**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.66/5/2014-SP&PA/ 740-752 dated: 16.4.2014

| | |
|---|---|
| 1. Managing Director,<br>Bihar State Power Transmission Company,<br>Vidyut Bhavan, Baily Road,Patna-800021.<br>Tel. 0612-2504442<br>Fax No. 0612-2504968 | 2. Director (System),<br>Damodar Valley Corporation<br>DVC Towers, VIP Road,Kolkata-700054.<br>Tel. 033-23557934<br>Fax No. 23554841 |
| 3. Member Secretary,<br>Eastern Regional Power Committee,<br>14, Golf Club Road, Tollygange,<br>Kolkata-700033.<br>Tel. No. 033-24235199<br>Fax No.033-24171358 | 4. Director (Commercial),<br>Grid Corporation of Orissa Ltd,<br>Jan path, Bhubaneshwar-751022.<br>Tel. No. 0674-2541127<br>Fax No. 0674-2543452 |
| 5. Director (Transmission),<br>Orissa Power Transmission Corporation Ltd, Jan path, Bhubaneshwar-751022.<br>Tel. No. 0674-2540098<br>Fax No.0674-2541904 | 6. Director (System Operation),<br>West Bengal State Electricity Transmission Company Ltd,<br>Vidyut Bhavan, 5th Floor, Block-D, Bidhannagar, Sector-II,<br>Kolkata-700091.<br>Tel. No. 033-23370206<br>Fax No.033-2337206 |
| 7. Principal Chief Engineer cum Secretary, Power Department<br>Government of Sikkim, Sikkim.<br>Tel. No. 03592-2022440<br>Fax No.03592-202927 | 8. Director (Projects),<br>Power Grid Corporation of India<br>"Saudamini" Plot No. 2, Sector-29,Gurgaon-122001<br>Tel. No. 0124-2571816<br>Fax No.0124-2571979 |
| 9. Director (Technical),<br>NTPC Limited,<br>Engineering Office Complex,<br>A-8, Sector 24, Noida.<br>Tel. No. 24362050<br>Fax No. 24362421 | 10. Member (Transmission),<br>Jharkhand State Electricity Board,<br>In front of Main Secretariat,<br>Doranda, Ranchi-834002.<br>Tel. No. 0651-2400827<br>Fax No. 0651-2400799 |
| 11. Executive Director (T&RE),<br>NHPC Ltd, NHPC Office complex,<br>Sector 33, Faridabad-121003.<br>Tel. No. 0129-2255805<br>Fax No. 0129-2256055 | 12. General Manager,<br>Eastern Regional Load Dispatch Center, 14, Golf Club Road,<br>Tollygange, Kolkata-700033.<br>Tel No. 033-24235867<br>Fax No. 033-24235809 |
| 13. Sh. S K Soonee, CEO, POSOCO,<br>B-9, Qutab Institutional Area,<br>Katwaria Sarai, New Delhi-110016.<br>Tel. No. 26524525<br>Fax No. 26852843 | |

Sub: Meeting of the Standing Committee on Power System Planning in Eastern Region.

Sir,

The Standing Committee meeting on Power System Planning in Eastern Region is scheduled to be held on 2.5.2014 at 11.00 hrs. at **NRPC, Katwaria Sarai, New Delhi. The agenda is available at CEA website: www.cea.nic.in.** (Path to access-*Power System/Standing Committee on Power System Planning/EASTERN REGION).* You are requested to kindly attend the meeting.

It is also to state that the proposed agenda includes items pertaining to connectivity/LTA applications. The concerned generation developers/applicants are requested to attend the meeting at 1.00 P.M. to discuss LTA/connectivity issues. List of generation developers (applicants) has also been uploaded. POWERGRID is requested to intimate the developers for participation in the meeting beginning from 1.00 P.M.

Yours faithfully,

(K.K. Arya)
Chief Engineer I/C (SP&PA)

**Sikkim IPPs Phase-1:**

| | |
|---|---|
| **Shri S. S. Sharma**<br>Executive Vice President<br>PTC India Limited,<br>2nd Floor; NBCC Tower,<br>15 Bhikaji Cama Place<br>New Delhi – 11 00 66<br>Ph : 011-41659136 | **Shri R.Sri Nagesh**<br>Lanco Energy Pvt. Ltd.<br>Plot No:397,Udyog Vihar<br>Phase-III,Gurgaon-122016<br>Ph : 0124-4741000/01/02/03<br>Extn.1305<br>Ph: 0124-4741305<br>Mobile:9810571433 |
| **Shri Y. Nagendra Rao**<br>Director, Dans Energy Pvt. Ltd<br>5th Floor, DLF Building No. 8<br>Tower-C, DLF Cyber City, Phase-II<br>Gurgaon – 122002<br>Ph : 0124-4696300 | **Shri M. K. Sharma**<br>Chief Executive Officer<br>Jal Power Corporation Limited<br>A-102, Sector-65<br>NOIDA-201307<br>Ph : 0120-4397444 |
| **Dr. B. M. Goswami**<br>Chief Executive Officer<br>Madhya Bharat Power Corporation Ltd.<br>Daragaon, Tadong<br>Near Sikkim Computers<br>Gangtok – 737102<br>Ph : 03592-231771, 320519, 09891643501 | **Shri Sanjeev Upadhyay**<br>President, Hydro<br>Gati Infrastructure Limited &<br>Gati Bhasmey Power Pvt. Ltd.<br>268, Udyog Vihar, Ph-IV<br>Gurgaon – 122016, Haryana<br>Phone : 0124-2644284 |

**Sikkim IPPs Phase-2:**

| | |
|---|---|
| **Shri T. Nagendra Rao**<br>Director, Shiga Energy Pvt. Ltd.<br>5th Floor, DLF Building No. 8<br>Tower-C, DLF Cyber City, Phase-II<br>Gurgaon – 122002<br>Ph : 0124-4696300, 4100393 | **Shri Vijay Kumar Atluri**<br>CEO<br>Sneha Kinetic Power Projects Pvt.Ltd.<br>#31-A, National Highway,<br>Behind SNOD building, Deorali, Gangtok<br>Sikkim-737102<br>Ph: 09959222836 |
| **Shri Shekhar Gupta**<br>Chief Executive Officer<br>Himagiri Hydro Energy Pvt. Ltd.<br>A-404,Plot No:27,sector-12,<br>Sunny Valley,Dwaraka,<br>New Delhi-110075<br>Ph : 08447032890, 011-28033186 | |

**Bihar IPPs:**

| |
|---|
| **Shri Shyam K. Patel**<br>Dy. General Manager (Projects)<br>JAS infrastructure and Power Limited<br>Maple Plaza, Opposite Road No. 2<br>Ashok Nagar, Ranchi, Jharkhand – 834002<br>Ph : 0651-3981900-908; 09386617931 |

**Jharkhand IPPs:**

| | |
|---|---|
| **Shri Arun Gupta**<br>Chief Executive Officer<br>Corporate Power Ltd.<br>Maple Plaza<br>Opposite Road No. 2<br>Ashok Nagar, Ranchi, Jharkhand – 834002<br>Ph : 0651-3981900-908 | **Shri B.H.Ravindra**<br>Managing Director- EPJL<br>Essar Power Complex, Kanchan Nagri,<br>Chandwa, District- Latehar<br>Jharkhand<br>Pin- 829203<br>Phone: +91 651 2240679 |
| **Shri Vikas Saksena**<br>Executive Vice President<br>Jindal Steel and Power Ltd.<br>Plot-2, Tower-B, Sector-32<br>Gurgaon, Haryana- 122001 | |

**Odisha IPPs Phase-1:**

| | |
|---|---|
| **Shri R. K. Singh**<br>Sr. Vice President<br>Sterlite Energy Ltd.<br>Project Site Office<br>Bhurkhamunda, P.O. – Sripura<br>Distt : Jharsuguda (Odisha)-768202<br>Ph : 06645-26600<br>Mobile : 09777451777 | **Shri S.K.Sekar**<br>COO<br>CEO & SBU Head-Thermal<br>Lanco Babandh Power Pvt. Ltd.<br>Plot No. 397, Phase-III<br>Udyog Vihar, Gurgaon-122 016<br>Ph : 0124-4691101<br>Mobile : 9717782800 |

**Odisha IPPs Phase-2:**

| | |
|---|---|
| **Shri Subrato Trivedi**<br>Director<br>VISA Power Ltd.<br>VISA House, 4th Floor,<br>8/10, Alipur Road,<br>Kolkata-700027<br>Ph : 09836447744, 033-30519040 | **Shri KRC Shekhar**<br>Vice President<br>NSL Orissa Power and Infratech Pvt. Ltd.<br>HIG – 8, 1st Floor, Gangadhar Meher Marg,<br>Jayadev Vihar, Bhubaneswar – 751013<br>Orissa<br>Ph : 07894466550, 0674-2300299 / 2300809<br>Fax : 0674-2300299 |
| **Shri Purushottam Thakur**<br>General Manager-Projects<br>Tata Power Company Ltd.<br>HIG-22,BDA Colony, Jaydev Vihar<br>Bhubaneswar-751013<br>Ph : 09238003939, 0674-2302151<br>Fax : 0674-2302151 | **Shri C. Narasimha**<br>Head-Electrical<br>J R Power Gen Private Ltd.,<br>8-2/293/82/A/431/A,<br>Road No:22, Jubilee Hills.<br>Hyderabad-500033,<br>Ph : 040-23559922-25, 09177029345<br>Fax : 040-23559930 |
| **Shri Ashok K. Bhargava**<br>Chief Executive Officer<br>Sahara India Power Corp. Ltd.<br>Sahara India Centre<br>5th Floor, 2, Kapoorthala Complex<br>Aliganj, Lucknow – 226024, UP<br>Ph : 9307474747, 9839011205, 9937291060<br>Fax : 0522-2333886, 2330135 | **Shri Rahul Sengupta**<br>Executive Vice President<br>Bhusan Energy Ltd.,<br>F-Block,1st Floor,<br>International Trade Tower,<br>Nehru Place, New Delhi -110019<br>Ph : 09899655551, 011-39194000<br>Fax : 011-26478750 |

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|---|---|
| **Shri S.S Mishra**<br>AGM (Elect)<br>NTPC Ltd (Gajmara)<br>Engineering Office Complex, A-8A,<br>Sector-24, Noida-201301 (U.P)<br>Ph :09650991145<br>Fax : 0120-2410108 | **Shri D. Vijay Bhaskar**<br>President<br>NSL Nagapatnam Power & Infratech Pvt.Ltd.<br>NSL Icon, 4th Floor, 8-2-684/2/A<br>Road No. 12, Banjara Hills<br>Hyderabad - 500034<br>Ph : 91-40-30514444<br>Fax : 91-40-23327919 |
| **Shri Punit Gupta**<br>Director<br>Jindal India Thermal Power Ltd.<br>Plot-12, Sector B-1<br>Local Shopping Complex<br>Vasant Kunj, New Delhi – 110 070<br>Ph : 09810155662<br>Fax: 011-26125739 | |

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**Agenda for the forthcoming Standing Committees Meeting of Power System planning of Eastern Region**

## 1.0 Modification in the scheme of "Transmission System associated with Phase-I IPPs in Sikkim"

A 400/220 kV 2x315 MVA GIS sub-station at Kishanganj was planned under the above approved inter-state scheme with the following scope of works (shown in Fig.1):

- New 2x315MVA, 400/220 kV GIS sub-station at Kishanganj
- **LILO of New Siliguri - New Purnea 400kV D/c (quad) at Kishanganj**
- **LILO of New Siliguri – New Purnea 400kV Twin moose D/c line (being re-condcutored with HTLS) ) at Kishanganj**
- LILO of Siliguri - Dalkhola 220kV D/c line at Kishanganj

Earlier, the sub-station was planned to be established at Karandighi in West Bengal and it was subsequently changed to Kishanganj (Bihar) due to land acquisition issues.

POWERGRID has informed that after finalization of location of the Kishanganj S/S, the route length of LILO of New Purnea - New Siliguri 400 kV D/c line (re-condcutoring with twin HTLS conductor) and New Purnea - New Siliguri 400 kV D/c line (quad conductor) has undergone considerable change. Length of New Siliguri – Kishanganj section after LILO becomes about 177 km for twin conductor line and 102 km for quad conductor line.

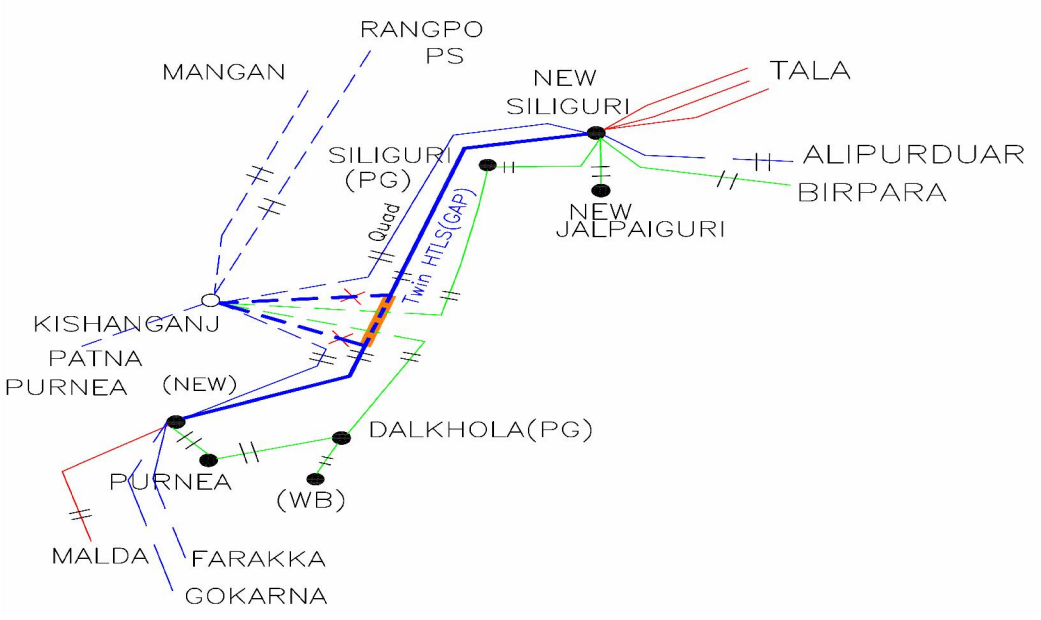



Fig-1: Proposed Transmission System associated with Phase-I IPPs in Sikkim

POWERGRID, based on the system studies carried out by them, considering revised line lengths, has suggested that in case of LILO of Siliguri – Purnea 400kV 2xD/c at Kishanganj, load sharings on the Kishanganj – Siliguri section of the D/C

quad moose conductor line and the D/C twin HTLS conductor line are very uneven **(Annexure-1a)**. But, if only quad conductor line is LILOed at Kishanganj, load sharing in each D/C of the 2xD/C lines improves **(Annexure-1b)**. Considering this, it is proposed that LILO of New Purnea - New Siliguri 400 kV D/c line (being re-condcutored with twin HTLS conductor) at Kishanganj may be deleted.

