

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

No. 51/4/SP&PA-2014/ 312-325

Date: 02-July-2014

Sub: 37th meeting of the Standing Committee on Power System Planning of Southern Region
- **Agenda for the meeting**

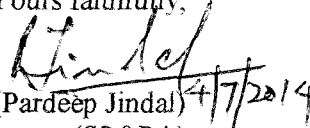
Sir,

The **37th meeting** of the Standing Committee on Power System Planning of Southern Region is proposed to be held in the month of July 2014.

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

Exact date and venue of the meeting would be conveyed separately.

Yours faithfully,


(Pardeep Jindal) 4/7/2014
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
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 -2228367

<p>5. The Director (Transmission), Transmission Corp. of Andhra Pradesh Ltd., (APTRANSCO) Vidyut Soudha, Hyderabad – 500 082. FAX : 040-66665137</p>	<p>6. The Director (Grid Transmission and Management), Transmission Corp. of Telangana Ltd., (TSTRANSCO) Vidyut Soudha, Khairatabad Hyderabad – 500 082. FAX : 040-23321751</p>
<p>7. The Member (Transmission), Kerala State Electricity Board, Vidyuthi Bhawanam, Pattom, P.B. No. 1028, Thiruvananthapuram - 695 004. FAX : 0471-2444738</p>	<p>8. Member (Distribution), Tamil Nadu electricity Board (TNEB), 6th Floor, Eastern Wing, 800 Anna Salai, Chennai - 600002. FAX : 044-28516362</p>
<p>9. The Director (Power), Corporate Office, Block – I, Neyveli Lignite Corp. Ltd., Neyveli , Tamil Nadu – 607 801. FAX : 04142-252650</p>	<p>10. The Superintending Engineer –I, First Floor, Electricity Department, Gingy Salai, Puducherry – 605 001. FAX : 0413-2334277/2331556</p>
<p>11. Director (Projects), National Thermal Power Corp. Ltd. (NTPC), NTPC Bhawan, Core-7, Scope Complex, Lodhi Road, New Delhi-110003. FAX-011-24360912</p>	<p>12. Director (Operations), NPCIL, 12th Floor, Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai – 400 094. FAX : 022- 25991258</p>

Copy to:

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

**Agenda Note for 37th Meeting of
Standing Committee on Power System Planning in Southern Region (SCPSPSR)**

Date and Venue: (to be communicated shortly)

1.0 Confirmation of the minutes of previous (36th and the Joint SR-WR) meetings of the Standing Committee

1.1 The Minutes of 36th meeting of the Standing Committee on Power System Planning of Southern Region were issued vide CEA's letter No. 51/4/SP&PA-2013/1693-1704 dated 27th September, 2013.

1.2 **Minutes of Joint Standing Committee (SR and WR):** Further, a joint meeting of Standing Committee of Power System Planning of Western Region and Southern Region was held on 26th Dec, 2013 to discuss following two issues:

- Transmission system of KPTCL for evacuation of power from Yermarus(2x800MW) and Edlapur(1x800 MW) Thermal Power Generation.
- The concept on General Network Access (GNA) titled 'Ensuring adequacy in the planning and development of Inter –state transmission network'.

1.3 The minutes of the joint meeting were issued vide CEA's letter No 51/4/SP&PA-2014/150-171 dated 21st January, 2014. No observations were received on the circulated minutes, as such these minutes, as circulated, may be confirmed.

1.4 TANTRASNCO vide their letter no. CE/Plg&RC/ SE/SS/EE1/ AEE1/ F.36thSCM/D.454/2013 dated 25.11.2013 (copy enclosed- Annex1) has given observations on para 21.0 - Contingency Plan for evacuation of Power from ILFS, of the minutes of the 36th meeting of Standing Committee on Power System Planning of Southern Region.

1.5 In the minutes of the 36th meeting, following was agreed for Contingency Plan for evacuation of Power from ILFS (2x600 MW).

- a) LILO of 2nd circuit of Neyveli – Trichy 400 kV D/C line (LILO of 1st

circuit already under implementation) would be carried out at Nagapattinum pooling station as contingency plan, by CTU.

- b) Strengthening of Neyveli TS-II to Neyveli TS-I expansion link with higher capacity conductor as contingency plan, by CTU.
- c) ILFS would be allowed to evacuate through these lines only if there are margins available in the grid.

1.6 In this connection TANTRASCO had given the observations:

“It is to be stated that, allowing IL&FS to evacuate the power by making LILO of both lines (i.e., NLC TS2 – Alundur and NLC TS1 Exp – Alundur) will over load the existing 400 kV lines at Neyveli complex. Hence, it is suggested that LILO of only one circuit Neyveli – Trichy 400 kV D/C line as agreed earlier to provide start up power to the plant may be carried out.

The evacuation system for the ILFS generation, Nagapattinum – Salem 765 S/C line & Salem – Madhugiri 765 S/c line may be speeded up to evacuate power from IL&FS.”

1.7 Members may discuss and accordingly the minutes of the 36th meeting, may be confirmed.

2.0 TANGEDCO/TANTRANSCO proposals:

2.1 Based on the joint studies carried out at Gurgaon with CEA and PGCIL on 05-03-2014 to 07-03-2014 and later on 11-06-2014 in Delhi. TNEB/TANGEDCO vide their letter no. CE/Plg&RC/SE/SS/EE1/AEE1/F.Stg Comm/D194 dated 17-06-2014 (Annex-2.1) has proposed following Intra-State transmission system.

2.2 This system will also cater to following generation projects in Tamil Nadu.

Capacity addition of 3440 MW in Chennai area by TANGEDCO:

<u>Name</u>	<u>Capacity</u>	<u>CoD</u>
a) ETPS Expansion	1x660MW	2017-18
b) Ennore SEZ (NCTPS Stage–IV)	2x660MW	2017-18
c) ETPS Replacement	1x660MW	2018-19
d) NCTPS Stage–III	1x800MW	2018-19

In addition to above, OPG Power Generation Pvt. Ltd has proposed to establish coal based power plant of capacity 2x360MW in Gummidipoondi, North Chennai and they have applied connectivity to TANTRANSCO. This Generator has not signed PPA/MOU with TANGEDCO. Expected commissioning date is June 2015.

2.3 Capacity addition of 2120 MW in Udangudi area by TANGEDCO:

- | | | | |
|---|-------------------|-----------|---------|
| a | Udangudi Stage I | 2x660MW | 2017-18 |
| b | Udangudi Stage II | 1X800 MW. | 2018-19 |

2.4 Following transmission system has been planned to evacuate the power from above generation projects and transmitting to load centres in Tamil Nadu:

I ATS FOR ETPS EXPANSION – 1X660MW:

- i) 400kV DC Quad connectivity from ETPS Expansion switchyard to the 765/400kV Pooling station at North Chennai. (Generation at 400kV level)
- ii) 1X125 MVAR,420kV Bus Reactor at generation switchyard.

II ATS FOR ENNORE SEZ (NCTPS Stage-IV) – 2X660MW:

- i) 400kV DC Quad connectivity from Ennore SEZ switchyard to the 765/400kV Pooling station at North Chennai. (Generation at 400kV level)
- ii) 400kV DC Quad inter link between the ETPS Expansion and Ennore SEZ switchyard for reliability.
- iii) 2X125MVAR, 420kV Bus Reactors at generation switchyard.

III. ATS FOR NCTPS Stage III – 1X800MW:

- i) 765kV DC line from NCTPS Stage III switchyard to the North Chennai Pooling station. (Generation at 765kV level)
- ii) 1X240MVAR,765kV Bus Reactor at generation switchyard

IV. ATS FOR ETPS Replacement – 1X660MW:

- i) 765kV DC line from ETPS Replacement switchyard to North Chennai

Pooling station. (Generation at 765kV level)

- ii) 765kV DC inter link to NCTPS Stage-III for reliability.
- iii) 1X240MVAR, 765kV Bus Reactor at generation switchyard.

V. ATS for M/S.OPG Power generation Ltd.- 2X360MW : (By OPG)

- i) 400kV DC line to the North Chennai Pooling station.
- ii) 2X80 MVAR ,420kV Bus Reactor at the generation switchyard.

