

Agenda note for 21st meeting of the Standing Committee Meeting on Power System Planning of Northern Region

(1) Confirmation of the minutes of 20th meeting of the Standing Committee held on 22.04.2006 at Nainital, Uttaranchal.

The minutes of the 20th meeting of Standing Committee on Power System Planning in Northern Region held on 22.04.2006 at Nainital Uttaranchal, were circulated vide CEA letter No. 1/9/2004-SP&PA/ 368-83 dated 26.05.2006. No Comments from any constituent states have been received.

The minutes of the meeting may please be confirmed.

(2) Evacuation of power from Allain Dhuhangan HEP.

Evacuation system for Allain Dhuhangan HEP in H.P. was discussed in the 16th meeting of the Standing Committee and it was decided to the pre-pone Panarsa pooling station covered under Parbati-III transmission system to match with ADHP and establish 220/400kV step-up at Panarsa so that 220kV evacuation line from ADHP could be connected to Panarsa and the 400kV Panarsa-Koldam-Nalagarh line covered under Koldam/Parbati-II/Parbati-III could be utilized for evacuation of ADHP power also. However, the execution of Panarsa pooling station and the 400kV line has got delayed and now the schedule of ADHP is ahead of the schedule of the 400kV line.

Since the execution of the work for construction of the line from Parbati pooling to Koldam has not started so M/S AD Hydro power Ltd. had requested to allow them connectivity to 220kV Nalagarh and to construct their 220 D/C line from their generation plant up to Nalagarh. As the need for construction of the evacuation system from Allain Dhuhangan HEP is urgent, this has worked out to be the only feasible solution. With this, the revised evacuation system for ADHP would be independent of Panarsa pooling station and they would have their Allain Dhuhangan HEP – Nalagarh 220 kV D/C line.

POWERGRID would also need to resolve the issues relating to evacuation system for Parbati-II and Parbati-III so that delay in execution of the transmission system does not become bottleneck for the other on-going and future projects. However, as ADHP would now be injecting power in to regional transmission system at 220kV at Nalagarh, the time schedule for commissioning of Panarsa/400kV lines would need to be tied-up with other on-going and future projects. In this context Panarsa pooling station may still be needed for taking injection for Malana-II & Sainj HEP or some other alternative, including review of Parbati-III transmission system, could also be thought of.

Member may discuss and concur.

(3) Providing 2 nos 220kV bays to HP at Nalagarh s/s of PGCIL

Two nos. 400 kV bays at Nalagarh were earmarked for enabling HPSEB for taking out 400 kV D/C outlet to Kunihar. However, as discussed in the 19th meeting, wherein HPSEB informed that they have deferred construction of the Nalagar-Kunihar 400kV line, it was decided that these 2 nos. of 400kV line bays at Nalagarh would be utilized for terminating 400 kV lines from Parbati II/ Koldam HEP and POWERGRID would provide two bays to HPSEB whenever they require the same for terminating their own lines and for that HPSEB have to inform POWERGRID at least two year in advance.

HPSEB had also requested for providing 2 nos. of 220kV bays at Nalagarh and it was considered to provide them the same by taking-up the additional 2 nos. 220kV bays at Nalagarh as a regional system strengthening scheme. However, as PSEB and UT of Chandigarh had not utilized the 220kV bay at Nalagarh earmarked to them, the issue was discussed in a subsequent meeting taken by CE(SP&PA), CEA with utility from POWERGRID, HPSEB, UT of Chandigarh and PSEB in November, 2005, and it was discussed that PSEB and UT of Chandigarh should programme to complete construction of their transmission lines from Nalagarh by March 2006 and if the progress on

construction of the line was not up to the mark, the allocation of the bays would be reviewed. Since then, UT of Chandigarh has given its program of utilizing their 220kV bays but PSEB has not yet responded. It is therefore proposed that the two 220kV bays provided for PSEB could be utilized by H.P. and bays for PSEB could be provided on knowing their definite program at least two years in advance of the requirement.

Members may discuss and decide.

(4) Transmission System of Northern Region for import of power from NER - 400 KV Bongaigaon - Siliguri D/C Quad and Purnea-Biharsharif D/C line as part of system strengthening scheme of Northern Region.

