



भारत सरकार / **Government of India**  
विद्युत मंत्रालय / **Ministry of Power**  
केन्द्रीय विद्युत प्राधिकरण / **Central Electricity Authority**  
विद्युत प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग - I  
**Power System Planning & Project Appraisal Division-I**  
सेवा भवन ,आर - नई दिल्ली ,पुरम.के.110066  
**Sewa Bhawan, R. K. Puram, New Delhi-110066** [ISO: 9001:2008]



**No. 1/9/38th /PSP&PA-I-2016 /**

**Dated: May, 2016**

**-As per list enclosed-**

**Subject: 38<sup>th</sup> Standing Committee Meeting of Power System Planning of Northern Region (SCMPSPNR) to be held on 30<sup>th</sup> May, 2016-Additional Agenda for the meeting**

Sir/ Madam,

In continuation of our letter of even no. dated 12<sup>th</sup> May, 2016 vide which agenda items for the 38<sup>th</sup> SCMPSPNR was circulated. Subsequent to that, additional agenda items have been received from Powergrid and RRVPNL for the meeting. Accordingly, it is intimated that additional agenda items for 38<sup>th</sup> SCMPSPNR have also been uploaded on CEA website: [www.cea.nic.in](http://www.cea.nic.in) (path to access– Home Page-Wing specific document/power system related reports/ Standing Committee on Power System Planning/ Northern region). This is for your information and necessary action please.

It is requested to kindly make it convenient to attend the meeting

Yours faithfully,

(Chandra Prakash)  
Director

**Copy to:**  
**Member (Power System), CEA**

1.	Member, Secretary, NRPC, 18-A Shajeed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi - 110016 (Fax-011-26865206)	2.	Director (W &P) UPPTCL, Shakti Bhawan Extn,3rd floor, 14, Ashok Marg, Lucknow - 226 001 (Fax:0522-2287822)	3.	Director (Projects) PTCUL, Urja Bhawan Campus, Kanawali Road Dehradun-248001. Uttrakhand Fax-0135-276431
4.	Director (Technical), Punjab State Transmission Corporation Ltd. (PSTCL) Head Office The Mall Patiala - 147001 Fax-0175-2304017	5.	Member (Power) BBMB, Sectot-19 B Madhya Marg, Chandigarh-1 60019 (Fax-01 72-2549857)	6.	Director (Operation) Delhi Transco Ltd. Shakti Sadan, Kotla Marg, New Delhi-110002 (Fax-01123234640)
7.	Director (Technical) RRVNL, Vidut Bhawan, Jaipur-302005. Fax:-0141-2740794	8.	Director (Technical) HVPNL Shakti Bhawan, Sector-6 Panchkula-134109 Fax-0172-256060640	9.	Director (Technical) HPSEB Ltd. Vidut Bhawan, Shimla -171004 Fax-0177-2813554
10.	Managing Director, HPPTCL, Barowalias, Khalini Shimla-171002 Fax-0177-2623415	11.	Chief Engineer (Operation) Ministry of Power, UT Secretariat, Sector-9 D Chandigarh -161009 Fax-0172-2637880	12.	Development Commissioner (Power), Power Department, Grid Substation Complex, Janipur, Jammu, Fax: 191-2534284
13.	Chief Engineer (Transmission) NPCIL, 9-S-30, Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai-400094 Fax-022-25993570	14.	Director (T&RE) NHPC Office Complex, Sector-33, NHPC, Faridabad-121003 (Fax-0129-2256055)	15.	Director (Projects) NTPC, NTPC Bhawan, Core 7, Scope Complex-6, Institutional Area, Lodhi Road. New Delhi (Fax-011-24361018)
16.	Director (Technical) THDC Ltd. Pragatipuram, Bypass Road, Rishikesh-249201 Fax: 0135-2431519)	17.	Director (Projects) POWERGRID Saudamini Plot no. 2, Sector - 29. Gurgaon-122 001 (Fax-0124-2571809)	18.	CEO, POSOCO B-9, Qutab Institutional Area, Katwaria Sarai New Delhi – 110010 (Fax:2682747)
19.	COO (CTU) POWERGRID, Saudamini, Plot no. 2, Sector -29, Gurgaon-122 001 (Fax-0124-2571809)				

## **Additional Agenda 38<sup>th</sup> meeting of the Standing Committee Meeting of Power System Planning of NR**

### **1.0 OPGW on main transmission line being LILOed**

1.1 In the 36<sup>th</sup> Standing Committee Meeting of Power System Planning of NR, it was agreed to include one 24 Fibre (OPGW) in all new transmission lines including transmission lines to be implemented under TBCB route and communication equipment (SDH–STM-16) to be provided at all upcoming substations. Further, establishment of data and voice connectivity for new substation with RLDC is mandatory for charging the transmission system as per CERC guidelines.

1.2 While giving inputs to BPC, about communication requirement for TBCB projects the following problem are being faced:

- (a) **OPGW:** In case of LILO of existing line, the TBCB scope covers construction of LILO portion of transmission line along with construction of new substation. While planning the communication connectivity of this new substation, sometimes it has been observed that in some cases OPGW has not been laid on the main line owned by POWERGRID/other utilities. In these cases, proposed OPGW in LILO portion will not provide communication connectivity to new substation unless OPGW is installed in main line being LILOed. Thus, it is proposed that the provision of OPGW in the main line may be taken up by the respective owner of the transmission system to provide communication connectivity to these new substations.
- (b) **Communication equipment:** For projects that are being implemented under TBCB route, the communication equipment (SDH and PDH, PMU, SASIRTU, Approach cable & FODP) for new substation are included in the RfP document. But the communication equipment of other end of transmission line which is under ownership of POWERGRID/other utility is not covered. In these cases, end to end communication will not be established unless the communication equipment for other end is commissioned. It is proposed that the provision of communication equipment at the other end may be taken up by the respective owners.

1.3 It may be mentioned that a Joint Meeting of all the five Regional Standing Committees on Power System Planning was held on March 5, 2012 on the issue of “**Unified Real Time Dynamic State Measurement**”. As per the minutes of the meeting, the following was decided:

***“It was agreed that the scheme would be implemented in the following manner:***

- (i) *The URTDSM scheme will cover placement of PMU at sub-stations and both ends of transmission lines at 400kV and above level including generating stations at 220 kV level under State and Central Sector coming up by 2014-15 time frame.*
- (ii) *The proposed URTDSM scheme will be implemented in two stages.*

- (iii) *In the Stage-I, PMUs will be placed at those locations where fiber optic communication link is either available or would be made available under microwave frequency vacating program and regional strengthening program by 2014-15 along with installation of PDCs at all SLDCs, RLDCs, NLDC, NTAMC, strategic locations in state, remote consoles at RPCs, CEA, CTU and other locations. Nodal PDC shall be provided for collection of data from 40 PMUs in a cluster.*
- (iv) ***In stage-II, PMUs would be installed at balance locations along with communications links.***
- (v) *For effective utilization of synchrophasor technology national and international level training programs will be arranged for engineers from State utilities, RPCs, CEA, CTU and POSOCO under the URTDSM scheme.*
- (vi) *After deliberations, members of regional Standing Committees on Power System Planning agreed that “Unified Real Time Dynamic State Measurement (URTDSM)” scheme to be taken up for implementation. It was also agreed that scheme is to be implemented by POWERGRID as system strengthening and cost shall be added in the National transmission pool account and to be shared by all the Designated ISTS Customers(DICs) as per the POC mechanism under the CERC regulation.”*

**Powergrid may please update the status.**

## **2.0 Refurbishment/ overhauling of the existing 1500 MW HVDC Rihand- Dadri Bipole and Capacity enhancement of Rihand- Dadri HVDC from 1500MW to 2500MW along with R&M of existing HVDC Rihand- Dadri Bipole**

2.1 The matter was discussed in 37<sup>th</sup> SCM held on 20<sup>th</sup> January, 2016. After detailed deliberation the proposal of up-gradation of existing Rihand-Dadri HVDC bipole by 1000 MW was agreed in principally, however before finalizing, the following was to be submitted to CEA:

- (i) RLA report for the Rihand - Dadri HVDC Bipole
- (ii) Expected life of existing Rihand-Dadri HVDC bipole after R&M
- (iii) Expected combined life of 2500MW HVDC bipole
- (iv) Estimated cost of R & M works and augmentation works

It was decided that the above information would be placed before the Committee Members before taking up the execution works.