2.5 Common Transmission system for above generation projects in Chennai area:

I Establishment of 765/400kV Pooling Station in North Chennai area:

- i) 3X1500MVA, 765/400kV ICTs at North Chennai Pooling station.
- ii) 765kV DC connectivity from North Chennai 765kV pooling station to the proposed Ariyalur 765/400kV SS with 240 MVAR, 765kV switchable line reactors in each line at both ends. Another 765kV DC connectivity from North Chennai 765kV pooling station to the proposed Ariyalur 765/400kV SS may be reviewed at a later date depending of the commissioning of the projects.
- iii) 400kV DC line from North Chennai Pooling station to the proposed Pulianthope 400/230kV SS.
- iv) 500MVA, 400/400kV Phase Shifting transformer(PST) at the Pooling station to control the power flow on the Pooling station – Pulianthope 400KV DC line. PST to have the capability to control power flow in both the direction and provision to be made to bypass PST during maintenance if required.

II Establishment of 765/400kV Sub Station in Ariyalur (near Villupuram):

- i) 2X1500MVA, 765/400kV ICTs with the following 765kV and 400kV connectivity.
- ii) 765kV DC connectivity from Ariyalur 765/400kV SS to the Thiruvallam PGCIL 765/400kV SS with 240 MVAR, 765kV switchable line reactors in each line at both ends.

- iii) LILO of both the circuits of Pugalur – Kalivantapattu 400kV DC Quad line at Ariyalur. (in lieu of the approved connectivity for the Singarapet 400/230kV SS which has been approved in the 28th Standing Committee meeting).
- iv) 2X240MVAR, 765kV Bus Reactor at 765kV bus of Ariyalur 765/400kV SS. Provision for 420kV bus reactor at 400kV bus for future requirement if needed depending on actual field condition.

III Establishment of 765/400kV SS in Coimbatore Region

- i) 2X1500MVA, 765/400kV ICTs with the following 765kV and 400kV connectivity.
- ii) 765kV DC connectivity to the proposed Ariyalur 765/400kV SS with 240 MVAR, 765kV switchable line reactors in each line at both ends.
- iii) 400kV DC connectivity to the sanctioned Edayarpalayam 400/230KV SS.
- iv) 400KV DC connectivity to sanctioned Rasipalayam 400/230KV SS.
- v) 2X240 MVAR, 765kV bus Reactors at 765kV bus of Coimbatore 765/400kV SS. Provision for bus reactor at 400kV bus for future requirement if needed depending on the actual field condition.

2.6 ATS for proposed power plants at Udangudi (2x660 MW + 1x 800MW)

- i) 400kV DC Quad line to the Kayathar 400kV SS.
- ii) 400kV DC line to the proposed Samugarengapuram 400/230-110 kV SS.
- iii) 400kV Quad DC line to the proposed Ottapidaram 400/230-110KV SS.

The following two substations are required as system strengthening for the Udangudi projects:

- I) Ottapidaram 400/230-110 KV Substation with 2x 315MVA, 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs with the following 400kV connectivity.
 - a. 400 KV D/C Quad line from Udangudi Switchyard.
 - b. 400 KV D/C Quad line to Kamuthi 400/230-110 KV Substation.
- 230kV connectivity:
- o LILO of TSipcot – Kavanoor 230kV SC line.

- 230kV DC line from Indbharath generation switchyard of 2x150 MW.
- LILO of TSipcot – Savasapuram 230kV SC feeder.

II) Kamuthi 400/230-110 KV Substation for Solar Power injection (maximum 1000 MW) with 3x 315MVA 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs with 400 KV DC Quad line from Kamudhi SS to the existing Karaikudi 400kV PGCIL Substation.

230kV connectivity:

- 230kV DC line to the proposed Muthuramalingapuram 230kV SS.
- 230kV DC line to the existing Kavanoor 230kV SS.

2.7 TANTRANSCO has proposed to establish the following 400 KV Substations, as System strengthening, throughout TamilNadu within the end of 13th plan.

(i) **Samugarengapuram** 400/230-110 KV wind Substation with 2x 315MVA, 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs with 400 KV D/C line from Udangudi Switchyard. In Aralvaimozhi pass wind area of southern part of TN, the existing wind capacity is 1800MW and there is no 400kV substation available. To avoid the existing congestion and to accommodate the future wind addition (maximum 300 MW) and for load drawal during non wind season Samugarengapuram 400/230-110kV SS is proposed. The following 230kV connectivity is proposed:

- LILO of Kudankulam – SRPudur 230kV SC line
- LILO of Udayathur – Sankaneri 230kV SC line
- 230kV DC line to proposed Muppandal 230kV SS.

(ii) **Pudukottai** 400/230-110 KV Substation for load drawal with 2x 315MVA, 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs with LILO of both 400 KV Karaikudi – Pugalur TANTRANSCO DC Quad line.

230kV connectivity:

- 230kV SC line to Karambium 230kV SS.
- 230kV SC line to Pudukottai 230kV SS.
- 230kV SC line to proposed Tuvakudi (BHEL) 230kV SS.

(iii) **Turaiyur** 400/230 KV Substation for load drawal with 2x 315MVA, 400/230kV ICTs with LILO of one of the NLC – Pugalur 400 KV PGCIL line, and 400 KV D/C line to the proposed Mangalapuram 400 KV Substation.

230kV connectivity:

- 230kV SC line to Perambalur 230kV SS.
- 230kV SC line to Samayapuram 230kV SS.
- 230kV SC line to sanctioned Jambunathapuram 230kV SS
- 230kV SC line to the sanctioned Poyyur 230kV SS

(iv) Kolapalur 400/230-110 KV Substation with 2x 315MVA 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs with LILO of one of the 400 KV MTPS Stage III – Karamadai TANTRANSCO line, and 400 KV D/C line from Rasipalayam 400 KV Substation.

230kV connectivity:

- 230kV SC line to Thingalur 230kV SS.
- 230kV SC line to Anthiyur 230kV SS.
- 230kV SC line to Shenbagapudur 230kV SS.
- LILO of Gobi – Pallakapalayam 230kV feeder
- LILO of Karamadai – Ingur 230kV line

(v) Mangalapuram 400/230 KV Substation with 2x 315MVA, 400/230kV ICTs with LILO of both the Ariyalur – Pugalur 400 KV D/C Quad line.

230kV connectivity:

- LILO of Salem – Singapuram
- LILO of Deviakurichi – Valayapatty 230kV feeder.
- 230kV SC line to the proposed Thammampatty 230kV SS
- 230kV SC line to the proposed Udayapatty 230kV SS.

(vi) Sholingur 400/230-110 KV Substation with 2x 315MVA, 400/230kV ICTs and 2x200 MVA, 400/110kV ICTs with LILO of Sriperumbudur- Tiruvalam - Kolar 400 KV S/C PGCIL line. (In between Sriperumbudur & Tiruvalam 400 KV Substation)

230kV connectivity:

- LILO of Tiruvalam – Mosur 230kV feeder
- LILO of SVChatram – Arni 230kV feeder
- 230kV DC line to the proposed Pattaraiperumbudur 230kV SS.

(vii) Pulianthope 400/230 KV Substation with 3x 315MVA, 400/230kV ICTs with 400kV DC Quad line from the proposed North Chennai Pooling Station and 400 kV DC line from Manali 400/230-110 KV Substation.

230kV connectivity:

- 230kv SC cable link to Tondiarpet, Basinbridge and sanctioned Vysarpadi &CMRL Central 230kV substations which are under execution.

(viii) Mylapore 400/230 KV Substation with 2x 315MVA, 400/230kV ICTs with 400 KV SC cable from proposed Pulianthope 400/230 KV Substation and 400 KV SC cable to Guindy 400 KV Substation. (Upgradation of existing Mylapore 230/110kV SS).

(ix) Palavadi 400/230-110 KV Substation: For the already sanctioned Singarapet 400KV Substation, the land has now been identified at Palavadi near Salem 765/400 KV PGCIL Substation with 400 KV DC quad line from MTPS Stage III and 400KV DC quad line from Tiruvalam 400 KV Substation and 400 quad 2XDC line from Rasipalayam 400 KV Substation (One DC line via Salem 765/400 KV Substation).

230kV connectivity:

- LILO of Karimangalam - MALCO 230kV SC line
- 230kV link line to the sanctioned Gurubarahally 230kV SS.
- 230kV DC link line to the sanctioned Udanapally 230kV substation.

