Additional Agenda Items for ER Standing Committee Meeting

1) Augmentation of Transformation Capacity at 220/132 kV Ara Sub-station of POWERGRID

Review of loading pattern of 2x100MVA ICTs at 220/132kV Ara Sub-station of POWERGRID during last three (3) months has revealed that loading of ICTs operating at this Substation had exceeded 100 MW on several occasions and maximum loading on ICT had gone up to 120MW during October and Nov, 2011. Moreover, another 132kV line from Ara (BSEB) to Jagdishpur (BSEB) is under construction as part of Bihar Sub-Transmission Scheme which would further increase the loading on the subject ICT at Ara.

In view of such increased loading pattern in respect of operating ICTs at Ara substation and need for meeting future load growth around Ara, **it is proposed to augment the transformation capacity of Ara by installation of 1x160 MVA, 220/132kV transformer to take care of the outage of any one of the ICTs at the above sub-station.**

Members may discuss and concur.

2) Augmentation of Reactive Compensation at 400/220 kV Muzaffarpur Sub-station

On study of voltage profile at 400kV Muzaffarpur Bus, it is observed that during considerable period in a month, 400kV bus voltage remains high even after commissioning of 2x125 MVAR Bus Reactors at 400 kV Purnea Sub-Station of POWERGRID. To contain over voltage, multiple 400 kV lines are being kept open on instruction of RLDC affecting Grid Security.

In view of the above, **it is proposed to install 2X125 MVAR Bus Reactors at Muzaffarpur.** Out of this, one 125 MVAR reactor may be installed by replacing the existing 63 MVAR Bus Reactor at Muzaffarpur. The existing 63 MVAR Reactor may be used as Regional spare to meet any contingency.

Members may discuss and concur.

3) Shifting of 2x50MVAR line reactor from Patna end of 400kV Kahalgaon/Barh – Patna D/C line to Balia end of 400kV Patna – Balia D/C line

50 MVAR line reactor was installed at Patna end of 257 kms. long Kahalgaon - Patna 400kV D/c (quad) line. Subsequently, the line was looped-in and looped-out at Barh TPS resulting in 217 km long Kahalgaon – Barh 400kV D/c line and 93 kms. long Barh – Patna 400kV D/c line. As a result, 50 MVAR line reactor at Patna end of Barh - Patna 400kV D/c line provides high degree of compensation resulting in induced voltage / resonance like phenomena when one of the D/c line is out of service while the other ckt is in service. On the other hand, existing Patna-Balia 400kV D/c (quad) line is 195 kms. long and it has no line reactors at either end.

In view of the above, **it is proposed to shift the above mentioned 2 nos. of 50MVAR line reactors from Patna sub-station (installed at Patna end of 400kV Kahalgaon/Barh – Patna D/c line) to Balia sub-station in Northern region and install it as fixed line reactor at Balia end of 400kV Patna – Balia D/c line.**

Members may discuss and concur.

4) Eastern Region System Strengthening Scheme-VI

Future demand projection as given by Bihar indicate a power demand of about 5600 MW by the year 2016-17. This demand is about 10% higher than the 18th EPS (draft) projection of CEA. Out of this, about 2100 MW power demand is in the Northern part and about 3500 MW power demand is in Southern part of the state. Regarding power availability in 2016-17 time-frame, it is to mention that Bihar would have additional share of about 2500 MW form Central generating stations (Barh-I&II-500MW, Nabinagar-I&II-1500MW, Tilaiyya-500MW). In addition, there are no. of generation capacity additions planned under state and private sector which are expected to come up in next 5-6 years. Considering this generation addition program, power availability in the state is expected to be about 8200 MW as against its envisaged power demand of about 5600 MW by the year 2016-17.

Northern part of Bihar has only 2 nos. of 400kV sub-stations (Purnea & Muzaffarpur) with total capacity of 1260MVA as against projected demand of about 2100 MW in 2016-17 time

frame. Keeping in view the load growth requirement, following 2 nos. 400kV ISTS sub-station need to be established in North Bihar:

(I) 400/220kV Substation at Darbhanga

- ✓ Keeping in view the location of existing 400kV sub-stations (Purnea & Muzaffarpur) in North Bihar, it would be desirable to establish one 400kV sub-station at Darbhanga in between Purnea and Muzaffarpur.

- ✓ It would be utilized to cater to future power demand projected for 2016-17 time frame of Darbhanga(90 MW); Madhubani(160 MW) and Samatipur (155 MW) district.

- ✓ Darbhanga sub-station would be connected to Muzaffarpur and/or Purnea sub-station of POWERGRID.

- ✓ Further, this sub-station may also be connected to Banka sub-station in South Bihar where power from state sector generation generation projects (viz. JAS Infra IPP-2x660MW) at Banka & state sector TPS at Pirpainti-2x660MW - proposed to be implemented through Case-II bidding route, may be injected.

