2031	DVC			
TO 241011	MOSABANI1	132.00	1	28.7	5.6	29.2	34			0.33	0.80	2003	DVC	2031	DVC			
TO 241011	MOSABANI1	132.00	2	28.7	5.6	29.2	34			0.33	0.80	2003	DVC	2031	DVC			
TO 241031	JOJOBE_1	132.00	1	0.0	-0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC			
TO 241031	JOJOBE_1	132.00	2	0.0	-0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC			
TO 242002	JAMSHEDPUR2	220.00	1	-89.8	-19.5	91.9	51	1.0000UN		0.39	7.88	2003	DVC	2031	DVC			
TO 242002	JAMSHEDPUR2	220.00	2	-89.8	-19.5	91.9	51	1.0000UN		0.39	7.88	2003	DVC	2031	DVC			
BUS 241006	MHS1	132.00	CKT	MW	MVAR	MVA	% 1.0319PU	0.84	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241006
							136.21KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				50.8	12.7	52.4												
TO 221018	JAMTARA	132.00	1	69.6	30.3	75.9	88			1.27	3.02	2002	JHARKHAND	2021	JHARKHAND			
TO 231007	PANCHET1	132.00	1	34.8	6.8	35.4	41			0.18	0.42	2003	DVC	2031	DVC			
TO 241007	PATHARDIH1	132.00	1	70.7	2.1	70.7	82			1.72	4.08	2003	DVC	2031	DVC			
TO 241007	PATHARDIH1	132.00	2	70.7	2.1	70.7	82			1.72	4.08	2003	DVC	2031	DVC			
TO 241009	KLYNS1	132.00	1	-119.5	-21.3	121.4	140			0.21	0.49	2003	DVC	2031	DVC			
TO 241009	KLYNS1	132.00	2	-119.5	-21.3	121.4	140			0.21	0.49	2003	DVC	2031	DVC			
TO 241009	KLYNS1	132.00	3	-63.8	-11.4	64.8	75			0.11	0.26	2003	DVC	2031	DVC			
TO 241009	KLYNS1	132.00	4	-63.8	-11.4	64.8	75			0.11	0.26	2003	DVC	2031	DVC			
TO 241010	KUMARDHUBI1	132.00	1	70.1	16.0	71.9	83			0.34	0.81	2003	DVC	2031	DVC			
TO 241027	SULTANG	132.00	1	0.0	-4.6	4.6	5			0.01	0.01	2003	DVC	2031	DVC			
BUS 241007	PATHARDIH1	132.00	CKT	MW	MVAR	MVA	% 1.0059PU	-2.49	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241007
							132.78KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				125.4	31.4	129.3												
TO 241006	MHS1	132.00	1	-69.0	-0.1	69.0	82			1.72	4.08	2003	DVC	2031	DVC			
TO 241006	MHS1	132.00	2	-69.0	-0.1	69.0	82			1.72	4.08	2003	DVC	2031	DVC			
TO 241015	PUTKI 1	132.00	1	-3.4	-16.0	16.3	19			0.04	0.08	2003	DVC	2031	DVC			
TO 241015	PUTKI 1	132.00	2	-3.4	-16.0	16.3	19			0.04	0.08	2003	DVC	2031	DVC			
TO 241022	SINDRI1	132.00	1	9.7	0.8	9.7	11			0.01	0.03	2003	DVC	2031	DVC			
TO 241022	SINDRI1	132.00	2	9.7	0.8	9.7	11			0.01	0.03	2003	DVC	2031	DVC			
TO 241094	BALIHARI	132.00	1	0.0	-0.8	0.8	1			0.00	0.00	2003	DVC	2031	DVC			
BUS 241009	KLYNS1	132.00	CKT	MW	MVAR	MVA	% 1.0344PU	1.05	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241009
							136.54KV			MW	MVAR	2003	DVC			2031	DVC	
TO LOAD-PQ				95.6	24.0	98.5												
TO 231008	KALIPAHARI1	132.00	1	-11.2	9.0	14.4	17			0.05	0.12	2003	DVC	2031	DVC			

TO 231008 KALIPAHARI1	132.00	2	-11.2	9.0	14.4	17		0.05	0.12	2003	DVC	2031	DVC					
TO 241006 MHS1	132.00	1	119.8	21.7	121.7	140		0.21	0.49	2003	DVC	2031	DVC					
TO 241006 MHS1	132.00	2	119.8	21.7	121.7	140		0.21	0.49	2003	DVC	2031	DVC					
TO 241006 MHS1	132.00	3	63.9	11.5	64.9	75		0.11	0.26	2003	DVC	2031	DVC					
TO 241006 MHS1	132.00	4	63.9	11.5	64.9	75		0.11	0.26	2003	DVC	2031	DVC					
TO 241090 MAL IMPX	132.00	1	0.0	-0.1	0.1	0		0.00	0.00	2003	DVC	2031	DVC					
TO 242003 KLYN2	220.00	1	-148.1	-36.3	152.5	95	1.0000UN	1.04	19.88	2003	DVC	2031	DVC					
TO 242003 KLYN2	220.00	2	-148.1	-36.3	152.5	95	1.0000UN	1.04	19.88	2003	DVC	2031	DVC					
TO 242003 KLYN2	220.00	3	-144.2	-35.6	148.5	93	1.0000UN	0.99	19.36	2003	DVC	2031	DVC					
BUS 241010 KUMARDHUBI1	132.00	CKT	MW	MVAR	MVA	%	1.0246PU	0.26	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241010
							135.25KV			MW	MVAR	2003	DVC					
TO LOAD-PQ			66.0	16.5	68.1													
TO 231007 PANCHET1	132.00	1	3.8	-1.0	3.9	5		0.00	0.00	2003	DVC	2031	DVC					
TO 241006 MHS1	132.00	1	-69.8	-15.6	71.5	83		0.34	0.81	2003	DVC	2031	DVC					
BUS 241011 MOSABANI1	132.00	CKT	MW	MVAR	MVA	%	0.9966PU	-5.88	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241011
							131.55KV			MW	MVAR	2003	DVC					
TO LOAD-PQ			84.8	21.2	87.4													
TO 231002 KHARGPUR1	132.00	1	-14.0	-3.6	14.5	17		0.18	0.42	2003	DVC	2031	DVC					
TO 231002 KHARGPUR1	132.00	2	-14.0	-3.6	14.5	17		0.18	0.42	2003	DVC	2031	DVC					
TO 241005 JAMSHEDPUR1	132.00	1	-28.3	-7.0	29.2	35		0.33	0.80	2003	DVC	2031	DVC					
TO 241005 JAMSHEDPUR1	132.00	2	-28.3	-7.0	29.2	35		0.33	0.80	2003	DVC	2031	DVC					
BUS 241012 RAMKANALI1	132.00	CKT	MW	MVAR	MVA	%	1.0222PU	0.02	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241012
							134.93KV			MW	MVAR	2003	DVC					
TO LOAD-PQ			50.9	12.8	52.5													
TO 231000 DTSP1	132.00	2	-45.2	2.2	45.3	53		1.21	2.88	2003	DVC	2031	DVC					
TO 231007 PANCHET1	132.00	1	-11.3	-2.2	11.5	13		0.02	0.04	2003	DVC	2031	DVC					
TO 231007 PANCHET1	132.00	2	-11.3	-2.2	11.5	13		0.02	0.04	2003	DVC	2031	DVC					
TO 241002 CTPS1	132.00	1	16.9	-10.6	20.0	23		0.23	0.54	2003	DVC	2031	DVC					
BUS 241013 RAMGARH1	132.00	CKT	MW	MVAR	MVA	%	1.0135PU	-4.51	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241013
							133.78KV			MW	MVAR	2003	DVC					
TO LOAD-PQ			117.3	29.4	120.9													
TO 241003 GOLAI	132.00	1	3.5	1.6	3.9	5		0.00	0.01	2003	DVC	2031	DVC					
TO 241003 GOLAI	132.00	2	3.5	1.6	3.9	5		0.00	0.01	2003	DVC	2031	DVC					
TO 241097 PATRATU1	132.00	1	40.3	9.4	41.4	49		0.49	1.16	2003	DVC	2031	DVC					
TO 241097 PATRATU1	132.00	2	40.3	9.4	41.4	49		0.49	1.16	2003	DVC	2031	DVC					
TO 242007 RAMGARH2	220.00	1	-102.4	-25.8	105.6	59	1.0000UN	0.43	10.29	2003	DVC	2031	DVC					
TO 242007 RAMGARH2	220.00	2	-102.4	-25.8	105.6	59	1.0000UN	0.43	10.29	2003	DVC	2031	DVC					
BUS 241015 PUTKI 1	132.00	CKT	MW	MVAR	MVA	%	1.0116PU	-2.55	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241015
							133.53KV			MW	MVAR	2003	DVC					
TO LOAD-PQ			133.6	33.5	137.8													
TO 241002 CTPS1	132.00	1	-30.7	-11.6	32.9	39		0.25	0.59	2003	DVC	2031	DVC					
TO 241002 CTPS1	132.00	2	-30.7	-11.6	32.9	39		0.25	0.59	2003	DVC	2031	DVC					
TO 241002 CTPS1	132.00	3	-30.7	-11.6	32.9	39		0.25	0.59	2003	DVC	2031	DVC					
TO 241002 CTPS1	132.00	4	-30.7	-11.6	32.9	39		0.25	0.59	2003	DVC	2031	DVC					
TO 241007 PATHARDIH1	132.00	1	3.4	15.3	15.7	18		0.04	0.08	2003	DVC	2031	DVC					
TO 241007 PATHARDIH1	132.00	2	3.4	15.3	15.7	18		0.04	0.08	2003	DVC	2031	DVC					
TO 241021 NIMIAGHAT1	132.00	1	-8.8	-8.7	12.4	15		0.05	0.13	2003	DVC	2031	DVC					
TO 241021 NIMIAGHAT1	132.00	2	-8.8	-8.7	12.4	15		0.05	0.13	2003	DVC	2031	DVC					
BUS 241016 JAM_DV2	132.00	CKT	MW	MVAR	MVA	%	1.0027PU	12.01	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241016
							132.35KV			MW	MVAR	2003	DVC					