Accordingly, the revised scope is proposed as under:

- New 2x315MVA, 400/220 kV GIS 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 (being re-condcutored with HTLS conductor) at Kishanganj and associated 4 nos. 400 kV line bays at Kishanganj (proposed for deletion)
- LILO of Siliguri - Dalkhola 220kV D/c line at Kishanganj

**Members may discuss & concur.**

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

The above approved scheme was planned to transfer surplus power from generation projects in NER & Bhutan to power deficit areas in NR/WR and is under implementation phase with the following scope of works:

- New 2x315MVA, 400/220kV AC & HVDC sub-station with ± 800kV, 3000MW converter module at new pooling station at Alipurduar
- Extension of ± 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)

POWERGRID has proposed that the LILO portion of Tala-Siliguri at Alipurduar has a length of about 80km and with this, loadflow study has been conducted with and without LILO of Tala – Siliguri 400kV D/c at Alipurduar. The results of load flow studies (**Annexure-2a**) 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. Variation in loading becomes more pronounced (433 MW and 867 MW-per circuit) with the outage of one pole of Alipurduar – Agra HVDC bipole **(Annexure-2b)**.

POWERGRID has also proposed from their studies that with a new Alipurduar-Siliguri 400kV D/c quad line ($2^{nd}$) the loading is well balanced over the new proposed line and Alipuduar – Siliguri 400kV D/c (Quad) line ($1^{st}$ - formed after

LILO of Siliguri – Bongaigaon 400kV D/c quad line at Alipurduar) in normal as well as HVDC single pole outage cases. Hence, it is proposed to construct a new Alipuduar-Siliguri 400kV D/c quad line ($2^{nd}$) in parallel with the $1^{st}$ quad line, instead of LILOing Tala-Siliguri 400kV D/c twin moose line at Alipurduar **(Annexure-2c and 2d).**

The $2^{nd}$ Alipurduar-Siliguri 400kV D/c quad line has been proposed with Punatsangchu-II and Mangdechu projects in Bhutan under Agenda item: 3.

Accordingly, the revised scope of the scheme is proposed as under:

- New 2x315MVA, 400/220kV AC & HVDC sub-station with ± 800kV, 3000MW converter module at new pooling station at Alipurduar
- Extension of ± 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 and associated 4 nos. 400 kV line bays at Alipurduar (proposed for deletion)**
- 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)

**Members may discuss and concur.**

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

In Bhutan, Punatsangchhu-I HEP(1200MW), Punatsangchhu II HEP (990MW), Mangdechhu HEP (720MW) and Wangchhu HEP (570MW) HEPs are at various stages of development. Generations from these projects would be transferred to India after meeting small local demand. The associated transmission system for evacuation of power from the HEPs have been evolved in the NTGMP (National Transmission Grid Master Plan) for Bhutan based on detailed system studies corresponding to 2020 time frame, as part of consultancy rendered by CEA to RGoB. The project specific transmission system (shown in Fig. 2) is hereunder.

### (I) 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)

**(II) 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/ Lhamo Zingkha 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-1 system.

**(III) 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)

**(IV) 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.

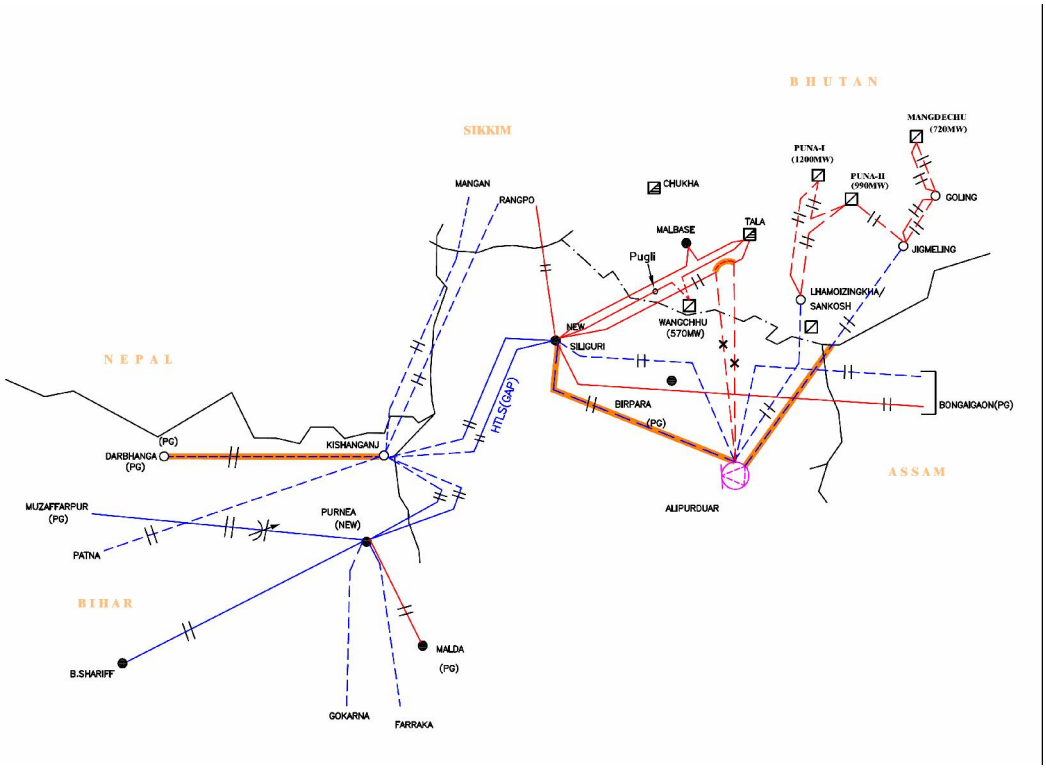



Fig-2: Evacuation Systems for Puna-I, Puna-II, Mangdechhu and Wangchhu HEPs

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

In addition to above system requirements in India, POWERGRID has proposed for 400kV D/c line from Kishanganj to upcoming Darbhanga substation.

In this context, study results of POWERGRID shows that quantum of power flows on both Alipurduar – Siliguri 400kV D/c (Quad) line and Kishanganj – Darbhanga 400kV D/c (Quad) line are significant under normal (**Annexure-3a)** and single pole outage of Alipurduar – Agra HVDC (**Annexure-3b)** conditions.

**Accordingly, System requirements in India for the above 4 HEPs are proposed as following:**

**(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.**

Keeping in view the sensitivity of developing cross-border interconnection with Bhutan, it is suggested that the transmission lines at (1) and (2) may be constructed by PGCIL on cost plus basis whereas transmission lines at (3) may be constructed on Tariff Based Competitive Bidding (TBCB) route.

**Members may discuss and concur.**

**4.0 Conversion of 50 MVAr Line Reactor existing at Jeerat end of Bahrampur – Jeerat 400 kV line to Bus Reactor in parallel with existing Bus Reactor at Jeerat**

Conversion of 50 MVAr fixed line-reactor at Jeerat end of 400 kV Jeerat-Baharampur line to switchable line reactor was approved in the 25th TCC / ERPC meeting held on September 20-21, 2013.

Subsequently, it is felt to convert the subject line reactor as bus reactor in parallel with existing Bus Reactor it was discussed and agreed in the 26th TCC / ERPC meeting held in Kolkata on January 17-18, 2014.

**Members may note.**

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

Replacement of existing 63 MVAr bus reactor by 125 MVAr bus reactor at 400kV Jeypore S/S (PG) was approved in the Standing Committee Meeting held on 08-02-2012, and it is under implementation by POWERGRID as part of Eastern Region Strengthening Scheme-VIII. It has been assessed by PGCIL that space for installation of 125 MVAr bus reactor would be available even after retaining the existing 63 MVAr bus reactor. In order to utilise the existing 63 MVAR bus reactor, it is proposed to install new 125 MVAr bus reactor in parallel with existing 63 MVAr bus reactor at Jeypore. Further, for operational flexibility, it is also proposed to provide separate CB for switching operation of the 125 MVAr bus reactor.

**Members may concur.**

**6.0 Proposal for additional Reactive Power Compensation in Eastern Region**

In order to arrest high voltage at Banka, Bolangir, Baripada, Keonjhar, Durgapur, Chaibasa and Lakhisarai in the Eastern Grid, a review exercise with the existing, under implementation and planned reactors (given in Table-1) and also considering additional reactors at the above sub-stations has been carried out by PGCIL. 400kV voltage profile and voltage sensitivity (2 to 6kV) with additional reactor (s) proposed by PGCIL at the various sub-stations are given below in the Table-2.

**Table-1**

| Sl. | Sub-Station | Status | Bus Reactor (MVAr) | | |
|---|---|---|---|---|---|
| | | | Existing | Under Imp. | Proposed (additional) |
| 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

Regarding Durgapur sub-station, PGCIL has informed that split bus arrangement at this sub-station is already under implementation after which one split bus section at Durgapur will be left with only one bus reactor.

**Table-2**

| Sl. No | Sub-Station | Three Phase Fault Current (in kA) | Base Voltage (in kV) ($V_1$) | Voltage after installation of Additional 125MVAr Bus Reactor (in kV) ($V_2$) | Voltage Sensitivity ($\Delta V=V_1 - V_2$) (in kV) |
|---|---|---|---|---|---|
| 1 | Banka | 17 | 407 | 405 | **2** |
| 2 | Bolangir | 11 | 404 | 399 | **5** |
| 3 | Baripada | 22 | 407 | 404 | **3** |
| 4 | Keonjhar | 11 | 407 | 401 | **6** |
| 5 | Durgapur (split) | 33 | 412 | 411 | **1** |
| 6 | Chaibasa | 27 | 412 | 410 | **2** |
| 7 | Lakhisarai | 20 | 414 | 411 | **3** |

**Members may discuss & concur.**

**7.0 Downstream 220kV system development of STUs** (Bihar, Jharkhand & Odisha) **from the various approved and ongoing sub-stations of PGCIL.**

- **ERSS-III Scheme**

Under the ERSS-III scheme, following new 400 kV sub-stations have been / are being commissioned by POWERGRID

- 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.

The sub-stations at Banka, Bolangir & Keonjhar have been commissioned by PGCIL, but the downlinking 220 & 132 kV lines/systems have not yet been developed by the concerned STUs.

Bihar, Jharkhand & Odisha need to furnish their respective system strengthening plan for drawl of power from substations and its time frame for execution so that proper anchoring of the associated line be achieved to enable proper utilization of transmission assets.

- **220kV downstream link from the existing 400/220kV 2x315 MVA Bolangir S/S (PG) in Odisha by OPTCL.**

PGCIL has since commissioned the 2x315MVA 400/220kV Bolangir S/s by LILOing of 400kV Meramandali-Jeypore S/C line with an objective of supplying

power from ER grid to Bolangir and its adjoining areas in Odisha. In spite of several persuasions from CEA/CTU, OPTCL has not been able to make it till date. The downstream 220kV system from the Bolangir 400kV S/S (PG) should be executed by OPTCL on topmost priority to enable proper anchoring of the 400kV S/S and to utilize the sub-station facility. OPTCL may furnish the implementation status, timeline for creating the downstream 220kV network from Bolangir(PG).

**8.0 (a) Transmission System associated with Odisha UMPP (4000 MW) and,**
**(b) Associated 765kV System Strengthening Scheme in Eastern Region**

**8.0 (a) Transmission System associated with Odisha UMPP (4000 MW)**

Odisha UMPP with an Installed Capacity of 4000 MW (5x800 MW) located at Bhedabahal in Odisha is expected to come up during 2017-18. The step-up voltage is envisaged at 765kV for evacuation. Transmission system associated with Odisha UMPP is proposed to be divided into two parts viz.

i) Immediate evacuation system of the UMPP project and
ii) Strengthening scheme.

System studies have been carried out by PGCIL to determine the system requirements for the UMPP. Earlier, in the SCM held on 28-12-10 evacuation arrangement were discussed. Presently, to firm-up the system, PGCIL has conducted the system studies and prepared a brief report given at **Annexure-4**. Based on the study results, the following system are proposed :

**i) Immediate evacuation system for the Odisha UMPP:**

Generation will be injected at 765kV level and evacuated 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 be in a position to absorb its share at Lapanga and Kesinga S/Ss being planned by OPTCL. Accordingly, the following UMPP switchyard provision and immediate evacuation arrangement have emerged.

**A) <u>UMPP switchyard scope for evacuation system</u>**

1. Generation to be stepped up at 765kV
2. 4 no. 765 kV line bays
3. 6 no. 400 kV line bays (suitable for quad conductor lines)
4. 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
5. 2x 240 MVAr Bus Reactor at 765 kV bus of Generation Switchyard
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 no 400kV line bays.

9. 1x80 MVAr 1-phase spare reactor
10. The 765KV and 400kV switchyard may be designed for 50KA and 63KA fault levels respectively.

**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
3. Odisha UMPP – Keonjhar (PG) 400kV D/c line
4. Odisha UMPP – Kesinga (OPTCL) 400kV D/c line

**ii) Associated System Strengthening requirements :**

The immediate evacuation from Odisha UMPP project involves LILO of Angul – Jharsuguda 765kV D/c lines at Odisha UMPP. The proposal of system strengthening inter-alia involves creation of a ±800kV, 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 ($2^{nd}$) 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.

(i) ±800kV, 6000MW HVDC bipole line from Angul to suitable location in NR/WR with 3000MW terminal at either ends.
(ii) New 2x1500MVA, 765/400kV S/s at Jajpur Road
(iii) Angul – Jajpur Road 765kV D/c line
(iv) Jajpur Road – Medinipur 765kV D/c line#
(v) Jajpur Road – Duburi 400kV D/c line (quad/HTLS)
(vi) Jajpur Road – Keonjhar 400kV D/c line (quad/HTLS)
(vii) 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 explained below].

**8.0(b) Associated 765kV System Strengthening Scheme in Eastern Region**

It has been observed from the future load generation scenario in Eastern Region ($13^{th}$ Plan) that while there is a steady growth in the load all over the ER, the generation projects are mainly coming up in the central and western part of Eastern Region (Odisha, Jharkhand and Bihar). No major generation addition is taking place in the Eastern part (West Bengal). While 765kV inter-state substations at Ranchi, Gaya, Angul and Jharsuguda/Sundergarh are being implemented by PGCIL to enable export of power outside the region.