- ✓ Accordingly, the sub-station capacity and its connectivity to the Bihar grid are proposed as following:
  - **2x500 MVA, 400/220kV new sub-station at Darbhanga with LILO of Purnea – Muzaffarpur 400kV D/c or Muzaffarpur - Darbhanga 400kV D/c line#**
  - 2x160 MVA, 220/132kV sub-station at Samastipur by LILO of 220kV Begusarai(BSEB) - KTPS D/C.
  - Darbhanga – Darbhanga (BSEB) 220kV 2xD/c line
  - Darbhanga – Saharsa / Madhepura (BSEB)220kV D/c line
  - Darbhanga – Samastipur 220kV D/c line

  # final decision in this regard would be taken after more techno-economic analysis.

- ✓ The 220kV lines for drawl of power from Darbhanga 400/220kV sub-station would be under the scope of Bihar State Electricity Board (BSEB). This also requires construction of 2x160 MVA, 220/132kV new sub-station at Samastipur which would be under the scope of BSEB.

(II) 400kV Substation at Motihari

- ✓ This sub-station would be located at Motihari which is in between Muzaffarpur and Gorakhpur.
- ✓ It would be utilized to cater to future power demand projected for 2016-17 time frame of Motihari(135 MW), West Champaran(90 MW) and Sheohar (60 MW) district.
- ✓ The Motihari sub-station at district would be established through LILO of Barh-Gorakhpur 400kV D/c (quad) line.
- ✓ Further, it would also be connected to 2x660 MW state sector generation project of India Power Corporation Ltd. (IPCL) being established near Areraj in Motihari district itself.
- ✓ In future, this substation may also utilized for additional power exchange between India and Nepal either through LILO of Muzaffarpur (India) – Dhalkebar (Nepal) 400kV line or through constructing new transmission lines from Motihari to suitable locations in Nepal.
- ✓ Accordingly, the Motihari sub-station capacity and its connectivity to the Bihar grid are proposed as following:

    - **3x200 MVA, 400/132kV new sub-station at Motihari**
    - **LILO of Barh – Gorakhpur 400kV D/C line at Motihari (about 50 kms.)**
    - Motihari - Motihari (BSEB) 132 kV 2xD/C line
    - Motihari – Betiah (BSEB) 132kV D/C line with HTLS conductor

- ✓ The 132kV lines for drawl of power from Motihari 400/132kV sub-station would be under the scope of BSEB.

The above strengthening of ISTS is proposed as "Eastern Region Strengthening Scheme-VI'. The estimated cost of the ISTS portion of the proposed scheme would be about Rs. 300 Crore. The transmission tariff for the proposed system would be payable as per the prevailing Point of Connection (PoC) tariff mechanism.

5) Modification in Transmission System for Phase-I Generation Projects in Jharkhand & West Bengal

POWERGRID is implementing the transmission System for IPP Generation Projects in Jharkhand & West Bengal after concurrence from various constituents and Regulatory approval from CERC. As part of the subject transmission scheme, LILO of Gaya – Balia 765 kV S/c line at Varanasi was planned for onward transfer of power from Gaya as well for providing 765 kV interconnection between Balia and Varanasi.

After site selection of Varanasi substation, it has 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 long LILO distance would result into unbalanced loading on Gaya – Varanasi 765 kV lines. Further, it is to mention that the LILO tapping point of Gaya – Balia line is close to Balia substation.

Keeping above in view **it is proposed to implement Varanasi – Balia 765 kV S/c direct line instead of above referred 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. CEA has in principle agreed to the proposal and informed PGCIL on 19-1-12.

Members may kindly note and agree.

6) Interim arrangement for facilitating evacuation of power from up-coming DVC generation projects in Eastern Region

