The 1st meeting of Protection Sub-Committee was held on 25th July 2006 in the Conference Hall of Southern Regional Electricity Board, Bangalore. The list of participants is at Annexure I.

Shri K.Srinivasa Rao, Member-Secretary, SRPC welcomed the participants to the 1st meeting of the Protection Sub-Committee. He informed the Members that Government of India vide Resolution F.No.23/1/2004-R&R dated 25th May 2005 had notified establishment of Southern Regional Power Committee (SRPC) followed by Amendment Resolution dated 29th November 2005. He added that subsequently during the 1st SRPC meeting held at Chennai on 6th June 2006, Members were requested to intimate the nominations for various Sub-Committees including Protection Sub-Committee as per the guidelines provided in the draft business rules. He informed the committee that usually a meeting of Working group of Specialist Engineers would be held on the preceding day to discuss and analyze the trippings in detail and followed by the Protection committee for finalization. In this connection he requested the Members to send in nominations for Working group in respect of their organizations at the earliest for needful in future.

Member-Secretary, pointed out that when compared to earlier Protection Committee, the new Protection Sub-Committee would have additional Members from LDCs, DISCOMs, ESCOMS, Pondichery and IPPs and would thus help in wider participation from all types of utilities in the Region to enable arrive at interactive and useful solutions to problems. He informed the committee that Shri M.M.Patro, Dy. Chief Engineer, NPCIL was specially invited to the meeting to discuss the issues related to the Special Protection scheme for Kudankulam APS. He added that the agenda points also included the islanding scheme for RSTPS, Talcher TPS and Kaiga generating station which required active consideration for apt solutions.

The Agenda items were then taken up for discussion and the proceedings are detailed as under:

1. **Confirmation of the minutes of the 77th meeting of Protection Committee held on 30th January 2006.**

Kaiga vide Fax message dated 18th July 2006 have requested for an amendment in the minutes of the 77th Protection Committee Meeting at Page 4 Point No.2.2.7 with regard to the
reverse power protection provided on Kaiga – Kadra, Kaiga – Kodasalli lines at Kaiga, during the System occurrence on 7.11.2005 at 16.21hrs.

*Quote:* 
"During this time the reverse power protection earlier provided at Kaiga on 220kV Kaiga – Kadra & Kaiga – Kodasalli lines had been temporarily kept out of service by the authorities and the house load operation of selected Unit (for the condition of one of the Kaiga – Guttur line being not available & the other line getting over loaded) was kept at “zero” selection by Kaiga, as reported”.

*Unquote:* 
In this connection the committee informed Kaiga that the recordings are based on the Fax message received from Kaiga vide letter No. KGS-1&2/TU/2005/S dated 14.12.2005, wherein it is stated that

*Quote:* 
“As you are kindly aware, that the tripping scheme provided for reverse power flow on Kaiga – Kadra and Kaiga – Kodasalli lines was kept temporarily ineffective (with the consent of all concerned) considering the availability of additional outlets with enhanced capacity for power evacuation and reduced generation at Kaiga”

*Unquote:* 
Responding to the above Shri K.Pavan, STE (E&I) representing Kaiga informed the committee that there was some communication gap and stated that the intention of Kaiga authorities were incorrectly reflected in their communications. He further said that the reverse power protection was in service during the occurrence and requested for the amendment in the minutes. He also requested that the recording on house load operation for the units at Kaiga was kept at “Zero” may be amended to “None”. The committee conveyed that “Zero” and “None” may not make any difference in the availability of the house load scheme. However considering the above the committee agreed and amended the minutes at Page 4 Point No.2.2.7 as under:

*Quote:* 
“During this time the house load operation of selected unit (for the condition of one of the Kaiga-Guttur line being not available & the other line getting over loaded) was kept at “ None” selection by Kaiga, as reported”.

2. **SYSTEM OCCURRENCE:** Various system occurrences during the period were analysed. Details are as under: _
2.1 System Occurrence in AP system on 09.02.2006 at 10.00hrs.

2.1.1 On 09.02.2006 at 10.00hrs, due to dropping of aluminium foil by a bird on conductors between Unit-4 GT HV bushings and CTs, Unit-4 at KTPS tripped on overall differential protection.

2.1.2 Due to delayed clearance of fault through Unit-4 overall differential protection, all the Generators and 220kV feeders connected to KTPS & KTPS Vth Stage tripped at remote / source ends causing a loss of generation of about 1000 MW (Unit 2 was under LC).

2.1.3 The SR grid frequency dipped from 49.55Hz to 48.53Hz and led to the operation of Stage – I UFR & df/dt relays and a load relief of about 117MW & 73MW respectively obtained in AP system.

2.1.4 During the above occurrence at about 10.07hrs, Unit-1 at NTPC, Simhadri tripped due to governor problem, causing an additional loss of generation of about 450MW.

