भारत सरकार/ Government of India
विद्युत मंत्रालय / Ministry of Power
केंद्रीय विद्युत प्राधिकरण/ Central Electricity Authority
प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग
System Planning & Project Appraisal Division
सेवा भवन, आर.के .पुरम, नई दिल्ली - 110066
Sewa Bhawan, R.K. Puram, New Delhi – 110066

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No. 51/4/(37th)/SP&PA-2014/ 1729-42 Date: 22-September-2014

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

Sir,

The **37th meeting** of the Standing Committee on Power System Planning of Southern Region was held on 31st July 2014 in NRPC Committee room, Katwaria Sarai, New Delhi.
The Minutes of the meeting are enclosed.
The Minutes are available at CEA's website (www.cea.nic.in).

Yours faithfully,

22/9/2014

(प्रदीप जिंदल /Pardeep Jindal)
निदेशक (प्र यो एवं प मू)/Director (SP&PA) Division,
(Tel: 011-26198092, Fax: 011-26102945)

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 -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 Member (Transmission), Kerala State Electricity Board, Vidyuthi Bhawanam, Pattom, P.B. No. 1028, **Thiruvananthapuram - 695 004.** FAX : 0471-2444738	8. Member (Distribution), Tamil Nadu electricity Board (TNEB), 6th 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 80**1. 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, 12th Floor, Vikram Sarabhai Bhawan, Anushakti Nagar, **Mumbai – 400 094.** **FAX : 022- 25991258**

Copy to:

1.	The Director (Projects), 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

MINUTES OF MEETING

Draft-Minutes of 37th Meeting of the Standing Committee on Power System Planning in Southern Region (SCPSPSR) held on 31st-July-2014 at NRPC, Katwaria Saria, New Delhi

1. Introduction

1.1 Member(PS) welcomed the participants and said that number of changes have taken place since the last meeting held in September 2013 and based on these the agenda for today's meeting has been put up for consideration by Standing Committee. He mentioned that Ministry of Power has suggested that Standing Committee Meetings should be called on quarterly basis to address various issues related to planning. We would henceforth need to convene meetings of Standing Committee on regular basis. He also informed as part of Prime Minister's 100 days program, 20 year perspective plan is to be brought out by CEA in association with CTU and POSOCO Acommittee for developing the perspective plan for has been constituted. and would bring out broad transmission corridors for the country. He urged participants to be specific while presenting their views. With these views he requested Director (SP&PA) to take up agenda items.

1.2 List of participants is given at **Annex-I.**

1.3 These Minutes may be read along with the Agenda circulated for this meeting.

2. Confirmation of the minutes of 36th meeting of the Standing Committee

2.1 Director(SP&PA), CEA stated that minutes of the 36th meeting of the Standing Committee on Power System Planning of Southern Region were issued vide. CEA's letter No. 51/4/SP&PA-2013/1694-1704 dated 27th Sept, 2014. In this regard, TANTRASNCO has given observations on para 21.0 – "Contingency Plan for evacuation of Power from ILFS" as per which, the 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.

2.2 TANTRANSCO in its letter 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.

2.3 DGM(CTU) stated that minutes circulated have actually recorded what was agreed. In fact based on these decisions POWERGRID has already gone ahead towards implementation of contingency scheme. Approval of MoP in this regard has also been received. Director, CEA proposed that observation of TNEB can be recorded but without altering the decision taken in the earlier meeting of the Standing Committee, which was agreed by TNEB and CTU.

2.4 Director, CEA stated that the minutes of joint meeting of Standing Committee of Power System Planning of Western Region and Southern Region held on 26th Dec, 2013 to discuss – (i) Transmission system of KPTCL for evacuation of power from Yermarus(2x800MW) and Edlapur(1x800 MW) Thermal Power Generation and (ii) GNA concept paper, were issued vide CEA's letter No 51/4/SP&PA2014/150-171 dated 21st January, 2014.

No observations were received on the circulated minutes, as such these minutes, as circulated were confirmed.

2.5 DGM(CTU) further pointed out a typographical error in the point 16.3 (c) of issued minutes wherein 2x80 MVAR switchable line reactors at Nellore Poling station for Nellore (Pooling station) – Gooty 400 kV Quad D/c line has been agreed in place of 2x63 MVAR switchable line reactors for controlling high voltages at Nellore.

2.6 Accordingly, the minutes of 36th Standing Committee of Power System Planning of , as circulated were confirmed with following changes:

Para 16.3 (c) is modified as below:

2x63 MVAR switchable line reactors at Nellore Pooling Station(PS) for Nellore PS – Gooty 400 kV Quad D/c line.

Para 21.5 is modified as below:

ED(SRLDC), POSOCO said that Neyveli – S P Budur line always remains overloaded and allowing ILFS to evacuate the power would further increase the overloading. Further TANTRANSCO 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 765kV S/C line & Salem – Madhugiri 765kV S/c line may be speeded up to evacuate power from IL&FS.

3. TANGEDCO/TANTRANSCO proposals

3.1 Director (SP& PA) stated that joint studies were carried out at Gurgaon, with CEA and PGCIL on 05-03-2014 to 07-03-2014 and later on 11-06-2014 in Delhi, to finalize the Intra-State transmission system proposed by TANTRASCO, for the evacuation of 4160MW (State sector – 3440MW + OPG Private power plant – 720MW) generation in Chennai Area and 2120 MW generation in Udangudi area.

3.2 TANTRANSCO stated that based on the guidelines given by CEA, joint studies were carried out and following transmission system has been evolved 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.

3.3 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. A second 765kV DC connectivity from North Chennai 765kV pooling station to the proposed Ariyalur 765/400kV SS may be reviewed at a later date depending upon 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 Thiruvalam 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.

3.4 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.

iv) 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.

c. 230kV connectivity:

i. LILO of TSipcot – Kavanoor 230kV SC line

ii. 230kV DC line from Indbharath generation switchyard of 2x150 MW.

iii. LILO of TSipcot – Savasapuram 230kV SC feeder.

v) 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 Kamuthi SS to the existing Karaikudi 400kV PGCIL Substation. This S/S would have following 230kV connectivity:

i. 230kV DC line to the proposed Muthuramalingapuram 230kV SS.

ii. 230kV DC line to the existing Kavanoor 230kV SS.

3.5 TANTRANSCO has proposed to establish the following 400 KV Substations and transmission lines as System strengthening, throughout Tamil Nadu 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:

i. LILO of Kudankulam – SRPudur 230kV SC line

ii. LILO of Udayathur – Sankaneri 230kV SC line

iii. 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. The following 230kV connectivity is proposed:

i. 230kV SC line to Karambium 230kV SS.

ii. 230kV SC line to Pudukottai 230kV SS.

iii. 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. The following 230kV connectivity is proposed:

i. 230kV SC line to Perambalur 230kV SS.
ii. 230kV SC line to Samayapuram 230kV SS.
iii. 230kV SC line to sanctioned Jambunathapuram 230kV SS
iv. 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. The following 230kV connectivity is proposed:

i. 230kV SC line to Thingalur 230kV SS
ii. 230kV SC line to Anthiyur 230kV SS
iii. 230kV SC line to Shenbagapudur 230kV SS
iv. LILO of Gobi – Pallakapalayam 230kV feeder
v. 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. The following 230kV connectivity is proposed:

i. LILO of Salem – Singapuram
ii. LILO of Deviakurichi – Valayapatty 230kV feeder.
iii. 230kV SC line to the proposed Thammampatty 230kV SS
iv. 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 and Tiruvalam 400 KV Substation). The following 230kV connectivity is proposed:

i. LILO of Thiruvalam – Mosur 230kV feeder

ii. LILO of SVChatram – Arni 230kV feeder

iii. 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. The following 230kV connectivity is proposed:

i. 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 400/230-110KV 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). The following 230kV connectivity is proposed:

i. LILO of Karimangalam - MALCO 230kV SC line

ii. 230kV link line to the sanctioned Gurubarahally 230kV SS.

iii. 230kV DC link line to the sanctioned Udanapally 230kV substation.

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

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

xi) **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. The following 230kV connectivity is proposed:

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

3.6 SRLDC stated that there is need to clarify that system strengthening required for evacuation of power from generating stations is necessarily a part of ATS(Associated Transmission System) and should be in place before the commissioning of generation units. In the absence of commissioning of entire transmission system required for evacuation of power from generating station and feeding into load centres, the generation leans on ISTS and leads to congestion in the network. **He also emphasized the need of commissioning of associated 220kV lines in the time frame of 400kV network as the mismatch in commissioning of these elements would lead to congestion and TNEB would need to back down their generation to contain loading. These provisions were agreed by TNEB.**

3.7 DGM(CTU) agreed with SRLDC view and stated that in the absence of commissioning of the proposed transmission system, generators for which transmission system has not commissioned should be backed down first and the access of other generators including ISGS generators should not be affected. **These provisions were also agreed by TNEB.**

3.8 TNEB stated that for the Udangudi projects, they are proposing to build an **Udangudi Pooling Station** where both the Stage-I and Stage-II would be pooled with following connectivity lines:

Connectivity for Udangudi Power Project Stage-I (2x660MW):

i) 400kV DC Quad line to the Udangudi Pooling station.

Connectivity for Udangudi Power Project Stage-II (1x800MW):

i) 400kV DC Quad line to the Udangudi Pooling station.
ii) 400kV DC Quad line to the Udangudi Power Project Stage -1 -2x660MW

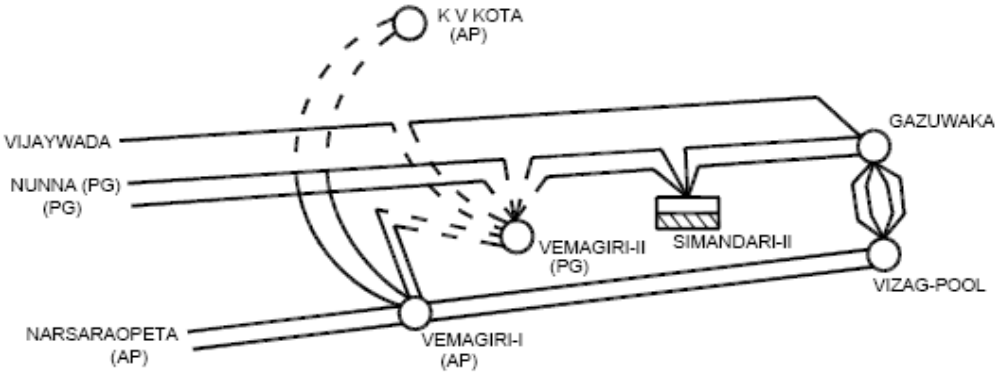
These lines and the Udangudi Pooling Station would be in addition to the earlier planned system. **This system for Udangudi projects was agreed provided the Udangudi Pooling Station is commissioned along with the generation project commissioned first.**

3.9 Members agreed to the proposal of TANGEDCO with the above modifications and the provisions as mentioned earlier.

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

4.1 Director, CEA stated that, as informed by APTRANSCO, there is space constraint at APTRANSCO's Vemagiri 400 kV substation and it would be difficult to provide bay extension for bringing the KV Kota -Vemagiri 400 kV DC line at Vemagiri. This line was agreed in the 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. APTRANSCO had 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.

4.2 He said that, the matter was discussed with APTRANSCO and PGCIL and accordingly, a rearrangement of Gazuwaka- Vijzywada/Nunna was proposed in the Agenda, as depicted below:



4.3 After deliberation following 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)

4.4 APTRANSCO informed that the transmission system associated with evacuation of Hinduja Power Project shall be completed in a year. SRLDC stated that since there are no loads at Narsaraopeta, the combined power from gas generation in Vemagiri area and Hinduja units may be reduced so as to limit loading on Vizag - Narsaroapeta transmission lines to about 700 MW. This is necessary to allow the import of power from Gazuwaka HVDC b-t-b to allow import of power from ER to

SR through the Gazuwaka HVDC b-to-b APTRANSCO agreed towards limiting the generation in Vemagiri and Vizag area to the said limits. APTRANSCO informed that as a new capital of Andhra Pradesh is being envisaged to be built in the Narsaraopeta/ Vijayawada area, the load in the area is likely to increase.

4.5 KPTCL asked that why import from Gazuwaka HVDC b-t-b is being curtailed to about 700 MW instead of its capacity of 1000MW. In this regard, DGM(CTU) stated that the restriction is in the Eastern Region due to non-availability of Talcher-Behrampur-Gazuwaka 400 kV lines which were to be built by Reliance.

4.6 After discussion Members agreed to the proposal of rearrangement for Vemagiri as stated above.

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

5.1 Director, CEA stated that Southern Region is facing power deficit which has arisen mainly due to – (i) delay/deferment of anticipated generation projects, for example, Krishnapattam UMPP (4000 MW), Cheyyur UMPP(4000 MW), Udangudi TPS, IPP projects in Nagapatanam/ Cuddalore area (3000 to 4000 MW), Kundankulam APP (2000 MW), Kalpakkam PFPR (500 MW), East coast 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.

5.2 He further stated that joint studies were carried out by CTU and CEA to facilitate import of 16000 MW power to Southern region by 2018-19 based on the pessimistic scenario of non-availability / delay in commissioning of some of the generation projects in Southern region. The system was tested for contingencies including total outage of an entire inter-regional link and other critical regional lines for reliability.

5.3 Accordingly, the following transmission schemes were put up for discussion in the meeting:

A. 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.

B. 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 – Thiruvalam 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.

C. 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) Srikaukulam 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.

5.4 APTRANSCO informed that in the 36th meeting of Standing Committee Podli 400/220 kV substation along with 400 kV D/c line between Podli and Narsaraopeta has been approved as APTRANSCO scheme therefore this substation should be excluded from the transmission system proposed under Scheme-III. DGM(CTU) stated that Podli substation and Chilakaluripeta-Podli and Chilakaluripeta-Narsaraopeta is nothing but re-routing of earlier proposed Podli-Narsaraopeta. These elements have been covered under Scheme-III above to make the scheme in a complete manner as any mismatch in construction of Chilakaluripeta-Podli and Chilakaluripeta-Narsaraopeta shall render Vemagiri-Cuddapah section too long without anchoring. These schemes are meant for delivery of power in Chilakaluripeta area as APTRANSCO is facing huge deficit of power. APTRANSCO stated that they have already acquired land in Podli area and extensive work is

being done towards construction of 400/220 kV substation in Podli. Hence, it was decided that item no. (iii) and (ix) of the Scheme-III shall be deleted from its scope, and following system will be implemented by APTRANSCO, as decided in the last meeting.

5.5 System strengthening agreed to be implemented by APTRANSCO

1. Establishment of 400/220kV substations at Podli with 2x315 MVA transformers and 2x125 MVAR bus reactors
2. Narsaraopeta – Podili 400kV D/c line.

5.6 TSTRANSCO and TANGEDCO suggested that the Raigarh-Pugalur HVDC may be implemented by POWERGRID due to urgent need of power transfer to SR.

5.7 Director, CEA opined that the proposed HVDC may be planned in phases with 3000 MW in the first phase and later on to be upgraded by another 3000 MW module. This way we can defer Rs4000-5000 crores of investment.

5.8 DGM (CTU) stated that the experience of implementation of Champa-Kurukshetra HVDC line in two phases suggests that phase wise implementation may involve number of issues such as contractual and complexity in integration of two modules especially when these are supplied by different manufacturers. Further, since the power shortage in Southern region is very high which is likely to remain so for a long time and as such the requirement of second phase may be envisaged within a very short span of time, it may be implemented as 6000 MW capacity HVDC in a single phase.

5.9 In this regard, KSEB suggested that the drawl of power from the proposed 6000 MW HVDC may be divided with 4000 MW terminal at Pugalur and balance 2000 MW may be extended to Kerala as the state is facing acute power shortage.

5.10 DGM(CTU), PGCIL said that this shall require substantial land in Kerala area where land acquisition is difficult. Further the HVDC for such a small distance of about 250 km is too short for making the scheme economically viable. He suggested that looking into RoW problems in Kerala area provision of VSC based underground cables can be explored.

