

**Chief Engineer Central Electricity Authority  
System Planning & Project Appraisal Division  
Sewa Bhawan, R.K. Puram, New Delhi – 100 66.**

No. 51/4/SP&PA-2001/

Date : 05-9-2003.

**To**

1.The Member Secretary, Southern Regional Electricity Board, 29, Race Course Cross Road, Bangalore 560 009. FAX : 080-2259343	2.The Executive Director (Engineering), Power Grid Corp. of India Ltd. Plot No.2,Sector-29,Gurgaon,Haryana.  FAX : 95124-2571802
3.The Director (Transmission), Transmission Corp. of Andhra Pradesh Ltd., Vidyut Soudha,Hyderabad – 500 082.  FAX : 040-3317652, 3320565	4.The Director (Transmission), Karnataka State Power Transmission Corp. Ltd.,Cauvery Bhawan, Bangalore 560 009. FAX : 080 -2228367, 221352
5.The Member (Transmission), Kerala State Electricity Board, Vidyuthi Bhawanam, Pattom, P.B. No. 1028, Thiruvananthapuram - 695 004. FAX : 0471-446774	6.The Executive Director/ Planning, Tamil Nadu Electricity Board, 6 <sup>th</sup> Floor, Eastern Wing, 800 Anna Salai, Chennai – 600 002. FAX : 044-8521210, 8544528
7.The Director (Power), Corporate Office, Block – I, Neyveli Lignite Corp. Ltd., Neyveli, Tamil Nadu – 607 801. FAX : 04142-52646	8.The Superintending Engineer –I, First Floor, Electricity Department, Gingy Salai, Pondicherry – 605 001.  FAX : 0413-334277
9.The Executive Director (Engineering), NTPC Ltd., Engg. Office Complex, A-8, Sector 24, Noida – 201 301. FAX: 91-539462, 91-4410136, 91-4410137	10.The General Manager (Transmission), Nuclear Power Corp. of India Ltd., 9 <sup>th</sup> Floor, South Wing,Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai – 400 094. FAX : 022-25563350
11. The Director (Tech), Power Trading Corpn. of India Limited, 2 <sup>nd</sup> Floor, NBCC Tower, 15 Bhikaji Cama Place, NewDelhi 110066. FAX-011-51659504	

**Sub: 17<sup>th</sup> meeting of the Standing Committee on Power System Planning of Southern Region**

**Sir,**

Further to our letter dated 11-8-2003 forwarding therewith the agenda for the proposed meeting, it is informed that the 17<sup>th</sup> meeting of the Standing Committee on Power System Planning in Southern Region is scheduled to be held on 15<sup>th</sup> September, 2003 at 11-00 AM in the Conference Hall, SREB, Bangalore.

You are requested to kindly make it convenient to attend the meeting.

Yours faithfully,

**(A K Asthana)**  
Director (SP&PA)

**Chief Engineer Central Electricity Authority  
System Planning & Project Appraisal Division  
Sewa Bhawan, R.K. Puram, New Delhi – 100 66.**

No. 51/4/SP&PA-2001/

Date : 11-7-2003.

**To**

1.The Member Secretary, Southern Regional Electricity Board, 29, Race Course Cross Road, Bangalore 560 009. FAX : 080-2259343	2.The Executive Director (Engineering), Power Grid Corp. of India Ltd. Plot No.2,Sector-29,Gurgaon,Haryana.  FAX : 95124-2571802
3.The Director (Transmission), Transmission Corp. of Andhra Pradesh Ltd., Vidyut Soudha,Hyderabad – 500 082.  FAX : 040-3317652, 3320565	4.The Director (Transmission), Karnataka State Power Transmission Corp. Ltd.,Cauvery Bhawan, Bangalore 560 009. FAX : 080 -2228367, 221352
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11. The Director (Tech), Power Trading Corpn. of India Limited, 2 <sup>nd</sup> Floor, NBCC Tower, 15 Bhikaji Cama Place, NewDelhi 110066. <b>FAX-011-51659504</b>	

**Sub:** 17<sup>th</sup> meeting of the Standing Committee on Power System Planning of Southern Region

Sir,

Please find enclosed the agenda note for 17<sup>th</sup> meeting of the Standing committee on Power System Planning of Southern Region. The date, venue & time of the meeting shall be intimated in due course.

