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विद्युत मंत्रालय / Ministry of Power  
केंद्रीय विद्युत प्राधिकरण / Central Electricity Authority  
प्रणाली योजना एवं परियोजना मूल्यांकन विभाग /  
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No. 1/9/SP&PA-1 2 /

Dated: 04/02/2013-

As per list enclosed-

**Sub: Minutes of the 31<sup>st</sup> Standing Committee meeting on Power System Planning of Northern Region held on 2<sup>nd</sup> January 2013**

Sir,

The 31<sup>st</sup> meeting of the Standing Committee on Power System Planning of Northern Region was held on 02.01.2013 at POWERGRID, Gurgaon. The minutes of the meeting has been uploaded on CEA website : [www.cea.nic.in](http://www.cea.nic.in) (path to access - wing specific document /power system related reports / standing committee on power system planning / northern region).

The minutes of the connectivity and long term open access meeting held on 02.01.2013 shall be given separately and uploaded shortly.

Yours faithfully,

  
(B. K. Sharma) 11/2/13

Director (SP&PA)

**List of Addresses-**

<p><b>1 - Member Secretary</b>  <b>NRPC</b>  18-A Shajeed Jeet  Singh Sansanwal Marg,  Katwaria Sarai,  New Delhi - 1 1 001 6  (Fax-01 1-26865206)</p>	<p><b>7. Director (Transmission)</b>  UPPTCL, Shakti Bhawan  Extn,3rd floor,  14, Ashok Marg,  Lucknow - 226 001  (Fax-0522-228841 0)</p>	<p><b>13. Development</b>  <b>Commissioner (Power),</b>  Civil Secretariat,  JAMMU - 180 001  (Fax-0191-2545447,  2530265)</p>
<p><b>2. Director (Projects)</b>  NTPC, NTPC Bhawan,  Core 7,  Scope complex- 6,  Institutional Area,  LodhiRoad,  New Delhi - 110003  (Fax-01 1-24361018)</p>	<p><b>8. Director (Projects)</b>  PTCUL, Urja Bhawan,  Campus, Kanwali Road  Dehradun- 248001.  Uttarakhand  (Fax-0135-2763431)</p>	<p><b>14. Member (Power)</b>  BBMB, Sectot-19 B  Madya Marg,  Chandigarh-1 60019  (Fax-01 72-2549857)</p>
<p><b>3. Director (Technical)</b>  NHPC Office Complex,  Sector - 33, NHPC,  Faridabad - 121 003  (Fax-0129-2277941)</p>	<p><b>9. Director (Operations)</b>  Delhi Transco Ltd.  Shakti Sadan, Kotla Marg,  New Delhi - 11 0 002  (Fax-01 1-23234640)</p>	<p><b>15. Chief Engineer</b>  (Transmission)  NPCIL,9- S-30  Vikram Sarabhai Bhawan,  Anushakti Nagar,  Mumbai - 400 094  (Fax-022-25993570,  25563350)</p>
<p><b>4. Director (Projects)</b>  POWERGRID,  Saudamini,  Plot no. 2, Sector - 29,  Gurgaon-122 001  1Fax-0124-2571932'</p>	<p><b>10. Director(Technical)</b>  Punjab State  Transmission corporation  Ltd. (PSTCL), Head Office  The Mall  Patiala - 147 001  (Fax-0 1 75-230401 7 )</p>	<p><b>16. Chief Engineer</b>  (Operation)  Ministry of Power, UT  Secretariat, Sector-9 D  Chandigarh - 161 009  (Fax-01 72-2637880)</p>
<p><b>5.</b>  <b>Director (Technical)</b>  RRVPNL, Vidyut  Bhawan, Jaipur  Pin - 302 005.  Fax 0141-2740794</p>	<p><b>1 1. Director (Technical)</b>  HVPNL  Shakti Bhawan,  Sector -6  Panchkula - 134 109  (Fax-01 72-2560640)</p>	<p><b>17. Managing Director,</b>  <b>HP PowerTransmission</b>  <b>Corporation Ltd.</b>  Barowalias, Khalini,  SHIMLA-171002  (Fax-01 77-2623415)</p>
<p><b>6. Director(Technical)</b>  HPSEB Ltd.  Vidyut Bhawan,  SHIMLA-171004  (Fax-01 77-2813554)</p>	<p><b>12. Director(Technical)</b>  THDC Ltd.  Pragatipuram,  Bypass Road,  Rishikesh- 249201  Uttaranchal  (Fx-0135-2431519)</p>	

**Minutes of 31<sup>st</sup> Standing Committee Meeting on Power System Planning of Northern Region held on 2<sup>nd</sup> January 2013 at POWERGRID, Gurgaon**

List of participants is enclosed.

Member (PS), CEA welcomed the participants of 31<sup>st</sup> Standing Committee Meeting of Power System Planning of Northern Region and thanked them for their presence in the meeting. He asked Director (SP& PA), & CTU to take up the agenda items for discussion.

**1. Confirmation of minutes of 30<sup>th</sup> Standing Committee Meeting held on 19.12.2011**

Director (SP&PA) stated that Minutes of 30<sup>th</sup> meeting were uploaded on CEA website and intimation in this regard was sent to members vide CEA letter no. 1/9/SP&PA-12/ dated 20/1/12. He mentioned that the observation of RRVPN regarding LILO of an existing ISTS line for providing connectivity to new generation project, has been included in the agenda and would be discussed later in the meeting along with the other agenda issues.

Regarding NLDC observation on adequacy of interim arrangement agreed for evacuation of unit –I of Rihand-III (2x500 MW) TPS under N-1 contingency, Director (SP&PA), CEA informed that minutes clearly indicate that agreed system is adequate for evacuation of unit-1 generation under normal operating conditions only.

Director (Projects), Powergrid stated that NTPC must provide proper SPS on Rihand Generation station to take care of N-1 contingency. NTPC agreed for the same.

NTPC requested that Rihand-III may be treated on par with other ISGS generation in Singrauli-Rihand generation complex and schedule of all generations may be done proportionately. Members agreed to the request.

NLDC had also observed that augmentation of ICTs at Ludhiana and Moga would result in transformation capacity of more than 1000 MVA at both substations and new substations should be planned instead of augmenting ICTs at existing substations. In this regard, Member (PS), CEA mentioned that augmentation of transformation capacity is more than 1000MVA at certain locations due to non-availability of land and due to high concentrated load growth in this area.

As no other comment was received from members, the minutes of 30<sup>th</sup> Standing Committee meeting were confirmed.

**2. Reliability of Power Supply to J&K**

Director (SP&PA), CEA stated that presently the power supply to the Valley is through Kishenpur-Wagoora 400kV D/c, Kishenpur-Pampore 220kV D/c and Udhampur-Pampore 132kV D/c and there was a complete collapse of power supply to

Kashmir Valley on 6<sup>th</sup> & 7<sup>th</sup> Jan. '12 due to heavy snowfall and breakdown / tripping of all three existing links between Jammu region & Kashmir valley.

In this regard, PDD, J&K informed that all the existing and under construction lines are routed through Udampur – Batote – Banihal- Peerpanjal pass. The common corridor of existing transmission lines is highly prone to snow storms, landslides and other natural calamities making power supply to the Kashmir valley very vulnerable. Last year the valley was plunged into darkness for 72 hours due to one such snow storm. Further PDD, J&K representative also stated that power supply to Jammu and Kashmir is basically through 400/220 kV Kishenpur substation and there is immediate need for providing an alternate route for transfer of power from Jammu region to Kashmir valley. In addition, PDD J&K had informed that high load growth is anticipated in northern part of Kashmir and to cater to projected loads, a 400/220 kV substation at Amargarh (in North Kashmir area) may be planned.

Keeping above in view following transmission system was proposed:

- Jullandhar – Samba 400 kV D/c
- Samba –Amargarh 400 kV D/c
- LILO of both circuits of Uri – Wagoora 400 kV D/c line at Amargarh
- Establishment of 2x315 MVA (7x105 MVA), 400/220 kV GIS S/s at Amargarh

PDD, J&K proposed that the new 400 kV D/c line may be routed through a different corridor i.e. via Akhnoor, Rajouri and Mogul Road. This would have dual benefit i.e. the line would be constructed through a different corridor which is away from the existing line corridor as well when the demand in Akhnoor / Rajouri increases, the new 400 kV substation can be established by LILO of proposed 400 kV Samba – Amargarh line.

Director (SP&PA), CEA informed that as decided during the 30<sup>th</sup> SCM, a committee comprising of CEA, POWERGRID, NHPC, PDD J&K and JKSPDC visited J&K to assess the feasibility of transmission corridors for evacuation of power from the generation projects located in Chenab valley. The committee also looked into the feasibility of implementing a new transmission corridor through Moghul Road. It was observed that a wild life sanctuary located near Shopian is enroute of the Moghul Road. Further, the mountains have loose rocks and construction would be difficult.

Member (PS), CEA mentioned that the proposed transmission works would be implemented through Tariff Based Competitive Bidding (TBCB) route. He requested PDD, J&K to extend all the possible assistance to the implementing agency.

PDD, J&K assured that they would provide all the necessary assistance and support for obtaining requisite clearances from J&K Government.

RVPN stated that the proposed scheme should be implemented by PDD, J&K. Director (projects), POWERGRID explained that the proposed scheme is necessary to provide reliable feed to J&K from the grid and therefore members may consider this scheme under ISTS. He also mentioned that keeping in view the difficulties in construction of the 400 kV Samba –Amargarh D/c, the scheme may be taken up in two parts for ease of execution. He further stated that Amargarh was close to Uri and getting corridor for LILO would be difficult. Accordingly it was agreed that multi-circuit towers would be used near Amargarh substation for LILO work and new line termination.

It was discussed and decided that considering the above works to be implemented through Tariff Based Competitive Bidding route it would be taken as a system strengthening scheme of NR as given below:

#### **NRSS-XXIX**

- LILO of both circuits of Uri – Wagoora 400 kV D/c line at Amargarh
- Establishment of 7x105 MVA, 400/220 kV GIS substation at Amargarh
- Jullandhar – Samba 400 kV D/c
- Samba –Amargarh 400 kV D/c routed through Akhnoor & Rajouri

**Members agreed with the above proposal.**

### **3. Delinking of RAPP – Shujalpur 400 kV D/c line with RAPP 7&8 generation RAPP**

Director (SP&PA), CEA stated that RAPP – Shujalpur 400 kV D/c line was approved as the associated transmission system of RAPP-7&8 in the 29<sup>th</sup> SCM held on 29/12/10. After the grid collapse of July 2012, it was observed that strengthening of West – North interconnections are required to be taken up on priority. As such it is proposed to delink RAPP – Shujalpur 400kV D/c line from RAPP 7&8 generation for its early implementation.

RRVNL informed that RAPP/Kota area already experiences high voltages and addition of lines without generator may further aggravate the high voltage problem.

POWERGRID informed that 50 MVAR line reactors have been proposed at both ends of 400kV RAPP-Shujalpur D/c and the line would be adequately compensated. The line reactors at Shujalpur and bays for termination of the line at Shujalpur end would be taken up by POWERGRID while reactor and bays for termination of line at RAPP end are in the scope of M/s NPCIL.

NPCIL informed that the bays and 125 MVAR bus reactors at RAPP generation switchyard would be available by June'15 and RAPP generation is now expected by Feb'16.

Member (PS), CEA stated that the above line is being implemented under Tariff Based Competitive Bidding and likely to be commissioned by Feb 2016.

**Members noted the above.**

**4. Provision of 400 kV line bays at Srinagar S/s (PTCUL) for terminating 400 kV Srinagar-Tehri pooling point D/c line**

Director (SP&PA), CEA stated that 400kV Srinagar (PTCUL)- Tehri pooling station D/c (Quad) line was agreed during the 29<sup>th</sup> SCM as regional strengthening scheme and the line was to be taken up through Tariff based Competitive bidding route. While processing the scheme for implementation, it was gathered that there are space constraints at Srinagar substation of PTCUL and to assess the availability of space, a joint visit of CEA and POWERGRID was undertaken on 11-12<sup>th</sup> Apr.'12 to study the feasibility of construction of 400kV line bays at Srinagar substation for termination of the line. He also informed that during the site visit, it was observed that at Srinagar 400/220 kV substation (under construction) of PTCUL, sufficient space is not available in the switchyard for accommodating two nos of 400 kV AIS line bays. Two nos. 400 kV line bays can however be accommodated in available space, if the same are constructed as GIS bays. Under such scenario bus extension through GIS duct would be required.

Director (Projects), Powergrid mentioned that the generation projects in Uttarakhand are delayed and in view of this, the above line is deferred for the time being.

**Members noted the above.**

**5. Construction of four (4) nos. 400 kV line bays at 400/200 kV Sub-station of PTCUL at Kashipur**

Director (Projects), POWERGRID stated that the construction of 400 kV Bareilly-Kashipur D/c line & 400 kV Kashipur- Roorkee D/c line was agreed as a part of NRSS-XXI during 27<sup>th</sup> SCM of Northern Region held on 30.05.09. For termination of

these lines, four (4) nos. 400 kV bays are to be constructed at 400/220 kV Kashipur substation of PTCUL. These transmission lines are under construction whereas the MOU for construction of 400 kV bays at 400/220 kV Kashipur sub-station could not be finalized till date in spite of regular interactions with PTCUL. It was further informed that PTCUL had proposed that the bays may be constructed by POWERGRID and 15% of total cost may be paid to them as supervision charges.

POWERGRID stated that the entire works of design, engineering, procurement & erection of above bays at Kashipur S/s will be done by POWERGRID and as such PTCUL should not ask for any charges for this work.

Member (PS), CEA advised PTCUL not to ask for any overhead charges for the line terminating bays to be implemented under ISTS scheme by POWERGRID, as the scheme is for the benefit of State. He further mentioned that PTCUL may modify its practices to be followed for the ISTS system planned in the state to this effect. PTCUL agreed for the same.

POWERGRID also informed that 400 kV D/c Bareilly-Kashipur & 400 kV D/c Kashipur-Roorkee line sections are in advanced stage of construction and implementation of bays at Kashipur may take some time and therefore proposed to directly, connect Bareilly-Kashipur 400 kV D/c & Kashipur-Roorkee 400 kV D/c line sections, temporarily bypassing Kashipur till the time, bays at Kashipur are implemented. With the commissioning of bays at Kashipur LILO of the line at Kashipur would be taken up.