5.11 Director, KSEB explained that out of the estimated hydro-electric potential of about 6000 MW in the state, Kerala could harness only about 2040 MW so far. Further, no hydro projects with storage sufficient to provide peak support during summer is not possible due to environmental concerns. Hence, to meet the demand, the only option for the State is to import power from outside. It is estimated that an additional import capability of around 2000 MW by year 2018 and 4000 MW by year 2022 will become quite essential for meeting the forecasted demand of about

5000 MW and 6100 MW respectively (as per 18th EPS) for the time frame under consideration.

Regarding, ROW problem, he explained that the possibility of getting multiple corridors across the Western Ghats is also rare and has to be factored in. Considering these, a HVDC line can be an ideal technology for extending the ISTS to Kerala. He proposed that 2000 MW can be located at Kerala by maintaining 4000 MW at Pugalur itself as planned initially. Accordingly, the same ±800 kV HVDC link can be extended to Kerala with one Inverter stations of 4000 MW capacity at Pugalur and second of 2000 MW capacity at Madakkathara, Kerala. This would also avoid need for providing ac – dc conversion twice. Also, this arrangement would reduce the requirement of 765 kV and 400 kV AC corridors from Pugalur for further dispersal of power received at the HVDC Station.

He further explained that for the evacuation of 2000 MW power minimum of 5 number of 400 kV lines may be required (Considering the N-1 condition). 400 kV substation, Madakkathara (Trichur North) is connected to Palakkad (Udumalpet) and Kochi through 400 kV D/c corridors. A 400 kV D/c line is also planned towards Areakode and is expected to be taken up using the RoW of the Madakkathara – Areakode 220 kV S/c as soon as the 400 kV Mysore – Areakode D/c line is commissioned. The link is already approved in the Standing Committee for Power System Planning of Southern Region. Thus, the following six 400 kV lines will be available at 400 kV S/s Madakkathara S/S:

- Madakkathara – Palakkad D/c – Existing
- Madakkathara – Cochin D/c – Existing
- Madakkathara – Areakode – Mylatty – Uduppi D/c – Planned for evacuation.

Accordingly, the additional works required for evacuation of 2000 MW is thus minimal at Madakkathara.

The land requirement is expected to be around 80 acres since the 400 kV yard already exists and only extension is required. The land is available for acquisition and may be possible without much difficulty. The line construction in the eastern part of Madakkathara up to Kerala border is also possible with minimum RoW issues.

5.12 Based on the above discussions, it was agreed to have a 6000 MW HVDC link from Raigarh, Chhatisgarh to Southern Region. Regarding building this link as a multi-terminal HVDC, with one Inverter station of 4000 MW at Pugalur and another

Inverter station of 2000 MW capacity at Madakkathara in Kerala, it was decided that the same would be explored and finalized in next meeting of SCPSP.

5.13 POSOCO enquired about the need of PST to increase the flow on Sholapur- Raichur line in the light of the fact that the Aurangabad- Sholapur line has been planned for the same purpose very recently. CTU stated that the flow on the Raichur - Sholapur line is only 565 MW without Phase shifting transformer and to achieve some control of power on the AC network Phase Shifting Transformer (PST) of 3000 MVA (2x1500 MVA) at Sholapur is proposed. He stated that the loading on Raichur-Sholapur line improves considerably with the provision of PST.

5.14 After discussions, the following transmission system was agreed for the three ISTS schemes:

A) Scheme-I: Additional inter-Regional AC link for import into Southern Region i.e. Warora – Warangal and Chilakaluripeta - 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-Thiruvalam 765 kV D/c at Cuddapah

(viii) Cuddapah- Hoodi 400kV (quad) D/c line with 63 MVAR switchable line reactor at both ends.

B) Scheme-II: HVDC Bipole link between Western region (Raigarh, Chhattisgarh) and Southern region (Pugalur, Tamil Nadu)

(i) Raigarh(HVDC Stn) – Pugalur (HVDC Stn) 6000 MW HVDC bipole

(ii) Establishment of Raigarh HVDC Stn with 6000 MW HVDC terminals

(iii) Establishment of Pugalur HVDC Stn with 6000 MW HVDC terminals **(or Alternatively**: (i) with Pugalur HVDC Stn with 4000 MW terminal, and (ii) Madakkathara, in Kerala HVDC Stn with 2000 MW terminal and inter-connection with existing 400kV AC S/S at Madakkathara**)**

(iv) Raigarh HVDC Station – Raigarh(Existing) 400kV (quad) 2xD/c lines (or with bay extension)

(v) Pugalur HVDC Station – Pugalur (Existing) 400kV (quad) D/c line.

(vi) Pugalur HVDC Station – Arasur 400kV (quad) D/c line with 80 MVAR switchable line reactor at Arasur end.

(vii) Pugalur HVDC Station – Thiruvalam 400kV (quad) D/c line with 80 MVAR switchable line reactor at both ends.

(viii) Pugalur HVDC Station – Edayarpalayam 400 kV (quad) D/c line with 63 MVAR switchable line reactor at Edayarpalayam end.

(ix) Edayarpalayam – Udumalpet 400 kV (quad) D/c line.

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

C) Scheme-III: Strengthening of transmission system in Southern region 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 – Narsaraopeta 400kV (quad) D/c line

(iv) Cuddapah – Madhugiri 400kV (quad) D/c line with 80 MVAR switchable line reactor at both ends.

(v) Cuddapah-Hindupur 400kV (quad) D/c line with 80 MVAR switchable line reactor at Hindupur end.(to be implemented by APTRANSCO)

(vi) Srikaukulam Pooling Station – Garividi 400 kV (Quad) D/c line with 80 MVAR switchable line reactor at Garividi end.

(vii) Establishment of 765/400kV substations at Chilakaluripeta and Cuddapah with 2x1500 MVA transformers and 2x240 MVAR bus reactors each.

5.15 Augmentation of Transformer Capacities in SR: Director, CEA stated that transformer augmentation may be needed at a number of 400kV Substations in Southern Region and since this exercise requires further detailing the same shall be taken up in the next standing committee meeting.

5.16 Short circuit levels at 400kV and 765kV nodes in SR: Director, CEA said that 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 as given in Annex 4.1 of the Agenda. 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 a subsequent meeting of the Standing Committee. During discussions, it was observed that the fault levels given in the Agenda note had some discrepancies, i.e. the difference between SLG and three-phase-to-ground fault levels were observed to be high at some nodes. It was decided that the same would be looked into by CTU and correct values would be enclosed along with the Minutes, **the same are given at Annex-II.**

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

6.1 Director, CEA stated that, as per TSTRANSCO, a number of pumping stations are coming up in Karimanagar district under the Dr.B.R.Ambedkar Pranahitha Chevella Sujala Project lift scheme. TSTRANSCO(Transmission company of Telangana) made a presentation **(copy given at Annex-III)** on the transmission scheme for extension of supply to the packages of the Irrigation Scheme.

6.2 TSTRANSCO 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 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:

1. **Package-6, Myadaram, Karimnagar District**: Voltage rating is 13.8 kV with 6 pumps with the total power requirement of 750 MW.

2. **Package-7, Choppadandi, Karimnagar District:** Voltage rating is 11 kV with 3 pumps with the total power requirement of 123 MW.
3. **Package-8, Ramadugu, Karimnagar District:** Voltage rating is 13.8 kV with 5 pumps with the total power requirement of 670 MW.
4. **Package-9, Malakpet, Karimnagar District:** Power requirement of 30 MW.
5. **Package-10, Tippapur, Karimnagar District**: voltage rating is 13.8 kV with pumps with the total power requirement of 336 MW.

6.3 The transmission system proposed by TSTRANSCO included the following:

a) Erection of 400kV S/S at Ramadugu (Pkg-8).

b) Erection of 400kV S/S at Choppadandi (Pkg-7) with 2x315 MVA ICTs.

c) Erection of 400kV S/S at Myadaram (Pkg-6)

d) Erection of 400kV S/S at Tippapur (Pkg-10)

e) Erection of a 132kV S/S 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 KTPP – 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.

6.4 SRLDC stated that since these are seasonal pumps, there may be requirement of provision of reactors to prevent high voltages in non-operational season. SRLDC also asked about requirement of start-up power. **TSTRANSCO agreed to provide sufficient reactors under this scheme.**

6.5 It was also agreed that TSTRANSCO shall supply technical details related to start-up scheme of these motors. The **start-up schemes details,** sent later on by TSTRANSCO, **are given at Annex-IV.**

6.6 It was also pointed out that the transformation capacities at the 400kV and 220kV S/S proposed under the scheme was not indicated in the agenda/TSTRANSCO scheme proposal. **TSTRANSCO agreed to furnish the same to CEA.**

6.7 **After discussions the above scheme was agreed.** TSTRANSCO to provide technical details as mentioned above.

7. 400kV Bays in Dharmapuri (Salem) 765/400kV SS for terminating 400kV DC line from Rasipalayam 400kV SS:

7.1 Director, CEA stated that LILO of one circuit of Rasipalayam -Singarapet 400kV D/c line at Salem 765/400kV (POWERGRID) substation was agreed for evacuation of wind power projects in Tamil Nadu. PGCIL has informed that at present all the 400kV bays are allocated and there are no bays available at Dharmapuri substation for termination of above line. However, at a later stage when the system shall be operated at its rated 765kV level, 400kV bays will get released.

7.2 TNEB requested to allow inter connection at the designated 400kV bays meant for termination of 765/400 kV transformers. POWERGRID stated that at a later date when an up-gradation work will be taken up, this interconnection would become constraint in construction work; therefore, it would not be feasible to terminate the said line at Salem 765/400 kV substation. **SLD for Dharmapuri(Salem) PS, as requested by TNEB, is given at Annex-V.**

7.3 Director, CEA stressed upon the need of operating Tuticorin- Salem line at 765kV level in view of number of LTA applications are there for that region. **PGCIL agreed to study and bring the matter in the next meeting of Standing Committee.**

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

8.1 Director, CEA stated that the transmission system as agreed in 35th SCM for evacuation of power from 2x500 MW Neyveli Lignite Corporation Ltd. TS-I

(Replacement) (NNTPS) in Neyveli, Tamil Nadu, remains same except for minor modification in terms of type of conductor of Neyveli TPS-II - Neyveli(TANTRANSCO 230kV S/S), 230kV D/C line (by TNEB) which shall also be with HTLS conductor. 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

8.2 TNEB stated that a 400/220 kV substation now envisaged at Ariyalur is in the same vicinity as that of Ginjee which was covered under the NNTPS transmission system. Therefore, the scheme shall be required to be modified for exclusion of Ginjee substation and termination of NNTPS evacuation line at Ariyalur substation. DGM(CTU) stated that the scheme for NNTPS has already been notified for implementation under TBCB and such modification may cause the scheme to be notified again.

8.3 Director, CEA was of the view that constructing two 400 kV substations in the same area is not required. The requirement of NNTPS was enquired from representative of NLC, who confirmed that unit I and II would be commissioned in Oct 2017 and April 2018 respectively.

8.4 After discussions, it was decided that regarding the following system for evacuation of power from 2x500 MW Neyveli Lignite Corporation Ltd. TS-I (Replacement) (NNTPS) in Neyveli, Tamil Nadu under "Transmission System for LTA (as an ISTS)", shall be modified as under and shall be again taken up in the Empowered committee.

(i) NNTPS switchyard – Ariyalur (Villupuram) 400kV D/c line

8.5 The Ariyalur (Villupuram) 400kV S/S 2x500 MVA S/S would be implemented by TANTRANSCO, along with the bays for termination of line from NNTPS at Ariyalur.

8.6 It was also decided that TANTRANSCO shall submit documents/letter related to acquisition of land at Ariyalur and schedule of Ariyalur S/S. TANTRANSCO agreed to give in writing that they would allow line from NNTPS switchyard to be bussed at their Ariyalur (Villupuram) 400kV S/S. **A copy of letter, submitted by TNEB after the meeting, is given at Annex-VI.**

8.7 It was also decided that NLC will furnish a letter indicating the generation schedule of the units.

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

9.1 Director, CEA informed that the following connectivity arrangement for the Kudankulam units was agreed in the 36th Standing Committee meeting :

i) **Interim Arrangement for Units 1 & 2:** One 400 kV circuit from Kudankulam and one 400kV circuit from Madurai are terminating in the same diameter at Tirunelveli substation and therefore, through opening of two main breakers & keeping tie breaker in closed position in normal condition, shall provide the required bypass arrangement

ii) Tuticorin Pooling station – Tirunelveli section of the agreed Tuticorin Pooling station- Kudankulam 400 kV Quad D/c line to be constructed ahead of Kudankulam – 3 & 4 and one of the existing Kudankulam – Tirunelveli 400 kV Quad D/c may be connected to the same making Kudnakulam –Tuticorin Pooling station 400kV Quad D/c line .

9.2 NPCIL made a presentation **(given at Annex-VII)** regarding the proposed system. NPCIL stated that the present arrangement for evacuation of power from Unit-I and II i.e., one of the 4 circuits to Tirunelveli extended up to Madurai, bypassing the Tirunelveli Sub-Station is 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. He further added that in the eventuality of fault at Tirunelveli substation only one circuit to Madurai is left for evacuation of power from Unit 1 & 2 which may also be lost due to tripping on account of power swings as has happened in many instances in the nation at other locations. With respect to the rearrangement proposed for Unit 3 & 4 i.e., one additional 400kV D/C line to Tuticorin Pooling Station, one circuit of this D/C line to 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) also to be connected to KKNPP-1&2 and KKNPP-3&4, NPCIL

opined that under outage of two towers of each circuit of Kudankulam -Tirunelveli D/c line, only one line shall be available for evacuation of power Unit 3 & 4. Based on the above observations NPCIL proposed to review the scheme and plan additional lines for safe evacuation of power from Kudankulam Units.

9.3 Regarding implementation of the Tuticorin PS - Tirunelveli 400kV D/c line, which was agreed in the 36th Standing Committee meeting, for evacuation of power from KKNP, it was informed that the same shall be taken in the next meeting of the Empowered Committee.

9.4 After discussions it was agreed that studies shall be carried out for requirement of additional evacuation lines for KKNP Unit-3 & 4. Meanwhile, the earlier agreed scheme may be taken up for implementation.

10. Requirement of Additional 125 MVAR Bus Reactor at Kaiga

10.1 Director, CEA stated that during the 36th meeting of the SCPSPSR 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. NPCIL stated that as per the capability curve the machines could not absorb reactive power beyond margins stated in the planning criteria to control high voltages at Kaiga. SRPC stated that capability curve supplied by NPCIL is different from those given earlier.

10.2 Director, CEA clarified that margins specified in the planning criteria are kept for planning stage and these may be used by operator to control voltages in real time operation and as such NPCIL should either absorb requisite MVAR or provide suggested reactors to control the voltages at Kaiga.

10.3 After deliberations, it was agreed that NPCIL would provide 2x125 MVAR reactor and the 63 MVAR reactor may be used as a spare.

11. Reactive Compensation for Various Transmission Schemes approved in previous SCMs

11.1 Director, CEA stated that reactive compensation has been proposed for the following transmission schemes approved in previous Standing Committee Meetings and studies for the same were carried out and were enclosed with the agenda.

(1) <u>Wardha – Hyderabad (Maheswaram) GIS 765 kV Link:</u>

i. 1 no. 240 MVAR, 765 kV Bus Reactors at Nizamabad(GIS).

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

iii. 1 no. 240 MVAR switchable line reactor at Nizamabad(GIS) for both circuits of Wardha – Nizamabad(GIS) 765kV D/c line and Nizamabad(GIS) – Hyderabad (Maheshwaram)(GIS) 765kV D/c line.

(2) Substation works associated with Hyderabad (Maheswaram)(GIS) 765 kV Substation

i. 2 nos. 240 MVAR, 765 kV Bus Reactors at Maheshwaram Pooling Station (GIS)

(3) Sub-station Works associated with System Strengthening in Southern Region for import of power from Eastern Region:

i. 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.

ii. 2 nos. 240 MVAR, 765 kV Bus Reactors at Vemagiri Pooling Station.

iii. 1 no. 80 MVAR, 400 kV Bus Reactors at Vemagiri Pooling Station.

(4) Transmission System associated with ISGS Projects in Nagapattinam/Cuddalore Area of Tamilnadu – Part A

(Additional Reactor under this scheme)

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

ii. 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.

(5) GREN ENERGY CORRIDORS: ISTS-PART-A

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

11.2 Members agreed to the above proposals for reactive compensation.

11.3 Further DGM(CTU) stated that it is to be clarified that the bay work for Dichipalli substation for the Nizamabad - Dichipalli 400 kV D/c line under the scope of work of

"Wardha – Hyderabad (Maheswaram)765 kV Link" are to be built by POWERGRID and the same has been covered in the DPR. The same was noted.

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

12.1 Director, CEA stated that for establishment of the Tirunelveli Pooling Station as 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.

12.2 DGM(CTU) informed that PGCIL is planning to procure government land under control of Hindu Religious and Charitable Endowments Department of Tamil Nadu at an estimated value of Rs 2 lakh per acre and it can be acquired in a lesser time frame. He suggested that it is more techno-economical to implement the Tirunelveli Pooling Station as of GIS type.