Yours faithfully,

Encl: As above.

(A.K. Asthana)  
Director (SP & PA)

**Agenda for 17<sup>th</sup> Meeting of the Standing Committee on Transmission System Planning in Southern Region**

**1. Confirmation of the minutes of the minutes of 16<sup>th</sup> standing committee meeting held at Kaiga Generating Station, NPC on 20<sup>th</sup> Jan.,2003**

The minutes of 16<sup>th</sup> meeting of the Standing Committee on Power system planning of Southern Region held at Kaiga Generating Station NPC on 20-01-2003 were circulated to the constituents of Southern Region vide CEA letter No. 51/4/SP&PA/2001 dated 30-01-2003 . Subsequently,NLC vide their lr no.GM/PSB/TPS-II Expn/CEA/6985/03 dt. 20-6-03 had pointed out that the construction of 400kV Neyveli TS-II Expn – Pugalur D/C line envisaged as part of Neyveli TS-St II Expn Transmission system should be a S/C on D/C line.It was clarified vide CEA lr. no. 51/4/SP&PA-2002/706 dt 17-07-03 that a decision was taken in the meeting to establish it as a D/C line to meet transmission system requirements for NLC TS-II Expn. Project. It was also clarified that while TEC of the NLC TPS-II Expansion project was accorded, provision of 1 no. 400kV outgoing line bay from NLC TS-II switchyard complex was considered and this provision would now require to be enhanced to 2nos. for construction of 400kV Neyveli TS-II Expn – Pugalur D/C line. No other comments on the minutes of the meeting have since then been received on the minutes of the minutes from the constituents. As such the minutes of the 16<sup>th</sup> standing committee may please be confirmed.

**2 . Revised Evacuation System for Kudamkulam APP (2x1000 MW).**

**2.1** Kudamkulam APPP with a capacity of 2x1000 MW is being taken up by NPCIL.First unit is programmed for commissioning in 2007-08 and the second unit in 2008-09.In the last Standing Committee meeting held at Kaiga on 20-1-03 transmission system requirements for KAPP were discussed and it was observed that there would be severe ROW constraints in Kerala and therefore, proposal for evacuation arrangements should be evolved after carrying out route survey on feasibility of getting ROW. Accordingly, based on the route survey conducted by POWERGRID and KSEB, a meeting was held at Thiruvananthapuram in May 2003, in which CEA and NPCIL also participated. In this exercise, it has been identified that some of the existing 220kV lines could be utilized to construct multi-circuit line and/or to establish 400kV high capacity transmission lines along those corridors. Accordingly, transmission arrangements for KAPP evacuation were discussed and broadly formulated. It was proposed that power from KAPP station would be injected at Tenkasi/Tirunelveli S/S which is close to Kayathar S/S of TN through 400kV KAPP-Tenkasi/Tirunelveli 2xD/C Quad conductor lines and from thereon

further dispersal of power would be arranged towards Trissur/ at 400kV level with high capacity (Quad conductor) lines utilizing ROWs of existing 220kV lines. The extent of utilizing various 220kV ROWs in Kerala is indicated under the scope of evacuation arrangement.