TO 244000	TISCO_BRPS4	400.00	1	-0.0	-0.0	0.0	0	1.0000UN		0.00	0.00	2003	DVC		2031	DVC			
BUS 241017	KONARI	132.00	CKT	MW	MVAR	MVA	%	1.0431PU 137.69KV	0.61	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241017
TO LOAD-PQ				19.6	4.9	20.2													
TO 241000	BARHI1	132.00	1	10.4	-9.1	13.9	16			0.09	0.20	2003	DVC		2031	DVC			
TO 241001	BTPS1	132.00	1	-30.1	5.4	30.6	35			0.17	0.40	2003	DVC		2031	DVC			
TO 241099	HAZARIBABRD	132.00	1	0.0	-0.6	0.6	1			0.00	0.00	2003	DVC		2031	DVC			
TO 241099	HAZARIBABRD	132.00	2	0.0	-0.6	0.6	1			0.00	0.00	2003	DVC		2031	DVC			
BUS 241018	KTPP1	132.00	CKT	MW	MVAR	MVA	%	1.0845PU 143.16KV	1.40	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241018
TO LOAD-PQ				18.2	4.6	18.8													
TO 241000	BARHI1	132.00	1	51.7	25.1	57.4	63			1.03	2.44	2003	DVC		2031	DVC			
TO 241000	BARHI1	132.00	2	51.7	25.1	57.4	63			1.03	2.44	2003	DVC		2031	DVC			
TO 241032	KODERMA_OLD	132.00	1	31.4	7.1	32.2	35			0.15	0.36	2003	DVC		2031	DVC			
TO 241032	KODERMA_OLD	132.00	2	31.4	7.1	32.2	35			0.15	0.36	2003	DVC		2031	DVC			
TO 242006	KODERMA2	220.00	1	-92.1	-34.5	98.4	55	1.0000UN		0.21	7.81	2003	DVC		2031	DVC			
TO 242006	KODERMA2	220.00	2	-92.1	-34.5	98.4	55	1.0000UN		0.21	7.81	2003	DVC		2031	DVC			
BUS 241019	HAZARIBAGH1	132.00	CKT	MW	MVAR	MVA	%	1.0427PU 137.63KV	-0.69	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241019
TO LOAD-PQ				58.2	14.6	60.0													
TO 241000	BARHI1	132.00	1	-29.1	-7.3	30.0	34			0.08	0.20	2003	DVC		2031	DVC			
TO 241000	BARHI1	132.00	2	-29.1	-7.3	30.0	34			0.08	0.20	2003	DVC		2031	DVC			
BUS 241020	N KARANPURA1	132.00	CKT	MW	MVAR	MVA	%	0.9858PU 130.12KV	-6.67	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241020
TO LOAD-PQ				40.4	10.1	41.6													
TO 241095	ECR_RLY	132.00	1	0.0	-0.2	0.2	0			0.00	0.00	2003	DVC		2031	DVC			
TO 241095	ECR_RLY	132.00	2	0.0	-0.2	0.2	0			0.00	0.00	2003	DVC		2031	DVC			
TO 241097	PATRATU1	132.00	1	-20.2	-4.8	20.8	25			0.13	0.31	2003	DVC		2031	DVC			
TO 241097	PATRATU1	132.00	2	-20.2	-4.8	20.8	25			0.13	0.31	2003	DVC		2031	DVC			
BUS 241021	NIMIAGHAT1	132.00	CKT	MW	MVAR	MVA	%	1.0227PU 134.99KV	-2.24	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241021
TO LOAD-PQ				43.7	10.9	45.0													
TO 241015	PUTKI 1	132.00	1	8.8	6.5	10.9	13			0.05	0.13	2003	DVC		2031	DVC			
TO 241015	PUTKI 1	132.00	2	8.8	6.5	10.9	13			0.05	0.13	2003	DVC		2031	DVC			
TO 241023	GIRIDIH1	132.00	1	-30.6	-12.0	32.9	38			0.41	0.97	2003	DVC		2031	DVC			
TO 241023	GIRIDIH1	132.00	2	-30.6	-12.0	32.9	38			0.41	0.97	2003	DVC		2031	DVC			
BUS 241022	SINDRI1	132.00	CKT	MW	MVAR	MVA	%	1.0040PU 132.53KV	-2.68	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241022
TO LOAD-PQ				19.3	4.8	19.9													
TO 241007	PATHARDIH1	132.00	1	-9.6	-1.6	9.8	12			0.01	0.03	2003	DVC		2031	DVC			
TO 241007	PATHARDIH1	132.00	2	-9.6	-1.6	9.8	12			0.01	0.03	2003	DVC		2031	DVC			
TO 241028	PRADHAN	132.00	1	0.0	-0.8	0.8	1			0.00	0.00	2003	DVC		2031	DVC			
TO 241028	PRADHAN	132.00	2	0.0	-0.8	0.8	1			0.00	0.00	2003	DVC		2031	DVC			
BUS 241023	GIRIDIH1	132.00	CKT	MW	MVAR	MVA	%	1.0453PU 137.99KV	-0.89	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241023
TO LOAD-PQ				124.4	31.2	128.2													
TO 241021	NIMIAGHAT1	132.00	1	31.0	10.6	32.8	37			0.41	0.97	2003	DVC		2031	DVC			
TO 241021	NIMIAGHAT1	132.00	2	31.0	10.6	32.8	37			0.41	0.97	2003	DVC		2031	DVC			
TO 242005	GIRDHI2	220.00	1	-93.2	-26.2	96.8	54	1.0000UN		0.21	8.14	2003	DVC		2031	DVC			

