

Central Electricity Authority
Power System Planning & Appraisal-II Division
Sewa Bhawan, R.K. Puram, New Delhi – 110066

No. 51/4/PSPA-II-2015/362-375

Date: 18-Nov-2015

Sub: 39th meeting of the Standing Committee on Power System Planning of Southern Region - **Agenda for the meeting**

Sir,

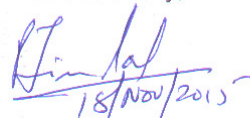
The **39th meeting** of the Standing Committee on Power System Planning of Southern Region **is to be held on 7th (Monday) and 8th (Tuesday) December, 2015** at NRPC Katwaria Sarai, New Delhi. The meeting will commence at 11:00 AM.

This meeting is likely to continue for two days and could be followed by LTA meeting for which agenda will be issued by PGCIL.

Kindly make it convenient to attend the meeting.

The agenda for 39th SCPSPSR is available at CEA's website (www.cea.nic.in).

Yours faithfully,



(Pardeep Jindal)
Director (SP&PA)

(Telephone: 011 26732325, Fax No. 011 26102045)

To

1. The Member Secretary, Southern Regional Power Committee, 29, Race Course Cross Road, Bangalore 560 009. FAX : 080-22259343	2. The Director (Projects), Power Grid Corp. of India Ltd. "Saudamini", Plot No.2, Sector-29, Gurgaon 122 001, Haryana. FAX : 95124-2571932
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2.The Director (Projects), Power Grid Corp. of India Ltd. "Saudamini", Plot No.2, Sector-29, Gurgaon 122 001, Haryana. FAX : 95124-2571932
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3. CEO, POSOCO, B-9, Qutub Institutional Area, Katwaria Sarai, New Delhi-110016	4. The Director (Transmission), Karnataka State Power Trans. Corp.Ltd., Cauvery Bhawan, Bangalore - 560 009. FAX : 080 -22228367
5.The Director (Transmission), Transmission Corp. of Andhra Pradesh Ltd., (APTRANSCO) Vidyut Soudha, Hyderabad – 500 082. FAX : 040-66665137	6. The Director (Grid Transmission and Management), Transmission Corp. of Telangana Ltd., (TSTRANSCO) Vidyut Soudha, Khairatabad Hyderabad – 500 082. FAX : 040-23321751
7. The Director (Trans. & System Op.), Kerala State Electricity Board, Vidyuthi Bhawanam, Pattom, Thiruvananthapuram - 695 004. FAX : 0471-2444738	8. Member (Distribution), Tamil Nadu electricity Board (TNEB), 6 th Floor, Eastern Wing, 800 Anna Salai, Chennai - 600002. FAX : 044-28516362
9. The Director (Power), Corporate Office, Block – I, Neyveli Lignite Corp. Ltd., Neyveli , Tamil Nadu – 607 801. FAX : 04142-252650	10. The Superintending Engineer –I, First Floor, Electricity Department, Gingy Salai, Puducherry – 605 001. FAX : 0413-2334277/2331556
11. Director (Projects), National Thermal Power Corp. Ltd. (NTPC), NTPC Bhawan, Core-7, Scope Complex, Lodhi Road, New Delhi-110003. FAX-011-24360912	12. Director (Operations), NPCIL, 12 th Floor, Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai – 400 094. FAX : 022- 25991258

Copy to:

1.	COO(CTU-Plg), Power Grid Corp. of India Ltd. “Saudamini”, Plot No.2, Sector-29, Gurgaon 122 001, Haryana. FAX : 95124-2571932
2.	GM, SRLDC, 29, Race Course Cross Road, Bangalore 560 009 FAX – 080-22268725

Agenda Note for 39th Meeting of Standing Committee on Power System Planning in Southern Region (SCPSPSR)

Date: 7th December (Monday) and 8th December (Tuesday) **Time:** 11:00AM

Venue: NRPC, Katwaria Sarai

1.0 Confirmation of the minutes of meeting of the Standing Committee

1.1 Confirmation of the minutes of 38th meeting of the Standing Committee on Power System Planning of Southern Region.

The Minutes of 38th meeting of the Standing Committee on Power System Planning of Southern Region held on 07.03.2015, were issued vide CEA's letter No. 51/4/(38th)/ SP&PA-2015/ 731-744 dated 23rd March, 2015.

TANTRANSCO vide their letter No CE/Plg.&.R.C/SE/EE1/AEE1/F.38th Stg Comm Modification/D.172 dated 5.05.2015 gave their observations on section 2.4(ii) regarding provision for 2x125 MVAR, 400kV bus reactor at Udangudi Stage I project and installation of reactor at Thiruvalem end of Thiruvalem-MTPS Stge III 400kV D/C line instead of MTPS stage III end at para 8.3.

Based on these observations a corrigendum to the minutes of 38th SCM was issued vide CEA letter no 51/4/(38th)/SP&PA-2015/1318-27 dated 9th June, 2015 (copy at Annex -1.1).

The minutes of 38th Meeting along with corrigendum given under Annex-1.1, and as circulated, may be confirmed.

1.2 Confirmation of the minutes of Joint meeting of the Standing Committee on Power System Planning of Southern Region and Western Region:

The minutes of **Joint Meeting** of the Standing Committee on Power System Planning of Southern and Western Regions held on 20.04.2015 were issued vide CEA letter No. 51/4/SR-WR/SP&PA-2015/845-867 dated 28th May, 2015.

CTU vide their letter no C/CTU/S/PLG dated 3rd June, 2015 gave their observations on para 5.2 regarding AC system strengthening at Pugalur end.

Based on the above observations a corrigendum to the minutes of the **Joint Meeting** of the Standing Committee on Power System Planning of Southern Region and Western Region was issued vide CEA letter no 52/6/SP&PA-2015/1342-64 dated 10th June, 2015 (copy at Annex- 1.2).

Minutes of the **Joint Meeting** of the Standing Committee on Power System Planning of Southern Region and Western Region along with corrigendum given under Annex-1.2, and as circulated, may be confirmed.

Issues discussed in previous meetings of SCPSPSR

2.0 Connectivity and LTOA for Cheyyur UMPP in Tamil Nadu:

In 38th SCPSPSR, it was decided to get the latest status of generation project from M/s Coastal Tamil Nadu Power Ltd. PGCIL vide their letter no C/CTU/S/PLG dated 5th June, 2015 (Annex-2)., has informed that MoP, Gol has listed Cheyyur UMPP under Plug and Play and proposed to bid out in the FY 2015-16. In this meeting it was also brought out during discussion that “-----we may keep the transmission planning in abeyance for the time being. The transmission that we plan now may have to be revised when the bidding resumes again”. Therefore, it is important to re-plan the transmission system as and when rebidding of generation project is taken.

Members may opine.

3.0 Studies for converting Fixed line reactor into switchable line reactors

PGCIL vide their letter no C/CTU/S/PLG dated 08.05.2015 (Annex -3), has informed that, as discussed in the 38th meeting of SCPSPSR, Dynamic overvoltage(DoV) studies has been carried out considering load throw off at line reactor end which is proposed to be made switchable

The results of Dynamic over voltage studies are tabulated below. From the study results it may be observed that as such for all the proposed lines the Dynamic Over Voltage is within limits even if line reactor is not in service. However in case of Gooty-Bangalore 400kV line(sl.no -9), the Dynamic over voltage is close to design value. Hence, it is proposed that all the line reactors made switchable except for Gooty-Bangalore 400kV line as mentioned below:

S. No	Transmission line	Length	Reactor		DOV				Proposal
			sending end	Receiving end	With Reactor (kV)	With Reactor (p.u)	W/O Reactor (kV)	W/O Reactor (p.u)	

1	Gazwel-Hyderabad II	62.5	-	50	431	1.26	441	1.29	Reactor at Hyderabad end may be made switchable
2	Nellore-Tiruvellam I & II (study has been carried out by switching off reactor at boths ends)	173	50	50	461	1.35	468	1.37	Line Reactor at both ends may be made switchable
3	Sriperumbur-Chittoor	105.7	50		447	1.31	454	1.33	Reactor at Sriperumbur end may be made switchable
4	Thiruvananthapuram - Tirunelveli	160	63		420	1.23	445	1.30	Line Reactor at Thiruvananthapuram end may be made switchable
5	Trichur-Palakkad - I & II	84	50		389	1.14	396	1.16	Already being taken up under SRSS-XX.
6	Udumalpet -Salem II	137	63		400	1.17	411	1.20	Line Reactor at Udumalpet end may be made switchable
7	Madurai-Karaikudi	130	63		441	1.29	446	1.30	Line Reactor at Madurai end may be made switchable
8	Sriperumbadur-SV Chatram	18	50		413	1.21	415	1.21	Line Reactor at Sriperumbadur may be made

									switchable
9	Bangalore-Gooty (study has been carried out by switching off reactor at boths ends)	302	63	63	497	1.45	512	1.50	Line reactor may be retained as fix reactors
10	Kochi-Tirunelveli-I & II (study has been carried out by switching off reactor at boths ends)	231	63	63	457	1.34	482	1.41	Line Reactor at both ends may be made switchable
11	Madurai-Trichy	130	50		455	1.33	470	1.37	Line Reactor at Madurai end may be made switchable
12	Trichy-Nagapattinam I	159	50		456	1.33	466	1.36	Line Reactor at Trichy end may be made switchable
13	Trichy-Nagapattinam -II	159	63		449	1.31	460	1.35	Line Reactor at Trichy end may be made switchable
14	Salem-Hosur II	125	50		447	1.31	454	1.33	Reactor at Salem end may be made switchable

15	Malakaram-Hyderabad-II(Upto LILO point)	28		50	404	1.18	412	1.20	Reactor at Hyderabad may be made switchable
16	Kurnool-Gooty	113		50	439	1.28	451	1.32	Reactor at Gooty may be made switchable

Members may discuss

4.0 Transformer augmentation

- 4.1 In the 38th meeting of SCPSPSR, transformer augmentation at eight nos of 400kV substations were proposed and discussed. After deliberations augmentation at (i) Arasur, (ii) Karaikudi, (iii) Tirunelveli and (iv) Pondicherry were agreed. For the rest of the four locations i.e: (i) Munirabad, (ii) Madhugiri, (iii) Kochin, (iv) Palakkad, it was decided that it will be re-discussed in the next Standing Committee meeting based on input to be provided by KSEB and KPTCL.
- 4.2 KPTCL vide their letter no CEE(P&C)/SEE(plg)/EE(PSS)KCO-97/34319/2015/-16/2305-2306 dated 9th June 2015(Annex- 4.1), has informed that the studies conducted for time frame 2017-18 showed transformer at Munirabad loaded at 12% of its rated MVA capacity, while load of Yelahanka transformers is exceeding 70% of its rated MVA capacity. Thus there is need to augment transformers at Yelahanka instead of Munirabad. CTU vide letter dated 17/9/2015, Annex-4.1.2 has informed that 2x500 MVA, 400/220kV S/S at Yelahanka is under commissioning stage and transmission line works are held up due to severe RoW problem. The requirement of transformer augmentation would be reviewed after its commissioning. However the space for 3rd 500 MVA transformer is available there.
- 4.3 KSEB may respond to transformer augmentation at Kochi and Palakkad.
- 4.4 Considering the load growth potential, augmentation of all transformer capacity in future may be taken as 500MVA transformers.

Members may discuss.

Augmentation of power transformers capacity at 400/220kV Dichpally SS

and 400/220kV Veltoor SS- Proposal by Telangana state

4.4 TSTRANSCO vide their letter dated 20.08.2015(Annex -4.2) has requested for in-principle approval for installation of 1 no of additional 315 MVA, 400/220kV power transformer each at 400/22kV Dichpally SS and 400/220kV Veltoor SS under the proposed 9 hours agricultural power supply scheme to be operational from April 2016.

4.5 TSTRANSCO may present.

Members may discuss

5.0 Change in scope of the schemes (i) “Strengthening of transmission system beyond Vemagiri”, and (ii) “Additional inter-regional AC links for import of power into Southern Region”, being implemented under TBCB

5.1 CEA vide its letter dated 28th August, 2015 (Annex -5.1), has given in-principle approval for the change in scope of these two schemes which are being implemented under TBCB:

(i) Strengthening of transmission system beyond Vemagiri,

(ii) Additional inter-regional AC links for import of power into Southern Region

5.2 The changes in scope of these two schemes would be required mainly because of the following reasons:

a) **Changes in rating (MVAR) of some of the line reactors at various locations due to change in estimated length** of the lines found out after preliminary survey by the BPCs. PGCIL vide their letter no C/CTU/S/PLG dated 15-5-2015(Annex-5.2), have proposed modification in reactive compensation of following schemes/lines, proposed in 37th SCSPSR:

Sl. No.	Transmission line	length	Existing	Modified
1.	Warangal(New)-Hyderabad 765kV DC	160Km	330 MVAR switchable line reactor at Warangal end	240MVAR
2.	Cudadpah-Hoodi 400kV Quad DC	200Km	63 MVAR switchable line reactor at both end	63 MVAR switchable line reactor at

				Hoodi end
3.	Cuddapah – Madhugiri 400kV (quad) D/c	240 Km	80 MVAR switchable line reactor at both ends	50 MVAR switchable line reactor at both ends
4.	Srikaukulam Pooling Station – Garividi 400 kV (Quad) D/c	130 Km	80 MVAR switchable line reactor at Garividi end	No Reactor required.

- b) Inconsistency in the scope of the scheme 'as notified in the gazette' viz- viz the 'scope as agreed in the Standing Committee on Power System Planning in the Southern Region (SCPSPSR)'.
- c) **Difficulty in obtaining Right of Way at existing Hoody 400kV S/S** for the Cuddappah – Hoody 400kVD/c line under scheme.

PGCIL vide their letter no C\CTU-PIg\S\CEA\Hoodi dated 29.04.2015 (Annex- 5.3(i)), has informed that KPTCL is to provide two nos of 400kV line bays along with line reactors at Hoodi, however as per information from PGCIL site office ,space constraint exists for bays at Hoodi.

KPTCL vide their letter no CEE(P&C)/SEE(PIg)/EE(PSS)/KCO-97/34318/2015-16/4372-4375 dated 30th July, 2015(Annex- 5.3(ii)), has informed that 400kV DC Quad line between Hoody and Cuddapah, agreed during the 36th SCPSPSR, is facing RoW problem at Hoody end. Therefore, 400kV connectivity from Cuddapah to any other 400kV SS needs to be explored by conducting detailed studies considering the upcoming 2000MW solar power generation in Tumkur district of Karnataka.

KPTCL has informed that they are constructing a 2X 100 MVA, 220/66kV sub-station at Devanahalli and there is a proposal to establish 2X 100 MVA, 220/66kV sub-station at Aerospace park. Both these substations are located at Bangalore International Airport. There are already two nos of 2X 100 MVA, 220/66kV sub-station at Bangalore International Airport and Hoskote. Hence it is suggested to establish a 400/220kV SS at Devanahalli with a 400kV connectivity at Cuddapah

- d) The suggestion to keep the line bays and switchable line reactors, at Chilakaluripeta end of Warangal – Chilakaluripeta 765 kV D/c line, in the scope of (i) scheme in place of in the scheme(ii), due to ease of implementation and O&M

5.3 The modified scope of the “**Strengthening of transmission system beyond Vemagiri**” (RECTPCL as BPC) scheme is given below:

Scope as per Gazette Notification	Modified Scope
(i) Vemagiri-II – Chilakaluripeta 765kV D/C line with 240 MVAR switchable line reactors at both ends.	(i) Vemagiri-II – Chilakaluripeta 765kV D/C line with 240 MVAR switchable line reactors at both ends of each circuit. (The line bays and line reactors at Chilakaluripeta to be in the scope of TSP and those at Vemagiri end in the scope of CTU).
(ii) Chilakaluripeta – Cuddapah 765kV D/C line with 240 MVAR switchable line reactors at both ends.	(ii) Chilakaluripeta – Cuddapah 765kV D/C line with 240 MVAR switchable line reactors at both ends of each circuit. (The line bays and line reactors at Chilakaluripeta to be in the scope of TSP and those at Cuddapah end in the scope of CTU).
(iii) Chilakaluripeta – Narsaraopeta 400kV (quad) D/C line	(iii) Chilakaluripeta – Narsaraopeta (Sattenapalli) 400kV (quad) D/C line (The line bays at both ends to be in the scope of TSP)
(iv) Cuddapah – Madhugiri 400kV (quad) D/C line with 80 MVAR switchable line reactors at both ends.	(iv) Cuddapah – Madhugiri 400kV (quad) D/C line with 50 MVAR switchable line reactors at both ends of each circuit. (The line bays and reactors at both ends to be in the scope of CTU)
(v) Cuddapah – Hindupur 400kV (quad) D/C line with 80 MVAR switchable line reactors at	

Scope as per Gazette Notification	Modified Scope
<p>Hindupur end.</p> <p>(vi) Srikakulam Pooling Station – Garividi 400 kV (Quad) D/C line with 80 MVA switchable line reactor at Garividi end.</p> <p>(vii) Establishment of 765/400 kV substation at Chilakaluripeta with 2x1500 MVA transformers and 2x240 MVA bus reactors each. Transformers: 765/400 kV, 7 x 500 MVA (One unit spare)</p> <p><u>765 & 400 kV Bay Requirements</u></p> <p>(i) 765 kV line bays at Chilakaluripeta: 4 no.</p> <p>(ii) 765/400 kV Transformer bays at Chilakaluripeta: 2 no.</p> <p>(iii) 400 kV line bays Chilakaluripeta : 2 no.</p> <p>(iv) Space for future 765 kV line bays at Chilakaluripeta: 6 no.</p> <p>(v) Space for future 400 kV line bays at Chilakaluripeta: 8 no.</p> <p>Note:</p> <p>CTU to provide two nos. 765 kV bays at Vemagiri-II Pooling station for Vemagiri-II – Chilakaluripeta 765 kV D/C line</p> <p>CTU to provide requisite no. of 765 kV and 400 kV bays and line reactors for termination of transmission lines at Cuddapah</p>	<p>(v) Srikakulam Pooling Station – Garividi 400 kV (Quad) D/C line (The line bays at Garividi end to be in the scope of TSP and those at Srikakulam Pooling Station end in the scope of CTU).</p> <p>(vi) Establishment of 765/400 kV substation at Chilakaluripeta with 2x1500 MVA transformers and 2x240 MVA bus reactors each. Transformers: 765/400 kV, 7x500 MVA (Single-Phase units with one spare)</p> <p><u>765 kV Bays (at Chilakaluripeta)</u></p> <p>ICT bays : 2 nos. Line bays : 4 nos. 765 kV Bus Reactor Bays : 2 nos. Spare bays (Space) : 6 nos.</p> <p><u>400 kV Bays</u></p> <p>ICT bays : 2 nos. Line bays : 2 nos. Spare bays (Space) : 8 nos.</p> <p>(vii) <u>Note about provision of line reactors and bays:</u></p> <p>a) CTU to provide 2 nos. 765kV line bays along with 240 MVA switchable line reactors at Vemagiri-II Pooling station for termination of Vemagiri-II – Chilakaluripeta 765kV D/c line.</p> <p>b) CTU to provide 2 nos. 765kV line bays along with 240 MVA switchable line reactors at Cuddapah 765/400kV substation for termination of Chilakaluripeta –</p>

Scope as per Gazette Notification	Modified Scope
<p>CTU to provide two nos. 400kV bays & line reactors at Madhugiri 400 kV substation for Cuddapah – Madhugiri 400kV (quad) D/C line</p> <p>CTU to provide two nos. 400 kV bays at Srikakulam 400kV substation for Srikakulam Pooling Station – Garividi 400 kV (Quad) D/C line</p>	<p>Cuddapah 765kV D/c line.</p> <p>c) CTU to provide 2 nos. 400kV line bays along with 50 MVAR switchable line reactors at Cuddapah 765/400kV substation for termination of Cuddapah – Madhugiri 400kV (quad) D/c line.</p> <p>d) CTU to provide 2 nos of 400kV line bays along with 50 MVAR switchable line reactors at Madhugiri 400kV substation for termination of Cuddapah – Madhugiri 400kV (quad) D/c line.</p> <p>e) CTU to provide 2 nos. 400kV line bays at Srikakulam 400kV substation for termination of Srikakulam Pooling Station – Garividi 400 kV (Quad) D/c line.</p> <p>f) APTRANSCO to provide space for 2 no 400 kV line bays at Narsaraopeta (Sattenapalli) 400kV sub- station</p> <p>g) APTRANSCO to provide space for 2 no 400 kV line bays at Garividi 400kV sub-station</p>

Note-1:

- CTU: Central Transmission Utility
- APTRANSCO: AP Transmission Company Limited
- TSP: Transmission Service Provider

Note - 2: The “Cuddapah – Hindupur 400kV (quad) D/C line with 80 MVAR switchable line reactors at Hindupur end” has been given to CTU for implementation under compressed time schedule.

