

**Central Electricity Authority**  
 प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग  
**System Planning & Project Appraisal Division**  
 सेवा भवन, आर. के. पुरम, नई दिल्ली-110066  
**Sewa Bhawan, R. K. Puram, New Delhi-110066**

No.66/5/2013-SP&PA/1223-35

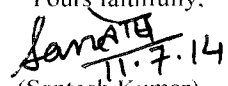
dated: 11.07.2014

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Sub: Summary record of discussions of the 1st - 2014 meeting of the Standing Committee on Power System Planning of Eastern Region on 02.05.2014 at NRPC, New Delhi.

Sir,

Minutes of the meeting for the Standing Committee Meeting on Power System Planning in Eastern Region was held on 02.05.2014 at NRPC, Katwaria Sarai, New Delhi is uploaded on the CEA website: [www.cea.nic.in](http://www.cea.nic.in). (path to access: Wings of CEA/Power Systems/Standing Committee on Power System Planning/EASTERN REGION) for kind perusal.

Yours faithfully,  
  
 11.7.14  
 (Santosh Kumar)  
 Dy. Director (SP&PA)

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## **Minutes of Meeting of the 1<sup>st</sup>-2014 Standing Committees Meeting on Power System planning in Eastern Region held at NRPC, New Delhi on 02-05-2014**

List of Participants is attached at Annexure-4.

Member (PS), CEA welcomed the participants and stated that the agenda items be taken up followed by LTA cases. After brief introduction it was noted that no representative from state of Bihar and Jharkhand are participating in the meeting. Thereafter, he requested Director (SP&PA), CEA to take up the agenda. Director (SP&PA) CEA in his opening remarks informed that POSOCO was incorporated as a member of the Standing Committee. Thereafter, he took up the proceedings. The brief on the deliberation is given below:

### **1.0. Confirmation of Minutes of the last Meeting of Standing Committee held on 27-08-2013**

Director (SP&PA), CEA stated that Minutes of the Standing Committee Meeting (SCM) held on 27-08-2013 at NRPC, Delhi were circulated through CEA Website. As no comments were received, the minutes were confirmed.

### **2.0 Modification in Transmission System associated with Phase-I IPPs in Sikkim**

Director (SP&PA), CEA informed that the subject scheme was approved in the standing committee held on 20-09-2010 and is presently under implementation by POWERGRID with the following scope of works:

- New 2x315MVA, 400/220 kV sub-station at Kishanganj
- LILO of New Siliguri - New Purnea 400kV D/c (quad) at Kishanganj
- LILO of New Siliguri – New Purnea 400kV D/c (twin-being re-conducuted) at Kishanganj
- LILO of Siliguri - Dalkhola 220kV D/c line at Kishanganj

The Kishanganj. Sub-station was earlier planned to be established at Karandighi in West Bengal. Due to land acquisition issues, location of the sub-station was changed to Kishanganj in Bihar. CTU/PGCIL informed that after finalization of the location of Kishanganj, route length of loop-in & loop-out of both the New Purnea - New Siliguri 400 kV D/C twin moose line (being re-conducuted with twin HTLS conductor by PGCIL) and New Purnea - New Siliguri 400 kV D/c quad conductor line has increased to 177 km and 102 km respectively. It was explained through the results of their system study that power flow on the above two lines ,after LILO, were found to be very uneven and, if only quad conductor line was LILOed at Kishanganj, the load sharings on quad conductor and twin conductor line got improved . Accordingly, CTU proposed to delete the scope of LILO of New Purnea - New Siliguri 400 kV D/c line (being re-conducuted with twin HTLS conductor) at Kishanganj.

On the query of POSOCO about the system studies carried out by CTU for 2017-18, and about the typical pattern of inter-regional power flow, CTU clarified that studies were carried out for high hydro condition with about 22GW deficit in NR, while 9GW, 27GW and 3GW surplus in WR, ER and NER respectively. Due to availability of generation projects in ER, the power flow pattern in the ER-NR and WR-NR corridors are in the range of 16GW and 6GW respectively.

POSOSCO suggested for additional studies considering 10-20% overload capacity of hydro projects during high hydro condition and also to consider low hydro scenario with low generation at Palatana GBPP in NER to examine the operational flexibility of different combinations of converter/inverter mode at Bishwanath Chariali-Alipurduar-Agra HVDC stations.

CTU explained that enough margins in the 400KV Alipurduar-Siliguri-Kishanganj-Purnea corridor, specially after commissioning of 3000MW HVDC terminal at Alipurduar, would take care of the 10-20% overload of the hydro projects. It was also added that during low generation in NER, this link may be utilized for feeding power from NR to NER utilizing different combination of converter/inverter mode of operation at the HVDC terminals so as to enable reverse power flow through the HVDC bipole line.

ERPC opined that Kishanganj 400/220 kV 2x315 MVA sub-station capacity would be required to be augmented and it should have 2x500 MVA ICTs. CTU informed that 2x315 MVA transformers are already under implementation and a 3<sup>rd</sup> ICT of 500 MVA would be considered and it is included in the forthcoming agenda items.

WBSEDCL, ERLDC and ERPC were of the same view that LILO of Siliguri - Dalkhola 220kV D/c line at Kishanganj should be dropped or may be taken up after commissioning of Rajarhat – Purnea 400 kV D/C line or re-conductoring of Farakka – Malda 400 kV D/C line, to avoid high/critical loading in the line. It was informed by CTU that the proposed 220kV LILO work is already under implementation and major portion of material has already been supplied to the site for execution. Director CEA insisted CTU to make best efforts to schedule the commissioning of the above 400kV lines before execution of the 220kV LILO work.

On the query of POSOCO about transformation capacity at Rangpo 400/220kV S/S, CTU stated that there would be 5x315MVA ICTs (16 nos 1-phase units of 105 MVA each) which could take care of the N-1 contingency.

**After deliberation, Members agreed for deletion of the following scope of work from the scheme:**

- **LILO of New Purnea - New Siliguri 400 kV D/c line (being re-conductored with twin HTLS conductor) at Kishanganj**
- **4 nos. 400 kV line bays associated with above LILO at Kishanganj**

### 3.0 Modification in Transmission System for development of pooling station in Northern part of West Bengal and transfer of power from Bhutan to NR/WR

Director (SP&PA), CEA informed that in order to transfer surplus power from upcoming generation projects in NER & Bhutan to NR/WR, the following planned transmission scheme are under various stages of implementation:

- New 2x315MVA, 400/220kV AC & HVDC sub-station with  $\pm$  800kV, 3000MW converter module at new pooling station at Alipurduar
- Extension of  $\pm$  800 kV HVDC station with 3000 MW inverter module at Agra
- LILO of Bishwanath Chariali – Agra HVDC line at new pooling station in Alipurduar for parallel operation of the HVDC station
- LILO of Bongaigaon – Siliguri 400kV D/c line (quad) (under pvt. Sector) at new pooling station in Alipurduar
- LILO of Tala-Siliguri 400kV D/c line at new pooling station in Alipurduar
- LILO of Birpara-Salakati 220kV D/c line at new pooling station in Alipurduar
- Punatsangchu-1 (Generation Project in Bhutan) – Alipurduar 400kV D/c with quad conductor (Indian Portion)

CTU/POWERGRID informed that the LILO portion of Tala-Siliguri at Alipurduar would be about 80km long and accordingly, load flow studies were carried out with and without Tala – Siliguri 400kV D/c LILO at Alipurduar. The results of load flow studies (**Annexure-1a**) indicate that when Tala – Siliguri 400kV D/c line is LILoed at Alipurduar, loading on the Alipurduar – Siliguri section (220 MW per circuit) differs significantly from the other Alipurduar – Siliguri 400kV D/c line (443 MW per circuit) formed after LILO of Siliguri – Bongaigaon 400kV D/c (Quad) line at Alipurduar.

They proposed for creating a parallel new Alipurduar-Siliguri 400kV D/c quad conductor line, dispensing LILO of 400kV Tala – Siliguri 400kV line at Alipurduar, and explained the study result showing almost equal loading on 2x D/C quad lines (**Annexure-1b**). This 2<sup>nd</sup> Alipurduar-Siliguri 400kV D/c quad line was proposed to be considered under system strengthening works associated with Punatsangchu-II and Mangdechu projects in the forthcoming agenda with deletion of the following works from the subject scheme:

- LILO of Tala-Siliguri 400kV D/c line at Alipurduar
- 4 nos. 400 kV line bays associated with above LILO at Alipurduar

**While members agreed initially to the above proposal, Director (SP&PA) CEA highlighted that the planned scheme is associated with evacuation and transfer of power from the existing/approved hydro projects (viz. Tala HEP, Wangchhu HEP etc.) in Bhutan, and deletion of the works proposed**



by CTU would be subject to concurrence of Bhutan. Members endorsed the same view.

#### **4.0 Transmission System for evacuation of power from Punatsangchhu-I (1200MW), Punatsangchhu II (990MW), Mangdechhu (720MW) and Wangchhu (570MW) HEPs in Bhutan**

Director, CEA stated that, Punatsangchhu-I (1200MW), Punatsangchhu II (990MW), Mangdechhu (720MW) and Wangchhu (570MW) HEPs in Bhutan are at various stages of development. Generations from these projects would be transferred to India after meeting small local demand in Bhutan. The associated transmission systems were evolved as part of the NTGMP (National Transmission Grid Master Plan) for Bhutan corresponding to 2020 and 2030 time frames. The project specific transmission system is given hereunder.

#### **4.1 Punatsangchhu-I (1200MW) (targeted to be commissioned by 2015)**

##### **Bhutan Portion:**

- 400kV step-up voltage
- 400kV Punatsangchhu-I - Sankosh/Lhamoizingkha Twin Moose 2xD/C (one D/C routing via Punatsangchhu-II HEP)
- Sankosh- Alipurduar 400 kV Quad Moose D/C line (Bhutan portion)
- 400/220kV, 4X105MVA ICT at Punatsangchhu-I
- LILO of 220kV Bosochhu-II – Tsirang S/C line at Punatsangchhu-I.
- 1X80MVAr 420 kV Bus Reactor at Punatsangchhu-I

##### **Indian Portion:**

- Sankosh- Alipurduar 400 kV Quad Moose D/C line (Indian portion beginning from Lhamoizingkha near Bhutan border)

#### **4.2 Punatsangchhu II HEP (990MW) (expected by 2017)**

##### **Bhutan Portion:**

- 400kV step-up voltage
- Loop-in-Loop-out(LILO) of one 400 kV D/C Punatsangchhu-I -Sankosh/Lhamoizingkha line at Punatsangchhu-II
- 400 kV Punatsangchhu-II - Jigmeling D/C line
- 1x80 MVAr 420kV Bus Reactor at Punatsangchhu-II HEP.

**Indian Portion:** as proposed in Punatsangchhu-I system.

#### **4.3 Mangdechhu HEP (720MW) (expected by 2017)**

##### **Bhutan Portion:**

- 400kV step-up voltage
- 400kV Mangdechhu- Goling 2x (S/C on D/C) tower line with twin moose conductor (stringing of 2P circuit in each line under Nikachhu HEP)
- 400kV Goling – Jigmeling 2x (S/C on D/C) twin moose tower lines
- 400kV Jigmeling - Alipurduar D/C Quad moose line (Bhutan portion).

- 400/220kV, 4X167MVA Jigmeling pooling station (GIS).
- 1X80 MVAR, 420kV Bus Reactor at Mangdechhu
- 1X80 MVAR, 420kV Bus Reactor at Jigmeling
- 132kV Mangdechhu-Yurmu D/C line
- 400/132kV, 4X67 MVA ICT (1st) at Mangdechhu

**Indian Portion:**

- 400kV Jigmeling - Alipurduar D/C Quad moose line (Indian portion beginning from Jigmeling near Bhutan border)

**4.4 Wangchhu HEP (570MW) (expected by 2019)**

Generation would be evacuated through the existing 400kV Tala transmission system and the associated transmission system is given below:

**Bhutan Portion:**

- 400kV step-up voltage
- LILO of one circuit of 400 kV Tala-Pugli-Siliguri D/C line at Wangchhu HEP
- 1x63MVAR 420 kV Bus Reactor at Wangchhu

**Indian Portion:** existing network will be utilized.

**4.5 Requirement of additional system strengthening in Indian portion:**

CTU explained their study results and stated that quantum of power flows on both Alipurduar – Siliguri 400kV D/c (Quad) line and Kishanganj – Darbhanga 400kV D/c (Quad) lines are significant under normal (**Annexure-2a**) and single pole outage of Alipurduar – Agra HVDC (**Annexure-2b**) bipole section. Accordingly, the following system requirements on the Indian side were proposed:

- (i) Jigmeling - Alipurduar 400kV D/C line with Quad moose conductor (Indian Portion)
- (ii) Alipurduar – Siliguri 400kV D/c line with Quad moose conductor
- (iii) Kishanganj – Darbhanga 400kV D/c line with Quad moose conductor.

Director CEA stated that the requirement of an additional 400kV quad D/C line from Alipurduar to Siliguri instead of LILO of 400 Tala-Siliguri D/C twin moose D/C line at Alipurduar was already discussed under item-3. It was reiterated that deletion above LILO would be subject to concurrence of Bhutan, and with this, members agreed to the above system strengthening works. Director(SP& PA) further highlighted that cross-border interconnection is having international perspective, and suggested the transmission lines at (i) and (ii) may be implemented by PGCIL on cost plus basis whereas transmission line at (iii) may be constructed on Tariff Based Competitive Bidding (TBCB) route.

CMD WBSEDCL and MS I/C ERPC opined that keeping in view the importance of the cross border power transfer, above three lines should be taken up by a

single agency preferably by Powergrid. Others Members unanimously agreed to get the above works done by POWERGRID on compressed time schedule.

COO CTU raised the emerging issue how to provide connection agreement/LTA for cross border power transfer to India, and desired the views of members. As the issue required through discussions, Member (PS) CEA suggested to hold a separate meeting of CEA, CTU, POSOCO & CERC shortly. Members agreed and welcomed the suggestion.

#### **5.0 Conversion of 50 MVAR Line Reactor presently installed at Jeerat end of Bahrapur - Jeerat 400 kV line to Bus Reactor in parallel with existing Bus Reactor at Jeerat**

Director (SP& PA), CEA informed that conversion of 50 MVAR fixed line reactor at Jeerat end of 400kV Jeerat-Baharampur section (140km) to switchable one was agreed in the 25<sup>th</sup> TCC/ERPC. Subsequently, CTU suggested to convert the line reactor to a switchable bus reactor in parallel with existing 63 MVAR Bus Reactor at Jeerat and it was agreed in the 26<sup>th</sup> TCC / ERPC meeting in January, 2014,

MS I/C ERPC opined that as of now there would be no requirement of this line reactor at Jeerat and the same could be shifted and installed as bus reactor at Baharampur. COO CTU explained that 50 MVAR line reactor could be utilized to control voltage. ERLDC opined that voltage at Jeerat in most occasion remains low, but sometimes experiences high voltage also. **After deliberations, members agreed to the proposal of putting 50MVAR fixed line reactor in parallel with existing bus reactor at Jeerat.**

#### **6.0 Modification in scheme for installation of 125 MVAR Bus Reactor at Jeypore (already approved in SCM on 08-02-2012).**

In view of high voltage problem at 400kV Jeypore substation (PG) and space constraints there, replacement of existing 63 MVAR bus reactor by 125 MVAR bus reactor at Jeypore was approved in the 1<sup>st</sup>-2012 Standing Committee held on 08-02-2012. Accordingly, the scheme is under implementation by POWERGRID as part of ERSS-VIII. CTU representative stated that during implementation, it was observed that space could be made available to install 125 MVAR bus reactor in parallel to the existing 63 MVAR bus reactor.

GM ERLDC informed that in view of lower short circuit level at Jeypore, 63+125 MVAR bus reactors are not required. Subsequently, CTU stated that Jeypore voltage often remains between 410 and 420kV (shown in Fig.1) and provision of the 125MVAR bus reactor would provide operation independently.

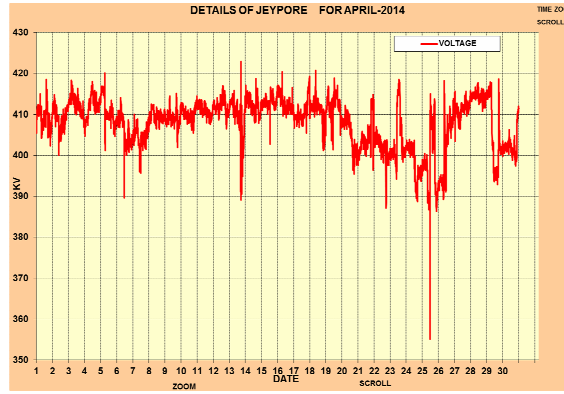


Fig 1: Voltage profile of 400kV Jeypore substation (PG)

**After deliberations, it was decided 125MVar bus reactor at Jeypore could be installed as separate bus reactor.**

## 7.0 Additional Reactive Compensation in Eastern Region

CTU informed that Eastern grid has been experiencing high voltage (shown in Fig. 2) and a review of the existing, under implementation and planned bus reactors in Eastern region indicates that there are 400 kV sub-stations having inadequate bus reactors. Therefore, it was proposed to install additional bus reactors at the following sub-stations (PG):

Sl.	Sub-Station	Status	Bus Reactor (MVar)		
			Existing	Under Imp.	Proposed
1	Banka	Existing	1x80	-	1x125
2	Bolangir	Existing	1x80	-	1x125
3	Baripada	Existing	-	1x125	1x125
4	Keonjhar	Existing	1x80	-	1x125
5	Durgapur#	Existing	1x50	2x125	1x125
6	Chaibasa	U/C	-	1x80	1x125
7	Lakhisarai	U/C	-	1x80	1x125

# Split bus arrangement under implementation

Director (SP& PA), CEA stated that sensitivity of voltage with an additional 125 MVar bus reactor each at 400kV Banka, Bolangir, Baripada, Keonjhar, Chaibasa & Lakhisarai sub-stations was studied by CTU and there would be reduction in voltage to the extent of upto 3 kV. CTU stated that the split bus arrangement at Durgapur sub-station is already under implementation, after which one split bus section at Durgapur would be left with only one bus reactor.