12.3 POSOCO suggested that Double Main and transfer bus arrangement may be considered in place of 'One and half breaker' scheme for increased reliability, which was agreed.

12.4 Accordingly, following system was agreed for giving LTA to wind generation projects in Tirunelveli area:

(i) Establishment of 2x500 MVA, 400/230 kV GIS type S/s at Tirunelveli Pooling Station with Double Main and transfer bus arrangement

(ii) Tirunelveli Pooling Station – Tuticorin Pooling Station 400 kV 2xD/c (Quad) line

(iii) 2x125 MVAR Bus Reactors at 400kV Tirunelveli Pooling Station

12.5 It was agreed that these transmission works are to be implemented after LTA has been given to the wind developers for injecting at Tirunelveli.

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

13.1 Director, CEA stated that 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 timeframe. But, the UMPP project could not be taken up as planned and got delayed. Now, the establishment of the project has been revived, and CTU has received LTA application from M/s Costal Tamil Nadu Power ltd., which is a SPV of PFC. As such

the transmission system for evacuation of power from UMPP may be finalized at the earliest.

13.2 DCDE(CTU) informed that some clarification was required from the generation developer pertaining to commissioning schedule and unit size of the generation units, which has been received recently. **Based on the inputs, system studies shall be carried out and shall be put up in the next meeting of the standing committee.**

14. APTRANSCO's Proposal regarding evacuation scheme for procurement of 1050 MW from three generators

14.1 Director, CEA stated 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)

14.2 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.	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	6x20 km

	Manubolu SS)	
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.	**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

14.3 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. 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.

14.4 DGM(CTU) stated that Krishnapatnam is a generation hub and based on the LTA applications of a number of IPPs coming up in the region, transmission system was planned. The proposal of APTRASNCO is unacceptable as the transmission system suggested shall only duplicate and may not be required. Further these IPPs were granted LTA based on target beneficiaries and as per the regulations on firming up of beneficiaries the transmission charges are to be borne by beneficiaries. Therefore, as per regulation APTRASNSCO shall not be relieved of the transmission charges just by building this system. He further added that creating more than one pooling station in the same area is not a techno-economical solution.

14.5 DGM(CTU), PGCIL further informed that the Thermal Powertech Corporation India Ltd. (TPCIL) was granted LTOA for 1320 MW (installed capacity) as per their LTOA application with allocation of 1125 MW in SR & 115 MW in WR. However TPCIL has now requested to reduce the Auxiliary consumption (@6.5%) from the LTOA

quantum of 1320 MW which is the Installed Capacity of the plant. It was agreed that this aspect would be taken up in the Connectivity & LTA meeting.

14.6 Director, CEA stated that transmission system should be planned and built for the entire capacity. APTRANSCO may build system for Krishnapatnam Power Corporation Ltd. as it has applied to APTRANSCO only and this was not considered while planning transmission scheme for evacuation of power from this area. He further said that the bidding document requires the procurer to arrange transmission access from generation switchyard, which can be achieved through the already granted LTA and instead of building a parallel system He further added that M/S Thermal Power Tech. Ltd has requested CEA that the transmission system proposed by AP would result in duplicate transmission asset, which may be avoided.

14.7 SRLDC was of the view that this proposal is not acceptable as it may lead to similar difficulties that are being faced in case of Udupi Power.

14.8 SRPC stated that this is a very unhealthy trend, wherein, home state on procuring power shall implement parallel system even though it is not required and an adequate system has already been built/ under implementation. It was also stated that with the creation of a new state of Telangana, delivery of the share to Telangana shall become inter-state and even the quantum which APTRANSCO have stated to be procured under case-I bidding shall get reduced to that extent. This was confirmed by CE (TSTRANSCO).

14.9 Member (PS) suggested that looking into the criticality of the matter, CEA would like to bring the matter to the attention of Principal Secretary of both the states.

14.10 APTRANSCO stated that they would like to consult their legal department regarding the issues pertaining to various clauses of Case-I bidding and shall revert back afterwards.

15. Augmentation of Talcher-II Transmission System

15.1 Director, CEA stated that SRPC 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. He further stated that 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

15.2 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.

15.3 On the issue of prolonged delay in implementation of Talcher-II back up Transmission system, NTPC representative expressed their concern and submitted the following:

1. For catering to the contingency of outage of 1-pole Talcher-Kolar HVDC link, back up transmission systems were deliberated at various meetings of SCMs and RPCs and after collective efforts of CEA, PGCIL, SR States and NTPC a back-up Transmission system were approved in Standing Committee Meetings of Southern Region and Eastern Region in 2007, and is to be implemented by Reliance.

2. In the absence of adequate system to cater to the contingency of one pole outage of Talcher-Kolar HVDC, the Talcher project is facing constraints in power evacuation to SR. On such outage of HVDC pole(s), power gets injected into ER system and to limit the jerk on the Grid, generation back-down/ unit tripping has been implemented for Talcher-II units. Accordingly, NTPC were asked to put a SPS scheme and the same is already in place since year 16th October 2005 named as SPS-450. This SPS scheme has subsequently been revised by ERLDC and a SPS- 1000 were also put in service since 2nd June 2007. As of now both the SPS scheme are in place and operation of SPS -450 or SPS-1000 are as per instruction of ERLDC.

3. NTPC informed that due to restrictions on power evacuation and SPS in service since June- 2005 is causing considerable generation loss due to unit back down/ trippings.

4. Since the subject scheme i.e. 'Augmentation of Talcher-II Transmission System' is linked to reliability/availability of Talcher-II generation to Regional beneficiaries under HVDC pole outages, this scheme is critical. Further, due to operation of SPS for such a long period both the beneficiaries as well as the generation projects are suffering and hence there is need to review the SPS at Talcher-II STPP on urgent basis.

15.4 Member Secretary(SRPC) stated that the matter was already discussed in SPRC meeting and since the matter is subjudice, therefore requirement of Talcher back

up system may not be reviewed by the SCPSPSR at this stage. Members agreed with the views of SRPC.

16. Operational feedback on Transmission constraints

16.1 DGM(SRLDC), POSOCO presented the transmission lines constraints in Southern region , highlights of which are given below:

- The SR has experienced high loading on Kolar-Hosur DC, S.V.Chathram-Pondy SC, Hosur-Salem both circuits, Salem-Udumalpet DC, Gooty/ Nelamangala/ Somanahalli 400kV lines. POSOCO report also mentions about North-South corridor constraint in future. He also mentioned that the loading across S1-S2 would be a concern going forward also as there are LTA's lined up across this seam. These loading/constraints are likely to be partly eased with the already planned transmission system for strengthening of S1-S2 corridor (Salem-Salem(New)_Bangalore quad D/C line). The Salem – Madhugiri 765kV lines will also help largely in easing North –South corridor constraints.
- He also mentioned that once these lines are in place the loading on 400 kV Salem-Udumalpet would be a concern until the 400 kV Arasur-Thiruvalam line is commissioned
- SR grid has also experienced high loading on 400kV Hiriyur-Nelamangala DC line and Jindal-BTPS SC Line. These constraints are likely to remain until commissioning of the transmission system planned for Yermaras TPS . The 220 kV Hiriyur-Gowrididanur D/C line under construction by KPTCL would help in relieving this line to some extent.
- POSOCO report also states that there may be constraint in the 400kV Khammam-Nagarjuna Sagar SC line which may ease after commissioning of 400kV D/C line between Khammam and Nagarjuna Sagar .

16.2 He also said that speeding up of the Kudamkulam Unit-1 & 2, Neyveli TPSII Exp Unit-1 and Neyveli TPSII Exp Unit-2 generation projects, and other generation projects in S2, would provide relief in SR grid.

16.3 He highlighted constraints at the following ICTs

- 400/220kV 315MVA ICTs at Hyderabad (Ghanapur 3Nos., Mamidipalli-3Nos.,and Malkaram-3Nos.)

- 400/220kV 500 MVA ICTs at Somanahalli -2 Nos., Nelamangala -2Nos.and Hoody-2 Nos.
- 400/220kV 315MVA ICTs at Mysore-2Nos.
- 400/220kV 315MVA ICTs at Kalvindapattu-2 Nos
- 400/220kV 315MVA ICTs at Trichur-2Nos and Palakkad-2Nos

In this regard, CEA stated that newly planned substations at Maheshwaram 400/220kV, 2x500MVA, Gajwel, Yeddumailaram likely to ease the ICTs at Hyderabad. For easing the loading on ICTs at Bangalore, redistribution/ re-configuration of 220kV transmission lines around these substations is required. Similarly, for relieving the loading at Mysore, strengthening at 220kV level around Mysore is required. This needs to be planned by KPTCL. He further stated that to relieve the loading at Kalvindapattu, newly planned substations at Thiruvalam and Sholinganallur would help. Also, ICTs at Trichur would ease after Mysore- Kozikode 400kV line.

16.4 DGM(SRLDC), POSOCO pointed out high voltage on a number of 400kV nodes as given in POSOCO report. In this regard CTU stated that 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.

16.5 DGM(SRLDC), POSOCO stressed the need to speed up following transmission lines affecting grid operation adversely:

- 400kV Edaman-Cochin DC line
- 400kV Mysore-Khozhikode DC line
- 400 kV Salem-Dharmapuri(Salem New)-Bangalore 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-Kanarpatti-Kayathar DC line, 400kV Kayathar-Karaikudi-Pugalur DC line
- 400kV Kalvindapattu-Pugalur DC line and 400kV Tiruvalam-Mettur-III DC line

16.6 Member took note of the above observations.

17. Additional Agenda related to Vemagiri-Khammam-Hyderabad corridor

17.1 CE(SP&PA), CEA stated that CERC vide its order dated 09.07.2012 of petition No. 127/2012,128/2012 & 156/2012 directed CEA to consider the necessity and utility of Vemagiri-Khammam-Hyderabad 765kV D/C line in the meeting of the Standing Committee on Power System Planning of SR.

17.2 He further stated that CEA in its letter to CERC has submitted that the Vemagiri – Khammam - Hyderabad 765kV D/C line was awarded to PGCIL for implementation and the SPV was acquired by it in April, 2012. Pre-award activities for this line have been completed and some of the post award activities have already been undertaken. The transmission developer has already applied to CERC for adoption of tariff and issue of transmission licence. Thus, the Vemagiri - Khammam - Hyderabad 765kV D/C line may be completed earlier than any new line that may be planned for evacuation of power beyond Vemagiri. The completion of this line would enable evacuation of power from gas based projects in Vemagiri and import of power from Eastern Region into Southern Region. Therefore, it is opined that the Vemagiri - Khammam - Hyderabad 765kV D/C line that is already awarded to PGCIL may be implemented as soon as possible.

17.3 DGM (CTU) stated that investment of about 2000 crores should not be made only on the basis of completion of some pre-award activities but should be based on the utility of the Vemagiri-Khammam-Hyderabad lines. He informed that comprehensive studies were carried out for import requirement of Southern region and based on the studies it has been found that this line is not required for meeting the import requirement of Southern region. In fact this line which was primarily planned for evacuation of power from gas based generation IPPs in the Vemagiri area does not carry substantial amount of power in the absence of these generation plants.

17.4 CEA opined that the Vemagiri-Khammam-Hyderabad line may be considered looking into the possibility of availability of gas in the Vemagiri area in near future.

17.5 DGM (CTU) informed that in present form, this system cannot be built as the prices at which it was bid two years ago don't hold today. In fact, based on the order given by Hon'ble commission, PGCIL has returned construction stage Bank Guarantee(BG) of Spectrum Power Generation Ltd and Samalkot Power Ltd and as such now there are no Long Term customers left. Bids and all procedures initiated for the system have been undone and now if the system is rebuilt then the Southern Region states are the only entity left for sharing of transmission charges and it is for the States to decide if they are ready to bear the same.

17.6 Director, CEA said that Samalkot Power Ltd in a petition in this case in CERC, has asked to return the BG since the transmission system is not being built even though the generation station is being commissioned. Samalkot has stated the following:

> "*Since CTU has failed to do its part of construction of transmission system even though generating station has been commissioned, the construction bank guarantee should not be insisted upon and may be returned by CTU.*"

17.7 KSEB stated that in case of availability of gas in the Vemagiri area in near future then this is the only system that can come earliest. Therefore, system studies should be carried out considering Vemagiri-Khammam-Hyderabad link.

17.8 APTRANSCO stated that since there is no gas availability in Vemagiri area, this link may not be needed and may be dropped as of now.

17.9 KPTCL stated that there would be low participation of bidders for the mentioned corridor due to uncertainty of gas and hence the link may be dropped.

17.10 NTPC agreed that even if gas generation comes in the region it will come with a different commercial background and then the system that was earlier quoted by SPV will also be on different commercial platform and may be a complex issue for contractual mitigations.

17.11 TANTRANSCO supported proposal of dropping the Vemagiri-Khammam-Hyderabad link.

17.12 TSTRANSCO stated that gas may be available in near future and there may be requirement of this link for evacuation of gas and hence these transmission lines may be taken up.

17.13 SRLDC stated that these lines may be required only if Hinduja generation comes earlier than the associated transmission system of APTRANSCO that has been planned to evacuat power from the Hinduja project.

17.14 POSOCO stated that Vemagiri-Khammam-Hyderabad lines may provide interlink between Wardha-Hyderabad corridor and Srikakulam-Vemagiri corridor as a East to West transmission corridor within Southern Region, and as such these may be taken for increasing reliability.

17.15 Director, CEA opined that this link may be used for east to west flow across Southern region and transmission of power imported from Angul in Eastern Region towards Telangana state.

17.16 DGM (CTU), PGCIL said that the tendency of power is to flow from North to South where power is required and as such no power shall flow from east to west especially in the absence of gas at Vemagiri and power demand at Hyderabad being

fulfilled by Wardha-Hyderabad link. He added that issue of interlinking of Wardha-Hyderabad and Srikakulam-Vemagiri corridors has already been addressed by Hyderabad-Warangal-C'Peta lines.

17.17 Director, CEA explained that the Vemagiri – C'Peta - Warrangal - Hyderabad 765kV D/C lines discussed and agreed earlier in this meeting are only a slight modification of the Vemagiri – Khammam - Hyderabad 765kV D/C lines. He opined that if the Vemagiri – Khammam - Hyderabad 765kV D/C lines were there or were under construction, these would have been modified (through LILO etc) to take advantage of import from Warora-Warangal link.

17.18 Member Secretary, SRPC said that these lines would only duplicate the transmission lines that were later on planned and agreed for import of power to Southern region, and hence the Vemagiri – Khammam - Hyderabad 765kV D/C lines may be dropped.

17.19 Based on the above discussions it may be inferred that the majority of the constituents opined that the Vemagiri – Khammam - Hyderabad 765kV D/C lines awarded to a company of PGCIL, may be dropped as of now. However, based on the availability of gas/ requests for LTAs from generating stations / prevailing demand-generation scenario, the necessity and utility of these lines may be evaluated at that time.

18. Meeting ended with vote of thanks.

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Annex-I

List of participants of the 37th Meeting of Southern Region held on 31.07.2014 at NRPC, Katwaria Sarai, New Delhi.

