New Transmission Schemes in WESTERN REGION

Following transmission systems have been approved for implementation in 2\textsuperscript{nd} WRSCT meeting held on 21.05.2019:

1. **Transmission System associated with Gujarat Phase II REZs (8.5GW)**

   (a) Kutch (Rapar) SEZ 5000 MW [3000MW near Rapar and 2000MW near Lakadia (for which transmission system already planned in Phase- I)] \& Banskantha SEZ 2500 MW

   i) Establishment of 765/400 kV, 3x1500 MVA \& 400/220 kV, 6x500 MVA Kutch(Rapar) SEZ Pooling Point

   ii) Augmentation of transformation capacity at Lakadia PS by 1x1500 MVA, 765/400 kV. Augmentation of 400/220 kV transformation capacity by 4x500 MVA, 400/220 kV ICTs (400 kV AIS and 220 kV GIS) for interconnection with SEZ in case of injection from RE projects are at 220 kV level at Lakadia.

   iii) Augmentation of transformation capacity at Radhanesda PS by 5X500 MVA, 400/220 kV ICTs for interconnection with SEZ

   iv) Establishment of 765/400 kV, 2X1500 MVA at suitable location near Ahmedabad (towards eastern side of Ahmedabad)

   v) Radhanesda PS - Banaskantha 400 kV D/c line (Twin HTLS)

   vi) Banaskantha – Zerda 400 kV D/c line

   vii) Kutch (Rapar) SEZ PP - Ahmedabad 765 kV D/c line

   viii) LILO of Lakadia – Banaskantha 765 kV D/c line at Kutch (Rapar) SEZ PP

   ix) LILO of Pirana(T) – Pirana(PG) 400 kV D/c line at Ahmedabad with twin HTLS along with reconductoring of Pirana – Pirana(T) D/c line with twin HTLS conductor

   x) Ahmedabad – Indore 765 kV D/c line

   xi) 220 kV line bays for interconnection of solar projects (25 nos)

   xii) Associated Reactive Compensation (Line + Bus)

   xiii) Associated spare reactors and transformers

   (b) Jamnagar SEZ 2500 MW \& Jamkambhaliya WEZ 500 MW

   i) Establishment of 400/220 kV, 5X500 MVA at Lalpur (Jamnagar) SEZ PP

   ii) Establishment of 400 kV switching station at Rajkot

   iii) Lalpur (Jamnagar) SEZ PP - Rajkot 400 kV 2xD/c line (Twin HTLS)

   iv) Lalpur (Jamnagar) SEZ PP – Jamvabliya PS 400 kV D/c line (Twin HTLS)

   v) LILO of CGPL - Jetpur 400 kV D/C(triple) at Rajkot

   vi) Rajkot – Ahmedabad 400 kV D/c line (Twin HTLS)

   vii) 220 kV line bays for interconnection of solar projects (8 nos)

   viii) Associated Reactive Compensation (Line + Bus)

2. **Transmission System associated with Maharashtra Phase II SEZs (4GW)**

   (a) Solapur SEZ 1500 MW

   i) Establishment of 400/220 kV, 2X500 MVA at Solapur PP*

   * Footnote: Detailed specifications and project implementation plans for each system are included in the document for comprehensive understanding.
ii) Augmentation of 400/220 kV, Solapur PP with 1x500MVA, 400/220kV transformer

iii) Solapur PP – Solapur(PG) 400 kV D/c line (Twin HTLS)*

iv) 220 kV line bays for interconnection of solar projects (5 nos)*

v) 1x125 MVAR, 420 kV Bus Reactor at Solapur PP*

*Already agreed in the 1st WRSCT

(b) Wardha SEZ 2500 MW

i) Establishment of 400/220 kV, 5X500 MVA at Wardha SEZ PP

ii) LILO of Wardha - Warora Pool 400 kV D/c (Quad) line at Wardha SEZ PP

iii) 220 kV line bays for interconnection of Solar projects (8 nos)

iv) 1x125MVAr bus reactor at Wardha SEZ PP

3. Transmission System associated with Madhya Pradesh SEZs (5GW)

(a) Rajgarh 2500 MW

i) Establishment of 400/220 kV, 5X500 MVA at Rajgarh SEZ PP (near Agar Malwa)

ii) Rajgarh SEZ PP - Bhopal (Sterlite) 400 kV D/c line (HTLS)

iii) Rajgarh SEZ PP – Shujalpur 400 kV D/c line (HTLS)