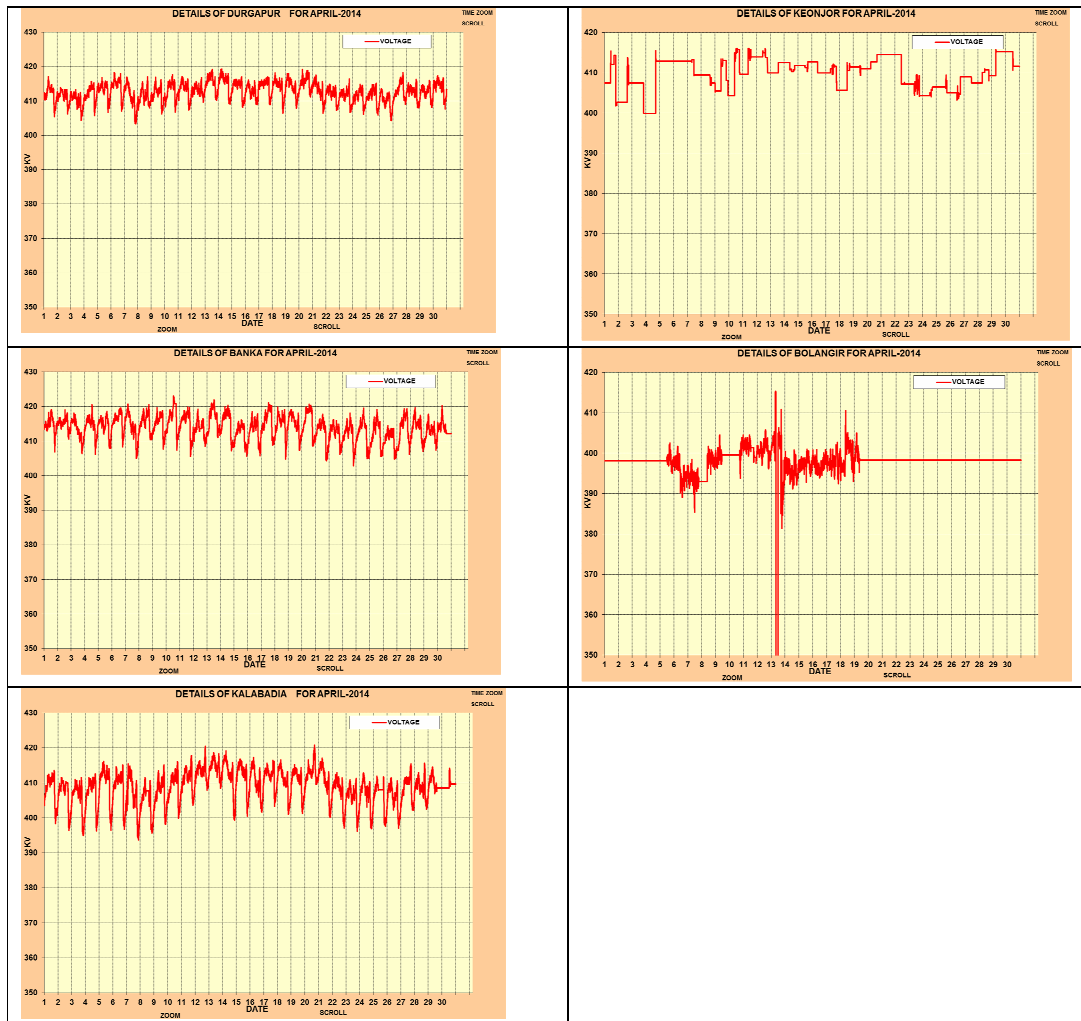


Fig. 2: Voltage profile of 400kV Banka, Bolangir, Baripada, Keonjhar, Chaibasa & Lakhisarai sub-stations

POSOCO stated that the arrangement at 400kV Durgapur S/S, consequent to bus splitting, could be informed so that no constraint arises in real time operation. CTU informed that the bus splitting arrangement at Durgapur was approved long ago and the same would be shared with POSOCO.

Keeping in view the high voltage profile at the above 400 kV sub-stations, and considering the extent of space availability there, proposal of CTU for installation 125MVar bus reactors with GIS bays (in parallel with the existing reactor wherever necessary) were agreed.

## 8.0 Evacuation of power from new sub-stations under Eastern Region Strengthening Scheme-III (ERSS-III)

Director (SP& PA), CEA stated that following new 400/220/132 kV sub-stations were / are being commissioned by POWERGRID under ERSS-III.

- **2x200 MVA, 400/132 kV sub-stations at Lakhisarai & Banka in Bihar**
- **2x315 MVA, 400/220 kV at Chaibasa & Daltonganj in Jharkhand**
- **2x315 MVA, 400/220 kV at Bolangir, Keonjhar & Pandiabil in Odisha**

However, the downlinking 220 & 132 kV lines/system to be developed by the concerned STU for power drawal and anchoring with 400kV system are yet to come up, causing non-utilization of the sub-stations developed by PGCIL and also great system operational problems.

In this context, OPTCL informed that LILO of Burla - Bolangir 220 kV line at Bolangir (PG) is expected to be completed by July-2014. Another outlet from Bolangir i.e. Bolangir (PG) - Kesinga 200 kV D/c line is under implementation and expected to be completed by June-2015. Regarding evacuation arrangement from Keonjhar (PG), OPTCL informed that Odisha dropped its proposal for new grid at Keonjhar due to non-materialization of industrial load there. Now, new 220 kV grid is being planned at Nayagarh (45 kms. from Keonjhar) which would be connected to Keonjhar (PG), and it would require at least 2 years. Regarding intra-state 220kV Pandiabil sub-station, OPTCL informed that Pandiabil – Puri 220 kV D/C and Pandiabil – Pratapsasan 220 kV D/C lines are being targeted for completion by June-2015.

With the above scenario, CEA, CTU and POSOCO expressed concern and stressed the need for implementation of the down linking system on priority basis by concerned STUs. MD, WBSEDCL suggested that in order to ensure timely utilization of 400kV ISTS sub-stations, some downstream networks should be considered as part of the main ISTS system and balance downstream network should be planned by respective STU. The suggestion was well taken and could be considered for future schemes.

## **9.0 (A) Transmission System associated with Odisha UMPP (4000 MW) (B) 765kV System Strengthening Scheme in Eastern Region**

### **(A) Transmission System associated with Odisha UMPP (4000 MW)**

Director (SP& PA), CEA stated that Odisha UMPP with an installed capacity of 4000 MW (5x800 MW) located at Bhedabahal in Odisha is expected to materialize during 2017-18. The step-up voltage is envisaged at 765kV for evacuation. It was mentioned that evacuation arrangement of Orissa UMPP project was earlier discussed in the Standing Committee Meeting held on 28-12-10. Now, CTU reviewed the system requirement based on revised system studies (report attached with the agenda) and proposed the following system requirements:

#### **I) Immediate evacuation system for Odisha UMPP:**

Generation would be evacuated at 765kV level by LILO of Angul - Jharsuguda 765kV D/c line at the UMPP and through 400kV transmission lines from 765/400kV step-down transformers at UMPP to 400kV sub-stations at Keonjhar (PG), Lapanga (OPTCL) and Kesinga (OPTCL). Odisha would inter-alia draw its share at Lapanga and Kesinga sub-stations being planned by OPTCL. Accordingly, the following UMPP switchyard provision and immediate evacuation arrangement were proposed.

#### **I-a) UMPP switchyard scope for evacuation system**

1. Generation to be stepped up at 765kV
2. 4 nos. 765 kV line bays
3. 6 nos. 400 kV line bays (suitable for quad conductor lines)
4. 2X1500 MVA, 765/400kV ICT (6 nos. 1-phase 500 MVA transformer connected with switching arrangement and 1 no. 1-phase 500 MVA standby transformer) with OLTC  $\pm 5.5$  %, along with associated bays at Generation Switchyard
5. 2x 240 MVAr Bus Reactor at 765 kV bus of Generation Switchyard with 1x80 MVAr 1-phase spare reactor
6. 2x125 MVAr Bus Reactor at 400 kV bus of Generation Switchyard
7. 2x240MVAr switchable line reactor along with 750 ohm NGR each corresponding to 2 no 765kV line bays.
8. 4x80MVAr switchable line reactor along with 450 ohm NGR each corresponding to 4 nos. 400kV line bays.
9. The 765KV and 400kV switchyard would be designed for 50KA and 63KA fault levels respectively.

#### **I-b) System for Immediate Evacuation of power from UMPP Project**

1. LILO of Angul - Jharsuguda 765kV D/c line at Odisha UMPP
2. Odisha UMPP – Lapanga (OPTCL) 400kV D/c line (quad moose or HTLS)
3. Odisha UMPP – Keonjhar (PG) 400kV D/c line (quad moose or HTLS)
4. Odisha UMPP – Kesinga (OPTCL) 400kV D/c line (quad moose or HTLS)

OPTCL needs to develop the proposed intra-state 400kV sub-stations at Lapanga and Kesinga matching with the UMPP.

#### **II) Associated System Strengthening requirements:**

The system strengthening inter-alia involves creation of a  $\pm 800$ kV, 6000MW HVDC corridor from Angul (Odisha) to a suitable location in NR/WR with 3000MW terminal at either ends initially. This corridor would be upgraded in future with addition of 3000MW terminal (2nd) at both ends of the line. The strengthening scheme also consists of establishment of 765/400kV substation at Jajpur Road in Odisha with 400kV high capacity interconnection to nearby 400kV substations viz. Duburi and Keonjhar and 765kV D/C line from Angul to Medinipur (proposed) via Jajpur Rd. The system requirements were proposed as following:

1.  $\pm$  800kV, 6000MW HVDC bipole line from Angul to suitable location in NR/WR with 3000MW terminal at either ends.
2. New 2x1500MVA, 765/400kV S/s at Jajpur Road
3. Angul – Jajpur Road 765kV D/c line
4. Jajpur Road – Medinipur 765kV D/c line#
5. Jajpur Road – Duburi 400kV D/c line (quad moose or HTLS)
6. Jajpur Road – Keonjhar 400kV D/c line (quad moose or HTLS)
7. Suitable AC Strengthening system at the remote end of the HVDC bipole line in NR/WR.

[#Creation of 765kV Medinipur S/S and forming of a 765kV ring in ER are envisaged under a separate system strengthening scheme in ER, as deiberated below].

### **(B) 765kV System Strengthening Scheme in Eastern Region**

Referring the study report (attached with the agenda), CTU explained with a presentation the future load generation scenario in ER (13th Plan) and stated that there would be a steady growth in the load all over the ER, but the major generation projects are envisaged in the central and western part of ER (Odisha, Jharkhand and Bihar), and no major generation addition is expected in the eastern part (West Bengal). The 765kV inter-state substations at Ranchi, Gaya, Angul and Jharsuguda/Sundergarh are being implemented by PGCIL to enable mainly to export power outside the region. In order to provide reliable and secure power supply within the region from various future generation sources and also to facilitate power exchange with the neighboring regions under various operating conditions, it was proposed to build a strong transmission network in ER optimizing RoW requirements by creating a 765kV ring/corridor viz. 765kV Ranchi (New)-Medinipur-Jeerat (New)-Katwa-Banka (New)-Gaya-Ranchi D/c ring with establishment of 765/400 kV new substations at Banka (New), Medinipur (in West Bengal), Jeerat (New) and Katwa (in West Bengal). These 765/400kV sub-stations would be interconnected with the nearby 400kV substations at Banka (PG), Gokarna (WBSETCL), Chanditala (WBSETCL), Kharagpur (WBSETCL), Durgapur(PG), Arambagh (WBSETCL), Rajarhat (PG) and Jeerat (WBSETCL) through 400kV high capacity D/c lines. Accordingly, following 765kV D/C transmission system was proposed:

#### **765kV strengthening system in Eastern Region**

1. Ranchi (New) – Gaya 765kV D/c line
2. Ranchi (New) – Medinipur 765kV D/c line
3. Medinipur – Jeerat (New) 765kV D/c line
4. Jeerat (New) – Katwa 765kV D/c line
4. Katwa – Banka (New) 765kV D/c line
5. Banka (New) – Gaya 765kV D/c line
6. New 2x1500MVA, 765/400kV S/s at Medinipur, Jeerat (New), Katwa & Banka (New)
7. Medinipur – Arambagh (WBSETCL) 400kV D/c line (quad moose or HTLS)
8. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur
9. Jeerat (New) – Jeerat (WBSETCL) 400kV D/c line (quad moose or HTLS)
10. Jeerat (New) – Rajarhat (PG) 400kV D/c line (quad moose or HTLS)



11. LILO of Chandithala – Gokarna (WBSETCL) 400kV D/c line at Katwa
12. Katwa – Durgapur (PG) 400kV D/c line (quad moose or HTLS)
13. Banka (New) – Banka (PG) 400kV D/c line (quad moose or HTLS)

POSOCO stated that the power flow is generally expected to be from Angul to Jharsuguda/Sundergarh and onwards, and the possibility of locating HVDC at Jharsuguda rather than Angul could be explored. It was suggested that delinking the 765kV Angul - Jajpur Road - Midnapore line from Odisha UMPP and associating the same with 765kV transmission network in ER could help in providing a strong ring.

CTU explained that both Angul and Jharsuguda/Sundergarh would be major power hubs, but many generation projects of large installed capacity are expected to come at Angul and therefore, providing HVDC corridor right from Angul would additionally help in relieving the loading on Angul - Jharsuguda corridor.

After detailed discussions, members agreed to the overall concept and necessity of 765 kV ring. It was also opined that location of new 765kV substations should be finalized in consultation with respective STUs for better utilization of the 765kV high capacity ring. OPTCL commented that as the load in Keonjhar not coming up, the 765/400kV Jajpur Road could be initially connected to Duburi only. WBSETCL suggested 765/400kV substation at Gokarna (New) in place of Katwa would be technically better location. They had also referred to their intra-state system plan and stated that the 400kV connectivity between the nearby 400kV substations and the proposed 765/400kV substations at Medinipur, Jeerat (New) and Gokarna (New) would provide better flexibility to meet its future load growth.

BSPTCL could not attend the meeting, but subsequently commented on the proposal of 765kV ring on the SCM agenda and they prima-facie felt the technical requirement for creation of the ring.

Based on the suggestions of POSOCO, OPTCL, WBSETCL and other members, the proposal was subsequently reviewed and a revised study report of CTU explaining (A) 765kV transmission system in ER and (B) Transmission system associated with Odisha UMPP project is enclosed at **Annexure-3**.

As explained in the study report, the modified transmission systems finalized in consultation with STUs are as given below:

**(A) 765kV system strengthening in Eastern Region – Revised**

1. Establishment of 765/400 kV new substations at Banka (New), Gokarna(New), Medinipur, Jeerat (New) and Jajpur Road.
2. Angul – Jajpur Road 765kV D/c line
3. Jajpur Road – Medinipur 765kV D/c line
4. Ranchi (New) – Medinipur 765kV D/c line
5. Medinipur – Jeerat (New) 765kV D/c line

6. Jeerat (New) – Gokarna (New) 765kV D/c line
7. Gokarna(New) – Banka(New) 765kV D/c line
8. Gaya – Banka (New) 765kV D/c line
9. Gaya – Ranchi (New) 765kV D/c line
10. Jajpur Road – Duburi 400kV D/c line (quad/HTLS)
11. Medinipur – Haldia New (NIZ) (WBSETCL) 400kV D/c line (quad/HTLS)
12. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur
13. Jeerat (New) – Subhasgram 400kV D/c line(quad/HTLS)
14. Jeerat (New) – Jeerat 400kV D/c line (quad/HTLS)
15. LILO of Sagardighi – Subhasgram 400kV S/c line at Rajarhat
16. LILO of Sagardighi – Rajarhat 400kV S/c line (formed through LILO of pt. 15) at Jeerat
17. Gokarna (New) – Gokarna 400kV D/c line (quad/HTLS)
18. Gokarna (New) – Durgapur (PG) 400kV D/c line (quad/HTLS)
19. Banka (New) – Banka 400kV D/c line (quad/HTLS)

**(B) Evacuation system for Odisha UMPP project – Revised**

*(a) Scope of evacuation arrangement at UMPP switchyard*

1. Generation to be stepped up at 765kV
2. Provision for Split Bus Arrangement on 765kV UMPP Bus
3. 4 no. 765 kV line bays
4. 6 no. 400 kV line bays (suitable for quad conductor lines)
5. 2X1500 MVA, 765/400kV ICT with OLTC +/- 5.5 % (as per CEA Standard for 765kV Substation Equipment) (7 nos 1-phase 500 MVA transformer connected with switching arrangement for 1 no. standby transformer) along with associated bays at Generation Switchyard
6. 2x 240 MVAR Bus Reactor at 765 kV bus of Generation Switchyard
7. 2x125 MVAR Bus Reactor at 400 kV bus of Generation Switchyard
8. 2x240MVAR switchable line reactor along with 750ohm NGR each corresponding to 2 no 765kV line bays.
9. 4x80MVAR switchable line reactor along with 450ohm NGR each corresponding to 4 no 400kV line bays.
10. 1x80 MVAR 1-phase 765kV spare reactor.
11. The 765KV and 400kV switchyard may be designed for 50kA and 63kA fault levels respectively.

*(b) For Immediate Evacuation of power from UMPP Project*

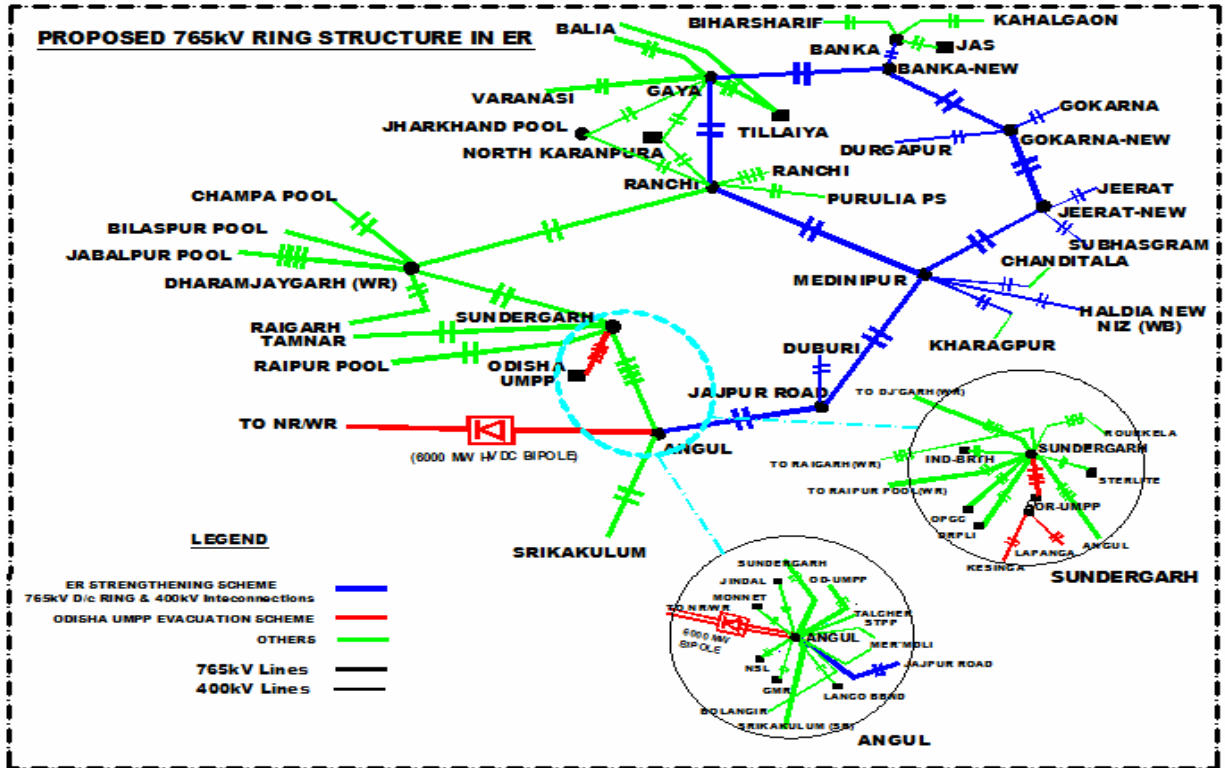
1. Odisha UMPP – Sundergarh (Jharsuguda) 765kV 2xD/c line
2. Odisha UMPP – Lapanga 400kV D/c line (quad/HTLS)
3. Odisha UMPP – Kesinga 400kV D/c line (quad/HTLS)

*(c) System Strengthening Scheme associated with Odisha UMPP*

1.  $\pm 800$ kV, 6000MW HVDC bipole line from Angul to suitable location in NR/WR with 3000MW terminal at either end.