2.2 Powergrid vide letter dated 13/5/2016 has submitted that the RLA experts are not available for such type of HVDC installations. However, ABB as an OEM has done the audit & assessment about the health of HVDC equipment at Rihand and Dadri and has submitted its

report indicating the equipment which needs replacement / revamping. The report for the same was forwarded to CEA on 12/02/2016.

2.3 Powergrid has also submitted that CERC has allowed technology up-gradation with existing  $\pm 500$  MW Rihand – Dadri HVDC Bi-Pole vide their tariff order dated 28.01.2016 under O&M add cap. During technology up-gradation of these HVDC terminals at Rihand and Dadri, provision would be kept in control & protection system to take care of parallel converter operation requirement for upgrading of Rihand – Dadri HVDC by 1000MW. This would provide additional capacity for transfer of 1000MW from pit head generating station to NCR with no extra land/transmission corridor.

2.4 In the 37<sup>th</sup> meeting of the SCPSPNR, Powergrid proposed to club the works of Renovation and Modernization of existing Rihand-Dadri HVDC terminals with the capacity enhancement works of the  $\pm 500$ kV Rihand-Dadri HVDC link for the following advantages:

- (i) Sharing of the space of the existing Filters and Switchyard equipment in view of space constraints with the available aid of GIS/ hybrid technology design solutions.
- (ii) Enhancing the AC Filter capacity for 2500 MVA for parallel operation of the two bi-poles.
- (iii) Integrated control & protection for parallel operation of the existing and new bi-poles leading to flexible Operation with Master Control with parallel Converters.
- (iv) Reactive power control for both the bi-poles.
- (v) Replacement of existing Control & Protection Systems for IEC 61850 compliance.
- (vi) Shifting of 2 number of 400kV bays from NTPC Dadri Switchyard to HVDC Switchyard to avoid 400kV bus capacity up-gradation works of NTPC plant and interconnection between NTPC & POWERGRID 400kV bus-bars.
- (vii) The Up-gradation work and the Augmentation work for 1000 MW are planned in staggered manner in such a sequence that the reduction of existing Bi-pole capacity due to Pole shutdown is avoided.

2.5 **Issues for deliberation:** Can the capacity up-gradation be treated as standalone project. Regarding order of the Hon'ble CERC on technology upgradation, Powergrid may like to inform the committee whether the views expressed by the committee members were placed before the Commission. There is already high short circuit level in the NCR region. The impact of additional power injection may create additional short circuit level detrimental to the nearby switchyards and sub-stations requiring large scale equipment replacements with higher ratings which may not be viable for many utilities. Powergrid may like to elaborate further on the

issue. Moreover, the report forwarded to CEA vide letter dated 12/02/2016 was the draft report. Subsequently, the same report has been provided vide letter dated 23/5/2016 indicating as approved.

2.6 Powergrid has carried out for dispersal of power beyond Dadri. Study results with upgradation of Rihand- Dadri HVDC bipole are enclosed:

- |   |                   |
|---|-------------------|
| (i) Basecase-   | <b>Exhibit-1A</b> |
| (ii) Outage of Dadri- Maharanibagh 400kV S/C line-            | <b>Exhibit-1B</b> |
| (iii) Outage of one circuit of Dadri- Mandola 400kV D/C line- | <b>Exhibit-1C</b> |
| (iv) With increased Dadri Gas Generation-                     | <b>Exhibit-1D</b> |
| (v) Outage of Dadri- Maharanibagh 400kV S/C line-             | <b>Exhibit-1D</b> |
| (vi) Outage of one circuit of Dadri- Mandola 400kV D/C line-  | <b>Exhibit-1E</b> |

2.7 Powergrid has submitted that there is no constraint for dispersal of power beyond Dadri. Accordingly, Powergrid has proposed that capacity up-gradation of Rihand-Dadri HVDC Bi-pole of 1000MW may be agreed as a standalone project which would be integrated with the existing Rihand- Dadri HVDC Bi-pole as parallel converter operation.

2.8 Study results with & without augmentation of capacity of Rihand- Dadri HVDC Bipole are enclosed at **Exhibit-2 & Exhibit-3** respectively.

2.9 **In view of para 2.4, it is found that these two proposals are interrelated.** Accordingly, the capacity up-gradation cannot be treated as standalone project.

**Members may like to deliberate.**

### **3.0 220kV bays at 400kV Bahadurgarh (PG) substation:**

3.1 HVPNL vide letter dated 26/06/09 had earlier requested for 2 no of 220 kV bays at 400kV Bahadurgarh (PG) sub-station, to provide connectivity and feed to proposed new substation of HVPNL at Sikanderpur on Jhajhar – Badli road through a 220 kV D/C line.

3.2 Subsequently, HVPNL vide letter dated 27/01/2016, informed that creation of proposed 220kV substation at Sikanderpur stands cancelled. Instead of this, HVPNL has now proposed for LILO of one circuit of 220kV D/C line from 220kV Bahadurgarh to 400/220kV substation Daulatabad at 400kV Bahadurgarh (PG). Accordingly, HVPNL has requested to reallocate the 220 kV bays for providing connectivity and feed to Sikanderpur substation, to accommodate LILO of one circuit of 220kV D/C line from 220kV Bahadurgarh to 400/220 kV Daulatabad substation at 400kV Bahadurgarh (PG).

PGCIL has confirmed the availability of 2 nos. of 220kV bays is available at 400kV Bahadurgarh (PG) substation.

**Members may please note.**

#### **4.0 400 kV bays at 400kV substation Bhinmal and Sikar:**

4.1 In the 30<sup>th</sup> Standing committee meeting of NR, RRVPNL requested Powergrid to provide two nos. on 400 kV bays each at 400 kV Bhinmal and 400 kV Sikar substation for termination of 400 kV D/C lines being constructed by RRVPN for evacuation of power from renewable energy projects expected to come up in Rajasthan. During the meeting, Powergrid requested RRVPNL to inform time frame in which these bays would be required. RRVPNL agreed to intimate in due course of time.

4.2 Subsequently, RRVPNL vide letter dated 13/04/2016 intimated that 400 kV D/C Bikaner - Sikar (Twin Moose) transmission line through Public Private Partnership (PPP) mode would be commissioned by January, 2018. Accordingly, RRVPNL has requested Powergrid for two nos. of 400 kV line bays along with 50 MVAR line reactors on each circuit by January, 2018. However, the time frame in which bays at 400kV Bhinmal S/s will be required is yet to be informed by RRVPNL.

4.3 Further, implementation of bays would take about 24-30 months. In case RRVPNL desires these bays earlier, they may implement the same on their own.

**Members may please like to note.**

#### **5.0 Transmission system for Ultra Mega Solar Park in Fatehgarh, distt. Jaisalmer Rajasthan**

5.1 In the 36<sup>th</sup> Meeting of Standing Committee on Power System Planning in Northern Region held on 13.07.15, following interstate transmission scheme for evacuation of 3000MW of solar power in Jaisalmer (Parewar and Fatehgarh: 2000MW) and Jodhpur (Bhadla:1000MW) was in-principally agreed.

- (i) 765kV Parewar – Bhadla(PG) D/C (initially to be charged at 400kV)
- (ii) 765kV Fatehgarh – Bhadla(PG) D/C (initially to be charged at 400kV)
- (iii) 765kV Bhadla (PG) – Bikaner(PG) D/C
- (iv) 400kV Bhadla (PG)- Bhadla (RVPN) D/C (Quad)
- (v) Establishment of 3x500MVA, 400/220kV Pooling Station at Parewar (with a provision to upgrade at 765kV level)

- (vi) Establishment of 3x500MVA, 400/220kV Pooling Station at Fatehgarh (with a provision to upgrade at 765kV level)
- (vii) Establishment of Pooling Station at Bhadla (PG) (765/400kV: 3x1500MVA 400/220 kV: 3x500MVA,)
- (viii) 220kV line bays at Parewar, Fatehgarh & Bhadla (PG) for interconnection of solar plants
- (ix) Associated reactive compensation (both bus & line reactor)

5.2 It was also agreed that implementation of above system shall be taken up only after receipt of LTA of at least 25% of their installed capacity from respective Solar park developers. Subsequently, M/s Saurya Urja (500MW), M/s Adani (250MW) & M/s Essel Saurya (750MW) applied for LTA for injection at Bhadla for which transmission scheme was agreed in 37<sup>th</sup> NR SCM with establishment of 765/400/220kV Bhadla substation along with 765kV Bhadla (PG)-Bikaner and 400kV Bhadla (PG)-Bhadla (RVPN) interconnection which is in the process of implementation.