2.8 **Kayathar – Koilpatty (Tuticorin Pooling point) 400kV DC Quad line:**

Kayathar – Koilpatty (Tuticorin Pooling point) 400kV DC Quad line for additional connectivity with ISTS and increased reliability purpose.

2.9 **Pavoorchatram 400kV SS (Tennampatty 400kV SS):**

For the Thenampatty 400/230-110kV SS which has been approved in the 34th Standing committee meeting, now the land has been identified near Pavoorchatram. The 400kV connectivity is as decided in the 34th Standing committee meeting i.e. 400kV DC line to Kayathar 400kV SS.

230kV connectivity:

- LILO of Kodikurichi – Veeranam 230kV line in addition to the connectivity to new wind substations.

2.10 The above system is depicted in a diagram given at Annex- 2.2. Members may discuss.

3.0 Constraints in 400kV bays extensions at 400kV Vemagiri S/S.

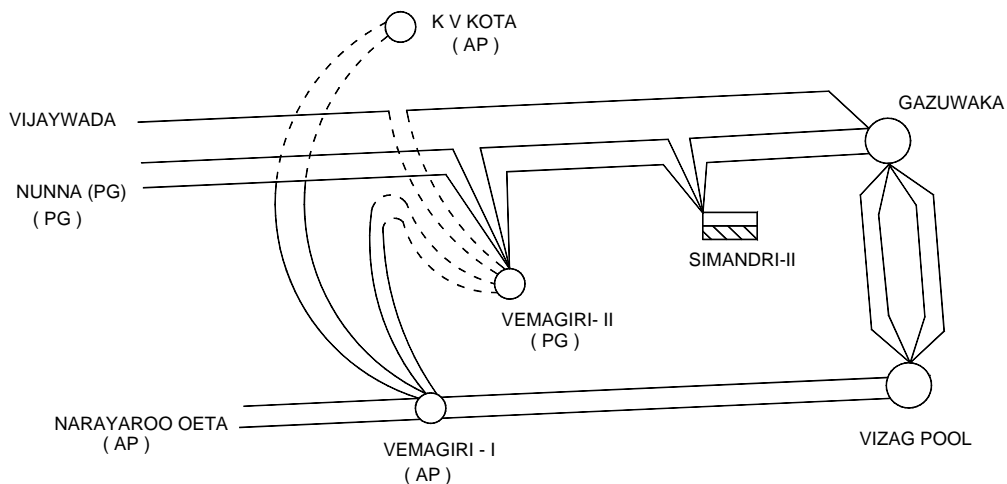
3.1 APTRANSCO vide their letter no. CE (PS)/SE (SP)/ DE (SS)/F. Hinduja/D. No. 57/2014 dated 28.03.2014 (copy enclosed at Annex-3.1) has informed that there is space constraints at their Vemagiri 400 kV substation and it has become difficult to provide bay extension there. Therefore, there is difficulty in bringing the KVKota-Vemagiri 400 kV DC line at Vemagiri. This line was agreed 36th meeting of the Standing Committee, as part of the transmission system for evacuation of power from 1040 MW M/s Hinduja (HNPCL) Power Project.

3.2 As a solution, they have proposed to remove LILO at 400 kV Vemagiri Substation and make through one circuit of 400 kV Simhadri-II – Nunna DC line (PGCIL) LILOed at 400kV Vemagiri SS.

3.3 The matter was discussed with APTRANSCO and PGCIL and accordingly, following is proposed:

- 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 – Vemagiri-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)

3.4 The above re-arrangements are depicted below. Members may discuss.



4.0 System for increasing capacity of Inter-State Transmission system for import of power into SR up to 2018-19.

4.1 Presently, Southern Region is facing power deficit which is of the order of 3500 MW (as per CEAs monthly report on power supply position). This situation has arisen mainly due to – (i) delay/deferment of anticipated generation projects, for example, Krishnapattam UMPP (4000 MW), Cheyyur UMPP(4000 MW), Udangudi TPS(---MW), IPP projects in Nagapatanam/ Cuddalore area (3000 to 4000 MW), Kundankulam APP (2000 MW), Kalpakkam PFPR (500 MW), East cost project in Srikakulam (1320 MW), Gas based projects in Vemagiri (about 3000 MW) etc. and (ii) also due to non-availability of gas for existing gas projects in Southern Region.

Some of the constraints in import of power into Southern Region and delivering up to Kerala and Tamil Nadu has also been due to long delay in commissioning of important 400 kV transmission lines, for example, Mysore - Kozikode 400 kV D/C line (delayed by more than 7 years), Tirunelveli-Edamon-Cochin 400 kV D/c line (delayed by about 4 years) and Narendera-Kolhapur inter-regional 765 kV D/C line. Some constraints have also been caused due to delay in the transmission systems of states, for example, the system associated with Narsaropeta, Vijaywada-Hyderabad & Kakatiya TPS in Andhra Pradesh, system associated with Yermarus TPS and non-finalisation of land for New Narendera in Karnataka and transmission system for wind projects and North Chennai TPS in Tamil Nadu.

4.2 The present power supply Scenario of Southern Region as per Mar, 2014 SRLDC Report is as given below:

State	Installed Capacity (MW)	Demand (MW)	Availability (MW)	Deficit (-) / Surplus (+)
Andhra Pradesh	9198	13671	13162	-509
Karnataka	6536	9559	9168	-391
Kerala	2187	3575	3588	14
Tamil Nadu	6925	12969	12650	-319
Pondicherry	33	320	319	-1
IPPs	23200			
Central Sector	10310			
Southern Region	58468*	37831	36985	-846

** As per SRLDC Report, the Installed Capacity is 59968 which includes NLC-II Ext-2x250 MW and Kudankulam – 1x1000 MW. These plants are only synchronized and yet to declare CoD. Hence, IC = 59968-1500 = 58468 MW

4.3 Looking at the generation projects which are in pipe line or under planning stage and may be materialized by 2018-19, a total of about 30,000 MW of installed capacity may be added in Southern Region. List of these projects is given in following table. This list does not include the Cheyyur UMPP of 4000 MW which may be delayed beyond 2018-19. Considering possibility of delay in some of the above generation projects, three generation addition scenarios have been worked out for i.e. Scenario S-I (29450 MW), S-II (25740 MW) and S-III(22060 MW).

State/Type	Future Generation Addition (2018-19)	Installed Cap (MW)		Scenarios		
		Units	Total	S-I	S-II	S-III
A.P Hydro	N'Sagar TR	2 x 25	50	50	50	50
	Lower Jurala	6 x 40	240	240	240	240
			290	290	290	290
A.P Thermal	Hinduja	2x520	1020	1020	1020	1020
	Krishnapatnam JV (APPDCL)	2 x 800	1600	1600	1600	1600
	Kakaliya TPP St-II	1 x 600	600	600	600	600
	Rayalaseema TPS St-IV	1 x 600	600	600	600	600
	Singareddipalli (2012-14)	5 x 40	200	200	200	200
			4020	4020	4020	4020
TN Hydro	Kundah PSS	4 x 125	500	500	500	500
			500	500	500	500
TN-Thermal	Neyveli TS-I Replacement	2 x 500	400	400	400	400
	Ennore TPS Annex	1 x 660	660	660	660	660
	Replacement of existing Ennore TPS	1 x 660	210	210	0	0
	North Chennai St-II	1 x 600	600	600	600	600
	North Chennai St-III (2015-16)	1 x 800	800	800	800	800
	North Chennai St-IV (2015-16)	2 x 660	1320	1320	0	0
	Udangudi TPS JV (TNEB-BHEL)	2 x 660	1320	1320	660	660
	Udangudi TPS JV St-II	1 x 800	800	800	0	0
OPGC		2x360	720	720	0	0
			6830	6830	3120	3120
Kar-Hydro	Nil	0	0	0	0	