**Members agreed for the above proposal.**

## **6. Evacuation of Power from Malana-II**

Director (SP&PA), CEA stated that the evacuation of power from Malana-II HEP was planned by LILO of one circuit of AD HEP – Nalagarh 220 kV D/c line of M/s AD Hydro at 220/132kV Chhaur substation of M/s Everest Power Pvt. Ltd.(EPPL) and power from generation project was to be injected at Chhaur S/s through a 132 kV D/c line. Further, AD HEP – Nalagarh 220 kV D/c line is not adequate for reliable evacuation of power from both the projects especially under contingency condition. In the 30<sup>th</sup> Standing Committee Meeting of Northern Region, it was agreed to construct a 220 kV D/c line from 220/132kV Chhaur to Parbati Pooling Station enabling injection of power from Malana-II HEP at Parbati Pooling Station (ISTS). From Parbati Pooling Station, power can be evacuated over ISTS system. It was also decided to provide 2 nos. of 400/220 kV, 315 MVA ICTs (7x105 MVA single phase units) alongwith 4 nos. of 220 kV line bays (2 bays for M/s EPPL and 2 bays for HPPTCL).

He further mentioned that HPPTCL had informed that only one 220 kV line could be constructed from Chhaur to Parbati Pooling Station due to ROW constraints and HPPTCL also intends to inject about 170 MW power from Small HEPs at Chhaur substation for its further transfer to Parbati Pooling station. As such, HPPTCL proposed that they would construct the 220kV D/c line from Chhaur substation to Parbati Pooling station for which funds are also being tied up with ADB. Further, HPPTCL would also take up the ownership of 132/220 kV Chhaur S/s from M/s EPPL to make it a part of their STU system.

Member (PS), CEA enquired HPPTCL about the expected commissioning schedule of the above 220kV line. HPPTCL informed that the same would be ready by 2015.

POWERGRID stated that Malana-II generation is directly connected to ISTS grid, for which Long Term Open Access has been processed and granted by CTU. In case this line is constructed by HPPTCL (STU), the direct connectivity of Malana-II with ISTS would be lost and M/s EPPL would have to bear STU charges in addition to PoC charges.

Member (PS) stated that under proposed proposal Malana-II would be treated as State-embedded generator and would have to pay applicable charges accordingly. He enquired M/s EPPL for their consent to the above proposal.

M/s EPPL informed that they are agreeable to the proposal and they would sort out all commercial issues with HP.

While finalizing the proposal it was also decided that **400/220 kV, 2x315 MVA ICTs (7x105 MVA single- phase units) along with the associated bays and 2 nos. of 220 kV line bays would be provided at Parbati pooling station (PG) under ISTS scheme and since it is augmentation work in existing switchyard of POWERGRID S/s, the same would be carried out by POWERGRID.**

**Members agreed to the above proposal.**

#### **7. LILO of Gladini – Hiranagar S/c line at Samba 400/220 kV substation**

POWERGRID stated that 220 kV Sarna – Jammu (Gladini) S/c line was implemented as a part of Salal transmission system (ISTS) and subsequently, LILO of this line at Hiranagar was carried out by PDD J&K at their cost. POWERGRID informed that PDD J&K intends to LILO Gladini – Hiranagar section of this line at 400/220 kV Samba substation of POWERGRID for meeting load requirement of the area. As this line is a part of ISTS system, therefore the proposal to LILO Gladini – Hiranagar section of the line at 400/220 kV Samba substation of POWERGRID was put up to Standing Committee for consideration.

**Members agreed to the proposal.**



**8. Space at 400/220 kV Roorkee (Puhana) substation(POWERGRID) for establishing 220/33 kV substation of PTCUL**

Director (SP&PA), CEA stated that during the 30<sup>th</sup> SCM , PTCUL had informed that there are severe Right- of- Way constraints in the vicinity of the 400 kV Roorkee substation, due to which it was not possible to construct 220kV double circuit line from this substation and therefore PTCUL had proposed to set up their 220/33 kV, 2x50 MVA S/s in the premises of POWERGRID's 400/220 kV Roorkee substation. A team of representatives from CEA, DTL, RVPNL, PTCUL and POWERGRID visited Roorkee 400/220 kV substation and observed the following:

- It is not feasible to accommodate the two nos. of 220/33 kV transformers along with 33 kV bays and control facilities in the vacant land available outside switchyard area within the boundary of POWERGRID substation.
- Committee also looked into the feasibility of taking out 220 kV overhead feeders & found that the 220 kV overhead line is not feasible even with gantry structure & pipe bus as adequate clearances are not available.
- The only feasible option is to take 220 kV outlets through 220 kV underground cables. The laying of cable would involve crossing State owned Roorkee – Dehradun Road adjacent to 400/220 kV POWERGRID substation. The width required for laying 2 circuits of 220 kV cable would be approx. 1.6 meter. Committee does not envisage any constraint in implementation of this option.

PTCUL informed that they had revisited the proposal and is of the view that space is available for 220/33 kV Transformers within Roorkee substation.

RVPNL stated that during the site visit the team had analyzed the overall feasibility and thereafter suggested PTCUL to go for 220 kV cables for immediate take off of outlets from 400/220 kV S/s.

Member (PS), CEA stated that the available space at 400/220 kV Roorkee S/s(PG) should not be consumed for accommodating 33kV distribution feeders. He advised PTCUL to take up outlets through 220kV cables in the immediate vicinity of 400 kV substation and thereafter 220 kV overhead line could be taken up to their 220/33 kV substation. Further, in case of non-availability of adequate land, PTCUL may establish 220/33 kV substation as GIS.

**Members agreed to the above.**

## **9. Taking up of Transmission system of Singrauli-III TPS (1x500 MW) as System Strengthening Scheme**

Director (SP&PA), CEA stated that during the 29<sup>th</sup> Standing Committee Meeting of Northern Region, following transmission system was planned for evacuation of power from Singrauli –III TPS (1x500 MW)

- Singrauli – Allahabad 400 kV S/c (due to ROW constraints, about 50 km section of Singrauli-Allahabad line to be strung on existing 400 kV D/c tower from Singrauli end)
- Allahabad - Kanpur 400 kV D/c

POWERGRID informed that NRLDC had raised concerns for transmission constraints in the existing Rihand / Singrauli / Anpara /Obra complex. Additionally, from Meja TPS one 400 kV D/c line was planned only up to Allahabad, considering that Allahabad – Kanpur 400 kV D/c line would be available in the matching time frame which would facilitate power evacuation from Meja also.

Member (PS), CEA stated that considering the requirement of transmission system from Singrauli/Rihand/Obra/Anpara complex as well as power transfer requirement beyond Allahabad, the above identified transmission scheme may be taken up as system strengthening scheme.

Accordingly, following was agreed **under Northern Region System Strengthening Scheme- NRSS XXX:**

- Singrauli – Allahabad 400 kV S/c (due to ROW constraints, about 50 km section of Singrauli-Allahabad line to be strung on existing 400 kV D/c tower from Singrauli end.). Strengthening of existing towers, wherever required shall also be carried out
- Allahabad - Kanpur 400 kV D/c

It was further agreed that the above scheme may be implemented by POWERGRID as its BPTA was agreed before the cut-off date of Tariff Based Competitive Bidding and now only the name of the scheme is changed.

**Members agreed to the proposal.**

## **10. System strengthening to overcome constraints in Northern Region**

### **a) High loading in Nathpa Jhakri - Nalagarh lines:**

POWERGRID stated that from the operation experience, it has been observed that during the paddy season loading on 400 kV Nathpa Jhakri – Nalagarh – Patiala lines remains on the very high side i.e. in the range of 800 MW per circuit and outage of one circuit in this corridor results in the overloading on the remaining circuit, thus

endangering the grid security whereas loading on Nathpa Jhakri – Panchkula – Abdullapur line remains on the lower side. To alleviate this problem, it is necessary to provide alternate supply to Patiala.

Studies were carried out with Panchkula – Patiala 400 kV D/c line to meet this requirement. From the results of the studies, it is observed that this line provides a relief to Nathpa Jhakri – Nalagarh lines as well as help during the contingency of outage of one circuit Nathpa Jhakri – Nalagarh 400 kV line. **The study results are given at ANNEX-III.**

POWERGRID informed 400 kV Karcham Wangtoo – Abdullapur D/c line is constructed with Quad conductor and in order to increase loadability of this line for better sharing of load, **it was proposed to provide 40% series compensation on 400 kV Karcham Wangtoo – Abdullapur D/c line. This would not only improve the loadability of Karcham Wangtoo – Abdullapur 400 kV D/c but also help in reducing the oscillations.**

HVPNL stated that there might be R-o-W issue for this line and they have also planned 220kV lines from Panchkula. There is already constraint in the area as forest area fall en-route of lines from Panchkula S/s.

The scheme was discussed and it was agreed that multi circuit towers for 400 and 220kV lines emanating from Panchkula S/s would be considered to optimally utilize the R-o-W, in consultation with HVPNL (here it is to mention that 220 kV line to UT Chandigarh is also being planned which may also be taken up on the Multicircuit towers in forest area depending upon the requirement & feasibility).

NLDC stated that this line is an urgent requirement for reliable evacuation of power from Karcham Wangtoo / Nathpa Jhakri complex and **should be implemented on priority by Powergrid on compressed time schedule.**

**Members agreed to the above proposal.**

#### **b) Constraint in 400 kV Unnao-Panki S/C line**

Director, CEA explained that 400 kV Unnao-Panki S/c line forms a vital link in the several grand loops of EHV lines from Kanpur-Panki-Unnao- Lucknow in the Central U.P. and Moradabad- Muradnagar –Muzaffarnagar -Meerut- Mandaula -Bawana-Bamnauli-Ballabgarh. As informed by NLDC the loading on the line often remains to 600-700 MW.

POWERGRID mentioned that 400 kV Lucknow substation (PG) is connected strongly with Unnao S/s and 400 kV Kanpur S/s(PG) with 400 kV Panki S/s of UPPTCL. Both Kanpur and Panki S/s are important for import of power from Eastern Region. A strong inter-connection between Kanpur and Lucknow S/s would improve

the reliability of the grid. Accordingly, POWERGRID proposed Lucknow (PG)-Kanpur (New) (PG) 400kV D/c line. **The study results are given at ANNEX-IV.** NRLDC stressed that the proposed line is very much required for reliable Grid Operation.

Member (PS), CEA stated that considering the Lucknow(PG)-Kanpur (New)(PG) 400kV D/c line is necessary from Grid security point of view and therefore it **should be taken up urgently by POWERGRID on compressed time schedule.**

**Members agreed to the above proposal.**

**c) Additional Corridor to Amritsar**

CEA stated that 400/220 kV Amritsar substation is having 2x315 MVA transformation capacity and considering the load growth in Amritsar area, augmentation of transformation capacity by 1x500 MVA is under implementation. At present Amritsar S/s is being fed by a 400 kV S/c line from Jullandhar and is also going to be connected with Parbati Pooling station by a 400 kV D/c line. In addition, as part of PSTCL system, 400 kV Makhu – Amritsar D/c line is being constructed for providing connectivity of STU grid with ISTS grid.

POWERGRID stated that although, Amritsar S/s is planned to be connected to Parbati Pooling station and Makhu (PSTCL substation), however the power supply to Amritsar area would be mainly through Jullandhar 400kV substation as during winters the generation of hydro projects would reduce to very low levels as well as in case of low generation at Talwandi Saboo TPS, Makhu S/s may also draw power from Amritsar. It is therefore necessary that power supply arrangement to Amritsar S/s is augmented. It was further stated, HVDC station at Kurukshetra is being established for supply of power from pit head generating stations of Chattisgarh. Accordingly, for augmenting power supply to Amritsar S/s, following transmission works were proposed to be implemented through **Tariff Based Competitive Bidding as System strengthening scheme of NR:**

- 400 kV Kurukshetra – Malerkotla D/c line
- 400 kV Malerkotla – Amritsar D/c line

RVPNL enquired about the availability of space at Amritsar substation. POWERGRID informed that space is available and if required they would implement 400kV GIS bays for extension in Amritsar station.

**Members agreed to the above proposal.**

**e) Augmentation of Transformation capacity at 400/220 kV Ballabgarh substation**

POWERGRID informed that a review of loading pattern of 400/220 kV ICTs at Ballabgarh sub-station of POWERGRID during last one year has revealed that loading on all the ICTs operating at this substation had exceeded 250 MW on several occasions and maximum loading on each ICT at the sub-station had gone up to 292 MW during January 2012.

In view of such increased loading pattern and to meet any eventuality in the event of failure of anyone of the ICTs at the above sub-station, POWERGRID proposed for augmentation of transformation capacity by replacing 3x315 MVA ICTs by 3x500 MVA ICTs to cater to N-1 contingency of ICT and to avoid cascade tripping of remaining ICTs in service. The dismantled 315 MVA ICTs was proposed to be maintained as Regional spare after refurbishment.

CEA explained that the above requirement of augmenting the transformation capacity is to cater to the present load considering N-1 contingency of outage of one 500 MVA ICT. **It was suggested that all four ICTs may be replaced with 500MVA ICTs.**

RVPNL representative enquired about the adequacy of 220 kV bus capacity and 220kV outlets to utilize the proposed augmentation. HVPNL also enquired about the bus capacity of Ballabgarh 220kV bus of BBMB.

Powergrid explained that augmentation of transformation capacity is being provided to meet the growing power drawl on existing 220kV lines. Subsequently, the same was checked and as per information quad tarantula conductor has been used for 220kV bus of Ballabgarh (BBMB) S/s which has adequate capacity considering above augmentation work. Regarding equipment rating no problem is envisaged and in case of any modification required the same would be taken care during detailed engineering.

**After discussions, Members agreed to the above proposal.**

**f) Augmentation of Transformation capacity at 400/220 kV Mandola substation**

During 30<sup>th</sup> meeting of the Standing Committee on Power System Planning of Northern Region held on 19/12/11, augmentation of transformation capacity at Mandola substation by 1x500MVA ICT was approved.

POWERGRID informed that due to the space constraint at the above substation, this augmentation is not feasible. However looking into the load growth, it was proposed to replace existing 3 nos. of 315 MVA ICTs with 3x500 MVA ICTs. The dismantled 315 MVA ICTs were proposed to be maintained as Regional spare after

refurbishment. POWERGRID mentioned that most of the ICTs at present are very old now and may need to be replaced. During the discussions it was deliberated that all **the 4 ICTs at Mandaula should be replaced in line with the replacement of ICTs at Ballabhgarh.** It was also agreed that these ICTs may be kept as spare after refurbishment. RVPNL suggested that in future, if required, these spare ICTs may be given to states. POWERGRID stated that these ICTs shall be kept as regional spares and shall be available for use by any NR constituent.

**Members agreed to the above augmentation at Mandaula S/s.**

POWERGRID further informed that during the last Standing Committee Meeting augmentation of Transformation capacity by 3x105 MVA 400/220 kV transformers was agreed at Samba S/s. However 3 phase 315 MVA ICT capacity would be provided at Samba S/s instead of 3x105 MVA, as the substation is close to National Highway and there are no transportation constraints. This would reduce the overall cost of ICT.