Central Electricity Authority (CEA)

1.	Major Singh	Member(PS)
2.	K. K. Arya	Chief Engineer(SP&PA)
3.	Pardeep Jindal	Director (SP&PA)
4.	Shivani Sharma	Dy. Director(SP&PA)

Southern Region Power Committee (SRPC)

8.	S R Bhat	Member Secretary I/c
9.	Anil	Executive Enginer

Power Grid Corporation of India Limited (POWERGRID)

10.	DilipRozekar	DGM(CTU)
11.	Anil Kumar Meena	DCDE(CTU)
12.	Nageswar Rao	Sr. Engineer(CTU)
13.	Ankush Patel	Engineer(CTU)
14.	G. Venkatesh	Engineer(CTU)
15.	K. jyoth Kumar Naidu	Officer(CTU)

Power System Operation Corporation Limited (POSOCO)

20.	P. Raghuram	ED, SRLDC
21.	S. R. Narsimhan	AGM, NLDC
22.	S P Kumar	DGM, SRLDC
23.	Madhukar G.	Dy. Manager, SRLDC

NTPC Limited (NTPC)

24.	S. S. Mishra	AGM (Engg-Electrical)

Nuclear Power Corporation of India Limited (NPCIL)

25.	SandeepSarwate	ACE (Tr.)
26.	N K Jain	AD(Tr.)

Neyveli Lignite Corporation Ltd (NLC)

27.	T Avudaithanbam	ED(Thermal)

Transmission Corp. of Andhra Pradesh Ltd. (APTRANSCO)

28.	S Subrahamanyam	Director
29.	C V Subba Rao	SE (SP)

Transmission Corp. of Telangana State Ltd. (TSTRANSCO)

28.	B Vizian Kumar	CE(Plg)
29.	M Sheshagiri	ADE(SS)

Karnataka Power Transmission Corporation Ltd. (KPTCL)

32.	S Sumant	Director(Trans.)
33.	V Bharatheesha Rao	Dy. Director
34.	AJ Hosamani	CEE(P&C)
35.	TV Srinivas	EE(PSS)

Kerala State Electricity Board (KSEB)

36.	K.V. Nair	Director
37.	Vijayakumamari P	CE
38.	S K Anand	EE
39.	S SBiju	AEE

Tamil Nadu Electricity Board (TNEB) / TANGEDCO/TANTRANSCO

34.	Rangaraj K	Director(TANTRANSCO)
35.	S. Raichandran	SE (TANGEDCO)
36.	R Santhanakumar	EE(TANGEDCO)
37.	R Kumutha	AEE(TANGEDCO)

Annex-II

Short Circuit Levels at 765/400kV Sub-Stations in Southern Region

Sl. No.	Substation		Three Phase		Single Phase	
	Name	Voltage level (kV)	Fault Current (kA)	Short Circuit (MVA)	Fault Current (kA)	Short Circuit (MVA)
1	CUDP800	765	33.6	44532	21.8	28902
2	KURL800	765	35.0	46345	23.4	31035
3	SHOLAPUR	765	16.0	21139	11.1	14714
4	HYDR_800	765	30.5	40429	19.3	25526
5	DICHPALI	765	20.8	27556	11.6	15340
6	WARN800	765	29.0	38421	18.7	24714
7	NELL-POL	765	16.5	21843	13.3	17583
8	SRI_POOL	765	19.7	26128	14.9	19684
9	VEM-II80	765	20.9	27713	14.9	19724
10	CPETA800	765	25.7	34049	15.9	21008
11	RAIC800	765	25.7	34044	17.8	23565
12	SALE800	765	10.4	13799	7.8	10278
13	NCTPS765KV	765	23.0	30518	22.2	29447
14	TIRUVLM	765	34.7	45949	27.4	36244
15	ETPSREP7	765	20.9	27667	19.2	25408
16	ARIYALUR7	765	34.6	45908	27.3	36227
17	COIMBTR7	765	15.2	20122	11.4	15155
18	RSTP	400	36.8	25466	37.7	26085
19	HYDR	400	32.1	22220	21.6	14968
20	NSAG	400	31.4	21782	23.1	15978
21	KHAM	400	31.2	21608	22.0	15261
22	VIJW	400	41.9	29040	32.6	22554
23	GAZW	400	32.2	22310	30.3	21016
24	CUDP	400	47.2	32679	33.7	23336
25	GOOT	400	34.9	24190	21.8	15137
26	CHAND-SR	400	10.0	6947	6.6	4546
27	GAZU-SR	400	32.2	22310	30.3	21016
28	SSLBPH4	400	21.6	14952	19.1	13252
29	HYDR-AP4	400	32.6	22602	21.7	15069
30	KURNOOL4	400	39.4	27275	27.9	19336
31	SIMHADRI	400	34.4	23837	34.1	23657
32	SIMHD-II	400	29.1	20148	27.7	19172
33	VIZPOOL	400	35.7	24743	35.7	24708
34	VEMAGIR4	400	44.8	31073	33.4	23122
35	TPCIL4	400	28.3	19588	27.0	18722
36	NELLORE4	400	47.2	32711	36.9	25599
37	RAM-PVT4	400	26.1	18064	21.0	14560
38	DICHPAL4	400	27.3	18921	18.0	12477

Sl. No.	Substation		Three Phase		Single Phase	
	Name	Voltage level (kV)	Fault Current (kA)	Short Circuit (MVA)	Fault Current (kA)	Short Circuit (MVA)
39	GAJWEL4	400	30.4	21036	21.1	14600
40	MAHABUB4	400	26.1	18083	16.7	11537
41	CHITOR	400	48.1	33334	34.2	23685
42	VIJ-AP	400	37.6	26035	27.1	18754
43	KRISH-AP	400	33.4	23129	31.5	21796
44	KURL-NEW	400	40.7	28223	30.5	21099
45	KAKTIA-G	400	26.3	18212	24.1	16677
46	VIJTP-IV	400	41.6	28836	32.5	22498
47	SINGARENI	400	11.5	7970	11.0	7624
48	GARIVIDI	400	18.4	12772	13.0	9033
49	HINDPR40	400	13.6	9442	8.7	6023
50	KOTH-IV	400	14.1	9754	12.0	8284
51	MAILARM4	400	40.4	27970	27.3	18888
52	MALKARM4	400	20.2	13961	13.6	9452
53	MUDN400	400	9.4	6499	9.3	6431
54	SURYPET4	400	17.9	12401	11.8	8204
55	NIRMAL	400	9.5	6563	7.9	5471
56	WARN4	400	37.8	26201	29.2	20199
57	PODLI	400	15.8	10960	11.1	7705
58	SIMHP-OA	400	19.2	13332	16.8	11655
59	MENAK-OA	400	20.9	14481	19.9	13764
60	EAST-OA	400	27.1	18757	25.8	17867
61	VEMAG-II	400	45.1	31260	33.1	22918
62	NEL-POOL	400	48.0	33234	43.4	30056
63	NCCPPL	400	28.3	19588	27.0	18722
64	HINDJ-OA	400	32.7	22658	32.1	22253
65	CPETA400	400	30.6	21221	22.3	15444
66	MAHESWRM	400	42.7	29594	30.1	20863
67	NELLORE-AP	400	46.9	32519	36.8	25469
68	KVKOTA40	400	25.0	17293	16.6	11497
69	KONDPRM	400	15.9	11003	9.8	6773
70	URVKND	400	16.2	11232	10.0	6900
71	FSC-1	400	6.2	4267	3.6	2520
72	FSC-2	400	6.5	4516	3.8	2651
73	FSC-3	400	4.8	3295	2.8	1916
74	FSC-4	400	4.8	3295	2.8	1916
75	SMNH	400	36.1	25002	23.1	15991
76	MNRB	400	11.3	7802	7.3	5085
77	RAIC	400	38.3	26508	32.4	22413
78	DAVAN4	400	25.3	17509	17.6	12208
79	HOODI4	400	34.8	24131	22.2	15367
80	TALAGUP4	400	9.5	6611	7.5	5202

Sl. No.	Substation		Three Phase		Single Phase	
	Name	Voltage level (kV)	Fault Current (kA)	Short Circuit (MVA)	Fault Current (kA)	Short Circuit (MVA)
81	NELMANG4	400	40.7	28201	26.4	18307
82	UDUPI400	400	13.3	9226	14.3	9934
83	HASSAN4	400	20.6	14249	14.5	10023
84	MYSORE4	400	22.1	15285	14.3	9920
85	KOLAR	400	34.2	23707	21.8	15097
86	KAIGA	400	18.2	12613	16.6	11515
87	RAIC-NEW	400	39.1	27114	31.5	21845
88	NARDR-NW	400	32.7	22671	32.3	22411
89	GULBRG	400	8.2	5710	5.6	3864
90	KUDGI-NT	400	32.1	22247	33.6	23257
91	ECITY	400	22.6	15641	14.6	10121
92	HIRY	400	22.4	15507	14.6	10124
93	NAREND-4	400	29.6	20489	25.0	17320
94	TORNGL4	400	36.1	25018	34.7	24025
95	BIDADI	400	37.7	26143	24.3	16805
96	BELLARY	400	40.9	28338	40.2	27876
97	YERAMRS	400	25.7	17780	27.3	18890
98	YELAHNKA	400	31.5	21831	20.5	14219
99	EDLAPUR	400	24.4	16921	24.6	17067
100	BELLARY-POOL	400	42.2	29208	40.7	28173
101	CNHALLI	400	23.5	16292	15.9	10984
102	MADHUGI4	400	48.1	33298	32.5	22495
103	KOCHIN4	400	16.7	11596	11.3	7863
104	TNRT	400	20.7	14357	14.4	9973
105	TRIVAND4	400	9.0	6255	5.9	4110
106	KOZIKOD4	400	13.5	9326	9.1	6313
107	PALAKKAD	400	21.0	14527	14.2	9834
108	CHENN-EX	400	33.2	22973	30.6	21175
109	NYVL	400	46.9	32470	46.5	32243
110	MADR	400	33.0	22881	23.5	16277
111	SALE	400	34.9	24167	22.7	15732
112	TRIC	400	18.4	12725	12.5	8671
113	MADURAI4	400	32.7	22673	23.2	16097
114	UDMP	400	39.1	27071	28.9	20047
115	HOSUR4	400	24.4	16879	15.5	10773
116	PAVOORCHATRM	400	17.8	12330	12.2	8438
117	NEYEXTN4	400	37.7	26141	33.9	23489
118	NAGAPTNM4	400	32.8	22719	29.2	20251
119	PUGALUR4	400	31.7	21944	20.9	14472
120	ARSUR4	400	27.4	18964	19.6	13569
121	PUGALUR-NEW	400	30.2	20912	19.3	13405
122	KARAIK	400	26.4	18284	18.0	12485

Sl. No.	Substation		Three Phase		Single Phase	
	Name	Voltage level (kV)	Fault Current (kA)	Short Circuit (MVA)	Fault Current (kA)	Short Circuit (MVA)
123	TIRUNEL4	400	36.4	25202	29.7	20588
124	NEY_IIEX	400	37.1	25682	33.2	23005
125	KUDAN4	400	26.0	18031	27.2	18833
126	ALMATI4	400	38.5	26705	32.1	22237
127	OPG400KV	400	18.1	12556	17.1	11842
128	MANGLAPURAM	400	24.4	16889	16.2	11201
129	KANAPATT	400	34.2	23688	26.0	17985
130	KAYATHAR4	400	41.4	28703	35.2	24394
131	KORATUR4	400	28.1	19437	22.8	15793
132	MANALI4	400	30.9	21390	25.8	17904
133	METTUR4	400	26.6	18437	22.4	15504
134	NEY(REP)4	400	45.5	31498	45.0	31198
135	TANJORE4	400	12.0	8331	8.5	5878
136	TUTICORN	400	29.2	20235	28.2	19557
137	UDNGDI4	400	29.4	20388	30.4	21080
138	PONDY4	400	14.5	10027	9.4	6521
139	MYLAPRE4	400	33.0	22848	26.1	18107
140	MALEKTT	400	35.8	24814	26.6	18445
141	TIRUVLM	400	66.2	45872	51.5	35677
142	VALLUR TPS	400	29.9	20747	28.9	20023
143	SVCHTRM	400	37.5	25955	28.9	20007
144	SHOLNGNR	400	31.9	22116	23.2	16088
145	KARMDAI	400	22.9	15884	16.4	11373
146	TAPPAKUN	400	9.1	6297	8.7	6035
147	ANIKADAV	400	29.6	20538	21.5	14874
148	TUTI-POOL	400	38.8	26900	35.9	24871
149	ILFS-OA	400	30.4	21067	28.4	19677
150	RASIPALA	400	37.1	25708	30.5	21162
151	DHARMPR	400	46.9	32469	25.9	17912
152	CEPL	400	24.9	17250	24.2	16765
153	IND-BARATH	400	22.9	15853	20.1	13946
154	EDAMLYRM	400	40.4	27970	29.2	20236
155	ETPSEXP4	400	30.3	20985	31.8	22060
156	PULNTOPE4	400	31.7	21936	25.6	17728
157	THERVOI4	400	15.1	10437	14.0	9708
158	ARIYALUR4	400	40.4	27987	32.8	22750
159	COIMBTR4	400	40.1	27771	29.5	20466
160	KARAIKUD74	400	23.5	16290	15.8	10917
161	NCTPSSTG4	400	32.5	22486	35.5	24599
162	KAMUTHI4	400	15.6	10783	10.5	7293
163	GUINDY4	400	36.0	24951	28.3	19609
164	KOLAPALUR4	400	26.1	18082	19.2	13305

Sl. No.	Substation		Three Phase		Single Phase	
	Name	Voltage level (kV)	Fault Current (kA)	Short Circuit (MVA)	Fault Current (kA)	Short Circuit (MVA)
165	PALAVADI4	400	41.5	28721	19.8	13685
166	OTTAPIDARAM4	400	19.7	13642	15.3	10623
167	SAMUGARANGAP	400	19.8	13752	16.2	11245
168	SOLINGHUR4	400	25.6	17706	17.2	11925

Annex-III

Presentation on Dr.B.R.Ambedkar Pranahita- Chevella Sujala Sravati Lift Irrigation Scheme

CHIEF ENGINEER/Planning,Power System & IT

- The Government of undivided AP(before02-06-2014) has decided to take up the Pranahita – Chevella Lift Irrigation scheme.

- The project has huge requirement of power about 3300 MW with a total of 22 Nos. pumping stations under various packages.

- The project consists of construction of barrage across river Pranahitha at its birth place, (a tributary of river Godavari) just at the confluence point of Wardha & Waiganga rivers at Tummidihetti (V), Kautala (M), Adilabad dist, with river banks existing in Telangana & Maharastra States.

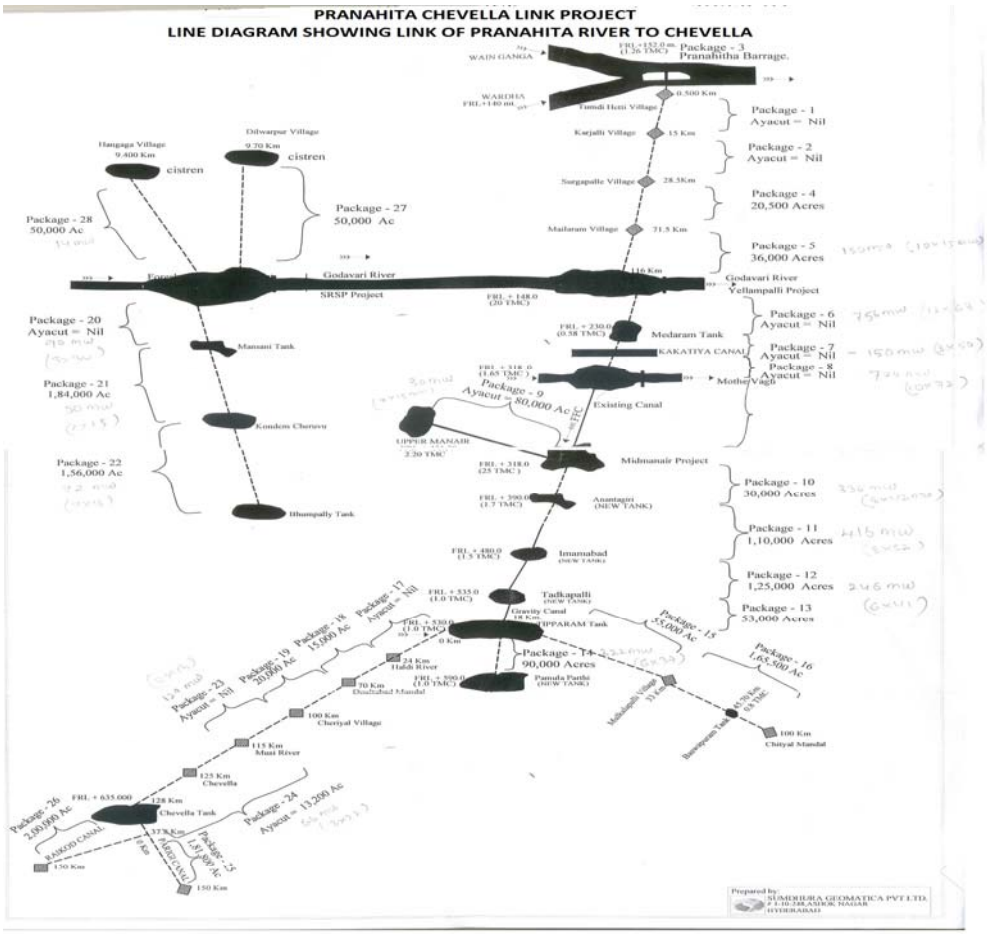
- Dr. BRAPCSS envisages diversion of 160 TMC of water by constructing a barrage across River Pranahita, a major tributary to River Godavari.
- This project provides
  - Irrigation facility for 1640000 hectares of Drought prone areas in 7 Districts of Telangana State.
  - 10 TMC Drinking water to the villages enrouting 30 TMC Drinking water to twin cities of Hyderabad and Secunderabad and 16 TMC as for utilisation of Industrial sector.
  - Further utilises 19.5 TMC of water from River Godavari for Sripada Lift Irrigation Project.