iv) 220 kV line bays for interconnection of solar & wind projects (8 nos)

v) 1X125 MVAR, 420 kV Bus Reactor at Rajgarh SEZ PP

(b) Khandwa SEZ: 2500 MW

i) Establishment of 400/220 kV, 5X500 MVA at Khandwa SEZ PP

ii) Khandwa SEZ PP - Khandwa Pool 2XD/c line (Twin HTLS)

iii) Augmentation of 1X1500 MVA, 765/400kV ICT at Khandwa Pool (Sterlite)

iv) 220 kV line bays for interconnection of solar projects (8 nos)

v) Associated Reactive Compensation: 1X125 MVAR, 420 kV Bus Reactor at Khandwa SEZ PP

4. Transmission system for providing immediate connectivity to Dholera UMSP

(i) Power injection from the Solar Park may be at 400kV level.

(ii) Establishment of 765/400kV Dholera Pooling station

(iii) LILO of Lakadia – Vadodara 765 kV D/c line at Dholera UMSP

(iv) Dholera PS – Ahmedabad 765kV D/c line

(v) Associated Reactive Compensation

(vi) Spare reactors and transformers

5. Conversion of 80 MVAr fixed line reactor at Boisar to switchable line reactor

(i) Conversion of 80 MVAr fixed line reactor at Boisar end of Aurangabad- Boisar 400 kV D/c line to switchable line reactor alongwith NGR bypass arrangement
6. **Connectivity system for NTPC Lara STPP 2x800MW Stage-II generation project**

   (i) Reconductoring of Lara STPP I – Raigarh (Kotra) 400kV D/c line with HTLS conductor (Quad Moose capacity) – scheme under ISTS

7. **Navsari (PG) – Bhestan/Popada (GETCO) 220 kV D/C line**

   (i) Navsari (PG) – Bhestan 220 kV D/C line (with minimum capacity of 400MVA per circuit)
   Associated 220 kV line bays at Navsari 400/220 kV (PGCIL) substation and Bhestan 220 kV substation has already been implemented by POWERGRID and GETCO respectively.
New Transmission Schemes in SOUTHERN REGION

Following transmission systems have been approved for implementation in 2\textsuperscript{nd} SRSCT meeting held on 10.06.2019:

1. Transmission scheme for Solar Energy Zone in Andhra Pradesh (3500 MW)
   a) Ananthpuram (Ananthapur) SEZ (2500 MW) and Kurnool SEZ (Kurnool-1000 MW)
      i. Establishment of 400/220 kV, 7x500 MVA pooling station at suitable border location between Ananthpuram & Kurnool Distt
      ii. Ananthpuram PS-Kurnool-III PS 400 kV (High capacity equivalent to quad moose) D/c Line
      iii. Ananthpuram PS-Cuddapah 400 kV (High capacity equivalent to quad moose) D/c Line with suitable line reactors
      iv. 220 kV line bays for interconnection of wind/solar projects (12 nos.)
      v. 2x125 MVAr (400 kV) bus reactors at Ananthpuram PS

2. Transmission Scheme for Solar Energy Zone in Karnataka (5000 MW)
   a) Gadag SEZ (2500 MW)
      i. Establishment of 400/220 kV, 5x500 MVA Gadag Pooling Station.
      ii. Gadag PS-Koppal PS 400 kV (high capacity equivalent to quad moose) D/C Line.
      iii. Gadag PS-Narendra (New) PS 400 kV (high capacity equivalent to quad moose) D/C Line.
      iv. 220 kV line bays for interconnection of solar projects (8 nos.)
      v. 1x125 MVAr (400 kV) bus reactor at Gadag PS.
      vi. Upgradation of Narendra (New) to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x330 MVAr Bus Reactor.
      vii. Upgradation of Kolhapur (PG) to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x330 MVAr Bus Reactor.
      viii. Upgradation/charging of Narendra new - Kolhapur (PG) 765 kV D/c line (initially charged at 400 kV) to its rated voltage of 765 kV along with 1x330 MVAr switchable Line Reactor on Kolhapur (PG) end of each circuit.