- Suitable AC strengthening system at the remote end of the HVDC bipole line in NR/WR.

The corresponding schematic diagram is given below:



- Augmentation of Transformation capacity at 400/220kV Baripada S/S (PG)-Addition of 1x500 MVA, 400/220 kV ICT with GIS bays at Baripada 400/220/132kV sub-station of POWERGRID

Director (SP & PA), CEA informed that the loading on the existing Baripada 2x315 MVA ICTs is exceeding 400MW on several occasions with maximum loading up to 501 MW. POWERGRID has proposed for augmentation of transformation capacity by an additional 1x500MVA ICT as tripping of any one of the ICTs may lead to overloading of the other ICT and might cause cascaded tripping of remaining ICTs in service leading to complete outage. The matter was discussed in the Standing Committee Meeting of Eastern Region held on 27-08-2013 wherein OPTCL informed that they have planned to shift the load of Baripada sub-station to nearby sub-stations, which would reduce the loading on Baripada ICT and accordingly the proposal was dropped.

The matter was further discussed in the 25<sup>th</sup> TCC / ERPC meeting held on 20-21 September, 2013 wherein ERLDC informed that, in view of load growth of OPTCL, augmentation of ICT could be considered. OPTCL agreed to the proposal of additional 500 MVA, 400/220kV ICT at Baripada S/s and accordingly the proposal was approved by the ERPC. **Members agreed.**

**11. Replacement of 1X100 MVA 220/132kV, 3<sup>rd</sup> ICT with 1X160 MVA, 220/132 kV ICT at Purnea 220/132 kV sub-station of POWERGRID, along with necessary bay eqpt/protection system**

Director (SP& PA), CEA informed that 220/132 kV Purnea sub-station of POWERGRID is having 3 nos. ICTs, 2 of 160 MVA each and the 3<sup>rd</sup> one of 100 MVA. In view of increased power demand in the area and on request of BSPHCL, ERPC in its 25<sup>th</sup> meeting held on 20-21 September, 2013, approved replacement of 3<sup>rd</sup> 100 MVA ICT with 160 MVA ICT. 100 MVA ICT thus released shall be kept in the pool of spare ICTs. **Members agreed.**

**12. Augmentation of transformation capacity of 220/132 kV Birpara (PG) and Silliguri S/s (PG)**

Director(SP& PA), CEA informed that as per Standing Committee Meeting (20.09.10) on Power System Planning for ER, augmentation of 220/132kV Silliguri and Birpara S/S has been carried out by addition of 1 no. 160 MVA ICT in parallel to existing 100MVA ICT under ERSS-IV. During 59<sup>th</sup> OCC, it was discussed that the transformation capacity of 100 MVA ICT at Silliguri (PG) is inadequate to cater to peak load of North Bengal and Sikkim because of degradation over its expected life span of 25 years. The condition of 100 MVA ICT at Birpara is also similar. Even after reconditioning at respective site, the condition of transformer has not improved. As per the decision taken in the 25<sup>th</sup> TCC / ERPC meeting held on 20-21 September, 2013, and after deliberation, **members agreed to the following:**

- Replacement of existing 100 MVA, 220/132kV ICTs with 1X160 MVA, 220/132 kV ICT at Siliguri 220/132 kV sub-station of POWERGRID, along with necessary bay eqpt/protection system.
- Replacement of existing 100 MVA, 220/132kV ICTs with 1X160 MVA, 220/132 kV ICT at Birpara 220/132 kV sub-station of POWERGRID, along with necessary bay eqpt/protection system.
- The 100 MVA ICTs (2 nos.) may be kept as emergency spare for the time being.

**13. Modification of 132kV bus arrangement at 220/132kV Purnea Substation with GIS**

In order to improve reliability of 132/220kV system, the existing Single Main & Transfer Bus Scheme at 132kV level and Double Main & Transfer Bus Scheme at 220kV level at 220/132kV Purnea Substation (PG), Director (SP& PA), CEA stated that the proposal of CTU for upgrading the 132kV bus scheme into Double Main Scheme was approved in the 25<sup>th</sup> TCC / ERPC meeting held on 20-21 September, 2013. It was also proposed that for any space constraint, 132kV GIS bays could be considered. **Members agreed.**

**14. Construction of 4 nos. 220 kV line bays at Kishanganj sub-station of POWERGRID/ Construction of down linking Transmission network for drawl of power from Kishanganj 400/220 kV Sub-Station of POWERGRID & Installation of 3<sup>rd</sup> 400/220 kV ICT (500 MVA) at Kishanganj**

Director(SP& PA), CEA stated that BSPTCL has planned to establish their new 220/132 kV sub-station at Kishanganj to be connected to upcoming Kishanganj 400/220 kV 2x315 MVA sub-station (PG) through 2 nos. 220 kV high capacity D/C lines. Accordingly, on the proposal of BSPHCL for providing 4 nos. 220 kV line bays at Kishanganj (PG) under the regional scheme, CEA vide its letter dated 16-09-2013 accorded in-principle approval.

Further, with above addition of 220 kV outlets at Kishanganj, there would be altogether 8 nos. 220 kV outlets (4 nos. for Kishanganj-BSEB & 4 nos. for LILO of Siliguri – Dalkhola 220 kV D/c). It was felt that 2 nos. 315 MVA transformers would not be adequate to extend power supply in power starved north Bihar & northern West Bengal and therefore proposed for the 3<sup>rd</sup> ICT with a capacity of 500MVA. After deliberation, **Members agreed to the provision of 4 nos. 220KV line bays and 3<sup>rd</sup> ICT of 500MVA capacity at Kishanganj (PG) under regional scheme.**

**15. Modification of 132kV Bus arrangement at 220/132kV Birpara Sub-station of POWERGRID**

Director (SP& PA), CEA stated that In order to improve reliability of 132 kV systems at Birpara, existing 132kV single Main & Transfer Bus Scheme was proposed to be upgraded to Double Main Scheme. Considering the importance of 132kV Birpara substation, modification of 132kV Bus arrangement along with switchgear at 220/132kV Birpara substation of POWERGRID was agreed. It was also considered and agreed that for any space constraint, 132 kV GIS bays could be also adopted at Birpara (PG).

**16. Signing of LTA Agreements for Darlipalli Generation Plant of NTPC**

CTU informed that LTA was granted to NTPC for the Darlipalli Plant (2x800 MW) in Odisha. The beneficiaries of this plant are Bihar, Jharkhand, Sikkim and West Bengal. As per CERC Regulations, LTA Agreements are to be signed by beneficiaries. Accordingly, draft LTA Agreement was sent to all the DICs in Aug, 2013. But, in spite of persuasion, the signing of the same is still pending. Director, CEA emphasized that the implementation of Associated Transmission system could only be taken up after signing of LTA Agreement by the above beneficiaries, and requested all the DICs to sign the agreement without any further delay.

Sikkim and West Bengal re-iterated that they would not sign the agreement till the PoC issue pending with the court gets resolved. CTU/POWERGRID informed that construction of immediate evacuation system for Darlipalli TPS has been entrusted to POWERGRID by Ministry of Power, Govt. of India for

implementation under compressed time schedule. If implementation of the system gets delayed due to delay in signing of agreement by beneficiaries, POWERGRID should not be held responsible. NTPC representative requested beneficiaries to sign the agreement without further delay. **After discussions, Member (PS), CEA directed Chief Engineer I/C (SP&PA), CEA to convene a separate meeting to discuss the issue and convey the deliberations to Ministry of Power, Govt. of India.**

#### 17. Signing of Transmission Service Agreement (TSA)

Director(SP& PA), CEA highlighted that as per the provisions of the CERC (Sharing of Inter State Transmission Charges and Losses) Regulations, 2010, which was implemented w.e.f. 01.07.2011, all the DICs are required to enter into a Transmission Service Agreement (TSA) with CTU. CTU informed that ER beneficiaries namely, Bihar, Odisha, Jharkhand, West Bengal, DVC and Sikkim have not yet signed the TSA, and these States have gone to Delhi High Court against the Regulation and the case is pending. However, based on the interim order dated 30.07.2013 of Delhi High Court, the above DICs/States are making full payment, but re-iterated their stand not to sign the agreement till the PoC issue is pending with the court.

#### 18. Transmission System for Phase-I Generation Projects in Sikkim

Director (SP& PA), CEA requested the generation developers to update the status of progress of generation project, immediate evacuation system and associated line bays for termination of line at POWERGRID sub-station. The updated status is as given below:

##### A. Generation Project:

Sl.	Generation Project	Comm. Schedule BPTA / Revised	Ins. Cap. (MW)	LTOA Quantum (MW)
1	Teesta-III	Aug-11 / Jan-15	1200 (6x200)	1200
2	Teesta-VI	Nov-12 / Apr-16	500 (4x125)	500
3	Jorethang	Apr-12 / Oct-14	96 (2x48)	96
4	Rangit-IV	Jun-13 / Jun-16	120 (3x40)	120
5	Rongnichu	Sep-14 / Dec-17	96 (2x48)	96
6	Chuzachen	Sep-12 / Apr-13 (Commissioned)	99 (2x49.5)	99
7	Bhasmey	Jun-12 / Mar-17	51 (2x25.5)	51
			<b>2162</b>	<b>2162</b>

## B. Immediate Evacuation: Implementation by Generation Developer

- Teesta-III : Teesta-III - Kishanganj 400kV D/c line with Quad Moose conductor : Expected by March-2015
- Jorethang : Jorethang – New Melli 220kV D/c line : Expected by Sep-2014
- Rangit-IV : Rangit-IV – New Melli 220kV D/c line : Expected by June-2015
- Chuzachen : Chuzachen – Rangpo 132kV D/c line with Zebra conductor : Line completed, 2 nos. 132 kV line bays to be awarded by Govt. of Sikkim
- Rongnichu : Rongnichu – Rangpo 220kV D/c line with Zebra conductor : To be implemented by the developer matching with the commissioning of generation project.
- Bhasmey : LILO of one ckt of Chuzachen-Rangpo 132kV D/c line at Bhasmey : To be implemented by Govt. of Sikkim matching with the commissioning of the generation project
- Teesta-VI : Teesta-VI – Rangpo 220kV D/c line with Twin Moose conductor : Expected by June-2015

CTU explained that Chuzachen HEP (99MW) was provided with an interim arrangement through LILO of Gangtok-Melli 132kV S/c line upto Rangpo, where Chuzachen-Rangpo 132kV D/c has been connected forming Chuzachen-Gangtok and Chuzachen-Melli 132kV S/c lines. Once Rangpo sub-station (PG) is commissioned, the interim arrangements would be withdrawn to connect Chuzachen directly with Rangpo sub-station through Chuzachen - Rangpo 132 kV D/c line. Otherwise, even after commissioning of Rangpo sub-station, LTA granted to Chuzachen HEP would not commence. The generation developer informed that implementation of 2 nos. 132 kV line bays for termination of Chuzachen – Rangpo 132 kV D/c line at Rangpo is under the purview of Govt. of Sikkim. Representative of Govt. of Sikkim stated that they are taking up the work on top priority.

The generation developer/applicant was requested to furnish progress of generation project and immediate evacuation system on regular basis.

## 19. Connectivity / Open Access for Phase-II Generation Projects in Sikkim

Generation developers informed the latest status of generation project, immediate evacuation system and associated line bays for termination of line at POWERGRID sub-station as given below:

### Generation Projects:

SI No	Project	Ins. Cap (MW)	LTOA (MW)	Applied for	Remarks	Expected Commissioning Schedule
1.	Tashiding (Shiga Energy Pvt. Ltd.)	97	97	LTOA	LTOA Granted, LTTA signed /BG submitted Dedicated system under scope of Generation Developer	Dec-2015

2.	Dikchu (Sneha Kinetic Power Projects Ltd.)	96	96	Connectivity & LTA	LTA Granted LTTA not signed & BG not submitted. Dedicated system under Govt. of Sikkim.	May-2015
3.	Panan Himagiri Hydro energy Ltd.	300	300	Connectivity	To apply for LTA.	April-2018
	<b>Total</b>	<b>592</b>	<b>592</b>			

## **A. Transmission System for Tashiding HEP (97 MW)**

### **A1. Immediate Evacuation System (under the scope of Generation Developer)**

- Tashiding - Legship 220kV D/c line

### **A2. Common Transmission System under the scope of Govt. of Sikkim**

- Establishment of 220kV substation at Legship
- Legship - New Melli 220kV D/c with twin moose conductor

Director (SP& PA), CEA stated that the intra-state 220kV Legship sub-station is to be established by Govt. of Sikkim and if they do not take timely action in this case the generation of Tashiding HEP could get bottled up similar to that of Dikchu generation. Representative of Govt. of Sikkim confirmed that the sub-station would be made available matching with commissioning of Tashiding – Legship 220 kV D/c line.

## **B. Transmission System for Dikchu HEP (96MW)**

### **B1. Immediate Evacuation System (under the scope of Govt. of Sikkim)- (re-planned)**

- Dikchu - New Gangtok (Bermiok) - Rangpo (Samardong) 220 kV D/c line with twin moose conductor ( to be operated initially at 132kV)
- Dikchu - Singhik 220 kV D/c line with twin moose conductor ( to be operated initially at 132kV)
- Establishment of 2x50MVA, 132/66kV substation at Rangpo (Samardong)

Energy & Power Department, Govt. of Sikkim vide letter dated 07-11-2013 informed that the above works related to the power evacuation and drawal of the State's share from Dikchu HEP, has been included as a part of the intra state Comprehensive scheme related to the strengthening of the Transmission & Distribution system in Sikkim to be executed through Central Government funding, and MoP is processing the case for the Govt's approval. Sikkim representative stated that even after the scheme is approved, the re-survey, design & tendering and the land acquisition for both forest and private lands



would take a minimum of 12 months, and implementation of the aforesaid intra-state evacuation arrangement for Dikchu would get considerably delayed leading to the generation getting stranded.

The developer of Dikchu stated that the commissioning schedule of the project is May 2015 and added that in view of the severe ROW problem in the state of Sikkim and implementation of the 220kV Dikchu - New Gangtok (Bermiok) - Rangpo (Samardong) 220kV line (to be operated at 132kV) line of about 30km long would take at least 3 years from the commencement of construction.

In view of the above, Energy & Power Department, Sikkim as well as Dikchu developer requested to consider their proposal for alternate evacuation arrangement by LILoing one circuit of Teesta-III - Kishanganj 400 kV D/c at Dikchu HEP.

The matter was discussed in detail including technical and regulatory issues involved for considering the 400kV LILo proposal as an interim evacuation arrangement to be withdrawn after the Dikchu-Rangpo line is commissioned. After deliberation, it was felt that the matter needs to be discussed in details. *Member (PS) CEA advised Chief Engineer I/C (SP&PA) to convene a separate meeting with project developers, CTU, POSOCO and Govt. of Sikkim to finalize the matter.*

**C. Connectivity Application of 300MW Panan HEP (Himagiri Hydro energy Ltd.)**

CTU informed that the application of Panan HEP for grant of Connectivity to its 1x300 MW generation project was discussed in the 2<sup>nd</sup> 2013 SCM meeting held on 27-08-2013 regarding connectivity & LTA wherein the generation developer had informed about financial closure by Oct'13. Now the generation developer informed that the land is under possession, Forest Clearance and Environment clearance were obtained, financial closure was achieved on 06-03-2014, civil works have been awarded and the 1<sup>st</sup> unit is expected to be commissioned in April-2018. CTU/POWERGRID requested the generation developer to apply for LTA at the earliest so that the transmission system could be finalized and implemented in time. The generation developer assured to submit the LTA application very soon.

**20. Transmission System for Phase-I Generation Projects in Jharkhand**

The generation developers updated the latest status of progress of generation project, immediate evacuation system and associated line bays for termination of line at POWERGRID sub-station as given below:

**A. Generation Project:**

Sl No	Applicant	Comm. Schedule BPTA / Revised	Ins. Cap. (MW)	LTOA Quantum (MW)
1.	Adhunik Power & Natural Resources Limited	Jan & Mar-12 / Jan & May-13 (Commissioned)	540 (2x270)	450

2.	Essar Power (Jharkhand) Ltd.	Mar & May-13 / Dec-16	1200 (2x600)	1100
3.	Corporate Power Limited Ph-I	May & Jul-12 / Uncertain	540 (2x270)	480
4.	Corporate Power Limited Ph-II	Sep & Dec-13 / Uncertain	540 (2x270)	480
5.	WBSEDCL	Prog. by 14-15 / Prog. by 14-15	1000 (State Surplus)	1000
	<b>Total</b>		<b>3820</b>	<b>3510</b>

CTU/POWERGRID informed that the Jharkhand Pool substation (PG) is already under construction and the generation developers viz. Essar and Corporate-II need to ensure that their dedicated transmission line alongwith associated line bays at Jharkhand pool get commissioned matching with the commissioning schedule of the Jharkhand Pool substation.

Essar Power informed that all project activities have been stopped due to de-allocation of coal blocks by Ministry of Coal in Feb'14 and matter is sub-judice. No funds are being released by lenders till the coal blocks issue is resolved. However, it was informed that the 1<sup>st</sup> unit could be expected to be commissioned by the end of 2016 onwards subject to regulatory clearances for the coal blocks.

Corporate Power informed that they are facing severe financial crisis, all project activities are on hold and, future of the generation project is quite uncertain.

CTU stated that the transmission system is already under implementation and therefore generation developers are liable to pay applicable transmission charges as and when the transmission system gets commissioned.

POWERGRID further explained that even if the Essar and Corporate-II generators fail to connect their dedicated line to Jharkhand pool substation, the Jharkhand Pool – Ranchi and Jharkhand Pool –Gaya lines would be useful interconnection between Ranchi and Gaya and would help in wheel power from ER to NR as well as from WR to NR via ER.

CTU/POWERGRID also informed that Corporate Power is not making payment of its MTOA bills to POWERGRID and requested members to impress upon the generation developer to pay the outstanding bills within 2 months. Members agreed with the proposal and also decided that in case of nonpayment of MTOA bills to POWERGRID within 2 months, CTU may request CERC for penal action like cancellation of Connectivity & LTA.

## **21. Request of Essar Power (Jharkhand) Ltd. for extension of date of commencement of LTA**

CTU informed that Essar Power (Jharkhand) Ltd. was granted LTA for 1100 MW power from its 2x600 MW generation project in Latehar district of Jharkhand. The transmission system viz. High Capacity Transmission Corridor for Jharkhand IPPs is under implementation by POWERGRID / Private Sector Transmission Licensee. The generation developer has signed necessary

commercial agreements with POWERGRID / Private Sector Transmission Licensee for payment of transmission charges after commissioning of the transmission system.

Now, the generation developer vide its letter dated 14-02-2014 & 20-02-2014 intimated that their generation project is getting delayed due to various unforeseen reasons and could be expected to be commissioned by the end of 2016. Accordingly, the generation developer requested to extend the date of commencement of its LTA to the end of December-2016.