- The requirement of power under different packages of Dr.BRAPCSS in Karimnagar District is:

S.No	Package No	Village	Mandal	District	Voltage Rating and Capacity of Pumps	Total power required in MW
1	6	Nandimedaram	Medaram	Karimnagar	6 Nos 13.8 kV	756.00
2	7	Rangampet	Choppadandi	Karimnagar	3 Nos 11 kV	150.00
3	8	Venkatraopalli	Ramadugu	Karimnagar	5 Nos 13.8 kV	720.00
4	9 (Lift-I)	Malakpet	Konaraopet	Karimnagar	2 Nos. 11 kV	30.00
5	10	Tippapur	Illanthakunta	Karimnagar	8 Nos 13.8 kV	336.00
				TOTAL		**1992.00**

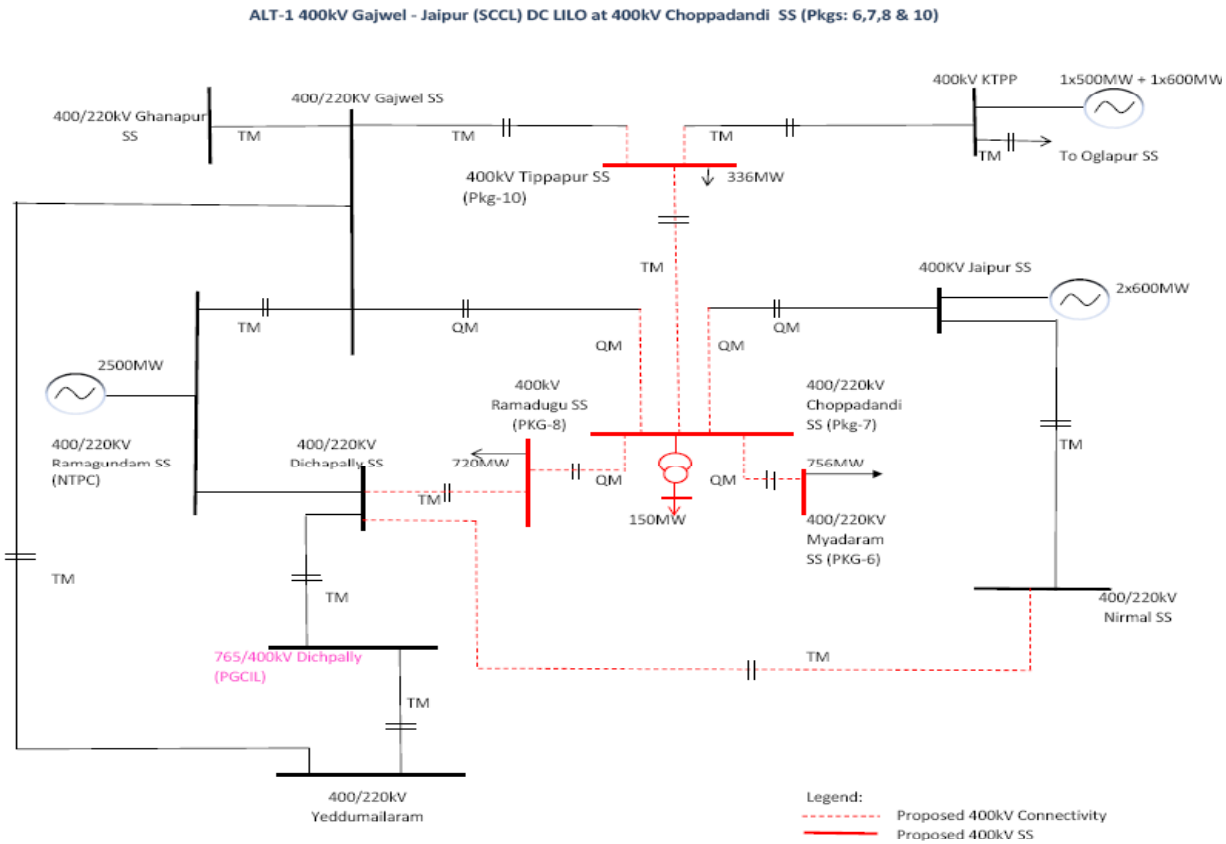
- All the motors are synchronous with 0.95 PF lag/lead

- Power System studies are taken up on the request of Irrigation and CAD Department of State Government.
- The studies are carried out with two alternative connectivity.



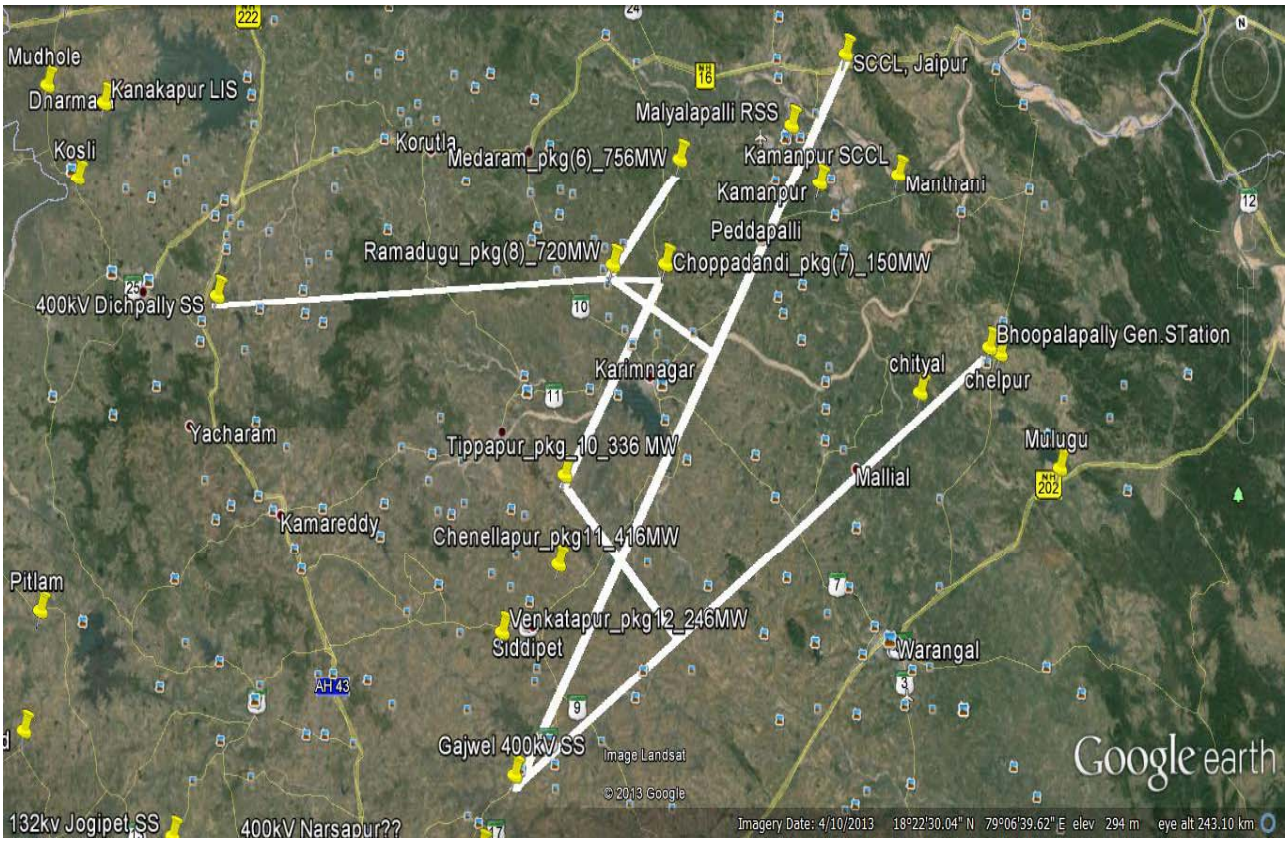
Alternate – 1 with the erection of

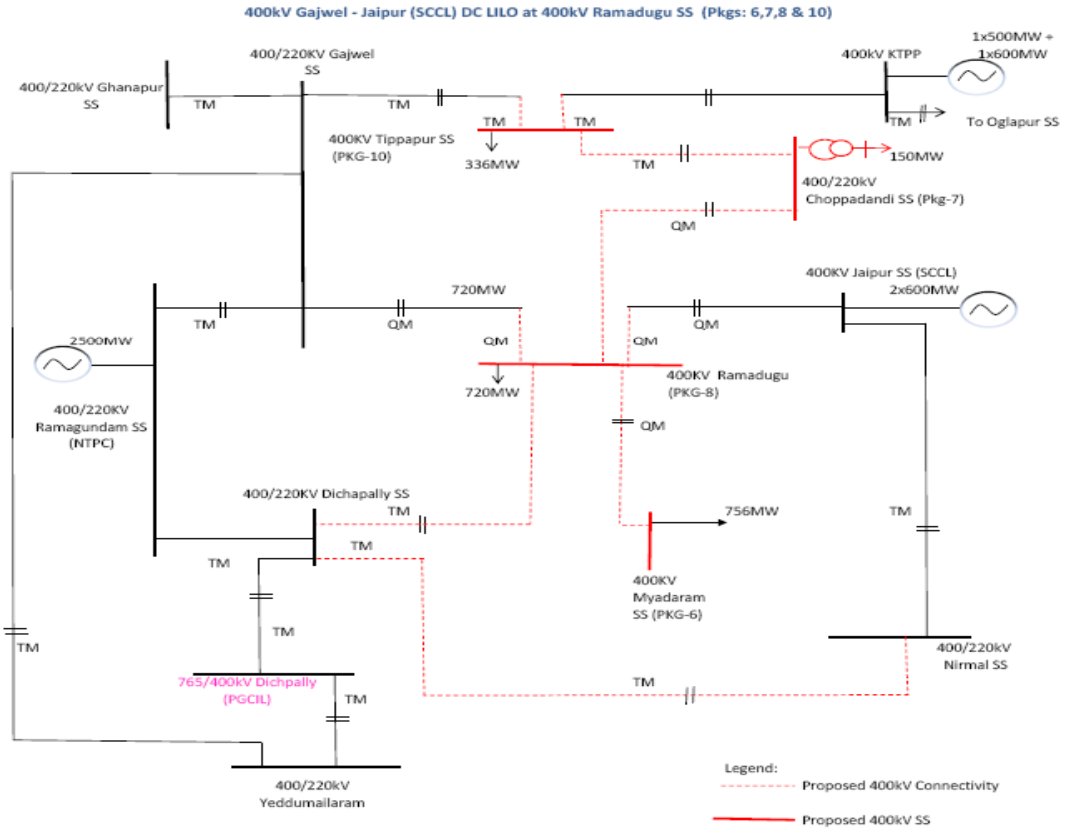
1. 400 kV SS at Ramadugu(Pkg-8),Mydaram(Pkg-6),Tippapur(Pkg-10)
2. 400 kV SS at Choppadandi (Pkg-7) with 2 x 315 MVA ICTs.
3. 132 kV SS at Malakpet.
4. LILO of both circuits of 400 kV Quad Moose D/C SCCL-Gajwel line at the proposed 400 kV Choppdandi SS (total 34 km for two LILO DC lines)
5. LILO of both circuits of 400 kV KTPP –Gajwel Twin Moose D/C Line at the proposed 400 kV Tippapur SS (total 80 km for both LILO DC LInes)
6. 400 kV Quad Moose D/C lines from 400 kV Choppadandi SS to Mydaram SS (25 km), 400 kV Ramadugu SS to 400 kV Choppadandi SS (25 km).
7. 400 kV Twin Moose D/C lines from 400 kV Dichpalli to the Proposed 400 kV Ramadugu SS(90 km), 400 kV Choppadandi SS to 400 kV Tippapur SS(40 km),400 kV Dichpally SS to 400 kV Upcoming 400 kV Nirmal SS (60 km) to have a back bone supply from PGCIL lines.
8. 132 kv D/C Line from 220 kV Jagityala SS to the proposed 132 kV Malakpet SS (30 km) to supply Malakpet Lift Irrigation Scheme which is about 30 MW.



Alternate – 2 with the erection of

1. 400 kV SS at Ramadugu(Pkg-8),Mydaram(Pkg-6),Tippapur(Pkg-10)
2. 400 kV SS at Choppadandi (Pkg-7) with 2 x 315 MVA ICTs.
3. 132 kV SS at Malakpet(Pkg.9).
4. LILO of both circuits of 400 kV Quad Moose D/C SCCL-Gajwel line at the proposed 400 kV Ramadugu SS (total 50 km for two LILO DC lines)
5. LILO of both circuits of 400 kV KTPP –Gajwel Twin Moose D/C Line at the proposed 400 kV Tippapur SS(total 80 km for both LILO DC LInes)
6. 400 kV Quad Moose D/C lines from 400 kV Choppadandi SS to Mydaram SS (25 km), 400 kV Ramadugu SS to 400 kV Choppadandi SS (25 km).
7. 400 kV Twin Moose D/C lines from 400 kV Dichpalli to the Proposed 400 kV Ramadugu SS(90 km), 400 kV Choppadandi SS to 400 kV Tippapur SS(40 km),400 kV Dichpally SS to 400 kV Upcoming 400 kV Nirmal SS(60 km) to have back bone supply from PGCIL lines.
8. 132 kV D/C Line from 220 kV Jagityala SS to the proposed 132 kV Malakpet SS (30 km) to supply Malakpet Lift Irrigation Scheme which is about 30MW.





ANNEXURE

400kV LINE LOADINGS WITH PRANAHITA CHEVELLA LIS SCHEME (PACKAGE - 6, 7, 8 & 10) - NORMAL CONDITIONS

SL. No.	Description	ALT-1 400 kV Gajwel - Jaipur (SCCL) LILO at 400 kV Choppadandi SS						ALT-2 400 kV Gajwel - Jaipur (SCCL) LILO at 400 kV Ramadugu SS					
		NO KTPP - Gajwel LILO at Tippapur Case(A)		KTPP - Gajwel LILO at Tippapur Case (B)		Case (B) + 400kV Dichpally-Nirmal Connectivity Case (C)		NO KTPP - Gajwel LILO at Tippapur Case(A)		KTPP - Gajwel LILO at Tippapur Case (B)		Case (B) + 400kV Dichpally-Nirmal Connectivity Case (C)	
		No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load
1	400kV SCCL - Choppadandi	2 x 323.3	2 x 395.3	2 x 327.1	2 x 374.0	2 x 323.0	2 x 435.6	-	-	-	-	-	-
2	400kV Gajwel - Choppadandi	2 x -227.5	2 x 229.7	2 x -239.2	2 x 10.5	2 x 238.4	2 x -0.6	-	-	-	-	-	-
3	400kV Choppadandi - Ramadugu	2 x 94.1	2 x 0.70	2 x 85.7	2 x 91.6	2 x 83.4	2 x 130.8	2 x -0.00	2 x -243.3	2 x 2.2	2 x 80.1	2 x 3.7	2 x 72.4
4	400kV Choppadandi - Myadaram	2 x 0.00	2 x 378.6	2 x 0.00	2 x 378.5	2 x 0.00	2 x 378.5	-	-	-	-	-	-
5	400kV Gajwel - Ramadugu	-	-	-	-	-	-	2 x -222.8	2 x 228.4	2 x -236.8	2 x 18.9	2 x -235.5	2 x 9.3
6	400kV SCCL - Ramadugu	-	-	-	-	-	-	2 x 327.9	2 x 398.3	2 x 331.4	2 x 378.8	2 x 323.5	2 x 437.3
7	400kV Dichpally (AP) - Ramadugu	2 x -93.8	2 x 362.1	2 x -85.5	2 x 269.9	2 x -83.2	2 x 230.3	2 x -103.0	2 x 362.1	2 x -94.8	2 x 263.6	2 x -89.7	2 x 222.3
8	400kV Ramadugu - Myadaram	-	-	-	-	-	-	2 x 0.00	2 x 378.6	2 x 0.00	2 x 378.5	2 x 0.00	2 x 378.5
9	400kV Gajwel - Tippapur	-	-	2 x -261.0	2 x -64.7	2 x -260.7	2 x -71.8	-	-	2 x -259.7	2 x -70.6	2 x -259.1	2 x -75.7
10	4000kV KTPP - Tippapur	-	-	2 x 263.3	2 x 399.5	2 x 264.2	2 x 395.7	-	-	2 x 264.9	2 x 398.5	2 x 265.8	2 x 395.9
11	400kV Ramagundam - Gajwel	355.2	438.3	381.3	473	381.9	470.3	357.4	439	383.7	475.1	384.3	473.3
12	400kV Gajwel - Ghanapur	61.9	-191.8	32.7	-240.9	32.2	-231.4	61.6	-189.6	32.3	-240.7	31.4	-232.9
13	400kV Dichipally(765) - Dichipally (AP)	2 x 8.6	2 x 425.1	2 x 9.8	2 x 358.6	2 x 8.9	2 x 386.3	2 x -0.7	2 x 420.7	2 x 0.2	2 x 351.3	2 x -2.1	2 x 375.2
14	400kV Dichipally(765) - Yeddumailaram	2 x 153.4	2 x 116.3	2 x 154.9	2 x 148.6	2 x 155.4	2 x 136.8	2 x 155.6	2 x 116.3	2 x 157.2	2 x 150.2	2 x 158.4	2 x 140.0
15	400kV Yeddumailaram - Gajwel	2 x -109.2	2 x 26.4	2 x -94.4	2 x 63.4	2 x -93.9	2 x 53.6	2 x -108.6	2 x 24.9	2 x -93.7	2 x 63.5	2 x -92.8	2 x 55.2
16	400kV Choppadandi - Tippapur	2 x 0.00	2 x 168.3	2 x 0.70	2 x -162.00	2 x -0.40	2 x -151.2	2 x 0.00	2 x 168.3	2 x -2.2	2 x -155.1	2 x -3.7	2 x -147.4
17	400kV KTPP - Gajwel	2 x 331.0	2 x 392.7	-	-	-	-	2 x 332.1	2 x 393.1	-	-	-	-
18	400kV SCCL - Nirmal	2 x 216.7	2 x 144.7	2 x 212.9	2 x 166.0	2 x -215.5	2 x 104.4	2 x 212.1	2 x 141.7	2 x 208.6	2 x 161.2	2 x 216.5	2 x 102.7
19	400kV Dichpalli - Nirmal	-	-	-	-	2 x 3.40	2 x-87.6	-	-	-	-	2 x -8.8	2 x 83.7
	EHT system losses	774.600	854.100	779.100	842.900	778.000	840.100	775.000	850.200	778.700	841.200	777.800	837.600