   b) Bidar SEZ (2500 MW)
      i. Establishment of 765/400/220 kV, 3x1500 MVA, 5x500 MVA pooling station at suitable border location near Bidar.
      ii. Bidar PS – Maheshwaram (PG) 765 kV D/C line along with 1x240 MVAr switchable Line Reactor on Bidar PS end of each circuit.
      iii. 220 kV line bays for interconnection of solar projects (8 nos).
      iv. 1x240 MVAr (765 kV) & 1x125 MVAr (400 kV) bus reactor at Bidar PS.
3. Common transmission system strengthening in Southern Region for enabling evacuation and export of power from Solar & Wind Energy Zones in Southern Region

   i. Upgradation of Tuticorin PS to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x330 MVar Bus Reactor.
   ii. Upgradation of Dhandapuri (Salem New) to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x240 MVar Bus Reactor.
   iii. Upgradation of Madhugiri (Tumkur) to its rated voltage of 765 kV level alongwith 2x1500 MVA transformer and 1x240 MVar Bus Reactor.
   iv. Upgradation/charging of Tuticorin PS - Dhandapuri (Salem New) 765 kV D/c line (initially charged at 400 kV) to its rated voltage of 765 kV along with 1x330 MVar switchable line reactor on both end of each circuit.
   v. Upgradation/charging of Dhandapuri (Salem New) - Madhugiri (Tumkur) 765 kV 2xS/c line (initially charged at 400 kV) to its rated voltage of 765 kV along with 1x330 MVar switchable Line Reactor on Dhandapuri (Salem New) end of each circuit.
   vi. Upgradation/charging of Madhugiri (Tumkur) - Narendra New 765 kV D/c line (initially charged at 400 kV) to its rated voltage of 765 kV along with 1x330 MVar switchable line reactor on both end of each circuit.
   vii. Conversion of 400 kV line reactors installed on 765 kV circuits/ lines (initially charged at 400 kV) mentioned at SI no. iv, v and vi into 400 kV bus Reactor with suitable arrangements at respective substations

4. Transmission System strengthening for controlling fault level at 400 kV bus of Thiruvalam substation

   i. 12Ω, 420 kV fault limiting bus series reactors between:
      a. Bus section-A and bus section-B
      b. Bus Section-B and bus section-C
   ii. Opening of the one of the bus (other than on which fault limiting bus series reactors are being installed) between the above mentioned bus sections through suitable arrangement.
   iii. Bypass of Kolar-Thiruvalam and Thiruvalam-Sriperumbudur 400 kV S/c line to form Kolar – Sriperumbudur 400 kV S/c direct line.

5. Transmission system for controlling High loading of Nellore – Nellore PS 400 kV (Quad) D/c line

   i. Shifting of 125 MVAR and 80 MVAR line reactors at Nellore (PG) on Nellore PS-Nellore(PG) 400kV D/c line with suitable arrangement on Nellore(PG) – Sriperumbudur 400kV D/c line.
   ii. Bypassing Nellore PS – Nellore 400 kV D/c (quad) line and Nellore – Thiruvalam 400kV D/c (quad) line at Nellore (PG) for making Nellore PS – Thiruvalam 400kV D/c (quad) line
New Transmission Schemes in NORTHERN REGION

Following transmission systems have been approved for implementation in 4th NRSCT meeting held on 24.07.2019:

1. Transmission scheme for controlling high loading and high short circuit level at Moga substation

400kV Bus splitting at Moga to be carried out in order to resolve the issues of high short circuit level and high loading levels 400kV

**Bus Section-1**

- 400kV Kishenpur D/c feeders
- 400kV Hisar D/c feeders
- 2 nos. 765/400kV transformers
- 1 No. 50 MVAR 400kV

**Bus Section-2**

- 400kV Jalandhar D/c feeders
- 400kV Bhiwani feeder
- 400kV Fatehabad feeder
- 400kV Nakodar feeder
- 400kV Talwandi Sabo/Malkana Feeder
- 4 nos. 400/220kV transformers
- 1 No. 125 MVAR

2. Construction of 2 nos. of 400 kV bays under ISTS at 765/400 kV PGCIL substation, Varanasi:

- 2 nos 400 kV bays(GIS) at Varanasi (PGCIL) for termination of Varanasi - Jaunpur (UPPTCL) 400kV D/c line

3. Additional 1x500 MVA, 400/220kV Transformer at Amritsar Substation (PG), Balachak:

- 1x500 MVA, 400/220kV Transformer (4th) at Amritsar Substation (PG)

4. Transmission schemes for Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II

   **A. EHVAC Portion**

   i) Establishment of 400/220kV, 4x500 MVA pooling station at suitable location near Ramgarh/Kuchheri in Distt Jaisalmer (Ramgarh-II PS)
ii) Establishment of 400/220kV, 6x500MVA pooling station at suitable location near Bikaner (Bikaner-II PS) with suitable bus sectionalisation at 400 and 220 kV level.