2.1.5 The above trippings resulted in interruption of supply to all loads fed from Manuguru and Sitharampatnam substations for about 45 minutes.

2.1.6 The system was normalised with the restoration of 220kV KTS – KTS V Tie I feeder at 14.10hrs and with the synchronising of Unit 10 at KTS V Stage at 20.50hrs on 09.02.2006.

When the committee referred to the cause of delayed clearance of fault on Unit-4 at KTPS through overall differential protection, APTRANSCO representative informed the committee that they have checked the overall differential relay subsequent to the incident and found the relay was set with a time delay of 300 m.sec, which was not correct. He added that they have now set the time delay to zero and the relay was put back into service.

2.2 System Occurrence in AP system on 19.02.2006 at 20.55hrs.

2.2.1 On 19.02.2006 at 20.55hrs, the ‘R’ phase CT of BHEL make of Bus coupler I blasted at 220kV Tallapally Switching station and created a 220kV bus fault on both the Buses, causing the operation of bus bar protection.

2.2.2 Due to the above all the 220kV feeders, ICT – 1, 2 & 3 and Bus couplers 1&2 connected to both the Buses tripped on Bus bar protection at 220kV Tallapally Switching station.

2.2.3 With the above both 220kV Bus 1 & 2 became dead.

2.2.4 However there was no interruption of supply to any of the loads due to the above trippings.

2.2.5 The system was normalised with the restoration of all 220kV feeders & ICTs one after the other by 22.35hrs on 19.02.2006.

2.3 System Occurrence at Neyveli TPS - II on 27.02.2006 at 05.04hrs.

2.3.1 On 27.02.2006 at 05.04hrs, 400/230kV, ICT-2 tripped on backup earth fault protection at Neyveli TPS - II.

2.3.2 Simultaneously 400/230kV, ICT – 1 also tripped on backup earth fault protection and while the 400kV breaker tripped, the 230kV breaker did not trip.

2.3.3 The above resulted in operation of 50 LBB relay Stuck breaker protection and all the elements of 230kV Bus-I tripped along with Bus coupler.
2.3.4 The following feeders connected to 230kV Bus - I tripped on operation of bus bar protection at 230kV Neyveli Thermal Power Station II, Stage – I:

Units 1, 2 & 3
230 kV Bus coupler
230kV MF1
230kV MF3
Tie - I
230kV STCMS - II
ST –1 & 4
ICT 1 & 2
230kV Pondy

Tie – II & Kadalangudi feeders tripped at other end only.

2.3.5 400/230 kV, ICT – II was brought back into service at 08.05hrs on 27.02.2006. All the feeders, Units and ICTs were restored in a phased way and the system was normalised.

2.4 System Occurrence at NTPC, Talcher STPS, Stage – II on 25.03.2006 at 18.29hrs.

2.4.1 On 25.03.2006 at 18.29hrs, all the 4 x 500 MW Units tripped at NTPC, Talcher STPS, Stage – II.

2.4.2 CEA constituted an enquiry committee to analyse the cause of disturbance and to suggest remedial measures.

2.4.3 During the incident HVDC Kolar Pole 1 & 2 blocked and the SR grid frequency dipped from 49.4 Hz to 48.32 Hz after blocking.

2.4.4 The combined power flow of Pole 1 & 2 was about 1550 MW prior to the blocking No inter trip signal was sent to the constituent systems and thus no load relief could be obtained.

2.4.5 Prior to Pole 1 and Pole 2 blocking, all the four AC interconnections between HVDC Talcher and NTPC Talcher station got tripped due to operation of protection at NTPC Talcher.

2.4.6 At Kolar, both Poles blocked on DC under voltage protection which is a back-up protection with 4 sec. delay. PGCIL intimated as pole request was not received at Kolar from Talcher, inter trip signal was not transmitted.

After deliberations the committee expressed its concern on the non-operation of inter trip scheme during such major loss of import to SR. Responding to the above AGM, PGCIL, Kolar informed the committee that during such times the ESOF signal (Emergency Switch Off) should get initiated from Talcher HVDC station and transmitted to Kolar HVDC station so that the Poles gets blocked immediately and the inter trip scheme could operate. He added that as the ESOF signal was not received at Kolar, it tripped on under voltage after 4 secs and the inter trip scheme did not operate as the power loss was derived for the operation of the scheme only 2secs immediately prior to Pole block. He said that subsequent to the incident the problem was analysed and they found the time duration for initiating ESOF signal was quite less and they have increased this time and said that such problems may not repeat henceforth.
2.5 System Occurrence in Karnataka system on 05.07.2006 at 06.11hrs.