**Members noted the same.**

AGM (OS), POWERGRID also informed that with the increase in transformation capacity at Wagoora, Kishenpur, Moga and Hissar, the 220 kV bus are required to be replaced. After detailed deliberations it was agreed that POWERGRID may replace the 220 kV buses as per requirement in line with augmented 400/220 kV transformation capacity at the above substations.

**f) 220 kV BTPS – Ballabhgarh D/C**

POWERGRID explained that 220 kV Ballabhgarh-Badarpur D/c line is a vital link between BTPS and Ballabhgarh, which is used for inter-state power transfer. During summer/ monsoon months the line is overloaded due to heavy import by Delhi to feed South Delhi area. During winter off-peak period the line is overloaded due to export of surplus generation in Delhi. The line overloading has been highlighted by NLDC.

POWERGRID proposed that to take care of above, additional feed to South Delhi is required to be planned directly from 765/400 kV Jhatikara S/s or some other suitable source so as to reduce dependency of South Delhi load on 220 kV Ballabhgarh – Badarpur line. Accordingly, Powergrid proposed a Voltage Source converter station of 500MW connected through HVDC cable from 765/400 kV Jhatikara S/s.

DTL proposed a 400kV substation at Mehrauli to feed south Delhi area.

POSOCO stated that Samaypur-Mehrauli was planned earlier, but could not be implemented due to severe R-o-W constraints. POSOCO further stated that while carrying out the studies all old units of BTPS within Delhi should be considered as de-commissioned and studies may be carried out.

Member, CEA explained that Delhi has been requesting for evolving a composite scheme for supply of power up to 2022. Member, CEA directed DTL to provide the load, generation and system data on priority so that a comprehensive scheme is evolved.

NTPC informed that BTPS units trip due to unbalanced loading this may also be addressed in the studies.

It was decided that CEA, CTU and DTL would carry out further studies & identify the space availability and submit the detailed proposal in the next meeting.

**Keeping above (point 10 (a to f)) and para 6, 11 17, 36 & 41 in view, following transmission works were proposed as Northern Regional System Strengthening scheme**

**NRSS-XXXI (Under Tariff Based Competitive Bidding)**

- Establishment of a 2X315MVA, 400/220 kV substation at Kala Amb (**refer para no-17**)
- LILO of both circuits of Karcham Wangtoo – Abdullapur 400 kV D/c line at Kala Amb (**refer -para no-17**)
- 40% Series Compensation on 400 kV Karcham Wangtoo – Kala Amb D/c line
- 400 kV Kurukshetra – Malerkotla D/c line
- 400 kV Malerkotla – Amritsar D/c line
- Bay extension at existing / under construction substations of POWERGRID, shall be carried out by POWERGRID

**NRSS-XXXII: By POWERGRID**

- 400 kV Panchkula – Patiala D/c line (with 10 km on multi-circuits towers in forest area near Panchkula for accommodating 220 kV D/c line for power supply to Chandigarh)
- 400 kV Lucknow (PG) – Kanpur (New)(PG) D/c line
- LILO Dadri-Malerkotla line at Kaithal S/s (PG) (**refer para no.41**)
- LILO of both circuits of RAPP – Kankroli 400 kV D/c line at Chittorgarh 400/220 kV substation of RRVPNL (**refer para no.36**)
- Conversion of 50MVAR line reactors at Kankroli end of RAPP-Kankroli 400kV line into bus reactor (Subject to space confirmation by RVPN ) (**refer para no.36**)

- Augmentation of transformation capacity at 400/220 kV Ballabhgarh substation by replacing existing 4x315 MVA ICTs with 4x500 MVA ICTs. The 4x315 MVA ICTs were agreed to be kept as regional spares after refurbishment.
- Augmentation of Transformation capacity at Mandola by replacing 4x315 MVA ICTs with 4x500 MVA ICTs. The dismantled 315 MVA ICTs were agreed to be maintained as regional spares after refurbishment.
- Provision of 7x105 MVA, 400/220 kV ICT at Parbati Pooling station along with associated bays and two nos. of line bays. (**refer para no. 6**)
- Augmentation of 400/220kV, transformation capacity by 500MVA ICT(4<sup>th</sup>)at Sector-72 Gurgaon (PG) Substation (**refer para no. 11**)

In case of space constraint for bay extension in any of the existing substation, the substation extension works would be carried out with GIS equipment.

**Members concurred the above proposal.**

#### **11. Absorption/ transfer of power from Jhajjar Complex**

CEA informed that Haryana has tied up about 3300MW power to be injected in Jhajjar/ Mohindergarh/ Daulatabad area.

S.No.	Generation available in Jhajjar complex	Haryana Allocation
1	Adani Power to be injected at Dhanonda Substation by Feb. 2013	1424 MW
2	50% of IGSTPS (Jhajjar-I) (3X 500MW)	693 MW
3	MGSTPS(CLP Jhajjar) (2X660MW)	1188MW
		3305MW

Presently, there are constraints in absorption of available generation/injection in Jhajjar area (which is likely to continue in next 2-3 years) due to which power is being injected into ISTS network. To mitigate the problem, joint studies were carried out by CEA, POWERGRID and HVPNL and accordingly, the following system strengthening was agreed to be implemented by HVPNL:



- Establishment of a new 400/220kV, 2X315 MVA substation near Farukhnagar area of Gurgaon by LILO of both circuits of 400kV Dhanonda- Daulatabad D/c line
- Augmentation with 400/220kV, 1X315MVA, ICT (3<sup>rd</sup>) at Kaboolpur(Rohtak) & ICT (4<sup>th</sup>) at Daulatabad S/s - To meet outage of ICT
- LILO of 400kV Bahadurgarh - Bhiwani(PG) line at Kaboolpur(HVPN) S/s and 400 kV Dhanonda- Bhiwani(PG) D/c line in place of already approved 400 kV Kaboolpur- Bhiwani(PG) D/c line - To be implemented on priority)

Member (PS), CEA enquired about the status of ongoing 400kV lines in Jhajjar complex. HVPNL informed that 400kV Dhanoda-Daultabad 400kV D/c line shall be completed in 15-20 days and 400kV Daultabad-Gurgaon 400kV D/c line shall be completed by June'13.

In addition to the above, to meet ICT outage, augmentation with 400/220kV, 500MVA ICT (4<sup>th</sup>) at Sector-72 Gurgaon (PG) Substation was agreed to be implemented by POWERGRID as ISTS system strengthening under **NRSS-XXXII**.

**Members agreed with the above proposal.**

**12. 220kV Transmission line from NTPC Faridabad- Provision of 2 no. of 220kV bays at Faridabad Gas Power Project (Agenda by HVPNL)**

CEA stated that presently evacuation from Faridabad CCGT (430 MW) is at 220 kV. There are 2 nos. of 220 kV D/c lines, one D/c line towards 220 kV Samaypur Substation of BBMB and other line towards 220 kV Palla S/S of HVPNL. During the 27<sup>th</sup> SCM of NR, NTPC had proposed that one of the 220 kV Samaypur- Ballabgarh line be bypassed at Samaypur and connected directly to one of the 220 kV Faridabad - Samaypur line, thus creating an alternative route, as Faridabad GPP has witnessed several station blackouts on account of major failure at Samaypur S/s. During that meeting, HVPNL had informed that they would be establishing 400/220 kV Nawada substation which would be connected to 220 kV Palla substation via intermediate 220 kV substations. Hence, this would provide desired outlets for reliable evacuation of power from Faridabad GPP even under line contingency condition. Hence, the proposal of NTPC was dropped. CEA asked HVPNL to present the agenda further.

HVPNL representative stated that the planned system of HVPNL from 400/220 kV Nawada S/s includes:

- 220 kV Nawada-A5 D/c line
- 220 kV A5-A3(Palla) D/c line

- LILO of one ckt. of 220kV A5-A3 D/c at A4

HVPNL informed that 220 kV Nawada-A5 D/c line and A5-A4 sections of 220kV line are in progress. However there are severe right -of -way constraints between A4 and A3 (Palla) section due to reserve forest area.

Accordingly, HVPNL proposed the following works:

- LILO of one circuit of 220 kV A5-A4 D/c line at Faridabad generating station
- LILO of one circuit of 220 kV Faridabad Generation station-A3 (Palla) D/c line at BPTP S/s
- .LILO of other circuit of 220 kV A5-A4 D/c line at BPTP substation

HVPNL stated that the proposed arrangement would provide additional connectivity to Faridabad generation.

**The proposal of HVPNL was discussed and agreed by the members.**

### **13. Transmission System for transfer of power from IPPs of SR to WR/ NR**

CEA stated that the following transmission corridors were finalized for transfer of power from SR and WR IPPs to Western and Northern Region:

- i) Solapur-Pune 765 kV S/c (2 nd ) line
- ii) Jabalpur Pooling station - Orai 765 KV D/c line
- iii) Orai – Bulandshahar 765kV D/c line
- iv) Buandshahar – Sonipat 765kV D/c line
- v) Orai – Orai(UPPCL) 400kV D/c (Quad) line
- vi) Sonipat - Kurushetra 400 KV D/c (Quad) line
- vii) Sonipat (New) - Sonipat 400 KV D/c (Quad) line  
Sonipat (New) - Kaithal
- viii) Bulandshahar-Hapur (UPPCL) 400 KV D/c (Quad) line
- ix) 2x1000MVA, 765/400 KV substation at Orai by LILO of one circuit of Satna-Gwalior 765 KV D/c line
- x) 2x1500MVA, 765/400KV S/s at Bulandshahar by LILO of Agra-Meerut 765 kV S/c line

xi) 2x1500MVA, 765/400KV S/s at Sonipat by LILO of Bhiwani-Meerut 765 kV S/c line

POWERGRID stated that Solapur-Pune 765 kV S/c (2<sup>nd</sup>) line was deferred which has been mentioned as deleted in the agenda note due to typographical error.

POWERGRID informed that for implementation of above transmission system regulatory approval from CERC was taken. However, considering the slow progress of generation projects in southern region, the above transmission scheme was not taken up for implementation. From the present generation scenario it was observed that more and more generation is coming up in Western region and imports from Western region to Northern region are increasing. During the recent two grid disturbances it was observed that there is a need to provide strengthening between Northern and Western regions.

In addition to above following was observed:

- UP is establishing 765 kV substation at Greater Noida under PPP mode and already awarded the works. It was gathered that the site identified for 765 kV Greater Noida and Bulandshahar S/s are in close proximity. Establishment of two 765 kV substations in close proximity is not desirable.
- Kanpur – Jhatikara 765 kV S/c line is under construction, which is about 450 km long and for smooth operation it is desirable to LILO this line at some substation to reduce its length.
- Earlier a 765/400 kV substation at Sonipat was planned, however with the coming up of CLP Jhajjar & Aravali Jhajjar generations as well as considering the injection of power from Adani at Mohindergarh, there was a need to review the requirement of establishment of 765/400 kV substation at Sonipat.

Considering the above, it was proposed that the establishment of 765/400 kV substation at Bulandshahar be shifted to Aligarh and LILO of Kanpur – Jhatikara 765 kV S/c line also be carried out at Aligarh. Further, it was also proposed that instead of taking 765 kV D/c line from Aligarh to Sonipat, 765 kV D/c line may be taken towards Hapur substation.

Considering the revised scenario it was deliberated that at present scheme may be implemented only upto Aligarh and the transmission scheme beyond Aligarh may be taken up later as per the system requirement. Accordingly it was agreed that initially the Aligarh substation may be a 765 kV switching station with 765 kV interconnections to Agra, Meerut, Kanpur and Jhatikara. Subsequently 765/400 kV transformation capacity may be provided in future as per the system requirement. The space may be acquired considering the development of 765/400 transformation capacity and 400 kV switchyard in future. Further the new 765 kV station at Aligarh may be constructed as GIS.

Accordingly, it was decided that the following transmission would be taken up as Inter-regional System Strengthening Scheme for NR & WR:

- a) Solapur-Pune 765 kV S/c (2<sup>nd</sup>) line
- b) Jabalpur Pooling station - Orai 765 KV D/c line
- c) Orai – Aligarh 765kV D/c line
- d) Orai – Orai(UPPTCL) 400kV D/c (Quad) line
- e) LILO of one circuit of Satna-Gwalior 765 KV line at Orai S/s
- f) 2x1000MVA, 765/400KV substation at Orai S/s
- g) LILO of Agra-Meerut 765 kV S/c line at Aligarh S/s
- h) 765KV Switching Station at Aligarh (GIS)
- i) LILO of Kanpur – Jhatikara 765 kV S/c at Aligarh S/s

Regarding implementation of the above scheme it was deliberated that POWERGRID has already taken the regulatory approval for implementation of the scheme, however this scheme is (with some minor modifications) now delinked with the earlier identified generation projects and is to be taken up on priority. After detailed deliberations, it was decided that the scheme may be taken up by POWERGRID, and the same may be informed to Secretary (CERC).

**Members agreed to the above proposal.**

#### **14. 125 MVAR Bus Reactor at Koteshwar**

CEA stated that during the 30<sup>th</sup> SCM of NR, it was deliberated that transmission system in Tehri area is frequently experiencing over voltages under light load conditions and it was agreed to provide 125 MVAR bus reactor at Koteshwar switchyard. POWERGRID had informed that Koteshwar is a commissioned project and bus reactor at Koteshwar generating station was proposed due to space constraints at Tehri Pooling station. THDC, during the 25<sup>th</sup> NRPC meeting had proposed that the above mentioned 125 MVAR bus reactor at Koteshwar may be provided by POWERGRID. After detailed deliberations, the implementation of Reactor by POWERGRID was agreed in the 25<sup>th</sup> NRPC meeting.

**Members noted the above.**

#### **15. Establishment of 400/220 kV substation at Patran**

CEA stated that a 400/220 kV substation was approved in the 30<sup>th</sup> Standing Committee Meeting of Power System Planning of Northern region. This substation is being developed through Tariff Based Competitive Bidding.

Considering the fact that the substation is located in a very fertile area of Punjab where the acquisition of land would be a challenging task, it is proposed to develop this substation as Gas Insulated substation.

**Members agreed to the above proposal.**

#### **16. Evacuation of Power from Sainj HEP (100 MW)**

CEA stated that the evacuation of power from Sainj HEP was discussed during the 30<sup>th</sup> SCM of NR and it was stated that injection of Sainj HEP of HPPCL shall be through LILO of Parbati-II – Parbati-III 400 kV line however in case of outage of one circuit, 10% overload generation, 0.9 pu voltage and 0.9 power factor there may be certain constraints and generation would have to be backed down.

NHPC informed that enhancement of current carrying capacity of 400 kV XLPE cable is not possible and hence evacuation of power of Sainj through XLPE cable provide at Parbati-III HEP is not feasible.