5.4 The modified scope of the “**Additional inter-regional AC links for import of power into Southern Region**” (PFCCCL as BPC) scheme is given below:

Transmission Scheme as per Gazette Notification	Modified Scope
<p>1. Establishment of 765/400kV substations at Warangal (New) with 2x1500 MVA transformers and 2x240 MVA bus reactors</p> <p>Transformers: 765/400 kV, 7x500 MVA (One unit Spare)</p> <p><u>765 & 400 kV Bay Requirements</u></p> <p>(i) 765 kV line bays : 6 no.</p> <p>(ii) 765/400 kV Transformer bays : 2 no.</p> <p>(iii) 400 kV line bays : 2 no.</p> <p>(iv) Space for future 765 kV line bays : 6 no.</p> <p>(v) Space for future 400 kV line bays : 8 no</p>	<p>1. Establishment of 765/400kV substations at Warangal (New) with 2x1500 MVA transformers and 2x240 MVA bus reactors.</p> <p>Transformers: 765/400 kV, 7x500 MVA (Single-Phase units with one spare)</p> <p><u>765 kV & 400 kV Bay Requirements (in Warangal)</u></p> <p>(i) 765 kV line bays : 6 nos.</p> <p>(ii) 765 kV Transformer bays : 2 no.</p> <p>(iii) 400kV Transformer bays : 2 no.</p> <p>(iv) 400 kV line bays : 2 no.</p> <p>(v) Space for future 765 kV line bays : 6 no.</p> <p>(vi) Space for future 400 kV line bays : 8 no</p>
<p>2. Warora Pool – Warangal (New) 765kV D/c line with 240 MVA switchable line reactor at both ends</p>	<p>2. Warora Pool – Warangal (New) 765kV D/c line with 240 MVA switchable line Reactor at both ends of each circuit</p> <p>(The line bays and reactors at both ends to be in the scope of TSP)</p>
<p>3. Warangal (New) –Hyderabad 765 kV D/c line with 330 MVA switchable line reactor at Warangal end</p>	<p>3. Warangal (New) –Hyderabad 765 kV D/c line with 240 MVA switchable line reactor at Warangal end of each circuit.</p> <p>(The line bays and reactors at Warangal end to be in the scope of TSP and the line bays at Hyderabad end in the scope of CTU)</p>
<p>4. Warangal (New) – Warangal (existing) 400 kV (quad) D/c line</p>	<p>4. Warangal (New) – Warangal (Existing) 400 kV (quad) D/c line</p> <p>(The line bays at Warangal (New) end to be in the scope of TSP and the line bays at Warangal (Existing)</p>

Transmission Scheme as per Gazette Notification	Modified Scope
	end in the scope of CTU)
5. Hyderabad – Kurnool 765 kV D/c line with 240 MVAR switchable line reactor at Kurnool end	5. Hyderabad – Kurnool 765 kV D/c line with 240 MVAR switchable line reactor at Kurnool end of each circuit (The line bays and reactors in the scope of CTU)
6. Warangal (New) – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends	6. Warangal (New) – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends of each circuit. (The line bays and reactors at both ends to be in the scope of TSP)
7. Cuddapah – Hoodi 400kV (quad) D/c line with 63 MVAR switchable line reactor at both ends	
<p>Note :</p> <ul style="list-style-type: none"> i) Warora Pool developer to provide space for two nos. 765 kV line bays at Warora Pool for termination of Warora Pool – Warangal (New) 765kV D/c line alongwith 240 MVAR switchable line reactor ii) CTU to provide two nos. 765 kV bays at Hyderabad for termination of Warangal (New) –Hyderabad 765 kV D/c line iii) CTU to provide two nos. 765 kV bays at Hyderabad for termination of Hyderabad – Kurnool 765 kV D/c line iv) CTU to provide two nos. 765 kV line bays at Kurnool for 	<p>7. <u>Note about provision of line reactors and bays</u></p> <ul style="list-style-type: none"> i) Warora Pool developer to provide space for 2 nos. 765 kV line bays at Warora Pool for termination of Warora Pool – Warangal (New) 765kV D/c line with 240 MVAR switchable line reactor ii) CTU to provide 2 nos. 765 kV bays at Hyderabad for termination of Warangal (New) –Hyderabad 765 kV D/c line iii) CTU to provide 2 nos. 765 kV bays at Hyderabad for termination of Hyderabad – Kurnool 765 kV D/c line iv) CTU to provide 2 nos. 765 kV line bays along with 240 MVAR

Transmission Scheme as per Gazette Notification	Modified Scope
<p>Hyderabad – Kurnool 765 kV D/c line with 240 MVAr switchable line reactor at Kurnool end</p> <p>v) CTU to provide four nos. 400 kV bays at Warangal (existing) for Warangal (New) – Warangal (existing) 400 kV (quad) D/c line</p> <p>vi) M/s KPTCL to provide two nos. 400 kV bays at Hoodi for termination of Cuddapah – Hoodi 400kV (quad) D/c line along with 63 MVAr switchable line reactors</p>	<p>switchable line reactor at Kurnool end for Hyderabad – Kurnool 765 kV D/c line.</p> <p>v) CTU to provide 2 nos. 400 kV bays at Warangal (existing) for Warangal (New) – Warangal (existing) 400 kV (quad) D/c line</p>

Note-1:

- CTU: Central Transmission Utility
- APTRANSCO: AP Transmission Company Limited
- TSP: Transmission Service Provider

Note - 2: The “Cuddapah – Hoodi 400kV (quad) D/c line with 63 MVAr switchable line reactors at both end” **has to be reviewed in later stage**, therefore the same is now deleted from the scope of this scheme.

5.5 Members may note.

Transmission planning proposals in Telangana

6.0 Transmission evacuation schemes of Manuguru TPP, Kothagudam TPS Stage- VII.

6.1 TSTRANSCO vide their letter no SE(PS)/ DE(SS<SS)/F. Evacuation /D.No.87/15, dated 26/06/2015 (Annex -6.1) has requested to arrange approval in the Standing Committee meeting for the proposed evacuation schemes of **Manuguru TPP, Kothagudem TPS STg-VII, Damercharela TPP**. Following details are submitted for the transmission scheme:

A) Manuguru(4x270 MW)

- i) Manuguru TSGENCO plant switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose DC line –about 80kms.
- ii) From proposed 400/220kV Bommanapalli SS to existing 400/220kV Khammam(PGCIL) SS with Quad Moose D/c line– about 50kms.

B) KTPS VII(1X800MW) :

- i) KTPS Stage VII switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose DC line.- about 25 kms
- ii) From proposed 400/220kV Bommanapalli SS to upcoming Suryapet 400/220/132kV SS by Quad Moose DC line –about 125kms.
- iii) From proposed 400/220kV Bommanapalli SS to proposed 400/220kV Jangaon SS by Quad DC line –about 120kms.
- iv) From proposed 400/220kV Jangaon SS to proposed 400kV Tippapur LI SS by Quad Moose DC line –about 70kms.
- v) From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Kallur SS by Single Moose DC line-about 70kms.
- vi) From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Pedagogathi SS by Single Moose DC line-about 110kms.
- vii) From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Bommanapalli SS by Single Moose DC line.
- viii) From Proposed 400/220 kV Jangaon SS to Upcoming 220/132 kV Jangaon SS by Single Moose Dc Line – about 15 kms.
- ix) From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Husnabad SS by Single Moose Dc Line – about 60 kms.
- x) From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Bhongiri SS by Single Moose Dc Line – about 70 kms.

The proposed new substations for both Manuguru and KTPS VII:

- i) 400/220 kV Bommanapalli SS with 2 x 315 MVA
- ii) 400/220 kV Jangaon SS with 3 x500 MVA
- iii) 220/132 kV Kallur SS with 2 x 100 MVA
- iv) 220/132 kV Husnabad SS with 2 x 100 MVA

6.2 Further TSTRANSCO vide their letter no SE(PS)/DE(SS<SS)/F.evacuation/D.No.85/15, dated 18.06.2015 (Annex-6.2) has proposed to upgrade 220kV Dindi switching station into 400/220kV conventional SS by April, 2016, to draw about 500 MW to meet the state programme of providing 9 hrs day time agricultural supply. Creation of Dindi 400/220 kV substation and its connectivity line was part of transmission system for Damercharella(2x600+4x800 MW). As Damarcharella Generation cannot be expected by 2016, TSTRANSCO has

proposed to either LILO one circuit of 400kV Srisailam- Mamidipalli line or LILO of 400kV Nagarjuna Sagar-Kurnool ISTS line at the proposed Dindi 400/220kV SS

6.3 Joint studies were carried out with PGCIL and Telangana on 26.06.2015, based on the studies, following has emerged:

- i) Damaracherla (2 x 600 + 4 x 800 MW) generation project is not expected by 2016, as such, it was not considered in the studies
- ii) LILO of 400kV N Sagar- Kurnool line at Dindi is not effective, however LILO of both ckts of 400 kV Srisailam –Mamdipally DC line at Dindi was useful and therefore it is recommended.
- iii) LILO of both circuits of Malkaram- Vijaywada DC line at Suryapeta should be considered, instead of the present one circuit. It was seen that there was a loop flow when LILO of only one circuit was considered.
- iv) Power from both the generation i.e: Manuguru(4x270 MW)+ KTPS VII(1X800MW) are pooled at 400/220kV Bommanapalli SS and proposed to be dispersed through three corridors i) via Jangaon-Tippapur-Hyderabad; ii) via Suryapeta- Hyderabad; iii) via Khammam-Warangal.
- v) Under the outage of Bommanapalli- Jangaon Quad 400kV DC line and without Khammam, the flow on Bommanapalli- Suryapeta Quad 400kV DC line is well within limits (2x664 MW) (Exhibit III).
- vi) Similarly under the outage of Bommanapalli- Suryapeta Quad 400kV DC line, flow on Bommanapalli- Jangaon Quad 400kV DC line , is well within limits (2x589 MW) (Exhibit IV).
- vii) It is seen from above that the outward transmission corridors from Bommanapalli i.e: Bommanapalli- Suryapeta and Bommanapalli- Jangaon are adequate (even under n-1-1 contingency) even without Bommanapalli – Khammam corridor. As such the connection towards Khammam is not necessary. Please refer to Exhibit II, III and IV(without Khammam) viz a viz Exhibit I(with Khammam). Further since Khammam is an ISTS S/S and needed to be discussed with other stakeholders, therefore 400/220kV Bommanapalli to Khammam is not considered in the studies.The connectivity to Khammam can be taken up as additional reliability after discussion in SCPSPSR.
- viii) It is also seen that as both the generation (Manuguru(4x270 MW)+ KTPS VII(1X800MW)) are pooled at Bommanapalli SS, the system

beyond Bommanapalli is common to both Manuguru(4x270 MW) and KTPS VII(1X800MW).

6.4 In principle approval was given by CEA, vide letter no 51/4/SP&PA-2015/1520-21 dated 10.07.2015 (Annex-6.3) for (i) Transmission system for Manuguru(4x270 MW) TPS, (ii) Transmission system for Kothagudem VII (1X800MW) TPS, (iii) Common transmission system for Manuguru(4x270 MW) TPS and (iv) Transmission system for Dindi 400/220kV SS. Accordingly following system is proposed for consideration of SCPSPSR:

- A) Manuguru(4x270 MW) TPS:
 - i) Manuguru TSGENCO plant switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose 400 kV DC line –about 80kms.

- B) Kothagudem VII(1x800MW) TPS:
 - i) KTPS Stage VII switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose 400kVDC line.

- C) Common transmission system for Manuguru(4x270 MW) TPS and Kothagudem VII(1x800MW) TPS:
 - i) From proposed 400/220kV Bommanapalli SS to upcoming Suryapet 400/220/132kV SS by Quad Moose 400kV DC line –about 125 km
 - ii) From proposed 400/220kV Bommanapalli SS to proposed 400/220kV Jangaon SS by Quad Moose 400kV DC line –about 120 km
 - iii) From proposed 400/220kV Jangaon SS to proposed 400kV Tippapur LI SS by Quad Moose 400kV DC line –about 70 km
 - iv) From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Kallur SS by Single Moose 220kV DC line-about 70 km
 - v) From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Pedagopathi SS by Single Moose 220kV DC line-about 110 km
 - vi) From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Bommanapalli SS by Single Moose 220kV DC line.
 - vii) From Proposed 400/220 kV Jangaon SS to Upcoming 220/132 kV Jangaon SS by Single Moose 220kV DC Line – about 15 km
 - viii) From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Husnabad SS by Single Moose 220kV DC Line – about 60 km
 - ix) From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Bhongiri SS by Single Moose 220kV DC Line – about 70 km

The proposed new substations for both Manuguru and KTPS VII:

- a. 400/220 kV Bommanapalli SS with 2 x 315 MVA
- b. 400/220 kV Jangaon SS with 3 x500 MVA
- c. 220/132 kV Kallur SS with 2 x100 MVA

d. 220/132 kV Husnabad SS with 2 x 100 MVA.

D) Dindi 400/220kV SS

i) LILO of both circuits of 400 kV Srisailam –Mamdipally DC line at Dindi 400/220kV S/S

E) Additional System requirement (based on studies)

i) LILO of both circuits of Malkaram- Vijaywada 400kV DC line at Suryapeta 400kV S/S instead of LILO of only one circuit.

6.5 System above is adequate to evacuate power from Andhra Pradesh projects. The connectivity to Khammam is only an additional reliability.

6.6 Members may discuss.

7.0 Transmission evacuation schemes of Damercharela TPP

7.1 TSTRANSCO vide their letter no SE(PS)/ DE(SS<SS)/F. Evacuation /D.No.87/15, dated 26/06/2015 (Annex-6.1) has requested to arrange approval in the Standing Committee meeting for the proposed evacuation schemes of Damercharela TPP. Following details are submitted for the transmission scheme:

Damaracherla (2 x600 + 4 x 800 MW) Power Evacuation Scheme:

i) Proposed Damaracherla Switchyard to Proposed 400/220/132 kV Choutuppal SS by Quad Moose Dc Line – about 150 kms.

ii) Proposed Damaracherla Switchyard to Proposed 400/220kV DindiSS by Quad Moose Dc Line – about 140 kms.

iii) Proposed Damaracherla Switchyard to Proposed 400/220 kV Maheswaram (TSTRANSCO) SS by Quad Moose Dc Line – about 155kms.

iv) Proposed Damaracherla Switchyard to Proposed 400/220kV Jangaon SS by Quad Moose Dc Line – about 155 kms.

V) LILO of both circuits Ssisailan~ - Man~idipalli 400kV Twin Moose DC line to proposed 400/220kV Diudi SS - about 15KM.

v) vi) LTLO of Nagarjuna sagat (Tallapalli) - Kumooi 400kV Twin Moose line to proposed 400/220kV Dindi SS - about 5KM. From Proposed 400/220/132 kV Choutuppal SS to Upcoming 220/33 kV Hayatnagar SS by Single Moose Dc Line – about 50 kms.

The proposed new substations:

i) 400/220 kV Dindi SS with 3 x 500 MVA

- ii) 400/220 kV Choutuppal SS with 3 x500 MVA

7.2 The above system may be firmed up after appropriate studies. Members may discuss. Dindi S/s is to be advanced and linked with Manuguru and Kotagudum system as given in preceding agenda. .

8.0 Palamur-Ranagareddy Lift Irrigation Scheme with 2548 MW Load.

8.1 TSTRANSCO vide their letter no SE(PS)/ DE(SS<SS)/F. Evacuation /D.No.87/15, dated 26/06/2015 (Annex-6.1) has requested to arrange approval in the Standing Committee meeting for the following proposed evacuation schemes of Palamaru- Ranga Reddy Lift Irrigation scheme

400kV Transmission lines

- i) Proposed 400/220kV Maheswaram (TSTRANSCO) SS to Existing 400/220kV Veltoor SS by Quad Moose Dc Line – about 137 kms.
- ii) Proposed 400/220kV Maheswaram (TSTRANSCO) SS to Proposed 400 Parigi LI SS by Quad Moose Dc Line – about 120 kms.
- iii) Existing 400/220 kV Veltoor SS to Proposed 400 kV Madaram LI SS by Quad Moose Dc Line – about 78 kms.
- iv) Proposed 400 kV Madaram (Dhanwada Mandal) LI SS to Proposed 400 kV Nancharlakota LI SS by Quad Moose Dc Line – about 54 kms.
- v) Proposed 400 kV Nancharlakota LI SS to Proposed 400 kV Parigi LI SS by Quad Moose Dc Line – about 42 kms.

The proposed new substations:

- i) 400 kV Madaram LI SS.
- ii) 400 kV Nancharlakota LI SS
- iii) 400 kV Parigi SS
- iv)

8.2 **All 400kV S/s shall have 125MVAR bus reactors. The new 400kV S/s may be designed for 50 KA fault level strength.**

Both the generating stations need to provide 125MVAR bus reactors to absorb reactive power under light load condition for more stable operation of the generating units.

8.3 Members may discuss.

9.0 Power Evacuation scheme for Telangana STPP Phase-I (2X 800 MW)

- 9.1 NTPC vide their letter dated 31.07.2015 (Annex -9) has proposed to establish Telangana STPP Phase-I (2X 800 MW). These two units will be set up in the available land near Ramagundam STPP (RSTPP).