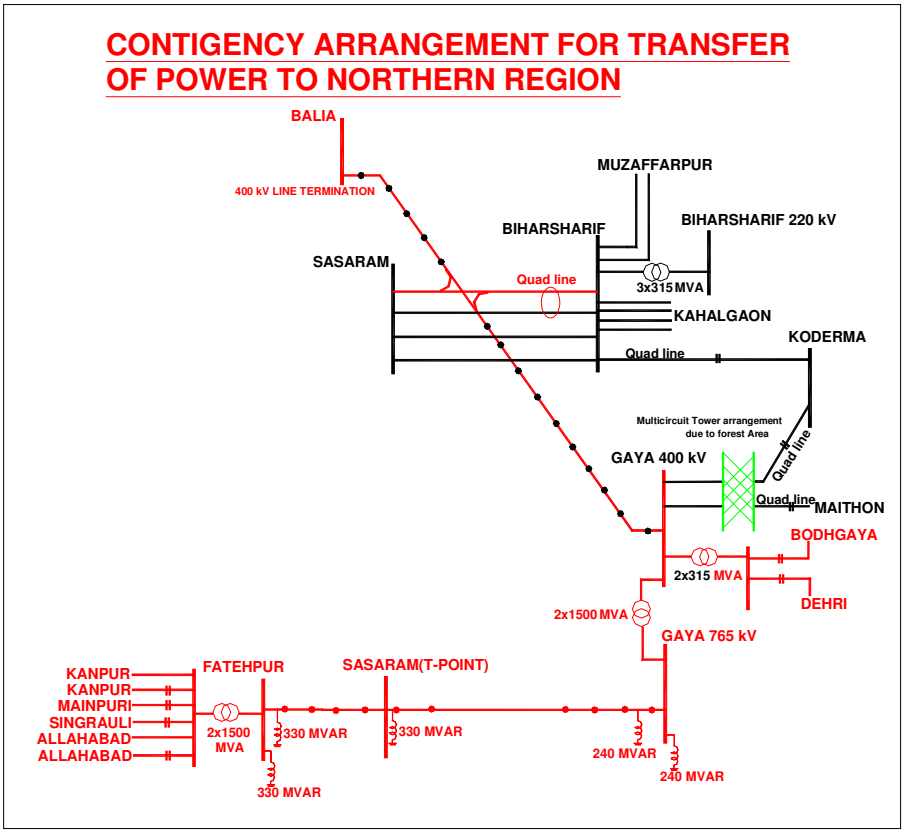
A number of generation projects having a total capacity of about 5700 MW were proposed by DVC for commissioning in Eastern region with major beneficiaries of power in Northern region. The transmission system was evolved wherein power from Eastern to Northern region was planned to be pooled at Gaya through Maithon-Gaya and Koderma-Gaya 400kV D/c line and then transfer to NR through Sasaram and Balia. The transmission system is under various stages of construction. One unit of 500 MW each at Mejia, Maithon-RB &

Koderma have been commissioned and another unit of 500 MW at Durgapur STPS and Maithon RB TPS is expected to be commissioned shortly. The commissioning of other units shall take place progressively. POWERGRID is attempting to match the commissioning of adequate transmission system.

The Koderma - Gaya 400kV D/c line and Maithon - Gaya 400kV D/c lines are passing through dense forest stretch of about 37 kms. The forest clearance of these lines is awaited. In order to judiciously utilise the Right of Way, POWERGRID has taken up the construction of these two D/c lines on one tower by using multi-circuit tower configuration in the forest stretch. The case for forest clearance was submitted long back in September-2009. The final clearance for Bihar portion is already available; the 1st stage clearance for Jharkhand portion is expected shortly. Thereafter the 2nd stage clearance for Jharkhand portion shall follow in about two months time. Considering dense forest in this area, the completion of line shall take about six months after forest clearance.

Keeping above in view and in order to avoid any generation evacuation constraint for generation projects stated above an interim arrangement has been evolved. **To carry out the interim transmission arrangement (shown below) , the Gaya-Balia 765kV S/c line which is crossing Biharsharif-Sasaram 400kV D/c (Quad) line presently under construction shall be re-configured as Biharsharif-Gaya 400kV line and Sasaram-Balia 400kV line**. This shall enable injection of power from DVC projects at Gaya through Biharsharif – Gaya 400kV line for onward transmission to Northern region through Gaya-Sasaram-Fatehpur 765kV line. Further, this would also enable Bihar to draw power from Gaya through the 400/220kV 2X315 MVA ICTs and Dehri-Bodhgaya 220kV line being LILOed at Gaya.

The above interim arrangement shall be withdrawn and the normal/planned transmission system would be in place upon completion on Maithon-Gaya 400kV line and Koderma-Gaya 400kV lines which are expected to commissioned in October 2012, anticipating forest clearance by March 2012. CEA has in principle agreed to the interim arrangement and accordingly informed PGCIL on 25-1-12.



Members may kindly note and agree.

7) Line Bays & Reactors for Private Sector Lines under ATS of Phase-I IPPs in Orissa

ATS for Phase-I IPPs in Orissa was finalised in ER Standing Committee Meeting held at New Delhi on 20-09-2010 and ratified in the 16th ERPC meeting held at Bhubaneswar on 17-18 Dec, 2010. Following elements of the subject transmission system are being implemented under private sector through tariff based competitive bidding:

- Jabalpur Pool -Bhopal-Indore 765kV S/c
- Bhopal New S/s – Bhopal (MP) 400kV D/c (High Capacity)
- Establishment of 765/400kV, 2x1500MVA Bhopal S/s

As advised by CEA, bay extension works of the above lines at POWERGRID substations viz. 765/400kV Jabalpur Pool and Indore along with line reactors are being implemented by POWERGRID.

Members may kindly note.