Member (PS), CEA had informed to NHPC that cable limitation may come in case of outage of one circuit, 10% over generation, 0.9 pu voltage and 0.9 power factor and possibility of occurrence of above contingency was very remote and HPPCL had agreed to back down the generation at Sainj, if required with a view to prevent the overloading of the XLPE cable of Parbati-III switchyard. Considering the above, HPPCL was advised to implement LILO of 400 kV Parbati-II – Parbati-III line for evacuation of power from Sainj HEP.

Subsequently, NHPC informed that backing down of generation at Sainj HEP does not safeguard the overheating of XLPE cable provided at Parbati-III switchyard and as such the arrangement is not acceptable to NHPC. HPPTCL stated that due to severe R-o-W issues it is not possible to plan independent line from the generation project.

After deliberations, Member (PS) decided that a committee consisting of CTU, CEA, HPPTCL, HPPCL & NHPC would be formed to solve the issue and if required joint site visit may be undertaken.

**Members agreed to the above proposal.**

#### **17. Establishment of 2x315 MVA 400/220 kV substation at Kala Amb**

POWERGRID stated that HPPTCL has informed that the present load in Kala Amb / Poanta / Giri area is about 350 MVA, which is likely to increase to about 500 MVA by 2015-16 whereas the available generation and transmission network in the area is not adequate to meet the present load.

In order to meet the present and future load requirement of the area, HPPTCL had proposed for establishment of a 400/220/132 kV substation at Kala Amb by LILO of one circuit of either N'Jhakri – Abdullapur or Karcham Wangtoo – Abdullapur 400 kV line. The matter was analysed and it was observed that N'Jhakri – Abdullapur 400 kV D/c line has already been looped in looped out at Panchkula and LILO of the same line has been approved at Sainj (near Simla). Considering the capacity of the line, it would not be desirable to LILO the N'Jhakri – Abdullapur line at Kala Amb. Further, as Karcham Wangtoo – Abdullapur 400 kV D/c line is also passing in close proximity to Kala Amb area and to meet the loads in the area, the LILO of the Karcham Wangtoo – Abdullapur 400 kV D/c was proposed to be carried out at Kala Amb. HPPTCL had proposed to LILO only one circuit 400 kV line however LILO of one circuit would result into unbalanced loading, it was therefore proposed that LILO of both the circuits may be carried out at Kala Amb.

Considering the issues of hilly terrain & scarcity of land in Himachal Pradesh, it was proposed to establish this substation as GIS station. HPPTCL had proposed the substation as 400/220/132 kV substation, however it was decided that the substation be established as 400/220 kV under ISTS and further works of 220kV and 132kV may be carried out by HPPTCL as per their requirement. **It was also agreed that LILO may be carried out on Multi-circuit Towers to conserve R-o-W.**

**The constituents agreed to take up the above proposed works as Northern Regional System Strengthening Scheme- NRSS-XXXI.**

#### **18. Constraints in NR GRID as per NLDC**

POWERGRID stated that NLDC have informed constraints in Grid Operation in Northern Region. Remedial measures for most of these constraints in ISTS network have already been planned / are being planned. The details of these constraints were given in the agenda. The states were advised to take up adequate action to address the constraints being observed in state transmission system. The brief of the discussions on this agenda item, is summarized below:

- a) **Tehri – Koteshwar Evacuation:** Evacuation of Tehri (4x250 MW) and Koteshwar (4x100 MW) HEP is through 765 kV series compensated double circuit line from Tehri pooling point to Meerut. This line is presently charged at 400 kV. On 10<sup>th</sup> September 2012 when the generation in the complex was 1350 MW (1050MW at Tehri and 300 MW at Koteshwar), one circuit of Tehri pooling point – Meerut (ckt-1) tripped and oscillations were observed. All the four units of Tehri and three units of Koteshwar power station tripped. The FSC of the line was not in service. However the availability of FSC is not visible to the operator in the NRLDC control room. Similar oscillations were observed on 3<sup>rd</sup> February 2011 whenever generation at Tehri exceeded 700 MW and only one circuit of 400 kV Tehri-Meerut was available. For evacuation of power from Tehri-I, Tuning of PSS was recommended in year 2003 by CEA and CTU. Considering the quantum of power, Series comp was proposed with Koteshwar. Now the PSS tuning has been carried out.
- b) **220 kV system in Uttar Pradesh (220kV Lucknow - Chihat S/c, 220kV Mainpuri- Harduaganj and 220 kV Mainpuri- Ferozabad) –** UPPTCL stated the problem of overloading of Lucknow – Chihat line would be mitigated after the commissioning of 400/220 kV Sohawal S/s as the load of Barabanki and Ramsnehighat would be diverted to be fed from Sohawal S/s. About the critical loading of other 220 kV lines, UPPTCL stated they would analyse and shall revert back. UPPTCL was requested to send the details after analysis.
- c) **220 kV system in Haryana (220kV Samaypur- Ballabgarh (3 circuits) 220kV Ballabgarh –Charkhi Dadri 220kV Samaypur –Charkhi Dadri) :** NRLDC stated that these circuits form a parallel path from Ballabgarh to Hissar. Due to the outage of 400/220kV, 500MVA ICT at Bhiwani (BBMB) and inadequate 220kV outlets from Manesar, Gurgaon, Daulatabad, Kabulpur, Deepalpur the existing 220kV lines in the corridor are heavily loaded. Outage of these circuits is likely to cause interruption in power supply in southern Haryana. BBMB informed that 400/220 kV ICT at Bhiwani has been commissioned recently. CTU stated that HVPNL needs to draw adequate 220 kV outlets from the already commissioned 400/220 kV substations in Haryana. Members (PS), CEA requested Haryana to send the complete details of 220 kV feeders to be connected from these new substations alongwith their status and target commissioning schedule.

Member (PS), CEA advised constituents to implement the 220 kV outlets from the new ISTS substations and asked them to submit the details of 220 kV feeders along with their commissioning schedule.

- d) **Singrauli – Anpara 400 kV S/c:** CTU stated that they are aware of criticality of this line. However there are severe R-o-W constraints and it is very difficult to construct the line in this area. Further there are space constraints at Singrauli generation switchyard. NTPC stated that there is no additional space for construction of 400 kV bay for a new line. CTU suggested that feasibility of connecting Rihand with Anpara may be explored. In this regard, NTPC and UPPTCL were requested to confirm about the availability of 2 nos. of 400 kV bays and POWERGRID was requested to look into the availability of corridor from Rihand to Anpara.
- e) **400/220 kV ICT at Bhiwani :** BBMB informed that ICT has already been commissioned

**19. Use of HTLS conductor on 400 kV lines at Kurukshetra S/s**

CEA stated that establishment of HVDC terminal station at Kurukshetra was planned as part of High Capacity Transmission Corridor for IPPs in Chattisgarh. While acquiring the land for Kurukshetra, it was suggested that the transmission lines near the Kurukshetra substation may be taken up as multi-circuit lines considering the present and future provision and it was also suggested that LILO of Sonipat-Abdullapur 400 kV D/c line may also be carried out on multi-circuit towers. Accordingly, following lines have been taken up on multi-circuit towers:

- 400 kV Kurukshetra – Jullandhar D/c (Quad) – about 5 km portion on multi-circuit
- LILO of 400 kV Abdullapur – Sonipat D/c (Triple) at Kurukshetra – about 16 km on multi-circuit

CEA informed that while finalizing the conductor configuration for the above lines, techno-economic comparison of conventional ACSR conductor v/s HTLS conductor was carried out by POWERGRID and it was observed that use of HTLS conductor with multi-circuit towers would be techno-economically a better option compared to 400 kV D/c (Triple Snowbird / Quad Moose) on multi-circuit towers.

Keeping above in view, it was informed that POWERGRID is going ahead with HTLS conductor instead of conventional ACSR conductor.

**Members agreed and noted the same.**



## **20. Modifications in the Transmission System for Phase-I IPPs in Jharkhand & West Bengal**

CEA stated that the transmission system for evacuation of power from Phase-I IPPs in Jharkhand & West Bengal was earlier approved and grouped into Part-A, Part-B & Private Sector. The same is enclosed at **Annexure-1**. Subsequently, following minor modification in the scheme were informed by the POWERGRID:

### **(i) Re-Grouping of Scope of Works**

According to the progress of the phase-I generation projects, scope of work has been re-grouped in three groups viz. Part-A1, Part-A2 and Part-B.

### **(ii) Change from AIS sub-station to GIS sub-station**

In view of the land acquisition problems, 400 kV Jharkhand pooling station, 765/400kV Varanasi sub-station and 765/400kV Kanpur sub-station are being constructed as GIS sub-stations.

### **(iii) Balia – Varanasi 765kV S/c line in place of ‘LILO of Gaya – Balia 765 kV S/c line at Varanasi’**

As part of the above transmission scheme, LILO of Gaya – Balia 765 kV S/c line at Varanasi was planned for onward transfer of power from Gaya as well as for providing 765 kV interconnection between Balia and Varanasi. After site selection of Varanasi substation, it had been observed that the estimated LILO distance of Gaya – Balia 765 kV S/c line at Varanasi comes to about 110 km and for implementing this LILO, 110 km of 765 kV D/c line would have to be constructed. This lengthy LILO would result into unbalanced loading on Gaya – Varanasi 765 kV lines. Further, it was also mentioned that the LILO tapping point of Gaya – Balia line is close to Balia substation. Keeping above in view, it was proposed to implement Varanasi – Balia 765 kV S/c direct line instead of above mentioned LILO. This would provide necessary connectivity between two major pooling stations i.e. Balia and Varanasi. Further, with the direct 765 kV interconnection instead of construction of 110 km of 765kV D/c line, the overall cost of the project would reduce and modified arrangement would lead to overall optimization. Considering these modifications, the final scheme as agreed is enclosed at **Annexure-2**.

**Members noted the same.**

## **21. Spare ICT 500 MVA**

POWERGRID stated that one no. of spare ICT of 400/220 kV, 500 MVA was approved in 26<sup>th</sup> NRPC meeting. This ICT is proposed to be kept at Neemrana. It was

proposed to include the above spare ICT either in a planned strengthening scheme or shall be taken up as a part of new strengthening scheme.

**Members agreed to the above.**

## **22. Evacuation of power from Chenab Basin Projects in J&K – Perspective Scheme**

CEA stated that during the 30<sup>th</sup> Standing Committee Meeting of Power System Planning for Northern Region, the issue of evacuation of power from various hydro projects located in Chenab Basin of J&K was discussed and it was decided that a task force may be constituted with participation from J&KSPDC, PDD J&K, CEA & POWERGRID to undertake a site visit and plan the comprehensive transmission system for implementation in phased manner matching with the generation commissioning schedule for the evacuation of power.

Based on the discussions with NHPC, J&K SPDC and PDD, J&K the status of the identified generation projects was informed as under:

a) **Kirthai-I HEP (240 MW):** This would be a State Sector Project. It was informed that the power potential studies are under revision and the project capacity would be 350 MW instead of 240 MW. In the meeting, it was informed that the project capacity would be 390MW. Also, it was informed that the DPR has been prepared and TEC is expected by end 2013. Implementation period for the project is 5 years from investment approval date. EIA studies were completed for 240 MW which needs to be revised due to revised power potential. Regarding land availability, it was informed that part of land has already been acquired and balance acquisition in progress. Project is expected to be commissioned during 13<sup>th</sup> Plan.

b) **Kirthai-II HEP (990 MW):** DPR submitted to CEA for concurrence. The same was discussed and necessary changes to be made in DPR were informed to JKPDC. The revised DPR is under preparation. The Project would be executed on EPC basis and tendering activities have been taken up. Pre-constructions activities are in progress. Project is expected to be commissioned during 13<sup>th</sup> Plan.

c) **Generation Projects of Chenab Valley Power Projects Limited (CVPPL):** It was informed that Kiru HEP (600 MW), Kwar HEP(520 MW) and Pakaldul HEP(1000 MW) are being executed by a JV company of J&KSPDC, NHPC & PTC named as CVPPL . The JV Company has been formed and Promoter agreement has been signed.

- **Pakal Dul HEP (1000 MW):** TEC of the project has been obtained earlier by NHPC. The same would be transferred to CVPPL. Forest clearance had been obtained from Forest Deptt. J&K. MoEF has accorded environment clearance. Construction activities have started. Tenders have been floated for civil works. Land acquisition is in progress and tenders have already been floated. Commissioning schedule of the project is 72 months from investment approval. Project is expected to be commissioned during 13<sup>th</sup> Plan.

- **Kiru HEP (660 MW):** DPR is to be resubmitted to CEA after revision. MoEF has accorded clearance for pre-construction activities and TOR for EIA studies has been finalized. Forest proposal is likely to be submitted soon. Commissioning schedule of the project is 54 months from the date of Government approval. Project is expected to be commissioned during 13<sup>th</sup> Plan.

- **Kwar HEP (560 MW):** Power potential has been revised to 560 MW. DPR is submitted to CEA for concurrence. MoEF has accorded clearance for pre-construction activities and TOR for EIA studies has been finalized. The commissioning schedule of the project is 54 months from the date of Government approval. Project is expected to be commissioned during 13<sup>th</sup> Plan.

d) **Bursar HEP (1020 MW):** It is a central sector project which would be executed by NHPC. 500 Ha forest land in Kishtwar high altitude national Park is involved. NOC for National park is yet to be obtained. DPR of the project is under preparation by NHPC. It was gathered that the location and capacity of the project may change. The project is in survey & investigation stage.

e) **Sawalkot HEP (1856MW):** As per the information, the project size is being revised to 1856 MW. Hydrology of the project is yet to be approved. At present there is no access road upto the project. For reaching project site, tunnel is to be constructed. Generation project is to be developed by JKSPDC. Access Road is under construction. Revised DPR is under preparation and is likely to be submitted to CEA by Mid 2013.

f) **Ratle HEP (850 MW):** This is an IPP being developed by M/s GVK. The concurrence of CEA was accorded on 22.10.2012. The evacuation system for the generated power has been approved by SCM of NR. The Developer has applied for Connectivity and LTA from CTU.

CTU informed that except for Ratle HEP, none of the Developers of the above projects had applied for connectivity/LTA. Until the connectivity / LTA application is received by CTU, the transmission system for evacuation of power from these projects cannot be finalized. However, a perspective plan has been evolved which may require revision /update depending on the progress / time frame of the generation projects.