State/Type	Future Generation Addition (2018-19)	Installed Cap (MW)		Scenarios		
		Units	Total	S-I	S-II	S-III
Kar-Ther	Bellary TPS U-3	1 x 700	700	700	700	700
	Taurangalu	1 x 300	300	300	300	300
	Yeramarus	2 x 800	1600	1600	1600	1600
	Edlapur	1 x 800	800	800	800	800
			3400	3400	3400	3400
Kerala-Hydro	Pallivasal Extn	2 x 30	60	60	60	60
	Mankulam		40	40	40	40
	Thottiar	1 x 30 + 1 x 10	40	40	40	40
			140	140	140	140
Ker-Thermal	Nil	0	0	0	0	0
Cent-Nuclear	Kudankulam	2x1000	2000	2000	2000	2000
	PFBR	1x500	500	500	500	500
			2500	2500	2500	2500
Cent-Thermal	Neveli TS - II Expansion	2 x 250	500	500	500	500
	Tuticorin JV	2 X 500	1000	1000	1000	1000
			1500	1500	1500	1500
IPP Thermal	Simhapuri	1x150	150	150	150	0
	Meenakshi	2x350	700	700	700	350
	Coastal Energen	2x600	1200	1200	1200	600
	IND-Barath Power	1x660	660	660	660	660
	IL&FS Tamil Nadu	2x600	1200	1200	1200	600
	East Coast Energy	2x660	1320	1320	1320	660
	Thermal Powertech.	2x660	1320	1320	1320	660
	NCC Krishnapatnam	2x660	1320	1320	1320	660
	Kudgi NTPC	3x800	2400	2400	2400	2400
				10270	10270	10270
	Total Hydro	930		930	930	930
	Total Nuclear	2500		2500	2500	2500
	Total Thermal (Coal)	26020		26020	22310	18630
	Total=Thermal+Nuclear			28520	24810	21130
	Total Additions	29450		29450	25740	22060

4.4 An analysis of surplus deficit in Southern Region considering above addition programme and scenario is given in the following table:

	MW		
Peak Demand Met	36985	A	
Peak import from NEW Grid	3950	B	
Peak Availability of Generation in SR	33035	C=A-B	
Projected Peak Demand as per 18th EPS Report including Loss	66111	E	
Projected Peak Demand excluding loss	64128	F=E*0.97	
	Scenario-I (Optimistic)	Scenario-II	Scenario-III (Pessimistic)
Projected Hydro Generation Addition (G)	930	930	930
Projected Thermal Generation Addition (H)	28520	24810	21130
Projected Total Generation Addition * (Installed Capacity) (I=G+H)	29450	25740	22060
Projected Generation Addition (Availability) (J=G*0.5+H*0.8)	23281	20313	17369
Total Import Requirement (MW) (K=E-C-J)	9795	12763	15707
* Wind Generation, Renewables, Gas Generation of Future addition are not considered.			

It is seen that Southern Region would be in a deficit situation by the end of 2018-19. The quantum of this deficit would range between 10000 to 16000 MW. It is felt that at this stage, we must plan sufficient transmission system to import power of the order of 16000 MW into Southern Region.

- 4.5 Following is a list of existing and planned/under-construction inter-regional transmission links:

The existing inter-regional links of SR with NEW grid are:

- (i) ± 500 kV, 2000 MW Talcher – Kolar HVDC bipole
- (ii) 1000 MW Chandrapur HVDC back-to-back
- (iii) 1000 MW Gazuwaka HVDC back-to-back
- (iv) Raichur – Sholapur 765 kV 2xS/c lines

Further, following additional inter-regional links are under construction

- (v) Narendra – Kolhapur 765 kV D/c (initially charged at 400 kV)
- (vi) Angul – Srikakulam – Vemagiri 765kV D/c line
- (vii) Wardha – Nizamabad - Hyderabad 765kV D/c line

- 4.6 The above existing/planned system can facilitate import of about 9000- 10000 MW

into Southern Region. To achieve the import objective of 16000 MW additional inter-regional transmission links would be needed along with strengthening within the Southern grid. Accordingly, following three schemes are proposed:

- (i) Additional inter-Regional AC link for import into Southern Region i.e. Warora-Warangal - Hyderabad- Kurnool 765kV link
- (ii) HVDC Bipole link between Western region (Chhattisgarh) and Southern region (Pugalur)
- (iii) Strengthening of transmission system beyond Vemagiri

Details of elements covered under these schemes are given below:

4.7 **Scheme-I: Additional inter-Regional AC link for import into Southern Region i.e. Warora-Warangal - Hyderabad- Kurnool 765kV link**

- (i) Establishment of 765/400kV substations at Warangal (New) with 2x1500 MVA transformer and 2x240 MVAR bus reactors.
- (ii) Warora Pool -Warangal (New) 765 kV D/c line with 240 MVAR switchable line reactor at both ends.
- (iii) Warangal (New) –Hyderabad765 kV D/c line with 330 MVAR switchable line reactor at Warangal end.
- (iv) Warangal (New) – Warangal (existing) 400 kV (quad) D/c line.
- (v) Hyderabad– Kurnool 765 kV D/c line with 240 MVAR switchable line reactor at Kurnool end.
- (vi) Warangal (New) – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends.
- (vii) LILO of Kurnool-Thiruvelam 765 kV D/c at Cuddapah
- (viii) Cuddapah- Hoodi 400kV (quad) D/c line with 63 MVAR switchable line reactor at both ends.

4.8 **Scheme-II: HVDC Bipole link between Western region (Chhattisgarh) and Southern region (Tamil Nadu)**

- (i) Raigarh(HVDC Stn) – Pugalur (HVDC Stn) 6000 MW HVDC bipole
- (ii) Establishment of Raigarh HVDC Stn and Pugalur HVDC Stn with 6000 MW HVDC terminals (with alternate of having 3000 MW in first phase)
- (iii) Raigarh HVDC Station – Raigarh(Existing) 400kV (quad) 2xD/c lines (or with bay extension)
- (iv) Pugalur HVDC Station – Pugalur (Existing) 400kV (quad) D/c line.
- (v) Pugalur HVDC Station – Arasur 400kV (quad) D/c line with 80 MVAR switchable line reactor at Arasur end.
- (vi) Pugalur HVDC Station – Thiruvalem 400kV (quad) D/c line with 80 MVAR switchable line reactor at both ends.
- (vii) Pugalur HVDC Station – Edayarpalayam 400 kV (quad) D/c line with 63 MVAR switchable line reactor at Edayarpalayam end.
- (viii) Edayarpalayam – Udumulpeta 400 kV (quad) D/c line.

- (ix) Establishment of 400/220kV substation with 2x500 MVA transformers at Edayarpalayam and 2x125 MVAR bus reactors.

4.9 **Scheme-III: Strengthening of transmission system beyond Vemagiri**

- (i) Vemagiri-II – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends.
- (ii) Chilakaluripeta – Cuddapah 765kV D/c line with 240 MVAR switchable line reactor at both ends.
- (iii) Chilakaluripeta – Podli 400kV (quad) D/c line
- (iv) Chilakaluripeta – Narsaraopeta 400kV (quad) D/c line
- (v) Cuddapah – Madhugiri 400kV (quad) D/c line with 80 MVAR switchable line reactor at both ends.
- (vi) Cuddapah-Hindupur 400kV (quad) D/c line with 80 MVAR switchable line reactor at Hindupur end.
- (vii) Srikakulam Pooling Station – Garividi 400 kV (Quad) D/c line with 80 MVAR switchable line reactor at Garividi end.
- (viii) Establishment of 765/400kV substations at Chilakaluripeta and Cuddapah with 2x1500 MVA transformers and 2x240 MVAR bus reactors each.
- (ix) Establishment of 400/220kV substations at Podli with 2x315 MVA transformers and 2x125 MVAR bus reactors.

4.10 The above schemes have been evolved through number of cases i.e base cases and contingency cases under various load generation scenarios. A list of cases for 16000 MW deficit scenarios as a justification for the proposed transmission schemes is given below:

Sl.No.	Case	Exhibit no.
1	Pessimistic Scenario Raigarh-pugalur 3000 MW	1.0
2	Pessimistic Scenario Raigarh-pugalur 4000 MW	2.1
3	Pessimistic Scenario Raigarh-pugalur 2000 MW	2.2
4	Pessimistic Scenario Raigarh-pugalur0 MW	2.3
5	Pessimistic Scenario Raigarh-pugalur 6000 MW	2.4
6	Pessimistic Scenario Warangal-Kurnool path HVDC-3000 MW	3.1
7	Pessimistic Scenario Warora-Warangal N-1	3.2
8	Pessimistic Scenario Warora-Warangal both ckt out	3.3
9	Pessimistic Scenario Angul Srikakulam N-1	4.1
10	Pessimistic Scenario Angul-Srikakulam both ckt out	4.2
11	Pessimistic Scenario Srikakulam-Vemagiri N-1	4.3
12	Pessimistic Scenario Vemagiri-CPeta N-1	4.4
13	Pessimistic Scenario CPeta-Cudappah	4.5
14	Case with only TN gen reduction	5.1
15	Case with only TN gen reduction-Warangal-Kurnool path	5.2
16	Optimistic case with TN full gen	6.1

17	Optimistic case with TN full gen-Warangal-Kurnool path	6.2
18	Optimistic case with TN full genKilpenathur-Coimbatore N-1	6.3
19	Optimistic case with TN full genKilpenathur-N.Chennai pool N-1	6.4
20	Case with PST 20 Deg	PST 20 deg
21	Case with PST 15 Deg	PST 15 deg
22	Case with PST 10 Deg	PST 10 deg
23	Case with PST 5 Deg	PST 5 deg
24	Case with PST 0 Deg	Without PST

4.11 Phase shifting transformer:

It has been observed that the flow on the Raichur-Sholapur line is only 565 MW without Phase shifting transformer(Exhibit- Without PST).