5.3 Now, M/s Adani Renewable Energy Park Rajasthan (AREPL) Ltd has applied for connectivity (1000 MW) and Long Term Access (250 MW) in ISTS with commissioning schedule of Jun'17 for its Ultra Mega Solar Power Park at Fatehgarh, distt. Jaisalmer, Rajasthan with target region as NR. Subsequently, M/s Adani Renewable Energy Park Rajasthan (AREPL) Ltd applied for additional LTA for 750 MW (application is under processing as of now) for its above Fatehgarh UMSPP. As per the combined LTA application, 1000 MW Power from Fatehgarh UMSPP is envisaged to be transferred to beneficiaries of Northern region by June, 2017.

5.4 MNRE has authorized M/s AREPL for 1500MW as solar power park developer (SPPD) to undertake infrastructural activities including arrangement for connectivity on behalf of the solar power generators in the park.

5.5 To evacuate power from the Fatehgarh UMSPP (1000 MW), Powergrid has proposed the following interState transmission scheme:

- 765 kV Fatehgarh Pool - Bhadla (PG) D/C line (initially to be operated at 400kV)
- Establishment of 3x500 MVA, 400/220kV Pooling Station at Fatehgarh (with a provision to upgrade at 765kV level)
- 8 nos. 220kV line bays at Fatehgarh PS for interconnection of Solar plants
- 1x125 MVAR Bus reactor at 400kV Fatehgarh PS

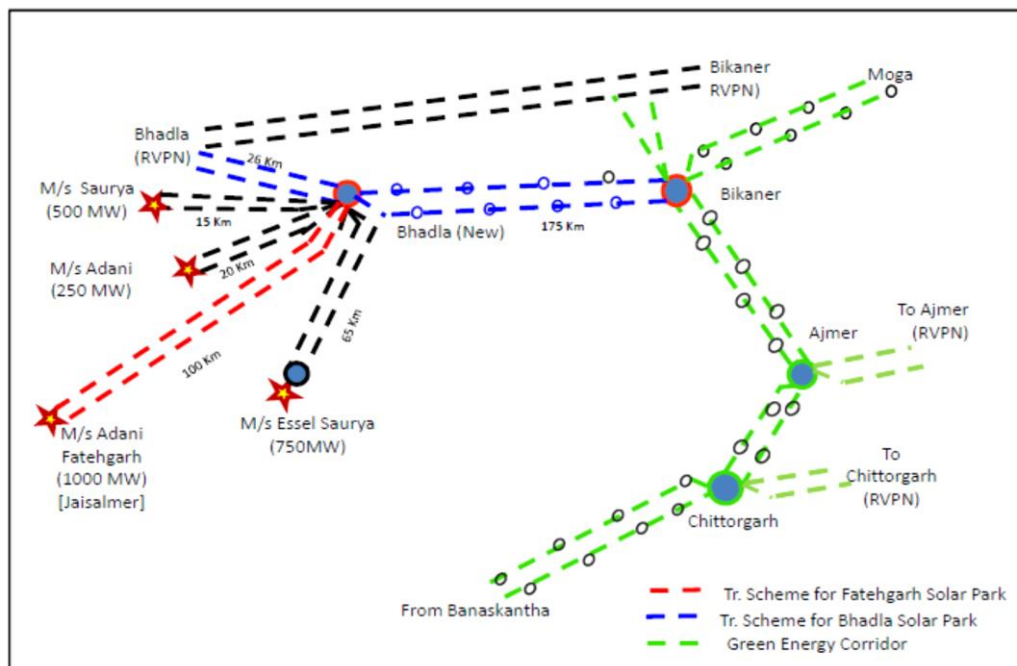
Study results with Fatehgarh UMSPP is enclosed at **Exhibit-4**.



5.6 It is observed that the proposed solar park are to be evacuated at 400kV level, the rationality of creating 3x500 MVA, 400/220kV S/s as well as eight number of 220kV bays for the solar parks generators connectivity is to be verified.

5.7 Bringing additional solar generation with no identified buyer may lead to creation of stranded asset. Moreover, in the meeting taken by Secretary (Power) on 24.02.2016, it was already decided that solar developers would construct their own dedicated line (100 km) to the pooling sub-stations in case of Bhadla. In the present case also M/s Adani may be advised to construct its own dedicated transmission line upto Bhadla pooling station. Further, there is a need to optimize the location of solar parks so that the idle time for transmission is minimized. Moreover, there is already instances of perennial high voltages at various nodes in the grid. Creating extra high voltage lines exclusively for solar generation with CUF of 20% may exacerbate already severe high voltage problem in the grid. Moreover, members may also like to deliberate on the treatment of the radial lines from the solar parks to the pooling sub-station during the night time.

**Schematic for the above proposed transmission scheme is as under:**



**Member may like to deliberate.**

## 6.0 Connectivity to Dhaulasidh Hydro Electric Power Project (66MW) of M/s SJVNL in Himachal Pradesh

6.1 The connectivity application from M/s SJVN Ltd. for 66 MW (Plus 10% inbuilt overload capability to meet grid requirement) was discussed during the 7<sup>th</sup> & 8<sup>th</sup> Meeting of

Northern Region Constituents for Connectivity/Long Term applications held on 14/07/2015 and 20/01/2016 respectively. The LTA application is yet to be received.

6.2 It was agreed to grant Connectivity to M/s SJVNL for Dhaulasidh HEP for 66 MW generating plant through the following Transmission system:

- Dhaulasidh HEP – Hamirpur (PG) 220 kV D/C line

6.3 It was deliberated that the connectivity line shall be constructed by SJVNL including bays at both ends, in line with CERC regulations. The representative of SJVNL informed the revised commissioning schedule of the project as December, 2022.

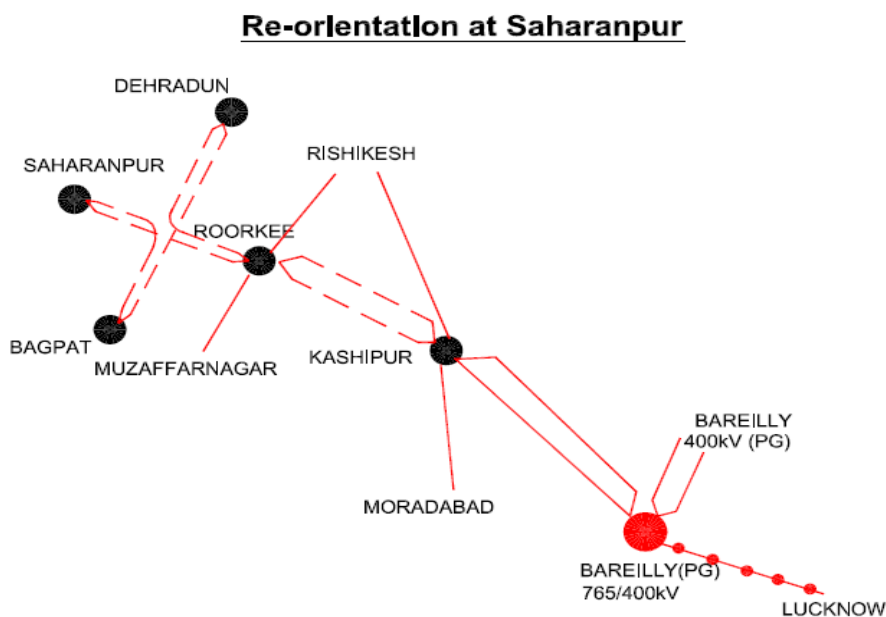
6.4 As the installed capacity of 66 MW is small quantum, evacuating the same at 220 kV would be *a non-optimal transmission plan*.