TO 242005 GIRDHI2	220.00	2	-93.2	-26.2	96.8	54	1.0000UN		0.21	8.14	2003	DVC	2031	DVC				
BUS 241024 RAJABAR	132.00	CKT	MW	MVAR	MVA	%	1.0252PU 135.32KV	-1.72	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241024
TO 241002 CTPS1	132.00	1	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
TO 241002 CTPS1	132.00	2	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
BUS 241027 SULTANG	132.00	CKT	MW	MVAR	MVA	%	1.0377PU 136.98KV	0.69	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241027
TO 241006 MHS1	132.00	1	-0.0	0.0	0.0	0			0.01	0.01	2003	DVC	2031	DVC				
BUS 241028 PRADHAN	132.00	CKT	MW	MVAR	MVA	%	1.0042PU 132.56KV	-2.68	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241028
TO 241022 SINDRI1	132.00	1	0.0	-0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
TO 241022 SINDRI1	132.00	2	0.0	-0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
BUS 241030 DHNABD_1	132.00	CKT	MW	MVAR	MVA	%	1.0741PU 141.78KV	4.86	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241030
TO 242004 DHANBAD2	220.00	1	-0.0	0.0	0.0	0	1.0000UN		0.00	0.00	2003	DVC	2031	DVC				
TO 242004 DHANBAD2	220.00	2	-0.0	0.0	0.0	0	1.0000UN		0.00	0.00	2003	DVC	2031	DVC				
BUS 241031 JOJOBE_1	132.00	CKT	MW	MVAR	MVA	%	1.0138PU 133.82KV	-4.50	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241031
TO 241005 JAMSHEDPUR1	132.00	1	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
TO 241005 JAMSHEDPUR1	132.00	2	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
BUS 241032 KODERMA_OLD	132.00	CKT	MW	MVAR	MVA	%	1.0768PU 142.14KV	0.84	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241032
TO LOAD-PQ			62.5	15.7	64.4													
TO 241018 KTPP1	132.00	1	-31.2	-7.8	32.2	36			0.15	0.36	2003	DVC	2031	DVC				
TO 241018 KTPP1	132.00	2	-31.2	-7.8	32.2	36			0.15	0.36	2003	DVC	2031	DVC				
BUS 241090 MAL IMPX	132.00	CKT	MW	MVAR	MVA	%	1.0344PU 136.54KV	1.05	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241090
TO 241009 KLYNS1	132.00	1	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
BUS 241091 BIADA	132.00	CKT	MW	MVAR	MVA	%	1.0191PU 134.52KV	-2.21	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241091
TO LOAD-PQ			36.5	9.1	37.6													
TO 241002 CTPS1	132.00	1	-18.2	-4.6	18.8	22			0.07	0.18	2003	DVC	2031	DVC				
TO 241002 CTPS1	132.00	2	-18.2	-4.6	18.8	22			0.07	0.18	2003	DVC	2031	DVC				
BUS 241094 BALIHARI	132.00	CKT	MW	MVAR	MVA	%	1.0061PU 132.80KV	-2.49	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241094
TO 241007 PATHARDIH1	132.00	1	0.0	-0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
BUS 241095 ECR_RLY	132.00	CKT	MW	MVAR	MVA	%	0.9858PU 130.12KV	-6.67	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241095
TO 241020 N KARANPURA1	132.00	1	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
TO 241020 N KARANPURA1	132.00	2	0.0	0.0	0.0	0			0.00	0.00	2003	DVC	2031	DVC				
BUS 241097 PATRATU1	132.00	CKT	MW	MVAR	MVA	%	0.9954PU 131.39KV	-5.91	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241097
TO LOAD-PQ			38.9	9.8	40.1													
TO 241013 RAMGARH1	132.00	1	-39.8	-9.9	41.0	49			0.49	1.16	2003	DVC	2031	DVC				
TO 241013 RAMGARH1	132.00	2	-39.8	-9.9	41.0	49			0.49	1.16	2003	DVC	2031	DVC				