For 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 is proposed to build a strong transmission network in ER optimizing RoW requirements with creation of a **765kV ring/corridor viz. 765kV Ranchi (New)-Medinipur-Jeerat (New)-Katwa-Banka (New)-Gaya-Ranchi D/c ring.**

**The proposed links would also involve establishment of 765/400 kV new substations at Banka (New), Medinipur (in West Bengal), Jeerat (New) and Katwa (in West Bengal).** These sub-stations are proposed to be interconnected through Ranchi (New)-Medinipur-Jeerat (New)-Katwa-Banka (New)-Gaya-Ranchi 765kV D/c lines. The 765/400kV substations 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.

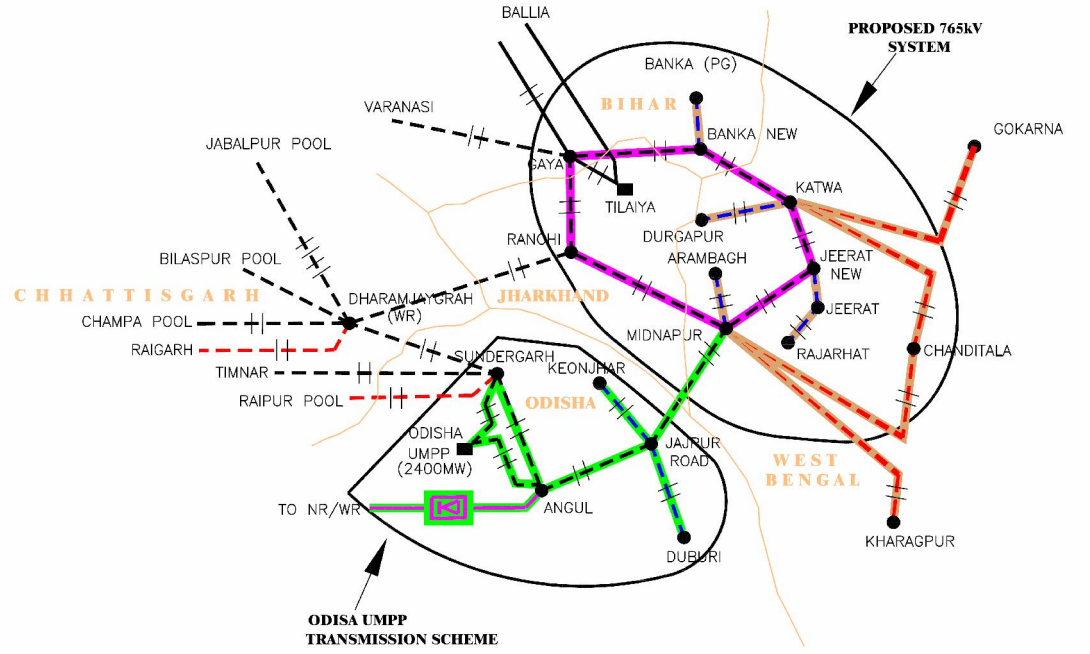



Fig-3. Evacuation system for Odish UMPP and proposed 765kV D/C ring in ER

Accordingly, following 765kV D/C transmission system is proposed:

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/HTLS)
8. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur
9. Jeerat (New) – Jeerat (WBSETCL) 400kV D/c line (quad/HTLS)
10. Jeerat (New) – Rajarhat (PG) 400kV D/c line (quad/HTLS)
11. LILO of Chandithala – Gokarna (WBSETCL) 400kV D/c line at Katwa

12. Katwa – Durgapur (PG) 400kV D/c line (quad/HTLS)
13. Banka(New) – Banka(PG) 400kV D/c line (quad/HTLS)

System studies have been carried out by PGCIL, results of which are given at **Annexure-4 (Exhibit 1-3)**. A brief presentation on the studies would be given by POWERGRID.

**Members may discuss and concur.**

**9. 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**

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 earlier discussed in the 25th TCC / ERPC meeting held on 20-21 September, 2013 wherein ERLDC informed that, in view of load growth of OPTCL, argumentation of ICT may be considered and it was agreed. OPTCL also agreed to the proposal.

**Members may note.**

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

220/132 kV Purnea sub-station of POWERGRID is having 3 nos. ICTs, 2 of 160 MVA each and the 3rd one of 100 MVA. In view of increased power demand in the area and on request of BSPHCL, ERPC in its 25th meeting held on 20-21 September, 2013, approved replacement of 3rd 100 MVA ICT with 160 MVA ICT. 100 MVA ICT thus released shall be kept in the pool of spare ICTs.

**Members may note.**

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

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 59th OCC, it was already pointed out that the transformation capacity of 100

MVA ICT at Silliguri (PG) is not sufficient to cater peak load of North Bengal and Sikkim because of degradation over its expected life span of 25 years. Even after reconditioning at site, the condition of transformer has not improved. The condition of 100 MVA ICT at Birpara is also similar with sudden Hydrogen rise (up to 1000ppm against limit of 100ppm) which has also been reconditioned at site. The matter was further discussed in the 25th TCC / ERPC meeting held on 20-21 September, 2013 and following was agreed:

- 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.

**Members may note.**

**12. Modification of 132kV bus arrangement at 220/132kV Purnea S/S with GIS**

Presently, Single Main & Transfer Bus Scheme at 132kV level and Double Main & Transfer Bus Scheme at 220kV level are existing. In order to improve reliability of 132kV system, the 132kV Bus scheme including switchgear is proposed to be upgraded to Double Main Scheme. The issue was discussed in the 25th TCC / ERPC meeting held on 20-21 September, 2013 and members agreed for modification of 132kV Bus arrangement along with switchgear at 220/132kV Purnea substation of POWERGRID. For any space constraint 132 kV GIS bays could be considered at Purnea substation.

**Members may note.**

**13. 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 3rd 400/220 kV ICT (500 MVA) at Kishanganj**

BSPTCL has proposed to establish their new 220/132 kV sub-station at Kishanganj which is to be connected to Kishanganj 400/220 kV sub-station of POWERGRID through 2 nos. 220 kV high capacity lines. Accordingly, BSPHCL requested POWERGRID to provide 4 nos. 220 kV line bays at POWERGRID's Kishanganj sub-station under the regional scheme. The matter was examined by CEA and CEA vide its letter dated 16-09-2013 has accorded its in-principle approval for the proposal.

Further, with above addition of 220 kV outlets at Kishanganj 2x315 MVA, 400/200 kV sub-station, there will be 8 nos. 220 kV outlets from Kishanganj (4 nos. for

Kishanganj-BSEB & 4 nos. for LILO of Siliguri – Dalkhola 220 kV D/c). 2 nos. 315 MVA transformers may not be adequate enough to cater to 8 nos. 220 kV outlets meant to extend power supply in power starved north Bihar & northern West Bengal area.
It is, therefore, proposed to install a 3rd 400/220 kV transformer of 500 MVA capacity at Kishanganj.

**Members may discuss and concur.**

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

At present single Main & Transfer Bus Scheme is functional at 132kV level and Double Main & Transfer Bus Scheme is functional at 220 kV level at 220/132kV Birpara substation of POWERGRID. In order to improve reliability of 132 kV system of Birpara, 132 kV Bus arrangement including switchgear need 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 is felt necessary. Due to the space constraint, 132 kV GIS bays could be considered at Birpara substation. The matter has been discussed and agreed in the 26th TCC / ERPC meeting held in Kolkata on January 17-18, 2014.

**Members may note.**

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

CTU has granted LTA to NTPC for their Darlipalli Generation 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 persistent follow up, the signing of the same is still pending. It may be informed that the implementation of Associated Transmission system can only be taken up after signing of LTA Agreement by above beneficiaries. Therefore, Bihar, Jharkhand, Sikkim and West Bengal are requested to sign the agreement at the earliest.

**16. Signing of Transmission Service Agreement (TSA)**

As per the provisions of the CERC (Sharing of Inter State Transmission Charges and Losses) Regulations, 2010 implemented w.e.f. 01.07.2011, all the DICs are required to enter into a Transmission Service Agreement (TSA) with CTU. ER beneficiaries namely, Bihar, Odisha, Jharkhand, West Bengal, DVC and Sikkim have not yet signed the TSA. These States have gone to Court against the Regulation. The case is presently pending in Delhi High Court. Delhi High Court vide interim order dated 30.07.2013, has ordered them to make full payment of Transmission Charges as per PoC mechanism pending decision in this case. As, all the above DICs have started making full payment as per the extant regulations. They are requested to sign the TSA.

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

## A. Generation Project :

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

## B. Transmission System :

### B1. Immediate Evacuation : Implementation by Generation Developer

- Teesta-III : Teesta-III - Kishanganj 400kV D/c line with Quad Moose conductor (through JV by POWERGRID and Teesta Urja)
- Jorethang : Jorethang – New Melli 220kV D/c line
- Rangit-IV : Rangit-IV – New Melli 220kV D/c line
- Chuzachen : Chuzachen – Rangpo 132kV D/c line with Zebra conductor
- Rongnichu : Rongnichu – Rangpo 220kV D/c line with Zebra conductor
- Bhasmey : LILO of one ckt of Chuzachen-Rangpo 132kV D/c line at Bhasmey
- Teesta-VI : Teesta-VI – Rangpo 220kV D/c line with Twin Moose conductor

### B2. Common System - Implementation by POWERGRID

- Establishment of New 2x315 MVA, 400kV sub-station at Kishanganj
- LILO of Siliguri (Existing) – Purnea 400kV D/c line(quad) at new pooling station Kishanganj
- LILO of Siliguri (Existing) – Purnea 400kV D/c line (on which reconductoring is being carried out) at Kishanganj with higher capacity (quad) conductor
- LILO of Siliguri – Dalkhola 220kV D/c line at new pooling station Kishanganj
- LILO of Gangtok-Melli 132kV S/c line upto Rangpo.
- LILO of Gangtok-Rangit 132kV S/c line at Rangpo.
- Establishment of 400/220/132kV (400/220kV, 16x105 MVA, Single Phase transformers and 220/132kV, 3x100MVA) Gas Insulated Substation at Rangpo
- Establishment of 220kV Gas Insulated switching station at New Melli
- LILO of Teesta III – Kishanganj 400kV D/c line (quad, Teesta III – Kishanganj 400kV D/c line to be constructed through JV route) at Rangpo
- Rangpo – New Melli 220kV D/c line (with twin Moose conductor)
- LILO of Teesta V – Siliguri 400kV D/c line at Rangpo
- Kishenganj – Patna 400kV D/c (quad) line

Evacuation of Chuzachen HEP (99MW) is being made by the interim arrangement through LILO of Gangtok-Melli 132kV S/c line upto Rangpo, where Chuzachen-Rangpo 132kV D/c has been connected so as to form Chuzachen-Gangtok and Chuzachen-Melli 132kV S/c lines. The 400/220/132kV Rangpo sub-station of POWERGRID is in advanced stage of completion. With the commissioning of the sub-station, interim arrangements would be withdrawn and the generation project

will be required to connect with Rangpo sub-station through Chuzachen - Rangpo 132 kV D/c line.

Accordingly, the generation developer needs to ensure completion of 2 nos. 132 kV line bays for termination of its line at Rangpo at its own cost. Otherwise, even after commissioning of Rangpo sub-station, LTA granted to Chuzachen HEP would not commence. Other Generation developers may furnish the update about the status of progress of the respective generation project, immediate evacuation system and associated line bays for termination of line at POWERGRID sub-station.

**Members may note.**

## 18. Revised Transmission system for Phase-II Generation Projects in Sikkim

The present status of phase-II IPPs in Sikkim is given below :

| Sl No | Project | Ins. Cap (MW) | LTOA (MW) | Applied for | Remarks |
|---|---|---|---|---|---|
| 1. | Tashiding (Shiga Energy Pvt. Ltd.) | 97 | 97 | LTOA | Granted, LTTA signed /BG submitted Dedicated system under Govt. of Sikkim. |
| 2. | Dickchu (Sneha Kinetic Power Projects Ltd.) | 96 | 96 | Connectivity & LTA | Granted LTTA to be signed & BG to be submitted. Dedicated system under Govt. of Sikkim. |
| 3. | Panan Himagiri Hydro energy Ltd. | 300 | 300 | Connectivity | To be reviewed after financial closure. To apply for LTA. |
| | **Total** | **592** | **592** | | |

- The evacuation arrangements for the above phase-II IPPs in Sikkim has been reviewed subsequent to the revision of the Comprehensive scheme of Sikkim on system strengthening to be funded under the GoI grant for implementation by POWERGRID. The Comprehensive Scheme inter-alia includes construction of a new 220kV Singhik-Dikchu-Bermoik-Rangpo (PG) D/C twin moose conductor line (initially to be operated at 132kV) in the northern Sikkim and a new 220/132kV sub-station at Legship in the western Sikkim. This is illustrated in Fig-4. The investment approval of GoI is expected shortly. The originally planned evacuation system for Dikchhu and Tashiding HEPs are reviewed keeping in view the need for development of the above 220kV corridor and Legship sub-station.

- **Reviewing of transmission System for Dikchu HEP (96MW) and revised ATS**

  The commissioning of Dikchu HEP as informed by the developer is expected in May 2015. Originally, **Dikchu-Rangpo 132kV D/C line with Zebra conductor** was planned to be implemented by E&PD, GoS under the State funding matching with the commissioning of the HEP. Subsequently, due to severe RoW issue in the above corridor, creation of a high capacity corridor i.e. 220kV Singhik-Dikchu-Bermoik-Rangpo (PG) D/C twin moose conductor line (initially to be operated at 132kV) has been planned to be established under the intra-state Comprehensive scheme, it inter-alia would facilitate to evacuate power from Dikchhu by constructing Dikchhu-Rangpo (30 km) section.

The E&PD Dept., GoS has informed that even after the investment approval of the Comprehensive scheme, its implementation by POWERGRID would take considerable time to carry out re-survey, design & tendering, land acquisition for both forest and private land, etc. Therefore, there will be delay in implementation of the Dikchhu-Rangpo (30 km) section of the planned 220kV corridor, and it could lead to the bottling up Dikchhu generation.