**Member may like to deliberate.**

## 7.0 Interim arrangement to provide alternate feed to 400kV 2x315MVA Saharanpur.

7.1 In the 36<sup>th</sup> Standing committee Meeting on Power System Planning of NR, reorientation of the originally agreed schemes (NRSS-XVIII, NRSS – XIX & NRTSS) was discussed and approved, due to severe R-o-W constraints faced during construction works. Accordingly, after reorientation of the original schemes, the interconnection is as follows:

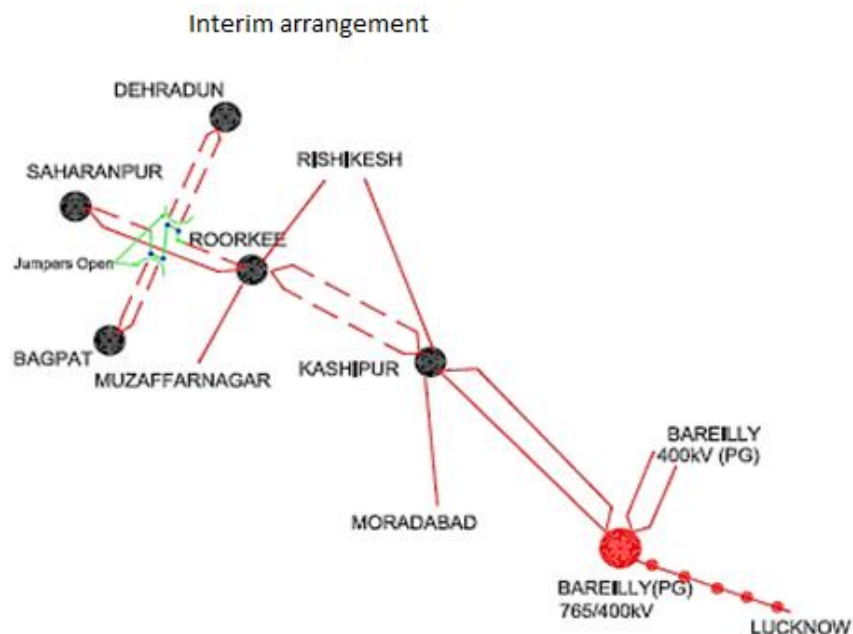
- 400kV Bagpat – Dehradun S/C line,
- 400kV Bagpat – Saharanpur S/C line,
- 400kV Roorkee – Dehradun S/C line,
- 400kV Roorkee – Saharanpur S/C line.



7.2 The 400/220kV, 2X315 MVA Saharanpur Substation was commissioned on 7<sup>th</sup> May, 2016 and is presently fed through 400 kV Roorkee – Saharanpur S/C line. 400/220 kV Saharanpur substation is also connected by LILO of Saharanpur (UP) - Nanauta 220kV S/C line. Presently, power flow through 400kV Roorkee – Saharanpur S/C line is about 250–300MW. Considering reliability of power supply to Saharanpur substation, it is proposed to charge the 2<sup>nd</sup> circuit of 400kV Roorkee- Saharanpur line (made ready after contingency arrangement at re-orientation point).

**Powergrid may please updated status of the other elements.**

**Schematic diagram of the contingency arrangement is as shown below:**



**Members may please concur.**

#### **8.0 220 kV bays at 400/220 kV Baghat (Pg) and Saharanpur (Pg) substations:**

8.1 400/220 kV, 2x315 MVA Saharanpur substation and 400/220kV, 2X500MVA Baghat substation have been commissioned. As per information available with Powergrid, only 2 Nos. of line bays have been utilised at Saharanpur Substation. Issue of utilisation of 220 kV bays is being discussed in CERC. Powergrid requested to inform the status and commissioning schedule of 220kV lines planned for utilisation of the remaining 4 nos. of 220kV line bays at Saharanpur and 8 nos. of 220 kV line bays at Baghat.

8.2 UPPTCL intimated that for utilization of bays at Baghat (Pg), the following downstream connectivities have already been approved previously in SCM:

- (i) Baghat (Pg) – Baghat (220) 220 kV S/C line

(ii) Baghpat (Pg)- Baraut (220) 220 kV S/C line

8.3 In addition to above, UPPTCL plan to connect further as follows:

- (i) Stringing of 220 kV II<sup>nd</sup> ckt of Baghpat (Pg) to Baghpat (UP) 220 kV line
- (ii) Stringing of 220 kV IInd ckt from Baghpat (Pg) to Baraut (UP) 220 kV line
- (iii) Baghpat (Pg) – Modipuram (II) 220 kV D/C line
- (iv) LILO of Moradnagar II (UP) – Shamli 220 kV S/C line at Baghpat (Pg)

Thus 8 nos 220 kV would be utilised.

8.4 UPPTCL also stated that 220 kV Baghpat (UP) substation has already been commissioned and has taken considerable load of 220/132kV Baraut (UP) substation. Moradnagar (400) - Shamli 220 kV S/C line has already been shifted to Moradnagar II 400/220kV substation. Further, it has already been informed that Moradnagar II- Shamli 220 kV S/C would be LILOed at 220kV Baghpat (UP). It is, however, held up due to ROW issues and may take some time.

8.5 UPPTCL also informed that for utilization of bays at Saharanpur (Pg), the following downstream elements are planned:

- (i) LILO of Saharanpur -Nanauta 220 kV SC line at Saharanpur PG (400) s/s: already informed in previous SCM
- (ii) LILO of Khara - Shamli 220 kV S/C line at Saharanpur (Pg)
- (iii) Saharanpur (Pg) - Saherswa (220) 220 kV D/C line
- (iv) LILO of one ckt of Khodri-Saharanpur 220 kV D/C line at Saherswa (220)  
(220/132/33 kV 2x160, MVA Saherswa S/s is under construction)

Thus 4 nos 220 kV would be utilised.

**Members may please note.**

## **9.0 Intra- State Transmission corridor in Rajasthan for evacuation of RE generation - Proposal from RRVPNL**

9.1 RRVPNL vide their letter RVPN/SE(P&P)/PSS/D -420 dated 13.5.2016 submitted that the following Solar Park developers and Wind Farms developers have sought grid connectivity with RVPN (STU) and PGCIL (CTU) pooling substations:

Solar Developer/ Location	Solar / Wind	Installed Capacity ( MW)	Point of connection	
			RVPN	PGCIL
RREC Bhadla I	Solar	75	75	-
RREC Bhadla –II	Solar	680	680	-
M/s SURAJ Bhadla –III	Solar	1000	500	500

M/s AREPRL Bhadla –IV	Solar	750	500*	250
M/s ESUCRL Phalodi/Pokaran	Solar	750	-	750
M/s AREPRL Fatehgarh	Solar	1500	500	1000
M/s Suzlon	Hybrid Solar/ Wind	1500	1500	-
	<b>Total</b>	<b>6255</b>	<b>3755</b>	<b>2500</b>

\* M/s AREPRL has sought approval for additional 250 MW with RVPN.

9.2 As per the guidelines on Solar Park Policy formulated by MNRE, **at least 20 % of installed capacity of Solar Parks** shall be bought by the State government through its discoms. The relevant extracts are reproduced for ready reference:

*The State Government in which the solar park is developed must agree to buy at least 20% of the power produced in the park through its Discom. The States which agree to buy higher percentage of power will be given preference. In such cases, where the State refuses to buy at least 50% power, the park should preferably be connected with CTU system. If STU system has to be used to evacuate power to other states, the STU/State Government concerned will agree to waive off the wheeling charges or reduce the wheeling charges to affordable level.*

Accordingly, Rajasthan shall be buying atleast 751 MW out of capacity of 3755 MW from aforesaid Solar Parks. Accordingly, 3004 MW connected with the State transmission may be exported to outside Rajasthan subject to the signing of the PPA by the SPPD with the prospective buyers.

9.3 Presently, solar power projects covered under JNNSM and inter-state open access of capacity 565 MW are already connected through State transmission system. The installed capacity of Solar and Wind Projects in Rajasthan as on 31.3.2016 is 5290.395MW.