ANNEXURE

400kV BUS VOLTAGES WITH PRANAHITA CHEVELLA LIS SCHEME (PACKAGE - 6, 7, 8 & 10) - NORMAL CONDITIONS

SL. No.	Description	ALT-1 400 kV Gajwel - Jaipur (SCCL) LILO at 400 kV Choppadandi SS						ALT-2 400 kV Gajwel - Jaipur (SCCL) LILO at 400 kV Ramadugu SS					
		NO KTPP - Gajwel LILO at Tippapur Case(A)		KTPP - Gajwel LILO at Tippapur Case (B)		Case (B) + 400kV Dichpally-Nirmal Connectivity Case (C)		NO KTPP - Gajwel LILO at Tippapur Case(A)		KTPP - Gajwel LILO at Tippapur Case (B)		Case (B) + 400kV Dichpally-Nirmal Connectivity Case (C)	
		No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load	No Lift Load	With Lift Load
		KV	KV	KV	KV	KV	KV	KV	KV	KV	KV	KV	KV
1	400kV SCCL SS	420	379.3	415.8	390.2	418.4	393.5	420.9	380.7	417.1	390.7	419.6	394.2
2	400kV Gajwel SS	398.7	380.8	398.2	381.8	399	382.7	398.7	381.2	398.4	381.9	399.2	382.8
3	400kV Choppadandi SS	413.2	369.2	408.7	380.9	410	382.5	413.9	367.6	408.5	381.5	409.6	382.9
4	400kV Myadaram SS	413.4	365	408.9	376.8	410.2	378.4	413.7	365.4	409.5	376.4	410.8	378.1
5	400kV Ramadugu SS	412.2	368.3	408.2	379.1	409.4	380.5	413.4	369.6	409.3	380.5	410.6	382.2
6	400kV Tippapur SS	413.6	365.9	406.2	384.2	407.1	385.3	414.3	364.3	406.1	384.6	406.9	385.6
7	4000kV KTPP SS	404.2	403.3	404.2	404.2	404.2	404.2	404.2	403.6	404.2	404.2	404.2	404.2
9	400kV Ghanapur SS	398.8	388.9	398.3	390.1	398.7	390.4	398.8	389.3	398.5	390.2	398.8	390.6
10	400kV Dichipally (AP) SS	404.8	379.6	403	385.3	403.6	385.5	405.5	380.5	403.6	386.1	404.5	386.5
11	400kV Dichipally(765) SS	404.8	382.8	403.3	387.4	403.8	387.7	405.3	383.6	403.8	388.1	404.5	388.5
12	400kV Yeddumailaram SS	397.6	382.9	396.9	384.8	397.4	385.3	397.7	383.4	397.1	385.1	397.7	385.6
13	400kV Nirmal SS	400.6	366.6	397.1	375.8	402.6	383.5	402.1	368.8	398.8	377	403.8	384.7

Alt -2 with N-1 Condition

- N-1 Contingency of SCCL – Ramadugu Line without Dichpally Nirmal connectivity.
- N-1 Contingency of SCCL – Ramagdugu DC Line without Dichpally Nirmal connectivity.
- Outage of 1x600MW KTPP unit without Dichpally Nirmal connectivity.
- Outage of 1x600MW KTPP unit with Dichpally Nirmal connectivity.
- Outage of one SCCL unit without Dichpally Nirmal connectivity.
- Outage of one SCCL unit with Dichpally Nirmal connectivity.
- Outage of two SCCL units without Dichpally Nirmal connectivity.
- Outage of two SCCL units with Dichpally Nirmal connectivity.
- N-1 Contingency of KTPP- Tippapur Line without Dichpally Nirmal connectivity.
- N-1 Contingency of KTPP- Tippapur Line with Dichpally Nirmal connectivity.

ANNEXURE

ALT -2 400 kV Gajwel - Jaipur (SCCL) LILO at 400 kV Ramadugu SS

400kV LINE LOADINGS WITH PRANAHITA CHEVELLA LIS SCHEME (PACKAGE - 6, 7, 8 & 10) - N-1 CONDITIONS

SL. No.	Description	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & N-1 Contigency of SCCL - Ramadugu	400kV Dichpally-Nirmal Connectivity & N-1 Contigency of SCCL - Ramadugu DC line	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi TM DC line & outage of 1x600MW KTPP unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line 400kV Dichpally-Nirmal Connectivity & outage of 1x600MW KTPP unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & outage of one SCCL unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line with 400kV Dichpally-Nirmal Connectivity & outage of one SCCL unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & outage of two SCCL unit	400kV Dichpally-Nirmal Connectivity & outage of two SCCL unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & N-1 Contigency of KTPP - Tippapur line	400kV Dichpally-Nirmal Connectivity & N-1 Contigency of KTPP - Tippapur line
1	400kV SCCL - Choppadandi	-	-	-	-	-	-	-	-	-	-
2	400kV Gajwel - Choppadandi	-	-	-	-	-	-	-	-	-	-
3	400kV Choppadandi - Ramadugu	2 x 89.5	2 x 88.4	2 x 21.7	2 x 12.3	2 x 144.4	2 x 129.6	2 x 209.5	2 x 187.4	2 x 25.3	2 x 17.6
4	400kV Choppadandi - Myadaram	-	-	-	-	-	-	-	-	-	-
5	400kV Gajwel - Ramadugu	2 x 28.9	2 x 27.3	2 x 30.8	2 x 19.1	2 x 93.1	2 x 74.5	2 x 165.2	2 x 141.6	2 x 36.2	2 x 26.0
6	400kV SCCL - Ramadugu	699.4	719	2 x 379.1	2 x 449.8	2 x 145.9	2 x 258.4	2 x -85.8	2 x 78.8	2 x 386.7	2 x 448.3
7	400kV Dichpally (AP) - Ramadugu	2 x 274.4	2 x 267.4	2 x 310.4	2 x 260.7	2 x 358.3	2 x 278.4	2 x 454.7	2 x 333.8	2 x 293.7	2 x 2500
8	400kV Ramadugu - Myadaram	2 x 378.5	2 x 378.5	2 x 378.5	2 x 378.5	2 x 378.5	2 x 378.5	2 x 378.6	2 x 378.6	2 x 378.6	2 x 378.5
9	400kV Gajwel - Tippapur	2 x -65.9	2 x -67.0	2 x -16.4	2 x -22.8	2 x -34.1	2 x -44.2	2 x -0.2	2 x -10.9	2 x -13.0	2 x -18.9
10	4000kV KTPP - Tippapur	2 x 403.5	2 x 403.4	2 x 283.5	2 x 280.5	2 x 427.4	2 x 422.6	2 x 460.5	2 x 448.6	572.1	568.2
11	400kV Ramagundam - Gajwel	481.2	481	469.3	466.9	497	493	520.3	512.6	511	508.7
12	400kV Gajwel - Ghanapur	-246.7	-245.1	-285.8	-276.3	-311.2	-296.1	-380.3	-361.4	-279.4	-270.9
13	400kV Dichipally(765) - Dichipally (AP)	2 x 353.6	2 x 358.5	2 x 420.3	2 x 449.4	2 x 448.3	2 x 494.2	2 x 548.5	2 x 611.6	2 x 365.0	2 x 390.2
14	400kV Dichipally(765) - Yeddumailaram	2 x 149.4	2 x 147.6	2 x 157.7	2 x 145.5	2 x 146.8	2 x 127.0	2 x 147.4	2 x 112.9	2 x 147.4	2 x 136.6
15	400kV Yeddumailaram - Gajwel	2 x 66.1	2 x 64.5	2 x 96.2	2 x 86.2	2 x 104.0	2 x 88.1	2 x 144.5	2 x 122.0	2 x 81.4	2 x 72.6
16	400kV Choppadandi - Tippapur	2 x -164.5	2 x -163.4	2 x -96.7	2 x -87.3	2 x -219.4	2 x -204.6	2 x -284.5	2 x -262.4	2 x -100.3	2 x -92.6
17	400kV KTPP - Gajwel	-	-	-	-	-	-	-	-	-	-
18	400kV SCCL - Nirmal	2 x 190.3	2 x 180.5	2 x 160.9	2 x 90.2	2 x 124.1	2 x 11.6	2 x 85.8	2 x -78.8	2 x 153.3	2 x 91.7
19	400kV Dichpalli - Nirmal	-	2 x 16.2	-	2 x 100.7	-	2 x 160.7	-	2 x 237.6	-	2 x 88.4
	EHT system losses	849.600	845.900	863.200	860.400	874.000	868.900	940.600	926.100	858.000	854.000

ANNEXURE

ALT-2 400 kV Gajwel - Jaipur (SCCL) LILO at 400 kV Ramadugu SS

400kV BUS VOLTAGES WITH PRANAHITA CHEVELLA LIS SCHEME (PACKAGE - 6, 7, 8 & 10) - N-1 CONDITIONS

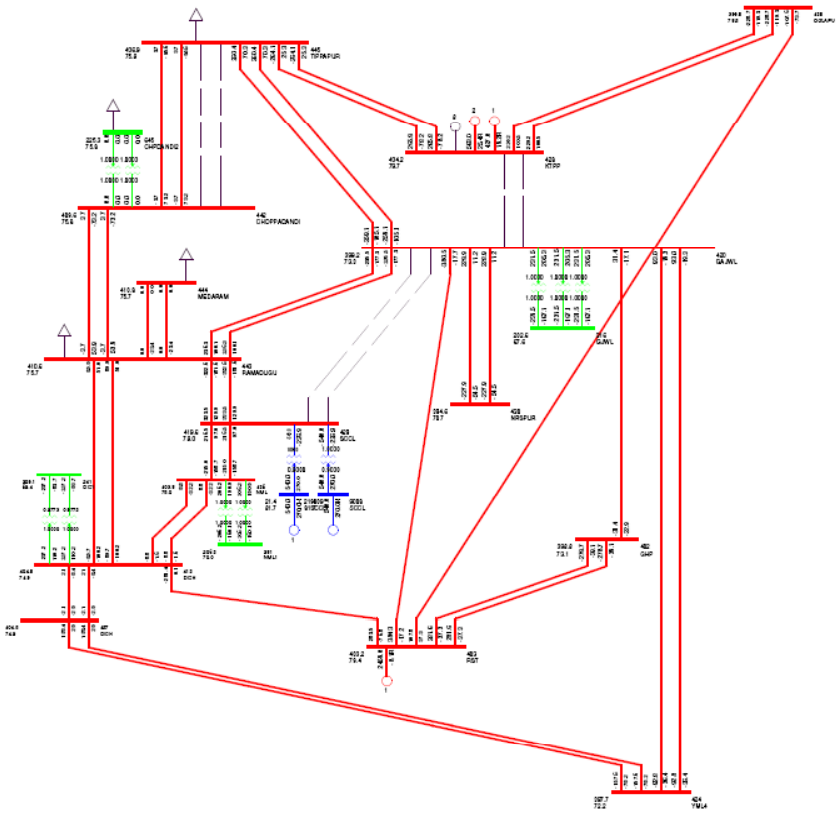
SL. No.	Description	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & N-1 Contigency of SCCL - Ramadugu	400kV Dichpally-Nirmal Connectivity & N-1 Contigency of SCCL - Ramadugu DC line	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi TM DC line & outage of 1x600MW KTPP unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line 400kV Dichpally-Nirmal Connectivity & outage of 1x600MW KTPP unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & outage of one SCCL unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line with 400kV Dichpally-Nirmal Connectivity & outage of one SCCL unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & outage of two SCCL unit	400kV Dichpally-Nirmal Connectivity & outage of two SCCL unit	KTPP - Gajwel LILO at Tippapur & Tippapur - Choppadandi DC line & N-1 Contigency of KTPP - Tippapur line	400kV Dichpally-Nirmal Connectivity & N-1 Contigency of KTPP - Tippapur line
		KV	KV	KV	KV	KV	KV	KV	KV	KV	KV
1	400kV SCCL SS	393.6	397.4	385.8	389.4	377	381.7	364.1	362.6	385.4	389.3
2	400kV Gajwel SS	379.9	381	377.8	378.8	376.3	377.6	372.9	367	377.5	378.6
3	400kV Choppadandi SS	378.2	379.8	376	377.8	373.3	375.5	367.2	361.7	375.2	377
4	400kV Myadaram SS	372.8	374.5	371.2	373.1	367.6	369.9	360.4	355.3	370.7	372.6
5	400kV Ramadugu SS	376.9	378.7	375.3	377.2	371.8	374.1	364.7	359.7	374.8	376.8
6	400kV Tippapur SS	382.1	383.4	378.6	380	377.9	379.6	374	367.4	377.1	378.6
7	4000kV KTPP SS	403.5	404.2	392.8	393.6	401.1	402.1	404.2	393.8	404.2	404.2
9	400kV Ghanapur SS	389.1	389.7	387.5	388	386.9	387.3	384.2	380.3	387.8	388.3
10	400kV Dichipally (AP) SS	384	385.4	381.7	382.3	379.7	379.7	374.5	367.3	382.3	382.7
11	400kV Dichipally(765) SS	386.2	387.4	383.8	384.4	382.2	382.2	377.2	371	384.6	385.1
12	400kV Yeddumailaram SS	383.5	384.4	381.5	382.1	380.4	381	377.2	372.1	381.8	382.5
13	400kV Nirmal SS	378.7	384.8	372.5	380.3	366	375.5	355.8	362.3	372.3	380.7

The following observations are made from the System Study results:

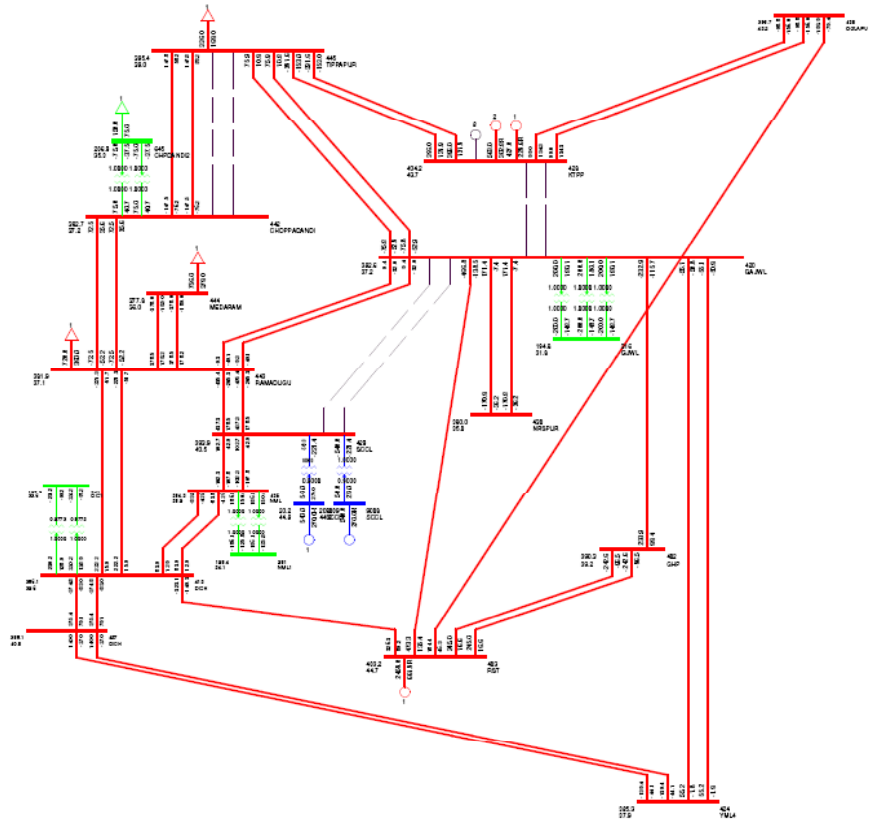
- The 400kV Dichpally-Ramadugu DC line is proposed to have a PGCIL backbone network.
- The 400kV Dichpalli – Nirmal DC line and the LILO of 400kV KTPP-Gajwel at the proposed 400kV Tippapur SS are proposed to have reliability and to improve the voltage profile in the normal conditions when all the lift loads are running.
- Both the alternatives are more or less same. With the LILO of 400kV SCCL-Gajwel Quad Moose DC line at the proposed 400kV Ramadugu SS, (ALT-2) there is slight improvement in the voltage profile and EHT System losses.