To overcome this situation and to achieve some control of power on the AC network Phase Shifting Transformer (PST) at Sholapur is proposed. This PST would be of 3000 MVA (2x1500 MVA). The loading on Raichur-Sholapur line improves considerably with the provision of PST.

The studies with 0 deg, 5 deg, 10 deg, 15 deg, 20 deg phase shifting transformer are shown in Exhibits.

4.12 Augmentation of transformation capacity in SR:

While carrying out the studies, it has been observed that the transformer augmentation may be needed at a number of 400kV Substations in Southern Region. An indicative list of such substations is given below:

List of substations where augmentation of ICTs is required

Sl.No.	Name of the substation	Sl.No.	Name of the substation
1	Ramagundam	22	Kolar
2	Hyderabad	23	Bangalore ElectronicCity
3	Gajuwaka	24	Narendra
4	Hyderabad-AP	25	Yelahanka
5	Kurnool	26	North tirchur
6	Vemagiri	27	Palakkad
8	Nellore-AP	28	Madras
9	Gajwel	29	Salem
10	Mahabubnagar	30	Neyveli
11	Chittoor	31	Salem
12	Garividi	32	Trichy

13	Hindupur	33	Madurai
14	Mailaram	34	Udmulpet
15	Malkaram	35	Hosur
16	Suryapet	36	Pugalur
17	Warangal	37	Neyveli-(REP)
18	Somanhally	38	Pondicherry
19	Davangiri	39	Edayarpalayam
20	Hoodi	40	Tanjore
21	Mysore	41	Kolapalur

The augmentation would depend on following factors:

1. Space availability at these stations
2. Confirmation from the states to draw additional power by putting more number of 220 kV transmission lines
3. re-configuration of 220 kV network

This exercise requires detailed analysis of above factors and shall be finalized in consultation with SR constituents. Further ICT augmentation would comparatively take lesser time than implementation of trunk transmission system. This is proposed to be taken up in the next meeting of the Standing Committee.

4.13 Short circuit levels at 400kV and 765kV nodes in SR:

While carrying out the studies for 2018-19, considering the system proposed above, it has been observed that the maximum fault level at existing, planned and proposed 400kV, 765 kV buses is given in Annex 4.1.

The buses indicated by * are approaching higher limits. To mitigate anticipated high fault level at these buses, detailed analysis of above factors are required considering options like series reactor, reconfiguration (splitting buses) etc and is proposed to be taken up in the next meeting of the Standing Committee.

5.0 Dedicated power supply to Pumping Stations at Myadaram, Choppadandi, Ramadugu, Malakpet

- 5.1 Transmission Corporation of Andhra Pradesh Ltd, vide their letter No. CE(PS) / SE(SP)/DE(SS)/ADE-2/F. Ph-chevella/D. No. 64 /2014, Dt. 16 .04.2014 9copy enclosed at Annex-5.1), has informed that the following pumping stations are coming up in Karimanagar district under Dr. B.R.Ambedkar Pranahitha Chevella

Sujala Project lift scheme.

- i) Myadaram, Karimnagar Dt. (Pkg-6) – 756 MW
- ii) Choppadandi, Karimnagar Dt. (Pkg-7) – 150 MW
- iii) Ramadugu, Karimnagar Dt. (Pkg-8) – 720 MW
- iv) Malakpet, Karimnagar Dt. (Pkg-9) - 30 MW
- v) Tippapur, Karimnagar Dt. (Pkg-10) - 336 MW

5.2 TSTRANSCO (Transmission company of Telangana) has informed that this project is designed to utilize 160 tmcft of Pranahita water and serve 16.4 lakh acres in the water scarcity areas of Adilabad, Karimnagar, Warangal, Nizamabad, Nalgonda, Medak and Ranga Reddy districts. The water from this Pranahitha barrage will be transferred into the reservoir of the Yellampalli project already constructed across the Godavari, before being released to the intended areas, including Hyderabad city (30 tmcft) for drinking purpose. TSTRANSCO has informed that motors would be synchronous motors to pump with average 530 meters average pumping head . These alternating current motors will run between 0.95 pf lead or lag. The packages under this project are:

- a) Package-6: voltage rating is 13.8 kV with 6 pumps with the total power requirement of 750 MW
- b) Package-7: voltage rating is 11 kV with 3 pumps with the total power requirement of 123 MW
- c) Package-8: voltage rating is 13.8 kV with 5 pumps with the total power requirement of 670 MW
- d) Package-10: voltage rating is 13.8 kV with 8 pumps with the total power requirement of 336 MW

5.3 Accordingly, the following transmission scheme for extension of supply to the above packages of Dr. B.R. Ambedkar Pranahita – Chevella Sujala Sravanti Lift Irrigation Scheme has been proposed by TSTRANSCO:

- a) Erection of 400kV SS at Ramadugu (Pkg-8).
- b) Erection of 400kV Sub-Station at Choppadandi (Pkg-7) with 2x315 MVA ICTs.
- c) Erection of 400kV SS at Myadaram (Pkg-6)
- d) Erection of 400kV SS at Tippapur (Pkg-10)

- e) Erection of a 132kV SS at Malakpet (Pkg-9)
- f) Erection of 400kV Quad Moose DC line for making LILO of both the circuits of 400kV SCCL – Gajwel Quad Moose DC Line at the proposed 400kV Ramadugu SS (total 50kM for two LILO DC lines).
- g) Erection of 90kM 400kV Twin Moose DC line from 400kV Dichpally SS to the proposed 400kV Ramadugu SS.
- h) Erection of 25kM 400kV Quad Moose DC line from 400kV Ramadugu SS to 400kV Myadaram SS.
- i) Erection of 25kM 400kV Quad Moose DC line from 400kV Ramadugu SS to 400kV Choppadandi SS.
- j) Erection of 40kM 400kV Twin Moose DC line from 400kV Choppadandi SS to 400kV Tippapur SS.
- k) Erection of 400kV Twin Moose DC line for making LILO of both the circuits of 400kV K TPP – Gajwel Twin Moose DC Line at the proposed 400kV Tippapur SS (total 80kM for two LILO DC lines).
- l) Erection of 60kM 400kV Twin Moose DC line from 400kV Dichpally SS to the upcoming 400kV Nirmal SS.
- m) Erection of 30kM 132kV DC line from 220kV Jagityala SS to the proposed 132kV Malakpet SS.

5.4 SLD showing above system is given at Annex-5.2. The load flow result considering all pumps running on full load and pumps running on no load are given at Annex -5.2.