CTU informed that as per CERC regulations and the commercial agreements signed between the generation developer and POWERGRID / Private Sector Transmission Licensee, the generation project is liable to pay the applicable transmission charges w.e.f date of commercial operation of the transmission system.

**22. Connectivity & LTA Application of Jindal Steel and Power Ltd (IC: 1320 MW; Connectivity: 1320 MW; LTA: 300 MW to NR)**

Director (SP& PA), CEA stated that the issue of connectivity & LTA of Jindal Steel and Power was discussed in the LTA meeting in January & July, 2013 wherein POWERGRID enquired about the transmission arrangements planned for transfer of power from the generation project to the proposed captive steel plant. The generation developer informed that the same shall be intimated shortly. Accordingly, it was decided to process the application after the desired details are furnished by the generation developer.

The generation developer informed that they will submit the fresh application by the end of May-2014. CEA and CTU requested the generation developer to furnish the evacuation plan for balance power to be available from the generation project along with the fresh application.

**23. Connectivity / LTA granted to JAS Infrastructure (Bihar) : (IC-1320MW, Connectivity & LTA -1200MW)**

CTU informed that based on deliberations in the Connectivity / LTA meeting held on 08-02-2012 at NRPC, New Delhi, intimations for grant of Connectivity and LTA were issued to the generation developer with the following transmission system :

Transmission system for immediate evacuation of the project  
(Under the scope of generation project)

- JAS TPS – Banka (POWERGRID) 400kV D/c line with triple snowbird conductor

Common Transmission system  
(To be implemented under Tariff Based Competitive Bidding)

- Banka – Gaya 765kV D/c (to be operated at 400kV)

The generation developer had signed the Long Term Access Agreement (LTAA) with POWERGRID and assured to submit the Bank Guarantee by 31<sup>st</sup> January, 2013. However, the same is yet to be furnished.

The generation developer requested for further time extension of 6 months. The matter was discussed and it was decided that if the generation developer could not submit the Bank Guarantee by 31-05-2014, the Connectivity & LTA shall be cancelled and the Application Bank Guarantee shall be encashed.

#### **24. Revision in LTA granted to Lanco Babandh in Odisha**

Director(SP& PA), CEA informed that Lanco Babandh Power Pvt. Ltd. (LBPL) vide our letter dated 14-05-2009 was granted Long Term Open Access for transfer of 1600 MW from its 4x660 MW generation project in Odisha. Further, LBPL signed the Bulk Power Transmission Agreement (BPTA) with POWERGRID and submitted the requisite Construction Bank Guarantee for Rs. 80 Crores. The associated transmission system is under implementation as part of High Capacity Power Transmission Corridor namely Transmission System for Phase-I Generation Projects in Odisha.

Subsequently, LBPL submitted a petition (Petition No. 118/ MP/2012) in CERC stating that the generation developer would not be able to commission 2 out of 4 units of its proposed generation projects in Odisha. The Hon'ble Commission (CERC) vide its order dated 08-06-2013 allowed the petitioner to relinquish the long-term access rights to the tune of 800 MW, without payment of any compensation. In view of the above, the LTA quantum needs to be revised.

Lanco Babandh vide letter dated 19-02-2014 has informed that they have signed PPAs with Uttar Pradesh and Rajasthan for 424 MW and 350 MW respectively. Accordingly, they have requested to revise the LTA quantum as following:

##### **Original Quantum:**

Installed Capacity : 4x660 MW = 2640 MW  
LTOA Quantum : 4x400 MW = 1600 MW  
Target Regions : NR-650MW & WR-950MW

##### **Revised Quantum:**

Installed Capacity : 2x660 MW = 1320 MW  
LTOA Quantum : 2x400 MW = 800 MW  
Firm Beneficiaries : Uttar Pradesh-424MW & Rajasthan-350MW  
Target Beneficiaries : Western Region – 26 MW

Members noted the same. POWERGRID informed that the revised intimation for grant of LTA shall be issued after confirmation from Uttar Pradesh and Rajasthan.

#### **25. Request of Sterlite Energy Ltd. for cancellation of 1000 MW LTA**

CTU informed that Sterlite Energy Ltd. was granted Connectivity / LTOA / LTA for 400 MW for their project under phase-I IPPs in Odisha, and granted 1000 MW connectivity/LTA for their units implemented under phase-II IPPs in Odisha. Accordingly, Sterlite Energy Ltd. has signed the BPTA and submitted requisite construction Bank Guarantee.

As the associated transmission system was under implementation and the generation project was to be commissioned, following interim arrangements were made for connecting the generation project with the regional grid.

**Interim arrangement for phase-I (400 MW LTOA)**

LILO of one circuit of Rourkela – Raigarh 400 kV D/c (1<sup>st</sup> line) at Sterlite

**Interim arrangement for phase-II (1000 MW LTA)**

LILO of one circuit of Rourkela – Raigarh 400 kV D/c (2<sup>nd</sup> line) at Sterlite

The transmission system for phase-I IPPs in Odisha including 400 MW of Sterlite is already under implementation by POWERGRID & private sector. The process of implementation for the transmission system for phase-II IPPs in Odisha including 1000 MW of Sterlite is to be initiated by the Empowered Committee.

Now, Sterlite Energy Ltd. vide its letter dated 09-09-2013 has requested POWERGRID to annul their phase-II LTA of 1000 MW due to issues like non-availability of coal, long term buyers etc. Further, Sterlite has also requested to allow it to maintain the proposed connectivity with Jharsuguda pooling station and release the construction bank guarantee.

Members discussed the issue as it was informed that the cancellation of 1000MW LTA by Sterlite would be associated with exit charges as per CERC Regulation. Sterlite may however approach the Hon'ble CERC similar to the case like Lanco Babandh and Navabharat in Odisha.

POSOCO stated that the interim arrangement of Sterlite is continuing even after the 400kV Jharsuguda substation had been commissioned for over a year. The dedicated line from Sterlite to Jharsuguda need to be completed without any further delay.

In this regard, the generation developer informed that they have planned to commission the 22 km long dedicated transmission line from Sterlite generation project to Jharsuguda by November-2016. The generation developer was requested to submit regular progress reports for generation project as well as immediate evacuation system.

POWERGRID stated that generation developer is not serious about construction of the dedicated transmission system and is continuing with the interim arrangement which is detrimental for the security of the grid. It was informed that Sterlite would be liable to pay the transmission charges once the

transmission system is commissioned however the scheduling under LTA would commence only when the dedicated transmission system upto Jharsuguda is commissioned.

## 26. Common Transmission System for Phase-II Generation Projects in Odisha

Director(SP& PA), CEA informed that 4 no. generation projects in Odisha with total installed capacity of 3270MW and LTA quantum of about 2600MW have been granted connectivity /LTA under Phase-II. The list of the generation projects along with associated transmission scheme is given below.

### A. Generation Projects

SI No	Applicant	Installed Capacity (MW)	LTA Quantum (MW)	Commissioning Schedule	Target Beneficiary Regions			
					WR	SR	NR	ER
1.	Sterlite Energy Ltd.	Included under Phase-I (2400 MW)	1000	Already Commissioned	400	-	400	200
2.	GMR Kamalanga Energy Ltd	350 (1x350)	220	Sep, 2017	220	-	-	-
3.	OPGC	1320 (2x660)	600	July, 2017	200	200	200	-
4.	Darlipalli	1600 (2x800)	793.25	Oct 2016	-	-	-	793.25
	<b>Sub-Total</b>	<b>3270</b>	<b>2613.25</b>		<b>820</b>	<b>200</b>	<b>600</b>	<b>993.25</b>
5.	Srikakulam	1320 (2x660)	1240	Jun'15		1240		
	<b>Total</b>	<b>6990</b>	<b>3853.25</b>		<b>820</b>	<b>1440</b>	<b>600</b>	<b>993.25</b>

### B. Transmission System

#### B1. Transmission System for Immediate Evacuation of Generation Projects

1. **GMR Kamalanga Energy Ltd (350 MW)** : Through Ph-I System i.e. GMR-Angul 400kV D/c line
2. **Sterlite Energy Ltd. (2400 MW)** : Sterlite – Jharsuguda 400 kV D/c line
3. **OPGC (1320 MW)** : OPGC – Jharsuguda 400 kV D/c (triple snowbird) line
4. **Darlipalli (1600 MW)** : Darlipalli – Jharsuguda 765 kV D/c line
5. **Srikakulam (1320 MW)** : Srikakulam – Srikakulam Pool 400 kV D/c line

#### B2. Common transmission system:

##### 1. Being Implemented by POWERGRID

- Angul – Jharsuguda (Sundargarh) – Dharamjaygarh 765 kV D/c line.

*This line is being implemented by POWERGRID as a part of evacuation system from generation projects in Srikakulam area of Andhra Pradesh in Southern region. The same would also be utilized for evacuation of power phase-II generation projects in Odisha.*

##### 2. To be implemented through Tariff based Competitive Bidding Route

- Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line. (350 km)
- LILO of both circuits of Rourkela - Raigarh 400 kV D/c (2<sup>nd</sup> line) at Jharsuguda (Sundargarh). (50 km)

### 3. To be implemented by POWERGRID

- Addition of 2x1500MVA, 765/400kV ICT at Jharsuguda (Sundargarh).
- Addition of 2x1500MVA, 765/400kV ICT at Angul
- Split bus arrangement at 400kV and 765kV bus in both Angul and Jharsuguda (Sundargarh) substations.

As mentioned above, the scheme includes Angul-Jharsuguda-Dharamjayagarh 765kV D/c (2<sup>nd</sup>) line, which has already been taken up for implementation by POWERGRID as part of transmission system associated with evacuation of power from generation project of East Coast Energy Pvt. Ltd. at Srikakulam. The item no. 2 of the common transmission scheme is to be implemented through Tariff based Competitive Bidding Route, details of which are given below :

Transmission Scheme	Estimated Line Length (km)
i) Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line	350
ii) LILO of both circuits of Rourkela - Raigarh 400 kV D/c (2 <sup>nd</sup> line) at Jharsuguda (Sundargarh)	2x400kV D/c line : each about 30 km

#### Note :

- CTU to provide 2x240 MW switchable line reactor at Jharsuguda (Sundargarh) end on Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line.
- CTU to provide 2x240 MW switchable line reactor at Raipur Pool end on Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line.
- CTU to provide 2 no. of 765kV line bays each at Jharsuguda (Sundargarh) and Raipur Pool for termination of Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line.
- CTU to provide 4 nos. of 400kV line bays at Jharsuguda (Sundargarh) for termination of LILO of both circuits of Rourkela - Raigarh 400 kV D/c (2<sup>nd</sup> line).

The scheme has been approved in the meeting with constituents of Eastern Region regarding connectivity and LTA on 05-01-2013 and 24<sup>th</sup> TCC/ERPC meeting on 26-27 April, 2013.

**Members noted and agreed.**

## 27. Immediate Evacuation System for OPGC (1320 MW) Project

Director (SP& PA), CEA informed that the immediate evacuation system for OPGC generation project, which is a part of phase-II generation projects in Orissa is proposed to be implemented through Tariff based Competitive Bidding Route. The scope of the transmission system is as below:

### Scope:

Transmission Scheme	Estimated Line Length (km)
i) OPGC (IB TPS) – Jharsuguda (Sundargarh) 400kV D/c line with Triple Snowbird Conductor alongwith 2 no. 400kV line bays at Jharsuguda (Sundergarh) substation. Bays at OPGC end of the line would be under the scope of the generation developer.	50

The scheme was approved in the meeting with constituents of Eastern Region regarding connectivity and LTA on 05-01-2013 and 24<sup>th</sup> TCC/ERPC meeting on 26-27 April, 2013.

Members noted and agreed.

## 28. Status of Connectivity/LTA Applicants not considered under Phase-II Generation Projects in Orissa

Director (SP& PA), CEA requested the generation developers to update the status of progress of the generation projects which were not considered under Phase-II generation projects in Orissa. Based on deliberations, the updated status is given below:

Sl No	Project/Applicant	Unit Size	Ins. Capacity (MW)	Connectivity / LT(O)A(MW)	Time Frame	Status of Application
1	VISA Power Ltd	2x660	1320	1250/842	Sep'16	No Progress, To be Closed
2	NSL Odisha Power & Infratech	2x660	1320	1240/	Jan'16	No Progress, To be Closed
3	Tata Power company Ltd	2x660	1320	1000/1000	Uncertain	To be reviewed after 6 months
4	J R Power Gen Pvt Ltd	3x660	1980	1980/1830	Uncertain	To be reviewed after 6 months
5	Jindal India Thermal (Phase-II)	1x600	600	522/522	Uncertain	To be reviewed after 6 months
6	Sahara India	2x660	1320	1100/	Jan'18	To be reviewed after 6 months
7	Odisha UMPP	5x800	4000	4000/4000	N. A.	System under discussion
8	Gajamara(NTPC)	2x800	1600	1600/	Under revision	To be reviewed after 6 months
9	Bhushan	4x660	2640	2640/	Uncertain	No Progress, To be Closed



10	NSL Nagapatnam Power&infotech (Earlier Mahanadi Aban Power)	2x660	1320	850/	Dec'17	Connectivity granted. To sign agreement for connectivity line by July-2014. To also apply for LTA
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**29. Charging of LILO of one circuit of Talcher - Meramundali 400 kV D/c line at Angul**

Director (SP& PA), CEA informed that the works for LILO of one circuit of Talcher - Meramundali 400 kV D/c line at Angul have been completed long back; however, charging of the same could not be done due to delay in shutdown permission by state of Odisha. The matter is being pursued regularly with OPTCL and Govt. of Odisha. **After discussions, it was concluded that the issue could be addressed to a competent level of the Govt. of Odisha by CEA so as to enable charging of the subject LILO at the earliest.**

**Additional Agenda**

**30. Proposal for establishment of 132 KV system at 400 KV Baharampur switching station of POWERGRID with 3 x 200 MVA, 400/132 kV ICTs**

Director(SP& PA), CEA informed that during 2<sup>nd</sup> -2013 Standing Committee Meeting on Power System Planning of Eastern Region held on 27<sup>th</sup> August, 2013 at New Delhi, conversion of Baharampur switching station into a Substation and feeding some load in and around that area for better controllability from system operation angle was discussed. POWERGRID informed that as per the load survey around Baharampur, power demand could be of the order of about 400MW in the area. In view of the above, it was proposed that 3x200 MVA, 400/132 kV Substation be established for meeting the load of Baharampur and surrounding area. It would also facilitate anchoring of Baharampur Substation with local load.

**WBSETCL informed that they are establishing Gokarna sub-station in the same area and presently there is no need of transformers at Baharampur.**

**31. Proposal of NTPC for 400kV D/C interconnection between Nabinagar STPP (3x660MW) and Nabinagar TPP (4x250MW) for start-up power arrangement for New Nabinagar STPP (3x 660 MW)**

NTPC explained that its Nabinagar STPP is located at a distance of about 10 km from another NTPC JV project i.e. Nabinagar Thermal Power Project(4x 250 MW) being executed by the Bharatiya Rail Bijlee Company Limited (BRBCL) a joint venture between NTPC and Railway. It was informed that the 400 kV switchyard of BRBCL project along with its associated transmission system is ready for charging.

In order to draw startup power/ unit commissioning from the BRBCL Plant's 400KV switchyard, NTPC vide letter dated 30/04/2014 proposed to establish a 400KV D/C line ( approx. 10.5 kms) for high start MVA drawl by large drive i.e. MDBFP at Nabinagar STPP. On the query of CEA about the implementation

plan of the 400 kV line and its other purpose of usages, if any, NTPC participant stated that they would construct the small 400kV tie line to be used exclusively for start-up power for Nabinagar STPP and not for power evacuation. It was also assured that the proposed tie line would be always switched-off after commissioning of the plant, except in case of extreme exigencies. **After deliberation, members agreed.**

**32. Proposal of ERPC to establish a 132kV Banka (PG)(new) - Deoghar D/C line (about 40 kms) to feed Deoghar S/S(JSEB) for reliable and uninterrupted power supply to Railways load.**

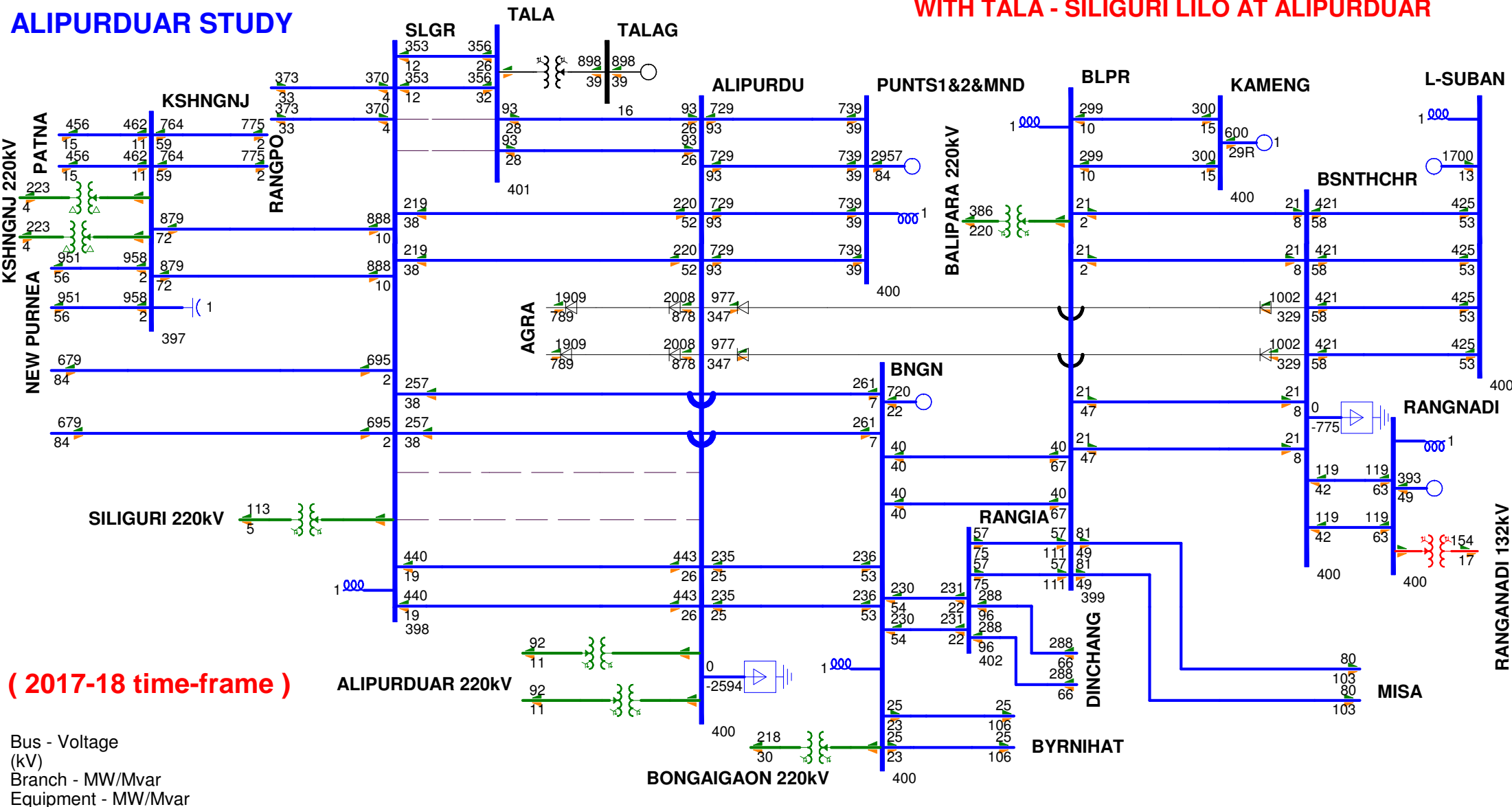
It was stated that presently 132kV Deoghar S/S (JSEB) is fed through 132kV line(s) from DVC source (132kV Maithon-Jamtara-Deoghar S/C) or from NTPC source (Lalmatia). There is also a feed from BSPTCL source through 132kV Sultanganj- Deoghar S/C line, which is normally kept open due to overloading in Kahalgaon-Sabour- Sultanganj section of BSPTCL system. The Deoghar & Jamtara sub-stations feed important railway loads of 10MW each to Shankarpur TSS and Jamtara TSS and normally receive power from DVC system through 132kV Maithon – Jamtara – Deoghar S/C line, and loading on this 132kV S/C line sometimes exceeds 75MW, and reliable supply to railway loads used to get largely affected/interrupted.