<b>RE Projects</b>	<b>Installed Capacity (MW)</b>	<b>Allocation to Rajasthan (MW)</b>	<b>Allocation to other States/beneficiaries (MW)</b>
Solar	1283.35	718.35	565.00
Wind	4007.045	3823.40	183.645
<b>Total</b>	<b>5290.395</b>	<b>4541.75</b>	<b>748.645</b>

9.4 As per the new National Tariff Policy, the Renewable Purchase Obligation (RPO) for solar is proposed to be 8% of the Energy Consumption of each State. Since it is anticipated that the total Energy consumption of Rajasthan would be 119056 MU in FY 2021-22, therefore the RPO would be 9524 MU at 8% and the equivalent Renewable Energy consumption would be 5436 MW (20% CUF). Looking at the past trend of RPO for wind, it is assumed that the RPO for wind would be 10.3% corresponding to 2021-22. Accordingly, for proposed energy

consumption of Rajasthan as 119056 MU in 2021-22, the RPO for wind would be 12263 MU and the equivalent renewable energy consumption would be 8749 MW (16% CUF). In view of above, the RPO requirement of solar and wind for Rajasthan vis-a-vis RE expansion programme in Rajasthan by 2021-22 would be as under:

<b>Particulars</b>	<b>RE expansion programme (as per RREC)</b>	<b>RPO of Rajasthan</b>	<b>RE power to be allotted to other States/beneficiaries</b>
Solar	27225 MW	5436 MW	21789 MW
Wind	8288 MW	8288 MW	-
<b>Total</b>	<b>35513</b>	<b>13724MW</b>	<b>21789 MW</b>

\* Restricted to the RREC Programme.

9.5 In the 32<sup>nd</sup> Standing Committee meeting held on 31.8.2013 and 36<sup>th</sup> Standing Committee meeting held on 13.7.2015, 765 kV D/C Bhuj-Banaskantha-Chittorgarh - Ajmer – Bikaner-Moga line with 2x1500 MVA, 765/400 kV sub-stations each at Chittorgarh, Ajmer and Bikaner have been approved under “Green Energy Corridor”. This comprehensive corridor was approved due to the requirement of transmission strengthening beyond Bhuj pooling station for integration of envisaged renewable capacity in Gujarat and Rajasthan.

9.6 In 37<sup>th</sup> Standing Committee Meeting, PGCIL informed that M/s Surya Urja Company of Rajasthan Ltd (500 MW), M/s Adani Renewable Energy Park Rajasthan Ltd (250 MW) and M/s Essel Saurya Urja Company of Rajasthan Ltd (750 MW) have applied for Connectivity / LTA at Bhadla (Jodhpur) in Rajasthan. Considering above three (3) long term applications for 1500 MW Solar Power transfer requirement through Bhadla pooling station, the following transmission scheme was agreed to be taken up for implementation as ISTS:

- Bhadla (PG) – Bikaner(PG) 765kV D/C line
- Bhadla (PG)- Bhadla (RVPN) 400kV D/C (Quad) line
- Establishment of Pooling Station at Bhadla (PG) (765/400kV: 3x1500MVA; 400/220kV: 3x500MVA)
- Associated reactive compensation (both bus and line reactor)

9.7 It is envisaged that by 2021-22, total capacity of 15231 MW would be installed in the State of Rajasthan. As the commissioning capacity of aforesaid Solar/ Wind Power Projects is high and load consumption is low in the Western part of Rajasthan, hence for evacuation of this RE capacity, RVPN has planned a transmission system of 8000 MW which is already in execution and following new intra State transmission system has been planned for evacuation of additional 7000 MW wind/ solar generation by 2021-22.

9.8 The existing Solar/Wind capacity is being evacuated with constraint through two 400 kV GSS at Akal and Barmer, ten 220 kV GSS and scattered 132 kV GSS. Presently, three 400 kV GSS at Bhadla, Ramgarh and Jaisalmer\_2 and seven 220 kV GSS at Kanasar, Pratapgarh, Chhatrail, Pokaran, Kolayat, PS\_1/Bajju and Undoo are under construction. Therefore, it is envisaged that 8000 MW of solar and Wind would be evacuated through the existing and under construction transmission system by 2017-18.

9.9 The following new intra-State transmission system has been planned for evacuation of additional 7000 MW wind/ solar generation by 2021-22:

#### 9.9.1 765 kV Transmission System

- (i) Establishment of 3x1500 MVA, 765/400 kV substation at Korna
- (ii) 1x330 MVAR, 765 kV bus reactor at proposed 765 kV GSS Korna
- (iii) 765 kV D/C Korna-Ajmer(PG) line (Hexa Zebra) along with 2x240 MVAR switchable, 765 kV line reactors at both ends of the line: 210 km
- (iv) LILO of both circuits of under construction 400 kV D/C Akal-Jodhpur(New) line at proposed 765 kV GSS Korna: 2 km
- (v) LILO of one circuit of 400 kV D/C Rajwest TPS-Jodhpur line (circuit between Rajwest TPS and Jodhpur (Mandore) at proposed 765 kV GSS Korna: 10 km
- (vi) 1x 125 MVAR, 400 kV bus reactor at proposed 765 kV GSS Korna
- (vii) 400 kV D/C line from approved 400 kV GSS Jaisalmer-2 to proposed 765 kV GSS Korna (Quad Moose) along with 2x50 MVAR switchable, 400 kV line reactors at Jaisalmer-2 end of the line: 135 km

#### 9.9.2 400 kV Transmission System

- (i) 2x500 MVA, 400/220 kV GSS at Pokaran (Upgradation of approved 220 kV GSS)
- (ii) 400 kV D/C line from proposed 400 kV GSS Pokaran to proposed 765 kV GSS Korna (Quad Moose) along with 2x50 MVAR switchable, 400 kV line reactor at Pokaran end of the line: 115 km
- (iii) 1x125 MVAR, 400 kV Bus Reactor at proposed 400 kV GSS Pokaran
- (iv) 25 MVAR, 220 kV Bus Reactor at proposed 400 kV GSS Pokaran
- (v) LILO of second circuit of 400 kV D/C Bhadla (400 KV GSS)-Bikaner line at PGCIL's 765 kV GSS Bikaner

### 9.9.3 **220 kV Transmission System**

- (i) 220 kV GSS Sheo (new location)
- (ii) 220/132kV, 2x160 MVA & 132/33kV, 2x40/50 MVA GSS at Sheo (new loc.)
- (iii) 220 kV D/C line from 220 kV GSS Sheo to approved 220 kV GSS Undoo: 50 km
- (iv) LILO of existing 220 kV S/C Akal- Barmer line at proposed 220 kV GSS Sheo: 25 km
- (v) LILO of existing 132 kV S/C Sheo-Undoo line at proposed 220 kV GSS Sheo: 5 km
- (vi) LILO of existing 132 kV S/C Sheo-Jaisalmer line at proposed 220 kV GSS Sheo: 5 km
- (vii) 25 MVAR, 220 kV Bus Reactor at proposed 220 kV GSS Sheo

### 9.9.4 **220 kV GSS near to Salamgarh / Ghatol (Banswara)**

- (i) 220/132kV, 2x160 MVA & 132/33kV, 2x40/50 MVA GSS at Salamgarh / Ghatol
- (ii) 220 kV D/C line from 220 kV GSS Pratapgarh to 220 kV GSS Salamgarh / Ghatol: 50 km
- (iii) LILO of 220 kV S/C Banswara-Aspur line at 220 kV GSS Salamgarh / Ghatol: 75 km
- (iv) 132 kV D/C line from proposed 220 kV GSS Salamgarh to 132 kV GSS Dalot. :15 kM
- (v) 25 MVAR, 220 kV Bus Reactor at proposed 220 kV GSS Salamgarh

### 9.9.5 **New 220 kV line**

- (i) 220 kV D/C Baithwasia-Kheenvsar line : 65 kM

### 9.9.6 **Augmentation at Existing /Approved 400 Sub-stations:**

- (i) Additional 1x500MVA transformer at 400/220kV Akal Sub-station
- (ii) Additional 2x500MVA transformers at 400/220kV Jaisalmer Sub-station

9.9.7 **Load flow studies:** Load flow studies have been carried out by RRVPNL for 2021-22 considering total load of Rajasthan as 18603 MW with following conditions:

- (i) Net despatch of Solar/ Wind generation is 75% of the installed capacity of Solar and Wind generators.
- (ii) Net despatch of coal based generators is 70% of their installed capacity.
- (iii) 500 MW Hybrid RE project has been considered at 400 kV GSS Ramgarh and 1000 MW Hybrid RE project at 400 kV GSS Pokaran.
- (iv) Additional load at 765 kV GSS Bikaner(PG) (2000 MW at 765 kV voltage level), 765 kV GSS Phagi (600 MW injection from Gwalior and 1700 MW drawl to Bhiwani) and 400 kV GSS Zerda (PG) (750 MW at 400 kV voltage level) and additional generation



at 765 kV GSS Chhitorgarh (1000 MW at 765 kV voltage level) have been reflected to simulate the conditions of power flow matching with PGCIL studies.