5.5 TSTRANSCO to present their proposal. Members may discuss.

6.0 400kV Bays in Dharmapuri (Salem) 765/400kV SS for terminating 400kV DC line from Rasipalayam 400kV SS:

6.1 During the 34th Standing Committee Meeting (**para 3.7(b)**) for Southern Region, following transmission system was inter-alia agreed for evacuation of wind power projects in Tamil Nadu

System for additional inter-connection with ISTS and increased reliability:

i) LILO of one Rasipalayam -Singarapet 400kV D/c line at Salem 765/400kV (POWERGRID) substation

- 6.2 TNEB vide their letter no Lr.No. CE/Plg.&R.C/SE/SS/EE1/AEE1/F.400kV Bays/D.202/14 Dated. 21.06.14 copy at Annex 6.1) has stated that as per PGCIL there are no bays available at Dharmapuri substation for TANTRANSCO now, and at a later stage when the operating voltage is at 765kV level, 400kV bays will get released.
- 6.3 TNEB has also informed that Thappagudu- Anaikadavu- Rasipalayam 400kV D/C line with 400kV S/S is on the fast track. The land for the Singarapet 400kV SS has been identified near Salem (Dharmapuri) 765kV PGCIL SS i.e., at Palavady., and the work is expected to be taken up shortly. Out of the 2 DC 400kV circuits from Rasipalayam to Palavady (Singarapet). One DC circuit has been already taken up and the other DC circuit is included in the KfW funding.
- 6.4 TNEB has requested that at least one of the Rasipalayam – Palavady 400kV line, the execution of which is on the fast track may be permitted to be made LILO at Dharmapuri. They have suggested that the two numbers 400kV Bays meant for ICTs in the Salem 765kV SS may be temporarily permitted to be used for making LILO of the above said line.
- 6.5 TNEB/TANTRANSCO may present the proposal. Members may discuss.

7.0 Transmission System for evacuation of power from 2x500 MW Neyveli Lignite Corp. Ltd. TS-I (Replacement) (NNTPS) in Neyveli, Tamil Nadu:

- 7.1 During the 35th meeting of the Standing Committee on Power System Planning of Southern Region held on 4th Jan, 2013, following transmission system was agreed for evacuation of power from 2x500 MW Neyveli Lignite Corporation Ltd. TS-I (Replacement) (NNTPS) in Neyveli, Tamil Nadu.

I. Transmission System for Connectivity

- (i) Provision of 7x167 MVA (single phase), 400/220 kV transformers at generation switchyard (by NLC)
- (ii) 1x80 MVAR Bus Reactor at generation switchyard (by NLC)
- (iii) LILO of existing Neyveli TS-II – Pondy cherry 400 kV S/c at NNTPS generation switchyard (by POWERGRID)

II. Transmission System for LTA (as an ISTS)

- (i) NNTPS switchyard – Villupuram (Ginjee) 400kV D/c line
- (ii) Villupuram (Ginjee) 400kV S/S 2x500 MVA

III. System Strengthening in Tamil Nadu:

- (i) Establishment of new 230/110kV, 3x160 MVA or 4x100 MVA S/S at Neyveli (TANTRANSCO 230kV S/S) (by TNEB)
- (ii) Shifting of the 230kV (3 nos) and 110kV(7 nos) lines owned by TNEB emanating from the existing Neyveli TS-I switchyard to Neyveli 230kV S/S (by TNEB)
- (iii) LILO of both circuits of Neyveli TS-I – Neyveli TS-II 230kV D/c line at NNTPS Switchyard (by NLC)
- (iv) NNTPS switchyard – Neyveli(TANTRANSCO 230kV S/S), 230kV D/C line with HTLS conductor (by TNEB)
- (v) Neyveli TPS-II - Neyveli(TANTRANSCO 230kV S/S), 230kV D/C line (by TNEB)

7.2 During the 36th meeting of Standing Committee on Power System Planning of Southern Region held on 4th Sept, 2013, following was also agreed as additional transmission system for evacuation of power from 2x500 MW Neyveli Lignite Corporation Ltd. TS-I (Replacement) (NNTPS) in Neyveli, Tamil Nadu:

Para 8.3

- (i) NNTPS switchyard – Neyveli (TANTRANSCO 230kV S/S), 230kV D/C line with HTLS conductor (by TNEB).
- (ii) Neyveli TPS-II – Neyveli (TANTRANSCO 230kV S/S), 230kV D/C line (by TNEB) also be with HTLS conductor.

7.3 NLC vide their letter no PSE/NNTPS/CEA/Elec/2013 dated 20.11.2013 (copy at Annex -7.1) has stated that for above additional system two additional bays each would be required at NNTPS 230kV switchyard and TPS-II 230kV switchyard. NLC has informed that there is no space available for construction of two additional bays at NNTPS 230kV switchyard and TPS-II 230kV switchyard and, hence, has requested to revise the evacuation scheme.

7.4 The above issue was discussed with TNEB official, in a meeting held in CEA, on 11 June 2014 and it was pointed out that the transmission elements mentioned at 4.1 (i) & (ii) above, **are not additional systems**. The only difference from whatever agreed in 35th SCM minutes was that, the Neyveli TPS-II – Neyveli (TANTRANSCO 230kV S/S), 230kV D/C line (by TNEB) would be built by HTLS conductor instead of normal Zebra conductor.

7.5 Accordingly, it is clarified that the following would be under the scope of System Strengthening in Tamil Nadu:

- (i) Establishment of new 230/110kV, 3x160 MVA or 4x100 MVA S/S at Neyveli (TANTRANSCO 230kV S/S) (by TNEB)
- (ii) Shifting of the 230kV (3 nos) and 110kV(7 nos) lines owned by TNEB emanating from the existing Neyveli TS-I switchyard to Neyveli 230kV S/S (by TNEB)
- (iii) LILO of both circuits of Neyveli TS-I – Neyveli TS-II 230kV D/c line at NNTPS Switchyard (by NLC)
- (iv) NNTPS switchyard – Neyveli(TANTRANSCO 230kV S/S), 230kV D/C line with HTLS conductor (by TNEB)
- (v) Neyveli TPS-II - Neyveli(TANTRANSCO 230kV S/S), 230kV D/C line (by TNEB) also be with HTLS conductor.

7.6 The above is only a clarification. Thus system as agreed in 35th SCM remains same except for minor modification in terms of type of conductor for the last item. Members may note.

7.7 Regarding the system under “Transmission System for LTA (as an ISTS)”, as TNEB has now planned to build Vilipuram S/S as 765/400/230kV S/S at Ariyalur, Villipuram S/S would now be under the scope of TNEB/ TANTRANSCO. Accordingly, now the following is proposed under the scope of ISTS:

Transmission System for LTA (as an ISTS)

- (i) NNTPS switchyard – Villupuram (Ariyalur) 400kV D/c line
- (ii) Villupuram (Ariyalur) 400kV S/S 2x500 MVA

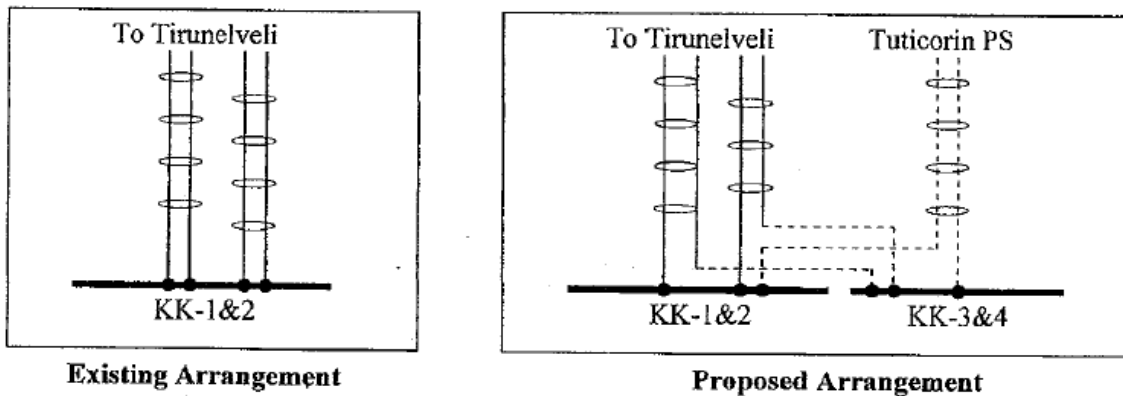
7.8 Members may discuss.

8.0 Connectivity for Kudankulam 3&4 (2x1000MW) with interstate transmission system.

8.1 NPCIL vide their letter No. NPCIL/(Trans)/2014/M/27 dated May 19, 2014 (copy at Annex 8.1) has informed that connectivity arrangement for Kundnkulam -3&4 (\-3&4, 2x1000 MW) has been planned independently from that of the existing Kundankulam-1&2 (KKNPP-1&2, 2x1000 MW) due to current rating as well as switchgear rating limitations of 400kV switchyard of KKNPP-1&2. Under the proposed scheme, one additional 400kV D/C line has been planned to Tuticorin Pooling Station, one circuit of this D/C line would be connected to KKNPP 1&2 and the other to KKNPP 3&4. Similarly, one circuit of each of the existing

2x400kV D/c lines (to Tirunelveli) will also be connected to KKNPP-1&2 and KKNPP-3&4. As per the proposed scheme 3 nos. of 400 kV lines, 2 nos. to Tirunelveli and 1 no. to Tuticorin, will emanate from both of the plants i.e. KKNPP-1&2 and KKNPP-3&4.