In view of above, it was proposed to provide an additional supply to Deoghar S/S (JSEB) from newly constructed 400/132kV Banka S/S (PG) by creating a 132kV Banka- Deoghar D/C lines (about 40 Kms). Director CEA stated that the above 132kV D/C line would be inter-state in nature and as per present guidelines; it should be established on TBCB route. **After deliberations, members agreed in principle to the establishment of the proposed 132kV D/C line.**

The meeting concluded with vote of thanks to the chair.

ALIPURDUAR STUDY

WITH TALA - SILIGURI LILO AT ALIPURDUAR



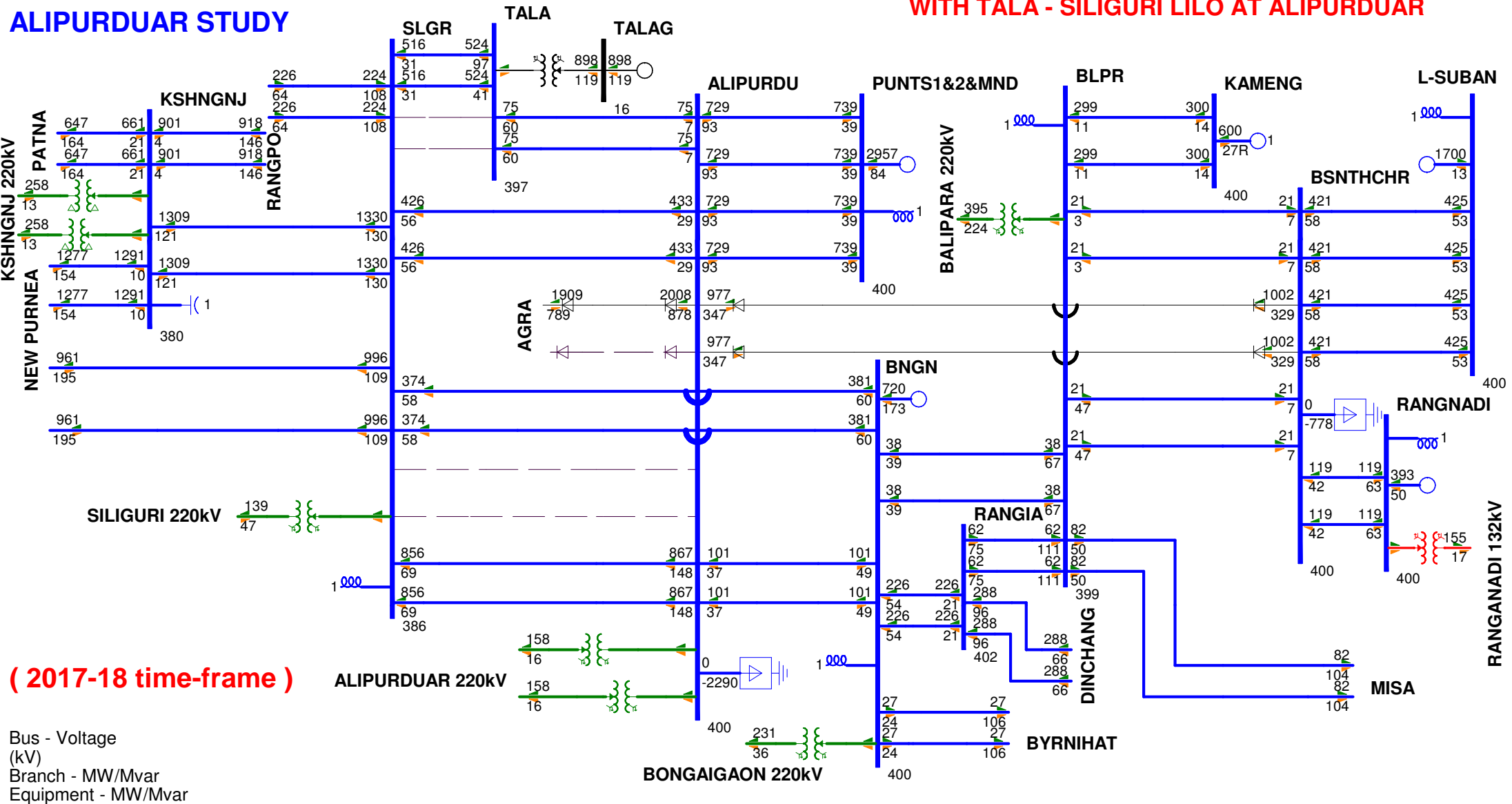
( 2017-18 time-frame )

Bus - Voltage (kV)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar

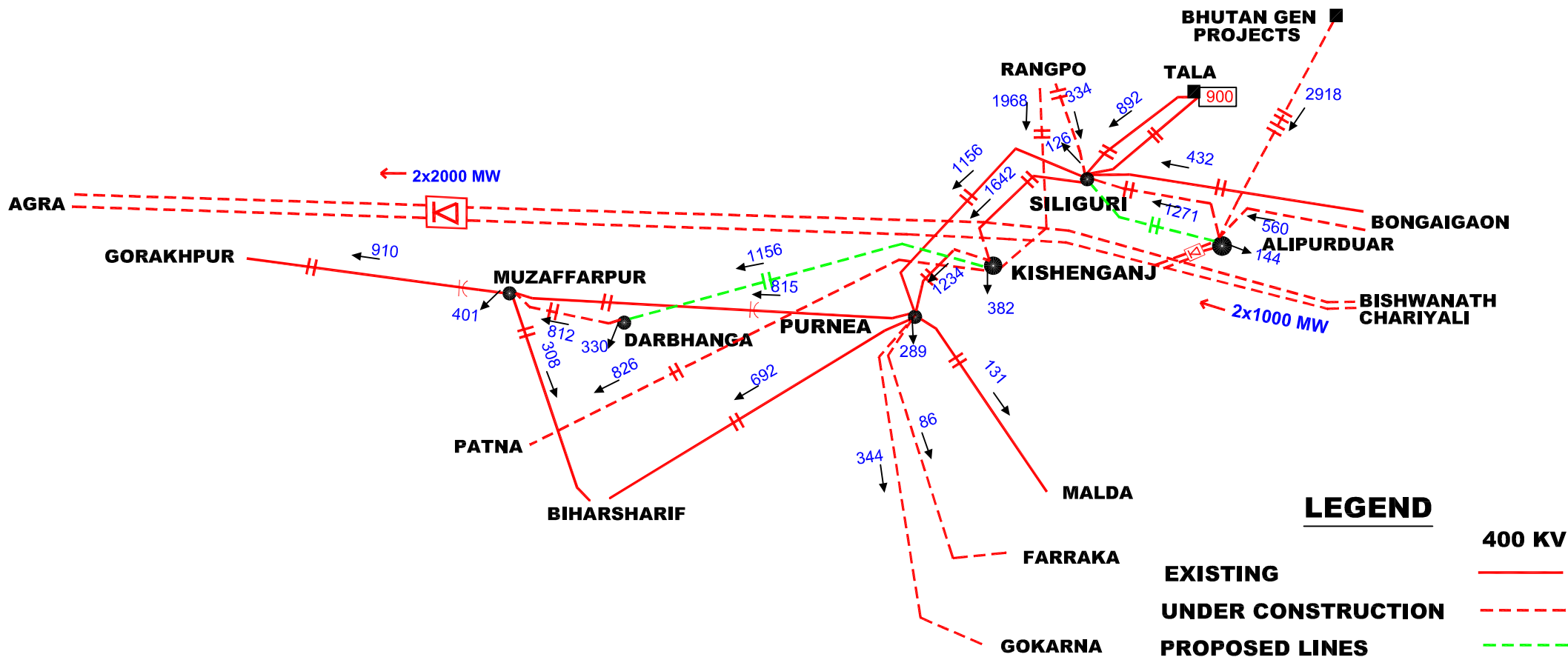
kV: <=110.000 <=132.000 <=220.000 <=400.000 <=765.000 <=1200.000 >1200.000

ALIPURDUAR STUDY

WITH TALA - SILIGURI LILO AT ALIPURDUAR



## Kishenganj - Darbhanga D/c (quad) & Alipurduar - Siliguri D/c (quad) (2017-18 time frame)





**Study for Odisha(Bhedabahal)UMPP and 765kV Strengthening System in ER**

**1.0 Introduction**

From the future load generation scenario in Eastern Region, it is observed that while there is a steady growth in the load all over the region, the generation projects are mainly coming up in the central and western part of Eastern Region (Odisha, Jharkhand, Bihar), however in the Eastern part (West Bengal) no substantial generation projects are coming up. While Eastern Region has 765kV substations acting as power hubs (Ranchi, Gaya, Angul, Jharsuguda) for export of power to other regions viz. Northern and Western Regions, there is hardly any 765kV corridor for distribution of power within the region. Accordingly, need is felt for establishment of a high capacity 765kV D/c network within the region in order to ensure better distribution of power within the region as well as exchange of power with the neighbouring regions.

Further, Odisha UMPP with an Installed Capacity of 4000 MW (5x800 MW) located at Bhedabahal in Odisha is expected to come up during 2017-18.

Accordingly, studies have been carried out in order to evolve a 765kV strengthening system in Eastern Region that can ensure secure and reliable supply of power within the Region as well as help in power evacuation of the Bhedabahal UMPP as and when it comes up in Odisha.

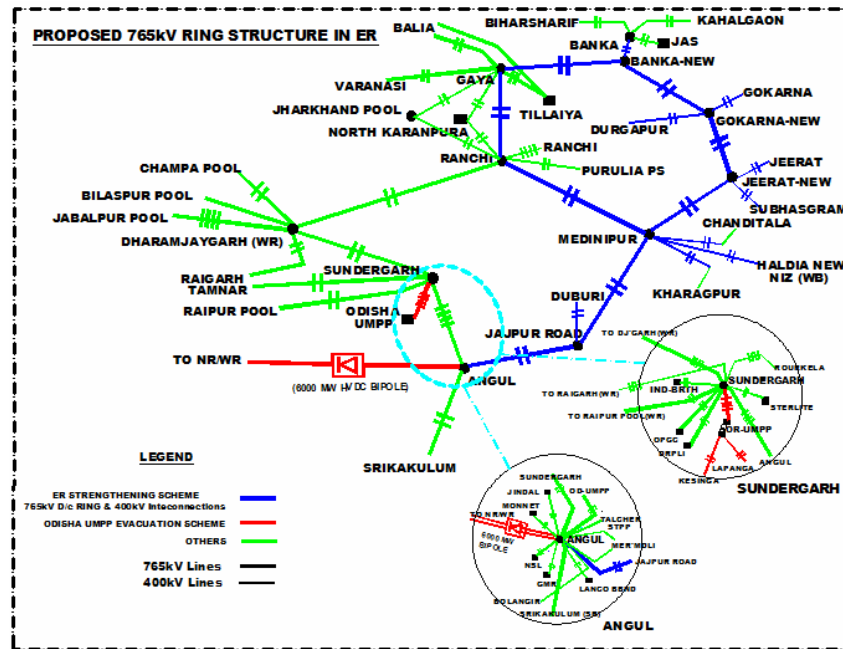
**2.0 Proposed Transmission System**

As described above, the following transmission system has been planned :

- i) Strengthening System in Eastern Region
- ii) Evacuation system for Odisha UMPP project

The schematic diagram of the proposed system is given below :

## ER 765kV Ring & Odisha UMPP Study



The details of the transmission system under (i) and (ii) are given below :

### 2.1 Strengthening system in Eastern Region

The idea of a 765kV ring within the Eastern Region was accepted during the 1<sup>st</sup> – 2014 Standing Committee Meeting of Eastern Region held on 2<sup>nd</sup> May, 2014, by all the constituents. Further, it was deliberated that the exact location of the 765kV substations should be evolved in consultation with the states.

Based on the suggestions of POSOCO, OPTCL, WBSETCL during the Standing Committee meeting as well as Subsequent discussion with WBSETCL the locations and connectivity of the new 765/400kV substations was identified.

Accordingly, the following system was finalised as a part of strengthening system in Eastern Region:

1. Establishment of 765/400 kV new substations at Banka (New), Gokarna (New), Medinipur, Jeerat (New) and Jajpur Road.
2. Interconnection of the above mentioned 765kV substation through Angul-Jajpur Road – Medinipur – Jeerat (New) – Gokarna (New) – Banka (New) – Gaya – Ranchi (New) – Medinipur 765kV D/c lines.
3. Interconnection of 765/400kV substations with the nearby 400kV substations viz. Banka (PG), Gokarna (WBSETCL), Chanditala (WBSETCL), Kharagpur (WBSETCL), Haldia New-NIZ (WBSETCL), Durgapur (PG), Subhasgram (PG), Jeerat (WBSETCL) and Duburi (OPTCL) through 400kV high capacity D/c lines.

### 2.2 Evacuation system for Odisha UMPP project



## *ER 765kV Ring & Odisha UMPP Study*

The transmission system is divided into two parts, i) Immediate evacuation system of the UMPP project and ii) Strengthening scheme.

### **2.2.1 Scheme for Immediate Evacuation from UMPP Project**

#### At UMPP Switchyard

Following System has been proposed at UMPP Generation Switchyard :

1. Generation to be stepped up at 765kV
2. Provision for Split Bus Arrangement on 765kV UMPP Bus
3. 4 no. 765 kV line bays
4. 6 no. 400 kV line bays (suitable for quad conductor lines)
5. 2X1500 MVA, 765/400kV ICT with OLTC +/- 5.5 % (as per CEA Standard for 765kV Substation Equipment) (7 nos 1-phase 500 MVA transformer connected with switching arrangement for 1 no. standby transformer) along with associated bays at Generation Switchyard
6. 2x 240 MVAR Bus Reactor at 765 kV bus of Generation Switchyard
7. 2x125 MVAR Bus Reactor at 400 kV bus of Generation Switchyard
8. 2x240MVAR switchable line reactor along with 750ohm NGR each corresponding to 2 no 765kV line bays.
9. 4x80MVAR switchable line reactor along with 450ohm NGR each corresponding to 4 no 400kV line bays.
10. 1x80MVAR 765kV 1-phase spare reactor.
11. The 765KV and 400kV switchyard may be designed for 50kA and 63kA fault levels respectively.

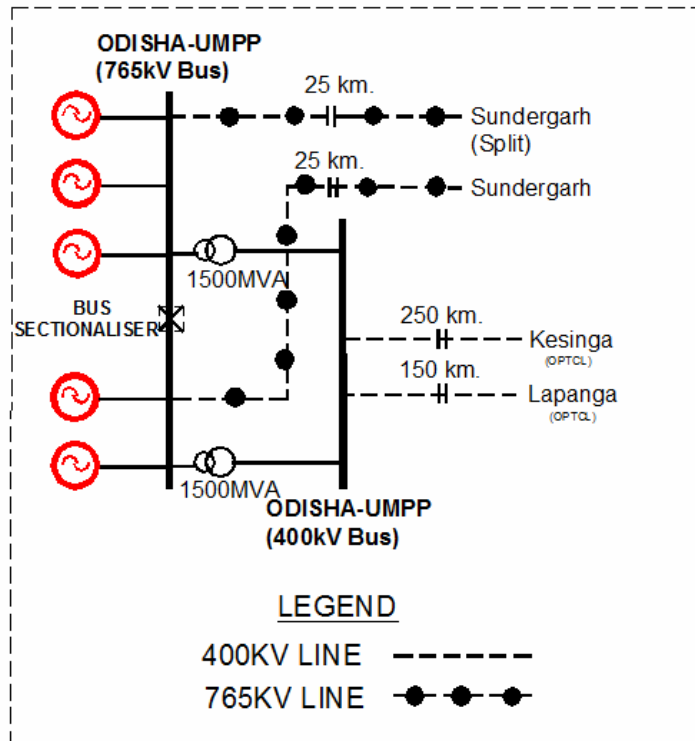
#### Immediate Evacuation Scheme

For immediate evacuation from UMPP project, the following system is envisaged:

1. Odisha UMPP – Sundergarh (Jharsuguda) 765kV 2xD/c line
2. Odisha UMPP – Lapanga 400kV D/c line(quad/HTLS)
3. Odisha UMPP – Kesinga 400kV D/c line (quad/HTLS)

A schematic of the above mentioned system is given below:

## ER 765kV Ring & Odisha UMPP Study



### 2.2.2 Strengthening Scheme associated with UMPP project

The strengthening scheme consists of an  $\pm 800$ kV, 6000MW HVDC corridor from Angul(Odisha) to a suitable location in NR/WR with 3000MW terminal at either end. This corridor would be upgraded in future with addition of 3000MW terminal(2<sup>nd</sup>) at both ends of the line.

#### Strengthening Scheme (HVDC from Angul – NR/WR)

1.  $\pm 800$ kV, 6000MW HVDC bipole line from Angul to suitable location in NR/WR with 3000MW terminal at either end.
2. Suitable AC Strengthening system at the remote end of the HVDC bipole line in NR/WR.

### 3.0 System Study

#### 3.1 LGB Considered (With UMPP)

- Time frame : 2017-18
- ER Generation : 52721 MW
- ER Load : 26380 MW
- Inter Regional Power Flows have been tabulated below:

	ER – NR	ER – WR	ER – SR	ER – NER	ER Net Interchange
Inter Regional Power Flow(MW)	16767	8148	5302	-2560	25008

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### 3.2 Study Results

The studies have been carried out for the following conditions :

- i) With proposed 765kV Strengthening System in Eastern Region (Without Odisha UMPP)
- ii) With Odisha UMPP and proposed 765kV Strengthening System in Eastern Region

#### 3.2.1 765kV Strengthening System in Eastern Region (Without Odisha UMPP)

The study result showing the Eastern Region Transmission System along with the proposed 765kV strengthening system is enclosed at **Exhibit-1**.