- (v) Non-simultaneous peak loads are reflected at 132 kV bus of the grid sub-station.
- (vi) Existing and approved transmission system has been considered in the load flow study.
- (vii) Total 2500 MW capacity Solar Park generation has been considered at Bhadla (1500 MW) and Fatehgarh (1000 MW) which is to evacuated through PGCIL transmission system.
- (viii) In load flow studies following ISTS network has been considered to evacuate the generation from solar parks to be set up at Bhadla and Fatehgarh:
  - Bhadla (PG) – Bikaner(PG) 765kV D/C line
  - Bhadla (PG)- Bhadla (RVPN) 400kV D/C (Quad) line
  - Pooling Station at Bhadla (PG) (765/400kV:3x1500MVA; 400/220kV:3x500MVA)
  - 400 kV D/C line from Fatehgarh Solar Park to 765 kV GSS Bhadla (PG)

Results of load flow study are plotted at **Exhibit- 5** and **Exhibit- 6**. The power flows based on the results of Load Flow Studies corresponding to FY 2021-22 conditions have been tabulated below:

Sl. No.	Transmission System	Power Flow (MW)
<b>A.</b>	<b>Proposed 765 kV GSS Korna</b>	
1	3x1500 MVA, 765/400 kV Transformers at Korna	2259
	<b>New Proposed Lines</b>	
2	765 kV D/C Korna-Ajmer (PG) line (Hexa Zebra)	2259
3	400 kV D/C Jaisalmer(2)-Korna line (Quad Moose)	1221
4	400 kV D/C Pokaran-Korna line(Quad Moose)	1111
5	<b>LILO of both circuits of Akal-Jodhpur (new) line at 765 kV GSS Korna</b>	
i	400 kV D/C Akal-Korna line	1193
ii	400 kV D/C Korna-Jodhpur(new) line	991
6	<b>LILO of 400 kV Rajwest LTPS-Jodhpur (Mandore) line at 765 kV GSS Korna</b>	
i	400 kV S/C Rajwest LTPS- Korna line (Twin Moose)	175
ii	400 kV S/C Korna-Jodhpur(Mandor) line (Twin Moose)	411
<b>B</b>	<b>Proposed 400 kV GSS Pokaran</b>	
1	2x500 MVA, 400/220 kV Transformers at Pokaran	-361
<b>C.</b>	<b>Existing 400 kV Transmission lines</b>	
1	Ramgarh-Bhadla (D/C) (Twin Moose)	1379
2	Bhadla-Bikaner(PG-765 KV GSS) (D/C) (Quad Moose)	1148
3	Bikaner(PG-765 KV GSS)-Bikaner(RVPN) (D/C) (Quad Moose)	1375
4	Bikaner-Sikar (D/C) (Twin Moose)	836
5	Bhadla-Jodhpur (S/C) (Twin Moose)	51
6	Bhadla-Merta(S/C) (Twin Moose)	393
7	Ramgarh-Akal (D/C) (Twin Moose)	223
8	Akal-Jaisalmer(2) (S/C) (Twin Moose)	443
9	Jaisalmer(2)-Barmer (D/C) (Twin Moose)	618
10	Barmer-Bhinmal (D/C) (Twin Moose)	1313

11	Akal-Jodhpur(S/C) (Twin Moose)	483
12	Akal-Barmer (S/C) (Twin Moose)	422
13	Jodhpur- Jodhpur (new)(2xS/C) (Twin Moose)	-37
14	Jodhpur-Kankroli (S/C) (Twin Moose)	472
15	Rajwest-Jodhpur(New) (S/C) (Twin Moose)	198
16	Bhadla (PG-765 KV GSS)- Bhadla(RVPN) (D/C) (Quad Moose)	-368
<b>D.</b>	<b>400/220 kV Grid substation</b>	
1	Ramgarh (3x500 MVA)	-1227
2	Bhadla (3x500 MVA)	-1273
3	Bikaner(2x315 MVA)	360
4	Merta (2x315 MVA)	352
5	Jodhpur (2x315 MVA)	498
6	Jodhpur (New) (2x315 MVA)	543
7	Akal (4x500 MVA)	-2319
8	Jaisalmer-2 (4x500 MVA)	-1024
9	Barmer(2x315 MVA)	-77
<b>E</b>	<b>PGCIL 765 kV GSS</b>	
1	Chhitorgarh	1153
2	Ajmer	1567
3	Bikaner	240
4	Bhadla	2231

#### 9.9.8 Analysis of the result of Load Flow Studies

- (i) Rajasthan power system would be able to integrate approx. 15231 MW RE power for the condition 2021-22
- (ii) None of the transmission system is over loaded in the proposed case.
- (iii) Power flow on proposed 765 kV D/C Korna(Jodhpur)-Phagi line is approx. 2259 MW which indicate that sufficient redundancy is available in the transmission system
- (iv) After the construction of 765 kV D/C Korna-Ajmer line along with 765 kV sub-stations at Korna (Barmer) loading on underlying 400 kV network in Jaisalmer and Jodhpur would be reduced. And this available spare capacity could also be used to evacuate power under low system load condition with peak wind season in Rajasthan.

9.9.9 Further, RRVPNL also carried load flow study results with LILO of both circuits 400 kV D/C Bhadla (RVPN)-Bikaner (RVPN) line at PGCIL's 765 kV GSS Bikaner are placed at **Exhibit-7**. LILO of first circuit of this line at Bikaner (765kV) has already been approved in the 36<sup>th</sup> Standing Committee meeting. With this arrangement, none of the lines are getting over loaded and unbalance loading is also avoided.

#### 9.9.10 Accordingly, RVPN proposes the following new intra State interconnections to the ISTS:

- (i) 765 kV D/C line from RVPN's 765/400 kV Korna SS to PGCIL's 765/400 kV Ajmer S/Stn with 2x240 MVAR, 765 kV line type switchable shunt reactors at Korna
- (ii) Powergrid to provide 2 no of 765 kV feeder bays at 765/400 kV Ajmer S/Stn
- (iii) LILO of second circuit of 400 kV D/C Bhadla (RVPN) – Bikaner (RVPN) line at PGCIL's 765/400 kV Bikaner GSS in addition to already approved first circuit in 36<sup>th</sup> Standing Committee meeting.

**Members may like to deliberate.**

### **10.0 Power Evacuation System of Suratgarh Super Critical TPS (2x660 MW)**

10.1 The evacuation system for Suratgarh TPS was discussed in the 27<sup>th</sup> SCM of NR held on 30<sup>th</sup> May, 2009. The transmission system of Suratgarh SCTPS had been re-examined due to change of capacity of the generating units from 3x660 MW to 2x660 MW and the following evacuation system had been planned by RRVPNL:

<b>Transmission System</b>	<b>Line Length /Transformation Capacity</b>	<b>Commissioned /Target</b>
2x315 MVA, 400/220 kV GSS at Babai (Jhunjhunu)	2 x315 MVA	2017-18
400 kV D/C (Quad Moose) Suratgarh TPS – Babai line with 2*80 MVAR Line Reactors at both ends of line	240 km	2017-18
LILLO of 220 kV S/C Khetri-Heerapura line at Babai	3 km	Commissioned
LILLO of 220 kV S/C Khetri-Reengus line at Babai	1 km	Commissioned
400 kV D/C (Twin Moose) Suratgarh TPS – Bikaner line	170 km	May, 2018
400 kV D/C (Twin Moose) Bikaner – Merta line with 1*50 MVAR Line Reactors at both ends of line	172 km	Commissioned
1x80 MVAR, 400 kV Bus Reactors at Babai	-	-
1x125 MVAR, 400 kV bus reactor at STPS	-	-

**Members may please note.**

### **11.0 Mismatch of network at the time of deceleration of Date of Commercial Operation (DOCO)**

11.1 CERC vide its recent orders has advised the following in the context of mismatch in the commissioning of the sub-stations and downstream STU networks:

"In case of cost plus, the mismatch between Generation/Downstream network/Upstream network, Transmission licensee will not burden the consumers and the charges would be compensated through the IA between the parties".

11.2 CERC has directed that such assets shall not be included in the computation of PoC charges and in cases of declaration of commercial operation of such assets, transmission charges shall be recovered from the concerned generator/ STU/ Discoms.