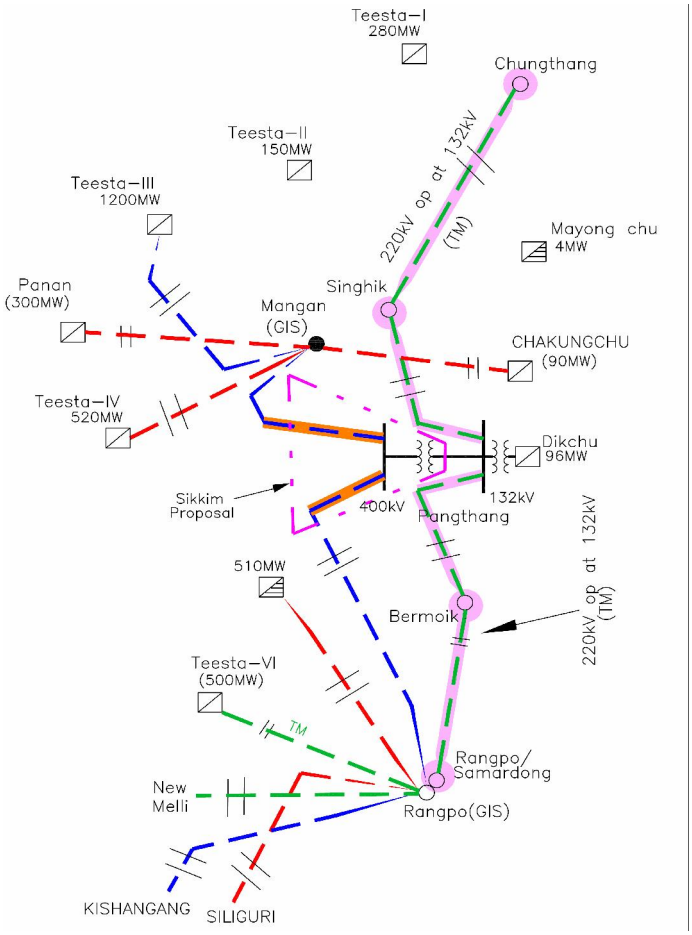



**Fig 4: Transmission System for Dikchu HEP (96MW)**

In view of the above, Energy & Power Department as well as the project developer have proposed to consider 400kV evacuation for Dikchhu generation by LILO of one circuit of Teesta-III – Rangpo - Kishanganj 400 kV D/c at Dikchu HEP, as the 400kV C line is passing very close (about 500m stated by the generation developer) to the Dikchhu project. The developer has proposed to do the LILO work with creation of a 400/132kV switchyard facility with adequate transformation capacity and protection system at their switchyard. They have also proposed to provide one 132kV outgoing bay for power supply to Sikkim.

Accordingly, the revised transmission system for Dikchhu HEP (under the scope of Project developer) may be as under:

- ✓ LILO of one circuit of Teesta-III –Rangpo- Kishanganj 400 kV D/c at Dikchu HEP

- ✓ Creation of the 400/132kV switchyard facility with adequate 400/132kV transformation capacity at Dikchu.

**Members may discuss and decide.**

- Tashiding HEP (97 MW) (under the scope of Generation Developer)

Originally, generation was planned to be injected at a 220kV pooling station near Tashiding and thereon to 220kV New Melli (PG) pooling point over a 220kV D/C line for further evacuation. This system was agreed to be developed by E&PD, GoS under their own funding. After review of the Comprehensive Scheme of the State, the location of Tashiding pooling station has been changed to Legship.

Accordingly, ATS for Tashiding HEP under the project developer is revised to:

- ✓ Tashiding - Legship 220kV D/c line

The Common Transmission System under the scope of Govt. of Sikkim

- ✓ Establishment of 220kV substation at Legship (under the scope of the Comprehensive scheme of Sikkim)
- ✓ Legship - New Melli 220kV D/c with twin moose conductor
- ✓ Establishment of 2x50MVA, 132/66kV substation at Rangpo (Samardong) (under the scope of the Comprehensive scheme of Sikkim)

**Members may discuss and concur.**

- 300MW Panan HEP by M/s Himagiri Hydro energy Ltd.

Application of Panan HEP for grant of Connectivity to its 1x300 MW generation project was discussed in the 2nd 2013 meeting regarding connectivity & Long Term Access on 27-08-2013 wherein the generation developer had informed that they were expecting financial closure by Oct'13. However, generation developer who is yet to apply for LTA may furnish the status of the scheme.

## 19. Transmission System for Phase-I Generation Projects in Jharkhand

### 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 |
| | **Total** | | **3820** | **3510** |

**B. Transmission System:**

**B1.Immediate Evacuation : Implementation by Generation Developer**

- Adhunik Power & Natural Resources Limited : Adhunik-Jamshedpur 400kV D/c (completed)
- Essar Power (Jharkhand) Ltd : Essar-Jharkhand Pool 400kV D/c (Quad)
- Corporate Power Limited Ph-I : Corporate Power-Ranchi (Existing) 400kV D/c
- Corporate Power Limited Ph-II : Corporate Power-Jharkhand Pool 400kV D/c

**B2.Common System : Implementation by POWERGRID / Licensee**

- Establishment of 400kV GIS Pooling Station (Jharkhand Pool)
- Ranchi - Gaya 400 kV D/c (Quad) line via Jharkhand Pool
- Ranchi New (765/400kV S/s) - Dharamjaygarh 765kV S/c
- 2x1500 MVA, 765/400 kV New GIS substation at Varanasi
- Gaya - Varanasi 765kV S/c
- Varanasi - Balia 765 kV S/c line
- New 2x1500 MVA, 765/400 kV substation at Kanpur
- Varanasi – Kanpur 765 kV D/c
- Kanpur – Jhatikra 765 kV S/c
- Kanpur (765/400kV) - Kanpur (Existing) 400kV D/C (Quad)
- Varanasi - Sarnath (UPPCL) 400kV D/c (quad)
- LILO of Sasaram - Allahabad 400kV line at Varanasi
- Opening of LILO of one ckt of Sasaram - Allahabad 400kV D/c line at Sarnath
- Dharamjaygarh – Jabalpur 765kV D/C line ($2^{nd}$ line)

In view of urgency expressed by generation developers, POWERGRID is making all out efforts to commission the transmission system on priority basis. Accordingly, generation developers are required to ensure that their dedicated transmission line alongwith associated line bays at Jharkhand pool / Ranchi is commissioned matching with commissioning of respective generation project.

Generation developers are required to update the status of progress of generation project, immediate evacuation system and associated line bays for termination of line at POWERGRID sub-station.

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

Essar Power (Jharkhand) Ltd. has been 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 is expected to be commissioned by the end of 2016. Accordingly, the generation developer has requested to extend the date of commencement of its LTA to the end of December-2016.

In this regard, it is to mention that as per CERC regulations as well as commercial agreements signed between the generation developer and POWERGRID / Private Sector Transmission Licensee, the generation project is liable to pay the applicable transmission charges with effect from the date of commercial operation of the transmission system.

**Members may discuss.**

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

The issue 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 may update.

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

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 has signed the Long Term Access Agreement (LTAA) with POWERGRID. They committed to submit the Bank Guarantee by 31st January, 2013 however the same is yet to be furnished.

The generation developer could not attend the last meeting held on 27-08-2013. The matter was discussed and it was decided to wait till Nov., 2013 for receipt of Bank Guarantee by the generation developer. The generation developer has not yet furnished the requisite construction Bank Guarantee. *The generation developer needs to submit the BG, otherwise the connectivity and LTA granted to the generation project may be cancelled and the application bank guarantee may be encashed.*

## 23. Revision in LTA granted to Lanco Babandh in Odisha

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 may kindly note**. Intimation for grant of LTA shall be issued after confirmation from Uttar Pradesh and Rajasthan.

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

Sterlite Energy Ltd. has been granted Connectivity / LTOA / LTA for 400 MW and 1000 MW respectively for their generation project at Jharsuguda in Odisha. 400 MW LTOA was granted as part of phase-I IPPs in Odisha. Connectivity and LTA was granted for 1000 MW as part of 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$^{st}$ line) at Sterlite

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

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

The transmission system for phase-I IPPs in Odisha with 400 MW LTA of Sterlite is already under implementation by POWERGRID & private sector. The additional 1000 MW LTA for Sterlite was considered under phase-II IPPs in Odisha and the corresponding transmission system has been taken up for implementation.

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.

In case of similar requests from Lanco Babandh and Navabharat in Odisha, they were requested to approach the Hon'ble CERC. Accordingly, it is proposed that Sterlite Energy Ltd. may approach CERC for resolution of the matter.

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

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

| Sl 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 |
| | **Sub-Total** | **3270** | **2613.25** | | **820** | **200** | **600** | **993.25** |
| 5. | Srikakulam | 1320 (2x660) | 1240 | Jun'15 | | 1240 | | |
| | **Total** | **6990** | **3853.25** | | **820** | **1440** | **600** | **993.25** |

### 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 ($2^{nd}$ 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 ($2^{nd}$) 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 Srikakulum. 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 ($2^{nd}$ 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 ($2^{nd}$ line).

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

**Members may kindly note.**

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

The following 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.

| Transmission Scheme | Estimated Line Length (km) |
|---|---|
| ✓ **400kV OPGC (IB TPS) – Jharsuguda (Sundargarh) D/c line with Triple Snowbird Conductor** alongwith 2 no. 400kV line bays at Jharsuguda (Sundergarh) S/S (PG).<br><br>✓ Bays at OPGC end of the line would be under the scope of the generation developer. | 50 |

The scheme was approved by the constituents of ER in the connectivity and LTA meeting on 05-01-2013 and also in the 24th TCC/ERPC meeting on 26-27 April, 2013.

**Members may kindly note.**

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

Based on deliberations in the Connectivity / LTA meeting held on 05-01-2013 and 27-08-2013, the present status of pending applicants for generation projects in Odisha is as 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 | To be reviewed |
| 2 | NSL Odisha Power & Infratech | 2x660 | 1320 | 1240/ | jan'16 | To be reviewed |
| 3 | Tata Power company Ltd | 2x660 | 1320 | 1000/1000 | Uncertain | To be reviewed |
| 4 | J R Power Gen Pvt Ltd | 3x660 | 1980 | 1980/1830 | Uncertain | To be reviewed |
| 5 | Jindal India Thermal (Phase-II) | 1x600 | 600 | 522/522 | Uncertain | To be reviewed |
| 6 | Sahara India | 2x660 | 1320 | 1100/ | Nov'16 | To be reviewed |
| 7 | Odisha UMPP | 5x800 | 4000 | 4000/4000 | N. A. | To be reviewed |
| 8 | Gajamara(NTPC) | 2x800 | 1600 | 1600/ | Under revision | To be reviewed |
| 9 | Bhushan | 4x660 | 2640 | 2640/ | Uncertain | To be reviewed |
| 10 | NSL Nagapatnam Power&infratech (Earlier Mahanadi Aban Power) | 2x660 | 1320 | 850/ | Jan'2016 | Conn. Granted. On hold as MOU expired between dev. & Orissa |
| | **Subtotal** | | **17420** | **16182 / 8194** | | |

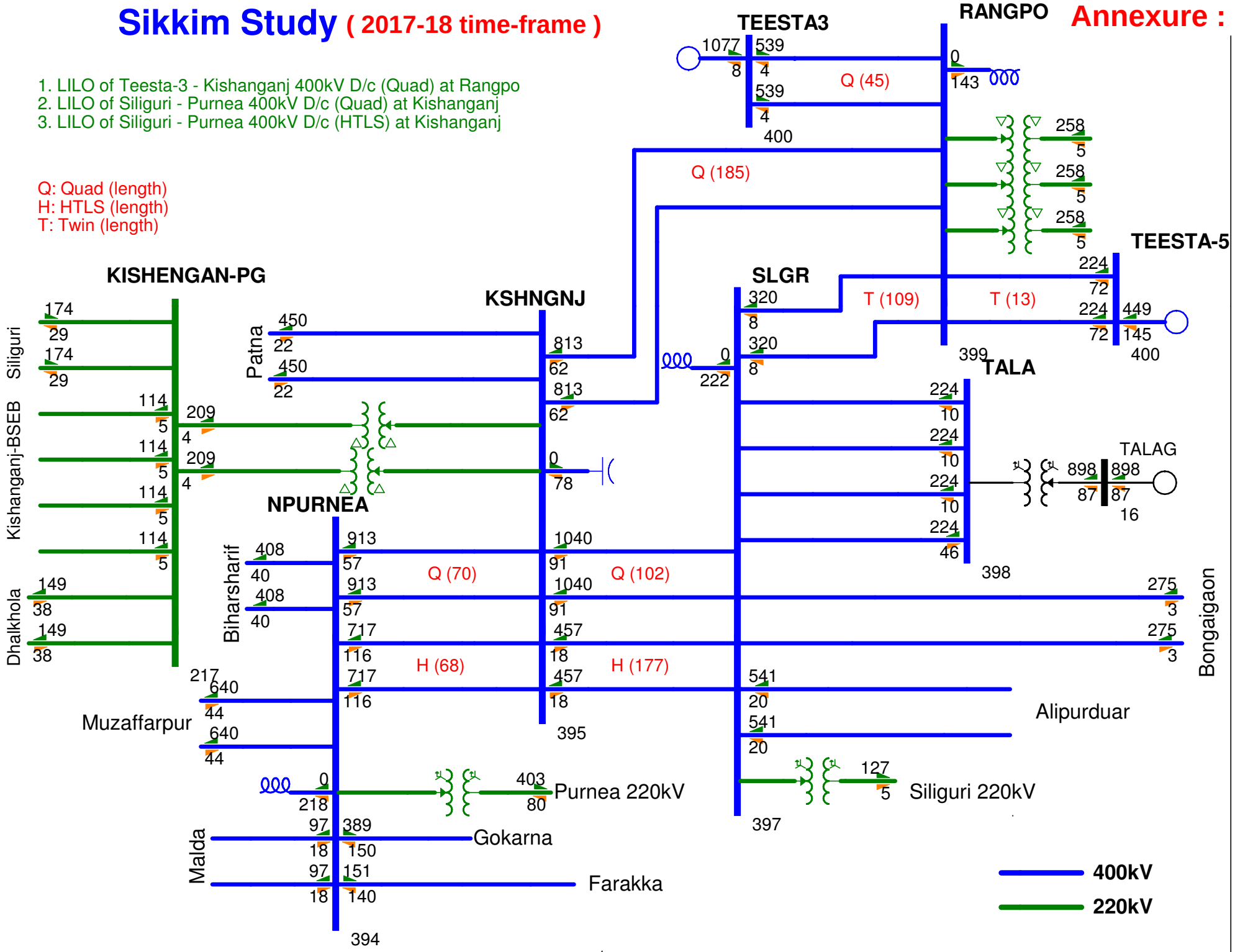
The generation developers may update the current status of their projects.