Telangana STPP Phase-I envisages a 400kV GIS switchyard with provision of 4 nos of 400kV line bays in generation switchyard. For start up power and project commissioning requirements, interconnection with existing 400kV switchyard of RSTPP has been proposed.

NTPC has also informed that Telangana TRANSCO is intending to execute the ATS of the project. NTPC has stated that tendering for various packages for the project has been completed and since Telangana STPP Phase-I is in the vicinity of RSTPP, the transmission line corridor may be planned, in association with PGCIL, keeping in view the existing nearby lines

- 9.2 ATS for Telangana STPP Phase-I (2X 800 MW) is awaited from Telangana TRANSCO. Further the short circuit level at Ramagundam 2019-2020 conditions is 38kA which would increase to about 45kA with connectivity of these Telangana units.

Members may discuss.

10.0 Provision of 315 MVA, 400/220kV in place of 200MVA, 400/132kV failed Power Transformer at NTPC Ramagundam

- 10.1 TSTRANSCO vide their letter no SE(PS)/DE(SS<SS) /F. Evacuation/D.No.131/15, dated 13/08/2015 (Annex-10) has proposed restoration of 200 MVA,400/132kV failed Power transformer with 315 MVA,400/220kV power transformer at NTPC Ramagundam. TSTRANSCO has suggested to spare one 315 MVA, 400/220kV transformer, modify the 132kV bay by providing required equipment by TS Transco and also modify 132kV lines.

- 10.2 TSTRANSCO may present. Members may discuss.

11.0 Reconductoring of 400kV transmission lines from Maheshwaram and Dichipally 765/400kV S/S of PGCIL

- 11.1 TSTRANSCO vide their letter dated 28.04.2015(Annex- 11), has proposed that the Twin Moose line between Maheshwaram 765kV PGCIL SS- Maheshwaram 400kV TS SS and Dichipally 765kV PGCIL SS- Dichipally

400kV TS SS needs to be enhanced to Quad Moose lines.

11.2 TSTRANSCO may present. Members may discuss.

12.0 Grant of LTA to Telangana State Southern Power Distribution Company Ltd. (TSSPDCL) for 2000 MW from Chhattisgarh to Telangana State DISCOMs

12.1 POWERGRID has informed that (Annex -12) Telangana State Southern Power Distribution Company Ltd. (TSSPDCL) has applied for LTA of 2000 MW in the month of February, 2015 for evacuation of 1000 MW power from Marwa Thermal power Station (Marwa TPS) and another 1000 MW power from other generating stations in Chhattisgarh i.e. total 2000 MW to the DISCOMs of Telangana namely Southern Power Distribution Company of Telangana Ltd. (TSSPDCL) & Northern Power Distribution Company of Telangana Limited (TSNPDCL) Details of application are as below.

Sl. No	Applicant	Location	Date of Application	Start Date of LTA	LTA Sought (MW)
1.	Telangana State Southern Power Distribution Company Ltd. (TSSPDCL)	1000 MW at Marwa STPP connected to STU & 1000 MW CSDCL, Chattisgarh	Feb, 2015	01.03.2015	2000

12.2 For grant of this LTA no additional transmission system is envisaged. The same may be granted on the existing/under construction and already planned transmission system. The detailed discussion on the subject matter will be taken up during LTA meeting.

Transmission planning proposals in AP

13.0 Transmission system for evacuation of power from 400kV ring main around the proposed capital city

13.1 APTRANSCO vide their letter No CE(PS)/SE(SP)/ADE-2/F.VTS-V& Inavolu/D.No.79/2015 dated 8.5.2015 (Annex-13.1), submitted the following dedicated transmission scheme for power evacuation from proposed 1 x 800 MW power plant of APGENCO at Vijayawada and 400kV ring around capital city:

I. Scheme for evacuation of 1 x 800 MW power plant of APGENCO at Dr.NTTPS,Vijayawada.

i) Proposed 400 kV VTS – Sattenapalli Quad Moose DC line (60 KM approx.).

II. Scheme for 400kV ring around capital city

i) Erection of 400/220/132 kV Gudiwada SS with 2 x 315 MVA PTRs.

ii) 400 kV LILO (10.5 KM approx.) of existing 400 kV Vemagiri– Sattenapalli Gudivada 400/220/132kV, 2x500MVA substation

iii) 400 kV Bus extension at proposed 765/400 kV Chilakaluripet (PGCIL) SS for erection of 400/220 kV Chilakaluripet SS with 2 x 315 MVA PTRs after the construction of proposed 765/400 kV Chilakaluripet (PGCIL) SS.

iv) Erection of 400/220 kV Inavolu/Thullur SS with 2 x 315 MVA PTRs.

v) 400 kV LILO (1.5 KM approx.) of existing 400 kV VTS – Sattenapalli DC line at proposed 400/220 kV Inavolu/Thullur SS.

vi) 400 kV QM DC line (90 KM) from proposed 400kV Chilakaluripet SS to 400kV Podili SS after the construction of proposed 765/400 kV Chilakaluripet (PGCIL) SS.

vii) 400 kV QM DC line (103 KM) from proposed 400kV Chilakaluripet SS to 400kV Gudiwada SS.

viii) Erection of 220/132 kV Chilakaluripet SS with 2 x 100 MVA PTRs.

ix) 220 kV DC line (20 KM approx.) from proposed 220/132 kV Chilakaluripet SS to 400/220 kV Chilakaluripet SS.

x) Up-gradation of existing 132/33 kV Tadepalli SS to 220/132/33 kV Tadepalli SS with 2 x 100 MVA PTRs.

xi) 220 kV DC line (11 KM approx.) from proposed 220/132 kV Tadepalli SS to 400/220 kV Inavolu/Thullur SS.

xii) 220 kV DC LILO (3 KM approx.) of existing 220 kV Nunna – Gudivada DC line at proposed 400/220/132 kV Gudivada SS.1

- xiii) 132 kV LILO (4 KM approx.) of existing 132 kV Kanumolu-Pamaru at proposed 400/220/132 kV Gudivada SS.
- xiv) 132 kV LILO (10.5 KM approx.) of existing 132 kV Chilakaluripeta – Nallapadu at proposed 220/132 kV Chilakaluripet SS
- xv) 132 kV LILO (10.5 KM approx.) of existing 132 kV Chilakaluripeta – Marrisalem at proposed 220/132 kV Chilakaluripet SS.

13.2 A joint study was conducted with CEA, PGCIL and APGENCO for evolving transmission system for power evacuation from proposed 4000 MW power plant by NTPC at Pudimadaka, 400 kV ring around capital city and proposed 400 kV substation at Thullur/Inavolu. The studies were carried out for 2019-20 timeframe considering a load of 12000 MW. After discussion with the APGENCO officials, 4000 MW Polaki, 1x800 MW VTS and Pudimadaka 5x800 MW were dropped from the studies as they were expected to come beyond 13th Plan.

13.3 Thus the following system was evolved for 400 kV ring around the capital city.

I) Elluru 400/220 kV substation, 2x315 MVA (To be upgraded to 765 kV with Pudimadaka) :

- i) Keep provision for 400/220 kV transformer with 2x500 MVA rating for future use.
- ii) Existing 132 kV Elluru to be upgraded to 220kV and will be connected with Elluru 400/220kV S/S.
- iii) Provision of D/C 220kV outlet from Elluru 220kV S/S.
- iv) LILO of Vemagiri-I Sattenpali 400 kV DC twin lines at Elluru 400 kV substation

II) Gudivada 400/220/132 kV, 2x500 MVA substation.

- i) LILO of existing Nunna- Gudiwada 220kVDC line at Gudiwada 400/220/132kV.
- ii) LILO of 220kV Gudiwada- Gudiwada 400/220/132kV DC line at Gannavaram.
- iii) Gudiwada 400/220/132kV- Machhliapatnam 220kV DC line.
- iv) Elluru - Gudivada 400 kV DC Quad line.
- v) Gudivada – C Peta 400 kV DC Quad line.

III) Sattenpalli 400/220kV S/S

- i) 2 x 315 existing transformer to be augmented by 2 x 500 MVA substation.
- ii) Sattenpalli- Guntur 220kV DC line.

IV) 400/220kV substation at CPeta by APTRANSCO – as a new substation close to 765/400kV CPeta (under ISTS) or as 400kV bus extension at proposed 765/400kV CPeta (ISTS) for erecting CPeta 400/220 kV, 2x500 MVA transformer

- i) CPeta 220/132kV, 2x100 MVA S/S.
- ii) 220kV DC line from CPeta 220/132kV to CPeta 400/220 kV.
- iii) 2 nos of 220kV DC line for future from CPeta 400/220 kV
- iv) LILO of Sattenpalli - VTS 400 kV DC line at Inavolu

V) Inavolu 400/220 kV, 2x500 MVA substation.

- i) Existing 132/33kV Tadepalli to be upgraded to 220/132/33 kV Tadepalli and further 220kV DC line to Inavolu.
- ii) 220kV DC line to Malkapuram.
- iii) 220kV DC line to Amravati.
- iv) Erection of 220/132/33 kV Amaravathi SS with 2 x 160 MVA PTRs.
- v) 220 kV DC line (14 KM) from proposed 400/220 kV Inavolu SS to proposed 220/132/33 kV Amaravathi SS.
- vi) 220 kV LILO (4 KM) of existing 3rd circuit of VTS – Tallapalli line at proposed 220/132/33 kV Amaravathi SS.
- vii) Erection of 220/132/33 kV Malkapuram SS with 2 x 100 MVA PTRs.
- viii) 220 kV DC line (6 KM) from proposed 400/220 kV Inavolu SS to proposed 220/132/33 kV Malkapuram SS.
- ix) 220 kV DC line (12 KM) from proposed 220/132/33 kV Tadepalli SS to proposed 220/132/33 kV Malkapuram SS.
- x) 220 kV DC LILO (5 KM) of existing VTS – Podili line at proposed 220/132/33 kV Malkapuram SS.

- xi) Up-gradation of 132/33 kV Repalle SS to 220/132/33 kV Repalle SS with 2 x 100 MVA PTRs.
- xii) 220 kV DC line (60 KM) from proposed 220/132 kV Guntur-2 SS to proposed 220/132/33 kV Repalle SS.
- xiii) Erection of 132/33 kV Amaravathi SS with 2 x 50 MVA PTRs.
- xiv) 132 kV DC line (5 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Amaravathi SS.
- xv) Erection of 132/33 kV Achampeta SS with 2 x 50 MVA PTRs.
- xvi) 132 kV DC line (32 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Achampeta SS.
- xvii) Erection of 132/33 kV Dondapadu SS with 2 x 50 MVA PTRs.
- xviii) 132 kV DC/SC line (15 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Dondapadu SS.
- xix) 132 kV DC/SC line (11 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Dondapadu SS.
- xx) Erection of 132/33 kV Peddaparimi SS with 2 x 50 MVA PTRs.
- xxi) 132 kV DC/SC line (19 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Peddaparimi SS.
- xxii) Erection of 132/33 kV Navuluru SS with 2 x 50 MVA PTRs.
- xxiii) 132 kV DC/SC line (12 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Navuluru SS.
- xxiv) 132 kV DC/SC line (16 KM) from proposed 132/33 kV Peddaparimi SS to proposed 132/33 kV Navuluru SS.
- xxv) Erection of 132/33 kV Uddandrayanipalem SS with 2 x 50 MVA PTRs.
- xxvi) 132 kV DC/SC line (3 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Uddandrayanipalem SS.
- xxvii) 132 kV DC/SC line (7 KM) from proposed 132/33 kV Dondapadu SS to proposed 132/33 kV Uddandrayanipalem SS.
- xxviii) Erection of 132/33 kV Krishnayanipalem SS with 2 x 50 MVA PTRs.
- xxix) 132 kV DC/SC line (6 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Krishnayanipalem SS.
- xxx) 132 kV DC/C line (3 KM) from proposed 132/33 kV Navuluru SS to proposed 132/33 kV Krishnayanipalem SS.

13.4 Study is enclosed at Annex- 13.2..

All 400kV S/s shall have 125MVAR bus reactors. The new 400kV S/s may be designed for 50 KA fault level strength.

The VTPS extn generating stations need to provide 125MVA bus reactors to absorb reactive power under light load condition for more stable operation of the generating units.

Members may discuss

14.0 Transmission system for evacuation of power from 4000MW power plant at Pudimadaka and 4000MW power plant of APGENCO at Polaki

14.1 APTRANSCO vide their letter dated 08.06.2015 (Annex-14.1), has submitted that NTPC has proposed 4x1000MW super critical TPS at Pudimadaka with 85% share of Andhra Pradesh with the following transmission system

- i) 765 kV Hexa zebra S/c line from Polaki 765 SS to Srikakulam 765/400KV SS of PGCIL
- ii) 765 kV Hexa zebra DC line from Polaki 765 SS to Pudimadaka 765/400KV SS.
- iii) 400KV Quad moose D/c line from Polaki 765 KVSS to Tekkali 400/220 KV SS.
- iv) 400 KV Quad moose D/c line from Polaki 765 KVSS to Garividi 400/220 KV SS.
- v) 400 KV Twin moose D/c line from Palasa 765 KVSS to Tekkali 400/220 KV SS.

- vi) 765/400 KV substation at Pudimadaka ,Visakhapatnam Dt.
- vii) 400/220 K SS at Koruprolu/Pudimadaka Vizag.
- viii) Laying of 400 KV Quad moose D/c line from Pudimadaka 765 KVSS to Koruprolu/Pudimadaka 400/220 KV SS.
- ix) 765/400 KV substation at Eluru ,West Godavari Dt .
- x) 765 kV Hexa zebra DC line from Pudimadaka 765 SS to Eluru 765/400KV SS.
- xi) 765 kV Hexa zebra DC line from Eluru 765 SS to Nellore 765/400KV SS of PGCIL.
- xii) 765 kV Hexa zebra **D/C line from Eluru 765 SS to Chilakaluripeta** 765/400KV SS of PGCIL.

- xiii) 400KV Quad moose D/c line from Eluru 765 KVSS to KV Kota 400/220 KV SS.
- xiv) 400KV Quad moose D/c line from Eluru 765 KVSS to Gudivada 400/220 KV SS

14.2 NTPC vide their letter no Cc:PEE:9591/ATS dated 01.05.2015 has submitted various power evacuation options from Pudimadaka. (letter at Annexure-14.2)

14.3 A joint study was conducted with CEA, PGCIL and APTRANSCO for evolving transmission system for power evacuation from proposed 4000 MW power plant by NTPC at Pudimadaka. Accordingly the elements from no.vi to xiv were considered in studies for Pudimadaka. APTRANSCO may present the proposal, PGCIL may supplement.

The Pudimadaka generating station needs to provide 2x240 MVAR bus reactors for 4000MW capacity to absorb reactive power under light load condition for more stable operation of the generating units.

14.4 4000MW power plant of APGENCO at Polaki was not considered as it is expected to come after 13th Plan.

14.5 For study please refer Annex- 13.2.

Members may discuss.

15.0 Issues regarding power supply under VCIC (Vizag Chennai Industrial Corridor) scheme

15.1 To M/s Sricity SEZ : APTRANSCO vide their letter dated 06.07.2015(Anenx-15.1), has approved the following dedicated transmission scheme for providing power supply to M/s Sricity SEZ under VCIC scheme and also to meet the up-coming loads in and around Chittoor district:

- i) Up-gradation of 220/132KV Rachagunneri SS to 400/220/132KV SS Rachagunneri with 2 x 315 MVA.
- ii) 400KV QMDC LILO of (45KM) 400KV SS Chittoor – 400KV APGENCO Krishnapatnam.
- iii) Up-gradation of 132/33KV Cherivi SS to 220/132/33KV Chervi SS with 2 x 160 MVA.

- iv) Erection of 220 KV DC line (50KM) from 400KV SS Rachagunneri to 220KV SS at Chervi in Chittoor district.
- v) Erection of 220KV DC line (30KM) from 220KV SS Sulluripet to 220KV SS Chervi in Chittoor District.
- vi) Erection of 132/33KV SS at Yerpedu with 2 x 80MVA.
- vii) Erection of 132KV DC line (5KM) from 400/220/132KV SS at Rachagunneri SS to proposed 132KV Yerpedu SS.

APTRANSCO may present and Members may discuss.

15.2 **Load demand by M/s APIIC :** APTRANSCO vide their letter dated 06.08.2015 (Annex-15.2), has proposed the following dedicated Transmission Scheme to meet the load demand of 200MW proposed by M/s APIIC at Menakur/Naidupet area under VCIC scheme and also to meet the up-coming loads in and around Chittoor district.

- i. Up-gradation of existing 132/33 kV Menakuru SS to 220/132/33 kV Menakuru SS with 2 x 100 MVA PTRs.
- ii. 220 kV DC line (40 KM) from proposed 400/220/132 kV Rachagunneri SS to proposed 220/132/33 kV Menakuru SS.
- iii. 132 kV LILO (15 KM) of existing 132 kV Naidupet – Gudur line to proposed 220/132/33 kV Menakuru SS.

APTRANSCO may present and Members may discuss.

16.0 Evacuation of Power from N. P. Kunta Solar Park(Part-B):

- 16.1 POWERGRID vide their letter C./CTU-Plg/s/NP-Kunta dated 3-6-2015 (Annex-16.1) has proposed that part of Cuddapah – Hindupur 400kV D/c line from Cuddapah end to LILO point be planned for completion matching with N. P. Kunta Solar Park Part-B by Dec 2016 and this shall be joined with LILO portion of the planned evacuation system of power from N. P. Kunta Solar Park(Part-B). The balance line portion of Cuddapah – Hindupur line shall be completed later in about 28 months of time frame. PGCIL also proposed to prepone the associated 2 nos. of 400kV bays at 400kV GIS S/s at Cuddapah in Dec 2016.
- 16.2 POWERGRID informed that construction of Cuddapah – Hindupur line shall take about 28 months (October 2017), whereas LILO of the same line is to completed by Dec 2016. Hence, considering the urgency of implementation of

N .P. Kunta transmission system, PGCIL has requested the in-principle approval for this scheme may be accorded.

- 16.3 In this regard, it may be noted that the implementation of Cuddapah – Hindupur 400kV D/c quad line is inter-alia in the scope of the ‘System Strengthening –XXIV in Southern Region (SSSR-XXIV)’ scheme. LILO of both circuits of Cuddapah – Hindupur 400kV D/c line at N.P.Kunta is inter-alia in the scope of the scheme ‘Transmission system for Ultra Mega Solar Park in Anantpur District, Andhra Pradesh- Part ‘B’ Phase-II (750 MW).
- 16.4 The above proposal is regarding taking up some portion of the two schemes on priority and implementing the remaining portion subsequently, as such, it does not result in any change in the final network topology. In view of this, CEA has given ‘no objection’ for PGCIL(Annex 16.2) to take up the above proposal i.e. implementing a part of Cuddapah – Hindupur line (i.e. from Cuddapah to LILO point for N.P.Kunta) and a part of LILO of both circuits of Cuddapah –Hindupur at N.P.Kunta (i.e. only one D/C out of the 2xD/c lines required for LILO at N. P. Kunta) initially, and the remaining parts of the two schemes as per their compressed time schedules.
- 16.5 PGCIL is to ensure that the above proposal do not result in any loss of reliability for evacuation of 1000 MW from N.P. Kunta Solar Park which is expected in Phase-I and Phase –II.
- 16.6 Members may note.