### **Major observations of site visit were:**

- **Serious Right-of-Way constraints** due to difficult mountainous terrain were observed en-route to Kirthai-I to Kwar HEPs. It was concluded that maximum two transmission corridors can be accommodated between these locations.
- The generation projects in the Chenab basin would be coming up in a widespread time frame from early 13<sup>th</sup> Plan period and beyond. Accordingly, it was considered prudent that two 400 kV high capacity corridors of about 3000 MW and 2300 MW capacity having switchgear rating of 4000 Amps respectively may be planned in the Chenab basin to cater to various identified generation projects. It was mentioned that about 1500 MW power of generation projects located in HP and J&K border area will also be evacuated through the high capacity transmission corridor planned for Kirthai-I and Kirthai-II HEPs.
- It was informed that the Task force visited the site for establishing 765/400 kV Pooling station at Kishtwar. Prima facie, the site appeared to be in order.
- It was observed that Pakaldul HEP is likely to be commissioned first considering its physical progress.
- Based on the above, the transmission system alongwith the phasing of the works was conceptualized.

### **Perspective Transmission System alongwith Phased development for Hydro projects located in Chenab Basin J&K**

#### **High capacity common corridor-I:**

This corridor would be merged with the corridor planned with Himachal Pradesh hydro projects of 1500 MW capacity located in Chandrabhaga basin. The total capacity of this corridor would be about 3000 MW.

- **Kirthai-I HEP(350 MW):**
  - LILO of one circuit of 400 kV D/c (Twin HTLS Conductor –Equivalent to about 1500MW) line from Reoli Dugli HEP (HP) – Kirthai-II generation switchyard
  - Switchyard Capacity etc. must be able to handle about 1500MW power generated by the generation projects located in upstream of the Kirthai-II generation project. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 3000 Amps current.

- 400 kV, 80 MVAR Bus Reactor

- **Kirthai-II HEP(990 MW) :**

- 400 kV D/c (Quad HTLS Conductor –Equivalent to about 3000MW) line from Kirthai-II HEP (HP) – Kishtwar Pooling station
- Termination of 400 kV D/c (Twin HTLS Conductor –Equivalent to about 1500MW) line from Reoli Dugli HEP (HP) at Kirthai-II generation switchyard
- Switchyard Capacity etc. must be able to handle about 3000MW power generated by the generation projects located in upstream of the Kirthai-II generation project. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
- 400 kV, 125 MVAR Bus Reactor

#### **High capacity common corridor-II:**

- **Kiru HEP(660 MW) :**

- 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Kiru HEP – Kishtwar Pooling station (High capacity common corridor-II)
- Switchyard Capacity etc. must be able to handle about 2300MW power generated by the generation projects located in downstream of the Kiru HEP. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
- 400 kV, 125 MVAR Bus Reactor

- **Kwar HEP(560 MW) :**

- LILO of one circuit of 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Kiru HEP – Kishtwar Pooling station
- Switchyard Capacity etc. must be able to handle about 2300MW power generated by the generation projects located in downstream of the Kiru

HEP. It is proposed that the GIS switchyard equipments and XLPE cables provided may be designed for carrying 4000 Amps current.

- 400 kV, 125 MVAR Bus Reactor

- **Pakaldul HEP(1000 MW) :**

- LILO of one circuit of 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Kiru HEP – Kishtwar Pooling station
- Establishment of 400 kV switching station at Kishtwar (establishment of Kishtwar pooling station has also been proposed with Himachal Projects).
- Establishment of 400/220 kV, 2x315 MVA substation near Gurdaspur/Sirhand by LILO of both circuits of 765 kV (operated at 400 kV) Kishenpur – Moga S/c lines.
- 765 kV Kishtwar- Gurdaspur/Sirhand D/c line (to be operated at 400 kV initially)
- Switchyard Capacity etc. must be able to handle about 2300MW power generated by the generation projects located in downstream of the Kiru HEP. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
- 400 kV, 125 MVAR Bus Reactor

- **Bursar HEP (1020 MW):** It was informed that there is a national park issue in the vicinity.

- 400 kV D/c (Twin HTLS Conductor –Equivalent to about 1200MW) line from Bursar HEP – Kishtwar Pooling station.
- 400 kV, 125 MVAR Bus Reactor

- **Sawalkote HEP(1856 MW):**

- LILO of both circuits of 400 kV Kishenpur-Wagoora D/c line at Sawalkote
- LILO of both circuits of 400 kV Kishenpur-New Wanpoh D/c line at Sawalkote

- Charging of Kishenpur – Gurdaspur/ Sirhind 2 xS/c lines at 765 kV level
- Establishment of 765/400 kV 2x1500 MVA Kishenpur substation
- Establishment of 765/400 kV 2x1500 MVA Gurdaspur/ Sirhind S/s
- 400 kV, 125 MVAR Bus Reactor

### **Tentative Phasing of System**

POWERGRID informed that Pakaldul project will be the first to come in Chenab basin. Accordingly, initially a 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Pakaldul HEP – Kishtwar Pooling station shall be constructed and extended to upstream side projects as per their commissioning schedule. The upgradation of Kishtwar pooling station to 765/400 kV, 2 x1500 MVA and operation of Kishtwar-Gurdaspur/Sirhand D/c line at 765 kV will be taken up matching with the next project commissioning in Chenab basin. In this time frame, charging of Gurdaspur/Sirhind – Moga 765 kV lines shall also be taken up. Further, with coming up of more generation, an additional 765 kV D/c line shall also be planned from Gurdaspur / Sirhind to some suitable location. With the coming up of Sawalkot generation charging of Kishenpur - Gurdaspur/Sirhind lines at 765 kV level shall be taken up.

With the addition of more generation the augmentation of Kishtwar pooling station by additional 2x1500 MVA, 765/400 kV ICTs and implementation of 2<sup>nd</sup> 765 kV D/c line from Kishtwar to Punjab area (exact location to be decided later on) will be taken up as per the requirement matching with the commissioning schedule of upstream projects in Chenab basin.

It was agreed that the above transmission plan is a conceptual plan and its updation / revision would be required based on the network topology and firm time schedule of the generation projects. It was also informed that it is necessary that the project developers apply to CTU for the connectivity & LTA so that the above plan can be firmed up.

Member (PS), CEA stated that the scheme is tentative and shall be firmed up only after the receipt of applications from the perspective developers. He also advised to upload the above perspective transmission plan on CEA website.

**Members agreed to the above perspective plan & noted the same.**

### 23. Rihand-III Transmission system:

CEA stated that for immediate evacuation of power from Rihand-III, 765 kV Rihand III -Vindhyachal Pooling Point D/c line (to be initially operated at 400 kV) had been planned. This line traverses through protected forest in Uttar Pradesh and both reserved and protected forest in MP. The line is expected by September'2013. The first unit of Rihand-III generation project is expected to be commissioned in December'12. NTPC representative informed that the second unit is expected to be commissioned by July/Aug'13. The power from Unit-1 may be evacuated by utilising existing margins in the transmission system under normal operating conditions. For unit-2 evacuation, it is proposed that power may be transferred to existing Vindhyachal 400kV Bus through HVDC Back to Back.

Presently first unit of Vindhyachal-IV has been commissioned. The Vindhyachal-IV generation is connected with existing generation Vindhyachal generation bus and is being evacuated over existing 400kV lines. NTPC representative informed that the second unit of Vindhyachal-IV is expected to be commissioned by Sep.'13. POWERGRID informed the status of various elements proposed in the area as below:

S no.	Elements	Commn. Schedule
<b>Transmission Line</b>		
1	Rihand III -Vindhyachal Pooling Point 765 kV D/c (to be initially operated at 400 kV)	September'13
2	Vindhyachal-IV – Vindhyachal pooling stn 400kV D/c	Forest clearance awaited. Exp. by December'13
3	Vindhyachal pooling stn- Sasan 400kV D/c	Ready for charging
4	Sasan - Satna 765kV 2x S/c	1 ckt.- Nov.'12 2 <sup>nd</sup> ckt.- Feb/Mar'13 (Forest clearance awaited)
5	Satna-Bina 765kV 2xS/c	Commissioned
<b>Substation</b>		
1	Vindhyachal pooling station	Land Acquisition in progress. Land by Dec'12



2	Sasan	1x1000MVA trf. installed.
3	Satna & Bina	765/400 kV commissioned

It was agreed that with the commissioning of 2<sup>nd</sup> unit of Rihand-IV, power from the generation may be evacuated to existing Vindhyachal generation bus through HVDC back to back depending on the available system margins.

NTPC suggested that the possibility of early commissioning of 2<sup>nd</sup> 765/400 kV 1000 MVA ICT at Sasan may be explored by Powergrid as the same would help in evacuation of generation. Member (PS) advised CTU to explore the feasibility of above proposal .

NTPC requested that Rihand-III may be treated at par with other ISGS generation in Singrauli-Rihand generation complex and schedule of all generations may be done proportionately. Members agreed to the request.

**Members agreed & noted the above.**

#### **24. Proposal for Static VAR Compensators (SVC) in Northern Region.**

CEA stated that in the recent past, major grid disturbances had been experienced in NEW grid on 30-07-2012 and 31-07-2012. The Enquiry Committee was constituted by Ministry of Power to analyze the causes of these disturbances and to suggest measures to avoid recurrence of such disturbance in future. Based on the analysis of these grid disturbances the committee recommended the following:

“ Reactive Power Planning : *In order to avoid frequent outages / opening of lines under over voltages and also providing voltage support under steady state and dynamic conditions, installation of adequate static and dynamic reactive power compensators should be planned*”. The committee has recommended 6 months time frame for this reactive power planning in all the regions.

In view of the above recommendation, the system studies considering All- India transmission system were carried out with POWERGRID to ascertain the quantum of dynamic reactive power compensation required in Northern Region. Based on these studies, SVC at Fatehpur was proposed.

CTU stated that subsequent to the joint studies they had carried out additional studies which also includes peak hydro scenario and based on the studies, four locations had been identified for providing dynamic reactive compensation. The maximum & minimum voltages observed at the four identified locations for the last year based on data from POSOCO is:

a) Northern Region:

Substation	Jul'11	Aug'11	Sep'11	Oct'11	Nov'11	Dec'11	Jan'12	Feb'12	Mar'12	Yearly Max.
<b>Maximum Voltage (kV)</b>										
Hissar	415	416	418	431	417	424	416	430	424	431.4
Nalagarh	424	438	423	436	433	431	432	429	431	438.2
Substation	Mar'12	Apl'12	May'12	Jun'12	Jul'12	Aug'12	Sep'12	Oct'12	Nov'12	Yearly Max.
Lucknow	428	429	429	427	430	429	431	429	429	431
Fathepur	424	425	424	428	429	431	433	429	430	432.5
Substation	Jul'11	Aug'11	Sep'11	Oct'11	Nov'11	Dec'11	Jan'12	Feb'12	Mar'12	Yearly Min.
<b>Maximum Voltage (kV)</b>										
<b>Minimum</b>	381	383	383	371	362	359	355	362	376	351.2
Nalagarh	377	388	388	402	402	401	401	401	401	377.2
Substation	Mar'12	Apl'12	May'12	Jun'12	Jul'12	Aug'12	Sep'12	Oct'12	Nov'12	Yearly Min.
Lucknow	419	418	418	416	417	421	418	420	421	416
Fathepur	386	393	391	390	390	405	405	402	404	386

- Nalagarh 400/220kV substation:** Nalagarh is connected to Nathpa Jhakri (1500MW) & Karcham Wangtoo (1000 MW) generation complexes through 400kV lines. In addition it was informed that Rampur HEP would be coming up next 2 years and for evacuation of power from Rampur no additional line has been planned. Such large generation in a small pocket has created many difficulties during operation. As per NRLDC report on Operational feedback for October 2012, there had been sudden closure of all generating units at Karcham Wangtoo and Jhakri HEP on account of silt flushing and there was a generation loss of 2800MW. This had been experienced on more than one occasion. The sudden dropping of units results light loading of 400kV lines and causes grid operational constraints. In future, generation from Koldam HEP (800MW) & Parbati HEPs (1320 MW) would also be pooled at Nalagarh. This may cause operational constraint due to high voltage in area due to offloading of lines and occurrence of oscillations in the grid which may affect other generations connected to it. SVC at Nalagarh would help in both damping and controlling voltage in the area. **In view of the above, SVC having rating of  $\pm 400$  MVAR is proposed at Nalagarh.**
- Interconnection points of inter-regional lines:** The load demand in Northern region is growing at a fast pace and power has to be imported from other regions to meet the peak demand. The large interconnected grid poses the challenge of operation of lines under various seasonal and operational conditions. This is particularly true for Northern region because as an importer of energy from other regions based on market forces, the flow of energy from other regions may change resulting in high or light loading of lines. The region from which power is to be imported and the quantum will vary widely. Operational experience has indicated that multiple contingency is a reality. Under such conditions, system stabilizing

controls should be available for the grid operator. Accordingly, static compensators SVC having **rating of  $\pm 400$  MVAR** proposed at Lucknow S/s and Fatehpur S/s. Lucknow S/s is connected to Balia and Gorakhpur substations while Fatehpur S/s is connected to Gaya S/s and Sasaram S/s by 765kV lines through which power from ER is imported. The dynamic compensators at these locations would help in damping any inter-regional oscillations and during black start.

- Hissar 400/220kV substation: Hissar is an important grid substation connecting the Southern part of NR with Northern part. It is connected to important substations like Bhiwadi, 765/400kV Bhiwani and Moga. These substations experience wide variation in voltage due to wide seasonal load variation. During peak load conditions when agriculture demand is very high the voltage variation is very large. Accordingly, It was proposed to provide SVC having **rating of  $\pm 400$  MVAR** at Hissar substation.

**After detailed deliberations, it was decided to provide SVC of  $\pm 400$  MVAR at Nalagarh and Lucknow in the first phase and SVC at Fatehpur, & Hissar may be firmed up later with additional studies with All-India network and put up to Standing committee again. The dynamic stability study results for SVC at Nalagarh and Lucknow are enclosed at Annex-V and VI.**

**Members agreed with the above proposal.**

## **25. Common Data Base among STUs, CTU and CEA**

CEA informed that CTU as a part of capacity building initiative has taken up the initiative of providing the system study software (PSS/E) to the state utilities. The software is world renowned software and being used by CTU, CEA & RLDC. POWERGRID has provided software to all state utilities, State Load dispatch centers and State Regulatory commission. The software is being distributed along with laptops in phased manner along with training. This initiative by POWERGRID would provide a common platform for all utilities to exchange system studies and details of transmission system.

Presently, States usually model their transmission system in detail, however their inter-connections with Regional grid at boundaries are being modeled as lumped load or generator due to lack of data or due to differences in data-base format maintained by different utilities. Such assumptions drastically affect the studies particularly while planning Intra-state and Inter-state EHV system. It was therefore necessary that a

common standard format for the data-base may be followed by all utilities to enable free exchange of data. This would also help in carrying out system studies in a better manner. In view of above, it was agreed that a team at regional level may be formed with members from CEA, CTU, RLDC, RPC and Northern region state transmission utilities. This team would develop a data-base for Transmission Planning for Northern region for present and year wise till 2016-17. This data-base can be posted on the website of CEA, CTU and STUs. Integration of the regional data-base with other regions to create a National Database would be created by another team consisting of members of CEA and CTU. It was agreed that CTU would co-ordinate this activity.