The connectivity of the new 765/400kV substations with the existing grid network both at 765kV and 400kV level as considered in the study is explained below :

##### 1. JAJPUR ROAD

The 2x1500MVA, 765/400kV Jajpur Road substation has been proposed near Duburi with the following interconnections:

1. Angul – Jajpur Road 765kV D/c line
2. Jajpur Road – Medinipur 765kV D/c line
3. Jajpur Road – Duburi 400kV D/c line (quad/HTLS)

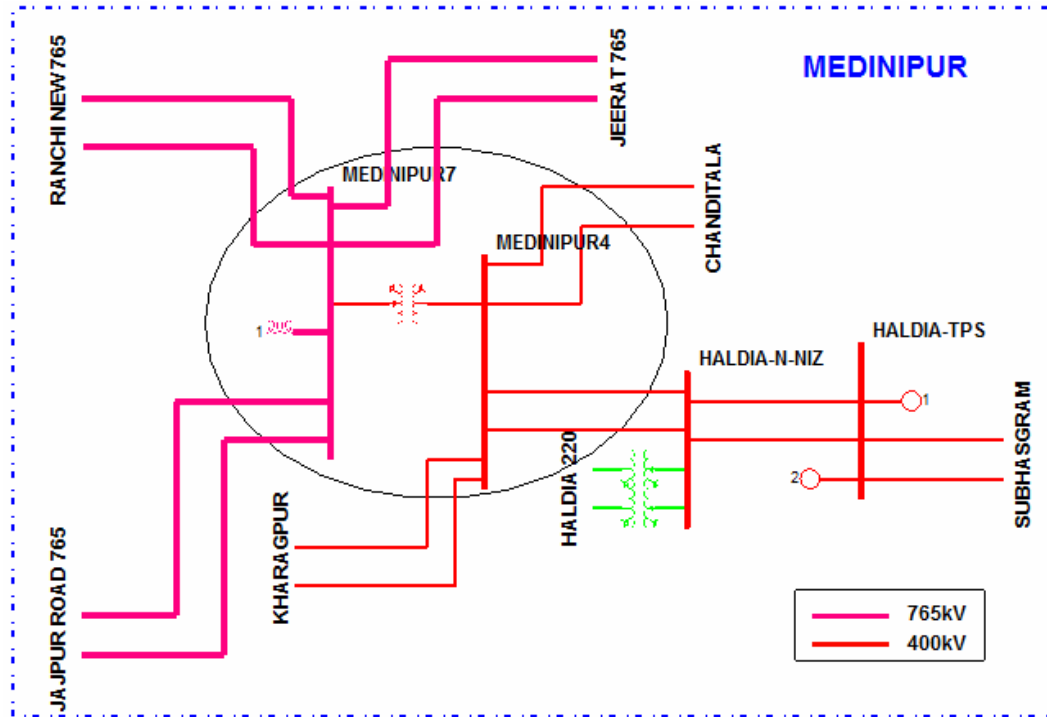
Initially, another 400kV D/c line (quad/HTLS) was planned between Jajpur Road and Keonjhar. However, OPTCL had pointed out that due to the absence of any substantial load near Keonjhar, Jajpur Road – Keonjhar line may remain unutilised. Accordingly, at present only the 400kV interconnection from Jajpur Road to Duburi with high capacity conductor has been considered.

##### Observations from Load Flow Studies:

Loading on Angul – Jajpur Road and Medinipur – Jajpur Road 765kV D/c lines is 180MW and 171MW respectively. Loading on Jajpur Road – Duburi 400kV D/c (quad/HTLS) line is 350MW.

The proposed connectivity of Jajpur Road substation is given below :





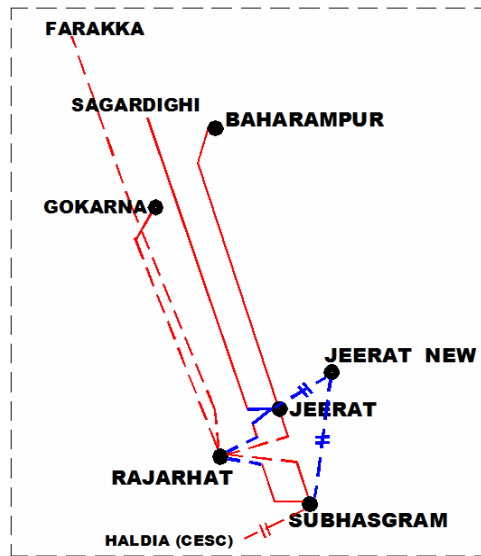
### 3. JEERAT NEW

It is proposed to establish a new 2x1500MVA, 765/400kV S/s at Jeerat with the following interconnections:

1. Medinipur – Jeerat (New) 765kV D/c line
2. Jeerat (New) – Gokarna (New) 765kV D/c line
3. Jeerat (New) – Subhasgram 400kV D/c line (quad/HTLS)
4. Jeerat (New) – Jeerat 400kV D/c line (quad/HTLS)
5. LILO of Sagardighi – Subhasgram 400kV S/c line at Rajarhat
6. LILO of Sagardighi – Rajarhat 400kV S/c line at Jeerat

The 400kV interconnections from Jeerat(New) substation were arrived at after extensive discussions with WBSETCL. Further, WBSETCL proposal of LILO of Sagardighi – Subhasgram 400kV S/c line at Rajarhat and further the LILO of Sagardighi – Rajarhat 400kV S/c line (formed after the former LILO) again at Jeerat in order to form Jeerat – Rajarhat – Subhasgram 400kV D/c lines was investigated and the proposal was found to be in order.

## ER 765kV Ring & Odisha UMPP Study

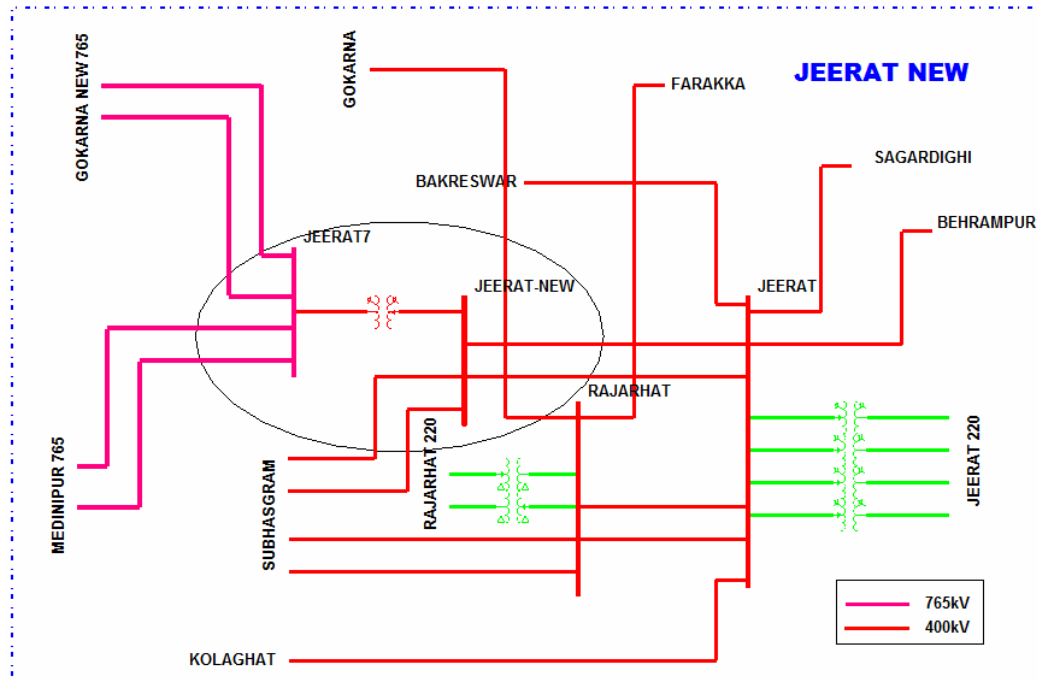


**Schematic Diagram of 400kV Interconnections associated with Jeerat New Substation (Pts. 3, 4, 5 and 6 mentioned above)**

Observations from Load Flow Studies:

Loading on Gokarna (New) – Jeerat 765kV D/c line is 762MW, while that on the Jeerat – Medinipur 765kV D/c line is very small. However, the ring is able to withstand comfortably the most severe contingency (N-1-1) – Outage of Gokarna (New) – Jeerat 765kV D/c line – with loading on Jeerat – Medinipur 765kV D/c line rising to 475MW (refer **Exhibit-2**). Further, loading on Jeerat New – Jeerat 400kV D/c (quad/HTLS) line is of the order of 400MW.

The proposed connectivity of Jeerat (New) substation is given below :



#### 4. GOKARNA NEW

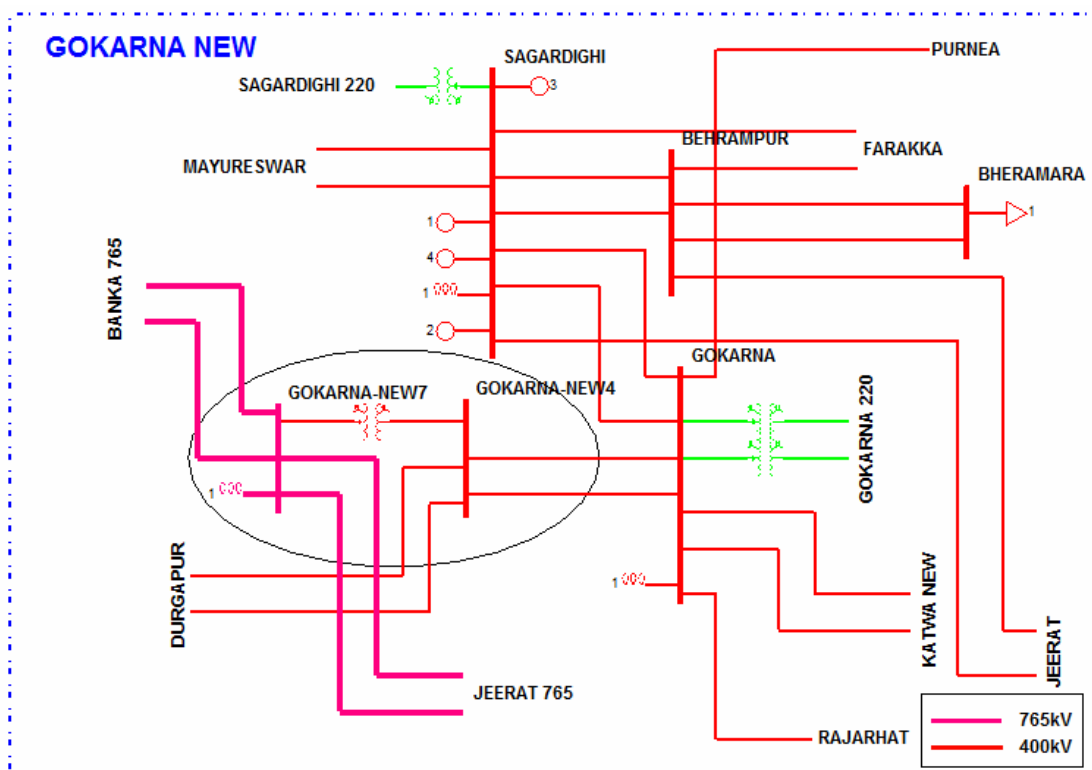
It is proposed to establish a new 2x1500MVA, 765/400kV S/s at Gokarna with the following interconnections:

1. Gokarna (New) – Jeerat (New) 765kV D/c line
2. Gokarna(New) – Banka(New) 765kV D/c line
3. Gokarna (New) – Gokarna 400kV D/c line(quad/HTLS)
4. Gokarna (New) – Durgapur (PG)400kV D/c line(quad/HTLS)

Durgapur (PG) substation receives power from several generating stations viz. Maithon, Maithon-RB, Raghunathpur, Farakkaetc and hence the 400kV Gokarna (New) – Durgapur (PG) interconnection would help in the up-linking of power to the 765kV Gokarna(New) substation from 400kV level. This would, therefore, ease loading on nearby 400kV lines and also facilitate better transfer of power from generation rich areas of DVC and West Bengal to load centres in the Southern parts of West Bengal.

#### Observations from Load Flow Studies:

Loading on Gokarna (New) – Jeerat (New) and Banka (New) – Gokarna (New) 765kV D/c lines is 762MW and 546MW respectively. The Gokarna (New) – Gokarna 400kV D/c (quad/HTLS) line is also fairly loaded (410MW). As explained above, Durgapur (Parulia) substation feeds power to Gokarna (New) substation to the tune of 630MW. The planned system is able to withstand the simultaneous outage of all units at Sagardighi with the loading on Gokarna (New) – Gokarna 400kV D/c and Durgapur – Gokarna (New) 400kV D/c lines being of the order of 710-720MW each (refer **Exhibit-3**).



## 5. BANKA NEW

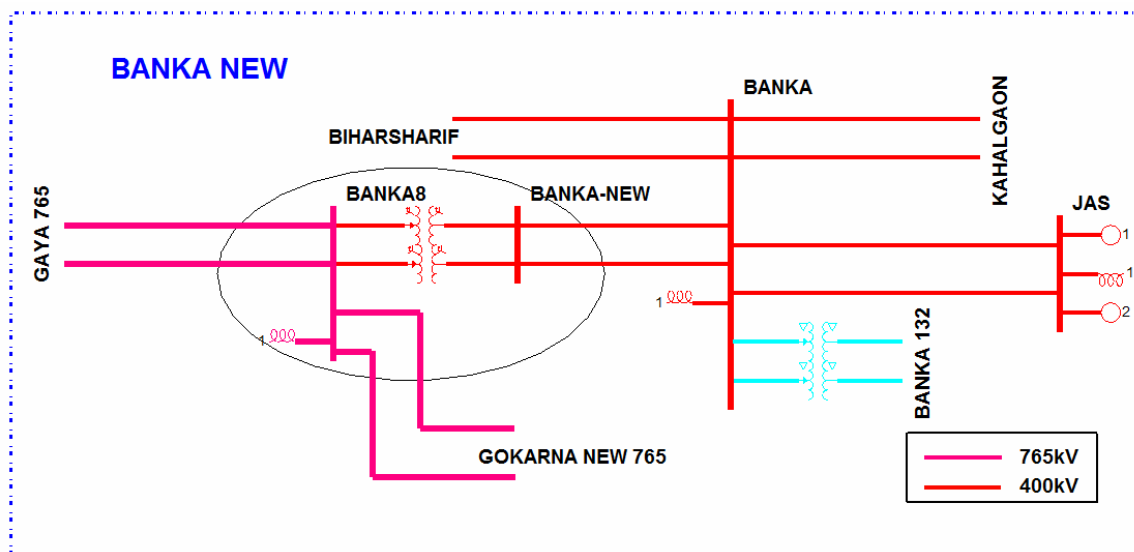
It is proposed to establish a new 2x1500MVA, 765/400kV S/s at Banka with the following interconnections:

1. Banka (New) – Gokarna (New) 765kV D/c line
2. Gaya – Banka (New) 765kV D/c line
3. Banka (New) – Banka 400kV D/c line(quad/HTLS)

Banka (New) 765/400kV substation would be an important substation in Bihar in the 765kV proposed ring of Eastern Region. This substation would be useful in pooling power from future generation stations in Bihar like Pirpainti(2x660 MW) and Lakhisarai (2x660 MW) and further distribution of power through 400kV links to Northern part of Bihar grid like Darbhanga and Fatuha (to be developed along with the generation projects).

### Observations from Load Flow Studies:

Loadings on Banka (New) – Gokarna (New) and Banka (New) – Gaya 765kV D/c lines are of the order of 550MW and 500MW respectively. Further, Loading on Banka – Banka(New) 400kV D/c (quad/HTLS) line is observed to be of the order of 1000MW.

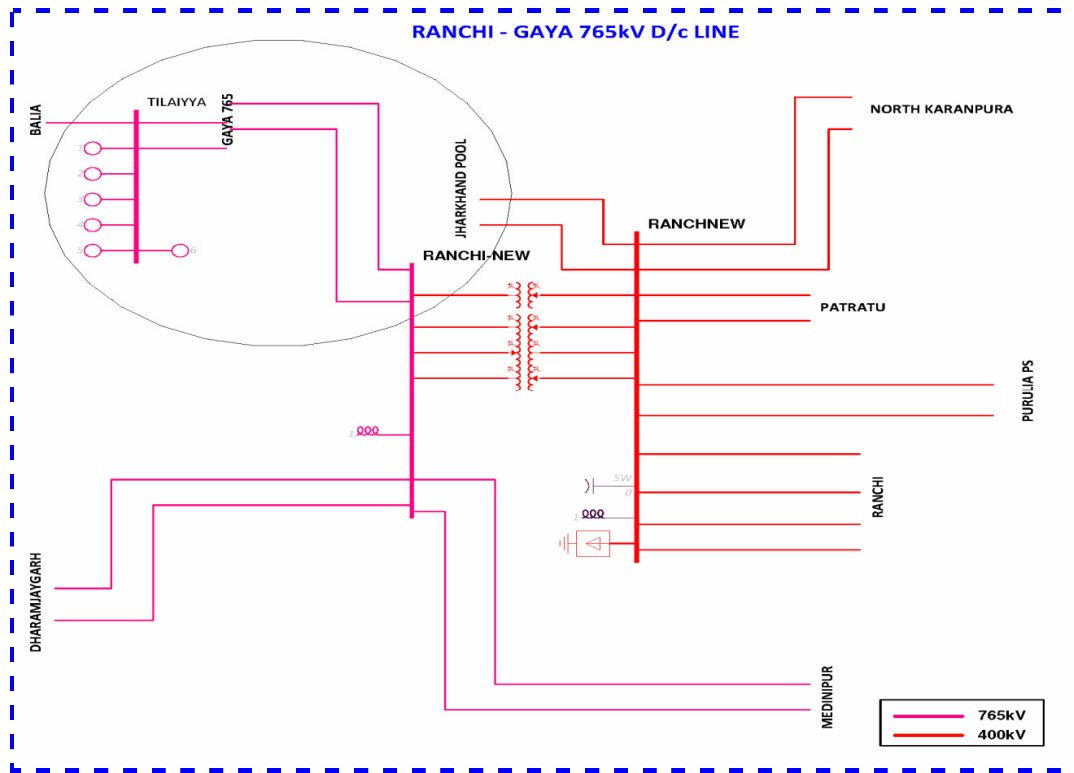


## 6. Gaya – Ranchi (New) 765kV D/c Line

In order to complete the ring it is proposed to build a 765kV D/c line between the existing Gaya and Ranchi (New) 765/400kV substations. From the load flow studies it is found that the power flow on this line is of the order of 175MW.



## ER 765kV Ring & Odisha UMPP Study



Load flow study results of various contingency cases considered have been tabulated below:

Sl. No.	Case	Flow on Gaya-Ranchi 765kV D/c (in MW)	Exhibit
1	Base Case	174	4
2	50% Generation at Tilaiyya UMPP (2000MW)	672	5
3	No Generation at Tilaiyya UMPP	1122	6
4	Outage of Ranchi-Dharamjaygarh 765kV D/c	634	7
5	Outage of Ranchi-Dharamjaygarh 765kV D/c and 50% Generation at Tilaiyya UMPP (2000MW)	988	8

### 3.2.2 With Odisha UMPP and proposed 765kV Strengthening System in Eastern Region

The study result showing the Eastern Region Transmission System along with the proposed 765kV strengthening system and Odisha UMPP evacuation system is enclosed at **Exhibit-9**.