# Sikkim Study ( 2017-18 time-frame )

Annexure : 1a

1. LILO of Teesta-3 - Kishanganj 400kV D/c (Quad) at Rangpo
2. LILO of Siliguri - Purnea 400kV D/c (Quad) at Kishanganj
3. LILO of Siliguri - Purnea 400kV D/c (HTLS) at Kishanganj

Q: Quad (length)
H: HTLS (length)
T: Twin (length)

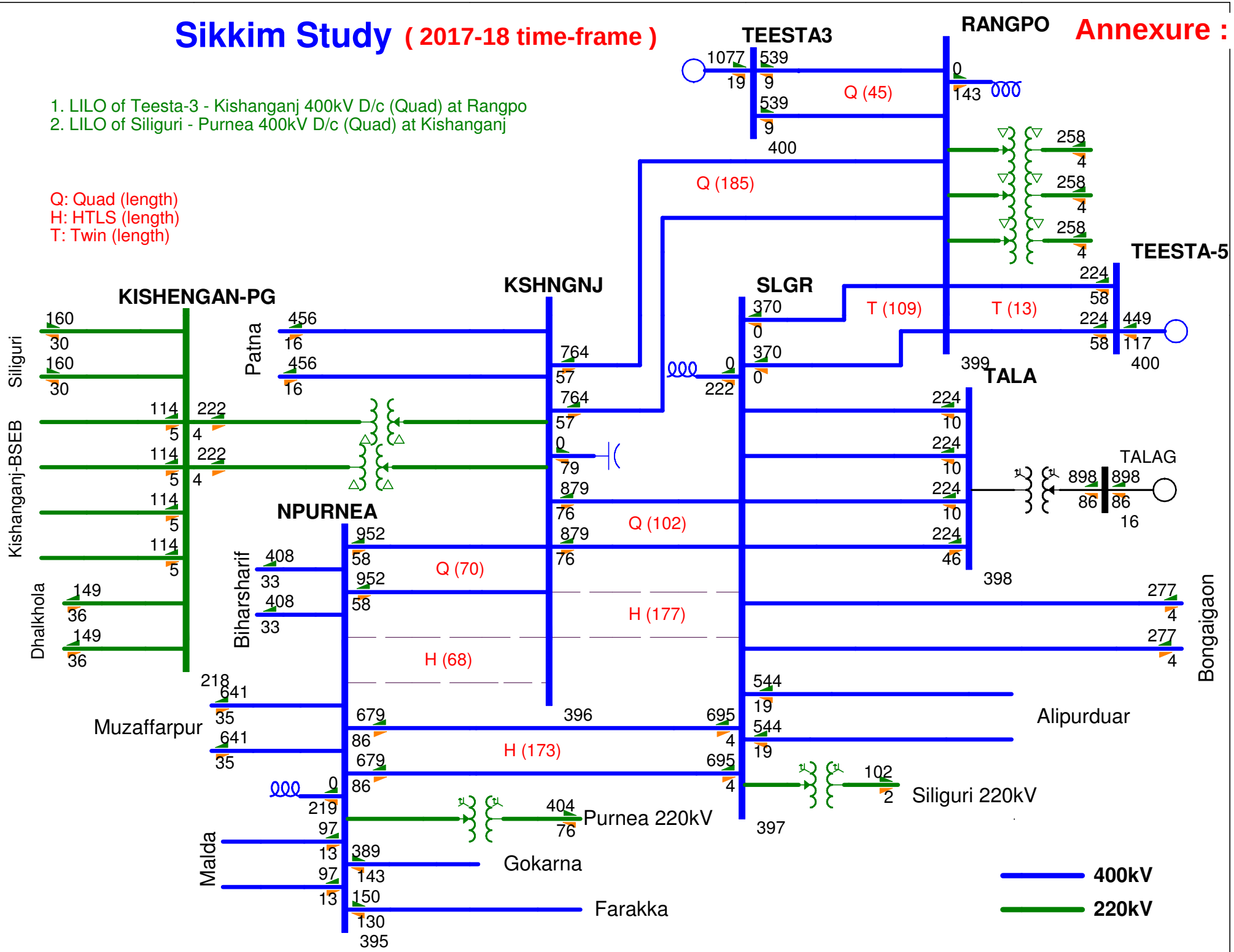


# Sikkim Study ( 2017-18 time-frame )

Annexure : 1b

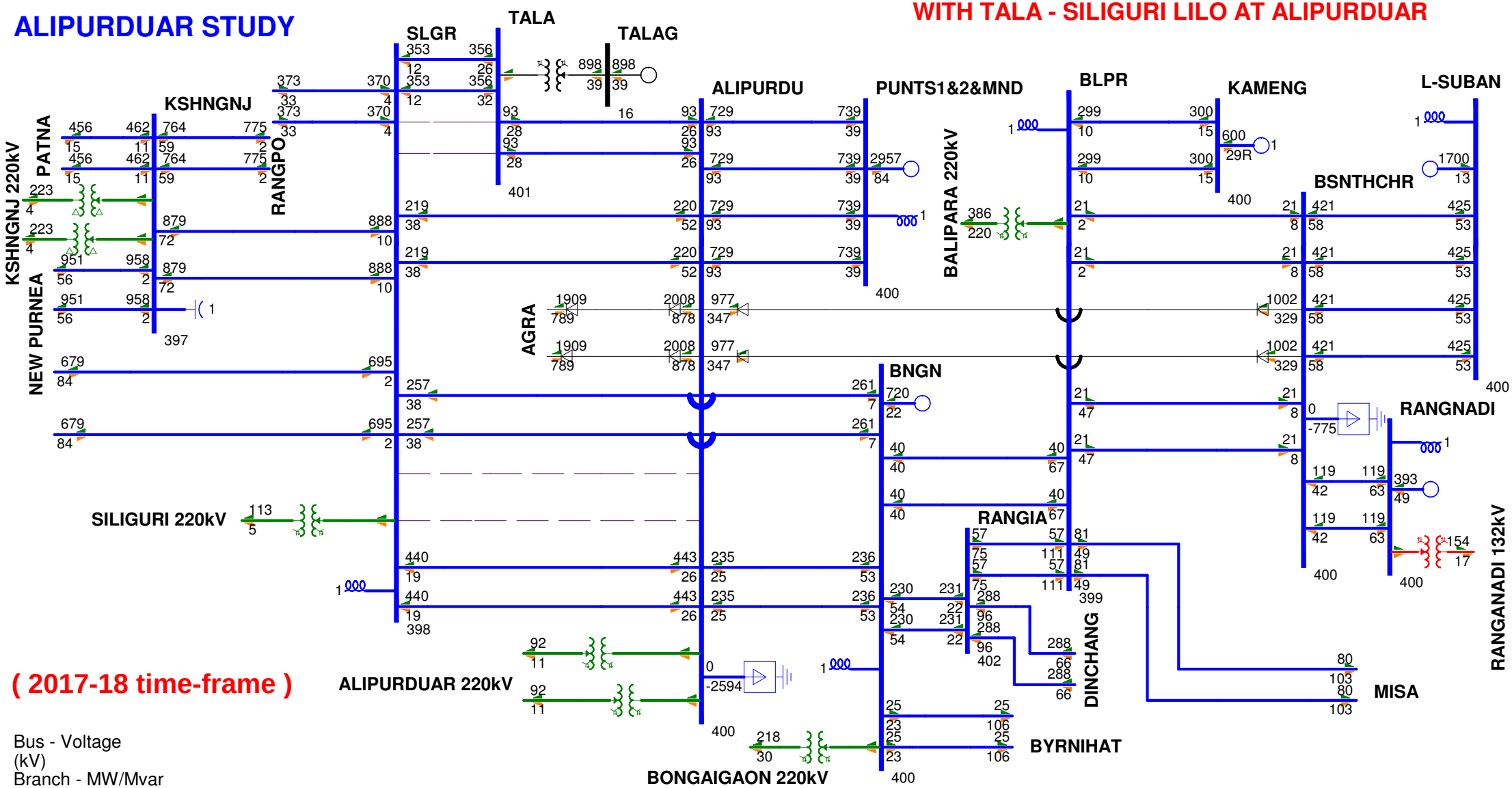
1. LILO of Teesta-3 - Kishanganj 400kV D/c (Quad) at Rangpo
2. LILO of Siliguri - Purnea 400kV D/c (Quad) at Kishanganj

Q: Quad (length)
H: HTLS (length)
T: Twin (length)

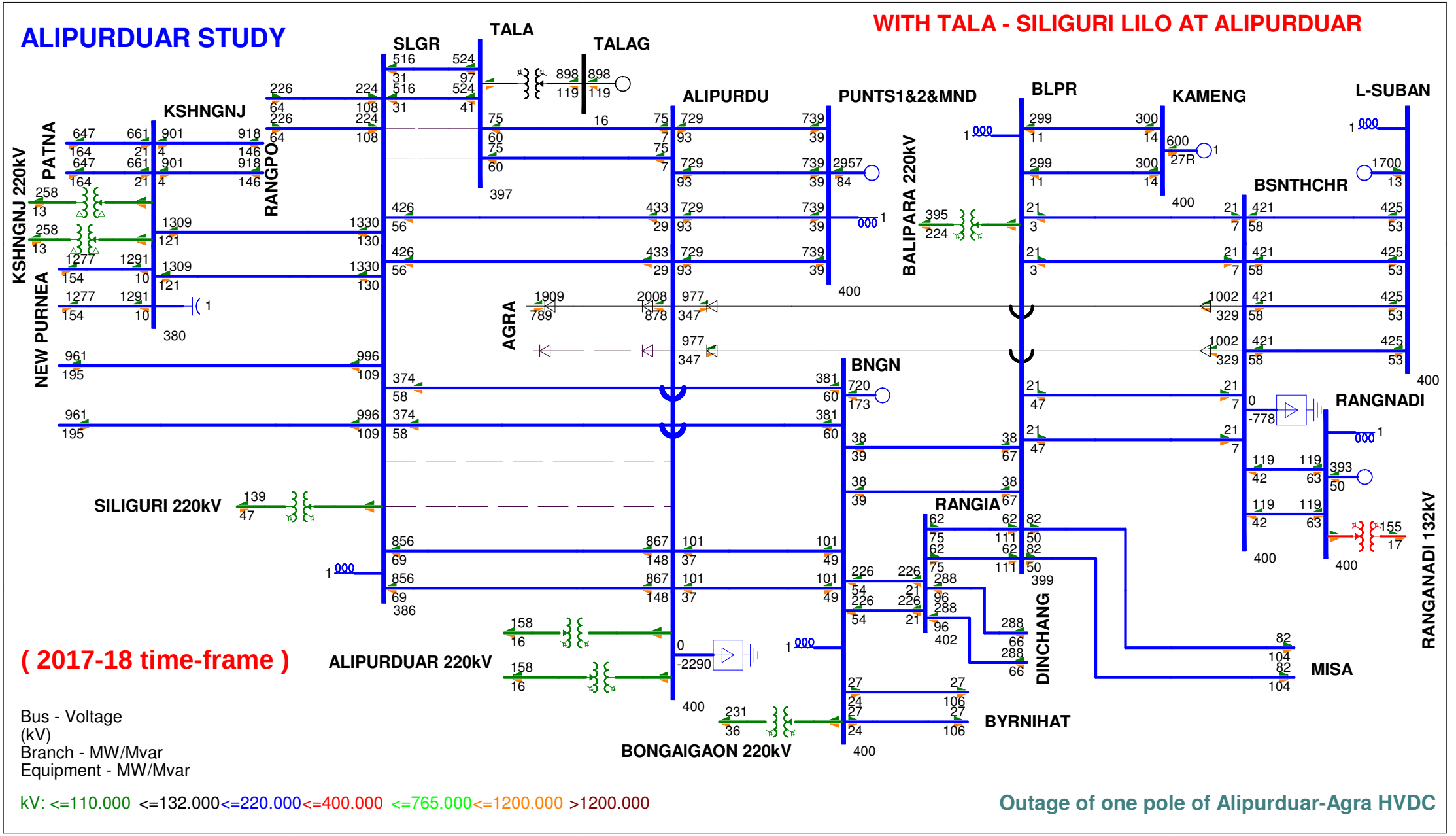


# ALIPURDUAR STUDY

## WITH TALA - SILIGURI LILO AT ALIPURDUAR



# Annexure : 2b

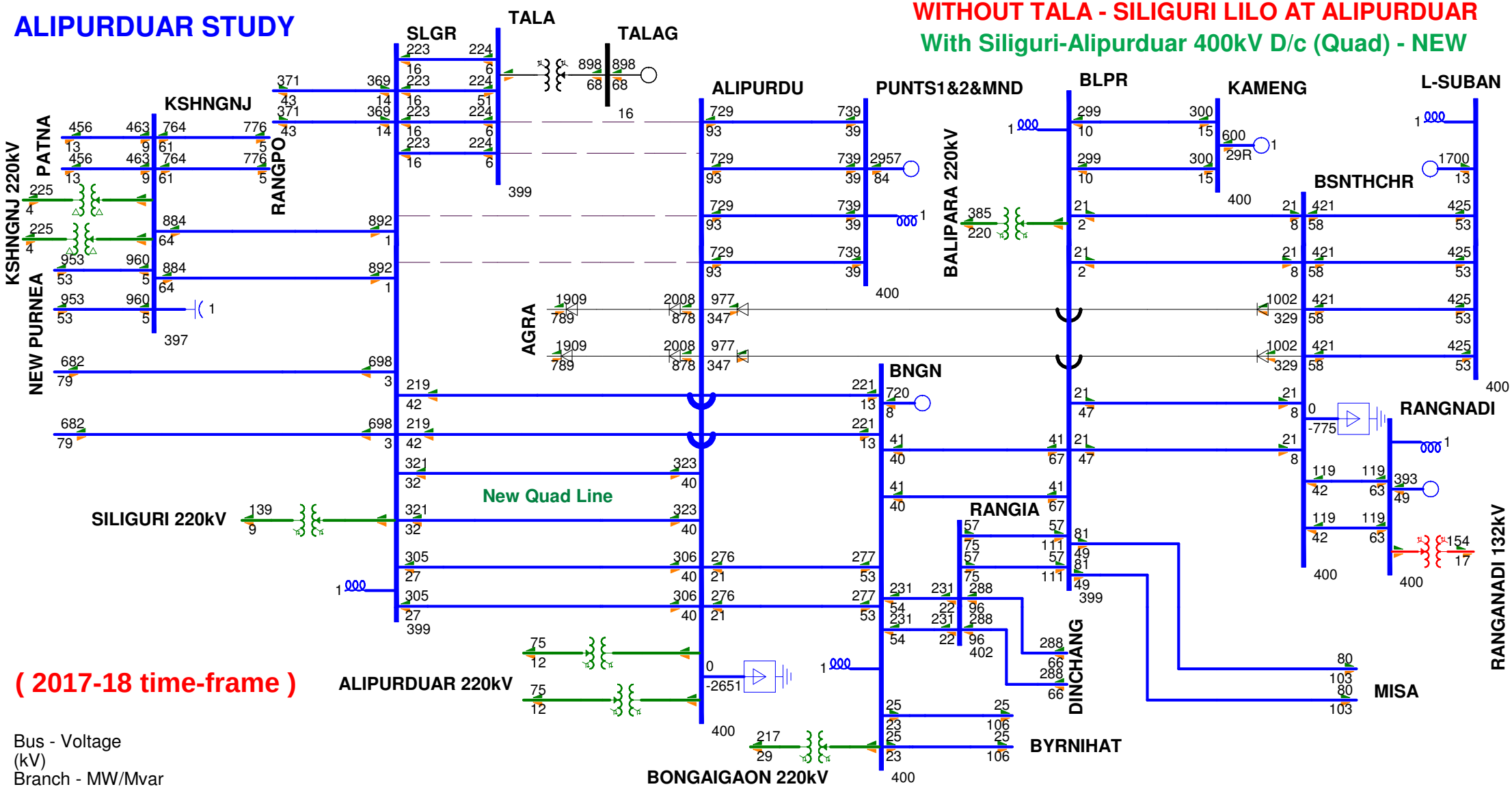

ALIPURDUAR STUDY
WITH TALA - SILIGURI LILO AT ALIPURDUAR
( 2017-18 time-frame )
KSHNGNJ 220kV
NEW PURNEA
PATNA
RANGPO
KSHNGNJ
SLGR
TALA
TALAG
ALIPURDU
PUNTS1&2&MND
BLPR
KAMENG
L-SUBAN
BSNTHCHR
RANGNADI
RANGANADI 132kV
BALIPARA 220kV
AGRA
BNGN
RANGIA
DINCHANG
MISA
BYRNIHAT
SILIGURI 220kV
ALIPURDUAR 220kV
BONGAIGAON 220kV
Bus - Voltage
(kV)
Branch - MW/Mvar
Equipment - MW/Mvar
kV: <=110.000 <=132.000<=220.000<=400.000 <=765.000<=1200.000 >1200.000
Outage of one pole of Alipurduar-Agra HVDC