Member (PS) advised CTU to convene a separate meeting of the constituents for detailed discussions & formulation of the methodology for developing the proposed Data-base.

**Members agreed to the same.**

**26. Establishment of 220/66 kV substation at U.T Chandigarh and connectivity with ISTS through Panchkula 400/220 kV S/s of POWERGRID (Agenda by UT Chandigarh)**

CTU stated that the maximum peak load of Chandigarh is about 363 MW and the projected max. load is 439 MW by 2016-17. Presently the load of Chandigarh is being fed from three different sources namely Kishangarh (3x100 MVA Power Transformers), Mohali (Load restricted to 2x80 MVA) & 66 kV D/c line from Dhulkote.

Load Flow Studies had been carried out by CTU for U.T Electricity Board (Chandigarh) for their 220/66kV Transmission System for present as well as for future scenarios. It had been observed from load flow studies that under normal and contingency conditions, some of the system elements get critically loaded. Therefore, the strengthening of transmission system is required at various points at U.T. Chandigarh.

Chandigarh mentioned that presently there is no ISTS inter-connection available to the Chandigarh's transmission system. The connectivity of Chandigarh transmission system with ISTS would help in providing reliable power supply to this area.

In view of the above, it was proposed to take up the following transmission works as System Strengthening Scheme of NR:

- A 220 kV D/c line from Sector-47 S/s to Panchkula 400/220 kV Substation of POWERGRID
- Establishment of 2X160 MVA, 220/66 kV substation at Sector-47

HVPN stated that there could be severe R-o-W constraints in Panchkula area (also mentioned at para no.-10 (a) in regards to proposed Panchkula – Patiala 400 kV D/c line).

Member (PS), CEA proposed that constituents may agree for in-principle approval of the above scheme and the scheme may be fine tuned later after discussions with Chandigarh, HVPNL and CTU.

**Members agreed to the above.**

## **27. Provision of PMU's under URTDSM Project**

CEA informed that the Unified Real Time Dynamic State Measurement (URTDSM) Project was approved in the Joint Standing Committee Meeting held on 5<sup>th</sup> March 2012. In line to approval, the Detailed Project Report (DPR) had been finalized and petition had also been filed with CERC for Regulatory Approval. As per advice of CERC, the project details had also been discussed in the RPC forums of WR, NR, ER & SR. The project details would be discussed in the upcoming NERPC meeting.

Broadly the scope under the DPR is as follows:

- Installation of 1739 PMUs
- Computer hardware and software at SLDC/RLDC/NLDCs.
- Installation OPGW based communication system (approx 10667km)
- Development of analytics.
- Consultancy services.

The estimated Project Cost as per DPR is Rs.655.98 Crores. As per discussions, the installation of PMUs and associated communication system at IPPs had also been included in the DPR. The NIT for this would be issued shortly.

It was informed that as per Joint Standing Committee approval, 15% of the PMUs to be installed under this project are to be manufactured in India. Subsequent to this approval, during the discussion with prospective Bidders, it had emerged that 15% of PMU quantity may not attract the Vendors to establish manufacturing facility in India. Hence, this percentage was agreed to be enhanced. This enhanced provision shall help establish indigenous manufacturing and utilities shall also have O&M support available within India. Therefore, **provision for 30% PMUs to be manufactured & supplied from India was agreed to be kept under URTDSM Project.**

**Members agreed to the above.**

**28. Connectivity of New Generating Stations through LILO arrangement (Agenda by RRVPNL)**

RRVPNL had informed that as per accepted practice CTU is responsible for development of evacuation system for Inter-State Generating Stations from the switchyard of the generating station. It had been further stated that PGCIL is routinely recommending LILO of existing transmission lines for providing connectivity to new generating stations seeking LTOA to ISTS. Though provided in CERC Regulations, LILO connectivity should be allowed only in exceptional cases as it compromises the redundancy & power dispatch from existing generating stations whose evacuation system is to be shared by new generating plant. RRVPNL had requested for suitable guidelines to allowing LILO connectivity to new generating stations either temporarily or permanently and for sharing of transmission charges and losses without adversely impacting the existing ISTS customers.

After detailed deliberations it was agreed that **LILO should be avoided as far as possible. However in exceptional case where no other feasible option emerges even after thorough deliberations in the SCM, it could be allowed with the consent of all constituents**

**Members agreed to the above.**

**Minutes of the meeting in respect of additional agenda items:**

**29. Power Supply to M/s Noida Power Company Limited (NPCL)**

CTU stated that NPCL had applied for connectivity for drawl of 500MW power for distribution in Greater Noida area in Uttar Pradesh. The issue of providing connectivity was discussed during the LTA/connectivity meeting held on 19/12/11, wherein it was proposed to LILO Dadri –G. Noida 400 kV circuit at Greater Noida (New) along with the establishment of a new 2x500 MVA, 400/220 kV substation at Greater Noida (new) for providing connectivity. As UPPTCL was not present in that

meeting it was decided that observations / concurrence of UPPTCL would be taken in this regard.

UPPTCL had communicated their concurrence subject to identification of strengthening & supply to their Greater Noida is not affected.

Member (PS), CEA mentioned that M/s NPCL had executed a Long Term PPA with M/s Essar Power (Jharkhand) Ltd for procurement of 240 MW power from April 2014 for 25 years and CTU had already granted Long Term Access of 400 MW (for Target Beneficiaries) in Northern Region to M/s Essar Power (Jharkhand) Ltd and they have requested to approve / provide LTA of 240 MW to NPCL being the actual beneficiary, out of total approved 400MW LTA in NR.

CEA explained that presently 400/220 kV, 3x315MVA transformers are installed at Greater Noida and the transformers are loaded heavily and to meet the future power demand another substation is required in the area. It was also mentioned that NPCL has submitted a letter from Greater Noida Authority informing earmarking of land for new 400 kV substation in Sector-Knowledge Park-V in Surajpur area.

CTU mentioned that the Dadri – Ballabgarh 400 kV D/c line had already been Looped in Looped out at three major substations of NCR i.e. Maharani Bagh, Greater Noida and Nawada and therefore establishment of one additional substation on the same line at Greater Noida would not be appropriate as it would result into over loading of the lines. In view of this and considering the concentration of growing loads in NCR area it is proposed to have a separate 2x500MVA 400/220kV substation along with 400kV line from Dadri/ Ballabgarh to meet their requirement. However due to R-o-W constraints for constructing line from Dadri, it is proposed to provide direct connectivity to the proposed 400/220 kV Greater Noida (new) S/s from Ballabgarh 400/220 kV substation through a 400 kV D/c line. This new 400/220 kV substation would be catering to both Uttar Pradesh and M/s NPCL and would be taken up as a ISTS strengthening scheme.

Members raised the issue of R-o-W constraints in Ballabgarh area. After discussions it was agreed to use multi-circuit towers in 5 km stretch of the above proposed line from Ballabgarh end.

Member (PS), CEA mentioned that the above proposal would be **taken up under Tariff Based competitive bidding**

Keeping all above in view, following transmission works were proposed as Northern Regional System Strengthening scheme-XXXIII. The scheme would be taken up under Tariff Based competitive bidding:

**NRSS-XXXIII:**

- Ballabhgarh – Greater Noida (New) 400 kV D/c (5 km from Ballabhgarh S/s on multi-circuit towers)
- Establishment of 2x500 MVA, 400/220 kV GIS substation at Greater Noida (New) with a short circuit current rating of 50 kA.

**Members agreed to the above proposal.**

**30. 400kV Power Evacuation System of Gidderbaha TPS (2640MW) and Mansa TPS (1320MW)**

Member (PS), CEA enquired about the status of Gidderbaha TPS (4x660MW) and Mansa TPS (2x660MW).

NTPC informed that the Gidderbaha generation project is on hold and they would revert back when there is a progress. PSTCL informed that Mansa TPS (1320MW) is also on hold for the time being.

Accordingly, it was **agreed that the evacuation system of these projects may be deferred till the schedule of generation gets firmed up.**

**31. Procurement of Spare 765/400 kV ICTs for Northern Region**

Powergrid proposed to procure three (3 units of 765/400 kV, 500 MVA (single-phase) ICTs and one (1) unit of 765/400 kV, 333 MVA (single-phase) ICT as spares for Northern region.

Member (PS), CEA enquired about the number of 765kV transformers presently installed.

AGM (OS), POWERGRID informed that fifty four (54) units of 500 MVA and seven (7) units of 333 MVA, 765/400 kV ICTs are in operation at Ballia, Lucknow,



Fatehpur, Agra, Moga, Bhiwani and Jhatikara Sub-stations. Further, additional six (6) units of 500 MVA, 765/400kV ICTs are likely to be commissioned by 31.03.2013 at Meerut S/s. He further mentioned that any major failure of these ICTs would necessitate repairs in their off-shore works only, which is time consuming because of long time taken in transportation of the unit from site to works & back and manufacturing of winding. Any failure of these units may cause overloading of the other units operating in parallel and result in transmission constraint at 765 kV level especially in view of ensuing commissioning of various power projects in the Region. In view of the above, it was proposed to procure three (3) nos. single phase 765/400 kV ICTs of 500 MVA capacity and one (1) no. single phase 765/400 kV ICT of 333MVA capacity as spare for Northern Regional Grid.

Considering above, following ICTs were agreed to be procured under “Spare transformers for 765/400KV ICTS in Northern Region” scheme:

- Three (3) nos. single phase 765/400 kV ICTs of 500 MVA capacity as spare ICTs (to be kept in ready for charging condition )
- One (1) no. single phase 765/400 kV ICT of 333MVA capacity as spare ICT (to be kept in ready for charging condition )

**Members agreed to the above proposal.**

### **32. Replacement of Bus Reactors under Additional Capitalization at Agra & Muradnagar**

CTU stated that the replacement of 02 nos. of 50 MVAR Bus Reactors installed at Agra & Muradnagar S/s with 80 MVAR bus reactors under renovation & modernization was approved by CERC for smooth & reliable operation of Grid. However CERC desired that since there is change in capacity, the matter be discussed with beneficiaries at NRPC level and technical requirement of appropriate capacity of the reactor may be finalized after detailed study. Accordingly, the matter was discussed in the 27<sup>th</sup> NRPC meeting held on 30/11/2012. During the meeting POWERGRID had proposed to replace 50 MVAR old reactors with 125 MVAR reactors instead of replacing the 50 MVAR reactors with 80 MVAR reactors (as proposed in CERC).

It was also informed that the studies indicated the reduction of voltage at Agra and Muradnagar S/s is of the order of about 0.5 kV with 50 MVAR bus reactors and about 2 kV with 125 MVAR bus reactors.

Considering the above, CTU proposed to replace the existing 50 MVAR Bus reactors with 125 MVAR Bus Reactors at Agra and Muradnagar (UPPTCL). It was also proposed to maintain the 50 MVAR reactors as regional spares after refurbishment.

Accordingly, it was agreed to under replacement of bus reactors in Northern region following is proposed under **“Replacement of bus reactors in Northern region”** scheme:

- 125 MVAR bus reactors at Agra and Muradnagar
- Refurbishment of existing 50MVA reactors at Agra and Muradnagar and using them as regional spares.

**Members concurred with the above proposal.**

**33. Drawl of power from 220 kV level of Agra (POWERGRID) 765/400/220 kV substation**

CTU informed that 4x105 MVA, 400/220 kV ICTs are provided at Agra (POWERGRID) substation. For supply of power to UP, two nos. of 220 kV line bays are also being constructed which may be utilised by UPPTCL for meeting the load demand in nearby area. UPPTCL was advised to plan 2 nos. of 220 kV feeders from this substation.

UPPTCL informed that they would utilize the above bays for LILO of Agra-Shamsabad 220kV S/c line.

**Members agreed to the above proposal.**

**34. Construction of four (4) nos. 400 kV Bays at 400/200 kV sub-station of PTCUL at Kashipur**

Already mentioned in para no.-5.

**35. Construction of two (2) nos. 400 kV Bays of POWERGRID at Rajpura substation for termination of LILO of Dehar – Bhiwani 400 kV S/c line associated with NRSS-XXVII**

CTU stated that implementation of LILO of Dehar – Bhiwani 400 kV S/c line at Rajpura substation (PSTCL) was agreed as part of NRSS-XXVII. For completion of these works, two nos. of 400 kV bays were to be implemented at Rajpura substation of PSTCL. For carrying out the works on deposit basis, as a practice being followed amongst other utilities & POWERGRID, normally 15% overhead charges are paid. The scope of deposit work includes tendering, placement of awards, engineering, supervision etc. However, PSTCL had intimated that the implementation of 400 kV bays at Rajpura may be carried out by POWERGRID and 12.5% departmental charges of the total project cost may be paid to PSTCL.

Member (PS), CEA stated that Dehar-Panipat and Dehar-Bhiwani lines belong to BBMB. To control the over voltage at Dehar generating station during low hydro condition, LILO of these long lines at intermediate substations was approved. Originally the LILO of Dehar-Panipat at Panchkula and LILO of Dehar-Bhiwani at Rajpura were to be carried out by Haryana and Punjab respectively. As the works were required to be carried out to ensure reliable operation of the grid it was agreed in earlier SCM that Powergrid would carry out these works. As such, it is not justified on the part PSTCL to ask 12.5% charges for extension of bays in Rajpura S/s. He advised PSTCL to allow POWERGRID to carry out the extension works in Rajpura S/s without any charges. **PSTCL agreed for the same.**

**Members agreed to the above proposal.**

**36. High Voltage conditions in RAPP area**

CTU intimated that the issue of high voltage conditions prevailing in RAPP area under light load condition was discussed in 27<sup>th</sup> NRPC meeting where in NPCIL informed that some relief in overvoltage conditions was observed after the commissioning of 125 MVAR bus reactor at Kankroli. However, the voltages in RAPP area are still high (about 420 kV). During the deliberations RRVPNL suggested that 400kV RAPP – Kankroli D/c line might be looped in looped out at Chittorgarh substation which is en-route to this line (LILO length is only about 5-10 km). This would result into smaller line sections and provide additional anchoring at

Chittorgarh. Accordingly, studies were carried out and it was observed from study results that the proposed LILO at Chittorgarh would reduce the voltage by 5 kV in the RAPP area. It was also mentioned that after the above LILO of the RAPP – Kankroli D/c line, the line reactors at Kankroli end could be gainfully utilized as bus reactors at Kankroli S/s.

As the Line belongs to POWERGRID and since the size of work is also small, it was agreed that the works can be carried out by POWERGRID as part of some new or ongoing scheme of POWERGRID.