17.0 Cuddapah 765/400kV substation under System Strengthening –XXIV in Southern Region:

- 17.1 POWERGRID vide their letter. C/CTU/S/PLG dated 9-4-2015(Annex-17.1) has proposed CEA to give in-principle clearance for adoption of GIS at Cuddapah for proposed 400kV expansion. The Cuddapah 765/400kV substation under the scheme “System Strengthening –XXIV in Southern Region” was agreed in the 37th Standing Committee Meeting on Power System Planning of Southern Region held on 31st July, 2014 at NRPC, New Delhi except for the GIS type S/S at Cuddapah instead of AIS type as earlier agreed. The issue of GIS at 765/400kV substation at Cuddapah was discussed in the 38th meeting of SCPSPSR held on 7 March, 2015 and it was agreed to implement the 765kV part as GIS and the augmentation of 400kV part as AIS for the Cuddapah 765/400kV S/s.

- 17.2 POWERGRID vide their letter dated 09-4-2015 has informed that considering the high fault level at Cuddapah and requirement of series reactor in future, it would not possible to accommodate 400kV substation as AIS. The land available at Cuddapah substation is suitable and sufficient for establishing new 765kV and 400kV as GIS
- 17.3 POWERGRID further stated that the project is to be taken up under compressed time schedule and the proposed change is only a minor modification to already approved scheme, therefore, has requested CEA to give in-principle clearance for adoption of GIS at Cuddapah for proposed 400kV expansion. POWERGRID has also submitted that any 400kV spare bay in AIS/GIS due to adoption of GIS shall be considered for utilization as per requirement in future. Considering the above, CEA vide its letter 51/4/(38th)/SP&PA-2015/1074 dated 7-5-2015(Annex-17.2) have conveyed 'in-principle' approval for adoption of GIS at Cuddapah for proposed 400kV expansion.
- 17.4 Members may note.
- 17.5 PGCIL to submit a comprehensive proposal for provision of series reactor in Southern Region to control short circuit level and would be put for discussion in next meeting of the SCPSPSR. However with cancellation of Cuddapah – Hoodi 400kV (quad) D/c line, earlier proposed under Additional inter-Regional AC link for import into Southern Region i.e. Warora – Warangal and Chilakaluripeta - Hyderabad - Kurnool 765kV link, short circuit level is not so critical the same would be put up with system growth.

18.0 Constraints in 400kV bays extension at 400kV Vemagiri substation

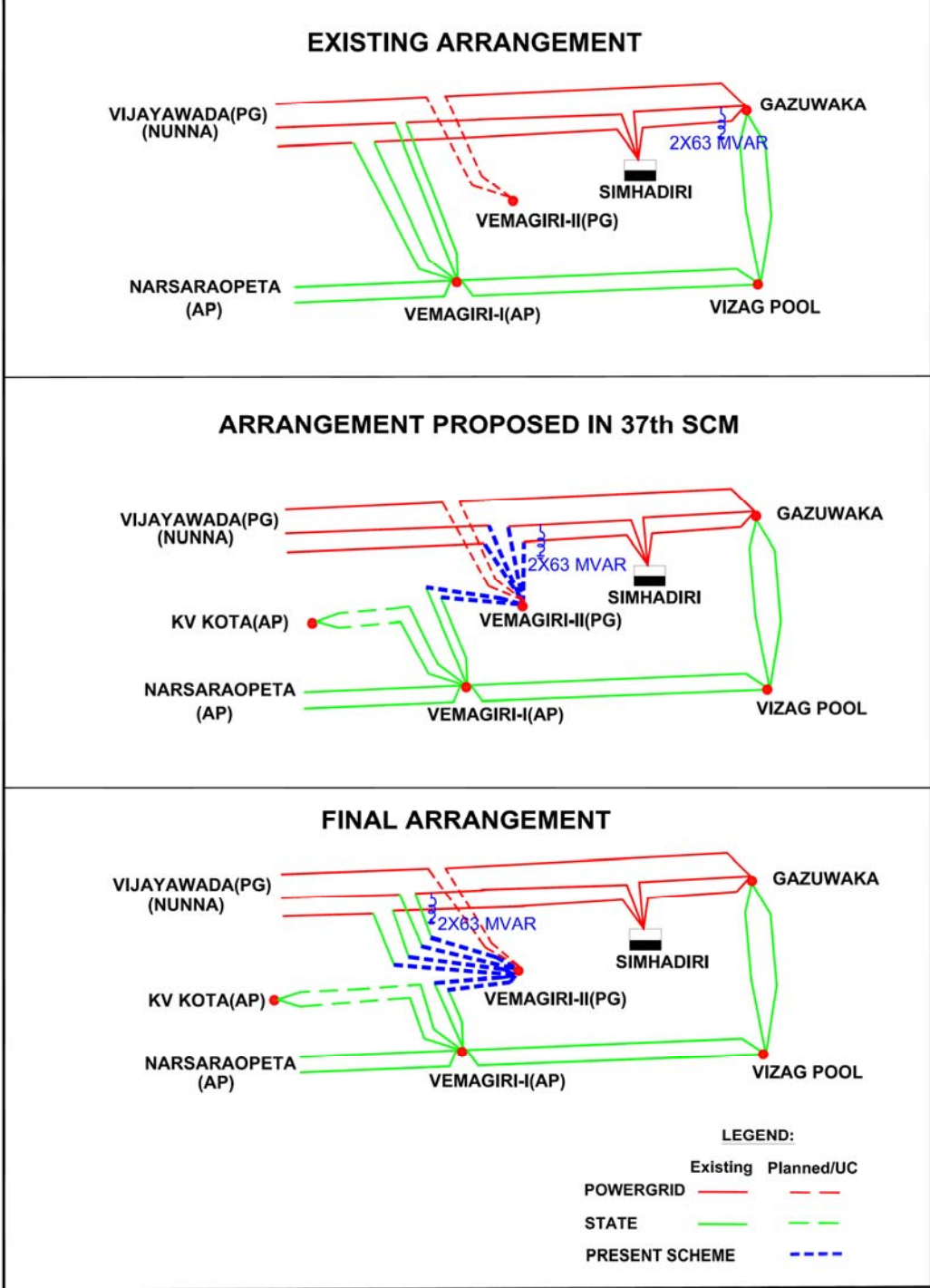
- 18.1 During the 37th SCPSPSR following scheme was agreed
- i) LILO of both circuits of Gazuwaka/Simhadri-II – Vemagiri(AP) 400kV D/C line at Vemagiri-II.
 - ii) Straighten Nunna- Gazuwaka 400kV D/C line (by disconnecting the LILO at Vemagiri-I) so as to make Nunna – Vemagriri-II 400 D/C link
 - iii) Use one LILO D/C portion (of Gazuwaka-Nunna at Vemagiri-I) to connect with K.V. Kota. APTARNSCO is implementing KVKota-Vemagiri 400 kV DC line agreed 36th meeting.
 - iv) Second LILO D/C portion to be extended to Vemagiri-II (by PGCIL)
- 18.2 PGCIL vide their letter no C/CTU/S/PLG dated 15.5.2015 (Annex-18) has informed that while carrying out the field survey it was observed that

interconnection of Simhadri- Vemagiri II could be achieved by LILLOing the LILO portion of Vijaywada- Simhadri 400kV DC line at Vemagiri-I. Accordingly following has been proposed by CTU

- i. Both circuits of one LILO D/c portion of Simhadri- Vijayawada 400kV line at Vemagiri-I(AP) shall be LILLOed at Vemagiri-II(PG) resulting in
 - o Simhadri-Vemagiri-II (PG) 400kV S/c line
 - o Vemagiri-II (PG)- Vijaywada 400kV S/c line
 - o Vemagiri-II (PG)-Vemagiri-I(AP) 400kV D/c line
- ii. Both circuits of Second LILO D/c portion of Simhadri-Vijayawada 400kV line at Vemagiri-I(AP) shall be Looped in at Vemagiri-II(PG). There shall be No Loop out. The open section of 400kV D/c line from Vemagiri-I(AP) shall be used for termination of KV Kota line resulting in
 - o Simhadri-Vemagiri-II (PG) 400kV S/c line
 - o Vemagiri-II (PG)- Vijaywada 400kV S/c line
 - o Vemagiri-I(AP)-KV Kota 400kV D/c line

The Schematic is depicted below

Constraints in 400kV bay extensions at 400kV Vemagiri S/s



18.3 PGCIL may present. Members may take note.

19.0 M/s Andhra Cements Ltd-Durga Cement Works- 30MW Captive power plant at Gamalapadu (V), Dachepalli (M), Guntur Dist.

19.1 APTRANSCO vide their letter no ED/HRD&PIg/DE-Comml/ADE-Con/F:Andhra Cement/D.No.163/15 dated 18.3.2015 ((Annex-19) has informed that M/s Andhra Cements Ltd has proposed to construct 30MW Captive power plant at Durgapuram, Dachepalli (M), Guntur Dist and wanted to connect to

APTRANSCO grid.

- 19.2 APTRANSCO has advised M/s Andhra Cements Ltd to construct 132kV switching station by making double LILO of circuits of 132kV Wadapalli-Tangeda lines and 132kV Wadapalli- Piduguralla lines at M/s Andhra Cements Ltd.
- 19.3 132kV Wadapalli- Tangeda lines and 132kV Wadapalli- Piduguralla lines are ISTS lines between Andhra Pradesh and Telangana.
- 19.4 APTRANSCO may present. Members may discuss.

20.0 LILO of 400kV Vemagiri- Nunna DC at 400kV Sattenapally

- 20.1 APTRANSCO vide their letter no Dir(Proj)/F.No.SRLDC Letters/2015 dated 15.10.2015 (Annex-20) has informed that due to non adequate loads at 400kV Sattenpally, only one circuit of 400kV Vemagiri- Nunna DC line was LILOed at 400kV Sattenpally, instead of the earlier agreed LILO of both circuits. Accordingly 400kV Vemagiri- Sattenpally was charged on 12.10.2015.
- 20.2 APTRANSCO has informed that SRLDC is not permitting AP to charge Nunna-Sattenpally 400kV line as they do not have changes contemplated in this scheme.
- 20.3 APTRANSCO may present. Members may discuss.

Transmission planning proposals in Karnataka

21.0 Modification in scope of transmission schemes of KPTCL for renewable energy generation projects to be taken up for KfW funding

- 21.1 During 36th Standing Committee Meeting on Power System Planning of Southern Region, the following System for RE projects in Karnataka was agreed:

1	Dhoni: Establishment 2x500MVA, 400/220kV Station along with associated Transmission lines as noted below; a) By LILO'ing the existing S/C 400 KV line running between 400 KV station at Davanagere and Guddadahally. b) By LILO'ing the existing 220KV D/C line running between 220 KV station at
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	Gadag and Lingapur to the proposed 400/220 KV station at Dhoni.
2	Shivanasamudram: Establishment 2x100MVA, 220/66kV Station along with associated Transmission lines noted below: a) By LILO'ing the existing 220 KV D/C line running between 220 KV stations at T.K.Hally and Madhuvinahally. b) Conversion of existing 220 kV Hootagally – Vajamangala – T.K. Halli S/C line to D/C line with Drake conductor – (associated transmission system strengthening)
3	Hosadurga: Establishment 2x100MVA, 220/66kV Station along with the associated Transmission lines
4	Running of 220kV D/C line between 220kV Stations at Gadag and Bagalkote & LILO of one of the existing 220kV D/C line running between 220kV Stations at Bidnal and Lingapur.
5	Conversion of existing 220kV SC line to 220kV DC line running between 220 KV stations at Guttur and Chitradurga.
6	Conversion of the existing 220kV SC line to 220kV DC line running between 220 KV stations at Chitradurga and Hiriyur together with running of 2 nd 220 KV S/C line between 400/220 KV & 220/66 KV stations at Hiriyur.
7	LILO'ing of one of the circuit of the existing 220KV DC line running between 220 KV stations at Narendra and Haveri to 220 KV station at Bidnal.
8	Conversion of the existing 66kV D/C line equipped with 'Coyote ACSR' to Drake ACSR' between 66kV stations at Sakalespura and 220kV station at Hassan.

21.2 **From the proposal submitted by KPTCL, it was worked out that a total of 4070 MW of RE Generation would be available by 2018-19.** Out of which 1343 MW is already connected, details of which are given below:

i. In /around Mughalkod

- a. 240 (160+80) MW of wind generation are proposed to be connected to 220kV Athani s/S

- b. 92 MW is proposed to be connected to 220kV Chikkodi
 - c. About 110 MW of wind generation are proposed in 110kV downstream of 220 kV Chikkodi, Ghatprabha, Belgaum
 - d. Some 418 MW are connected in 110 kV downstream of Chikkodi, Ghatprabha, Belgaum, Athani, Mahalingpur and Kudachi
- ii. **In/around Jagalur**
- a. 177(93+84) MW of wind generation are proposed to be connected to 220kV bus of 400/220kV Jagalur
 - b. 450(Wind=200+50; Solar=200) MW is proposed to be connected to 220kV Thalak
 - c. 518(218+300) MW is proposed to be connected to 220kV Guttur
 - d. About 60 MW of wind generation are proposed in 66kV downstream of 220 kV Davangere and Chitradurga
 - e. About 406 MW of wind generation are connected to 66kV downstream of 220 kV Davangere and Chitradurga
- iii. **In/around Dhoni**
- a. 80 MW of wind generation are connected to 220kV Gadag
 - b. 587(450+67+70) MW is proposed to be connected to 400/220kV Dhoni
 - c. 244 MW is proposed to be connected to 220kV Harti
 - d. About 90 MW of wind generation are proposed in 110kV downstream of 220 kV Gadag S/s
 - e. About 197 MW of wind generation are connected to 110kV downstream of 220 kV Gadag S/s
- iv. **In/around Shivanasamudram**

The power generated at Shivanasamudram is connected to SFC bus at 66 kV level. Also, 64.5 MW of IPPs are connected to SFC bus at 66 kV level. M/s. KPCL have established 5 MW of solar project and is connected to SFC substation at 66 kV. Number of power projects is proposed to be coming up around SFC complex viz. 10 MW of SM hydro, 24.75 MWs of XS hydro. About 10 MW solar is also proposed to be connected to SFC complex. 24.75 MW of Mini Hydrel generation of M/s. Shivanasamudram power and 8.25 MW of wind power of M/s. Vajharpada is proposed to be connected to 66 kV bus of 220/66/11kV Madhuvinahalli substation. To evacuate around 150 MW of Hydrel energy, existing and proposed RE

generations, being generated in and around Malavalli taluk, KPTCL has proposed to establish a 2x100 MVA, 220/66kV Shivanasamudram along with double LILO of 220kV T.K.Halli- Madhuvanahalli DC line

v. In/around Hosadurga in Chitradurga district

Presently around 253 MW of existing wind generations are being connected to 66 kV downstream of 220/66 kV Chitradurga sub-station

21.3 After studies with CTU, following system was evolved for KPTCL transmission schemes for evacuation of power from renewable energy (RE) sources that are to be implemented through funding from KfW.

KPTCL vide their letter no CEE(P&C)/SEE(PIg)/EE(PSS)KCO-97/16074/2014-15 dated 11th March, 2015 (Annex-21.1), informed that few proposals that were earlier approved under Green Energy Corridor scheme are revised. During the meeting held in CEA on 15-May-2015, KPTCL said that considering the progress of renewable energy generation projects and the transmission schemes, they would like to award some of the schemes by December 2015, others by June 2016 and one scheme by June 2017.

21.4 CEA vide their letter no 54/1/2014-SP&PA/1216-17 dated 20.05.2015, (Annex-21.2) submitted that the transmission schemes are in order. Accordingly, the proposed transmission schemes were divided in three groups and following was agreed in principle :

Sl. No.	Transmission Scheme	To be awarded by date
	<u>Group – I</u>	
1.	Establishing 2 x 500 MVA, 400/ 220 kV Sub station at Gadag(Doni) in Mundaragi Taluk, Gadag District. (i) Establishing 2 x 500 MVA, 400/ 220 kV Sub station at Gadag(Doni) in Mundaragi Taluk, Gadag District. (ii) Construction of 400 kV LILO line with Twin Moose ACSR conductor from 400 kV Guttur-Guddadahalli SC line to Proposed 400/220 kV S/S at Gadag(Doni) for a distance of 26.798 kms in Gadag District. (iii) Construction of 220 kV DC LILO line from 220 kV	To be awarded by Dec 2015

Sl. No.	Transmission Scheme	To be awarded by date
	Gadag-Lingapur DC line to proposed 400/220 kV Gadag(Doni) S/S for a distance of 2.775 Kms in Mundaragi Taluk, Gadag District	
2.	<p>Construction of 220 kV SC line from 400kV Hiriya (PGCIL) sub station to 220/66/11kV Hiriya sub station and Construction of 220kV DC line from 220/66/11kV Chitradurga sub station to 220/66/11kV Hiriya sub station in existing corridor in Chitradurga District.</p> <p>(i) Construction of 220 kV SC line on DC towers from existing 400kV PGCIL station Beeranahalli to existing 220/66/11kV SRS at Hiriya in Chitradurga Dist in existing corridor of 220kV SC line from Hoysalakatte to 220/66/11 kV sub station Hiriya (partly in new corridor i.e from PGCIL point to link 220 kV S/C line from Hoysalakatte to 220/66/11kV SRS at Hiriya).</p> <p>(ii) Construction of 220 kV DC line on DC towers from existing 220/66 kV Sub-Station Chitradurga to existing 220/66 kV Sub-Station Hiriya in Chitradurga Dist in existing corridor (partly in new corridor from LILLO point to 220 kV sub station Chitradurga) for a distance of 37.461Kms.</p> <p>(iii) Construction of Two Nos of 220 kV Terminal bays at 220/66/11 kV Chitradurga Sub-Station in Chitradurga Taluk and District.</p> <p>(iv) Construction of Two Nos of 220 kV Terminal bays at 220/66/11 kV Hiriya Sub-Station in Hiriya Taluk and Chitradurga District.</p> <p>(v) Releasing of towers in Existing 220kV Hoysalakatte SC line for stringing of proposed 220 kV SC line from 400/220kV Beeranahalli to 220/66/11kV Hiriya in Chitradurga Dist.</p> <p>(vi) Dismantling of 220 kV SC line from Location No 247 i.e at Doddasiddavvanahally limits near 220/66/11kV</p>	To be awarded by Dec 2015