11.3 Further, a new Regulation 6.3A on 'Commercial operation of Central generating stations and inter-State Generating Stations' has been framed under the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fourth Amendment) Regulations,

2016. Sub-Regulation 4 (iii) on ‘Date of commercial operation in relation to an inter-State Transmission System’, provides as under:

*Where the transmission system executed by a transmission licensee is required to be connected to the transmission system executed by any other transmission licensee and both transmission systems are executed in a manner other than through tariff based competitive bidding, the transmission licensee shall endeavour to match the commissioning of its transmission system with the transmission system of the other licensee as far as practicable and shall ensure the same through an appropriate Implementation Agreement. Where either of the transmission systems or both are implemented through tariff based competitive bidding, the progress of implementation of the transmission systems in a matching time schedule shall be monitored by the Central Electricity Authority.*

11.4 Keeping the Regulation and various orders of CERC in mind, Powergrid may please provide update on the ***endeavours to match the commissioning of the following sub-stations with the downstream transmission system of respective STUs.***

Sl. No.	Name of Substation	Capacity (MVA)	Expected Schedule
1	400/220kV Kurukshetra Substation (GIS)	2x500	commissioned
2	400/220kV Bagpat Substation (GIS)	2x500	commissioned
3	400/220 kV Saharanpur Substation	2x315	commissioned
4	400/220kV Substation at Patran(GIS)	2x500	End of May'16
5	400/220kV Dehradun Substation	2x315	July'16
6	400/220kV Parbati Pooling Station	2x315	Oct.'16
7	220/66kV GIS S/s at Sector 47, Chandigarh	2x160	24 months from IA
8	400/220kV S/s at Kala Amb	7x105	Oct.'18 (Likely to be preponed)
9	400/220kV S/s at Amargarh	7x105	Oct.'18
10	400/220kV Kadarapur S/s in Gurgaon area (GIS)	2x500	38 months
11	400/220kV Sohna Road S/s in Gurgaon area (GIS)	2x500	38 months
12	400/220kV Prithala S/s in Palwal area (GIS)	2x500	38 months
13	400/220kV Baram (Jauljivi) S/s	2x315	40 months

11.5 STUs are requested to ensure utilization of the 220kV line bays at the above mentioned new/under implementation ISTS substations planned under various transmission schemes. STUs may furnish the implementation schedule for the outgoing 220 kV lines from above substations to CEA and Powergrid.

**Members may like to deliberate.**

**12.0 Re-conductoring of 220kV Badarpur – Ballabgarh D/C line and 220 kV Narela - Rohtak Road D/C Line and establishment of 220kV GIS Bays at Rohtak Road S/Stn. of BBMB**

12.1 Re-conductoring of 220kV Badarpur – Ballabgarh D/C line and 220 kV Narela - Rohtak Road D/C Line and establishment of 220kV GIS Bays at Rohtak Road S/Stn. of BBMB were discussed in the 37<sup>th</sup> Standing Committee Meeting on Power System Planning of Northern Region held on 20<sup>th</sup> January 2016, wherein it was decided that the matter would be discussed among the member States of BBMB and the decision taken would be intimated in the next SCM.

**BBMB may please provide update.**

**13.0 Construction of 100 MVA, 33/220 kV sub-station at Phojal by LILO of one circuit of 220 kV Prini-Nalagarh D/C line of M/S ADHPL**

13.1 The construction of 100 MVA, 33/220 kV sub-station at Phojal by LILO of one circuit of 220 kV Prini-Nalagam D/C line of M/S ADHPL was discussed in the 37<sup>th</sup> Standing Committee Meeting on Power System Planning of Northern Region held on 20<sup>th</sup> January 2016, wherein it was decided that a separate meeting shall be convened by CEA with CTU, AD Hydro and HPPTCL to resolve the issue.

13.2 Accordingly, Member (Power System), CEA took a meeting on 1.3.2016, in which the following was decided:

- (i) LILO of one circuit of Pirni– Nalagarh 220 kV D/C line at Phojal was agreed as an interim arrangement only so that the small hydro generations is not bottled up.
- (ii) HPPTCL would file an affidavit before CERC to follow the formula as applicable to the AD Hydro and Malana – II HEPs for scheduling, loss allocation etc. among them i.e. AD Hydro, Malana-II and 40 MW being injected at Phojal by HPPTCL.
- (iii) HPPTCL shall be responsible for managing the schedules of the small HEPs at the proposed Phojal substation of HPPTCL and would give the consolidated schedule etc. to NRLDC.

**Members may like to take note of this.**

**14.0 Reliability issue at Sorang HEP**

14.1 In the 37<sup>th</sup> Standing Committee Meeting on Power System Planning of Northern Region POSOCO had raised the issue that the rating of switchgear equipment at Sorang HEP were of 2000 Ampere (2kA) rating while Sorang HEP has been connected to the grid with the LILO of

400 kV Karcham Wangtoo - Abdullapur line (Quad Moose) and the switchgear ratings at Karcham Wangtoo switchyard and Abdullapur substation are of 3000 Ampere (3 kA).

14.2 The matter was deliberated and it was decided that the developer shall have to upgrade the switchyard equipment matching with quad line capacity. In the present scenario, the LILO arrangement carried out by Sorang HEP shall be by passed.

**CTU may please provide update.**

## **15.0 Connectivity (6x660 MW) and LTA (4x660MW) Application of Barethi STPS of NTPC**

15.1 M/s NTPC had applied for connectivity (6x660 MW) and LTA (4x660MW) to Powergrid for their new generation project at Barethi. The subject application was discussed in the 22<sup>nd</sup> LTA and Connectivity meeting of WR constituents held on 30-11-2015 wherein it was decided that in view of uncertainty due to pending environment clearance and observation/suggestion of MPPTCL, the transmission system for connectivity and LTA for Barethi STPS shall be finalised in the next meeting. Proposed Barethi generation project is located in MP, close to the boundary of Uttar Pradesh. Considering the location of the project and availability of transmission network in the vicinity, system studies were carried out by Powergrid for connectivity and LTA for Barethi STPS and following system is proposed (Study results attached at **Exhibit – 8**):

### **Transmission System for Connectivity:**

- LILO of one ckt of Satna-Gwalior 765kV 2x S/C line at Barethi STPS\*

\*One ckt of Satna-Gwalior 765 kV 2x S/C line is already getting LILOed at Orai S/s. The proposal is to LILO other 765 kV S/C line at Barethi STPS.

### **Reactive Compensation**

- 240 MVAr Switchable Line Reactors at Barethi STPS end of Gwalior – Barethi STPS 765kV S/C line (approx. length: 225 km)  
*(formed after LILO of one ckt of Satna-Gwalior 765KV 2x S/C line at Barethi STPS)*

### **Transmission System Strengthening for LTA:**

- Barethi STPS - Orai 765kV D/C line (Approx Length: 180 km)
- Orai – Bareilly 765kV D/C line (Approx Length: 300 km)

### **Reactive Compensation**

- 240 MVAr Switchable Line Reactors in each circuit at both ends of Orai – Bareilly 765kV D/C line (Approx Length: 300 Kms.)

Further, provision of following is proposed at Barethi STPS switchyard under the scope of NTPC Ltd.:

- 765kV line bays: 2 nos.
- 765kV bus reactor: 2x240 MVAr

- 765kV switchable line reactor: 2x240 MVAR in Barethi STPS - Orai 765 kV D/C Provision of space for additional 4 nos. 765 kV line bays along with switchable line reactors may be kept as future provision

15.2 **Issues for deliberation:** NTPC to provide update on the environment clearance and the buyers of the generation. Powergrid to update the rationality of connecting to Orai S/s, which has hardly any load. Moreover, as per the planning of UPPTCL, UP would not be requiring this additional generation.

**Members may like to deliberate.**

## **16.0 Underground GIS at UT Chandigarh**

16.1 The establishment of 220/66kV, 2x160MVA GIS at UT Chandigarh was agreed in the 34<sup>th</sup> Standing Committee meeting of Power System Planning of Northern Region held on 8/8/2014 and implementation activities have been taken up by Powergrid subsequent to the allocation from Ministry of Power under compressed time schedule.

16.2 During the Power for All (PFA) document meeting of Chandigarh held on 11/02/2016 at MoP, it was desired that the possibility for establishing an underground GIS substation at Chandigarh may be explored. Powergrid has also received a letter from SE, Electy. OP circle, UT Chandigarh for necessary action.