Transmission system from Tripura Gas project (Palatana by ONGC) was discussed in the 20th meeting and it was agreed that the transmission system beyond delivery point of Tripura gas generation would be provided as NR strengthening. Subsequently, ONGC have informed that the generation capacity of their plant would be only 740 MW and their transmission system would be up to Bongaigaon. Accordingly, the injection point for open access would be Bongaigaon and NR beneficiaries would need to arrange the transmission beyond Bongaigaon up to NR grid. Accordingly, it is proposed to construct 400 kV D/C quad lines between Bongaigaon-Siliguri and Purnea-Biharsharif as part of system strengthening scheme of Northern Region. For the transmission between Siliguri-Purnea two 400 kV D/C lines are existing, out of which one is with quad conductor and the other with twin conductor is being already upgraded by ER by providing higher capacity INVAR conductor. This would provide sufficient transmission capacity and the NR constituents can seek short-term open access (STOA) from ER grid. At a later date, when requirement increases, 400 kV D/C quad line could also be constructed as NR system, after which NR could get power from NER without any STOA through ER. Beyond Biharsharif, the already provided transmission system would be adequate corresponding to this proposal. The proposed system can also be used for wheeling of additional power out of surplus from NER which could be imported by NR constituents, The above-proposed AC system would also

provide backup for the $\pm 800\text{kV}$, 6000MW Bishwanath Charyeli-Siliguri-Agra HVDC bi-pole line. From reliability consideration and to take care of single pole contingency of Bishwanath Charyeli-Siliguri-Agra HVDC bi-pole line, it would be a technical requirement to provide a parallel 400kV transmission corridor beyond Bongaigaon sub-station in NER (main inter-linking substation with ER) by additional 400kV Bongaigaon-Siliguri D/C and 400kV Purnea-Biharshariff D/C lines (Biharshariff being the main power landing point in ER for further dispersal of power towards NR) as part of system strengthening scheme of NR.

Transmission charges for the proposed 400 kV lines would be borne entirely by beneficiaries of NR constituents.

Member may discuss and concur.

(5) Evacuation system for Dadri Thermal Extn. (2x490MW).

NTPC is putting-up extension at Dadri Thermal by adding 2 more unit of 490MW each. Expected commissioning is 2009-10. Evacuation system for this extension project has been evolved keeping in view the short circuit level in the grid. Studies have shown the need of following transmission from Dadri together with bus splitting at Dadri:

- (1) removal of Dadri LILO from Muradnagar-Panipat 400kV line so as to restore 400kV Muradnagar-Panipat S/C line as per original construction
- (2) using LILO line from Dadri and extend it up to Bawana so as to have Dadri-Bawana 400kV D/C line
- (3) Bus splitting at Dadri so as to have gas plant units, Dadri-Panipat and Dadri-Bawana lines on one section and thermal units of stage-I+ stage-II, HVDC, Dadri-Mandola, Dadri-G-noida/Samaypur and Dadri-Malerkotla lines on the other section.

Switchyard provision at Dadri could be firmed-up based on above.

Further, the issue of short circuit level needs to be addressed. Short circuit study has been done with a case considering Bawana-Baharurgah 400kV D/C

and Abdullapur-Bawana 400kV D/C disconnect from Bawana and connected to form a direct 400kV D/C line from Abdullapur to Baharurgarh and including tentative evacuation system for Jhajhar (1500MW) as Jhajhar-Bahadurgar 400kV D/C and Jhajhar-Mundka 400kV D/C with 400/220kV Mundka s/s not connected to Delhi ring system and directly feeding to Delhi loads radially – interconnection at lower voltages for alternate supply to kept normally in open. The case shows short circuit levels are up to 39kA. Before firming up the transmission arrangement, further studies with generation added at Bawana, Faridabad and Hissar etc. are required. For containment of short circuit level, provision of series reactor and/or bus splitting at Samaypur/other places may be necessary. It is proposed to come up with a proposal in this context in the next meeting.

Members may discuss and concur the above proposal in respect of switchyard arrangement at Dadri-II and Dadri-II – Bawana 400kV D/C line etc. as in (1), (2) and (3) above.