- 8.2 NPCIL has opined that none of the switchyards satisfies the N-1-1 criteria and as such N-1-1 contingency may call for operational measures such as rescheduling of generation either manually or through automatic System Protection Scheme (SPS).
- 8.3 NPCIL has further stated that in existing configuration of KKNPP-1&2, one of the 4 circuits to Tirunelveli has been extended up to Madurai, bypassing the Tirunelveli Sub-Station as a temporary measure. In the event of non-availability of 400 kV Tirunelveli S/s, a SPS is under implementation to regulate the generation of KKNPP-1&2 to 700 MW within 10-15 minutes, so as to match it with the capacity of the only available line to Madurai. Thus they have requested to review the connectivity of KKNPP-3&4 (2x1000 MW).



- 8.4 NPCIL may make presentation for further discussion.

9.0 Requirement of Additional 125 MVAR Bus Reactor at Kaiga

- 9.1 During the 36th SCSPSR held on 4th Sept, 2013, it was agreed that NPCIL would explore the possibility to provide additional reactor of 125 MVAR at Kaiga or replace the 63 MVAR with 125MVAR, the dismantled 63MVAR reactor to be used as regional spare.
- 9.2 In this regard, NPCIL has informed that the studies on the subject reactor

requirement are under progress.

9.3 NPCIL may present the studies/status of studies. Members may discuss.

10.0 Reactive Compensation for Various Transmission Schemes approved in previous SCMs

10.1 Reactive Compensation has been proposed for the following transmission Schemes approved in previous Standing Committee Meetings

i. Wardha – Hyderabad (Maheshwaram)765 kV Link:

- 1 no. 240 MVAR, 765 kV Bus Reactors at Nizamabad.
- 1 no. 240 MVAR switchable line reactor at Maheshwaram and Wardha for both circuits of Wardha – Hyderabad (Maheshwaram) 765kV D/c line with anchoring at Nizamabad.
- 1 no. 240 MVAR switchable line reactor at Nizamabad for both circuits of Wardha – Nizamabad 765kV D/c line and Nizamabad – Hyderabad (Maheshwaram) 765kV D/c line.

ii. Substation works associated with Hyderabad (Maheshwaram) 765 kV Substation

- 2 nos. 240 MVAR, 765 kV Bus Reactors at Maheshwaram Pooling Station

iii. Sub-station Works associated with System Strengthening in Southern Region for import of power from Eastern Region:

- 1 no. 240 MVAR switchable line reactor at Vemagiri Pooling Station and Srikakulam Pooling Station each for both circuits of Srikakulam PP – Vemagiri-II Pooling Station 765kV D/C line.
- 2 nos. 240 MVAR, 765 kV Bus Reactors at Vemagiri Pooling Station.
- 1 no. 80 MVAR, 400 kV Bus Reactors at Vemagiri Pooling Station.

iv. Transmission System associated with ISGS Projects in Nagapattinam/Cuddalore Area of Tamilnadu – Part A1 (b)

- 1 no. 63 MVAR line reactor at Nagapattinam Pooling Station and Salem New (Dharmapuri) each for both circuits of Nagapattinam Pooling Station – Salem (New) 765 kV D/c line (initially charged at 400 kV) being implemented under Tariff based Bidding.

- 1 no. 63 MVAR line reactor at Madhugiri end of Salem New (Dharmapuri) – Madhugiri 765 kV S/c line (initially charged at 400 kV) being implemented under Tariff based Bidding.

v. GREN ENERGY CORRIDORS: ISTS-PART-A

- 2 no. 125 MVAR, 400 kV Bus Reactors at Tirunelveli Pooling Station.

10.2 System Studies were carried out for assessing Reactive Compensation for the above transmission Scheme and the results have been given at **Annex 10.1**.

10.3 Members may discuss and agree.

11.0 Establishment of 2x500 MVA, 400/230kV GIS S/S at Tirunelveli Pooling Station.

11.1 Regarding proposal for establishment of Tirunelveli Pooling Station of GIS type, PGCIL have informed that the total land requirement of GIS type is 16 acres as compared to 40 acres (including colony) for AIS type. They are planning to procure government land under control of Hindu Religious and Charitable Endowments Dept of TN at an estimated value of Rs 2 lakh per acre and in a lesser time frame. PGCIL has furnished substation layouts indicating land requirements for GIS and AIS types (Annex -11.1 and 11.2).

11.2 The comparative study between GIS and AIS at Trinellveli, as furnished by PGCIL, is given below:

Tirunelveli 400/230 kV new substation under Green Energy corridor

Details	GIS	AIS
No of 400KV diameters *	8 (4 for present scope)	8(4 for present scope)
400KV Switch yard Scheme	One and half breaker	One and half breaker
No of 400kV lines*	9 (4 in the present scope)	9(4 in the present scope)
No of 400/230KV Transformer*	5 (2 in the present scope)	5(2 in the present scope)
No of bus reactors	2 (2 in the present scope)	2(2 in the present scope)
No of line reactors *	3 (nil in the present scope)	3 (nil in the present scope)
220kV Switch yard scheme	Double main	Double main & transfer
220kV lines*	23(nil in the present scope)	23(nil in the present scope)
Over all space requirement	16 acres for GIS (i.e 280m*225m)	35 acres for switch yard and 40 acres in total considering 5 acres for Township and open stores space

		requirement for AIS (ie 415X 390m)
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* considering future requirement

11.3 Accordingly, it is proposed to implement the Tirunellveli S/S as GIS type because of above considerations. Members may discuss.

12.0 Transmission system for evacuation of power from Cheyyur Ultra Mega Power Project (UMPP) of 4000 MW capacity:

12.1 Earlier, a transmission system for evacuation of power from Cheyyur UMPP was finalized during the 28th meeting of SCPSPSR held on 15 June 2009 considering commissioning of UMPP in 2013-14 time frame. But, somehow the UMPP project could not be taken up and got delayed. Now, the establishment of the project has been revived. The RfQ has been issued and the project developer (M/s Costal Tamil Nadu Power Ltd., which is a SPV of PFC) had applied for the LTA to CTU. The earlier planned system was as under:

- 1) TNUMPP – Thiruvalem 765kV 2xS/c line
 - 2) TNUMPP- Salem 765kV S/c line
 - 3) Salem- Madhugiri 765kV S/c line (2nd circuit)
 - 4) Thiruvalem- Kurnool 765kV 2xS/c line
 - 5) Kurnool – Raichur 765kV 2xS/c line
- These lines are now covered under system strengthening

12.2 As per the LTA application by CTNPL following are the beneficiaries:

Region/States	Sharing in MW
<u>Northern Region (NR)</u>	
1. Uttar Pradesh	300
2. Punjab	200
Sub-total(NR)	500
<u>Western Region (WR)</u>	
1. Maharashtra	400
Sub-total(WR)	400
<u>Southern Region (SR)</u>	
1. Tamil Nadu	1600
2. Karnataka	800
3. Andhra Pradesh +Telangana	400
4. Kerala	300
Sub-total(SR)	3100
Total	4000

12.3 The earlier planned transmission system needs to be reviewed because of the changed load- generation scenario, newly planned/ under construction transmission systems, impact of renewable energy and new transmission planning criteria. M/s CTNPL, in its LTA application, has requested LTA from March 2019 onwards. Considering 4-5 years for construction of transmission system, there is need to firm up the transmission system for this UMPP.

12.4 PGCIL may present the studies/proposal. Members may discuss.

13.0 APTRANSCO’s Proposal regarding evacuation scheme for procurement of 1050 MW from three generators

13.1 APTRANSCO vide their letter dated 18-10-2013 (copy at Annex-13.1)has informed that APCPDCL had requested APTRANSCO for formulation of a Transmission evacuation scheme to evacuate 1050 MW power from the switchyards of following three generators as per case-I bid clause:

- M/s Thermal Power Tech. Ltd., Nellore Dt. (500 MW)
- M/s Krishnapatnam Power Corporation Ltd. Nellore Dt. (250 MW).
- M/s PTC India Limited (East Coast Energy Pvt. Ltd.) Srikakulam Dt.(300 MW)

13.2 Accordingly, APTRANSCO has proposed following evacuation schemes to draw part power from the above generators into the STU network of Andhra Pradesh.