From the load flow results, it is observed that the planned 765kV (Ring) strengthening system handles the power injection from the 5x800 MW Odisha UMPP with ease. Not only is the utilisation of the various sections of the 765kV ring enhanced, but also the controllability of power flowing through the 765kV D/c ring is obtained with the  $\pm 800$ kV, 6000MW HVDC bipole proposed at Angul.

### 3.3 Short Circuit Study

In order to contain the high value of short circuit level due to injection of power from 4000MW Odisha UMPP project, it is required to split the generation bus. The splitting of Angul and Jharsuguda 765kV and 400kV buses has been approved along with Odisha Phase-II projects. In the present study, the provision for splitting of Angul 765kV bus has been kept, however the breaker is kept on in order to maintain the reliability as the fault level at Angul 765kV is well within the acceptable limits. The split configuration has been given at **Exhibit – 10**.

The fault levels of different buses corresponding to the above discussed split configuration are given below:

Sl.	Bus	Voltage(kV)	Fault Level(kA)
1	Odisha UMPP (Split)	765	38 & 36
2	Odisha UMPP	400	33
3	Jharsuguda (Split)	765	46 & 42
4	Jharsuguda (Split)	400	43 & 41
5	Angul**	765	42
6	Angul (Split)	400	53, 27 & 34
7	Lapanga	400	24
8	Kesinga	400	13

*\*\*Provision for splitting Angul 765kV bus has been considered in the study*

### 4.0 Conclusion

The proposed transmission system that has been arrived at after detailed studies as mentioned in this report is given below. The corresponding schematic diagram is given at **Exhibit – 11**.

#### 4.1 765kV strengthening system in Eastern Region

1. Establishment of 765/400 kV new substations at Banka (New), Gokarna(New), Medinipur, Jeerat (New) and Jajpur Road.
2. Angul – Jajpur Road 765kV D/c line
3. Jajpur Road – Medinipur 765kV D/c line
4. Ranchi (New) – Medinipur 765kV D/c line
5. Medinipur – Jeerat (New) 765kV D/c line
6. Jeerat (New) – Gokarna (New) 765kV D/c line
7. Gokarna(New) – Banka(New) 765kV D/c line
8. Gaya – Banka (New) 765kV D/c line
9. Gaya – Ranchi (New) 765kV D/c line
10. Jajpur Road – Duburi 400kV D/c line (quad/HTLS)
11. Medinipur – Haldia New (NIZ) (WBSETCL) 400kV D/c line (quad/HTLS)
12. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur
13. Jeerat (New) – Subhasgram 400kV D/c line(quad/HTLS)
14. Jeerat (New) – Jeerat 400kV D/c line (quad/HTLS)
15. LILO of Sagardighi – Subhasgram 400kV S/c line at Rajarhat

16. LILO of Sagardighi – Rajarhat 400kV S/c line (formed through LILO of pt. 15) at Jeerat
17. Gokarna (New) – Gokarna 400kV D/c line (quad/HTLS)
18. Gokarna (New) – Durgapur (PG) 400kV D/c line (quad/HTLS)
19. Banka (New) – Banka 400kV D/c line(quad/HTLS)

#### **4.2 Evacuation system for Odisha UMPP project**

##### For Immediate Evacuation from UMPP Project

1. Odisha UMPP – Sundergarh (Jharsuguda) 765kV 2xD/c line
2. Odisha UMPP – Lapanga 400kV D/c line(quad/HTLS)
3. Odisha UMPP – Kesinga 400kV D/c line (quad/HTLS)

##### Scheme required at UMPP switchyard

###### At UMPP Switchyard

Following System has been proposed at UMPP Generation Switchyard :

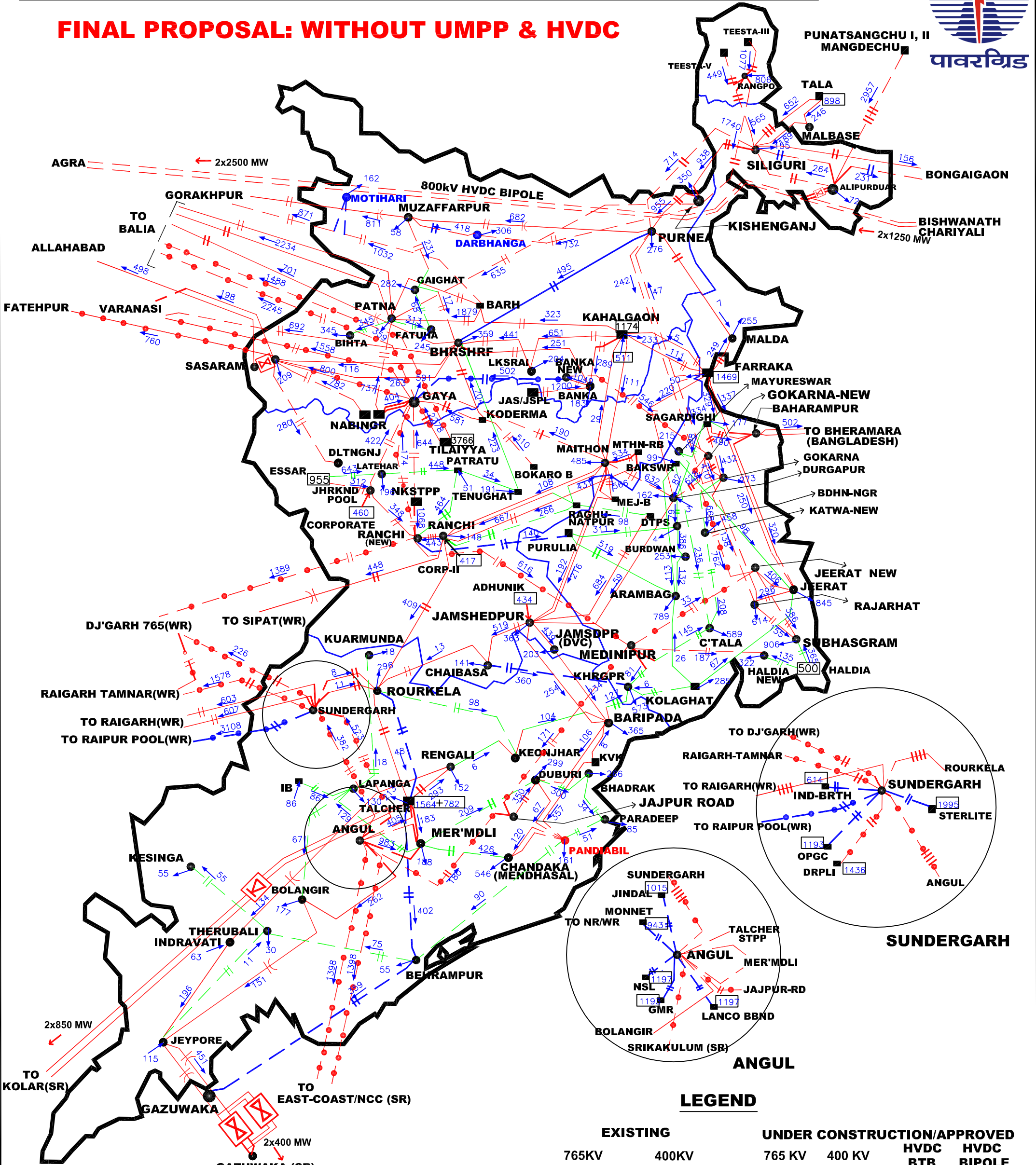
4. Generation to be stepped up at 765kV
5. Provision for Split Bus Arrangement on 765kV UMPP Bus
6. 4 no. 765 kV line bays
4. 6 no. 400 kV line bays (suitable for quad conductor lines)
5. 2X1500 MVA, 765/400kV ICT with OLTC +/- 5.5 % (as per CEA Standard for 765kV Substation Equipment) (7 nos 1-phase 500 MVA transformer connected with switching arrangement for 1 no. standby transformer) along with associated bays at Generation Switchyard
6. 2x 240 MVAR Bus Reactor at 765 kV bus of Generation Switchyard
7. 2x125 MVAR Bus Reactor at 400 kV bus of Generation Switchyard
8. 2x240MVAR switchable line reactor along with 750ohm NGR each corresponding to 2 no 765kV line bays.
9. 4x80MVAR switchable line reactor along with 450ohm NGR each corresponding to 4 no 400kV line bays.
10. 1x80 MVAR 1-phase 765kV spare reactor.
11. The 765KV and 400kV switchyard may be designed for 50kA and 63kA fault levels respectively.

##### Strengthening Scheme (HVDC from Angul – NR/WR)

2.  $\pm 800$ kV, 6000MW HVDC bipole line from Angul to suitable location in NR/WR with 3000MW terminal at either end.
2. Suitable AC Strengthening system at the remote end of the HVDC bipole line in NR/WR.

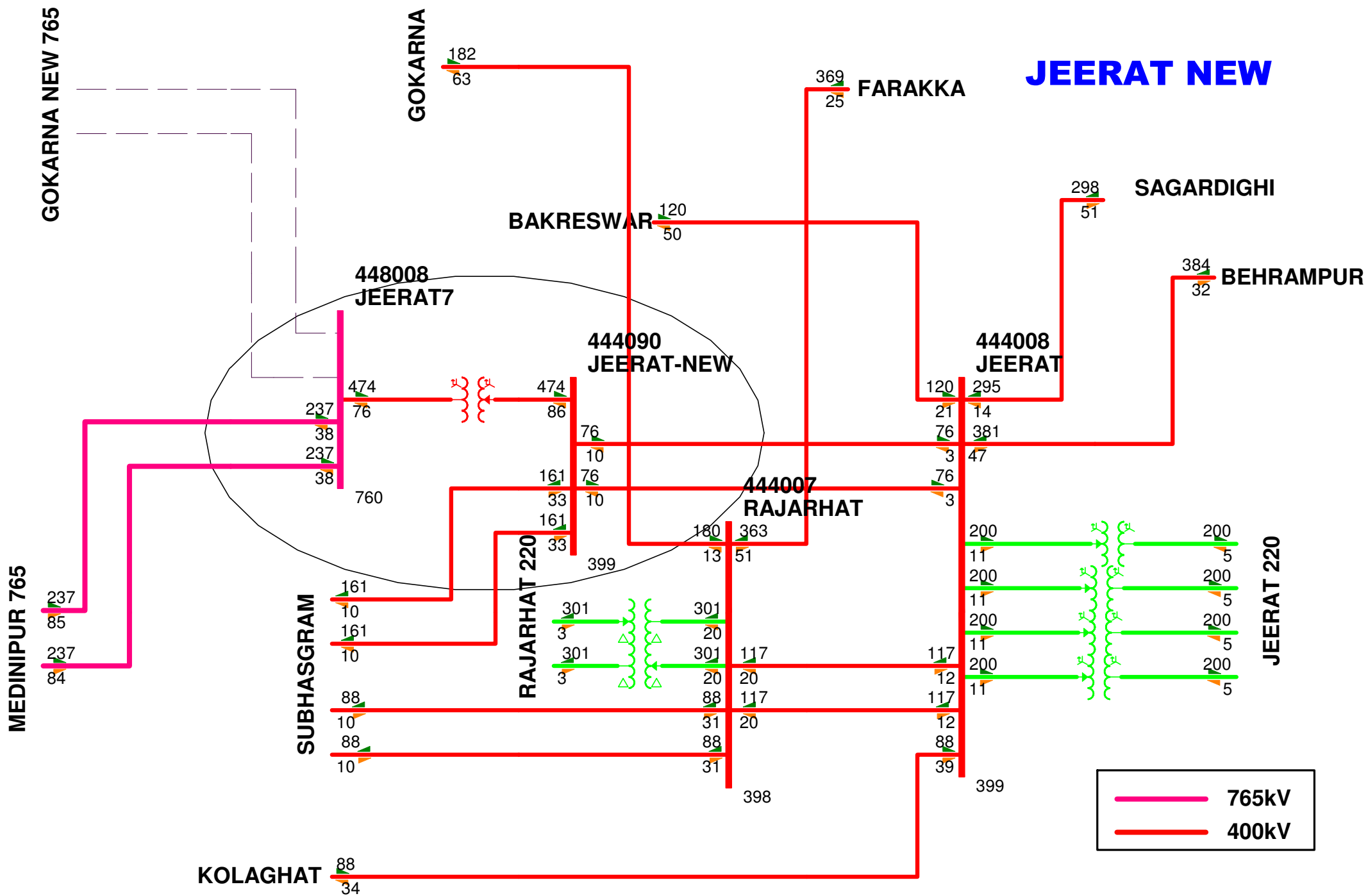
# POWER MAP OF EASTERN REGION

**FINAL PROPOSAL: WITHOUT UMPP & HVDC**



**LEGEND**

	EXISTING		UNDER CONSTRUCTION/APPROVED		HVDC	
	765KV	400KV	765 KV	400 KV	BTB	BIPOLE
<b>POWERGRID</b>						
<b>TBCB</b>						
<b>SEB</b>						



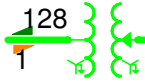
# JEERAT NEW

# GOKARNA NEW

444010  
SAGARDIGHI

290  
132 PURNEA

SAGARDIGHI 220



MAYURESWAR

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6  
32  
6

516  
67

444101  
BEHRAMPUR

522  
68  
477  
68

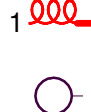
FARAKKA

444102  
BHERAMARA

250  
500  
25  
50  
250  
25

BANKA 765

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102



106  
24  
106  
24  
14  
25  
14  
25

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19  
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406

404

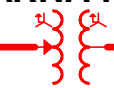
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GOKARNA-NEW7

444002  
GOKARNA-NEW4

444024  
GOKARNA

GOKARNA 220

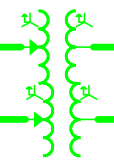
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79



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KATWA NEW

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138  
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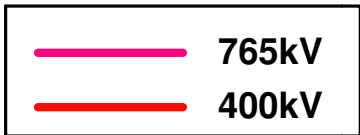
JEERAT