iii) Establishment of 765/400kV, 3x1500MVA substation at suitable location in Narela (near delhi)

iv) Augmentation with 765/400kV, 2x1500MVA transformer (5<sup>th</sup> & 6<sup>th</sup>) at Fatehgarh-II PS

v) Augmentation with 400/220kV, 4x500MVA transformer at Fatehgarh-II PS with suitable bus sectionalisation at 400 and 220 kV level.

vi) Augmentation with 400/220kV, 3x500MVA transformer at Bhadla-II PS with suitable bus sectionalisation at 400 and 220 kV level.

vii) Augmentation with 765/400kV, 1x1500MVA (3<sup>rd</sup>)transformer at Bikaner(PG)

viii) Ramgarh-II PS – Fatehgarh-II PS 400 kV D/c Line (Twin HTLS<sup>$</sup>)

ix) Ramgarh-II PS – Jaisalmer-II (RVPN) 400 kV D/c Line (Twin HTLS<sup>$</sup>)

x) Fatehgarh-II PS – Bhadla-II PS 765kV D/c line (2<sup>nd</sup>)

xi) Bikaner-II PS – Khetri 400kV 2xD/c line (Twin HTLS<sup>$</sup> line on M/c tower)

xii) Khetri - Bhiwadi 400kV D/c line (Twin HTLS<sup>$</sup>)

xiii) Removal of LILO of one circuit of Bhadla-Bikaner(RVPN) 400kV D/c(Quad) line at Bikaner(PG). Extension of above LILO section from Bikaner(PG) upto Bikaner-II PS to form Bikaner-II PS – Bikaner (PG) 400kV D/c(Quad) line

xiv) Khetri - Narela 765kV D/c line

xv) LILO of 765kV Meerut – Bhiwani S/c line at Narela S/s

xvi) Removal of LILO of Bawana – Mandola 400kV D/c(Quad) line at Maharani Bagh/Gopalpur S/s. Extension of above LILO section from Maharani Bagh/Gopalpur upto Narela S/s so as to form Maharani bagh – Narela 400kV D/c(Quad) and Maharani Bagh -Gopalpur-Narela 400kV D/c(Quad) lines.

xvii) LILO of both circuits of Bawana – Mandola 400kV D/c(Quad) line at Narela S/s

xviii) Power reversal on ±500kV, 2500MW Balia – Bhiwadi HVDC line upto 2000MW from Bhiwadi to Balia

xix) 220kV line bays for interconnection of solar projects at Bikaner-II PS (10 nos.), Ramgarh-II PS (7 nos), Fatehgarh-II PS (8 nos) & Bhadla-II PS (4 nos)

xx) 1x125 MVAr (420kV), 2x240 MVAr (765kV) Bus Reactor at Narela Substation

xxi) 2x125 MVAr (420kV) Bus Reactor each at Bikaner-II & Ramgarh-II PS

xxii) 1x240 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-II – Bhadla-II 765kV D/c line (2<sup>nd</sup>)

xxiii) 1x80 MVAr Switchable line reactor for each circuit at each end of Bikaner-II – Khetri 400kV 2xD/c line

xxiv) 1x240 MVAr Switchable line reactor for each circuit at each end of Khetri – Narela 765kV D/c line
Transmission System approved in the 2nd WRSCT, 2nd SRSCT & 4th NRSCT meetings

** Due to space constraints 400kV bays at Bhiwadi S/s to be implemented as GIS

$ with minimum capacity of 2200 MVA on each circuit at nominal voltage

B. HVDC Portion

1) VSC based HVDC system between Bhadla-II PS and suitable location near Modipuram
   i) ±400kV, 5000 MW HVDC terminal at Pooling point near Bhadla-II PS
   ii) ±400kV, 5000 MW HVDC terminal at Pooling point in suitable location near Modipuram
   iii) ±400kV HVDC line (Quad) between Bhadla-II PS and suitable location near Modipuram (on M/c tower)

AC interconnection at Pooling point in suitable location near Modipuram

   i) 5x1500MVA transformer at suitable location (near modipuram)
   ii) Modipuram - Bareily (PG) 765kV D/c line
   iii) Modipuram - Modipuram (UPPCL) 765kV D/c line
   iv) 2x240 MVar (765kV) Bus Reactor at Modipuram Substation
   v) 1x240 MVar Switchable line reactor for each circuit at each end of Modipuram - Bareily (PG) 765kV D/c line