(A) Proposed Scheme at Nellore for evacuation of 750 MW (500 MW power from M/s Thermal Power Tech. Ltd and 250 MW power from M/s Krishnapatnam Power Corporation Ltd.)		
Sl. No.	Description	Qty.
1	400 kV Pooling SS with 4x315 MVA at Krishnapatnam/Nellore	1 No.
2	400 kV Twin Moose DC line form the 400 kV Pooling SS to 400 kV Podli SS	100 km
3	400 kV Twin Moose DC line from the 400 kV Pooling to the generator M/s Thermal Power Tech. Ltd.	30 km
4	400 kV Twin Moose DC line from the 400 kV Pooling SS to the generator M/s Krishnapatnam Power Corp. Ltd.	30 km
5	220 kV New line with Moose equivalent HTLS conductor (To make LILO of 3 Nos. 220 kVc ckts between 220 kV Nellore and 400 kV Manubolu SS)	6x20 km
6	Re-conductoring of Existing 3 ckts between 220 kV Nellore and 400 kV Manubolu SS with Moose equivalent HTLS conductor	3x25 km

(B) Proposed Schemes at Tekkali, Srikakulam Dt. For evacuation of 300 MW (300 MW power from M/s PTC India Limited (East Coast Energy Pct. Ltd.))		
Sl. No.	Description	Qty.
1	400/220 kV at Tekkali/near by Generator SS 2x315 MVA	1 No.
2	220 kV DC Circuit with Moose equivalent HTLS conductor from the proposed 400/220 Tekkali SS to 220/132 kV Tekkali SS	15 km
3	220kV 2ndCkt Stringing between 220 kV Garividi SS – 220 kV Tekkali SS	92 km

- 13.3 The above proposals were discussed with officials of Transmission Company of Telangana (TGTRANSCO), Andhra Pradesh (APTRANSCO) and PGCIL in a meeting held in CEA on 13th June 2014. In the meeting PGCIL informed that they have given LTA to M/s Thermal Power Tech. Ltd and to M/s PTC India Limited (East Coast Energy Pct. Ltd.) and the transmission system for this LTA is under advanced stage of construction/ partly completed. These systems are : Thermal Power Tech - Nellore Pooling Station 400kV D/C line(as ISTS), Nellore- Kurnool 765kV Quad D/C line (under ISTS), East Coast- Srikakulam Pooling Station 400kV Quad D/C line (as Dedicated Transmission line by the generator), and strengthening beyond Srikakulam Pooling Station i.e Srikakulam Pooling Station - Angul -Jhasurguda- Dharamjaigarh 765kV D/C line(as ISTS). The recovery of transmission charges would be as per LTA agreement with the IPPs in accordance with the CERC regulations. Also, APTRANSCO, being part of LTA discussion was aware about it.
- 13.4 It was also informed that M/S Krishnapatnam Power Corporation Ltd has withdrawn the application so no LTA has been given by PGCIL. For the Krishnapatnam Power Corporation Ltd, APTRANSCO/ TGTRANSCO may plan and augment their transmission system. However the planned system should be sufficient to evacuate full installed capacity of the generator plant.
- 13.5 Further M/S Thermal Power Tech. Ltd has requested CEA that the transmission system proposed by AP would result in duplicate transmission asset which must be avoided **(copy enclosed at Annex -13.2).**

13.6 APTRANSCO/ TGTRANSCO may present their proposal. **Members may discuss.**

13.7 Further to above, following is also proposed for discussion:

- During 36th SCPSPSR a 400/220 kV S/S at Garividi connecting with Kalpakka S/s through 400kV quad moose line was agreed, which can be further strengthened by connecting Garividi to Srikakulam PS (under ISTS) and the 220kV 2nd circuit stringing between 220 kV Garividi SS – 220kV Tekkali SS (under STU network) as proposed above by APTRANSCO.

14.0 Augmentation of Talcher-II Transmission System

14.1 SRPC vide their letter no SRPC/SE-II/2014/ dated 24.04.2014, has intimated that the progress of implementation of Talcher-II augmentation transmission system was discussed in the 24th Meeting of SRPC held on 15th March, 2014. They had informed that TANTRANSCO had suggested taking up Talcher back up system in the Standing Committee Meeting and had requested to review the requirement of Talcher-Gazuwaka link in the present grid scenario.

14.2 The following transmission system was earlier agreed as part of evacuation system for Talcher II Augmentation System:

- i. Talcher II - Rourkela 400kv D/c (Quad) line
- ii. Talcher II - Behrampur 400kv D/c (Quad) line
- iii. Behrampur - Gazuwaka 400kV D/c line

Power from Talcher-II STPS (2000 MW) having SR constituents as its beneficiaries is evacuated through Talcher-Kolar bipole HVDC line. Talcher-II Augmentation scheme has been planned as a back up transmission system to cater to pole outage of HVDC line.

14.3 Since the matter is sub-judice, therefore requirement of Talcher back up system may not be reviewed by the SCPSPSR at this stage. **Members may discuss/note.**

15.0 Operational feedback on Transmission constraints

15.1 NLDC vide their letter No NLDC/Operational Feedback/68 dated 18 April 2014 (copy is available on the website of POSOCO), have submitted Operational Feedback of the National Grid for the quarter January-March 2014. POSOCO have stated present/likely transmission constraints in Southern Region under the

following categories:

- ii) Transmission Lines Constraints
- iii) ICT Constraints
- iv) Nodes experiencing High Voltage and lines opened on high Voltage
- v) Delay in Generation affecting grid Operation adversely.
- vi) Delay in Transmission Lines affecting grid Operation adversely

15.2 Transmission Lines constraints:

- The SR has experienced high loading on Kolar-Hosur DC, S.V.Chathram-Pondy SC, Hosur-Salem both circuits, Salem-Udumalpet DC, Gooty-Nelamangala 400kV lines. POSOCO report also mentions about North-South corridor constraint in future.

These loading/constraints are likely to be eased with the already planned transmission system for strengthening of S1-S2 corridor.

- SR grid has also experienced high loading on 400kV Hiriyur-Nelamangala DC line and Jindal-BTPS SC Line. **These constraints are likely to be eased with commissioning of the transmission system planned for Yermaras TPS.**
- POSOCO report also states that there may be constraint in the 400kV Khammam-Nagarjunasagar SC line. **A 400kV D/C line between Khammam and Nagarjun Sagar is already under construction.**
- Speeding up of the Kudamkulam Unit-1 & 2, Neyveli TPSII Exp Unit-1 and Neyveli TPSII Exp Unit-2 generation projects, as reported by POSOCO, would also provide relief in above constraints.

15.3 ICT Constraints

S. No	ICT	Solution to the constraints
1	400/220kV 315MVA ICTs at Hyderabad (Ghanapur-3Nos., Mamidipalli-3Nos. and Malkaram-3Nos.)	Newly planned substations at Maheshwaram 400/220kV, 2x500MVA, Gajwel, Yeddumailaram likely to ease the ICTs at Hyderabad.
2	400/220kV 500 MVA ICTs at Somanahalli-2Nos., Nelamangala-2Nos. and Hoody-2Nos.	Redistribution/ re-configuration of 220kV transmission lines around these substations is required.
3	400/220kV 315MVA ICTs at Mysore-2Nos	Strengthening at 220kV level around Mysore is required/ Augmentation of transformer capacity.

S. No	ICT	Solution to the constraints
4	400/220kV 315MVA ICTs at Kalvindapattu-2 Nos	Newly planned substations at Thiruvalem and Sholiangnalur would ease the ICTs at Kalvindapattu
5	400/220kV 315MVA ICTs at Trichur-2Nos and Palakkad-2Nos	Mysore- Kozikode 400kV line would ease the ICTs at Trichur.

15.4 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.

15.5 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 Kanarapatti SS, 400kV Kayathar SS, 400kV Tirunelvelli-Kanarapatti-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.

16.0 LTA/ Connectivity Agenda for discussion of POWERGRID

- 16.1 POWERGRID to present. **Members may discuss.**