**2.2** Subsequently, NPCIL have proposed vide their D.O. Ir no.NPCIL/DIE(T)/2003 dt. 07-5-03 to consider 400kV KAPP-Tankasi D/C Quad line and KAPP-Madurai D/C Quad line instead of 400 kV Kudankulam - Tenkasi/Tirunelveli 2xD/C from reliability and security angles. Another alternative has been suggested by POWERGRID in which it is proposed to consider 400kV KAPP-Udumalpet D/C Quad line instead of KAPP-Madurai D/C Quad line. TNEB have also suggested vide their letter No.ACE/SS/EE1/AEE1/F.Stg. Comm/D 266/2003 dt 30-6-2003 to consider 400kV sub-stations at Kayathar,Karaikudi and Jayamkondam in TN as part of KAPP transmission system for drawal of their respective share from the project. However, it is observed that the growth of loads at and around Karaikudi and Jayamkondam areas corresponding to the time frame of Kudankulam, does not justify creation of 400kV substations at these places till 2007-08 or even up to further few years later.

**2.3** On the allocation of share of various beneficiary States in the SR from KAPP project, NPCIL have informed the following allocation made by MoP:

Andhra Pradesh	-530MW
Karntaka	-286MW
Kerala	-172MW
Tamil Nadu	-669MW
Pondicherry	-43MW
<u>Unallocated</u>	<u>-300MW</u>
<b>Total</b>	<b>2000MW</b>

**2.4** Based on the various proposals/suggestions, revised system studies have been conducted to identify transmission system requirements for KAPP project. The evacuation arrangement is

being proposed as below:

**Evacuation System for KAPP (2x1000 MW) Project**

**A. 400 kV Transmission Work**

<b>Proposed Evacuation System for KAPP Project</b>		<b>Utilization of the existing 220kV RoWs</b>	<b>Remarks</b>
1	<p><b>Either</b> KAPP-Tenkasi/Tirunelveli D/C (Quad) and KAPP-Madurai D/C (Quad) – <b>CASE-I</b> <b>or</b> Kudamkulam(KAPP)-Tenkasi/Tirunelveli 2xD/C Quad line – <b>CASE-II</b> <b>or</b> KAPP-Tenkasi/Tirunelveli D/C (quad) and KAPP-Udumalpet D/C(Quad) -<b>CASE-III</b></p>		Close to existing 220kV Kayathar S/S in TN, establishment of a new 400kV S/S at <b>Tenkasi/Tirunelveli</b>
2	400kV Tenkasi/Tirunelveli – Muvattupuzha- Trissur D/C Quad line	220kV Idukki-Trissur S/C line of KSEB	Muvattupuzha n.ew 400kV S/S close to Cochin
3	400kV Tenkasi/Tirunelveli-Edamon D/C Quad line initially to be operated at 220 kV	220kV Kayathar-Edamon S/C	Kayathar –Edamon section to be constructed as multi-circuit line for 400kV and 220kV lines
4	LILO of both circuits of 400kV Madurai- Thiruvananthapuram D/C line at Tenkasi/Tirunelveli		

**B. 400kV Sub-Station Work**

- (1) **Establishment of new 400/220 kV, 2x315 MVA substation at Tenkasi/Tirunelveli and Muvattupuzha (near Cochin)**
- (2) **Augmentation of Sub-station capacity at Trissur and Thiruvananthapuram with third 400/220 kV, 315 MVA transformer**
- (3) **400kV line bay extension at the existing 400kV Thiruvananthapuram and Trissur sub-station –2Nos. at each S/S**
- (4) **Additional S/S Augmentation Requirements:**

Case-I : (i) Augmentation of 400kV Madurai S/S cap. with 3<sup>rd</sup> 400/220kV, 315MVA transformer  
(ii) 400kV Line bay extn. at Madurai- 2 nos.

Case-II : Nil

Case-III: (i) Augmentation of 400kV Udumalpet S/S cap. with third 400/220kV, 315MVA transformer  
(ii) 400kV Line bay extn. at Udumalpet- 2 nos.