(6) Transmission system for power evacuation from Sasan and Mundra Ultra Mega Projects

6.1 Government of India, in a major imitative, is facilitating development of very large size ultra mega generation projects at coal pit-head and coastal location in order to bridge the gap between demand and supply. The capacity of each of these projects is about 4000 MW, with 5x800 MW units. Efforts are on to have one unit during the 11th plan period by 2011-12 and full capacity is expected to be commissioned by 2013-14. Ultra Mega projects in the Western Region at Sasan in Madhya Pradesh and Mundra in Gujarat are on fast track. Sasan and Mundra Ultra mega projects are on fast track. Accordingly, transmission system planning studies have been carried out considering Sasan and Mundra to evolve the evacuation system. The studies and findings are at Appendix.

- 6.2 Based on the studies enclosed at Appendix, which focused the transmission system in Western Region, the following transmission schemes as associated transmission system of Sasan and Mundra were evolved, discussed and agreed in the Western Region:

Sasan Transmission System In WR:

- (i) Sasan-Satna 765 kV 2xS/C
- (ii) 765/400 kV 2x1000 MVA ICT at Sasan generating switchyard
- (iii) Satna 765/400 kV, 2x1000 MVA S/S
- (iv) Satna 765 kV-Satna 400 kV D/C quad inter-connecting line
- (v) Satna-Bina (PG) 765 kV 2xS/C
- (vi) Bina (PG)-Bina (MP) 400 kV D/C (2nd line)
- (vii) LILO of both circuits of one of the Vindhychal-Satna 400 kV D/C line at Sasan 400 kV 2xD/C
- (viii) Fixed Series Comp 30% on 400kV Sasan-Satna D/C
- (ix) Fixed Series Comp. 30% on both of Satna-Bina 2xD/C
- (x) Bina (PG)-Indore 765 kV S/C
- (xi) New 765kV substation at Indore, 2x1500 MVA 765/400kV
- (xii) Indore s/s (765 kV)-Indore (existing 400kV s/s) 400 kV D/C quad inter-connecting line
- (xiii) 765 kV operation of Agra-Gwalior-Bina-Seoni 765 kV lines and Upgrading Bina and Gwalior s/s to 765kV: 2x1000MVA 765/400kV at Bina and 2x1500MVA 765/400kV at Gwalior

Mundra Transmission System In WR:

- i) Mundra-Limbdi 400 kV D/C (Triple Moose)
- ii) Mundra-Ranchhodpura 400 kV D/C (Triple Moose)
- iii) Mundra-Jetpur 400 kV D/C (Triple Moose)
- iv) Kawas-Navsari 400 kV D/C
- v) Navsari 400 kV substation 2x315 MVA 400/220 kV
- vi) LILO of both ckts of Kawas-Navsari 220kV D/C line at Navsari 400kV s/s
- vii) Navsari-Mumbai New Location (PG) 400kV D/C and connecting to HVDC side of MSEB at this new s/s

- viii) Wardha 765kV s/s with 2x1500 MVA, 765/400kV
- ix) 765kV operation of Seoni-Wardha 2xS/C lines
- x) Wardha-Aurangabad 400kV D/C quad with 40% Fixed Series Capacitor

Transmission of Sasan and Mundra power to the load centers of Northern region takes place through displacement. As such, additional transmission system for Sasan and Mundra in the Northern region is also required. In addition, system strengthening in Western Region and Northern Region to augment the transformation capacity at 400/220kV is also needed.

The System strengthening scheme required in Western region is:

- **Western Region System Strengthening Scheme**
 - Additional 1x315MVA 400/220kV transformer each at Wardha, Pune, Gwalior, Bina and Raipur substation of PGCIL

- **Strengthening in States' system of WR constituents**
 - (i) Additional 3rd 315 MVA 400/220kV transformer at Bhopal (under purview of MPPTCL)
 - (ii) Additional 3rd 315 MVA 400/220kV transformer at Aurangabad (under purview of MSETCL)
 - (iii) VSC based HVDC transmission system between Mumbai New Location (PG)- Mumbai major load centers (Colaba / Andheri / Bandra area) HVDC with DC cable/submarine (under purview of MSEB)

Regarding sharing of transmission charges it was discussed and agreed by WR constituents in their Standing Committee meeting that any of the following two options were agreeable by WR constituents:

Option-1: Transmission charges for Sasan and Mundra transmission system in WR be pooled in to WR regional pooled transmission charges and NR beneficiaries sharing the same based on their total allocation from WR pool including Sasan and Mundra power. And transmission charges for Sasan and Mundra transmission system in NR shared by NR beneficiaries.