Accordingly, following was agreed to be included under **NRSS-XXXII** works:

- LILO of both circuits of RAPP – Kankroli 400 kV D/c line at Chittorgarh 400/220 kV substation of RRVPNL.
- Conversion of 50MVAR line reactors at Kankroli end of RAPP-Kankroli 400kV line into bus reactor (Subject to space confirmation by RVPN )

**Members discussed and agreed to the proposal.**

Member (PS), CEA enquired about the status of bus reactor installation by various generators at their station.

NTPC informed that bus reactor at Rihand is under implementation. NPCL informed that bus reactor at RAPP would be available by June'15.

Member (PS), CEA stated that the reactors had been planned looking into the system requirements and needed to be taken up on priority. He asked all the generating stations to intimate immediately the status of reactor installation in their generating switchyard to CEA & CTU.

**Members agreed to the above.**

**37. Review of Transmission Planning Criteria**

CEA stated that the Enquiry Committee headed by Chairperson, CEA for grid events in July 2012 has recommended that transmission planning criteria needs to be reviewed in the context of market scenario within three months. In this regard, a note on the issues relating to “Review of Planning Criteria” has been prepared. A copy of this note and the existing “Manual on Transmission Planning Criteria” are available on CEA website.

Members of the Standing Committee on Power System Planning of Northern Region were requested to furnish their comments/ suggestions regarding review of

transmission planning criteria to the undersigned along with a soft-copy mailed to cea.sppa@yahoo.in.

**Members agreed to give their views/observations in regard to review of Transmission Planning Criteria.**

**38. Integrated planning for State transmission system:**

CEA & CTU stated that as per section- 39 of the Electricity Act, STUs need to carry out their planning function related to intra-state transmission in coordination with the CEA and CTU. There have been a few instances in the past where, the STU has planned important transmission system or allowed connectivity to large generation capacities without involving CEA and CTU and this may result in congestion/operational difficulties for the ISTS/national grid. To start with, it was agreed that STU should evolve following of their systems involving CEA and CTU, which would subsequently be firmed up through the Standing Committee forum:-

- (a) 220 kV and above system
- (b) Large scale harnessing of renewable generation
- (c) System for evacuation of power from a complex having generation capacity of 250 MW and above in case of conventional and 50 MW and above in case of renewable.

**Members agreed to provide above information within a month.**

**39. State wise assessment of the Load Generation Scenario of Northern Region.**

CEA stated that in order to make the assessment of load generation scenario, all STUs of Northern Region should provide the seasonal load and generation data in prescribed format as given in the agenda.

**Members agreed to provide above information within a month.**

**40. Proposal of 10 kM LILO of one circuit of PGCIL's 220 kV D/C Dausa-Anta line at RRVPNL's proposed 220 kV GSS Lalsot (Agenda by RVPNL)**

CEA stated that Lalsot is a load center in Rajasthan presently being fed at 132kV radially from Dausa. To meet the growing power demand RRVPNL has proposed establishment of 220kV S/s in Lalsot by LILO of Anta-Dausa 220kV Line.

It was also intimated that Anta Gas (419MW) is a generating station of M/s NTPC located in Rajasthan. It is presently connected to the grid through following 220kV lines:

- (i) Anta –Bhilwara 220kV D/c
- (ii) Anta-Sakatpura 220kV S/c
- (iii) Anta – Dausa 220kV D/c with one circuit via Sawaimadhopur
- (iv) Anta-RAPP 220V S/c
- (v) Anta-Dahra 220V S/c

RRVPNL has proposed LILO of Anta-Dausa 220kV direct line at Lalsot. As per the Load flow study the loading on the lines would be about 130-150MW/ckt. RRVPNL had also furnished the loading on Anta-Dausa 220kV line during 2012-13 is as follows:

Name of Transmission line	April-12	May-12	June-12	July-12	Aug-12	Sep-12	Oct-12	Nov-12
220 kV S/C Anta GTPS-Sawaimadhopur	130	145	145	145	130	119	148	137
220 kV S/C Anta GTPS-Dausa	125	115	135	135	100	100	100	100
220 kV S/C Sawaimadhopur-Dausa	74	93	95	95	74	55	45	45

CTU stated that proposed LILO of 220 kV Anta-Dausa line (one circuit) at Lalsot S/s is in order.

**After deliberations, Members agreed for the above proposal of RRVPNL.**

#### **41. LILO of Dadri-Malerkotla line at Kaithal.**

CTU stated that Dadri-Malerkotla 400kV S/c is a 300km long line and under certain conditions, the Malerkotla end had experienced high voltages upto 430kV resulting in difficulty in maintaining this line in operation. This problem has also led to over fluxing of ICTs at Malerkotla as reported by PSTCL. In view of above, CTU proposed to **LILO Dadri-Malerkotla line at Kaithal S/s (PG) under ISTS regional strengthening scheme-NRSS-XXXII.**

**Members agreed to the above proposal.**

#### **42. Evacuation of Lalitpur STPS (3x660 MW) and Jawaharpur STPS (3x660 MW)**

Lalitpur STPS is located in western part of Uttar Pradesh near Jhansi and Jawaharpur STPS is located near Etah. UPPTCL has proposed following transmission system for evacuation of power from Lalitpur and Jawaharpur STPS for consideration in Standing Committee Meeting:

##### **Lalitpur STPS (3x660MW)**

- Lalitpur- Agra (UP) 765kV S/c – 400km
- Lalitpur- Jawaharpur 765kV S/c – 400km
- Establishment of 765/400kV 2x1500MVA substation at Agra (UP)
- Establishment of 765/220kV 2x300MVA substation at Lalitpur
- 220kV D/c Lalitpur-Jhansi -90km
- Lalitpur-Bina 765kV S/c -50km (for stable operation)

##### **Jawaharpur STPS (3x660MW)**

- Jawaharpur- Agra (UP) 765kV S/c – 110km
- Agra(UP)-Agra (PG) 765kV S/c - 50km
- LILO of Mainpuri-G Noida 765kV S/c at Jawaharpur-10km
- LILO of both circuits of Mainpuri-Aligarh 400kV D/c at Jawaharpur-15
- LILO of Panki-Muradnagar 400kV S/c at Jawaharpur-15km
- Establishment of 765/400kV substation at Jawaharpur

##### **Other associated Strengthening works:**

- LILO of one circuit of Agra-Agra(PG) at Agra (UP) 765kV S/s-10km
- Establishment of Agra (South) 400/132kV S/s
- Agra(UP)-Agra (south) 400kV S/c -30km
- LILO of Agra-Muradnagar at Agra (UP) 765kV-20km
- LILO of Agra-Muradnagar at Mathura -30km
- Establishment of Mathura 2x315MVA, 400/220kV S/s.
- LILO of Unnao-Agra at Firozabad-30km
- Establishment of Firozabad 2x315MVA, 400/220kV S/s.
- Agra (South)-Firozabaad 400kV s/c
- Establishment of 2x200MVA, 400/132kV S/s at Farrukhabad
- LILO of one circuit Mainpur-Aligarh at Farrukhabad.
- LILO of Bara-Mainpuri 400kV 765kV, 2xS/c at Unnao

- Noida (sec-148) –Noida(123) 400kV D/c monopole line-20km
- Establishment of 400/132kV GIS substation at Noida-123

As per UPPTCL Lalitpur STPS is under construction and is expected by 2014. The system studies were carried out by CEA & CTU considering the above proposal and discussions were held with UPPTCL representatives on 21/12/2012. Bina is an important substation in WR-NR inter-regional link. Interconnection of Lalitpur to Bina would affect the WR-NR power flow. Hence connection of Lalitpur to Bina is not possible. As per above system Lalitpur would be radially connected to Agra(UP) through two nos of 765kV line of 400km long. Radial connection of generator through such long distance lines is not desirable.

Considering the above, CEA and CTU proposed following modifications to the UPPTCL proposal:

**Lalitpur STPS (3x6600MW)**

- Lalitpur- Auraiya(UP) 765kV 2xS/c – 260km
- Auraiya(UP) -Agra(UP-765kV) 765kV S/c – 200km
- Auraiya(UP)-Mainpuri 765kV S/c -120km
- Agra(UP-765kV)-Hapur 765kV S/c –120km
- LILO of Orai-Mainpuri (UP) at Auraiya(UP)
- Establishment of 765/400kV 2x1500MVA substation at Agra (UP)
- Establishment of 765/220kV 2x1500MVA substation at Auraiya(UP)
- 220kV D/c Lalitpur-Jhansi -90km

**Jawaharpur STPS (3x6600MW)**

- Jawaharpur –Hapur 765kV S/c -210km
- Jawaharpur –Mainpuri 765kV S/c -70 km
- LILO of Mainpuri-G Noida 765kV S/c at Jawaharpur-10km
- LILO of Agra-Hapur 765kV S/c at Jawaharpur-10km
- LILO of both circuits of Mainpuri-Aligarh 400kV D/c at Jawaharpur-15 km
- LILO of Panki-Muradnagar 400kV S/c at Jawaharpur-15km
- Establishment of 765/400kV substation at Jawaharpur

Beyond Hapur, Hapur-Meerut 765kV line alongwith establishment of 765/400kV s/s at Meerut with 400kV interconnection has been proposed. The results of load flow



study considering the alternate proposal was also shared with UPPTCL during the meeting on 21/12/2012.

UPPTCL stated that they had certain apprehensions in agreeing to the above proposal for evacuation of power from Lalitpur and Jawaharpur STPS and needed time to examine the same.

Member (PS) advised UPPTCL to have another meeting with CEA and CTU after examination of the above proposal so that the evacuation system for Lalitpur and Jawaharpur STPS could be firmed up. UPPTCL agreed for the same.

**Members agreed to the above.**

**Meeting ended with thanks to chair.**

**Thereafter the meeting for connectivity and Long Term Open Access was held.**

**The minutes of this meeting are being prepared separately and uploaded shortly.**

**List of participants for the 31<sup>st</sup> Standing Committee Meeting on Power System Planning in NR held alongwith on 2.1.2013 at POWERGRID, Gurgaon**

	<b>Name</b>	<b>Designation</b>
<b>CEA</b>		
1.	Sh. Ravinder	Member (PS)
2.	Sh. K.K. Arya	Chief Engineer I/c (SP&PA)
3.	Sh. B.K. Sharma	Director (SP&PA)
4.	Anita Gehlot	Dy. Director
5.	Manjari Chaturvedi	Dy. Director
6.	NRLK Prasad	Dy. Director

<b>NRPC</b>		
7.	Sh. P.K. Pahwa	Member Secretary

<b>PGCIL</b>		
8.	Sh. I.S. Jha	Director(Projects)
9.	Sh. Y.K. Sehgal	COO (CTU)
10.	Sh. R.K. Chauhan	GM (CTU)
11.	Sh. Kamal Sarkar	AGM(OS)
12.	Sh. Mukesh Khanna	DGM(CTU)
13.	Sh. S.K. Tyagi	DGM(OS)
14.	Sh. V. Thiagarajan	CDE(CTU)
15.	Sh. A.V.S. Ramesh	Manager(OS)
16.	Ms. R.P. Joshi	Sr. Engineer(CTU)
17.	Ms. Ankita Singh	Engineer(CTU)
18.	Ms. Shruti Tiwari	Engineer(OS)

<b>NTPC</b>		
19.	Sh. Dinkar Devate	GM (Elect.)
20.	Sh. S.S. Mishra	AGM (Engg.)
21.	Sh. P.K. Goyal	AGM (PP&M.)
22.	Sh S.K. Sharma	AGM(Comm.)
23.	Ms. Sagarika Mohanty	DGM(PE-Elect.)
24.	Sh. Amit Arora	Manager (Comm.)
25.	Ms. Shilpa Agarwal	Manager(Comm.)

<b>NHPC</b>		
26.	Sh. Nain Singh	ED
27.	Sh. R.M. Agarwal	AM

<b>DTL</b>		
28.	Sh. Bhupender Nath	GM(Plg.)
29.	Sh. Saruda Prasanna Routray	Manager(Plg.)

<b>PTCUL</b>		
30.	Sh. Gurcharan Singh	CE(P)
31.	Sh. A.K. Agarwal	SE(Engg.)

**HPPTCL**

32. Sh. V.K. Kaprate Director  
33. Sh. Sandeep Sharma Sr. Manager(Plg/IT)

**HPPCL**

34. Sh. B.S.Negi DGM

**PTC**

35. Sh. S.S. Sharma Advisor

**HPSEB Ltd.**

36. Sh. M.L. Sharma Sr. XEN

**HVPNL**

37. Sh. R.K.Arora Director(Technical)  
38. Sh. J.K. Juneja CE(Plg)  
39. Sh. S.B. Moudgil Chief Engineer  
40. Sh. Gulshan Nagpal SE, Plg.(NCR)

**RVPNL**

41. Sh L.N. Nimawat CE(MM)  
42. Ms. Sona Shishodia XEN(PSS)

**J&K PDD**

43. Sh. Manzoor Salroo Dev. Comm.(P)  
44. Sh. T.K. Koul Consultant  
45. Sh. Sanjay Sharma E.E

**NPCIL**

46. Sh. K.P. Singh CE

**NLDC**

47. Sh. S.R. Narasimhan DGM  
48. Sh. M. Pradeep Reddy Engineer

**NRLDC**

49. Sh. V.V. Sharma GM  
50. Sh Rajiv Porwal Chief Manager

**UPPTCL**

51. Sh. S.K. Garg Director(Trans.)  
52. Sh V.P. Tiwari SE(Trans. & Planning)  
53. Sh. Hriday Prakash EE

**PSTCL**

54. Sh. Rachhpal Singh CE  
55. Sh. Sunil Puri Dy. CE  
56. Sh. Kuldeep Singh Addl. SE

**UT CHANDIGARH**

57.	Sh. Sunil Sharma	Executive Engineer
58.	Sh. Khushwinder Singh	Astt. Executive Engineer
59.	Sh. M.P. Singh	SE

**EPPL**

60.	Sh. Himanshu V.	V.P.
61.	Sh. M.P. Chakarvarty	Sr. DGM
62.	Sh. Atchibabu G.	Dy. Manager

**NPCL**

63.	Sh. S.S. Rizvi	GM
64.	Sh. Rajeev Goyal	DGM

## Annexure-1

### Transmission System for Phase-I Generation Projects in Jharkhand & West Bengal

#### I. Transmission System for Phase-I Gen. Projects in Jharkhand & West Bengal: Part-A

- (i) Ranchi – Gaya 400 kV (Quad) line via pooling station proposed near Essar / Corporate generation projects
- (ii) Ranchi New (765/400kV S/s) - Dharamjayagarh / near Korba 765kV S/c
- (iii) Establishment of 400kV Pooling Station (Jharkhand Pool) near Essar and Corporate generation projects. This will be a switching station without ICTs
- (iv) New 2x1500 MVA, 765/400 kV substation at Varanasi
- (v) Gaya – Varanasi 765 kV S/c
- (vi) LILO of Gaya - Balia 765 kV S/c line at Varanasi
- (vii) 400kV connectivity for new 765/400kV S/s at Varanasi
  - i. Varanasi - Sarnath (UPPCL) 400kV D/c (quad)
  - ii. LILO of Sasaram - Allahabad 400kV line at Varanasi