### **(5) Reactor Requirements**

- (i) Line Reactors at both ends of 400kV Tenkasi/Tirunelveli- Muvattupuzha D/C line- 4x63MVAR
- (ii) Bus Reactors at Tenkasi/Tirunelveli-2x63MVA
- (iii) Additional Reactor requirements

Case-I: (i) Bus Reactors at KAPP Station -2x80MVAR  
(ii) Bus Reactors at Madurai S/S -2x80MVAR

Case-II: (i) Bus Reactors at KAPP Station -2x80MVAR

Case-III: (i) Line reactors at both ends of 400kV KAPP-Udumalpet D/C line -4x80MVAR

### **2.5 Results of Power Flow Studies on Transmission Arrangements**

The evacuation arrangement has been contemplated at 400kV with high capacity conductor (quad) lines which would fit into the perspective plan corresponding to future transmission requirements of evacuation from KAPP Extn. also. Routing of the proposed 400kV transmission lines has been considered along the selected 220kV corridors in Kerala. While evolving KAPP transmission system contingency of 400kV D/C outage is taken into account from reliability and security consideration..

Considering that the 400kV lines proposed in the KAPP project are forming trunk corridor, RoW constraints in Kerala and future generation projects in the vicinity, the 400kV transmission system are proposed to be constructed with conductor temperature of 95°C. However, the following observations are noted from the results of the studies

### 2.5.1 Result Analysis

- (i) **400kV KAPP-Tenkasi/Tirunelveli Quad conductor D/C and KAPP-Madurai Quad conductor D/C (case-I) or, 400 kV Kudankulam -Tenkasi/Tirunelveli 2xD/C Quad line(case-II) or, 400kV KAPP-Tenkasi/Tirunelveli Quad conductor D/C and KAPP-Udumalpet Quad conductor D/C(case-III) or, 400kV KAPP-Tenkasi/Tirunelveli Quad conductor D/C,KAPP-Karaikudi Quad conductor D/C and Karaikudi-Madurai TM D/C lines (case-IV)**

In the first case, as suggested by NPCIL, generation from KAPP station is evacuated through two corridors viz. 400kV KAPP-Tenkasi/Tirunelveli Quad conductor D/C and 400kV KAPP-Madurai Quad conductor D/C lines. Power flows on the various transmission lines are shown at **Exhibit-I**. The transformation capacity at Madurai 400kV S/S is enhanced by 1x315 MVA resulting in total S/S capacity of 3x315MVA to meet load requirements in the area. Considering proximity of the existing 220kV substation and load center of TN, availability of land, infrastructure availability and proximity of the sub-station to Madurai-Thiruvananthapuram 400kV line and Kayathar-Edamon 220kV line, it is proposed to establish new 400kV S/S at Tirunelveli in place of Tenkasi. From the result of the studies it is observed that part of generation from KAPP station is injected at Madurai through the 400kV KAPP-Madurai D/C line in which a considerable portion is flowing down to Tenkasi/Terunelveli pooling station through 400kV Madurai- Thiruvananthapuram D/C line (proposed to be LILOed at Tirunelveli/Tenkasi) for further dispersal towards Cochin and Thiruvananthapuram. As such, in this alternative, utilization of 400kV KAPP-Madurai (Quad) and Terunelveli-Madurai (Twin Moose) 400kV lines is on lower side/ sub-optimal. As an alternative, Case-II has been formulated in which generated power from KAPP station is evacuated by establishment of 400 kV KAPP- Tenkasi/Tirunelveli Quad conductor 2xD/C lines instead of a D/C line each to Tenkasi/Tirunelveli and Madurai. In this case, the two 400kV D/C lines from KAPP to Tenkasi/Tirunelveli are to be constructed on different routes so that two independent corridors – one being KAPP- Tenkasi/Tirunelveli- Madurai and the other being KAPP- Tenkasi/Tirunelveli- Thiruvananthapuram are achieved through utilizing the operational flexibility of one and a half breaker arrangement in 400kV Tenkasi/Tirunelveli S/S. The studies have shown that in this alternative, the power flow scenario improves considerably (**Exhibit-II**). The utilization of the transmission lines is better and the distribution of transmission flows is more even.