JEERAT 765

351  
191  
351  
191

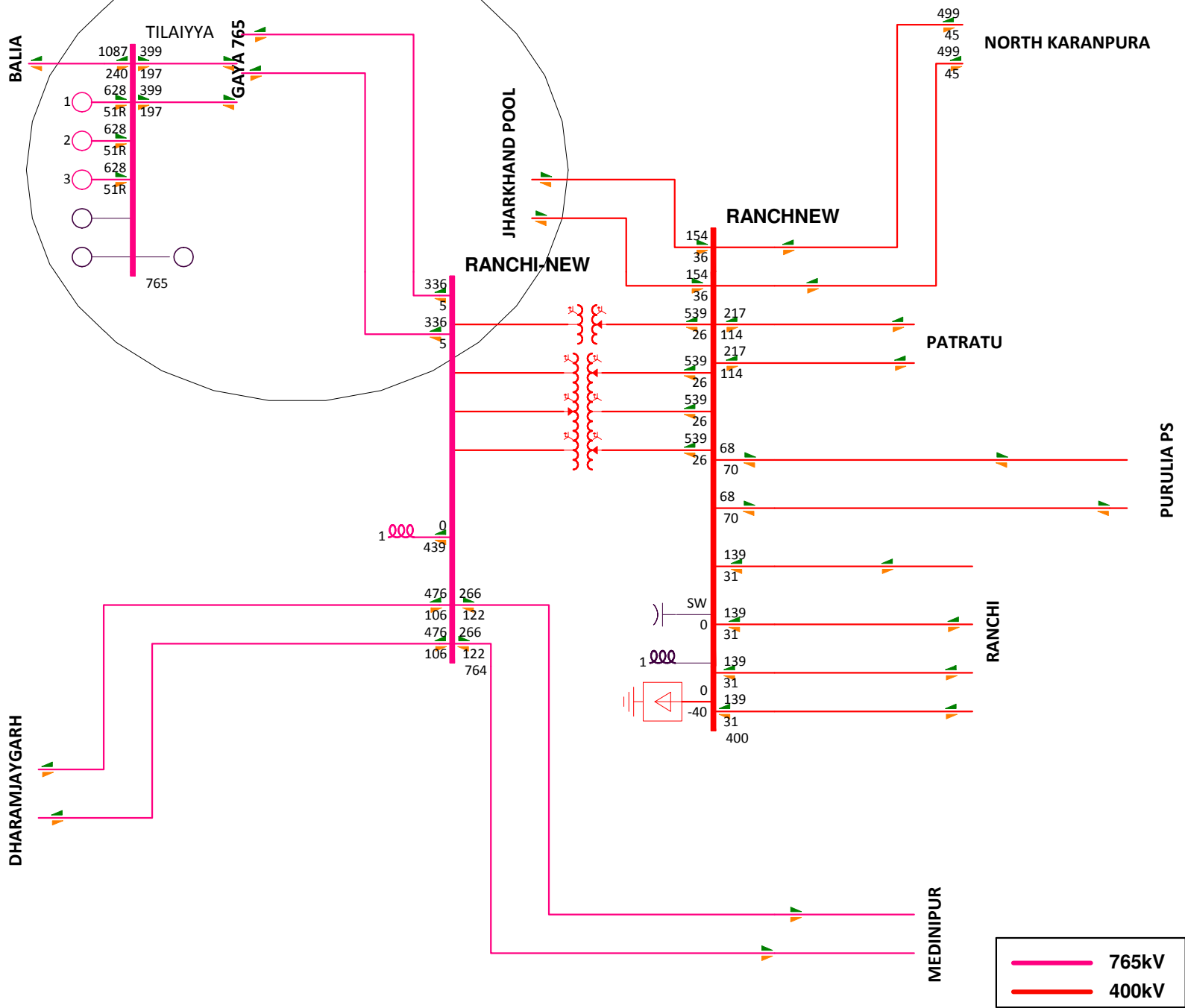
121  
2

RAJARHAT





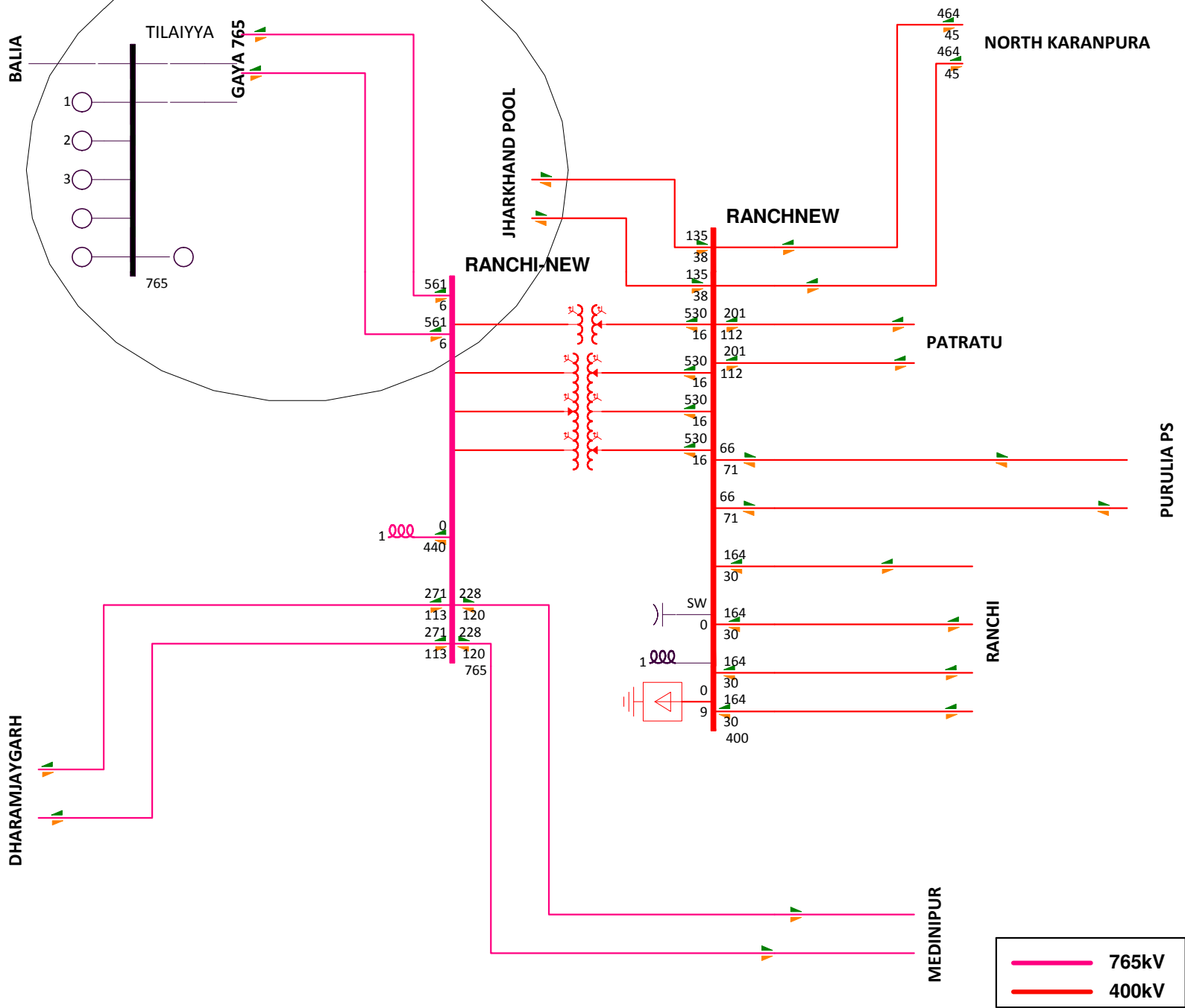
RANCHI - GAYA 765kV D/c LINE





NO GENERATION AT TILLAIYA UMP

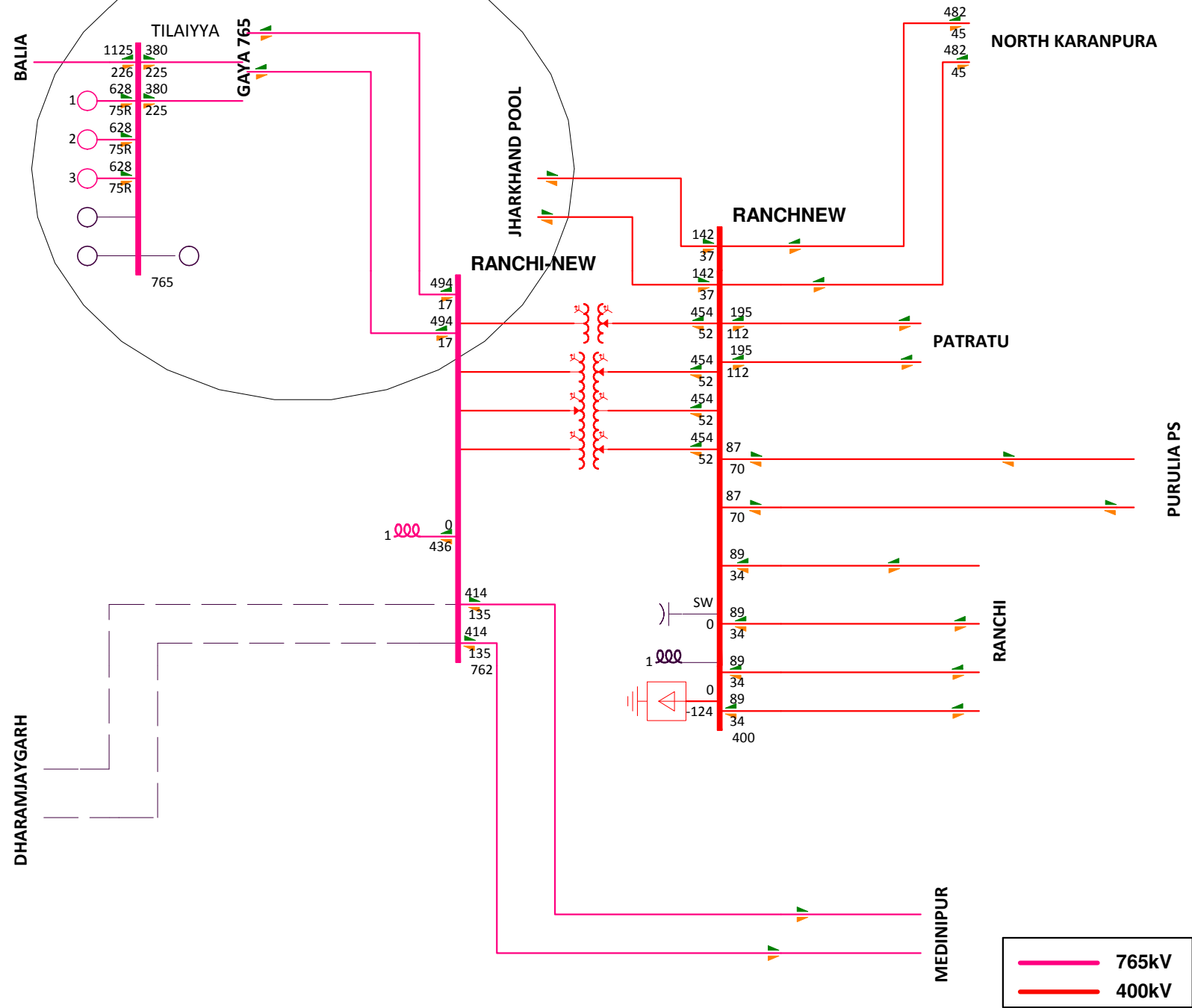
RANCHI - GAYA 765kV D/c LINE





50% GENERATION AT TILAIYA UMP +  
OUTAGE OF RANCHI - DHARAMJAYGARH 765kV D/c

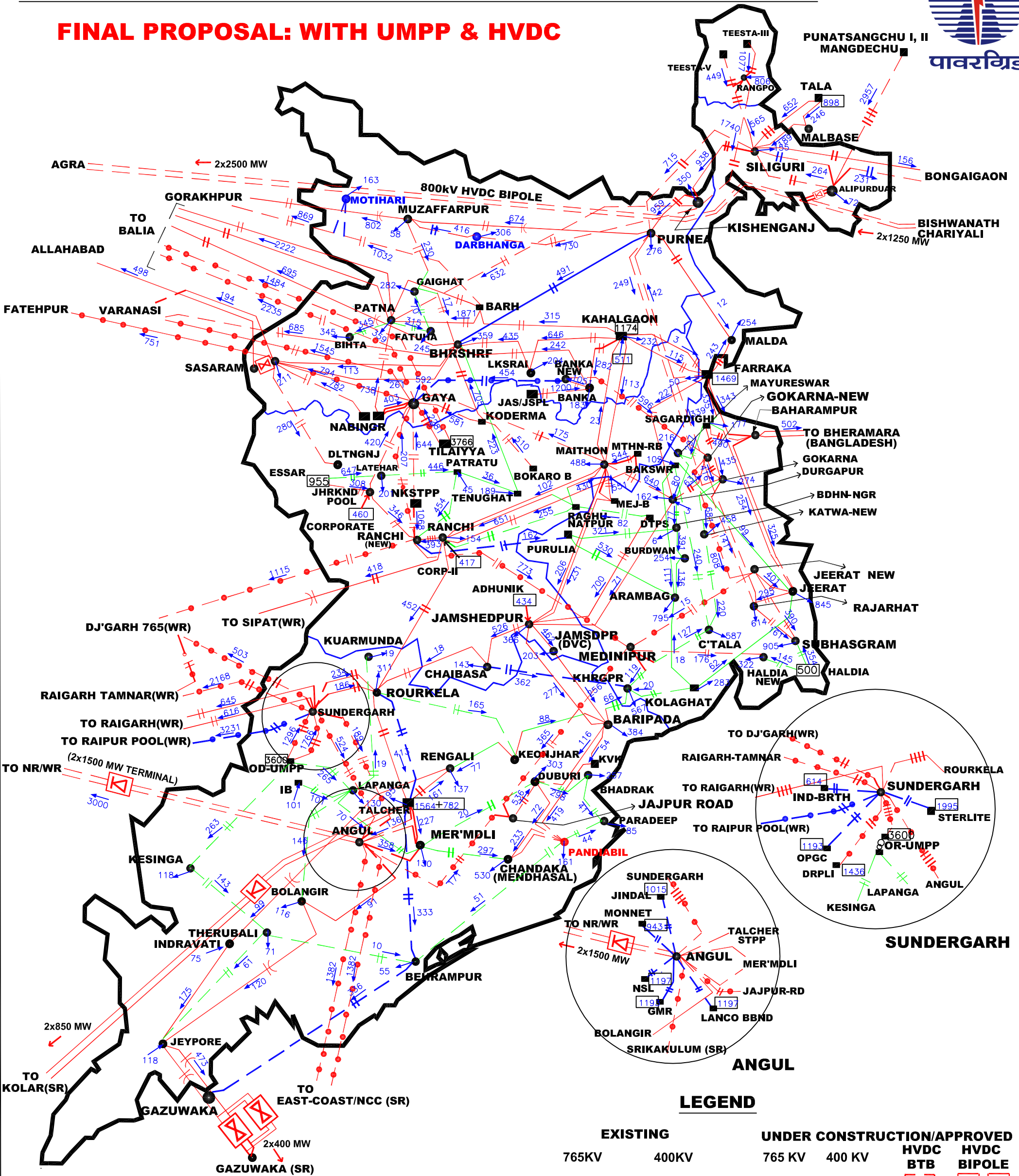
RANCHI - GAYA 765kV D/c LINE



# POWER MAP OF EASTERN REGION



## FINAL PROPOSAL: WITH UMPP & HVDC

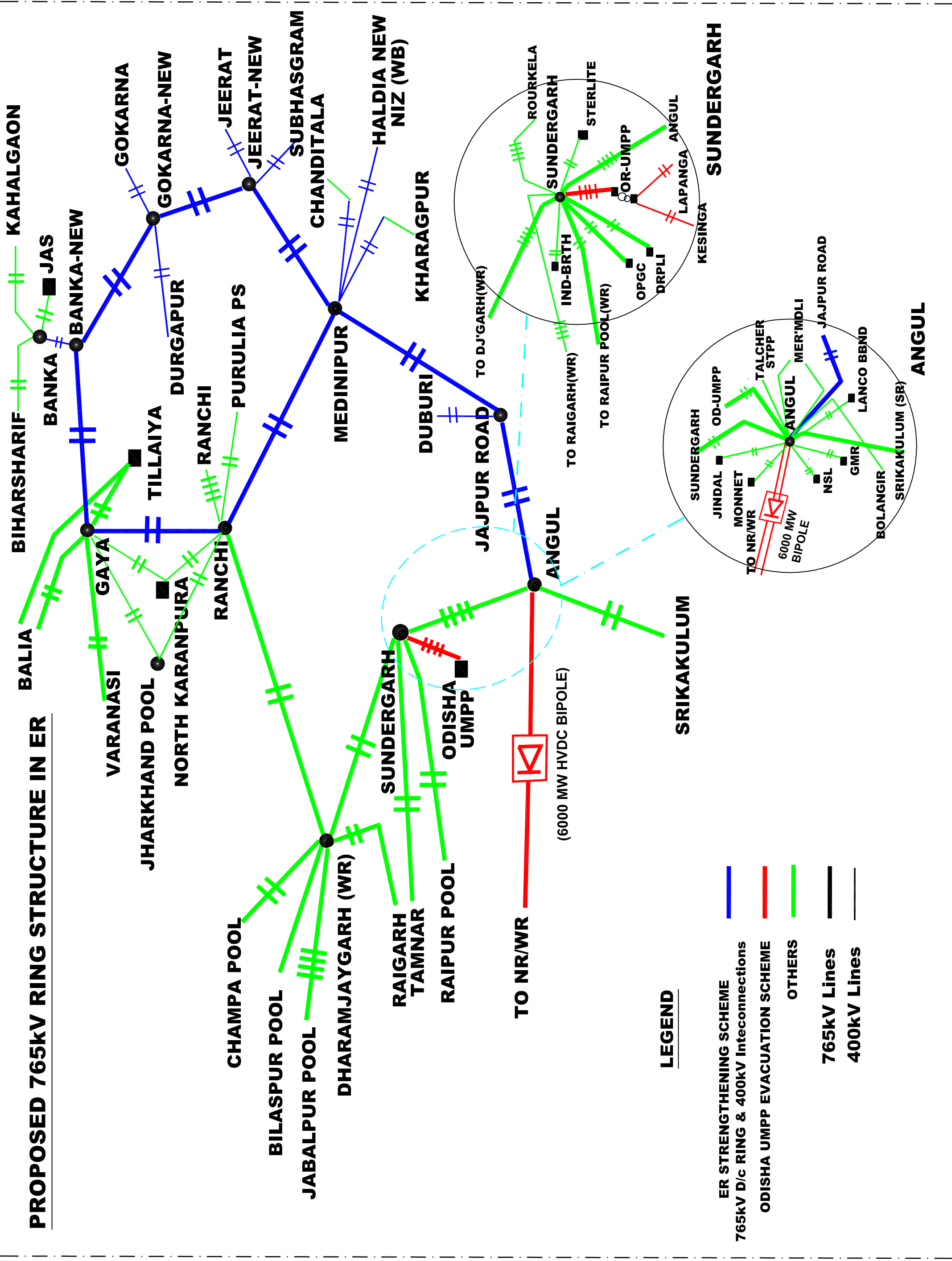


### LEGEND

	EXISTING		UNDER CONSTRUCTION/APPROVED		HVDC BTB	HVDC BIPOLE
	765KV	400KV	765 KV	400 KV		
POWERGRID						
TBCB						
SEB						



# PROPOSED 765kV RING STRUCTURE IN ER



## LEGEND

- ER STRENGTHENING SCHEME
- 765kV D/c RING & 400kV Intconnections
- ODISHA UMPP EVACUATION SCHEME
- OTHERS
- 765kV Lines
- 400kV Lines

**Annexure-4****STANDING COMMITTEE ON POWER SYSTEM PLANNING IN ER  
2<sup>ND</sup> MAY 2014 AT NRPC, NEW DELHI****LIST OF PARTICIPANTS**

<b>SL. NO.</b>	<b>NAME (Shri/Smt)</b>	<b>DESIGNATION</b>	<b>ORGANIZATION</b>
1	Major Singh	Member (PS)	CEA
2	K K Arya	CE I/C (SP&PA)	CEA
3	R Saha	Director (SP&PA)	CEA
4	Santosh Kumar	Dy. Director	CEA
5	Chandra Prakash	Dy. Director	CEA
6	Vikas Sahu	Engineer	CEA
7	Y K Sehgal	COO(CTU)	POWERGRID
8	N.K. Jain	GM(Commercial)	POWERGRID
9	Ashok Pal	AGM (CTU-Planning)	POWERGRID
10	A. Sensarma	DGM (Operation)	POWERGRID
11	Ramchandra	CM(CTU-Planning)	POWERGRID
12	Shruti Tiwari	Sr. Engineer (Operation)	POWERGRID
13	Manish Ranjan Keshari	Engineer (CTU-Planning)	POWERGRID
14	Pratyush Singh	Engineer (CTU-Planning)	POWERGRID
15	U.K. Verma	GM	ERLDC, POSOCO
16	S.R. Narasimhan	DGM	NLDC, POSOCO
17	S.S. Barpanda	DGM	NLDC, POSOCO
18	Surajit Banerjee	Chief Manager	ERLDC, POSOCO
19	A.K. Bandyopadya	MS I/c	ERPC
20	B. Sarkhel	SE(PS)	ERPC
21	D.K. Bauri	Executive Engineer	ERPC
22	S.S. Mishra	AGM (Elect)	NTPC
23	M. Anantha	CE (Elect)	NHPC
24	Achintya Debnath	CE(SPE-REP)	DVC
25	Subhasish Ghosh	Dy.CE (E)	DVC
26	T. Bandopadhyay	Ex. Director (System)	DVC
27	D. Mitra	Ex. Director (Project)	DVC
28	S.K. Das	M.D. WBSETCL	WBSETCL

SL. NO.	NAME (Shri/Smt)	DESIGNATION	ORGANIZATION
29	M.K. Bandyopadhyay	Dir (Op)	WBSETCL
30	S. Nath	CE (CPD)	WBSETCL
31	A. Karmakar	SE(E)	WBSETCL
32	P.B. Subba	PCE-cum-Secy	E&P Dept, Sikkim
33	S.P. Kazi	Addl. E.E.	E&P Dept, Sikkim
34	Dr. K. Balaraman	CGM	PRDC Consulstant
35	Pradipta Kumar Mohapatra	GM(Elect)	OPTCL
36	Sanjay Kumar Hota	CGM (Const)	OPTCL
37	UpendraNath Mishra	Sr. GM (Elect)	GRIDCO
38	K.C. Samantray	Sr. Manager	OPGC

#### IPP Developers

39	R.G. Yadav	Consultant	i. Gati Infrastructure ii. Sahara India Power
40	Rajesh Sharma	SM (Constructions)	Gati Bhasme HEP
41	DeveshGautam	Manager	Gati Infra Ltd
42	SomdattBhard	DGM	Abhijeet Group
43	Shyam K. Patel	DGM	Abhijeet Group
44	Debasis Bhattacharya	CFO	Essar Power (Jharkhand)
45	Deepak Rodricks	GM (Commercial)	Essar Power (Jharkhand)
46	FarrukhAamir	Manager	Tata Power
47	Nandita Singh	Manager	Tata Power
48	Asesh Kumar Nayak	Head Engineer	Tata Power
49	Atul Agrawal	Sr. GM (Elect)	Bhushan Energy Ltd
50	Shekhar Gupta	CEO	Himagiri Hydro Energy (P) Ltd
51	T.D. Negi	AGM	Himagiri Hydro Energy (P) Ltd
52	Yadu Sharma	GM	Visa Power
53	MahavirJhala	DGM(Comm)	LBPL
54	S.R. Ganguly	SPV Head	Lanco Teesta Hydro Power Ltd
55	K.R. Nargendra Kumar	Vice President (Energy)	JSPL
56	B. Sakshi Dev	AVP (Elect)	1. NSL Orissa Power 2. NSL Nagapatnam
57	Amit Pandey	Consultant	Sahara India Power Corp Ltd
58	A. Ravi	General Manager	Sesa Sterlite Ltd



<b>SL. NO.</b>	<b>NAME (Shri/Smt)</b>	<b>DESIGNATION</b>	<b>ORGANIZATION</b>
59	V V Sharma	GM	JITPL
60	K.C. Agrawal	Head, Power Sales	JITPL