**Annexure : 2c**

# ALIPURDUAR STUDY

## WITHOUT TALA - SILIGURI LILO AT ALIPURDUAR

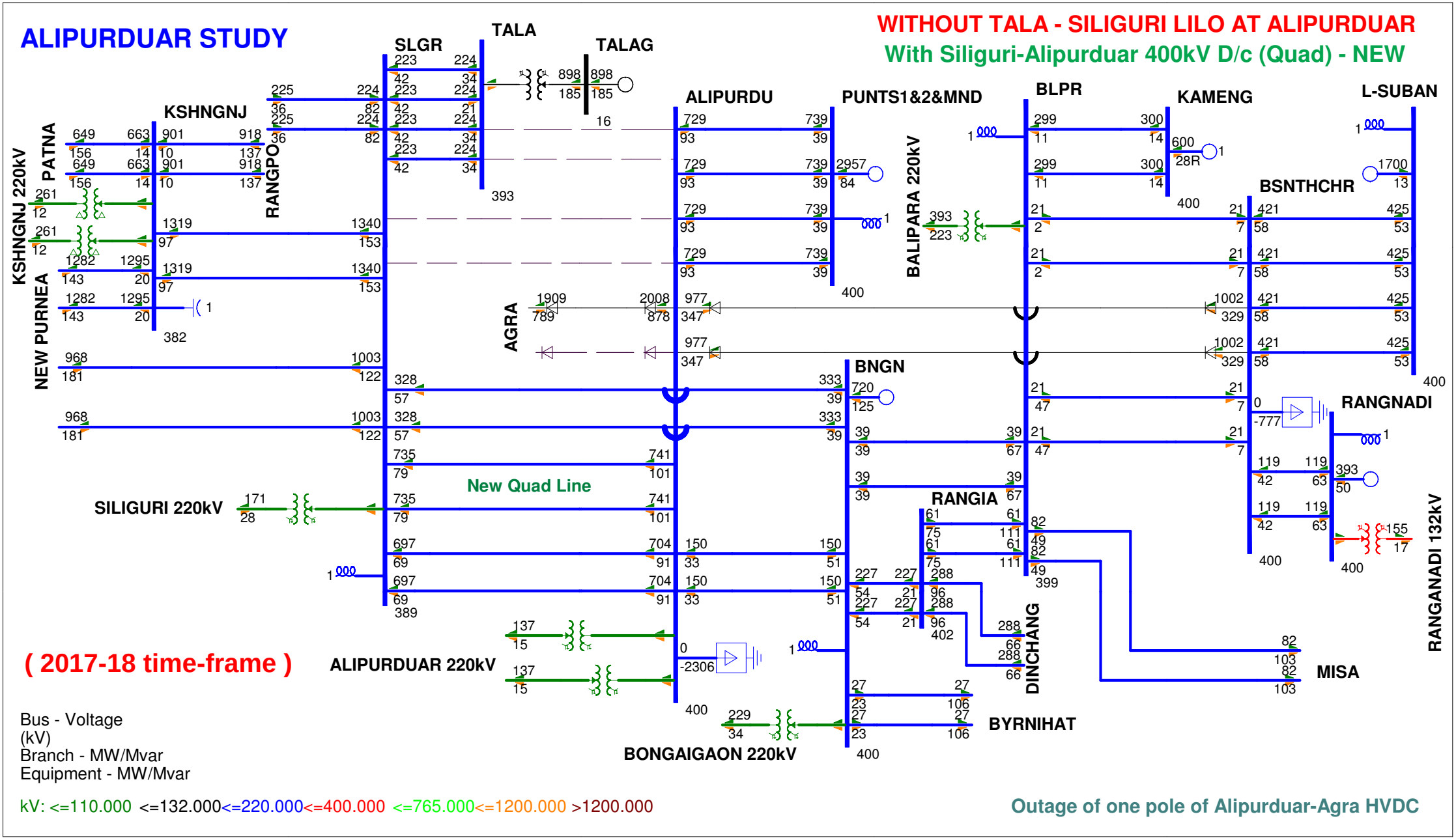
### With Siliguri-Alipurduar 400kV D/c (Quad) - NEW




**( 2017-18 time-frame )**

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

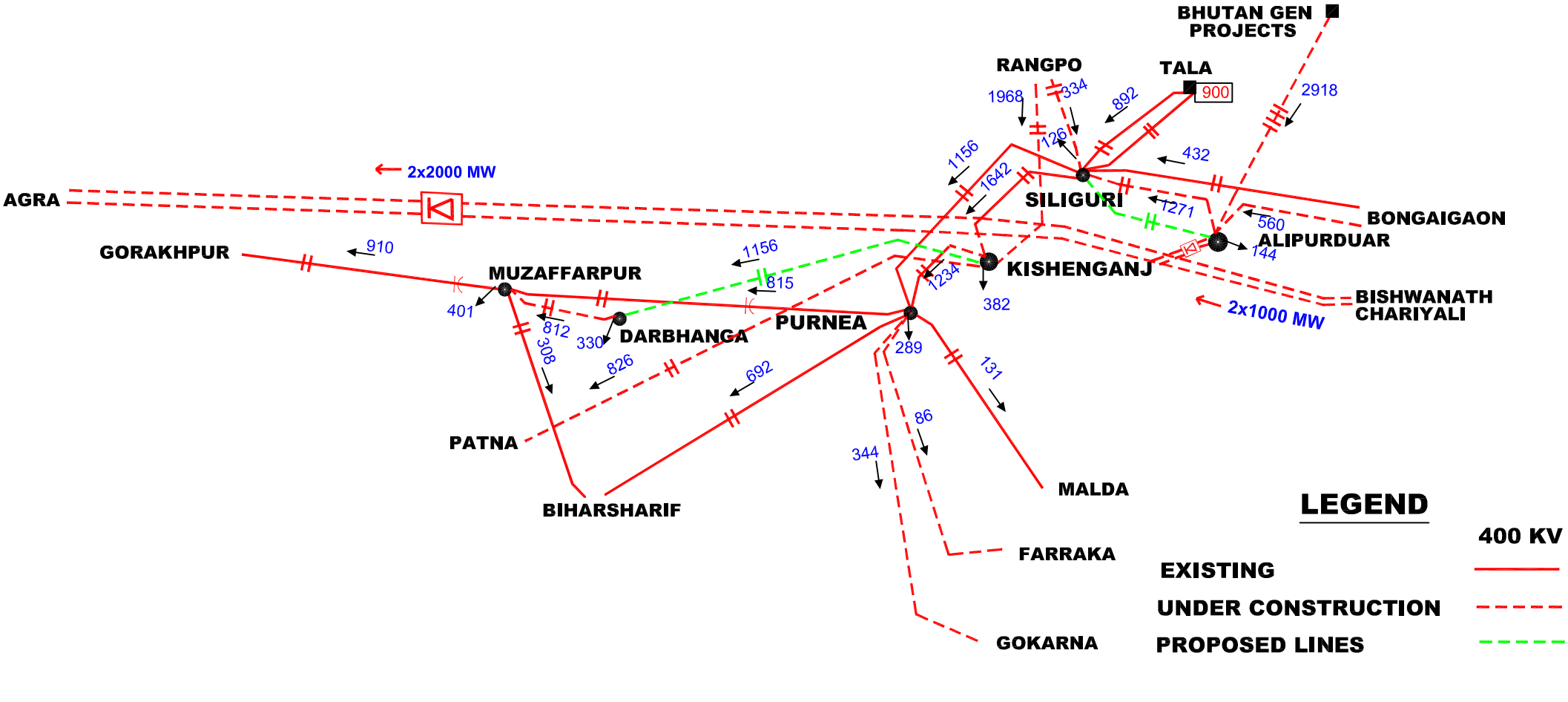
kV: <=110.000 <=132.000<=220.000<=400.000 <=765.000<=1200.000 >1200.000


ALIPURDUAR STUDY
WITHOUT TALA - SILIGURI LILO AT ALIPURDUAR
With Siliguri-Alipurduar 400kV D/c (Quad) - NEW
SLGR
TALA
TALAG
KSHNGNJ
ALIPURDU
PUNTS1&2&MND
BLPR
KAMENG
L-SUBAN
BSNTHCHR
RANGNADI
RANGANADI 132kV
KSHNGNJ 220kV
PATNA
NEW PURNEA
RANGPO
BALIPARA 220kV
AGRA
BNGN
RANGIA
DINCHANG
BYRNIHAT
MISA
SILIGURI 220kV
ALIPURDUAR 220kV
BONGAIGAON 220kV
New Quad Line
( 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
Outage of one pole of Alipurduar-Agra HVDC

Annexure : 3a

# Kishenganj - Darbhanga D/c (quad) & Alipurduar - Siliguri D/c (quad)

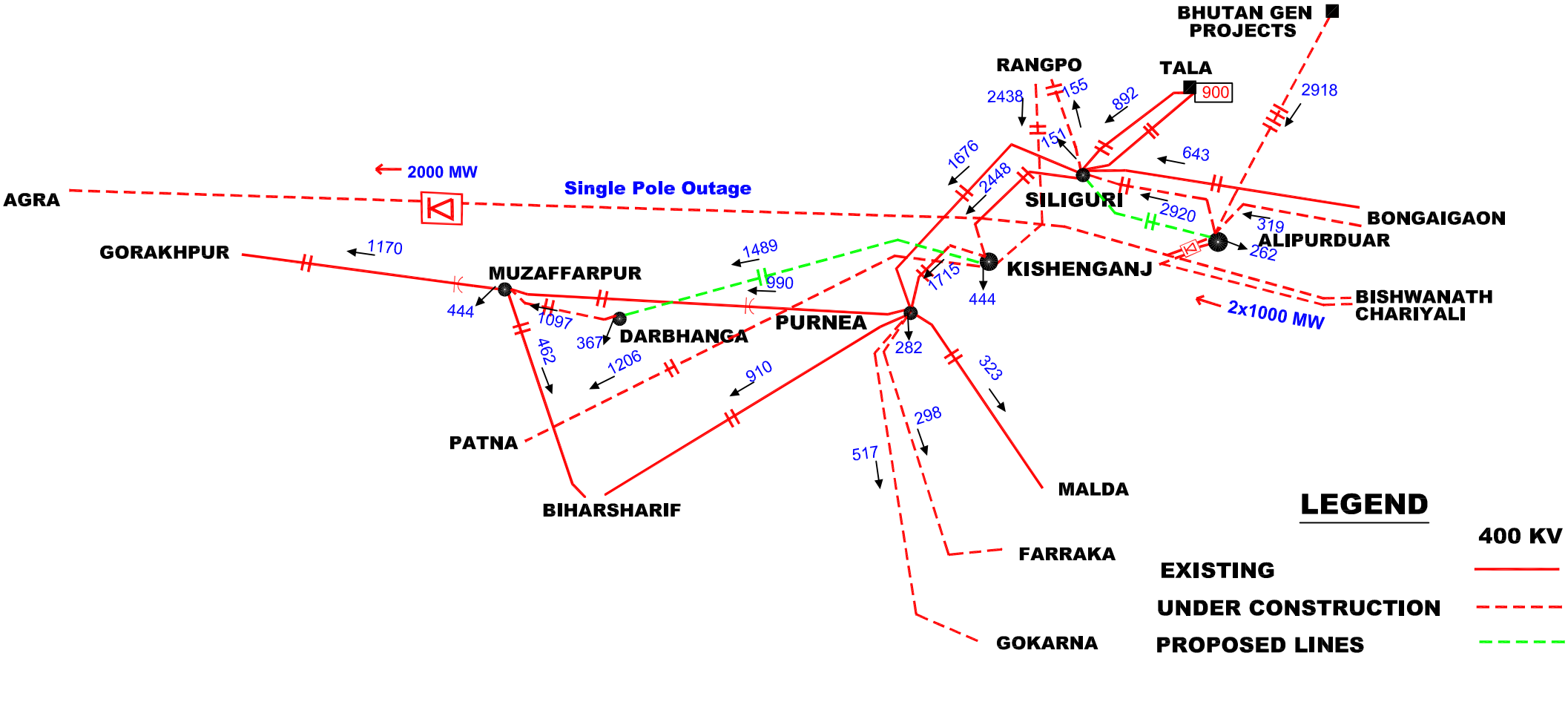
## (2017-18 time frame)



Annexure : 3b

# Kishenganj - Darbhanga D/c (quad) & Alipurduar - Siliguri D/c (quad)

## (2017-18 time frame)



**Annexure-4**

## 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 and 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 and Jharsuguda/Sundergarh) for export of power to other regions viz. Northern and Western Region, 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 with the following transmission system :

a. 765kV strengthening system in Eastern Region
b. Evacuation system for Odisha UMPP

### 2.0 Proposed Transmission System

### 2.1 765kV strengthening system in Eastern Region

As mentioned above, it is important now to plan for a high capacity 765kV D/c ring system in Eastern Region to ensure secure and reliable supply of power within the Region. Accordingly, it is proposed to establish a 765kV ring network connecting the existing 765kV power hubs in ER viz. Ranchi and Gaya. The proposed links would involve establishment of 765/400 kV new substations at Banka (New), Medinipur (in West Bengal), Jeerat (New) and Katwa (in West Bengal) and these sub-stations would be interconnected through Ranchi (New)-Medinipur-Jeerat (New)-Katwa-Banka (New)-Gaya-Ranchi 765kV D/c lines. The 765/400kV substations would be interconnected with the nearby 400kV substations viz. Banka (PG), Gokarna (WBSETCL), Chanditala (WBSETCL), Kharagpur (WBSETCL), Durgapur(PG), Arambagh (WBSETCL), Rajarhat (PG) and Jeerat (WBSETCL) through 400kV high capacity D/c lines. The proposed transmission system is as listed below :

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/HTLS)
8. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur
9. Jeerat (New) – Jeerat (WBSETCL) 400kV D/c line (quad/HTLS)
10. Jeerat (New) – Rajarhat (PG) 400kV D/c line (quad/HTLS)
11. LILO of Chandithala – Gokarna (WBSETCL) 400kV D/c line at Katwa
12. Katwa – Durgapur (PG) 400kV D/c line (quad/HTLS)
13. Banka(New) – Banka(PG) 400kV D/c line (quad/HTLS)

## 2.2 Evacuation system for Odisha UMPP project

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. 4 no. 765 kV line bays
3. 6 no. 400 kV line bays (suitable for quad conductor lines)
4. 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
5. 2x 240 MVAR Bus Reactor at 765 kV bus of Generation Switchyard
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 no 400kV line bays.
9. 1x80 MVAR 1-phase spare reactor
10. The 765KV and 400kV switchyard may be designed for 50KA and 63KA fault levels respectively.