In the third case, KAPP-Tenkasi/Tirunelveli 400kV D/C (Quad) and 400kV KAPP-Udumalpet D/C (Quad) lines have been inter-alia considered and power flows is shown at **Exhibit-III**. The transformation capacity at Udumalpet 400kV S/S is enhanced by 1x315 MVA resulting in total S/S capacity of 3x315MVA to meet load requirements in the area. Power flows on the proposed system are found to be within limits.

Studies/analysis have shown that arrangements as per Alternative-II would provide most optimal solution.

- (ii) **400 kV Tenkasi/Tirunelveli-Muvattupuzha(Cochin)-Trissur D/C Quad line:** From Tenkasi/Tirunelveli station, dispersal of power into KSEB system would take place towards load centers at Cochin/Trissur and Thiruvananthapuram. While the connectivity between Tenkasi/Tirunelveli and Thiruvananthapuram would be obtained by LILO of under construction Madurai-Thiruvananthapuram 400kV D/C line at Tenkasi/Tirunelveli, the connectivity between Tenkasi/Tirunelveli and Cochin/Trissur at 400kV would have to be created. KSEB have suggested that the 400kV line between Tenkasi/Tirunelveli and Muvattupuzha (Cochin)/Trissur could be constructed utilizing part of the existing corridors of Edamon-Sabarigiri and Idukki-Trissur 220kV lines. However, POWERGRID have observed that utilization of the existing corridor of 220kV lines for construction of Tenkasi/Tirunelveli – Cochin 400kV line would not be feasible due to involvement of wild life sanctuary and reserve forest in this corridor. Therefore, a new transmission corridor needs to be established for this 400kV line. However, for construction of 400kV line between Cochin and Trissur, RoW of the existing Idukki-Trissur 220 kV S/C line of KSEB could be utilized partly. The proposed line would meet load requirements of KSEB and also facilitate to meet future evacuation requirements for KAPP Extn. and Kayamkulam (2000MW) being envisaged during the 11<sup>th</sup> plan.
- (iii) **400 kV Tenkasi/Tirunelveli – Edamon D/C Quad line (initially to be operated at 220kV):** The line would be constructed utilizing the ROW of the existing 220 kV Kayathar-Edamon inter-state line and is proposed to be operated initially at 220 kV. Due to severe RoW constraints in Kerala, the line is being planned with high capacity conductor. With the existing 220kV Edamon-Pathencode (Thiruvananthapuram) D/C line, it would constitute a 220kV strong link from Tenkasi/Tirunelveli to Thiruvananthapuram to meet load demand in the city area. At a later date, the existing 220kV Edamon-Thiruvananthapuram D/C line would be upgraded with 400kV quad conductor D/C line utilizing the ROWs of the existing 220kV Edamon- Pathencode(Thiruvananthapuram ) D/C line and finally, a high capacity 400kV Tenkasi/Tirunelveli- Thiruvananthapuram D/C link would be established to meet future

evacuation requirements for KAPP Extn. and Kayamkulam Extn (2000 MW ) projects being envisaged during the 11<sup>th</sup> plan .

**(iv) LILO of existing 400 kV Madurai-Thiruvananthapuram D/C line at Tenkasi/Tirunelveli :**

Madurai - Thiruvananthapuram 400 kV D/C line has been planned as part of system strengthening scheme in the Southern Region and is under implementation stage by POWERGRID. LILOing of this line at Tenkasi/Tirunelveli would facilitate to pass on Tamil Nadu share from the KAPP project. It will also provide an additional transmission route for power evacuation from KAPP project. As Tenkasi/Tirunelveli station is located en-route and/or close to the Madurai - Thiruvananthapuram 400kV line, proposed LILO work would ensure reliability and security of the evacuation arrangement for KAPP. The line power flows towards Madurai and Thiruvananthapuram are within limits.