#### II. Trans. System for Phase-I Generation Projects in Jharkhand & West Bengal: Part-B

- (i) New 2x1500 MVA, 765/400 kV substation at Kanpur
- (ii) Varanasi – Kanpur 765 kV D/c
- (iii) Kanpur – Jhatikra 765 kV S/c
- (iv) 400kV connectivity for new 765/400kV S/s at Kanpur
  - i. Kanpur (765/400kV) - Kanpur (Existing) 400kV D/c (quad)

#### III. Private Sector line: In addition to the above work to be undertaken by PGCIL,

*In addition to the above work to be undertaken by PGCIL, Dharamjayagarh – Jabalpur 765kV D/C line (2nd line) would be under the scope of private sector. Associated 765kV line bays at Dharamjayagarh and Jabalpur sub-station would be under the scope of POWERGRID.*

## Annexure-2

### **I. Transmission system for Phase-I generation projects in Jharkhand and West Bengal (WB) - Part-A1:**

1. Establishment of 400kV GIS Jharkhand Pooling Station near Essar and Corporate generation projects (depending upon progress of Essar and Corporate IPPs). This will be a switching station without ICTs.
2. Ranchi – Gaya 400 kV D/C Quad line via proposed Jharkhand Pooling Station near Essar/ Corporate generation projects

### **II. Transmission system for Phase-I generation projects in Jharkhand and West Bengal - Part-A2:**

1. Ranchi New (765/400kV S/s) – Dharamjayagarh/near Korba 765kV S/C line
2. New 2x1500 MVA, 765/400 kV GIS substation at Varanasi
3. Gaya – Varanasi 765 kV S/C
4. Varanasi- Balia 765 kV S/C

### **III. Transmission system for Phase-I generation projects in Jharkhand and West Bengal - Part-B:**

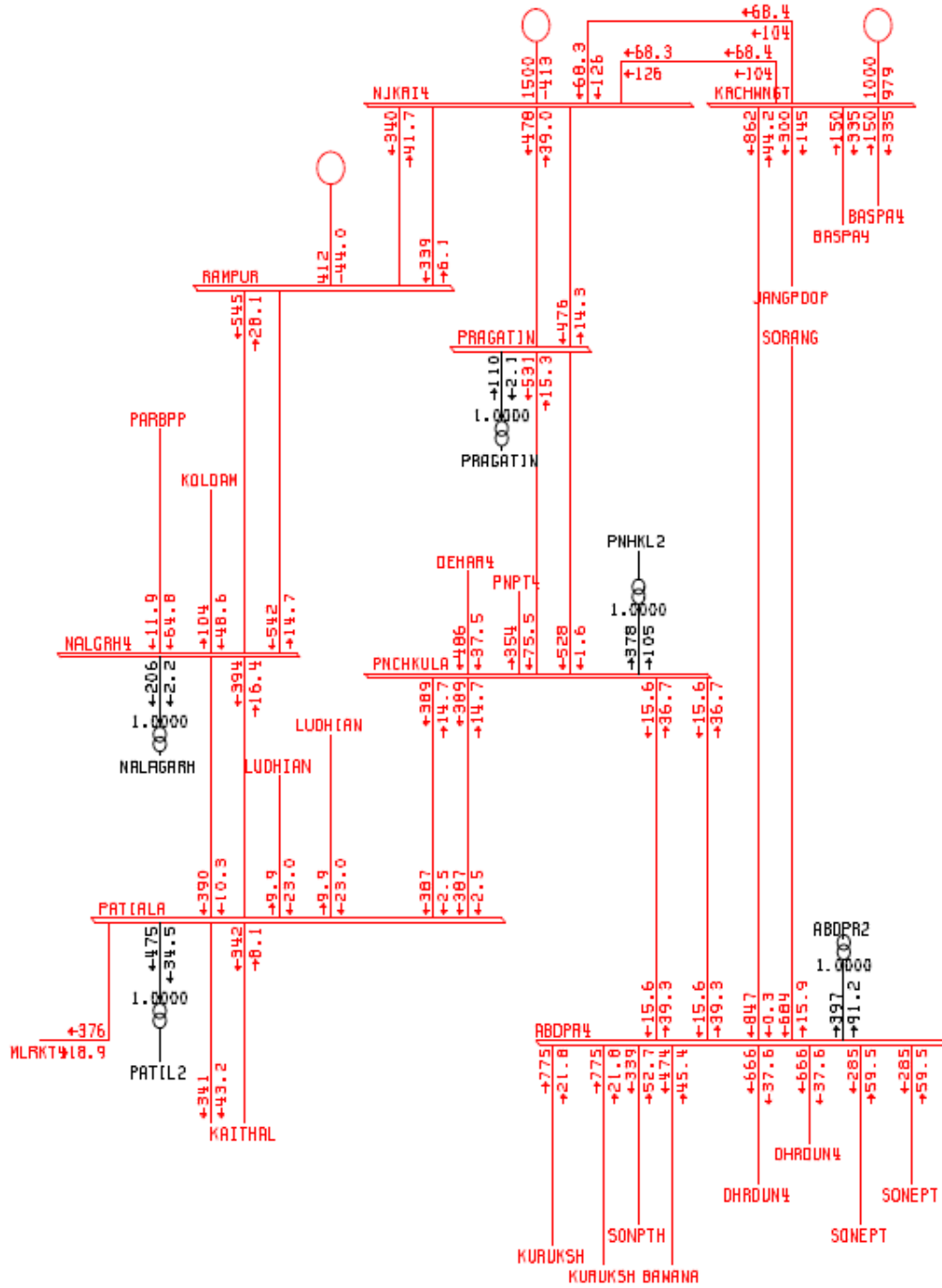
1. New 2x1500 MVA, 765/400 kV GIS substation at Kanpur
2. Varanasi – Kanpur 765 kV D/C
3. Kanpur – Jhatikra 765 kV S/C
4. 765/400 kV Kanpur – Kanpur(Existing) 400 kV D/C Quad line
5. 400kV connectivity for new 765/400kV S/s at Varanasi
6. Varanasi - Sarnath (UPPCL) 400kV D/C Quad line
7. LILO of Sasaram - Allahabad 400kV line at Varanasi
8. Opening of LILO of one circuit of Sasaram-Allahabad 400kV D/C line at Sarnath.

### **IV. Private Sector line:**

In addition to the above work to be undertaken by PGCIL, Dharamjayagarh – Jabalpur 765kV D/C line (2nd line) would be under the scope of private sector. Associated 765kV line bays at Dharamjayagarh and Jabalpur S/S would be under the scope of POWERGRID.



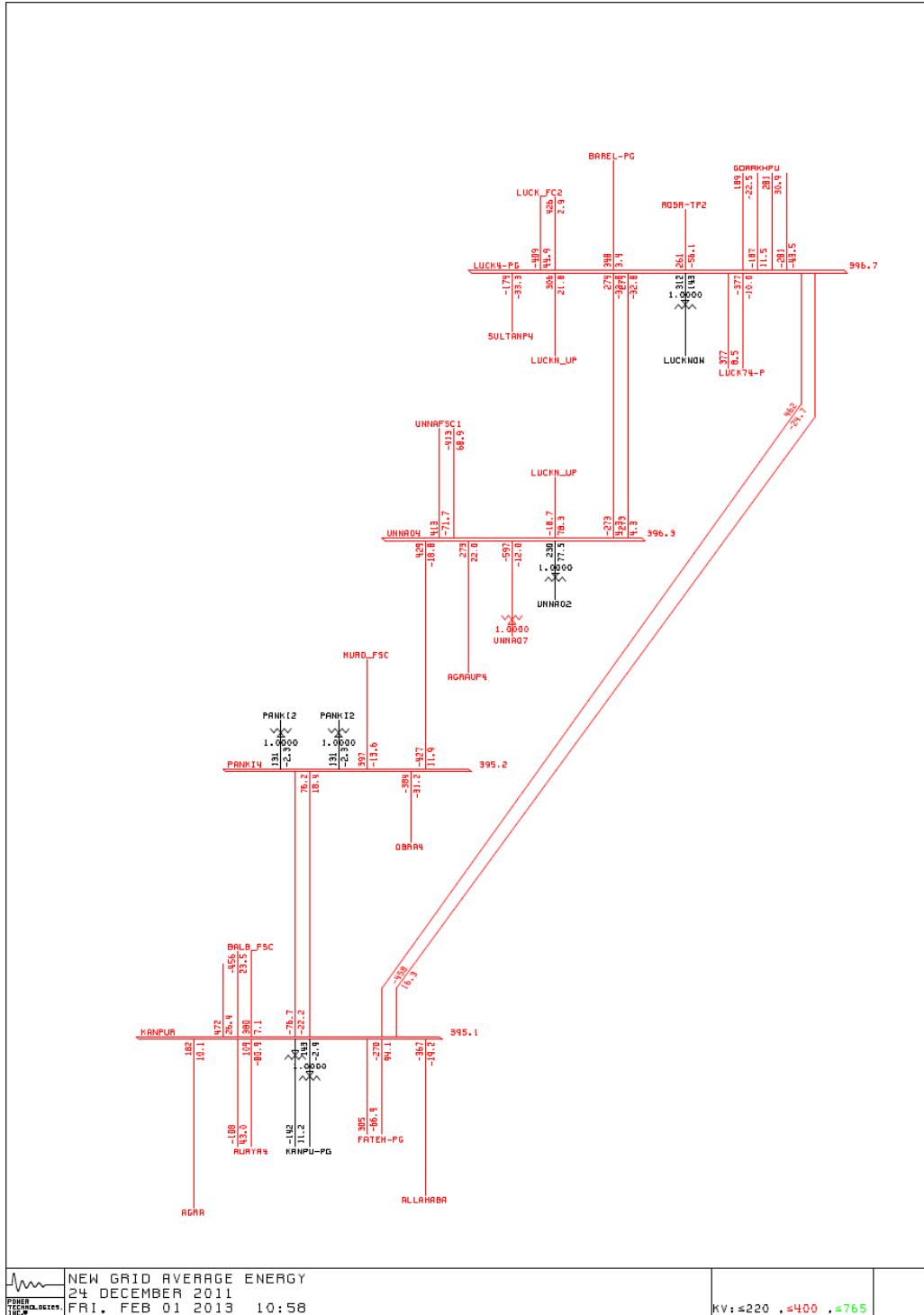
(ii) Proposed Arrangement





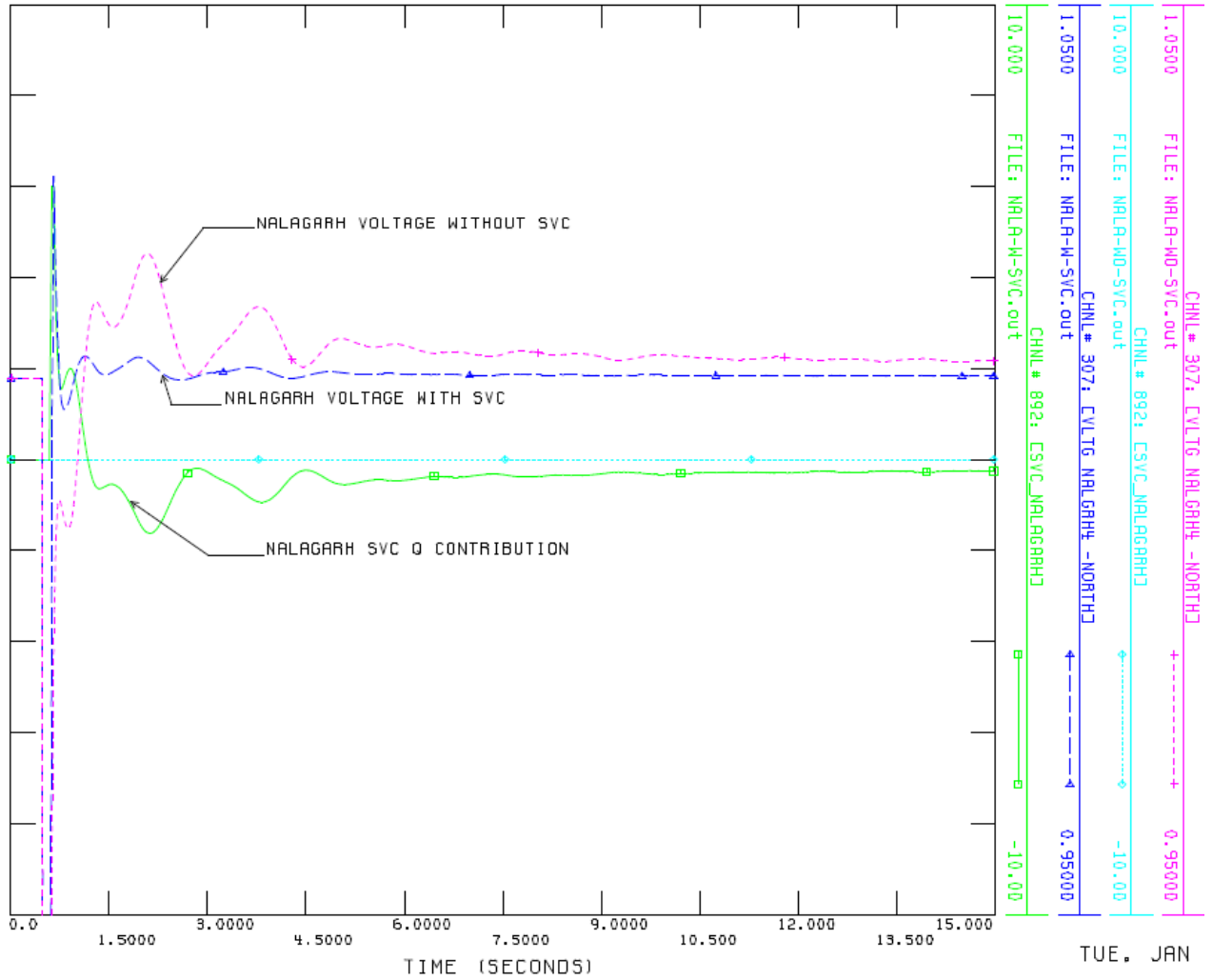


**(ii) With proposed Lucknow-Kanpur line.**



**ANNEX-V**

**SVC at Nalagarh**



**SVC at Lucknow**