Immediate Evacuation Scheme

For immediate evacuation from UMPP projects, following alternatives have been considered.

**Alt-1**

1. Odisha UMPP - Jharsuguda 765kV D/c line
2. Odisha UMPP – Ranchi 765kV D/c line
3. Odisha UMPP – Lapanga 400kV D/c line
4. Odisha UMPP – Keonjhar 400kV D/c line
5. Odisha UMPP – Kesinga 400kV D/c line

**Alt-2**

1. LILO of Angul - Jharsuguda 765kV D/c line at Odisha UMPP
2. Odisha UMPP – Lapanga 400kV D/c line
3. Odisha UMPP – Keonjhar 400kV D/c line
4. Odisha UMPP – Kesinga 400kV D/c line

### 2.2.2 Strengthening Scheme associated with UMPP project

The strengthening scheme consists of a ±800kV, 6000MW HVDC corridor from Angul (Odisha) to a suitable location in NR/WR with 3000MW terminal at either ends. 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 corridor from Angul to Medinipur (proposed) via Jajpur Rd. The 765kV corridor would thus be interconnected with the 765kV ring strengthening system proposed above.

Accordingly, following strengthening scheme associated with UMPP project has been proposed :

Strengthening Scheme

**A. HVDC from Angul – NR/WR**

1. ±800kV, 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.

**B. 765kV D/c line : Angul – Jajpur Road – Medinipur**

1. New 2x1500MVA, 765/400kV S/s at Jajpur Road
2. Angul – Jajpur Road 765kV D/c line
3. Jajpur Road – Medinipur 765kV D/c line
4. Jajpur Road – Duburi 400kV D/c line (quad/HTLS)
5. Jajpur Road – Keonjhar 400kV D/c line (quad/HTLS)

## 3.0 System Study

## 3.1 LGB Considered

- Time frame : 2017-18
- ER Generation : 57115 MW
- ER Load : 26790 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) | 16070 | 8601 | 5104 | –3020 | 26755 |

A schematic of Load Generation Scenarios as well as inter regional flows among various regions is provided on the last page of the report.

## 3.2 Load Flow Study

First, the load flow study was conducted considering only the 765kV Strengthening in Eastern Region and without Odisha UMPP and its associated strengthening scheme (Results enclosed at **Exhibit – 1**). The results indicate significant loading on Ranchi – Medinipur – Jeerat(New) – Katwa 765kV D/c section which helps in easing out loading on adjoining 400kV lines in the region.

Further, Study was conducted for alternatives 1 and 2 (Results enclosed at **Exhibits 2 & 3**) as mentioned under section 2.2.1 of this report, considering Odisha UMPP and its associated system in addition to the proposed 765kV Strengthening in ER. The despatch through HVDC bipole from Angul has been considered as 2000MW in the study.

In Alternative-1, the power flow in the UMPP-Ranchi section in quite low (64 MW) compared to the power flow in the UMPP-Jharsuguda section (3026 MW). Comparatively, in alternative-2, the distribution of power flow from UMPP to both the 765kV D/c lines viz. UMPP-Jharsuguda (2523 MW) and UMPP-Angul (608MW) lines is better. This would further improve with the enhancement of power flow in the HVDC corridor. Accordingly, **Alternative-2** is chosen as the preferred option.

## 3.3 Short Circuit Study

The fault levels of different buses corresponding to Alternative-2 are given below:

| Sl. | Bus | Voltage(kV) | Fault Level(kA) |
|---|---|---|---|
| 1 | Odisha UMPP | 765 | 45 |
| 2 | Odisha UMPP | 400 | 38 |
| 3 | Jharsuguda (Split) | 765 | 47 & 43 |
| 4 | Jharsuguda (Split) | 400 | 48 & 45 |
| 5 | Angul (Split) | 765 | 27 & 20 |
| 6 | Angul (Split) | 400 | 50 & 27 |
| 7 | Lapanga | 400 | 24 |
| 8 | Kesinga | 400 | 12 |
| 9 | Keonjhar | 400 | 32 |

## 4.0 Conclusion

The proposed transmission system and the corresponding schematic diagram are given below :

## 4.1 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/HTLS)
8. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur
9. Jeerat (New) – Jeerat (WBSETCL) 400kV D/c line (quad/HTLS)
10. Jeerat (New) – Rajarhat (PG) 400kV D/c line (quad/HTLS)
11. LILO of Chandithala – Gokarna (WBSETCL) 400kV D/c line at Katwa
12. Katwa – Durgapur (PG) 400kV D/c line (quad/HTLS)
13. Banka(New) – Banka(PG) 400kV D/c line (quad/HTLS)

## 4.2 Evacuation system for Odisha UMPP project

For Immediate Evacuation from UMPP Project

1. LILO of Angul - Jharsuguda 765kV D/c line at Odisha UMPP
2. Odisha UMPP – Lapanga 400kV D/c line
3. Odisha UMPP – Keonjhar 400kV D/c line
4. Odisha UMPP – Kesinga 400kV D/c line

Scheme required at UMPP switchyard

1. Generation to be stepped up at 765kV
2. 4 no. 765 kV line bays
3. 6 no. 400 kV line bays (suitable for quad conductor lines)
4. 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
5. 2x 240 MVAR Bus Reactor at 765 kV bus of Generation Switchyard
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 no 400kV line bays.
9. 1x80 MVAR 1-phase spare reactor
10. The 765KV and 400kV switchyard may be designed for 50KA and 63KA fault levels respectively.

Strengthening Scheme associated with Odisha UMPP project

### A. HVDC from Angul – NR/WR

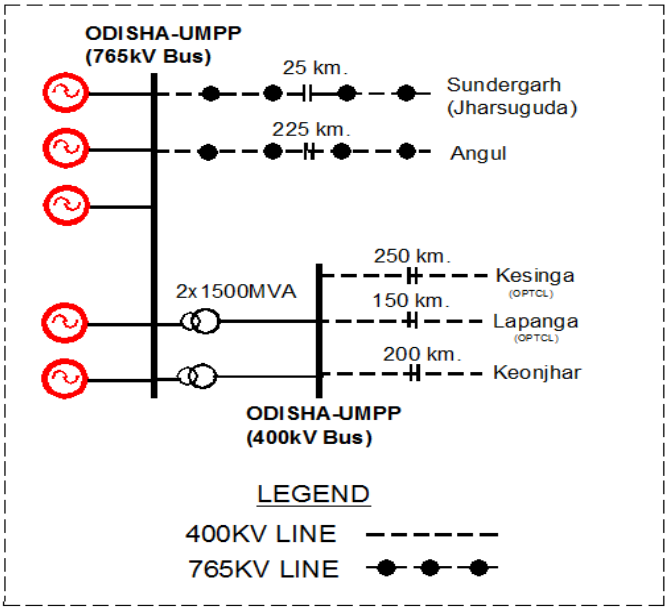
1. ±800kV, 6000MW HVDC bipole line from Angul to suitable location in NR/WR with 3000MW terminal at either end.
2. Suitable AC Strengthening system at the remote end of the HVDC bipole line in NR/WR.

**B. 765kV D/c line : Angul – Jajpur Road – Medinipur**

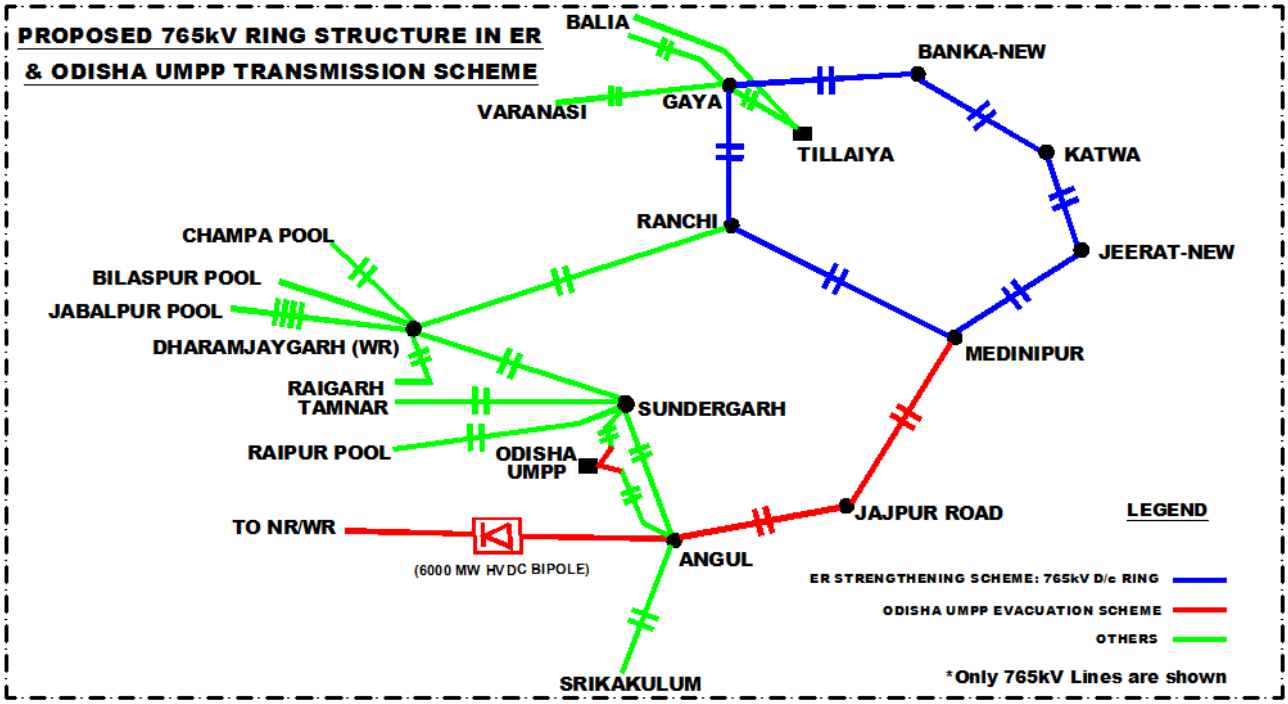
1. New 2x1500MVA, 765/400kV S/s at Jajpur Road
2. Angul – Jajpur Road 765kV D/c line
3. Jajpur Road – Medinipur 765kV D/c line
4. Jajpur Road – Duburi 400kV D/c line (quad/HTLS)
5. Jajpur Road – Keonjhar 400kV D/c line (quad/HTLS)