**(v) New 400/220 kV, 2x315 MVA substation at Tenkasi/Tirunelveli and**

**Cochin/Muvattupuzha:** Power being pooled at Tenkasi/Tirunelveli or Tirunelveli from KAPP station would be absorbed by KSEB through 400 kV Tenkasi/Tirunelveli-Muvattupuzha(Cochin)- Trissur D/C line, Tenkasi/Tirunelveli-Thiruvananthapuram 400kV D/C and Tenkasi/Tirunelveli-Edamon-Thiruvananthapuram 220kV D/C lines. It is observed from study result that a provision of 2x315 MVA transformation facility at Tenkasi/Tirunelveli would meet the system requirement even in case of outage of a transformer.

In view of space constraints near existing Cochin substation of KSEB, a new 400 kV substation at **Muvattupuzha** close to the existing **Kalamassery** S/S (Cochin) has been considered with 2x315 MVA transformer capacity to meet growing load requirements in the area.

**(vi) Third 400/220 kV, 315 MVA transformer at Trissur S/S of KSEB:**

Presently, transformer capacity of 2x315 MVA, 400/220 kV at Trissur substation of KSEB is catering to the load demand in the area. The result of the studies indicate that this capacity is inadequate to meet any outage of a transformer. It is needed to augment the transformation capacity with an additional 315 MVA transformer. The provision for an additional transformer at Trissur was discussed in the 15<sup>th</sup> Standing Committee Meeting and it was concurred that additional transformers would be provided by the respective utilities owing the substation at their own cost and compensatory provision under the regional scheme would be covered in some future scheme.

Based on various power flow studies including credible contingency cases, the reactor requirements, under-utilized 400kV lines, power factors at KAPP Station, system losses, tentative

investment requirements etc. have been worked out and accordingly, a comparative statement is given in Annex-1.

**Members may concur on the evacuation arrangement.**

## **2.6 Arrangement for Start - up power**

As per the planning criteria an atomic power project should have two independent sources of supply for start-up power.

Kudankulam Station would also have 220 kV level with a provision of 400/220kV, 2x315 MVA transformer. This facility needs to be provided with the following arrangement for start-up power.

- (i) Tuticorin-Nagarcoil-KAPP 220 KV D/C line
- (ii) Tankasi- Kayather 220 kV D/C line and
- (iii) Kayather – KAPP 220 kV D/C line

TNEB had earlier proposed to have a 220 kV substation of their own at Kudankulam(Nagarcoil). This could be connected to Kudankulam through a 220 kV D/C line of very short length. The cost of this interconnection along with associated 220 kV bay at Kudankulam is to be borne by TNEB.

**Members may concur on the start-up power arrangement.**

## **3. Provision of switching arrangement at Somanahally for utilizing the 50 MVAR line reactor as switch able reactor and a new 80MVAR bus reactor at Nellore:**

The existing 400 kV Cuddapah-Somanahally S/C line is operating with 50 MVAR line reactor at Somanahally. This line has been LILOed at Kolar substation under Talcher-II Transmission System. In the post Talcher-Kolar HVDC scenario the voltage profile around Bangalore area has witnessed considerable improvement and sometimes-high voltages are being experienced there. POWERGRID vide their letter No. C/ENG/SEF/SIRAM-III dated 28<sup>th</sup> April, 2003 have proposed to convert the fixed line reactor at Somanahally as a switchable line reactor for controlling the voltage around Bangalore area. POWERGRID may present their case and the **members may discuss and decide on this issue.**

POWERGRID have also intimated vide their letter dated 28-04-03 that the commissioned Vijaywada-Nellore-Sriperumbudur 400 kV line becomes 540 kms long without any anchoring in between and will be experiencing overvoltage problem under contingency condition. Anchoring this line at Nellore was envisaged to be provided by APTRANSCO under Krishnapattnam Transmission System with an arrangement of 400/220kV transformation facility. It is intimated that Krishnapattnam Project is uncertain and may not be in place in the next few years. It is proposed to provide a 80 MVAR bus reactor at Nellore substation from operational consideration. APTRANSCO may provide the status on the implementation of the transformer arrangement at Nellore under Krishnapattnam Transmission System.

**4. Any other issue with permission of Chair**