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TO 241020	N KARANPURA1	132.00	1	20.3	5.0	20.9	25		0.13	0.31	2003	DVC	2031	DVC				
TO 241020	N KARANPURA1	132.00	2	20.3	5.0	20.9	25		0.13	0.31	2003	DVC	2031	DVC				
BUS 241099	HAZARIBABRD	132.00	CKT	MW	MVAR	MVA	% 1.0432PU	0.61	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	241099
							137.70KV			MW	MVAR	2003	DVC					
TO 241017	KONAR1	132.00	1	0.0	-0.0	0.0	0		0.00	0.00	2003	DVC	2031	DVC				
TO 241017	KONAR1	132.00	2	0.0	-0.0	0.0	0		0.00	0.00	2003	DVC	2031	DVC				
BUS 242000	BTPS2	220.00	CKT	MW	MVAR	MVA	% 1.0136PU	3.83	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242000
							223.00KV			MW	MVAR	2003	DVC					
TO 241001	BTPS1	132.00	1	49.0	0.8	49.0	27 0.9670RG		0.10	2.07	2003	DVC	2031	DVC				
TO 241001	BTPS1	132.00	2	49.0	0.8	49.0	27 0.9670RG		0.10	2.07	2003	DVC	2031	DVC				
TO 242001	CTPS2	220.00	1	-9.2	52.2	53.0	25		0.14	0.78	2003	DVC	2031	DVC				
TO 242001	CTPS2	220.00	2	-9.2	52.2	53.0	25		0.14	0.78	2003	DVC	2031	DVC				
TO 242002	JAMSHEDPUR2	220.00	1	54.3	9.4	55.1	26		0.72	4.14	2003	DVC	2031	DVC				
TO 242002	JAMSHEDPUR2	220.00	2	54.3	9.4	55.1	26		0.72	4.14	2003	DVC	2031	DVC				
TO 242007	RAMGARH2	220.00	1	130.1	43.2	137.1	65		1.47	8.37	2003	DVC	2031	DVC				
TO 242007	RAMGARH2	220.00	2	130.1	43.2	137.1	65		1.47	8.37	2003	DVC	2031	DVC				
TO 244001	BTPS - A4	400.00	1	-224.2	-105.6	247.8	79 1.0000UN		1.18	23.72	2003	DVC	2031	DVC				
TO 244001	BTPS - A4	400.00	2	-224.2	-105.6	247.8	79 1.0000UN		1.18	23.72	2003	DVC	2031	DVC				
BUS 242001	CTPS2	220.00	CKT	MW	MVAR	MVA	% 1.0000PU	4.11	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242001
	FROM GENERATION			456.0	10.1R	456.1	78 220.00KV			MW	MVAR	2003	DVC					
	TO LOAD-PQ			160.1	40.1	165.0												
TO 241002	CTPS1	132.00	1	118.4	43.3	126.1	70 0.9409LO		0.54	13.36	2003	DVC	2031	DVC				
TO 241002	CTPS1	132.00	2	118.4	43.3	126.1	70 0.9409LO		0.54	13.36	2003	DVC	2031	DVC				
TO 241002	CTPS1	132.00	3	118.4	43.3	126.1	70 0.9409LO		0.54	13.36	2003	DVC	2031	DVC				
TO 242000	BTPS2	220.00	1	9.3	-55.9	56.7	27		0.14	0.78	2003	DVC	2031	DVC				
TO 242000	BTPS2	220.00	2	9.3	-55.9	56.7	27		0.14	0.78	2003	DVC	2031	DVC				
TO 242004	DHANBAD2	220.00	1	-39.0	-24.0	45.8	22		0.14	0.73	2003	DVC	2031	DVC				
TO 242004	DHANBAD2	220.00	2	-39.0	-24.0	45.8	22		0.14	0.73	2003	DVC	2031	DVC				
BUS 242002	JAMSHEDPUR2	220.00	CKT	MW	MVAR	MVA	% 0.9783PU	0.13	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242002
							215.23KV			MW	MVAR	2003	DVC					
TO 241005	JAMSHEDPUR1	132.00	1	90.2	27.4	94.3	52 0.9409LO		0.39	7.88	2003	DVC	2031	DVC				
TO 241005	JAMSHEDPUR1	132.00	2	90.2	27.4	94.3	52 0.9409LO		0.39	7.88	2003	DVC	2031	DVC				
TO 242000	BTPS2	220.00	1	-53.6	-26.7	59.9	29		0.72	4.14	2003	DVC	2031	DVC				
TO 242000	BTPS2	220.00	2	-53.6	-26.7	59.9	29		0.72	4.14	2003	DVC	2031	DVC				
TO 252029	JINDAL	220.00	1	-73.2	-1.3	73.2	36		1.10	6.29	2004	ODISHA	2043	ODISHA_N				
BUS 242003	KLYN2	220.00	CKT	MW	MVAR	MVA	% 1.0172PU	7.91	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242003
							223.79KV			MW	MVAR	2003	DVC					
TO 232001	MTPS2	220.00	1	-79.5	-8.9	80.0	38		0.75	4.00	2003	DVC	2031	DVC				
TO 232001	MTPS2	220.00	2	-79.5	-8.9	80.0	38		0.75	4.00	2003	DVC	2031	DVC				
TO 232001	MTPS2	220.00	3	-79.5	-8.9	80.0	38		0.75	4.00	2003	DVC	2031	DVC				
TO 232004	BURNPUR2	220.00	2	6.2	12.1	13.6	6		0.01	0.04	2003	DVC	2031	DVC				
TO 241009	KLYNS1	132.00	1	149.2	56.2	159.4	100 0.9409LO		1.04	19.88	2003	DVC	2031	DVC				
TO 241009	KLYNS1	132.00	2	149.2	56.2	159.4	100 0.9409LO		1.04	19.88	2003	DVC	2031	DVC				
TO 241009	KLYNS1	132.00	3	145.2	54.9	155.3	97 0.9409LO		0.99	19.36	2003	DVC	2031	DVC				
TO 242009	MAITHON PG2	220.00	1	-105.6	-76.5	130.4	62		0.19	1.02	2053	ER_ISTS_DVC	2031	DVC				
TO 242009	MAITHON PG2	220.00	2	-105.6	-76.5	130.4	62		0.19	1.02	2053	ER_ISTS_DVC	2031	DVC				
BUS 242004	DHANBAD2	220.00	CKT	MW	MVAR	MVA	% 1.0106PU	4.86	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242004
							222.34KV			MW	MVAR	2003	DVC					
TO LOAD-PQ				88.3	22.1	91.1												
TO 232089	ELECTRO STL	220.00	1	0.0	-11.9	11.9	6		0.00	0.01	2003	DVC	2031	DVC				