Sl. No.	Transmission Scheme	To be awarded by date
	Chitradurga sub station to 220/66 kV sub station Hiriyur in Chitradurga Dist.	
3.	<p>Establishing 2 x 500 MVA, 400/220 kV Sub station at Jagalur in Jagalur Taluk, Davanagere District.</p> <p>(i) Establishing 2 x 500 MVA, 400/220 kV GIS Sub station at Jagalur in Jagalur Taluk, Davanagere District.</p> <p>(ii) Construction of 400kV Multi circuit Quad Moose ACSR line for a length of 40kms from proposed 400/220kV Jagalur substation to LILO the proposed BTPS-CNHalli DC line at the rate of Rs.350.00Lakhs per km.</p> <p>(iii) Construction of 220kV Drake ACSR line for a length of 40kms from proposed 400/220kV Jagalur substation to 220/66kV Thallak substation at the cost of Rs.60.00Lakhs per km.</p> <p>(iv) Construction of 220kV Drake ACSR line for a length of 50kms from proposed 400/220kV Jagalur substation to proposed 220/66/11kV Kudligi substation at the cost of Rs.60.00Lakhs per km.</p> <p>(v) Construction of 4Nos of 220kV line terminal bays(2 Nos each at 220/66kV Thallak and prop 220/66/11kV Kudligi substations) at the cost of Rs:150.00 Lakhs per TB.</p> <p>(vi) Construction of 220kV DC line for a route length of 50kms from Jagalur to Chitradurga at the cost of Rs.60.00 Lakhs per km</p>	To be awarded by Dec 2015
4.	Construction of 220kV DC line for a length of 26kms from 220kV Bidnal substation to LILO one of the circuits of 220kV Narendra-Haveri DC line, in Haveri and Dharwad districts.	To be awarded by Dec 2015
	Sub- total (Group – I)	
	<u>Group – II</u>	
5.	Establishing 2x100MVA 220/66 kV and 1x8MVA 66/11kV sub station at Shivanasamudra, Malavalli taluk, Mandya	To be awarded by

Sl. No.	Transmission Scheme	To be awarded by date
	<p>district.</p> <p>(i) Construction of 220kV DC line for a distance of 1.5kms to link to 220kV line connecting 220kV T.K.halli substation at the cost of Rs.60.00Lakhs per km.</p> <p>(ii) Construction of 220kV DC line for a distance of 1.5kms to link to 220kV line connecting 220kV Madhuvanahalli substation at the cost of Rs.60.00Lakhs per km.</p> <p>(iii) Construction of 220kV DC Drake ACSR line for a length of 76kms in the existing 220kV Hootagally-Vajamangala-T.K.Halli SC line corridor including LILO to 220/66/11kV Vajamangala substation at the cost of Rs.60.00 Lakhs per km.</p> <p>(iv) Construction of 220kV line terminal bays-4Nos (one each at 220kV Hootagally and T.K.halli and two nos at Vajamangala) at the cost of Rs.150.00 Lakhs per TB.</p> <p>(v) Construction of 5kms of 66kV DC coyote ACSR lines to link M2 line,T.K.halli line,SFC line,Kollegala line,Madhuvanahalli lines to proposed 220/66/11kV Shivanasamudram substation near existing SFC substation at the cost of Rs.30.00Lakhs per kms.</p> <p>(vi) Establishing 2x100MVA 220/66 kV and 1x8MVA 66/11kV sub station at Shivanasamudra, Malavalli taluk, Mandya district</p>	June 2016
6.	<p>Establishing 2 x 100 MVA, 220/110 KV & 1x10 MVA, 110/11 KV Sub station at Mughalkod in Raibag Taluk, Belgaum District.</p> <p>(i) Establishing 2 x 100 MVA, 220/110 KV & 1x10 MVA, 110/11 KV Sub station at Mughalkod in Raibag Taluk, Belgaum District.</p> <p>(ii) Construction of 110kV DC for a length of 5kms to link 220/110/11kV Mughalkod to 110/11kV Itnal substation at the rate of Rs.40 Lakhs per km.</p> <p>(iii) Construction of 110kV DC for a length of 10kms to link</p>	To be awarded by June 2016

Sl. No.	Transmission Scheme	To be awarded by date
	<p>220/110/11kV Mughalkod to link to lines connecting Hidkal and Sultanpur substations at the rate of Rs.40 Lakhs per km.</p> <p>(iv) Construction of 110kV DC for a length of 15kms to link 220/110/11kV Mughalkod to lines connecting Mudalagi and Hunsyal substations at the rate of Rs.40 Lakhs per km.</p> <p>(v) Construction of 110kV DC for a length of 15kms to link 220/110/11kV Mughalkod to lines connecting Kuligod and Saidapur substations at the rate of Rs.40 Lakhs per km.</p> <p>(vi) Construction of 220kV DC line LILO Ghataprabha-Chikkodi for a route length of 40kms at a cost of Rs.60.00Lakhs per km</p>	
	Sub- total (Group – II)	
	<u>Group – III</u>	
7-	<p>Establishing 2x100MVA 220/66 kV and 1x12.5MVA 66/11kV sub station at Hosadurga, Hosadurga taluk, Chitradurga district.</p> <p>(i) Construction of 220kV DC line for a length of 45kms from proposed 220/66/11kV Hosadurga substation to 400/220kV CN Halli substation at the cost of Rs.60.00Lakhs per km.</p> <p>(ii) Construction of 220kV line terminal bays-2Nos at 400/220kV CN Halli substation at the cost of Rs.150.00 Lakhs per TB</p> <p>(iii) Construction of 66kV DC line for a length of 2kms from proposed 220/66/11kV Hosadurga substation to LILO 66kV SC Bagur-Ramagiri SC line at the cost of Rs.30.00Lakhs per km.</p> <p>(iv) Construction of 66kV DC line for a length of 10kms from proposed 220/66/11kV Hosadurga substation to 66/11kV Hosadurga substation in existing corridor at</p>	To be awarded by June 2017

Sl. No.	Transmission Scheme	To be awarded by date
	<p>the cost of Rs.30.00Lakhs per km.</p> <p>(v) Construction of 66kV DC line for a length of 15kms from proposed 220/66/11kV Hosadurga substation to 66/11kV Halurameshwara substation in existing corridor at the cost of Rs.30.00Lakhs per km.</p> <p>(vi) Establishing 2x100MVA 220/66 kV and 1x12.5MVA 66/11kV sub station at Hosadurga, Hosadurga taluk, Chitradurga district.</p> <p>(vii) Construction of 2 Nos 66kV TBs at 66/11kV Halurameshwara(2 Nos) at the cost of Rs.35Lakhs per TB.</p>	
	Sub- total (Group – III)	
	Total Cost of Schemes	

21.5 Members may note and agree.

22.0 Review of schemes for 'YTPS', 'ETPS', '3rd unit of BTPS' and for 'JSW Energy Ltd'.

22.1 KPTCL vide their letter no. CEE (P&C)/SEE(PIg)/EE(PSS)KCO-97/34319/2015-16 dated 23rd May, 2015 (Annex-22.1) has intimated that M/s. JSW Energy Ltd., had come up with a proposal for evacuating additional 660 MW generation recently (to be connected at 400 kV voltage level) together with the existing capacity of 4x300 MW (connected at 400 kV voltage level) and 2x130 MW (connected at 220 kV voltage level). The evacuation for this additional 660 MW has been considered on the Transmission scheme already approved comprehensively for 'YTPS', 'ETPS', '3rd unit of BTPS' and that for 'JSW Energy Ltd',. in the Joint Meeting of Standing Committee of Power System Planning of Southern Region and Western Region held on 26th December-2013 at SRPC, Bangalore. However, due to addition of this 660 MW, four circuits of 400 KV line were approved (two circuits with twin Moose and two circuits with quad Moose) instead of earlier approved two circuits of quad Moose to connect M/s. JSW Energy Ltd., plant with the 400 KV Ballari pooling station.

Detailed study was carried out for 2017-18 time frame for the feasibility of evacuation of 660 MW additional generation of M/s JSW Energy Ltd., considering the already approved Transmission scheme for the 'YTPS', 'ETPS', '3rd unit of BTPS' and that for 'JSW Energy Ltd'. The results of Load flow study is placed as (Annex-22.2). From the studies following was observed:

- 1) With the additional 660 MW generation of M/s. JSW Energy Ltd., and with outage of 400 kV DC Quad Moose line between 'Bellari Pooling Station' and 'Madhugiri new' (under N-1-1 contingency), the existing 400 kV DC twin Moose line between 'BTPS' and 'Hiriyur' gets loaded beyond its thermal limits.
- 2) Also, the fault level at 'BTPS' is nearing 40 KA due to ingress of additional 660 MW by M/s. JSW Energy Ltd., in to the Grid.

In view of these, KPTCL has proposed modification to the already approved Transmission scheme as appended below:

- 1) To retain the LILO to 'BTPS' only, from the existing 400 KV SC line running between 'RTPS-BTPS-JSW-Guttur (total line length-300 KM). This will help in cutting the existing line in to two equal halves in terms of line length thus reducing the reactive flow and also would provide additional evacuation facility to the 'BTPS' plant in terms of contingency requirement.
- 2) To drop the 400 KV DC quad line link (approximately 8 KM in length) between 'Ballari Pooling station' and 'BTPS' as this link is of hardly of any help as power flow on this link is very meagre (in terms of few hundred MW only during normal condition) and also will contribute for increased fault level at 'BTPS'.

22.2 In addition to this KPTCL also proposed to convert the proposed switching station into a step down station with 2x315 MVA, 400/220 kV ICT's in order to connect 220 KV network to this particular station. KPTCL also proposed to take up the 400 KV line approved under comprehensive evacuation scheme for 'YTPS', 'ETPS', '3rd unit of BTPS' and that for 'JSW Energy Ltd', noted at (b) below, may be taken up under southern region system strengthening as it would be connecting two ISTS stations.

- a) 400 KV DC quad Moose Line to connect the proposed 400 KV switching station at 'Chikkanayakanahalli' with 400/220 KV station at 'Mysuru'.
- b) 400 KV DC quad Moose Line to connect the 765/400/220 KV Receiving station at 'Madhugiri new' with 400/220 KV station at 'Mysuru'.

22.3 Joint studies were carried out with CEA, KPTCL and PGCIL. Studies enclosed at Annex – 22.3.

Members may discuss.

23.0 Establishment of 400kV Madhugiri substation under SRS-XIII – name/location change to Tumkur.

23.1 The 400kV Madhugiri substation under SRSS-XIII has been agreed in the 28th SCM and 10th SRPC meeting. POWERGRID vide their email dated 15.11.2015 (Annex – 23) has informed that for establishing the substation, the land identified by M/s. KPTCL in Madhugiri was not accepted as it was very undulating with wide level differences. Subsequently, KPTCL suggested a land at Kempanadodderi near Tumkur (which was already acquired by KIDAB (Karnataka Industrial Area Development Board)) which was being developed as industrial area and also their 220kV bays are planned at the same place. As the land was suitable for establishing substation and was also along the route of Gooty – Madhugiri – Yelahanka line, same was selected by POWERGRID for establishing substation. Accordingly, the location of the substation has been changed from Madhugiri to Tumkur. The same has been informed in the 113rd OCC meeting of SRPC and OCC had concurred for locating station at Tumkur. Accordingly, it is proposed that the Madhugiri 765/400kV substation inter alia under the scope of SRSS-XII may be changed to Tumkur 765/400kV substation at the above suggested site located near Tumkur.

Members may discuss

24.0 Transmission System for Tumkur Ultra Mega Solar Park (2000MW)

24.1 POWERGRID vide their letter(email dated 15-Nov-2015 at Annex24) has informed that - Government of India has taken an initiative for development of Ultra Mega Solar Power parks in various parts of the country. As part of above initiative, an ultra-mega solar Power park of 2000 MW capacity is being developed by M/s Karnataka Solar Power Development Corporation Ltd.(KSPDCL) (JVC of SECI & KREDL) in Pavagada in Tumkur distt, Karnataka.

- 24.2 In line with the CERC regulatory requirement, MNRE has already issued authorization to M/s KSPDCL, a Solar power Park Developer (SPPD), to apply for Connectivity/LTA for its 2000 MW Pavagada Solar Park in Tumkur district. MNRE also authorized SPPD to undertake infrastructural activities including arrangement for connectivity on behalf of the solar power generators in the park **(copy enclosed at Annexure-24.1)**.
- 24.3 M/s KSPDCL has also submitted connectivity & LTA application for transfer of power (2000 MW) from above Tumkur UMSPP **(copy of application enclosed at Annexure-24.2)**. As per the application, the project is envisaged to be developed in two (2) phases with 1000MW generation capacity in each phase (Total Capacity: 2000MW). The first 1000MW is proposed to be commissioned by Sep 2017, with beneficiary as DISCOMs of Karnataka (600MW) & balance 400MW by third party/captive IPPs/any state of Southern region. From the Second phase of generation (1000MW), about 500 MW drawl is indicated by DISCOMs of Karnataka and balance 500 MW by third party/captive IPPs/any state of Southern region. Phase-II generation is targeted to be commissioned by Sep 2018. Subsequently, M/s KSPDCL vide letter dated 30.10.15 indicated that 1600 MW shall be consumed by Karnataka DISCOMS against earlier 1100 MW and balance 400 MW by SR beneficiaries **(copy enclosed at Annexure-24.3)**.
- 24.4 Further, M/s KSPDCPL has also submitted an undertaking to bear all liabilities on behalf of the Solar Project generators to be set up in the Solar Park, as per the CERC regulations. **(copy enclosed at Annexure-24.4)**.
- 24.5 Joint studies were conducted by CEA, PGCIL and KPTCL held on 13 &14th October 2015 to discuss various transmission schemes in Karnataka including transmission system for Pavagada Ultra Mega Solar Power Park at Tumkur, Karnataka. Results of the joint studies are as under:

Transmission System for Tumkur Ultra Mega Solar Park (2000 MW)

- 24.6 Considering the time line for implementation of Solar Park (2-3 years) in two phases as well as requirement for development of matching transmission system for its grid integration, transmission scheme is also proposed to be developed in two phases. As indicated by M/s KSPDCL, Solar Power Park shall be developed in 250 MW blocks, which would be connected to their 33/220kV sub-pooling stations and through 220kV line(s) to the ISTS point, being established within the park by M/s KSPDCL (a Copy of letter in this regard is enclosed at **Annexure-24-5**). Accordingly, studies have been carried out with solar maximized as well as minimum Solar dispatch scenario, as under:

Phase-I : Transmission system for Tumkur Ultra Mega Solar Park (1000 MW)

- 24.7 As indicated above, Tumkur Phase-I (1000 MW) generation is scheduled to be commissioned by Sep'17. Considering schedule of solar park and Tumkur site being en route to 400kV Gooty – Madhugiri D/c line, it is proposed to establish a 3x500 MVA, 400/220kV Pooling station at Tumkur, through LILO of 400kV Gooty – Madhugiri D/c line. However, in case of n-1 & n-1-1 contingency, there is high loading on remaining lines which necessitates development of additional corridors from Tumkur PS. During discussion in the above joint

meeting, it was envisaged that there is a need for development of transmission corridors towards Mysore, however considering timeline for implementation of Tumkur Phase-I, it may not be feasible to match the transmission corridor towards Mysore due to long length and associated ROW issues. Accordingly, it was decided that a transmission line towards Mysore may be routed via existing 400kV station at Hiriya, so that power transfer can be affected through Tumkur PS-Hiriya transmission line as well.

24.8 In order to address reactive power management aspects including during low/no solar generation periods, 1x125 MVAR bus reactor at Tumkur S/s is proposed. For interconnection of 4 nos. sub pooling stations (4x250 MW, 33/220kV) & 4 nos. interconnecting 220kV D/c lines being developed by M/s KSPDCL as Solar Park Internal transmission system, scope for 8 nos. 220kV line bays has been kept under the present scope of main pooling station.

24.9 Considering above, proposed transmission system with Tumkur Phase-I generation (1000 MW) is as under:

- LILO of 400kV Gooty – Madhugiri D/c at Tumkur (Pavagada) Pooling station-5 km
- Tumkur Pooling station - Hiriya 400 kV D/c**-110 km
- Establishment of 3x500 MVA, 400/220KV Pooling station at Tumkur along with 1x125MVAR bus reactor
- 8 nos. 220kV line Bays at 400/220kV Tumkur Pooling Station

Estimated Cost : Rs 425 Cr

*** For 400kV Tumkur –Mysore line section routed via Hiriya S/s*

Results of various cases including contingency scenarios is enclosed at **Exhibit-25-I -VII**. From the above, it is observed that all line loadings are generally in order with above proposed system.

Phase-II : Transmission system for Tumkur Ultra Mega Solar Park (2000 MW)

24.10 For phase –II solar generation (1000 MW), which is schedule to be commission by Sep'18, LILO of Bellary Pool (KPTCL)- Madhugiri 400kV D/c (Quad) line at Tumkur Pooling station, is considered. Bellary Pool (KPTCL)- Madhugiri 400kV D/c line (quad) is already under implementation by KPTCL. KPTCL indicated that considering growing demand in Bangalore area and saturation of existing substations in terms of bay space etc., a new substation needs to be planned which shall also take care of drawl by Karnataka power from Tumkur project. In this regard, KPTCL proposed to interconnect 400kV Devanhally Substation near Bangalore, which to be developed by KPTCL, through a 400kV Tumkur - Devanhally (KPTCL) D/c line, to be kept under the proposed scheme of Tumkur.

24.11 Further, balance section of 400kV Tumkur PS- Hiriya-Mysore D/c line is also proposed under this phase. Based on the operational experience and various scenarios, if need felt on account of loading on lines like Hiriya-Neelmangala

etc., 400kV Tumkur PS- Hiriur-Mysore D/c line may be De-LILOed at Hiriur at a later date.

24.12 In order to address reactive power management aspects including during low/no solar generation periods, 2nd bus reactor (1x125 MVar) at Tumkur PS is proposed. For interconnection of 4 nos. sub pooling stations (250 MW, 33/220kV) & 4 nos. interconnecting 220kV D/c lines being developed by M/s KSPDCL in Phase-II, scope for 8 nos. 220kV line bays along with augmentation of transformation capacity (2x500 MVA) has been kept under the scope of the proposed scheme.

24.13 Considering above, proposed transmission system with Tumkur Phase-II generation (additional 1000 MW) is as under:

- LILO of 400kV Bellary Pool – Madhugiri D/c (Quad) (both circuits) [KPTCL line] at Tumkur Pooling station -60km
- Hiriur–Mysore 400 kV D/c line - 190km
- Tumkur Pooling station- Devanhally (KPTCL) 400kV D/c (Quad) -125km
- Augmentation of 2x500 MVA, 400/220KV transformer at Tumkur Pooling station
- 1x125MVAR bus reactor (2nd) at Tumkur Pooling Station
- 1x63 MVAR Line reactor each at Mysore end of Hiriur- Mysore D/c line
- 8 nos. 220kV line Bays at 400/220kV Tumkur Pooling Station

Estimated Cost : Rs 1180 Cr

24.14 Results of various cases including contingency scenarios with above proposed system is enclosed at **Exhibit-25-VIII-XVI**. From the studies, it is seen that all line loadings are generally in order.

Schematic for the proposed transmission scheme is enclosed at **Annexure-6**.