## 4.3 Schematic Diagram

A. Immediate evacuation of UMPP project




B. Transmission Scheme corresponding to Odisha UMPP project and 765kV strengthening system



# LGB and IR Flows Considered for 2017 – 18 Scenario

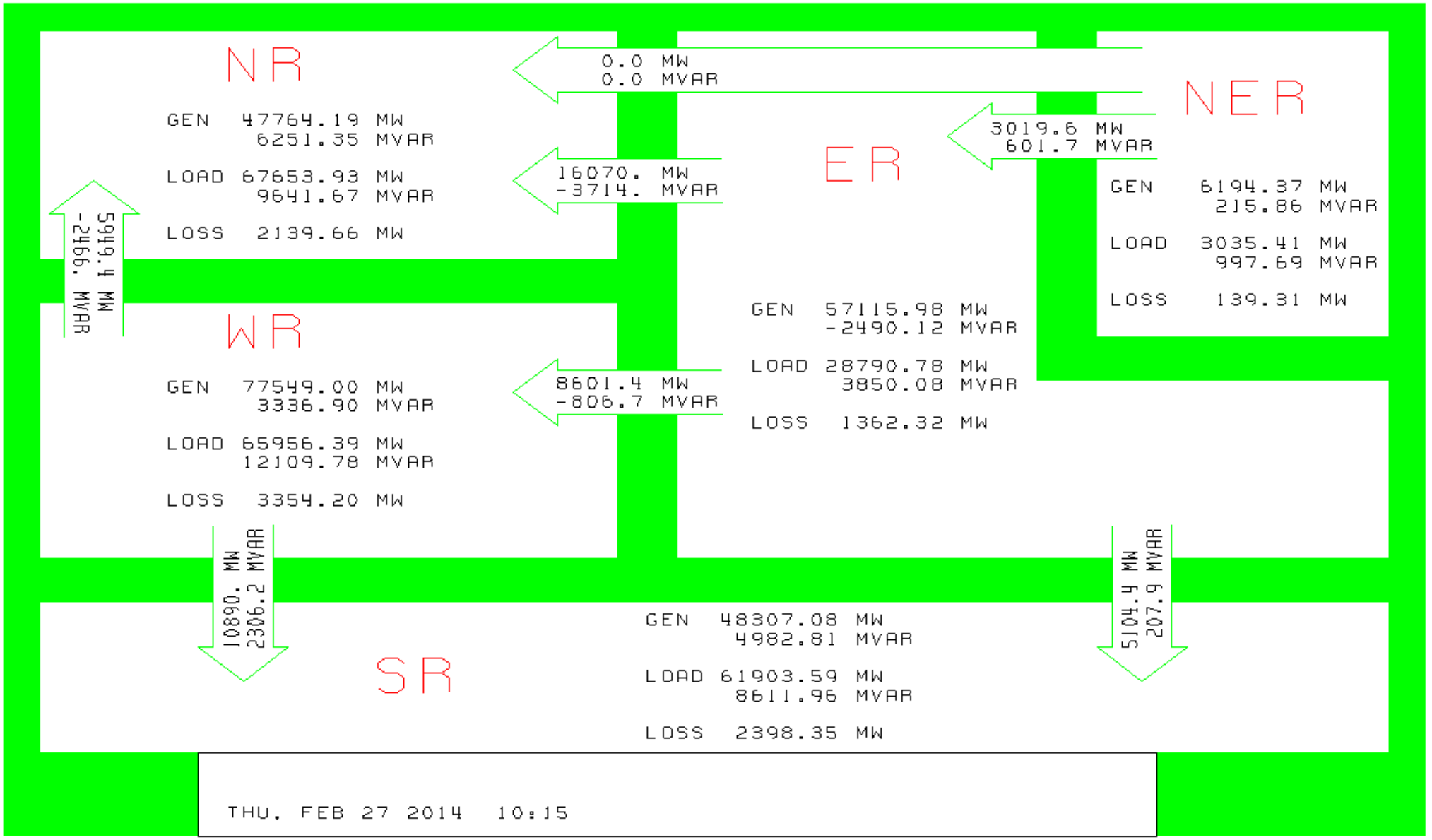
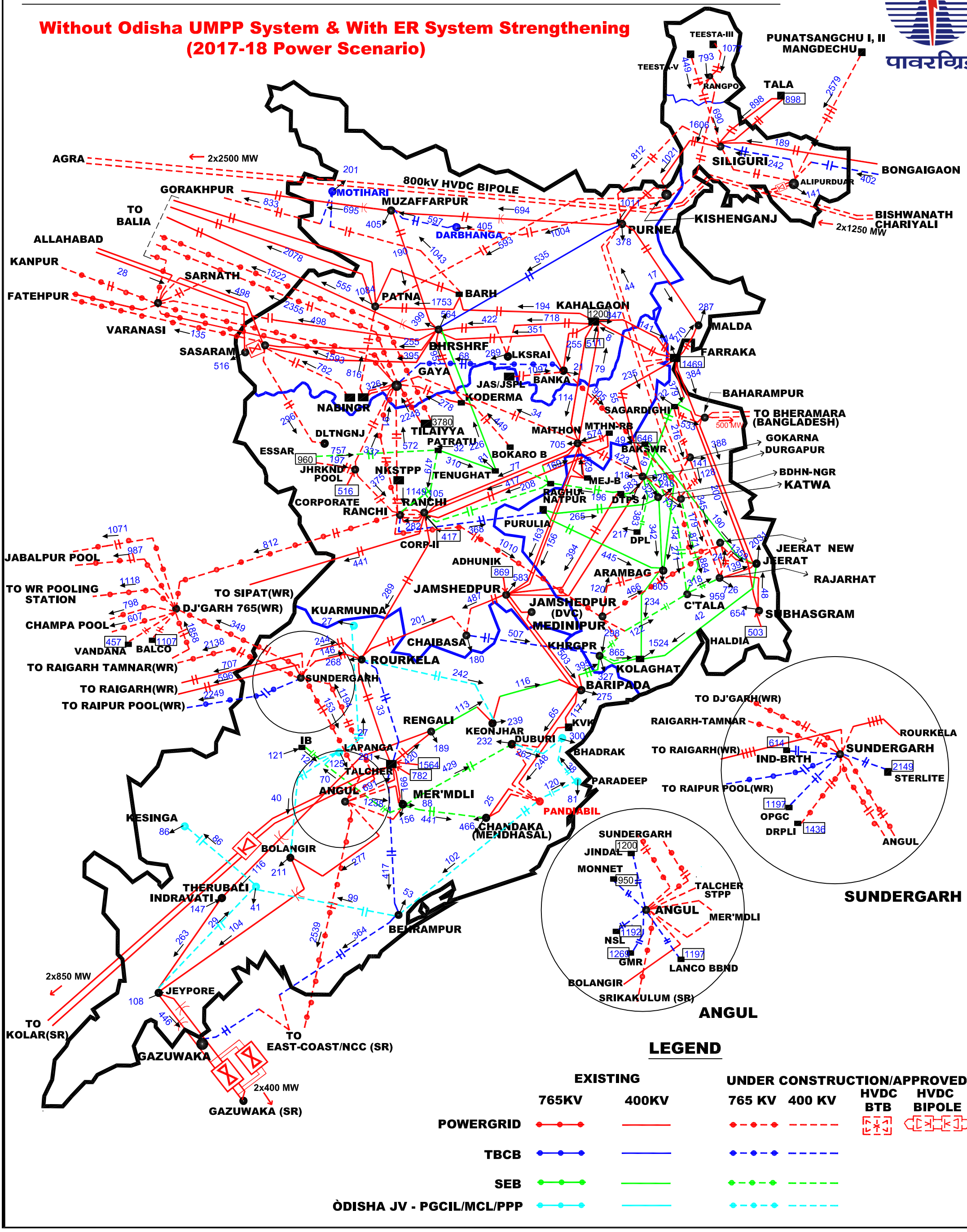


Exhibit : 1

# POWER MAP OF EASTERN REGION

पावरग्रिड

## Without Odisha UMPP System & With ER System Strengthening (2017-18 Power Scenario)




## LEGEND

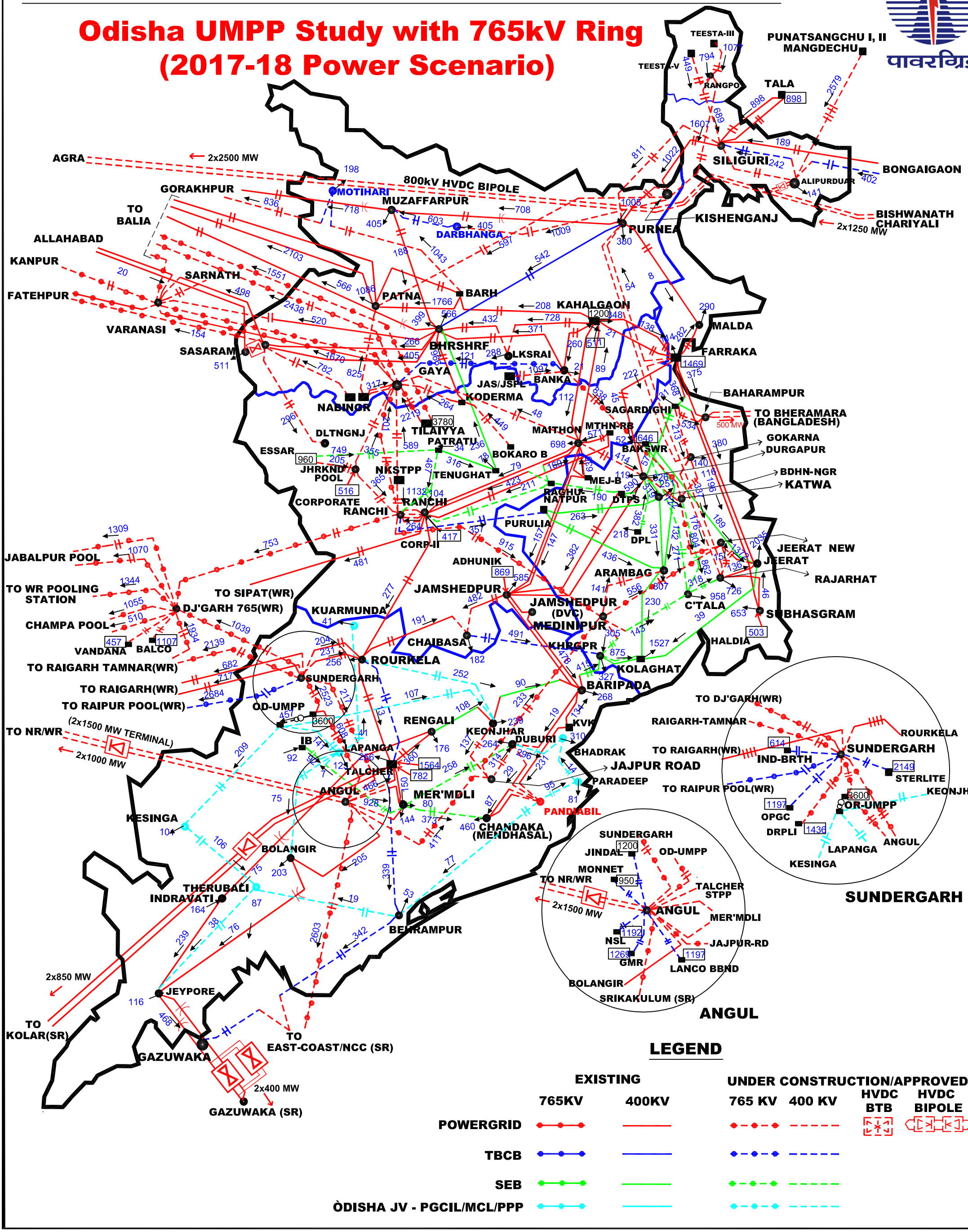
| | EXISTING 765KV | EXISTING 400KV | UNDER CONSTRUCTION/APPROVED 765 KV | UNDER CONSTRUCTION/APPROVED 400 KV | HVDC BTB | HVDC BIPOLE |
|---|---|---|---|---|---|---|
| POWERGRID | ●—●—● | ——— | ●–●–● | – – – | ⊠ | ⊠ |
| TBCB | ●—●—● | ——— | ●–●–● | – – – | | |
| SEB | ●—●—● | ——— | ●–●–● | – – – | | |
| ÒDISHA JV - PGCIL/MCL/PPP | ●—●—● | ——— | ●–●–● | – – – | | |

Exhibit : 2

# POWER MAP OF EASTERN REGION

## Odisha UMPP Study with 765kV Ring (2017-18 Power Scenario)

पावरग्रिड




## LEGEND

| | EXISTING | | UNDER CONSTRUCTION/APPROVED | | | |
|---|---|---|---|---|---|---|
| | 765KV | 400KV | 765 KV | 400 KV | HVDC BTB | HVDC BIPOLE |
| POWERGRID | | | | | | |
| TBCB | | | | | | |
| SEB | | | | | | |
| ÒDISHA JV - PGCIL/MCL/PPP | | | | | | |

Exhibit : 3

# POWER MAP OF EASTERN REGION

## Odisha UMPP Study with 765kV Ring (2017-18 Power Scenario)

(UMPP - Jharsuguda & UMPP - Ranchi Case)

पावरग्रिड

TEESTA-III
PUNATSANGCHU I, II
MANGDECHU
TEESTA-V
RANGPO
TALA
SILIGURI
BONGAIGAON
ALIPURDUAR
BISHWANATH CHARIYALI
2x1250 MW
KISHENGANJ
PURNEA
AGRA
2x2500 MW
800kV HVDC BIPOLE
GORAKHPUR
TO BALIA
MOTIHARI
MUZAFFARPUR
DARBHANGA
ALLAHABAD
KANPUR
FATEHPUR
SARNATH
VARANASI
SASARAM
PATNA
BARH
KAHALGAON
MALDA
FARRAKA
BHRSHRF
LKSRAI
GAYA
BANKA
JAS/JSPL
KODERMA
NABINGR
BAHARAMPUR
SAGARDIGHI
TO BHERAMARA (BANGLADESH)
500 MW
MAITHON
MTHN-RB
BAKRSWR
GOKARNA
DURGAPUR
BDHN-NGR
KATWA
DLTNGNJ
ESSAR
JHRKND POOL
NKSTPP
TILAIYYA
PATRATU
BOKARO B
TENUGHAT
CORPORATE
RANCHI
MEJ-B
RAGHUNATPUR
DTPS
PURULIA
DPL
CORP-II
ADHUNIK
JEERAT NEW
JEERAT
RAJARHAT
ARAMBAG
JAMSHEDPUR
JAMSHEDPUR (DVC)
C'TALA
SUBHASGRAM
MEDINIPUR
HALDIA
KHRGPR
KOLAGHAT
BARIPADA
CHAIBASA
ROURKELA
KUARMUNDA
TO SIPAT(WR)
DJ'GARH 765(WR)
TO WR POOLING STATION
CHAMPA POOL
VANDANA
BALCO
TO RAIGARH TAMNAR(WR)
TO RAIGARH(WR)
TO RAIPUR POOL(WR)
SUNDERGARH
OD-UMPP
RENGALI
KEONJHAR
DUBURI
KVK
BHADRAK
JAJPUR ROAD
PARADEEP
TO NR/WR
(2x1500 MW TERMINAL)
2x1000 MW
IB
LAPANGA
TALCHER
ANGUL
MER'MDLI
PANDIABIL
CHANDAKA (MENDHASAL)
KESINGA
BOLANGIR
THERUBALI
INDRAVATI
BEHRAMPUR
2x850 MW
JEYPORE
TO KOLAR(SR)
GAZUWAKA
TO EAST-COAST/NCC (SR)
2x400 MW
GAZUWAKA (SR)

### SUNDERGARH

TO DJ'GARH(WR)
RAIGARH-TAMNAR
ROURKELA
TO RAIGARH(WR)
IND-BRTH
SUNDERGARH
STERLITE
TO RAIPUR POOL(WR)
KEONJHAR
OR-UMPP
OPGC
DRPLI
ANGUL
LAPANGA
KESINGA

### ANGUL

SUNDERGARH
JINDAL
OD-UMPP
MONNET
TO NR/WR
TALCHER STPP
2x1500 MW
ANGUL
MER'MDLI
NSL
JAJPUR-RD
GMR
LANCO BBND
BOLANGIR
SRIKAKULUM (SR)

## LEGEND

| | EXISTING | | UNDER CONSTRUCTION/APPROVED | | | |
|---|---|---|---|---|---|---|
| | 765KV | 400KV | 765 KV | 400 KV | HVDC BTB | HVDC BIPOLE |
| POWERGRID | | | | | | |
| TBCB | | | | | | |
| SEB | | | | | | |
| ÒDISHA JV - PGCIL/MCL/PPP | | | | | | |