16.3 In the meeting taken by Member (Power System), CEA on 19.04.2016, it was decided to explore the possibilities of constructing GIS S/Stn. As (i) partly underground with transformers over the ground, (ii) fully underground S/Stn. and (iii) above the ground with nice aesthetics. The sub-station is being constructed for the benefit of UT of Chandigarh. There was no representation from Electricity Department, UT of Chandigarh. As decided in the meeting, CEA and Powergrid jointly carried site visit of the proposed GIS substation on 20/04/2016. Primarily there are two options for underground GIS i.e. (a) ICTs (Oil filled) on Ground & GIS is underground and (b) Completely underground GIS including Gas Insulated Transformers (GIT).

16.4 Preliminary estimates indicate that for option (a) the cost is about 30% higher (mainly on account of civil works) and for option (b), the cost is about 75% higher as compared to conventional over ground GIS. Considering that the cost of GIT (Gas Insulated Transformer) is approximately three times of conventional oil type transformer and only few GITs

manufacturer worldwide, it was proposed during site visit to further explore the option with ICTs on ground.

16.5 The cost of civil work for Under Ground substation would be higher, however there would be substantial saving in land surface area of approximately 4 acre in case of underground substation and also it would give a better aesthetic look. Further this would be the first of this kind in the country at this voltage level. Considering these aspects Powergrid has proposed that under-ground option for establishment of 220/66 kV substation may be considered.

**Members may like to deliberate.**

### **17.0 Connectivity to Moradnagar II 400/220KV 2X240 MVA S/S:**

19.1 UPPTCL vide letter dated 23<sup>rd</sup> May, 2016 stated that the shifting of Dadri-Moradnagar 400 kV line to Moradnagar II was approved in 37<sup>th</sup> SCM at point 12.5, subject to following:

- (i) Commissioning of 220/132 kV Baghpat (UP) S/Stn
- (ii) LILO of Moradnagar II - Shamli 220 kV S/C line at 220 kV Baghpat (UP) s/s
- (iii) Baghpat (PG)- 220 kV Bagpat (UP) S/C line
- (iv) Baghpat (PG) -Baraut 220 kV S/C line
- (v) LILO of Moradnagar-Moradabad 400kV S/C line at 765/400 kV Hapur s/s

17.2 It was apprised by UPPTCL in 37<sup>th</sup> SCM that connectivity of 765 kV Hapur (UP) could give additional strength to Moradnagar 400 after shifting Dadri-Moradnagar 400 kV S/C line. But it should not have been mentioned as a mandatory condition for shifting to Moradnagar II. Further, Hapur 765 kV substation is expected in July, 2016.

17.3 The committee is further apprised that 220kV Baghpat (UP) s/s is already commissioned and is now feeding heavily loaded area of Baghpat directly from 400 kV Baghpat (Pg) s/s. Earlier it being fed from 220kV Baraut s/s. Thus, the line loadings of Moradnagar II - Baraut 220kV feeding 220 kV Baraut s/s are considerably reduced. Baghpat (Pg) - Baraut 220 kV S/C line and LILO of MoradnagarII-Shamli 220 kV S/C line at 220 kV Baghpat (UP) already approved are having RoW constraints and may cause delays. Moradnagar 400/220 kV s/s still is having high loadings and additional loads need be shifted to Moradnagar II soon. It is, therefore, requested that shifting for Dadri-Moradnagar 400kV S/C line to Moradnagar II (400) be permitted alongwith revised system as follows:

- (i) Shifting of Agra UP-Moradnagar 400 kV S/C line to Moradnagar II (completed and charged)
- (ii) Shifting of Moradnagar-Baraut 220 kV S/C line to Moradnagar II (Completed and charged),



- (iii) Shifting of Moradnagar-Shamli 220 kV S/C line to Moradnagar II (Completed and charged)
- (iv) Commissioning of 220/132 kV Baghpat (UP) s/s (completed and charged)
- (v) 400kV Baghpat (Pg) – 220 kV Baghpat (UP) S/C line - 6km (completed and charged)
- (vi) Stringing of II<sup>nd</sup> 220 kV circuit from 400 kV Baghpat (PG) to 220kV Baghpat (UP) - 10 km (proposed and completion in max one month)
- (vii) LILO of Moradnagar II-Shamli 220 kV S/C line at 400 kV Baghpat (PG)-1.5 km (proposed for approval)-completion expected in a month

**Members may like to deliberate.**

**18.0 Construction of 400/220/132 kV, 2x500,2x160 MVA Raebareli S/s:**

18.1 UPPTCL vide letter dated 23<sup>rd</sup> May, 2016 stated that in 37<sup>th</sup> SCM at point 19, two nos 220 kV bays required by UPPTCL at 220 kV Raebareli (PG) S/s was not agreed by Powergrid due to space constraint. UPPTCL is presently constructing two nos 220/132/33 kV substations at Amethi and Sangipur (Partapgarh). It was desired in 37<sup>th</sup> SCM that UPPTCL may alternately propose 400/220/132 kV S/s in Raebareli area. Accordingly, it is proposed as follows:

- (i) Construction of 2x500MVA, 400/220kV; 2x160 MVA, 220/132 kV S/s at Raebareli
- (ii) LILO of one ckt of Unchahar – 400 kV Fatehpur (PG) D/C line (U/C twin moose) at Raebareli (400) – 40 km (Above 400 kV PGCIL Line is nearing completion)
- (iii) Raebareli (400) – Amethi 220 kV D/C line – 50 km
- (iv) Amethi, Sangipur 220 kV S/S to be connected to 3 No 132 kV S/s each

**Members may please note.**

**19.0 Utilizing 1km II<sup>nd</sup> ckt river stretch of Allahabad (PG) - Jhusi 220 kV D/C line for river crossing for Allahabad (PG) – Phulpur 220 kV S/C line:**

19.1 UPPTCL vide letter dated 23<sup>rd</sup> May, 2016 stated that in the earlier SCM, is aware that Allahabad (PG)– Phulpur (220) 220 kV S/C (60 km) UPPTCL new line is under construction to reduce overloading of existing Allahabad (PG) – Jhusi – Phulpur 220 kV S/C existing line. New line involves 1km of Ganga river crossing which is time consuming and may cause additional cost. It may be noted that existing Allahabad (PG) –Jhusi 220 kV S/C line is being maintained by PGCIL and it is having 1 km Ganga river crossing line portion already built on D/C towers with II<sup>nd</sup> ckt also strung. UPPTCL requests Powergrid to allow UPPTCL to use this unused II<sup>nd</sup> ckt on river crossing for its Allahabad PG – Phulpur 220 kV S/C new line. Powergrid and members may please agree to the following request of UPPTCL:

- Construction of Allahabad (PG) –Phulpur 220kV S/C (UP) line by utilizing II<sup>nd</sup> ckt (already strung but spare) of existing Allahabad – Jhusi 220 kV S/C line stretch over Ganga river crossing

**Members may like to deliberate.**

## **20.0 Strengthening of WR- NR corridor and Lalitpur TPS radial issue:**

20.1 UPPTCL vide letter dated 23<sup>rd</sup> May, 2016 stated that at para 1.2.3 of the minutes of 37th SCM, Powergrid had assured further study for an additional network which could be less costly and possible in limited time frame to remove the radial status of Lalitpur Thermal plant. In a discussion with Powergrid and CEA at New Delhi, it was felt that WR- NR strengthening and Lalitpur TPS radial issue can be resolved in a manner to save cost time and additional corridor as follows:

- Connecting 765kV Bina (PG) – Lalitpur TPS (765) 765 kV D/C line – 70 km
- 765kV Agra (UP)– 765kV Aligarh (PG) 765 kV S/C line – 50 km

20.2 The above will address both the issues of radial connectivity of Lalitpur TPS and strengthening of WR – NR corridors. In addition, in case of no generation at Lalitpur TPS, Lalitpur TPS - Agra 765 2XS/C UP lines would never remain idle. It could be an effective proposal for corridor optimization too.

**Members may like to deliberate.**

## **21.0 Augmentation of 400/220 kV Agra (PG) substation**

21.1 This substation is having only 1x315 MVA capacity and thus not N-1 compliant. It was informed by field units that recently, the ICT tripped on WTI and led to further downstream multiple trippings.

21.2 It is desired that capacity to be enhanced by adding to 1x500 MVA to make s/s N-1 compliant.

**Members may like to deliberate.**

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