24.15 Ministry of Power vide letter dated 08.01.15 & 04.08.15 intimated PGCIL for taking up of transmission line and pooling station from the solar generating parks (9 solar parks with capacity 7020 MW) including for Ultra Mega Solar park in Karnataka, on compressed time schedule basis as well as transmission system connecting solar parks to ISTS be declared as part of ISTS.

24.6 PGCIL may present. Members may discuss.

Transmission planning proposals in Kerala

25.0 Utilization of Tirunelveli - Edamon portion of Tirunelveli - Cochin 400kV

Quad D/C line

- 25.1 PGCIL vide their letter C\CTU-Plg\S\Tirunelveli-Edamon dated 20-4-2015, (Annex-25) has informed that Tirunelveli- Cochin 400kV quad D/C line (routed via Edamon on multi circuit towers upto Edamon) under the scheme “Transmission System associated with Kudankulam APP” is held up due to severe RoW issues in Edamon –Cochin section and would take some more time for completion. Considering severe power crisis in Kerala POWERGRID proposed to utilize the completed Tirunelveli-Edamon portion of Tirunelveli-Cochin 400kV quad D/C line by charging the line at 220kV level in Tirunelveli-Edamon portion for catering power requirement of Kerala.
- 25.2 POWERGRID has envisaged following benefits for the above proposal:
- Provides additional feeds to Kerala
 - The overloading on Palakkad – Udumalpet 400kV D/c line gets relieved to some extent which is limiting constraint for the import capability of Kerala.
 - Utilization of stranded assets which are left out idle from a long time.
- 25.3 Terminal equipments need to be changed by KSEB/PGCIL if Tirunelveli-Edamon portion of the Tirunelveli- Cochin 400kV line is to be charged at 220kV level.
- 25.4 Members may discuss.

26.0 Implementation of Uddupi –Kasargode- Kozikode 400kV transmission link.

- 26.1 KSEB vide their letter D(T&SO)/PSE/CEA/400kV/14-15/263 dated 20.3.2015 (Annex-26.1) has proposed the following:
- (i) The construction of Udupi – Kasrgode DC line may be taken up by PGCIL on account of emergency nature under compressed time schedule through regulated tariff mechanism.
 - (ii) The construction of Madakkathara –Areakode (Kozikode) and Areakode (Kozikode) – Kasargode 400kV DC using the RoW of existing 220/110kV feeders as 400/220kV multi-voltage multi circuit feeders be taken up by KSEB Ltd.
- 26.2 During the 30th meeting of SCPSPSR held on 13.4.2010, it was agreed to take up the Madakkathara –Areakode 400kV D/c line as regional system strengthening scheme. Regarding using the RoW of existing Madakkathara – Areakode 220kV S/c line of KSEB for implementation of this line, KSEB had

said that the load of north Kerala cannot be met during the construction phase and this can be considered after the commissioning of Kozhikode(Areacode) S/s and Mysore –Kozikide line. KSEB has proposed to construct the Madakkathara –Areakode 400kV D/c line themselves using the RoW of their existing 220kV line and construct 400kV and 220kV multi-voltage multi-circuit lines as a state transmission scheme.

- 26.3 There is merit in the KSEBL proposal to implement the Madakkathara – Areakode (Kozikode)- Kasargode 400kv D/c link as state transmission project. As such, the scheme may be agreed.
- 26.4 Further, Uddupi –Kasargode- Kozikode 400kV quad D/c line along with 2x500 MVA, 400/220kV GIS substation at Kasargode was agreed during the 35th meeting of SCPSPSR. Empowered Committee in its 31st meeting recommended the schemes for implementation through TBCB. EC also suggested that firm commitment from UPCL for providing 400 kV bays at Mangalore (UPCL) switchyard may be obtained.
- 26.5 Regarding the route of the line, KSEBL informed that the route between UPCL to Kasargode is comparatively better for laying transmission line and once the Kasargode substation is commissioned adjacent to 220kV substation, Mylatty where land is available, the Kasargode – Areakode portion can be constructed by extending the RoW of the existing 220kV line and constructing 400kV and 220kV multi circuit multi voltage line.
- 26.6 During the 38th meeting of SCPSPSR it was decided that the implementation of the UPCL- Kasargode 400kV D/C line can be initiated after considering views of Karnataka ESCOMS. In this regards, KPTCL vide their letter CEE(P&C)/SEE(plg)/EE(PSS)KCO-97/34319/2015-16/2983-88 dated 20-6-2015 (Annex-26.2) had informed that M/s Power Company of Karnataka Ltd.(PCKL) on behalf of ESCOMS of Karnataka has stated as follows:

“The proposed 400 kV DC line will draw power from UPCL to Kasargode and the existing UPCL to Hasan 400 kV Quad DC line will have reduced power flow and this will have cascading effect on Beeranahally (Hiriyur) and Nelamangla line. Since power to Mysore will be drawn from Nelamangala resulting in overloading of this line. Further 90% of UPCL power is contracted to Karnataka and if this power flows to Kerala then Karnataka is compensated by displacement method which results in additional losses to the system. You will appreciate that for improving power supply to one state, the internal transmission lines of other states should not be overloaded. Further, Kerala does not have any contract to off take UPCL power and Karnataka is already drawing 90% of installed capacity of UPCL and 10% installed capacity allotted to Punjab is also being drawn by Karnataka. Hence, requirement of UPCL-Kasargode- Kozhikode line does not arise.”

The Mysore-Kozhikode line which is under construction will strengthen the S1 & S2 corridor and the Edamon-Kochin line between Tamil Nadu and Kerala which is under construction will strengthen the power supply to Kerala within the S2 region. Hence, priority may be given for Edamon - Kochin line and Mysore-Kozhikode line.

Further, converting the existing 220kV single circuit Koadakola - Kaniyampetta line to double circuit will strengthen the power supply to Kerala and the need for UPCL-Kasargod 400 kV Quad DC line does not arise more so at the cost of other constituents States.”

26.7 KSEBL may present. Members may discuss.

27.0 Proposal for strengthening the Kerala Grid to meet the expected Demand

27.1 KSEB vide their letter no D(T&SO)/PSE/SRPC/SCPSP/2014-15/240 dated 2-3-2015 (Annex-27) has proposed the following schemes as a part of Regional System Strengthening Schemes:

- (i) 400kV S/s at Kanhirode with a transformer capacity of 2x315MVA, 400/220kV by LILO-ing the proposed 400kV Uduppi- Kasarkode(Mylatti) – Kazhikode D/C feeder.
- (ii) 400kV S/s at Ettumanoor with a transformer capacity of 2x315MVA, 400/220kV by LILO-ing the proposed 400kV Edamon –Cochin East D/C feeder.

27.2 As per the demand projections done by 18th EPS, a demand of 5479 is expected in Kerala during 2019-20 scenario. In order to meet such a demand intra-state transmission corridors along with ISTS dispersal points need to be strengthened by way of implementation of new EHT substations and corridors.

27.3 Hence, KSEB has proposed two S/Ss in Kanhirode and Ettumanoor considering the power demand in North Kerala and Central Kerala respectively.

27.4 KSEB may present. Members may discuss.

28.0 2000 MW HVDC corridor to the State of Kerala – assessing evacuation capability and transformer augmentation needs

28.1 KSEB vide their letter no No.: D(T&SO)/PSE/SCPSP/ HVDC/2015-16/125 dated 18.08.2015 (Annex-28) has informed that detailed system studies has been carried out for the year 2018-19, to assess the capability of the near vicinity and downstream transmission system to evacuate power from the ISTS

HVDC node and to determine the requirements for strengthening the intra state transmission system.

28.2 KSEB stated that for the evacuation of 2000MW power, minimum of five 400kV circuits are required (considering the N-1 condition). At present the transmission system at 400kV Substation, Madakathara (Trichur North) consists of the following:

- 400kV Madakkathara - Palakkad D/c – Twin Moose
- 400kV Madakkathara - Cochin D/c – Quad Moose

In addition to the above, 400kV Quad D/c corridor from Tirunelveli to Cochin East is under implementation and is expected to be available during the time frame. Further a 400kV D/c is also planned towards Areekode and is expected to be taken up using the RoW of the Madakkathara – Areekode 220kV S/c as soon as the 400kV Mysore – Areekode D/c line is commissioned.

28.3 The major conclusions from the studies are as follows:

- (i) 2000MW from the HVDC terminal can be evacuated without any major constrained under normal conditions by LILO of both circuits of existing 400kV Trichur North (Madakathara) – Cochin East Quad D/c circuit at the 400kV AC yard of HVDC Station along with the existing and the planned 400kV transmission system from 400kV Substation at Madakathara (KSEBL).
- (ii) Under (n-1) contingency, the available transmission system is still capable of evacuating the power though with a higher loading.
- (iii) Under (n-1-1) contingency, the transmission system for evacuation is observed to be satisfying the criteria. But under outage of both circuits from the 400kV HVDC station to Madakathara (Trichur North), the ICT's at 400kV Substation Cochin East and downstream elements are seen overloaded. Accordingly the efficacy and security of the transmission system can be increased by providing an additional 400kV Quad D/c link from the 400kV AC Switchyard of HVDC station to 400kV Substation Madakathara (Trichur North) of PGCIL (approximately 5km).
- (iv) Accordingly two more 400kV feeder bays in addition to the planned four AC feeder bays are required at the HVDC Station and two more 400kV feeder bays are required at 400kV Substation Madakathara (Trichur North-PGCIL). In this context it may be noted that KSEBL is planning to take up the

execution of the 400kV Madakathara – Areekode D/c feeder along the RoW of existing 220kV Madakathara – Areekode S/c feeder shortly after the commissioning of 400kV Areekode substation. Already two bays are planned for accommodating the above feeder at Madakathara (Trichur North (PGCIL)). These bays can be utilized for terminating the additional d/c feeders from HVDC station by shifting the termination of the Areekode d/c feeder to the 400kV yard of KSEBL substation at Madakathara. Since both 220kV and 400kV multi circuit feeders are planned for the above corridor, termination of the above feeder at KSEBL's substation is a better option.

- (v) One more 315MVA ICT at Cochin East may have to be provided and additional 220kV outlets are to be planned for containing the overloading of the existing 220kV downstream system from this node.
- (vi) The ICT's at 400kV Areekode substation may be enhanced by additional 1x315 MVA or 1x500 MVA transformer.

28.4 Future proposal

- (i) The 220kV Idukki – New Pallom S/c feeder is expected to be taken up for conversion to Double Circuit at a later stage wherein a 400kV corridor may also be planned along this RoW using multi circuit multi voltage towers. The 400kV D/c link is envisaged for providing connectivity to the 400kV Substation planned at Idukki in the event of enhancing the installed capacity of Idukki Power House from its present capacity of 780MW. This can also be interlinked with Tirunelveli and Udumalpet at a later stage by LILO of 400kV Tirunelveli- Udumalpet D/c at the proposed 400kV Substation at Idukki which will facilitate evacuation of Renewable energy in the area. Under a long term plan perspective and from the view point of absorbing the renewable energy generation a 220kV link is also planned from 400kV Kottayam substation to 220kV Substation Theni by LILO of 220kV Theni – Sabarigiri S/c Feeder to the proposed 400kV Substation Kottayam, so to have an East – West Power Corridor.
- (ii) *Further four more 400kV feeder bays in addition to existing two will be required at 400kV Substation at Areekode for terminating the 400kV Uduppi – Kasargode (Mylatti) – Kozhikode and Madakathara – Areekode D/c feeders. Alternatively in the event of any difficulty to obtain additional bays as above at*

400kV Substation Areekode, the sanctioned 400kV Uduppi – Kasargode (Mylatti) – Kozhikode and under execution 400kV Mysore – Areekode schemes may be redesigned as follows:

(i) Construction of a 400kV Substation at Neeleswaram (Mylatty, Kasargode) with 2x500 MVA Transformers by LILO of both circuits of the planned 400kV Uduppi – Areekode (Kozhikode) D/c feeder as per the original scheme sanctioned in the SCPSP for SR.

(ii) The routing of this feeder to 400kV Substation Areekode substation will be through a new switching station as proposed below.

- Construction of a new 400kV Switching Station at Anjukunnu (Kattikulam, Wyanad) near to the crossing point of 400kV Mysore – Areekode D/c and 66kV Kaniampetta – Anjukunnu S/c feeders. LILO of both circuits of 400kV Mysore – Areekode D/c at this switching station.*
- Construction of 400kV Neeleswaram (Mylatty) – Anjukunnu (Wayanad) D/c feeder.*

(iii) With the above arrangement RoW of existing 400kV Mysore – Areekode portion inside the State can be effectively utilized for constructing a corridor from North Kerala with a reduction in the bays required at 400kV Areekode (Kozhikode) Substation.

28.5 In order to facilitate further dispersal of power downstream to the ISTS nodes proposed as above, following 220kV Nodes and links are under execution / planned for implementation to cater the expected demand during the time frame under consideration without creating any system constraints. The availability of all these schemes is, however, not essential for (n-1) security of the study horizon.

(i) Construction of a new 220kV D/c corridor (along with the planned 400kV D/c using multi-circuit multi-voltage towers) from 400kV Substation Madakathara to 220kV Substation Malaparamba and then onwards to 220kV Substation Areekode.

- (ii) Construction of a new 220kV corridor from Mylatty to Kanhirode and additional 220kV interlinking to new 220kV substations at Thalassery, Kunnamangalam, Kakkayam etc
- (iii) Conversion of Wolf conductors in the existing 110kV circuits from Nallalam to Orkattery (one circuit) and Kakkayam (both circuits) to HTLS Helsinki
- (iv) Construction of a 220kV Substation at Elamkur (Malappuram) by LILO of existing 220kV Madakathara – Areekode feeder.
- (v) Construction of a 220kV Substation at Chalakkudy by LILO of one circuit of existing 220kV LP – Madakathara D/c feeder.
- (vi) LILO of 220kV Elappully (Palakkad) – Madakathara feeder at 220kV Substation Shornur
- (vii) Upgradation of existing 110kV Substation Aluva to 220kV, by constructing a 220kV D/c feeder from 220kV Substation Kalamassery using the RoW of existing sub-transmission system.
- (viii) Upgradation of existing 110kV Substation Kaloor to 220kV, by constructing a 220kV D/c feeder from 220kV Substation Brahmapuram.
- (ix) Inter-linking of 220kV Substations at Aluva and Chalakkudy
- (x) Construction of a 220kV Substation at New Muvattupuzha by LILO of second circuit of existing 220kV LP – Madakathara D/c feeder.
- (xi) Construction of a 220kV Substation at Kothamangalam by extending the erstwhile 220kV Idukki – Madakathara feeder to Kothamangalam.
- (xii) Upgradation of the existing 66kV Transmission system from Pallivasal to Kothamangalam and Aluva to 220kV/110kV D/c corridor
- (xiii) Construction of a 220kV substation at Ettumanoor by LILO of 220KV Pallom – Ambalamughal feeder and upgrading of the associated 66kV transmission systems to 110kV

- (xiv) Construction of a 220kV Substation at Parippally and interlinking with 220kV substations at Kundra and Pothencode using the RoW of existing 110kV feeders
- (xv) Construction of a 400kV Substation at Kollam (Kundra) by LILO of 400kV Tirunelveli – Cochin East feeder at Edamon and using the RoW of existing 110kV feeder from Edamon to Kundra.
- (xvi) Capacity enhancements at various 220kV substations are also proposed for facilitating unconstrained evacuation of power.

Kerala vide their letter no D(T&SO)/PSE/SCPSP/ HVDC/2015-16 dated 21.10.2015 has furnished consolidated list as given below:

A. Schemes for strengthening the 400kV transmission System

1) 400/220kV D/c Corridor between Madakathara and Areekode(400kV Madakathara – Areekode (Kozhikode) D/c feeder with twin Moose conductor is an already sanctioned scheme)

- a. Construction of two additional 400kV bays at existing 400kV Substation, Madakathara
- b. Construction of additional 220kV bays at Madakathara, Malaparamba, Nallalam and Areekode
- c. Construction of a **220kV Switching Station at Mavoor (Ambalaparamba)** with ten line bays for providing a pooling point by LILO of following 220kV feeders:
 - Areekode – Nallalam D/c
 - Areekode – Kaniampetta S/c and
 - Madakathara – Areekode D/c

The above switching station is required since the existing approach to the 220kV substation Areekode through multi-circuit towers is presenting constraint in connecting the planned 220kV D/c feeder from Madakathara to Areekode.

- d. Construction of **400/220kV Madakathara – Malaparamba – Mavoor D/c** feeders in MCMV towers with twin Moose equivalent HTLS for 400kV D/c and Single Moose equivalent HTLS for 220kV D/c using the RoW of existing 220kV Madakathara – Malaparamba – Areekode S/c feeder. 400kV D/c feeder from 400kV Substation, Madakathara (KSEBL) is planned to be terminated at 400kV Areekode (Kozhikode) substation of

PGCIL. PGCIL to provide two 400kV line bays. One 220kV circuit will be LILO-ed at 220kV Substation Malaparamba and the second 220kV circuit will be LILO-ed at 220kV Substation Nallalam.

- e. Uprating of 400kV Bus at 400kV Substation Madakathara with Quad Moose / equivalent HTLS

2) 400kV Mylatty(Kasargode) – Areekode (Kozhikode) D/c Corridor via Wayanad.

400kV Uduppi – Mylatty(Kasargode) – Areekode (Kozhikode) D/c feeder with Quad Moose conductor is an already sanctioned scheme. The above scheme requires two more 400kV line bays in addition to the two bays required for the already sanctioned 400kV Madakathara – Areekode D/c feeder which can be a constraint under the present arrangement at the station. Further it is proposed that KSEBL may be allowed to carry out the execution of the 400kV Substation at Mylatty along with the 400kV D/c corridor from Mylatty to Areekode as above. The 400kV corridor from Uduppi to Mylatty can be executed as per the original scheme sanctioned previously. Considering the above factors, the sanctioned 400kV Uduppi – Kasargode (Mylatty) – Kozhikode may be redesigned as follows:

a. Construction of a **400kV Substation at Wayanad (Kattikulam)**

This station is intended as a Switching station for dropping the existing 400kV Mysore – Areekode (Kozhikode) D/c feeder by LILO of both circuits for establishing onward connectivity with the proposed 400kV Substation at Mylatty. The substation is proposed with six 400kV line bays – 2+2 for LILO of both circuits of 400kV Mysore – Areekode D/c feeder and two bays for connectivity with 400kV Mylatty Substation through 400kV D/c feeder.

- b. Construction of a **400kV Substation at Mylatty (Kasargode)** with four 400kV Line bays and two transformer bays with 2x500MVA 400/220kV ICT's. The 400kV yard will be constructed in the same premises of the existing 220kV Substation, Mylatty and the 220kV side of the ICT's will be connected to the existing 220kV bays.

Downstream 220kV connectivity: -

- To Existing 220kV substations at Kanhirode and Thaliparamba
- New 220kV Double circuit feeder to the proposed 220kV Substation, Neeleswaram.