TO 232089	ELECTRO STL	220.00	2	0.0	-11.9	11.9	6		0.00	0.01	2003	DVC	2031	DVC						
TO 241030	DHNABD_1	132.00	1	0.0	-0.0	0.0	0	0.9409RG	0.00	0.00	2003	DVC	2031	DVC						
TO 241030	DHNABD_1	132.00	2	0.0	-0.0	0.0	0	0.9409RG	0.00	0.00	2003	DVC	2031	DVC						
TO 242001	CTPS2	220.00	1	39.2	18.2	43.2	21		0.14	0.73	2003	DVC	2031	DVC						
TO 242001	CTPS2	220.00	2	39.2	18.2	43.2	21		0.14	0.73	2003	DVC	2031	DVC						
TO 242005	GIRDHI2	220.00	1	58.7	-14.9	60.6	29		0.24	1.30	2003	DVC	2031	DVC						
TO 242005	GIRDHI2	220.00	2	58.7	-14.9	60.6	29		0.24	1.30	2003	DVC	2031	DVC						
TO 242009	MAITHON PG2	220.00	1	-142.1	-2.5	142.1	68		1.58	8.45	2053	ER_ISTS_DVC	2031	DVC						
TO 242009	MAITHON PG2	220.00	2	-142.1	-2.5	142.1	68		1.58	8.45	2053	ER_ISTS_DVC	2031	DVC						
BUS 242005	GIRDHI2	220.00	CKT	MW	MVAR	MVA	%	1.0111PU 222.44KV	3.59	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242005	
	TO LOAD-PQ			25.5	6.4	26.2					MW	MVAR	2003	DVC			2031	DVC		
TO 241023	GIRIDIH1	132.00	1	93.4	34.3	99.5	55	0.9409RG	0.21	8.14	2003	DVC	2031	DVC			2031	DVC		
TO 241023	GIRIDIH1	132.00	2	93.4	34.3	99.5	55	0.9409RG	0.21	8.14	2003	DVC	2031	DVC			2031	DVC		
TO 242004	DHANBAD2	220.00	1	-58.5	9.7	59.3	28		0.24	1.30	2003	DVC	2031	DVC			2031	DVC		
TO 242004	DHANBAD2	220.00	2	-58.5	9.7	59.3	28		0.24	1.30	2003	DVC	2031	DVC			2031	DVC		
TO 242006	KODERMA2	220.00	1	-47.7	-47.1	67.0	32		0.61	3.27	2003	DVC	2031	DVC			2031	DVC		
TO 242006	KODERMA2	220.00	2	-47.7	-47.1	67.0	32		0.61	3.27	2003	DVC	2031	DVC			2031	DVC		
BUS 242006	KODERMA2	220.00	CKT	MW	MVAR	MVA	%	1.0535PU 231.78KV	5.49	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242006	
	TO 241018	KTPP1	132.00	1	92.3	42.3	101.6	56	0.9409RG	0.21	7.81	2003	DVC	2031	DVC			2031	DVC	
TO 241018	KTPP1	132.00	2	92.3	42.3	101.6	56	0.9409RG	0.21	7.81	2003	DVC	2031	DVC			2031	DVC		
TO 242005	GIRDHI2	220.00	1	48.3	34.4	59.3	27		0.61	3.27	2003	DVC	2031	DVC			2031	DVC		
TO 242005	GIRDHI2	220.00	2	48.3	34.4	59.3	27		0.61	3.27	2003	DVC	2031	DVC			2031	DVC		
TO 244002	KTPS4	400.00	1	-140.6	-76.7	160.2	51	1.0000UN	0.46	9.17	2003	DVC	2031	DVC			2031	DVC		
TO 244002	KTPS4	400.00	2	-140.6	-76.7	160.2	51	1.0000UN	0.46	9.17	2003	DVC	2031	DVC			2031	DVC		
BUS 242007	RAMGARH2	220.00	CKT	MW	MVAR	MVA	%	0.9841PU 216.51KV	0.69	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242007	
	TO LOAD-PQ			51.5	12.9	53.1					MW	MVAR	2003	DVC			2031	DVC		
TO 241013	RAMGARH1	132.00	1	102.9	36.1	109.0	61	0.9409LO	0.43	10.29	2003	DVC	2031	DVC			2031	DVC		
TO 241013	RAMGARH1	132.00	2	102.9	36.1	109.0	61	0.9409LO	0.43	10.29	2003	DVC	2031	DVC			2031	DVC		
TO 242000	BTPS2	220.00	1	-128.6	-42.5	135.5	66		1.47	8.37	2003	DVC	2031	DVC			2031	DVC		
TO 242000	BTPS2	220.00	2	-128.6	-42.5	135.5	66		1.47	8.37	2003	DVC	2031	DVC			2031	DVC		
BUS 242009	MAITHON PG2	220.00	CKT	MW	MVAR	MVA	%	1.0231PU 225.09KV	8.23	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	242009	
	TO 222008	DUMKA NEW	220.00	1	55.1	13.6	56.8	26		0.34	1.95	2002	JHARKHAND	2021	JHARKHAND			2031	DVC	
TO 222008	DUMKA NEW	220.00	2	55.1	13.6	56.8	26		0.34	1.95	2002	JHARKHAND	2021	JHARKHAND			2031	DVC		
TO 242003	KLYN2	220.00	1	105.8	76.4	130.5	61		0.19	1.02	2003	DVC	2031	DVC			2031	DVC		
TO 242003	KLYN2	220.00	2	105.8	76.4	130.5	61		0.19	1.02	2003	DVC	2031	DVC			2031	DVC		
TO 242004	DHANBAD2	220.00	1	143.7	3.3	143.7	68		1.58	8.45	2003	DVC	2031	DVC			2031	DVC		
TO 242004	DHANBAD2	220.00	2	143.7	3.3	143.7	68		1.58	8.45	2003	DVC	2031	DVC			2031	DVC		
TO 244003	MAITHON PG4	400.00	1	-304.6	-93.3	318.6	64	1.0000UN	1.21	24.23	2053	ER_ISTS_DVC	2031	DVC			2031	DVC		
TO 244003	MAITHON PG4	400.00	3	-304.6	-93.3	318.6	64	1.0000UN	1.21	24.23	2053	ER_ISTS_DVC	2031	DVC			2031	DVC		
BUS 244000	TISCO_BRPS4	400.00	CKT	MW	MVAR	MVA	%	1.0027PU 401.06KV	12.01	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	244000	
	TO 241016	JAM_DV2	132.00	1	0.0	0.0	0	1.0000LK	0.00	0.00	2003	DVC	2031	DVC			2031	DVC		
TO 244004	JAMSHEDPUR4	400.00	Q1	-185.8	49.1	192.2	22		0.22	2.50	2053	ER_ISTS_DVC	2031	DVC			2031	DVC		
TO 254012	BARIPADA4	400.00	Q1	185.8	-49.1	192.2	22		0.67	7.21	2054	ER_ISTS_ODIS	2043	ODISHA_N			2031	DVC		
BUS 244001	BTPS - A4	400.00	CKT	MW	MVAR	MVA	%	1.0000PU 400.00KV	8.46	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	244001	
	FROM GENERATION			475.0	-13.3R	475.2	73				MW	MVAR	2003	DVC			2031	DVC		