Option-2: Total transmission charges for Sasan and Mundra transmission system in WR as well as in NR be divided in to NR and WR in ratio of their allocation from Sasan and Mundra and pooled in to regional pooled transmission charges of the respective regions.

In both the above options, transmission charges for system strengthening to be part of respective regions only.

As both the above options are acceptable to WR constituents, the option to be adopted is to be decided by NR constituents.

6.3 Further studies focused on Northern region have been done to evolve the transmission system for Sasan and Mundra in NR. Base case without any strengthening in NR (Exhibit-I) shows overloadings on east-west corridor of Northernregion and need of strengthening. Case for outage of Sasaram-Fatehpur 765kV S/C diverges. Case for outage of Fatehpur-Agra 765kV S/C (Exhibit-II) shows need of strengthening. Based on the strengthening needs, the following options have been considered.

Option-1: Additional transmission system: (Loas flow at exhibit-III)

- Gorakhpur-Lucknow 400kV D/C (second line)
- Sasaram-Fatehpur 765kV S/C second line
- Fatehpur-Gwalior 765kV S/C
- Gwalior-Jaipur 765kV S/C
- New 765/400kV, 2x1500MVA & 400/220kV, 2x315MVA s/s at (near) Jaipur
- Jaipur New-Jaipur PG 400kV D/C
- Jaipur New-Heerapura 400kV D/C
- Jaipur New-Alwar 400kV D/C
- New 400/220kV 2x315 MVA s/s at Alwar, Alwar 400kV-Alwar220kV 220kV D/C line
- LILO of one circuit of Abdullapur-Bahadurrah(Bawana) 400kV D/C at Sonipat with 2x315MVA 400/220kV s/s at Sonipat
- LILO of both circuits of Nathpajahkri-Abdullapur 400kV D/C at Panchkula with 2x315MVA 400/220kV s/s at Pachkula

Option-2: Additional transmission system: (Load flow at exhibit-IV)

- Gorakhpur-Lucknow 400kV D/C (second line)
- Sasaram-Fatehpur 765kV S/C (second line)
- Fatehpur-Agra 765kV S/C
- Agra-Alwar 400kV D/C quad
- New 400/200kV 2x315MVA s/s at Jaipur
- Jaipur New-Jaipur PG 400kV D/C
- Jaipur New-Heerapura 400kV D/C
- Jaipur New-Alwar 400kV D/C quad
- New 400/220kV 2x315 MVA s/s at Alwar, Alwar 400kV-Alwar220kV 220kV D/C line
- LILO of one circuit of Abdullapur-Bahadurahr(Bawana) 400kV D/C at Sonipat with 2x315MVA 400/220kV s/s at Sonipat
- LILO of both circuits of Nathpajahkri-Abdullapur 400kV D/C at Panchkula with 2x315MVA 400/220kV s/s at Pachkula

Both the above options are almost equal from technical suitability as well as cost economics. Estimated cost in both cases would be of the order of Rs 2000 crores. From long-term consideration when Agra HVDC terminal capacity is increased to 6000 MW, Option-2 may work out to be advantageous. Accordingly, option-2 is recommended.

The System strengthening scheme required in Northern region would be additional 4 or 5 nos. 315MVA 400/220kV transformers at substation of PGCIL/State utilities.

(7) Transmission system for power evacuation from hydro projects in Uttranchal

Government of Uttanchal is steering development of a number of hydro projects in their state power from which would be consumed in Uttranchal and also exported outside the state. Power Transmission Corporation of Uttranchal Ltd. has proposed to develop through ADB funding a comprehensive transmission system based on a master plan evolved in consultation with CEA. The

proposed transmission system would be used for intra-state as well as inter-state transmission and there are issues relating to transmission charge etc. which need discussion in the Standing Committee and subsequently in the RPC.

An agenda note received from PTCUL is enclosed.

PTCUL may present the issue.

It needs to be kept in view that the composite system would be used for intra-state as well as inter-state transmission and transmission charges for intra-state use may have to be separated so that these are not passed on to the inter-state beneficiaries.

Member may discuss and give their views.