- c. Construction of a **400kV Quad Moose / Twin HTLS (ACSS Curlew) D/c feeder** from 400kV Switching Station Wayanad (Kattikulam) to 400kV Substation Mylatty (Kasargode).
- d. **400kV Quad D/c feeder from Uduppi to Mylatty** as per the original sanctioned scheme. Considering the benefits of this corridor in reducing the congestion in S1-S2 corridor and in improving the import capability of S2 region, it is recommended that this ISTS scheme (**400kVQuad D/c feeder from Uduppi to Mylatty**) may be recommended for implementation by PGCIL under “Urgency Clause”.

3) 400kV Tirunelveli – Edamon – Cochin East D/c Corridor

- a. Construction of a **400kV Substation at Kottayam** with four 400kV Line bays, six 220kV line bays and two transformer bays with 2x315MVA 400/220kV ICT’s. The 400kV connectivity will be established by LILO-ing both circuits of 400kV Tirunelveli – Cochin East Quad Moose D/c feeder. Land for the 400kV substation is identified very near to the route of 400kV D/c line.

Downstream 220kV connectivity: -

- 220kV connectivity is planned to be established to existing Substations at Poovanthuruth, Sabarigiri and proposed 220kV substation at Ettumanoor.
- Additional connectivity by LILO of 220kV Idukki – New Pallom S/c feeder also being explored.

- b. Construction of a **400kV Substation at Kollam** with four 400kV Line bays, six 220kV line bays and two transformer bays with 2x315MVA 400/220kV ICT’s. The 400kV connectivity will be established by LILO-ing one circuit of 400kV Tirunelveli – Edamon – Cochin East Quad Moose D/c feeder.

Downstream 220kV connectivity: -

- 220kV connectivity is planned to be established to 220kV Substations at Kundara, Parippally and proposed 220kV substation at Sasthamkotta.

- c. Construction of a **400kV Substation at Edamon** with six 400kV Line bays and two transformer bays with 2x315MVA 400/220kV ICT’s. The 400kV connectivity will be established by charging existing 220kV Tirunelveli – Edmon D/c feeder, constructed in 400kV parameters, at

400kV and by LILLO-ing both circuits of 400kV Tirunelveli – Cochin East Quad Moose D/c feeder. Additional connectivity to 400kV Substation, Cochin East via the proposed 400kV substations at Kundara and Kottayam.

Downstream 220kV connectivity: -

- 220kV connectivity will be directly to existing 220kV switchyard of Edamon and further to following stations
- 220kV D/c feeder to Pothencode
- 220kV D/c and 220kV S/c feeders to Sabarigiri
- 220kV feeders to Kundara and Edappon.

B. Capacity Enhancements planned in 400kV transmission System

- a. Addition of 400/220kV, 1x315 MVA transformer at 400kV Substation, Areekode (PG)
- b. Addition of 400/220kV, 1x315 MVA transformer at 400kV Substation, Cochin East (PG)

C. Schemes for strengthening the 220kV transmission System

1) Construction of 220kV Substation at Neeleswaram, Kasargode Dt

Substation proposed with 220/110kV, 2x200MVA transformers and with ten 220kV and eight 110kV line bays. Connectivity proposed by LILLO of both circuits of existing 220kV Kanhirode – Mylatty 220kV D/c feeder. Additional connectivity planned at 220kV level to Mylatty and Thaliparamba by construction of two 220kV D/c feeders along the RoW of existing 110kV lines using MCMV towers. This station is also expected to provide connectivity for Solar PV projects planned in the area.

110kV connectivity:

- 110kV D/c feeder to 110kV Substation, Kanjangad
- 110kV D/c feeder to 110kV Substation, Cheruvathur

2) Construction of 220kV Substation at Thalassery, Kannur Dt

Substation proposed with 220/110kV, 2x160MVA transformers and with eight 220kV and six 110kV line bays. Connectivity by LILLO of existing 220kV Orkattery– Kanhirode feeder. Additional connectivity planned at 220kV level to

the proposed 220kV Substations at Mundayad and Kakkayam by construction of 220kV D/c feeders along the RoW of existing 110kV lines using MCMV towers.

110kV connectivity:

- 110kV D/c feeder to existing 110kV Substation, Thalassery
- Additional connectivity by LILO of existing 110kV Kuttiyadi – Kanhirode and Nadapuram – Kanhirode feeders.

3) 220kV Substation at Mundayad, Kannur Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x160MVA transformers and with four 220kV line bays. Connectivity planned by construction of 220kV D/c feeders along the RoW of existing 110/66kV lines using MCMV towers from the proposed 220kV Substation, Thalassery and existing 220kV Substation, Kanhirode.

110kV connectivity:

- 110kVD/c feeders to existing substations at Kanhirode, Sreekandapuram, Pinarayi, Thalassery, Azhikode and Mangad
- 110kV S/c feeder to 110kV Substation Chovva.

4) 220kV Substation at Kakkaym by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x200MVA transformers and with four 220kV line bays. Connectivity planned by LILO of existing 220kV Areekode – Kaniampetta S/c feeder. Additional interconnection with the proposed 220kV Substation, Thalassery by construction of 220kV D/c feeder along the RoW of existing 110kV D/c feeder using MCMV towers.

110kV connectivity:

- 110kV feeders to existing substations at Kuttiyadi and Orkattery
- 110kV feeders to substations at Koduvally and Chevayyur using Wolf equivalent HTLS conductor.

5) 220kV Substation at Kunnamangalam, Kozhikode Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by LILO of existing 220kV Areekode – Kanhirode feeder.

110kV connectivity:

- 110kV feeders to existing substations at Nallalam and Koduvally using Wolf equivalent HTLS conductor.
- 110kV feeders proposed to existing substations at Thamarassery and Kuttikattoor by upgrading the 66kV system to 110kV
- 110kV D/c feeder to existing 110kV Substation, Agasthyamoozhi

6) Construction of 220kV Substation at Elamkur, Malappuram Dt

Substation proposed with 220/110kV, 2x100MVA transformers and with two 220kV and four 110kV line bays. Connectivity planned by LILO of existing 220kV Madakathara – Areekode feeder.

110kV connectivity:

- 110kV feeders to existing substations at Malappuram and Manjeri by upgrading the 66kV system to 110kV.
- 110kV feeders to existing substations at Nilamur and Edakkara by upgrading the 66kV system to 110kV (using HTLS conductor up to Nilambur).

7) Construction of 220kV Substation at Vettathur, Palakkad Dt

Substation proposed with 220/110kV, 2x100MVA transformers and with two 220kV and four 110kV line bays. Connectivity planned by LILO of existing 220kV Madakathara – Areekode feeder. This substation is planned to be interconnected with the proposed 220kV substation at Kottathara (Agali) for evacuation of 80MW wind.

110kV connectivity:

- 110kVD/c feeder to existing substations at Mannarkau.
- 110kV D/c feeder to existing substation at Cherupulassery.

8) 220kV Substation Kunnankulam, Thrissur Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with two 220kV line bays. Connectivity planned by LILO of proposed 220kV Madakathara – Nallalam feeder.

110kV connectivity:

- 110kVD/c feeder to existing substations at Punnayurkulam.
- 110kV feeders to existing substations at Guruvayoor and Madakkathara.

9) 220kV Substation Edappal, Malappuram Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by LILO of proposed 220kV Madakathara – Malaparamba feeder. Additional interconnectivity with the proposed 220kV Substation Kunnankulam

110kV connectivity:

- 110kV feeders to existing substations at Ponnani, Kuttippuram, Kootanadu, Arangottukara and Shornur.

10) Construction of 220kV Substation at Panjal, Thrissur Dt

Switching station with eight 220kV line bays proposed for interlinking of 220kV Madakathara – Palakkad, Elappully – Madakathara, Shornur – Areekode and Madakathara – Areekode feeders.

11) 220kV Substation Viyyur, Thrissur Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by upgradation of existing 110kV Madakathara – Viyyur D/c feeder to 220kV D/c feeder. Additional interconnectivity with the proposed 220kV Substation North Parur planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.

110kV connectivity:

- 110kV feeders to existing substations at Pullazhi, Kandassakadavu, Ollur and Wadakkancherry.

12) 220kV Substation Chalakkudy, Thrissur Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by LILO of one circuit of existing 220kV Lower Periyar – Madakathara D/c feeder. Additional interconnectivity with the proposed 220kV Substation Aluva planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.

110kV connectivity:

- 110kV feeders to existing substations at Ollur, Kodakara, Kurumassery, Carbarandum, Poringal, Ayyampuzha, Sholayar, Mala, Kodungalloor, Karukutty, Angamally and Aluva.

13) 220kV Substation Aluva, Ernakulam Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x200MVA transformers and with six 220kV line bays. Connectivity planned by upgradation of existing 66kV Kalamassery – Aluva D/c feeder to 220kV D/c feeder. Additional interconnectivity with the proposed 220kV Substations at Kothamangalam, Pallivasal and Chalakkudy planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.

110kV connectivity:

- 110kV feeders to existing substations at Kurumassery, Carbarandum, Kalamassery, Angamally, Karukutty, Edayar, Edathala, Odakkali and Perumbavoor.

14) 220kV Substation North Parur, Ernakulam Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by upgradation of existing 66kV Aluva – North Parur D/c feeder to 220kV D/c feeder. Additional interconnectivity with the proposed 220kV Substation Viyyur planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.

110kV connectivity:

- 110kV D/c feeders to substations at Edayar, Kodungalloor, and Cherai.

15) 220kV Substation Kaloor, Ernakulam Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x200MVA transformers and with four 220kV line bays. Connectivity planned by construction of 220kV Bhramapuram – Kaloor D/c feeder. Additional interconnectivity with the 220kV Substation, Kalamassery also planned by upgrading existing 110kV transmission system to 220/110kV MCMV system.

Downstream connectivity:

- 110kV feeders to existing substations at Edappally, Kalamassery and 66kV feeder to 66kV Substation Marine Drive.

16) 220kV Substation Kothamangalam, Ernakulam Dt by upgradation of existing 66kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned from the erstwhile 220kV Idukki – Madakathara S/c feeder now terminated near to Kothamangalam Substation and lying idle at present. Additional 220kV interconnectivity with the proposed 220kV Substations at Pallivasal and Aluva planned by LILO of one circuit of 220kV Pallivasal – Aluva D/c feeder.

110kV connectivity:

- 110kV feeders to substations at Perumbavoor, Odakkali, Koothattukulam, Bhoothathankettu and Idamalayar.

17) Construction of 220kV Substation Pallivasal, Idukki Dt

Substation proposed with 220/66kV, 2x50MVA transformers and with four 220kV line bays. Connectivity planned by LILO of existing 220kV Udumalpet – Idukki S/c feeder. Additional interconnectivity with the proposed 220kV Substations at Kothamangalam, Kuyilimala and Aluva are planned by upgrading existing 66kV transmission system to 220/110kV MCMV system. The station is planned mainly for the constraint free evacuation of existing and upcoming hydro generation projects in the area.

18) Construction of 220kV Substation Kuyilimala, Idukki Dt

Substation proposed with 220/110kV, 2x100MVA transformers and with two 220kV line bays. Connectivity planned by LILO of 220kV Pallivasal – Idukki S/c feeder.

110kV connectivity:

- 110kV feeders to substations at Vazhathope, Kattappana, and Nedumkandom.

19) Construction of 220kV Substation Ettumanoor, Kottayam Dt

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by LILO of existing 220kV Pallom – Ambalamughal and Sabarigiri – Ambalamughal feeders. The station will be interconnected to existing 66kV substation Ettumanoor after upgrading to 110kV.

110kV connectivity:

- 110kV feeders to existing substations at Vaikkom, Cherthala, Thykattuserry, Gandhinagar, Kottayam, Kuruvilangadu, Pooventhuruthu and Pala subsequent to the upgradation of the 66kV network in the area.

20) Construction of 220kV Substation Eramalloor, Alleppey Dt

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by construction of a 220kV D/c feeder from Brahmapuram. Additional interconnectivity with the 220kV Substation Punnapra is planned by upgrading existing 110kV transmission system to 220/110kV MCMV system.

110kV connectivity:

- 110kV feeders to existing substations at Thykattusery and Aroor.

21) 220kV Substation Pathanamthitta by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by LILO of existing 220kV Sabarigiri – Edamon S/c feeder. Additional interconnectivity with 220kV Substation Edappon planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.

110kV connectivity:

- 110kV feeders to existing substations at Ranni, Kozhencherry, Edappon, Kakkad, Maniyar, Koodal, Pathanapuram and Adoor.

22) 220kV Substation Kakkad, Pathanamthitta Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x50MVA transformers and with two 220kV line bays. Connectivity planned by LILO of existing 220kV Sabarigiri –

Pallom feeder. Station planned for constraint free evacuation of power from the hydro generation projects in the area.

110kV connectivity:

- 110kV feeders to existing substations at Karikkayam and Pathanamthitta.

23) 220kV Substation Parippally, Kollam Dt by upgradation of existing 110kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by upgradation of existing 110kV Kundara – Parippally D/c feeder to 220/110kV MCMV feeder. Additional interconnectivity with 220kV Substations at Pothencode and Edamon planned by constructing a LILO of one circuit of existing 220kV Edamon – Pothencode D/c feeder along the RoW of existing 110kV network by upgrading it to 220/110kV MCMV system.

110kV connectivity:

- 110kV D/c feeders to existing substations at Attingal, Kundara, Kottiyam, Ayoor and Varkala.

24) 220kV Substation Vizhinjam, Trivandrum Dt by upgradation of existing 66kV Substation

Substation proposed with 220/110kV, 2x100MVA transformers and with four 220kV line bays. Connectivity planned by construction of 220kV Kattakkada – Vizhinjam D/c feeder. This station is planned for providing 220kV connectivity to Vizhinjam International Port.

D. Capacity Enhancements planned in 220kV transmission System

- a. Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Kattakkada
- b. Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Edappon
- c. Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Kundara
- d. Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Pallom
- e. Addition of 220/110kV, 1x200 MVA transformer at 400kV Substation Madakathara

- f. Replacing of existing 220/110kV, 2x160 MVA transformer with 2x200MVA at 220kV Substation Palakkad
- g. Replacing of existing 220/110kV, 2x100 MVA transformer with 2x200MVA at 220kV Substation Shornur
- h. Replacing of existing 220/110kV, 2x100 + 2x60 MVA transformers with 3x200MVA at 220kV Substation Nallalam
- i. Addition of 220/110kV, 1x160 MVA transformer at 220kV Substation Areekode
- j. Replacing of existing 220/110kV, 2x100 MVA transformer with 2x200MVA at 220kV Substation Malapparamba

28.6 Studies carried out by KSEBL in this regard are enclosed at Annex-28.2.

For all new 400 substations KSEBL may consider designing the same for 50KA fault level keeping in view the future requirements. Further, all 400kV S/s may be provided with atleast 125 MVAR bus reactors and space provision for additional reactors/transformers.

Transmission planning proposals in Tamil Nadu

29.0 Utilization of Salem – Dharmapuri 400kV quad d/c line along with Dharmapuri (Salem New) Pooling Station –reg.

29.1 PGCIL vide their letter no. C\CTU_plg\S\CEA\Dharmapuri dated 20-4-2015 (Annex-29.1) has submitted that 765/400V Dharmapuri (Salem) Pooling Station (initially charged at 400kV) along with Salem- Dharmapuri PS 400V quad line is ready for energization. However, transmission lines associated with Dharmapuri (Salem New) pooling station are under various stages of implementation and may take some more time for completion. Under this scenario, it would be prudent to utilize Salem- Dharmapuri 400kV quad line by LILoing one circuit of MTPS stage –III –Thiruvalem 400kV D/c line (being constructed by TANTRANSCO) at Dharmapuri (Salem New) Pooling Station. The proposed LILo shall involve construction of 6km of D/c line and LILo can be terminated at the existing bays constructed for Dharmapuri - Somanhalli 400kV D/c line. From the study results PGCIL has pointed out the following benefits:

- Reduces S1-S2 congestion and enhance the TTC between S1-S2 by 100MW
- The overloading on Kolar- Hosur 400kV D/C line gets relieved to some extent
- Provides additional path for feeding the loads at Salem.

29.2 TANTRANSCO vide their letter no. CE/Plg.&R.C/SE/SS /EE1/AEE1/F Standing Committee/D.187 dated 19-5-2015(Annex-29.2) stating that -

- (i) The commissioning of Dharmapuri - Somanhalli 400kV D/c line would provide as alternate path between Karnataka and Tamilnadu, hence would help in easing the S1-S2 congestion. As Salem 400kV S/s is well connected with NLC-II switchyard and Shoolgiri 400kV S/s, as such there is no problem for feeding the Salem loads.

Hence, TANTRANSCO suggested that PGCIL 765/400V Dharmapuri (Salem) Pooling Station and Salem- Dharmapuri 400kV quad line may be commissioned in the same time frame of Dharmapuri - Somanhalli 400kV D/c line.

29.3 Members may discuss.

30.0 Termination of Kayathar – Koilpatty(PG) (Tuticorin Pooling point) 400kV DC line

30.1 During the 38th meeting of SCPSPSR the issue of termination of 400kV DC line from Kayathar at Koilpatty (Tuticorin Pooling point) was discussed. As per the minutes, the Kayathar – Koilpatty(PG) 400kV DC line was agreed to be modified as Kayathar- Tirunelveli (Abhishekapatty) 400kV D/C line on suggestion of PGCIL.

30.2 TANTRANSCO vide their letter CE/C/TR/SE/CI/TR/EEC/F. KfW FUNDING/D.341/15 dated 18-5-2015 (Annex-30) has stated the following:

- In the meeting of SCPSPSR it is also clarified from PGCIL that Tirunelveli(PG) is the existing Abhishekapatty 400kV S/s or Tirunelveli Pooling station proposed from the wind injection and PGCIL has stated that it is existing Tirunelveli(PG) (Abhishekapatty) 400kV S/s only.
- In the meeting, TANTRANSCO has stated that instead of Kayathar – Koilpatty 400kV D/c line, TANTARNSCO's Kanarpatty – Abhishekapatty 400kV SC line on DC tower will be converted into 400kV DC line and requested PGCIL to provide one bay at Abhishekapatty 400kV SS.

- The Kayathar – Tirunelveli 400kV D./C line has not been agreed by TANTRANSCO and CEA is already requested to issue a corrigendum in this regard.
- Termination of 400kV d/c line from Kayathar to Tirunelveli PS will overload the existing Kaythar –Karikudi 400kV D/C line and Kayathar – Kanarpatty 400kV D/c line due to wind injection (who have applied PGCIL for connectivity) at Tirunelveli PS.

Hence, TANTRANSCO confirmed that 2 bays are not required at Tirunelveli Pooling Station and one additional bay may be provided at the existing Abhishekapatty 400kV S/s so that the ongoing TANTRANSCO's 400kV s/c line on D/C tower may be converted to D/C line.