TO 242000	BTPS2	220.00	1	225.4	129.3	259.8	82	0.9409RG	1.18	23.72	2003	DVC	2031	DVC					
TO 242000	BTPS2	220.00	2	225.4	129.3	259.8	82	0.9409RG	1.18	23.72	2003	DVC	2031	DVC					
TO 244002	KTPS4	400.00	T1	12.1	-136.0	136.6	16		0.22	2.45	2003	DVC	2031	DVC					
TO 244002	KTPS4	400.00	T2	12.1	-136.0	136.6	16		0.22	2.45	2003	DVC	2031	DVC					
BUS 244002	KTPS4	400.00	CKT	MW	MVAR	MVA	%	1.0221PU	8.20	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	244002
FROM GENERATION				950.0	600.0H	1123.6	96	408.83KV				MW	MVAR	2003	DVC				
TO SWITCHED SHUNT				0.0	94.8	94.8													
TO 214000	BIHARSHARIF	400.00	Q1	202.3	23.0	203.6	11		0.44	7.57	2051	ER_ISTS_BIH	2001	ER_BOUNDARY					
TO 214000	BIHARSHARIF	400.00	Q2	202.3	23.0	203.6	11		0.44	7.57	2051	ER_ISTS_BIH	2001	ER_BOUNDARY					
TO 214005	GAYA4	400.00	Q1	143.6	61.5	156.2	9		0.21	3.63	2051	ER_ISTS_BIH	2001	ER_BOUNDARY					
TO 214005	GAYA4	400.00	Q2	143.6	61.5	156.2	9		0.21	3.63	2051	ER_ISTS_BIH	2001	ER_BOUNDARY					
TO 242006	KODERMA2	220.00	1	141.1	85.9	165.2	52	0.9409RG	0.46	9.17	2003	DVC	2031	DVC					
TO 242006	KODERMA2	220.00	2	141.1	85.9	165.2	52	0.9409RG	0.46	9.17	2003	DVC	2031	DVC					
TO 244001	BTPS - A4	400.00	T1	-11.9	82.3	83.2	9		0.22	2.45	2003	DVC	2031	DVC					
TO 244001	BTPS - A4	400.00	T2	-11.9	82.3	83.2	9		0.22	2.45	2003	DVC	2031	DVC					
BUS 244003	MAITHON PG4	400.00	CKT	MW	MVAR	MVA	%	0.9900PU	12.22	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	244003
								396.01KV				MW	MVAR	2053	ER_ISTS_DVC				
TO SWITCHED SHUNT				0.0	155.6	155.6													
TO 214001	KHALGAON_B	400.00	T1	-57.1	-30.6	64.8	7		0.12	1.30	2102	KHSTPP	2012	BIHAR_S					
TO 214005	GAYA4	400.00	Q1	196.6	-100.9	221.0	13		1.06	18.24	2051	ER_ISTS_BIH	2001	ER_BOUNDARY					
TO 214005	GAYA4	400.00	Q2	196.6	-100.9	221.0	13		1.06	18.24	2051	ER_ISTS_BIH	2001	ER_BOUNDARY					
TO 234002	MTPS_B4	400.00	T2	-457.4	-41.5	459.3	55		2.39	26.65	2003	DVC	2031	DVC					
TO 234002	MTPS_B4	400.00	T3	-457.4	-41.4	459.3	55		2.40	26.65	2003	DVC	2031	DVC					
TO 242009	MAITHON PG2	220.00	1	305.8	117.6	327.6	66	0.9409RG	1.21	24.23	2053	ER_ISTS_DVC	2031	DVC					
TO 242009	MAITHON PG2	220.00	3	305.8	117.6	327.6	66	0.9409RG	1.21	24.23	2053	ER_ISTS_DVC	2031	DVC					
TO 244004	JAMSHEDPUR4	400.00	T1	-32.9	-75.5	82.3	10		0.06	0.60	2053	ER_ISTS_DVC	2031	DVC					
BUS 244004	JAMSHEDPUR4	400.00	CKT	MW	MVAR	MVA	%	1.0000PU	12.73	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	244004
								400.00KV				MW	MVAR	2053	ER_ISTS_DVC				
TO SWITCHED SHUNT				0.0	158.7	158.7													
TO 222002	RAMCHAND PG	220.00	1	107.9	109.3	153.6	39	0.9409LK	0.42	8.26	2052	ER_ISTS_JHA	2021	JHARKHAND					
TO 222002	RAMCHAND PG	220.00	2	107.9	109.3	153.6	39	0.9409LK	0.42	8.26	2052	ER_ISTS_JHA	2021	JHARKHAND					
TO 222002	RAMCHAND PG	220.00	3	107.9	109.3	153.6	39	0.9409LK	0.42	8.26	2052	ER_ISTS_JHA	2021	JHARKHAND					
TO 224002	ADUNIK	400.00	Q1	-236.4	17.3	237.0	27		0.00	0.03	2301	ADHUNIK	2021	JHARKHAND					
TO 224002	ADUNIK	400.00	Q2	-236.4	17.3	237.0	27		0.00	0.03	2301	ADHUNIK	2021	JHARKHAND					
TO 234001	DSTPS4	400.00	T1	-223.0	-18.6	223.8	26		1.43	15.24	2003	DVC	2031	DVC					
TO 234001	DSTPS4	400.00	T2	-223.0	-18.6	223.8	26		1.43	15.24	2003	DVC	2031	DVC					
TO 234002	MTPS_B4	400.00	T1	-148.2	-33.0	151.8	17		0.67	7.18	2003	DVC	2031	DVC					
TO 244000	TISCO_BRPS4	400.00	Q1	186.1	-64.4	196.9	23		0.22	2.50	2003	DVC	2031	DVC					
TO 244003	MAITHON PG4	400.00	T1	32.9	-15.1	36.2	4		0.06	0.60	2053	ER_ISTS_DVC	2031	DVC					
TO 244005	CHAIBASA PG4400.00	T1	120.6	-102.5	158.3	18		0.30	3.25	2053	ER_ISTS_DVC	2031	DVC						
TO 244005	CHAIBASA PG4400.00	T2	120.6	-102.5	158.3	18		0.30	3.25	2053	ER_ISTS_DVC	2031	DVC						
TO 254012	BARIPADA4	400.00	T2	189.0	-66.9	200.4	23		0.92	9.80	2054	ER_ISTS_ODIS	2043	ODISHA_N					
TO 264009	PARULIA_B	400.00	T1	94.0	-99.6	136.9	16		0.35	3.74	2055	ER_ISTS_WB	2052	S_BNG					
BUS 244005	CHAIBASA PG4400.00	CKT	MW	MVAR	MVA	%	1.0107PU	11.59	X---	LOSSES	---X	X----	AREA	-----X	X----	ZONE	-----X	244005	
								404.28KV				MW	MVAR	2053	ER_ISTS_DVC				
TO SWITCHED SHUNT				0.0	74.1	74.1													
TO 222010	CHAIBASA	220.00	1	29.4	-105.0	109.0	35	1.0000UN	0.23	4.60	2052	ER_ISTS_JHA	2021	JHARKHAND					
TO 222010	CHAIBASA	220.00	2	29.4	-105.0	109.0	35	1.0000UN	0.23	4.60	2052	ER_ISTS_JHA	2021	JHARKHAND					
TO 244004	JAMSHEDPUR4	400.00	T1	-120.3	101.8	157.6	18		0.30	3.25	2053	ER_ISTS_DVC	2031	DVC					
TO 244004	JAMSHEDPUR4	400.00	T2	-120.3	101.8	157.6	18		0.30	3.25	2053	ER_ISTS_DVC	2031	DVC					
TO 254007	ROURKELLA4	400.00	T1	-227.7	37.5	230.7	26		1.21	12.96	2054	ER_ISTS_ODIS	2001	ER_BOUNDARY					
TO 254007	ROURKELLA4	400.00	T2	-227.7	37.5	230.7	26		1.21	12.96	2054	ER_ISTS_ODIS	2001	ER_BOUNDARY					

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भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग -II
Power System Planning & Appraisal Division-II

To

As per List Enclosed.

Subject: Minutes of Meeting regarding review of Connectivity/ LTA/ evacuation system for OPGC IBTPS (2x660MW) thermal power project in Odisha.

Sir,

A meeting regarding review of Connectivity/ LTA/ evacuation system for OPGC IBTPS (2x660MW) thermal power project in Odisha was held on 26.03.2019 at CEA, New Delhi. Minutes of the Meeting are enclosed herewith.

Yours faithfully,

(Pardeep Jindal)

Chief Engineer (PSP&A-II)

I/4610/2019

List of addressee:

1. Member Secretary, Eastern Regional Power Committee, 14, Golf Club Road, Tollygange, Kolkata-700033. Tel. No. 033-24235199 Fax No.033-24171358	2. Managing Director, Bihar State Power Transmission Company, Vidyut Bhavan (4 th floor), Baily Road, Patna-800021. Tel. 0612-2504442
3. Chairman-cum-Managing Director, Jharkhand Urja Sancharan Nigam Limited Engineering Building, H.E.C., Dhurwa, Ranchi-834004.	4. Chairman-cum-Managing Director, Orissa Power Transmission Corporation Ltd, Jan path, Bhubaneswar-751022. Tel. No. 0674-2540098 Fax No.0674-2541904
5. Managing Director, West Bengal State Electricity Transmission Company Ltd, Vidyut Bhavan (8 th Floor), A-block, Salt Lake City, Kolkata-700091.	6. Principal Chief Engineer cum Secretary, Power Department Government of Sikkim, Sikkim. Tel. No. 03592-2022440 Fax No.03592-202927
7. Chief Operating Officer, Central Transmission Utility (CTU), Power Grid Corporation of India "Saudamini" Plot No. 2, Sector-29, Gurugram-122001	8. Managing Director, Odisha Power Generation Corporation Ltd.(OPGC), Zone-A, 7 th Floor, Fortune Towers, Chandrashekarapur, Bhubaneswar- 751023, Odisha.