- With the generating Stations and all the lines in Operation, the flows in the connected lines are normal and within the limits and the voltages at the LIS Substations are around 380-385 kV and New Generating Stations are required to match the Loading conditions.
- From the contingency analysis, it can be observed that SCCL generator is critical. In case of failure of SCCL generation, the voltages at the proposed Substations will be below the stipulated margins and will not satisfy the planning criteria.
- As such, in case of contingency, the load shedding has to be resorted to at these pumping stations till new Generating stations are operational.

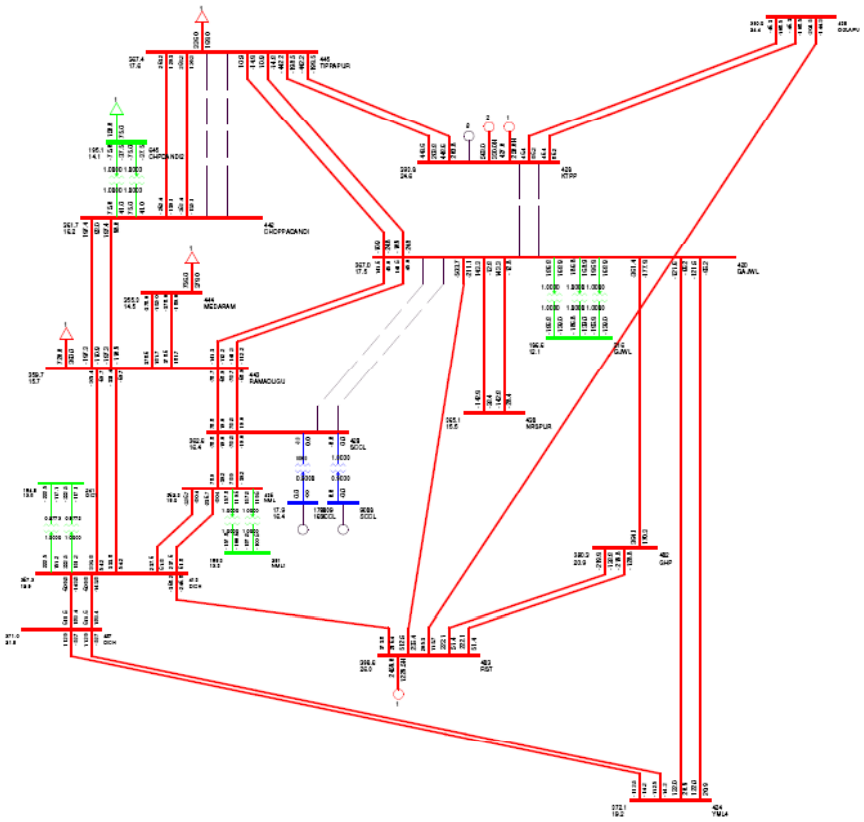
1. Without Lift Loads



2. With Lift Loads



3. With Contingency outage of two units of SCCL



THANK YOU

Annex-IV

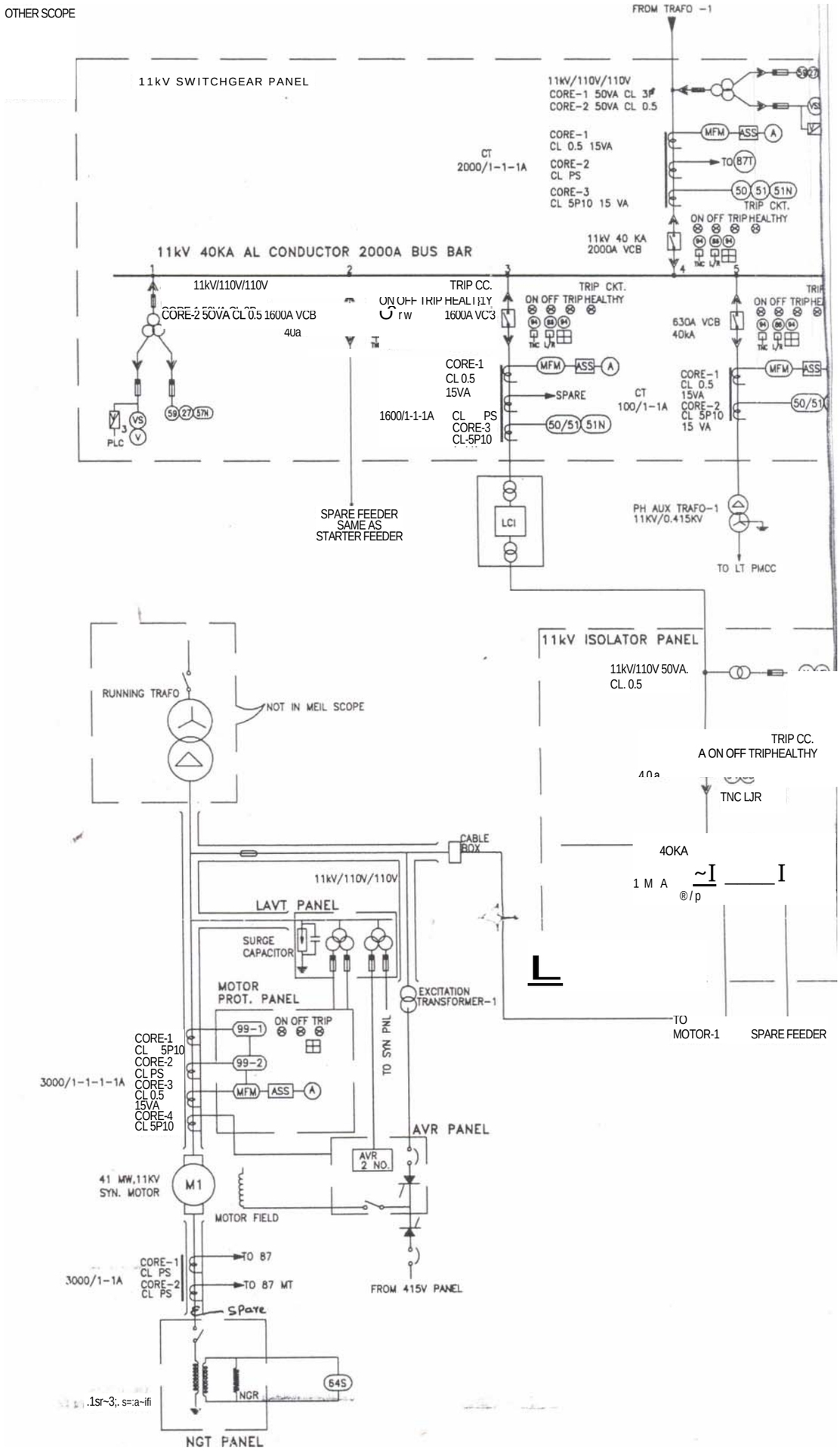
STARTING EQUIPMENT AND METHOD OF STARTING-

To limit the starting power Water depression is envisaged during starting along with the STATIC FRQUENCY DRIVES(VFD's. Initially water will be depressed upto the bottom of the runner by keeping the wicket gates closed by admitting pressure air uniformly into the runner chamber. The power drawl at the time of starting is controlled by adopting the static frequency converter method of starting. The starting power is limited to around 6-8 % of the rating of the machine. Once water was depressed to the required level the Field will be applied to the rotor and SFC will be started.

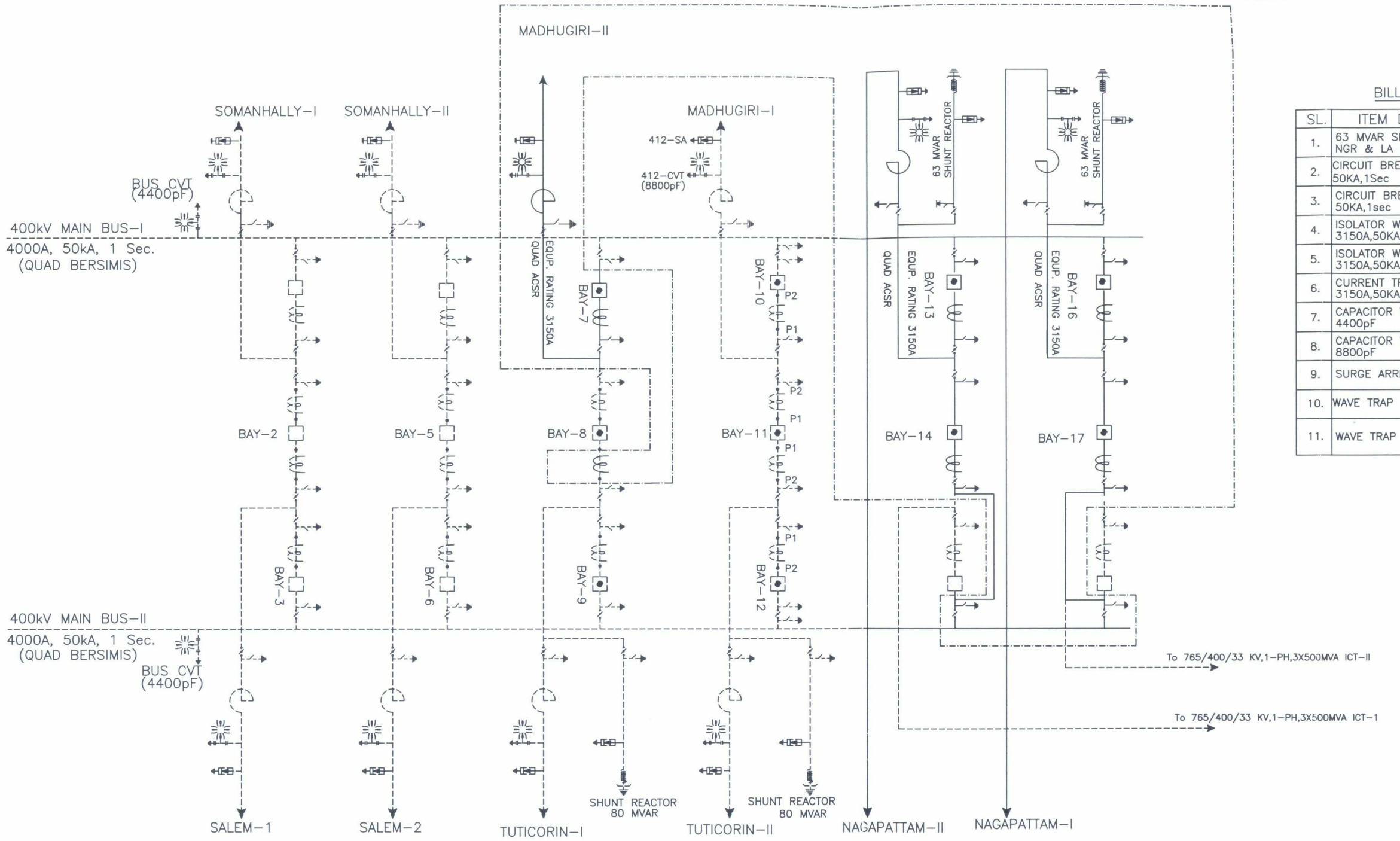
This power is taken at 11 KV terminals of the S.F.C. transformer: The S.F.C. equipment is connected to S.F.C. transformer through which it is connected to 11 kv cubicles SF6 circuit through 11 kv breaker. The 11KVis stepped down to required voltage and is converted to D.C. through silicon controlled rectifier circuit and again inverted to A.C. supply. This variable frequency and voltage is directly fed to the stator of motor through Breaker and Isolator. During this process, the output voltage and frequency are varied smoothly and fed to the stator of pump motor. Full field current is applied to the rotor just before variable frequency supply is fed to stator. When motor speed reaches to about 4% speed the voltage is again stepped up and fed to the stator of the motor. Application of low frequency supply to the motor results in slow start of the pump motor and drawl of power will be limited.

After the motor starts, the voltage and frequency of power supplied to the motor is increased (by the S.F.C. equipment) thereby increasing the torque and accelerating the pump motor. When the motor reaches 90% speed, the synchronizing equipment is switched on. Once the frequency and voltage matches to the grid system This will close the circuit breaker after synchronize check thus putting the machine on the grid supply. The S.F.C. is switched off. The Air from the runner chamber will be released by the release operation solenoid valve and then the wicket gates are opened and the pump starts pumping the water into the penstock. The load on the grid will rise to full value depending on grid frequency.

S.F.C. equipment requires 10 tol 5 minutes of cooling down time before it is applied for starting of next pump. This is not as limitation of the operation of the scheme and therefore it is sufficient to have one set of S.F.C. equipment. However to have redundancy 2nd set of all SFC equipment including SFC transformer are provided. Each S.F.C. transformer is of 12 M.V.A. capacity 1 I KV/4.1 6 to 6.6KV.