- 30.3 As one bay of the Tirunelveli 400kV S/s is likely to be vacant as per the modified ATS of Kudankulam project ,the proposal of TANTRANSCO to string second circuit on Kanarpatty –Abhishekapatty (Tirunelveli) 400kV line may be considered.
- 30.4 As informed by POWERGRID presently there is no space at Abhishekapatty (Tirunelveli) and no bay is likely to be vacant after commissioning of modified ATS of Kudankulam project. After the request of TANTRANSCO, a site inspection was carried out to look into availability of space at Tirunelveli and it was identified that a 63 MVAR 400kV bus reactor is available and the line can be terminated in the bay by converting the bus reactor into switchable line reactor.
- 30.5 As discussed with TANTRANSCO during 30-31 October, 2015, it was brought out that the proposed second 400kV (quad) circuit from Kanarpatty to Tirunelveli (Abhishekapatty) is mainly for reliability purpose and not for injection of power into ISTS Grid.
- 30.5 Members may discuss.

31.0 Transmission Scheme for evacuation of 1000 MW Solar Park to be developed by M/S Adani at Kamuthi

- 31.1 TANTRANSCO letter no CE/Plg.&R.C/SE/SS/EE1/AEE1/F.Solar park-Adani/D.112 dated 25.03.2015 letter (Annex-31.1) has conveyed that M/S Adani has proposed to develop 1000 MW Solar Park at Kamuthi in Ramnad district of Tamil Nadu within a period of one year. It has been further proposed that TANTRANSCO would enter into PPA with M/S Adani for buying 1000 MW

of solar power. Accordingly, TANTRANSCO has requested CEA for in-principle approval for following transmission system:

- a) Establishment of 400kV substation at Kamuthi for pooling the proposed 1000 MW solar park to be established by M/S Adani.
- b) 400kV D/C line from the proposed Kamuthi Solar park to the sanctioned Kamuthi 400/230-110kV S/S (TANTRANSCO).
- c) 400kV D/C line to the sanctioned Thoppakundu 400/110kV wind substation to the sanctioned Kamuthi 400/230-110kV S/S (TANTRANSCO).
- d) 2x80 MVAR bus reactor at Kamuthi 400/230-110kV S/S (TANTRANSCO).

31.2 CEA vide their letter 56/23/2015-SP&PA dated 15-4-2015(Annex-31.2) had requested TANTRANSCO to furnish following documents/information to study the above proposal:

- a) Copy of application(s) by M/S Adani seeking Connectivity and Long term Open Access from the STU of Tamilnadu required in accordance with the regulations 'Grid connectivity and Intra state Open Access regulations, 2014' of TNERC.
- b) The studies carried out by TNEB, in support of above proposal and as per requirements of TNERC regulations, corresponding to the time frame of 2016-17 and 2018-19 for transmission network in Tamilnadu. It is requested that the study results in SLD and PSSE load flow file may be sent by email. The studies may be carried out for high wind/ high solar/ no wind -no solar dispatch scenarios.
- c) The status of execution of the Kamuthi substation and associated transmission lines along with their expected date of commissioning.
- d) During the 37th SCPSPSR, establishment of Kamuthi 400/230-110 KV Substation (3x 315MVA 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs) was inter-alia agreed as part of evacuation of power from Udangudi Power Project (2x660MW+1x800MW). During this meeting, it was also agreed that a maximum of 1000 MW of solar power would be injected at Kamuthi. Accordingly, it is also requested that copies of the Connectivity and LTA application(s) of generation projects totalling to 1000 MW, that were earlier proposed to be connected at Kamuthi, may also be furnished.

31.3 TANTRANSCO may present. Members may discuss.

32.0 Implementation of 24x7 power supply in the state of Goa-

Interconnection with SR grid to Mapusa-Xeldam(New S/s) – Narendra 400kV D/c line.

32.1 For Implementation of 24x7 power supply in the state of Goa, provision of 400/220kV substation at Xeldam in Goa.

As per the new Planning Criteria under “n-1-1” contingency of 400 kV Kolhapur – Mapusa D/C line, there shall be severe constraints in meeting the demand of Goa on remaining 220 kV network. Hence it becomes imperative to plan for a second 400kV infeed to Goa in order to provide operational reliability and flexibility to the state.

32.2 To improve the reliability and power supply situation in Goa, an additional 400 kV infeed to Goa proposed. Following alternatives has been suggested:

Alt-1 : Establishment of 2X500 MVA, 400/20 kV substation at Xeldam and its interconnection with Narendra (existing) 400 kV substation through 400 kV D/C line with quad conductor.

Alt-1I : Establishment of 2X500 MVA, 400/20 kV substation at Xeldam and its interconnection with Mapusa (existing). Additional 400kV line between Kholapur and Mapusa

32.3 Members may discuss

33.0 Raigarh-Pugalur-Trichur HVDC system for import of power by SR constituents:

33.1 During the Joint Standing Committee meeting on Power System Planning of Southern and Western Region, held on 20/04/2015, Raigarh-Pugalur-Trichur HVDC system for import of power by SR constituents was agreed. The transmission scheme was split in three parts 1) Raigarh- Pugalur 6000 MW HVDC system. 2) AC System strengthening at Pugalur end and 3) Pugalur-Trichur 2000 MW VSC based HVDC system for ease of implementation. However, during the Joint SCPSPSR and WR it was agreed that the scheme 2 and 3 should be in place before the commissioning of scheme 1.

33.2 PGCIL vide their letter no C\CTU-Plg\S\Raigarh-Pugalur dated 27/08/2015 has stated that it may be appreciated that there are large no of uncertainties while implementing any transmission system mainly due to corridor or land issues.

33.3 POWERGRID in this regard has submitted that as the scheme was evolved as a comprehensive scheme, we are trying to complete all the three parts in matching time frame. However, in the minutes of the subject meeting it has been

mentioned that Scheme no. 2 and 3 should be in place before commissioning of Scheme-1. In this regard we would like to submit the following:

- i) The implementation of Scheme 2 & Scheme 3 as a pre-condition for commissioning of Scheme 1 may not be appropriate, whereas the commissioning of Scheme 1 irrespective of commissioning of Scheme 3 would be able to transfer large quantum of power to deficit Southern region.
- ii) Similarly, in case Scheme 3 is implemented even before commissioning of Scheme-1, the same can be utilized for export of power to Kerala which is facing large transmission constraints.
- iii) Further, in case part system of Scheme 2 and one pole of Raigarh – Pugalur HVDC link and / or VSC based HVDC to Kerala is commissioned, the system would be benefitted by enabling additional transfer of power.

33.4 POWERGRID has also submitted that there are large number of uncertainties while implementing any transmission system mainly due to corridor or land issues which are beyond the control. Keeping above in view it may not be prudent to put pre-condition of commissioning of Scheme 2 and Scheme 3 before commissioning of Scheme 1.

33.5 Accordingly, POWERGRID has requested to make suitable amendment to the subject Minutes of Meeting. Members may discuss.

34.0 Transmission system for LTA of 400 MW for 2x500 MW Neyveli Lignite Corporation Limited TS-1 (Replacement) (NNTPS) in Neyveli.

34.1 During 35th Standing Committee Meeting, the following was agreed for connectivity and LTA

1. Transmission system for connectivity: LILO of existing Neyveli TS-II – Pondicherry 400 kV S/c at NNTPS generation switchyard (by POWERGRID).
2. Transmission system for LTA (as an ISTS): NNTPS switchyard – Villupuram (Ginjee) 400kV D/c line and Villupuram (Ginjee) 400kV S/S with 2x500 MVA transformers has been agreed under transmission system for LTA (as an ISTS).

34.2 Subsequently, in the 32nd Empowered Committee Meeting, the Transmission system for LTA of 400 MW for 2x500 MW Neyveli Lignite Corporation Limited

TS-1 (Replacement) (NNTPS) in Neyveli was agreed to be implemented through TBCB route with the following scope.

- NNTPS switchyard – Villupuram (Ginjee) 400kV D/c line.
- Villupuram (Ginjee) 400/220 kV, 2x500 MVA S/S

However, the LILO of existing Neyveli TS-II – Pondy cherry 400 kV S/c at NNTPS generation switchyard (by POWERGRID) was inadvertently missed out in the agenda and minutes of the Empowered Committee meeting .

In the 37th SCM, TNEB stated that a 400/220 kV substation now envisaged at Ariyalur in the same vicinity as that of Ginjee which was covered under the NNTPS transmission system it was agreed that that constructing two 400 kV substations in the same area is not required. Accordingly in the meeting and it was agreed that it was decided that the 400kV line would be terminated at Ariyalur S/s of TANTRANSCO and bays to be provided by TANTRANSCO. The same has been noted in the 33rd Empowered Committee Meeting.

Subsequently CEA vide its letter No.100/11/REC-18/SP&PA/883-884 dated 07.04.2015 to Joint secretary (Trans), MoP has recommended the implementation of NNTPS switchyard – Ariyalur (Villupuram) 400kV D/c line by POWERGRID.

34.3 Accordingly, the complete transmission system for connectivity and transmission system for LTA for 2x500 MW Neyveli Lignite Corporation Limited TS-1 (Replacement) (NNTPS) in Neyveli includes the following elements:

- i. LILO of existing Neyveli TS-II – Pondy cherry 400 kV S/c at NNTPS generation switchyard.
- ii. NNTPS switchyard – Ariyalur (Villupuram) 400 kV D/c line.
- iii. 2 nos. of line bays at Ariyalur (Villupuram) substation for terminating NNTPS switchyard – Ariyalur (Villupuram) 400kV D/c line.

34.4 As per TANTRANSCO letter dated 1/10/2015 Ariyalur substation is expected by June'2108. Accordingly NNTPS-Ariyalur line would be matched with the commission of Ariyalur S/s. This may result in constraint in evacuation of power from NNTPS.

Members may discuss

35.0 POSOCO Quarterly observations on grid constraints.

35.1 NLDC in their Operational Feedback of the National Grid for the quarter July-September 2015. POSOCO have stated present/likely transmission constraints in Southern Region under the following categories:

- i) Transmission Lines Constraints
- ii) ICT Constraints
- iii) Nodes experiencing low Voltage
- iv) Nodes experiencing high Voltage.
- v) Lines opened on high voltage.
- vi) Delay in Generation affecting grid Operation adversely.
- vii) Delay in Transmission Lines affecting grid Operation adversely

The issue raised in the operational feedback are discussed below:

35.2 Transmission Lines constraints:

- The SR has experienced high loading on Kolar-Hosur 400kV DC, due to delay in commissioning of 400kV Somanahalli - Dharmapuri PS-Salem Dc line. With the commissioning of Mysore-Kozhikode S1-S2 capacity has increased to 5640MW as against requirement of about 4000MW. Hence the loading on Kolar –Hosur is limiting value and not a constraint.
- SR grid has also experienced high loading on 400kV Udumalpet-Palakkad D/C line. Presently the loading on these lines is in the range of 450-500 MW. With commission of Mysore-Kozhikode sufficient relief has been experienced **These constraints are likely to be eased with commissioning of the Raigarh-Pugalur-Trichur HVDC system and the transmission system planned by Kerala for absorption of this power.**
- POSOCO report also states that there is constraint in the 400kV Nellore Pooling Station - Nellore DC line. Four generations projects were granted Long Term Access (Simhapuri, Meenakshi, TPCIL and NCC) in Krishnapatnam area. While granting the LTA, in addition to associated transmission lines, some common transmission lines which were expected in that period like Gooty-Madhugiri-Yelahanka 400kV D/c line, Salem-Madhugiri 765kV line etc. were considered in the studies. However, some of these lines are yet to materialise due to ROW constraints. Presently, three generation projects (except NCC) have been commissioned. The MTOA of 800 MW has been granted from these projects, i.e. 500 MW from TPCIL and 300 MW from Simhapuri with commissioning of Gooty – Madhugiri-Yelhanka 400 kV D/C line.

Regarding Nellore PS-Nellore (POWERGRID) 400kV D/c loading , it may be mentioned that Simhapuri/Meenakshi have indicated that the Simhapuri/Meenakshi-Nellore PS 400kV Quad D/c line is designed for Maximum design conductor temperature of 75°C. This has adequate capacity to cater to power transfer requirement of above MTOA. However

additional power transfer under STOA, over and above MTOA would depend upon system condition, beneficiary of the project etc.

- The SR has experienced high loading on 400kV Jindal - BTPS SC Line. KPTCL has proposed to retain the LILO to 'BTPS' only, from the existing 400 KV SC line running between 'RTPS-BTPS-JSW-Guttur (total line length-300 KM). This will relieve the problem.
- With Full generation at Jindal TPS, Bellary TPS, Low generation at UPCL and high wind generation, the flow on 400kV Hiriyur-Nelamangala D/C line is continuously above 550MW. Also the 765kV Sholapur-Raichur D/C line commissioned without downstream network is creating further increase in the line flow. **Commissioning of 400kV Gooty-Madhugiri-Yelahanka D/C line and its associated downstream 220kV network, will relieve the problem.**
- POSOCO report also states that there is constraint in 220 kV Bangalore Metro Network, 220 kV Shoolagiri- Hosur(TN)- Yerrandahalli- Somanahalli SC line.
- SR has experienced constraints in Coastal AP.
- SR has experienced Constraints for Rayalaseema TPS Generation Evacuation.
- POSOCO reports also cited constraints for Northern Kerala System- This constraint has eased after commission of Mysore-Kozhikode 400kV D/c line.
- POSOCO reports also cited constraints in Chennai 230kV System and Overloaded 220kV Lines in Tamil Nadu
- SR has experienced constraints in 230kV Evacuation lines of MTPS and Kundah complex

35.3 ICT Constraints

S. No	ICT	Solution to the constraints
1	400/220kV 2x315MVA ICTs at Gazuwaka SS	There is space constraint at Gazuwaka.
2	400/220kV 2x315MVA ICTs at Vemagiri SS	With KV Kota 400/220kV S/s of APTRANSCO there is likely to be relief
3	400/220kV 2 X 315 MVA ICTs at Nellore	
4	400/220kV 2X500 MVA ICTs at Somanahalli	Redistribution/ reconfiguration of 220kV transmission lines required.

S. No	ICT	Solution to the constraints
5	400/230kV 2X315MVA ICTs at Arasur	Augmentation at Arasur agreed in 38 th SCPSR
6	400/220kV 3 X 315 MVA ICTs at Mamidipally	Newly planned substation at Maheshwaram, Gajwel, Yeddu will relieve loading.
7	400/220kV 2X315MVA ICTs at Mysore	Strengthening at 220kV level required.

35.4 Nodes Experiencing Low Voltage

Voltages at the following nodes are low during the peak load condition: 400kV Somnahally, Nelamangala, Bidadi. Voltages at the following nodes are low during the peak load condition & high wind period : 400kV Udumalpet, Salem, Trichur

35.5 Nodes experiencing high Voltages and lines opened on high voltage

- High voltage on a number of 400kV nodes has been reported. The planned augmentation of bus reactors, including SVC/STATCOMs would help in bringing down the voltages. Further, regulating generation voltages and reactive absorption limits of generators need to be undertaken.
- Study has been carried out by POWERGRID has proposed following reactive compensation.
 - POSOCO in its operational feedback has indicated high voltage in Southern Region during light load. As per the feedback, lines were opened more than 1045 times to control high voltage in Jul'15 quarter. Similar high voltage was also faced in October'15. One of the reasons for high voltages is that the system hasn't developed the way it was planned. Hence reactive power needs to be reassessed. In southern region under SRSS–XXIII reactive compensation was identified and is under implementation. Based on the inputs from POSOCO study has been carried out to identify locations where reactive compensation is required.
 - **Approach to the studies**

- To simulate light load condition aggregate load of 27,106 MW (28th Sept, 2015 3: 00 hrs data) has been modelled, Generation of 23,061 MW and import of 4628 MW was considered.
- In the study generators has been modelled with Qmin with 10% MVAR absorption as against typical 25%, so as so as to ensure that margin is available for operation. Further this would improve the grid as Q absorption and injection can be smoothly in vernier mode. Already fixed reactor portion of already approved STATCOM and Fixed shunt reactor approved under various schemes like SRSS-XXIII have been considered.
- **Reactive compensation required**
- Compensation should be provided at the place where reactive compensation is generated for effective voltage control. Hence the simulation is aimed to identify locations wherein MVAR is getting generated and quantum getting generated. To identify the same Static Compensation was simulated with wide range of MVAR on all 400kV and 765kV buses to control the voltage. Based on the MVAR generation following reactive compensation was simulated.

S/S	Existing/ Approved	Proposed	S/S	Existing/ Approved	Proposed
Cuddapah	50	125	Davanagere	0	125
Srisailam(LB)	0	125	Talaguppa	0	125
Chittoor	0	125	Raichur(765kV)	240	240
Vijayawada -AP	0	125	Almati	0	125
VTPS stage IV	0	125	Kaythar	0	125
Kurnool(765 kV)	240	240	Mettur	0	125
Nellore PS (765 kV)	240	240	Thiruvalem (765kV)	0	2X 240

Comparisons of voltage profiles with and without proposed reactors are tabulated below:

Voltage pu Range	Number of Buses	
	Base Case	With proposed Reactors
Above 1.07	2	NIL

1.06-1.07	8	NIL
1.05-1.06	9	NIL
1.04-1.05	7	1
1.03-1.04	12	0
1.02-10.3	23	20
1.01-1.02	16	25
1-1.01	19	35
<1	6	21
Total Buses	102	102

- Simulation results indicate that voltages are within 1.02 pu. It is proposed that reactive compensation at proposed CTU substation may be taken up as grid strengthening scheme and States may suitably take up reactive compensation at their station
- Members may like to discuss and approve above mentioned reactive compensation.

35.5 Delay in following transmission lines affecting grid operation adversely:

400kV Edaman-Cochin DC line
400kV Mysore-Khozhikode DC line
NCTPS-II Evacuation: 400kV Alamathy-SV Chathram DC line and Alamathy-Tiruvalam DC line
Stage-1 Wind evacuation system of TNEB: 400kv Kanarpatti SS, 400kV Kayathar SS, 400kV Tirunelveli-Kanarpatti-Kayathar DC line, 400kV Kayathar-Karaikudi-Pugalur DC line
400kV Kalvindapattu-Pugalur DC line and 400kV Tiruvalam-Mettur-III DC line

- **PGCIL, KSEB and TNEB may provide status of above transmission lines.**

36.0 Standardisation of OPGW in lieu of One Earth wire in all Transmission lines.

36.1 POWERGRID vide email dated 15.11.2015 has informed that the Power System requirement for Communication is increasing multifold due to Special protection schemes:

- i) Ever increasing data reporting to Load Dispatch Centre.
- ii) Phasor measurements based data collection and reporting.
- iii) Remote monitoring/operation of sub-station/elements.

iv) Differential protection on Lines

The practice of putting fibre in select lines lead to situation where station connectivity is held up due to either identified line delay, LILO of under construction line etc. OPGW installation on existing lines is taking long time/ delayed due to shut down, ROW issues as well as capacity constraints of executing agencies.

It is proposed to include one 24 Fibre (OPGW) in all transmission lines which will ensure availability of wideband communication from all substations to cater bandwidth for various power system application for which communication equipment (SDH– STM-16) shall be provided at all upcoming substations.

Members may discuss.