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Minutes of Meeting regarding review of Connectivity/ LTA/ evacuation system for OPGC IBTPS (2x660MW) thermal power project in Odisha held on 26.03.2019 at CEA, New Delhi.

List of participants are enclosed at Annexure-I.

1. Chairperson, CEA welcomed the participants and requested Chief Engineer (PSP&A-II) to appraise the issue.
2. Chief Engineer (PSP&A-II), CEA informed that Odisha Power Generation Corporation (OPGC) is constructing power project of 2x660MW (1b Valley U-3 & 4), out of which Unit-3 would be connected to STU system through OPGC-Lapanga 400kV D/c line (with twin moose conductor of 85 deg. C rating) and Unit-4 would be connected to ISTS through OPGC-Sundargarh 400kV D/c ISTS line (with triple snowbird conductor, under TBCB route). As the connectivities are separate for the two units, i.e. U-3 with STU and U-4 with ISTS, the system has been planned with a bus sectionaliser in generation switchyard, which would be normally kept open.
3. Representative of OPGC informed that Unit 3 and Unit 4 would be commissioned by the end of April, 2019 and May, 2019 respectively. He said that OPGC had taken connectivity and LTA for 660 MW (Unit-4) based on target region (200 MW for Northern Region, 200 MW for Western Region and 200 MW for Southern region). Subsequently, the coal linkage was cancelled due to coal blocks deallocation. Therefore, OPGC was compelled to purchase the coal from the state owned mining company (OCPL- Odisha Coal Private, Limited). Odisha government while providing coal linkage from OCPL, allocated total power of Unit 3 & 4 (1320MW) to GRIDCO, Odisha for a period of 25 years. As per PPA, OPGC has to deliver this power to GRIDCO at their switchyard, therefore, they have requested CEA to approve the proposal of operating the system under common bus mode i.e. by closing the bus sectionaliser between Unit-3 (connected to STU) and Unit-4 (connected to ISTS).
4. Chief Engineer (PSPA-II) stated that in the PPA, if delivery point is OPGC switchyard, the requisite transmission access and charges are to be arranged/paid by GRIDCO. And under the present configuration, there is no constraint in transmitting power to Odisha as per the PPA. However, OPGC has voluntarily relinquished the LTA granted to them but connectivity agreement with CTU still exists. OPGC would need transmission access to ISTS for scheduling & dispatch of their power from U-4. For this, one of the options is that OPGC may again apply for LTA, or alternatively, OPGC may seek Short Term Open Access (STOA). As complete transmission system has already been built as per request of OPGC's LTA application, any constraint in scheduling of power even under STOA, is unlikely.
5. Member Secretary, ERPC stated that, after closing the bus sectionaliser, the scheduling of the Unit 4 would come under jurisdiction of SLDC, Odisha.

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6. Representative of GRIDCO, Odisha, stated that GRIDCO wanted to evacuate the entire power through their STU network and requested to examine the technical feasibility of the system under common bus mode. This way, they can also avoid any transmission charges (and losses) of the ISTS for drawing power from U-4 of OPGC. GRIDCO, however, would abide by all the commercial terms and conditions, as per CERC regulations/order.
7. Representative of CTU stated that by closing the bus sectionaliser, the entire power (1320 MW) may not flow towards Odisha system through the STU network (OPGC-Lapanga 400 kV D/c line), as some power would also flow through the ISTS network (OPGC-Sundargarh 400kV D/c line). Also, if there is N-1 contingency on OPGC-Lapanga 400kV D/c line, the power flow on the other circuit may be on the higher side (near thermal limits) in some conditions. However, in case of outage of both circuits of OPGC-Lapanga (twin moose) line, entire power will have to be evacuated through OPGC-Sundargarh ISTS line, which is of higher capacity (triple snowbird).
8. Chief Engineer (PSPA-II) added that under separate bus mode, the reliability is better than that under common bus mode due to insufficient transmission capacity of the OPGC-Lapanga 400kV D/c line under N-1 conditions.
9. Representative of CTU further stated that OPGC-Sundargarh 400kV D/c ISTS line has been built under TBCB and executed by Odisha Generation Power Transmission Company Ltd (OGPTL, a subsidiary of Sterlite). The line has been exclusively built for evacuation of power from OPGC (Ib Valley) U 4 (660 MW) power. As the LTA has been relinquished, the additional burden of OPGC-Sundargarh ISTS line would lie on all the other DICs/states. Therefore OPGC may consider sharing the entire transmission charges of the OPGC-Sundargarh ISTS line as it would be used primarily by them.
10. Regarding avoidance of ISTS charges (and losses), Chief Engineer (PSPA-II) said that investment in the ISTS for evacuation of power from OPGC has already been carried out. If sectionaliser is closed, these assets would be used by OPGC but the charges for the same would not be shared by them. Such scenario would be unfair to other states/DICs. He opined that, the other states may also follow example of OPGC/GRIDCO and also take cue from some of the CERC orders (e.g. dated 09.03.2018 on Petition No. 20/MP/2017 and dated 04.05.2018 on Petition No. 126/MP/2017).
11. Representative of the BSPTCL stated that the matter would be examined in detail and their opinion would be conveyed in due course.
12. In view of the above, the following was concluded:
 - (a) The proposal of OPGC/GRIDCO regarding closing of bus sectionaliser between U-3 (connected to STU) and U-4 (connected to ISTS) is feasible, but with compromise in N-1 reliability, as explained in above discussion.
 - (b) There is no constraint in evacuation of power from U-4 in the planned arrangement i.e. with sectionaliser kept as open.

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- (c) OPGC U-4 is connected with ISTS and they may seek Long term/Short term open access in the ISTS for scheduling their power to Odisha, as per their PPA.
- (d) OPGC may approach CERC, if desired, for resolution of above technical/commercial matters.

Meeting ended with vote of thanks to chair.

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Annexure-1

List of participants of Meeting regarding review of Connectivity/ LTA/ evacuation system for OPGC IBTPS (2x660MW) thermal power project in Odisha.