OTHER SCOPE
FROM TRAFO -1
11kV SWITCHGEAR PANEL
11kV/110V/110V
CORE-1 50VA CL 3P
CORE-2 50VA CL 0.5
CT
2000/1-1-1A
CORE-1
CL 0.5 15VA
CORE-2
CL PS
CORE-3
CL 5P10 15 VA
TO 87T
50 51 51N
TRIP CKT.
ON OFF TRIP HEALTHY
11kV 40 KA
2000A VCB
11kV 40KA AL CONDUCTOR 2000A BUS BAR
11kV/110V/110V
CORE-2 50VA CL 0.5 1600A VCB
40a
TRIP CC.
ON OFF TRIP HEALTHY
1600A VCB
TRIP CKT.
ON OFF TRIP HEALTHY
630A VCB
40kA
CORE-1
CL 0.5
15VA
SPARE
1600/1-1-1A
CL PS
CORE-3
CL-5P10
CT
100/1-1A
CORE-1
CL 0.5
15VA
CORE-2
CL 5P10
15 VA
50/51
51N
PLC
SPARE FEEDER
SAME AS
STARTER FEEDER
LCI
PH AUX TRAFO-1
11KV/0.415KV
TO LT PMCC
11kV ISOLATOR PANEL
11kV/110V 50VA.
CL. 0.5
TRIP CC.
A ON OFF TRIPHEALTHY
TNC LJR
4OKA
1 M A
RUNNING TRAFO
NOT IN MEIL SCOPE
CABLE
BOX
11kV/110V/110V
LAVT PANEL
SURGE
CAPACITOR
MOTOR
PROT. PANEL
EXCITATION
TRANSFORMER-1
ON OFF TRIP
99-1
99-2
CORE-1
CL 5P10
CORE-2
CL PS
3000/1-1-1-1A
CORE-3
CL 0.5
15VA
CORE-4
CL 5P10
TO SYN PNL
AVR PANEL
AVR
2 NO.
41 MW,11KV
SYN. MOTOR
M1
MOTOR FIELD
TO 87
TO 87 MT
3000/1-1A
CORE-1
CL PS
CORE-2
CL PS
FROM 415V PANEL
Spare
64S
NGR
NGT PANEL
TO
MOTOR-1
SPARE FEEDER

PRESENT SCOPE UNDER NAGAPATTAM PART–A1



BILL OF QUANTITY 400 kV

SL.	ITEM DESCRIPTION	QTY.	SYMBOL.
1.	63 MVAR SHUNT REACTOR WITH NGR & LA (OWNER'S SUPPLIED)	2	
2.	CIRCUIT BREAKER WITHOUT CR 3150A 50KA,1Sec	0	
3.	CIRCUIT BREAKER WITH CR 3150A 50KA,1sec	5	
4.	ISOLATOR WITH ONE EARTH SWITCH 3150A,50KA, 1sec	16	
5.	ISOLATOR WITH TWO EARTH SWITCH 3150A,50KA, 1sec	0	
6.	CURRENT TRANSFORMER 3000/1 A 3150A,50KA, 1Sec	18	
7.	CAPACITOR VOLTAGE TRANSFORMER 4400pF	0	
8.	CAPACITOR VOLTAGE TRANSFORMER 8800pF	9	
9.	SURGE ARRESTOR 336 kV	15	
10.	WAVE TRAP 0.5mH, 3150A,50KA 1sec	0	
11.	WAVE TRAP 1mH, 3150A,50KA 1sec	6	

S.No.	LEGEND	
1.	———	PRESENT
2.	- - - - - - - - -	FUTURE/ EXISTING

Note: NAGAPATTAM–I & II and Madhugiri–II are 765KV Line to be charged at 400KV

FOR TENDER PURPOSE ONLY

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: Common Transmission system associated with ISGS projects in Nagapattinam/ Cuddalore area of Tamilnadu-PART-A

SUBSTATION: 400 kV SALEM POOLING SUBSTATION–EXTN (WITH A PROVISION OF 765/400 KV IN FUTURE)

TITLE: 400 KV SINGLE LINE DIAGRAM

CDE (ENGG–S/S)	DGM (ENGG–S/S)	DGM (ENGG–SEF)	AGM (ENGG–S/S)	GM (ENGG–S/S)	ED (ENGG.–S/S & T/L) & Civil
CHECKED	RECOMMENDED				APPROVED

DATE	DRAWN	DRG.NO.	REV.
08.04.13		C/ENGG/NAGAPATTINAM-A/SALEM-PS EXTN/SLD	01

Annex VI

TAMILNADU TRANSMISSION CORPORATION LTD.
(Subsidiary of TNEB Ltd.)

From

K.Rangaraj, B.E.,M.C.A.,F.I.E.,
Director/Transmission Projects,
TANTRANSCO,
5B, 144, Anna Salai,
Chennai -2.

To

The Member (Power System),
Central Electricity Authority,
Sewa Bhavan, R.K.Puram,
New Delhi 110 066.

Lr.No. CE/Plg.&R.C/SE/SS/EE1/AEE1/F.Stg. Committee /D.269/14Dated.07.08.14

Sir,

Sub: 37th Standing committee Meeting – Land acquired for establishment of Ariyalur (Villupuram) substation & GPS Coordinates requested - reg.

*****

1.0. In the 37th Standing Committee on Power System Planning for Southern Region held on 31.07.2014 at New Delhi, while discussing the ATS for the NNTPS project, the proposed Ariyalur (Villupuram) 765/400kV substation's GPS coordinates and the time frame at which the substation will be established has been requested from TANTRANSCO.

2.0. In this connection, the following are stated.

i. 99.5 acres of land has been acquired for the establishment of Ariyalur 765/400kV substation and the work for awarding the tender is under progress.

ii. The Ariyalur substation is expected in the time frame of the year 2017-18 matching with the commissioning of the NNTPS Project.

iii. The Ariyalur substation coordinates are indicated below:

NORTH EAST	SOUTH EAST	SOUTH WEST	NORTH WEST
N 11' 54.487	N 11' 54.867	N 11' 54.634	N 11' 54.993
E 78 ' 59.659	E 78' 59.796	E 78 ' 59.380	E 78 ' 59.546

3.0. Further, it is also stated that the 400kV DC line from NNTPS may be terminated at Ariyalur (Villupuram), TANTRANSCO substation.

(S.Ravichandran) (2/2)
Chief Engineer/Planning & R.C (i/c)
(For Director/Transmission Projects)

Annex VII

Presentation on
Issues related to Power Evacuation from
KKNPP-1&2 (2*1000 MW) and KKNPP-3&4 (2*1000MW)
By

SANDEEP SARWATE
Additional Chief Engineer (Transmission)

NPCIL
NPCIL Mumbai-94

REGULATORY FRAMEWORK FOR TRANSMISSION PLANNING

- CEA Transmission Planning Criteria (Feb.2013) is the "Governing Document" for Power System Planning in Country.
- As per this ,the loading limit for a transmission line shall be its thermal loading limit .
- Thermal limits represent equipment limit that can be sustained on continuous basis.
- Emergency Thermal limits represent the equipment limits that can be tolerated for a relatively short period which may be one hour or two hours depending upon equipment design.
- Emergency Thermal limits for planning purpose shall be 110% of the normal thermal limits.
- Existing and already planned transmission systems may be reviewed with respect to the provisions of these Planning Criteria.
- Additional system may be planned to strengthen the system accordingly.

POWER EVACUATION FROM 2*1000MWE KKNPP-1&2

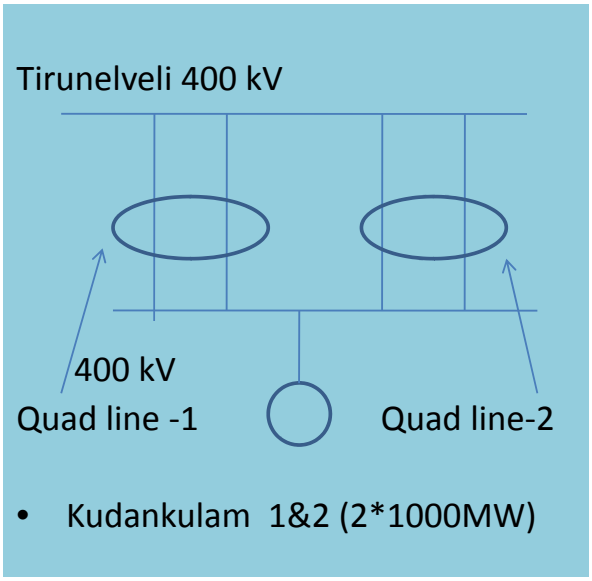
- KKNPP-1&2 comprises of 2*1000 Mwe LWR(Light Water Reactors) @ Kudankulam in Tirunelveli Dist.of Tamilnadu.
- The 1st unit has been synchronized on 23-10-2013 whereas the 2nd unit is under commissioning.
- The project has been granted connectivity to the ISTS of CTU via 2*400 kV D/c lines to Tirunelveli S/s of POWERGRID.
- Each of the above two nos. of D/c lines has been constructed utilizing high capacity Quad conductor.
- Thus there are 4 (four) power evacuation outlets from KKNPP-1&2.
- Implementation of KKNPP-3&4(2*1000MWe) has been proposed adjacent to KKNPP-1&2

POWER EVACUATION FROM 2*1000MWE KKNPP-3&4

- CTU suggested the following 400 kV grid connectivity
- One circuit of the 1st D/c to Tirunelveli will be shifted to KKNPP-3&4 ,while the other circuit stays with KKNPP-1&2.
- Similarly one circuit of the 2nd D/c to Tirunelveli will be shifted to KKNPP-3&4 ,while the other circuit stays with KKNPP-1&2.
- A new 400 kV D/c line will be laid from KKNPP-3&4 to Pooling Station (P.S.)of Tuticorin. One circuit of this line will be shifted to KKNPP-1&2, whereas the other circuit will stay with KKNPP-3&4.
- Thus each 400kV switchyard will have total 3(three circuits) i.e. two each to Tirunelveli and one to Tuticorin.

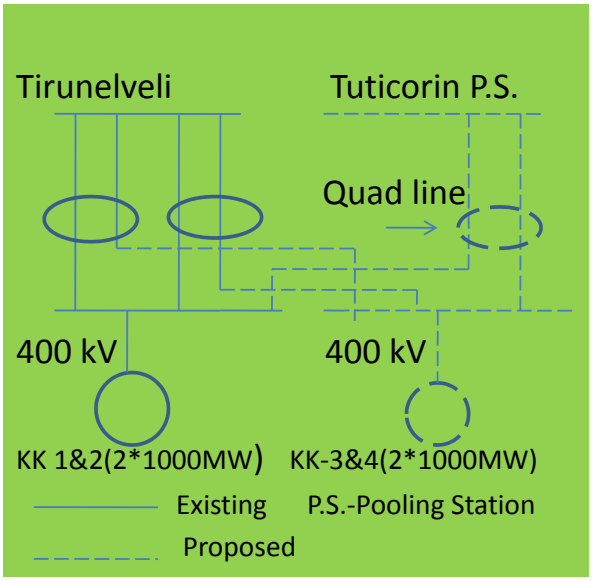
EXISTING & PROPOSED POWER EVACUATION SCHEMES

Existing Power Evacuation Scheme from KK-1&2

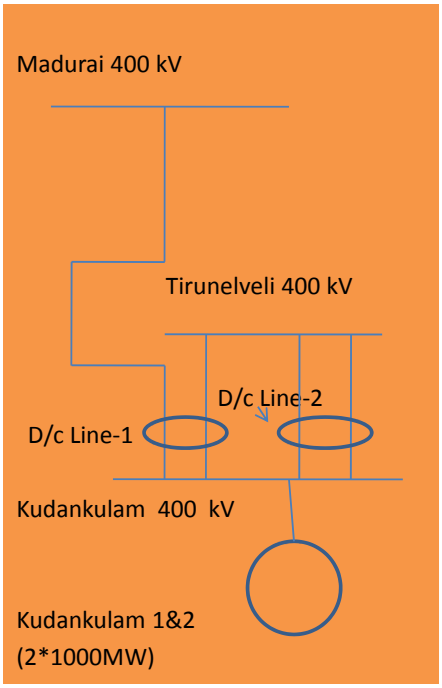


- Kudankulam 1&2 (2*1000MW)

Proposed Power evacuation scheme from KK-1&2 and KK-3&4



THE CURRENT INTERIM SCHEME(schematic)

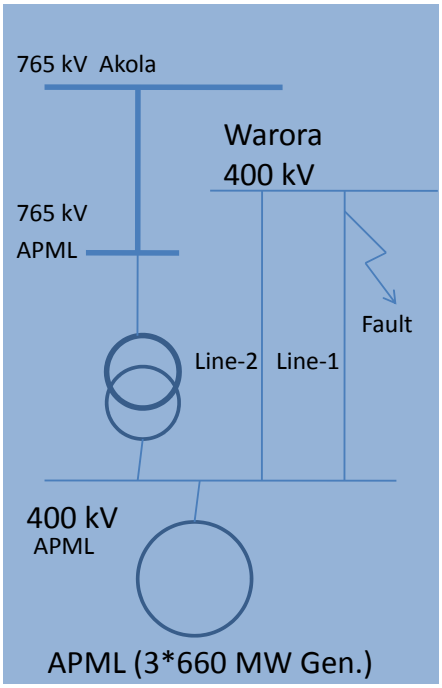


- One of the four ckts.to Tirunelveli, has been converted to KKNPP-Madurai 400 kV S/c, bypassing Tirunelveli S/c.
- This circuit (upto Tirunelveli) is Quad, and beyond it is Twin Moose.
- In the event of non availability of Tirunelveli s/s, the generation of KKNPP will be evacuated via radialy connected Madurai line.
- As per the suggested SPS, generation @ KKNPP will be regulated to match the evacuation capacity of KKNPP-Madurai S/c (700 MW) within 10 minutes.
- However field experience shows that in such a case there will be power swing and Madurai line may not hold.
- There is need for another corridor from KKNPP.

COMMENTS OF NPCIL ON THE PROPOSED SCHEME

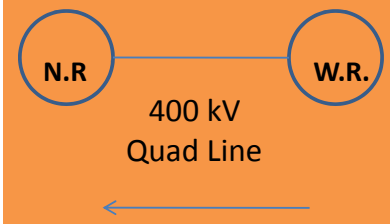
- The proposed scheme envisages 3 nos. of evacuating circuits(from either of the switchyards), whereas in present scheme there are 4 circuits.
- This depletes the evacuation capacity to 75 %, that may call for regulation of generation under contingency .
- **This also dilutes reliability of drawl of "Off Site Power" for cooling of Reactor core when units are not operating**.
- Under N-1-1 condition, the concerned switchyard may be left with only one circuit to evacuate the entire generation of 2000 MW.
- The available circuit may trip on power swings/load encroachment as explained in subsequent slides.
- Even fault on a near by transmission line may induce oscillations in Kudankulam generating m/cs.
- In event of a non availability of Tirunelveli S/s, the system carries the risks of loss of 2000 MW(when KK-1&2 are operating) and loss of 4000 MW(when KK-1&2 and KK-3&4) are operating.

TRANSIENT DATED 20/5/2014 AT APML TIRODA MAHARASHTRA



- On the given day , both 400 kV ckts.(Quad.) to Warora were evacuating 925 MW each. 765 kV line to Akola was out
- Due to LA failure at Warora,Line-1 tripped and power flow shifted to the Line-2.
- This created power swing and the other line also tripped leading to loss of corridor and all 3*660 MW generation lost.
- **SPS for Tiroda-Warora lines**
- *Alarm when either line loading >925 MW*
- *Back down when either line loading> 1020 MW*
- *Trip one unit when either line loading >1480 MW.*
- Thus, in the event of tripping of one line, before load on the healthy line reaches near thermal limit (1800MW for Quad line), the healthy line is also likely to trip on Power Swing and results in failure of SPS.

Grid disturbance dated 30/7/2013 in Northern Region



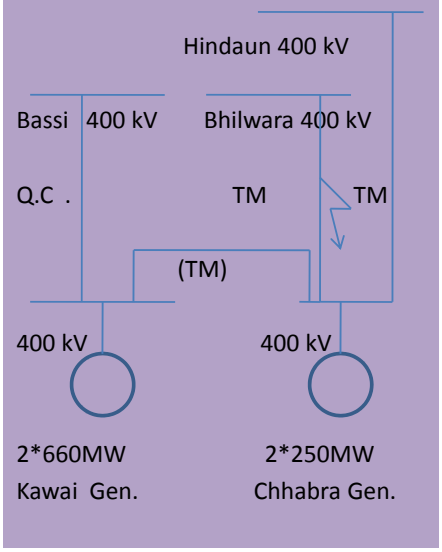
Antecedent power import was 1450 MW by N.R. Thermal limit is around 1800 MW

- On the given day N.R. and W.R. were operating in weak synchronism via 400 kV Agra-Gwalior (Quad S/c) line.
- Line loading was 1450MW towards N.R, and it was below the thermal limit of 1800 MW.
- Due to heavy reactive demand the voltage @ Gwalior bus had gone down to 374 kV as against the acceptable limit of 380 kV and **minimum emergency limit** of 372kV
- High current loading coupled with low voltage lowered the impedance seen by the relay and line tripped on Zone-III protection due to load encroachment, **though there was no fault in the line**. This line tripping created wide spread instability in the system.
- Thus during the phase of weak grid connectivity, a line may not be able to sustain loading near the thermal limit.

TRANSIENT DATED 1/2/2014 AT KAWAI(RAJASTHAN)

Q.C.-Quad conductor

TM—Twin Moose Conductor



- On given day the 400 kV Chhabra-Bhilwara S/c tripped on fault.
- This led to loading of 400 kV Kawai-Bassi S/c going up to 840 MW (Thermal limit of Quad conductor being 1800 MW)
- Kawai units observed hunting due to sudden reconfiguration of power flow.
- Similar oscillations were experienced by RAPS-5, during grid disturbance on 30/7/12 before it tripped on dead m/c protection.
- Such oscillations are manifestation of weak grid coupling.
- Subsequently SPS has been implemented @ Kawai to reduce the generation as soon as the flow on Kawai-Bassi line crosses 750 MW.
- Thus loading limit of a line may not be determined alone by consideration of thermal limit, but also from system transient stability.

TWO INDEPENDENT CORRIDORS FROM KKNPP-1&2

- There is need to advance commissioning KK-3&4-Tuticorin D/c line and convert it into KK-1&2-Tuticorin D/c at the earliest.
- The proposal has been agreed by the 36th Regional Standing Committee on Transmission Planning.