Sl. No.	Name	Designation	Organization
1	P.S. Mhaske (in chair)	Member(PS) & Chairperson	CEA
2	Pardeep Jindal	CE (PSP&A-II)	CEA
3	Ishan Sharan	Director (PSP&A-II)	CEA
4	U M Rao	Dy. Director (PSP&A-II)	CEA
5	J. Bandopadhyay	Member Secretary	ERPC
6	Ashok Pal	CGM (CTU-Plg)	POWERGRID
7	Manish Ranjan Keshari	Dy. Manager(CTU-Plg)	POWERGRID
8	Ravi S Prasad	ESE	BSPTCL
9	Abhishek Kumar	EEE/P&E	BSPTCL
10	Manas Kumar Das	Director (Commercial)	GRIDCO
11	P. K. Mishra	CGM	OPTCL
12	C.R. Mishra	DGM	OPTCL
13	A K Benarajee	AGM	OPTCL
14	Ritwik Mishra	GM	OPGC
15	K C Samantray	AGM	OPGC

I/4934/2019



भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग -II
Power System Planning & Appraisal Division-II

सेवामें/To

- | | | |
|--|--|--|
| 1 Chief Operating Officer,
Central Transmission Utility
(CTU),
Power Grid Corporation of
India Ltd.(PGCIL)
"Saudamini" Plot No. 2,
Sector-29,
Gurugram-122001 | 2. Director
(Technical),
NTPC Ltd,
Engineering Office
Complex,
A-8, Sector-24,
Noida (U.P.)-
201301 | 3. Vivek Singla,
NKTL, Sambhav
House,
Judges Bungalow
Road,
Bodakdev,Ahmedaba
d-380015 |
|--|--|--|

Subject: Minutes of Meeting regarding evacuation system for North Karanpura (3x660MW) generation project of NTPC w.r.t. Petition no. 194/MP/2017 of NKTL in CERC held on 23.04.2019 at CEA, New Delhi.

Sir/Madam,

A meeting regarding evacuation system for North Karanpura (3x660MW) generation project of NTPC w.r.t. Petition no. 194/MP/2017 of NKTL in CERC held on 23.04.2019 at CEA, New Delhi. Minutes of the meeting are enclosed herewith.

भवदीय/yours faithfully,

(Handwritten Signature)
 (बी.एस. बैरवा/B.S. Bairwa)

निदेशक/Director

Minutes of Meeting regarding evacuation system for North Karanpura (3x660MW) generation project of NTPC w.r.t. Petition no. 194/MP/2017 of NKTL in CERC held on 23.04.2019 at CEA, New Delhi.

List of participants are enclosed at **Annexure-I**.

1. Member (Power System), CEA welcomed the participants and asked Chief Engineer (PSPA-II) to take up the issue.
2. Chief Engineer (PSPA-II), CEA informed that CERC, in its order dated 20.03.2019 in Petition no. 194/MP/2017 has directed CEA to decide revised Scheduled Commercial Date of Operation(SCoD) for execution of the transmission system in consultation with NTPC and the Petitioner. An extract of the decision, in this order is enclosed at **Annexure-II**.
3. He enquired about the status of NoC from Ministry of Coal(MoC) /CCL to NKTL. Representative of NKTL stated that NKTL has received a letter from CCL regarding NoC, however NoC is yet to be received. NKTL furnished the letter dated 18.04.2019 in the meeting. The same is enclosed at **Annexure-III**.
4. Chief Engineer (PSPA-II), CEA enquired about the status of North Karanpura (3x660MW) generation project of NTPC. Representative of NTPC stated that the Unit -1 of the NKSTPP is scheduled for CoD in April, 2020. However, Startup power is required as soon as possible.
5. Chief Engineer (PSPA-II), CEA asked NKTL regarding compressed time schedule for the implementation of the transmission system.
6. Representative of NKTL presented the scope of project (schematic is at **Annexure-IV**). NKSTPP- Common point(AP/19) would be 13 km multi-circuit line and Common point – Gaya would be 98 km and Common point – Chandwa would be 25 km. New 400kV Dhanbad S/s would be established with 1.2 km D/c LILO of Ranchi-Maithon 400kV D/c line. He requested to approve the construction of multi-circuit portion of about 13km for NKSTPP – Gaya and NKSTPP – Chandwa lines.
7. Participants deliberated and “in principally” agreed for the modification in the scope of works. Chief Engineer (PSPA-II), CEA stated that this modification in the scope would be ratified in the forthcoming meeting of Eastern Region Standing Committee on Transmission(ERSCT).
8. Representative of NKTL stated that financial tie-up with revised time line and cost is under progress and financial tie-up is expected to be completed by Aug 2019. He stated that May,2019 is assumed as revised zero date(i.e. Date of receipt of NOC). He explained about various activities and their timelines (Details are at **Annexure-V**) to implement the transmission system. He stated that Authorization under section 164 of Electricity Act 2003 would require about 130 days and forest clearance would take about 12 months time.
9. Further, he stated that NKSTPP-Chandwa 400kV D/c line could be completed in 17 months, i.e. by September 2020. NKSTPP- Gaya 400kV D/c line could be

completed in 26 months, i.e. by June 2021. He mentioned that forest area is more in NKSTPP- Gaya 400kV D/c line, therefore forest clearance process would take more time. New 400kV Dhanbad S/s with 1.2KM D/c LILO of Ranchi-Maithon 400kV D/c line would be completed in about 18 months, i.e. by October 2020.

10. Regarding authorization under Section 164 of Electricity Act 2003, it was stated that CEA may expedite the matter
11. Representative of NKTL agreed for the above time lines are subject to getting the forest clearance for NKSTPP-Chandwa 400kV D/c line within 200 days and for NKSTPP-Gaya 400kV D/c line within 300 days.
12. After the deliberations, following were decided:
 - i. Revised scope of the project:
 - a. NKSTPP- Common point would be 13 km multi circuit 400kV line (quad moose conductor).
 - b. Common point – Chandwa would be 25 km 400kV D/c line(quad moose conductor)..
 - c. Common point – Gaya would be 98 km 400kV D/c line(quad moose conductor).
 - d. New 400kV Dhanbad Substation.
 - e. 1.2 km D/c LILO of Ranchi-Maithon 400kV D/c line.
 - ii. NKSTPP-Chandwa 400kV D/c line would be completed in 14 months, i.e. by June 2020 and NKSTPP-Gaya 400kV D/c line would be completed in 23 months, i.e. by March 2021. New 400kV Dhanbad S/s with 1.2 km D/c LILO of Ranchi-Maithon 400kV D/c line would be completed in about 18 months, i.e. by October 2020.
 - iii. Representative of NKTL agreed for the above time lines subject to getting forest clearance for NKSTPP-Chandwa 400kV D/c line within 200 days and for NKSTPP-Gaya 400kV D/c line within 300 days. .

Meeting ended with vote of thanks to chair.

List of the participants of Meeting regarding evacuation system for North Karanpura (3x660MW) generation project of NTPC w.r.t. Petition no. 194/MP/2017 of NKTL in CERC held on 23.04.2019 at CEA, New Delhi.

S. No.	Name	Designation	Organisation
1.	P.S. Mhaske (In –chair)	Chairperson & Member(PS)	CEA
2.	Pardeep Jindal	Chief Engineer(PSP&A-II)	CEA
3.	Ishan Sharan	Director (PSP&A-II)	CEA
4.	B. S. Bairwa	Director(PSP&A-II)	CEA
5.	U. M. Rao	Dy. Director(PSP&A-II)	CEA
6.	Ashok Pal	CGM (CTU-PIg)	POWERGRID
7.	Deepak Trehan	GM	NTPC
8.	Subhash Thakur	AGM	NTPC
9.	V S Dubey	AGM	NTPC
10.	L. N. Mishra	Sr. V.P.	NKTL
11.	Vivek Singla	Joint President	NKTL
12.	Sameer Ganju	AVP	NKTL
13.	Praveen Tamak	Manager	NKTL