2.5.1 Prior to the occurrence the following were the generation in Karnataka system:

<table>
<thead>
<tr>
<th>Generator</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharavathy</td>
<td>671</td>
</tr>
<tr>
<td>STRP</td>
<td>118</td>
</tr>
<tr>
<td>NPH</td>
<td>525</td>
</tr>
<tr>
<td>Almatti</td>
<td>204</td>
</tr>
<tr>
<td>Varahi</td>
<td>115</td>
</tr>
<tr>
<td>Kadra</td>
<td>150</td>
</tr>
<tr>
<td>Kodasalli</td>
<td>120</td>
</tr>
<tr>
<td>RTPS</td>
<td>825</td>
</tr>
<tr>
<td>Kaiga</td>
<td>284</td>
</tr>
<tr>
<td>CGS</td>
<td>480</td>
</tr>
</tbody>
</table>

2.5.2 The following 400/220 kV lines & ICTs were not in service in Karnataka system prior to the occurrence:

- 400kV Nelamangala – Talaguppa II
- 400kV Kaiga – Guttur II
- 400/220kV ICT I at Talaguppa
- 400/220kV ICT I at Guttur
- 220kV Nelamangala – Kadur
- 220kV Nelamangala – Hassan
- 220kV Nelamangala – K’halli
- 220kV Nelamangala – A’halli
- 220kV Nagjhari– Kodasalli II
- 220kV Nagjhari– Hubli II
- 220kV Nagjhari– Ambewadi II
- 220kV Narendra – Ambewadi II

2.5.3 Karnataka was picking up hydro generation to meet the morning peak demand. With the increase in generation at Sharavathy generating station, the loading on the only available ICT II at Talaguppa station increased further and led to tripping it on OCR. (ICT I was not available due to breaker problem) Simultaneously at 06.11hrs the following ICTs / lines tripped:

- 400/220kV ICT II at Talaguppa
- 400/220kV ICT II at Guttur
- 400/220kV ICT II at Munirabad
- 400kV Nelamangala – Talaguppa I 220kV Ittagi – Lingapura
- 220kV Gadag – Lingapura
- 220kV T’kare – Shimoga
- 220kV Shimoga – Bastipura
- 220kV Guttur– Narendra
- 220kV Hubli – Narendra
2.5.4 Due to the above tripping the power flow on 220kV Sharavathy – Ranebennur line increased and ICT II at Guttur tripped OCR. (ICT I was not available due to problem in parallel operation).

2.5.5 The above tripping further resulted in tripping of 220kV Ittagi – Lingapura, 220kV Gadag – Lingapura, 220kV T’kare – Shimoga, 220kV Shimoga – Bastipura, 220kV Guttur– Narendra and 220kV Hubli – Narendra lines on overload.

2.5.6 Due to the above trippings Nagjhari, Kaiga, Kadra, Kadasalli, Varahi and Sharavathy generating stations got islanded as a separate block with the loads of Shimoga, Davanagere, Hassan, Kadur and K’halli stations.

2.5.7 Due to load generation imbalance the frequency in the islanded block rose to about 51.7Hz and both Units at Kaiga tripped on high frequency and came on house load. Subsequently Kaiga Unit II got poisoned out.

2.5.8 The SR grid frequency dipped from 49.8Hz to 48.56 Hz and both UFR 1st Stage and df/dt relays operated in the constituent systems.

2.5.9 The islanded block was synchronised to SR grid by closing 400kV Nelamangala – talaguppa line II at 07.15hrs on 05.07.2006. Kaiga Unit I was synchronised back at 07.30hrs on 05.07.2006.

2.5.10 The system was normalised with the restoration of all feeders & transformers in a phased way.

The committee observed that under the circumstances regulation of generation at Sharavathy might have helped, especially when one ICT at Talguppa and one at Guttur were not available. Responding to the above the committee was informed that during that time the 400kV breaker of the ICT at Talguppa was tripping on Pole discrepancy and they were attending to the problem and that the problem of parallel operation of ICTs at Guttur has since been resolved and both the ICTs at Guttur are put on service from 6th July 2006. In this connection AGM, SRLDC informed the committee that in the absence of inputs to the SCADA from KPTCL and Kaiga they were unable to get all the data for trip analysis. He requested KPTCL & Kaiga to wire up all the SOE points at the RTU provided at their end at the earliest.

3. **Minor Trippings.**

Details of minor trippings in the region subsequent to the 77th meeting of the Protection Committee are furnished at Annexure – II.

4. **Issues related to evacuation of power from Kaiga Generating Station:**

4.1 **Tripping of transmission lines connected to Kaiga generating station.**

Details of tripping of lines connected to Kaiga generating station are furnished at Annexure – III.

4.2 **Review of the progress on the remedial measures in Kaiga - Kadra - Kadasalli -Nagjhari block.**

The status on the follow-up points discussed in the last Protection Committee meeting was reviewed by the Committee and is as given below:
KPTCL and KPCL had agreed to coordinate mutually and implement the carrier protection scheme for all the lines interconnecting Kaiga, Kadra, Kodasalli, Nagjhari stations. In this connection, Carrier protection has been commissioned on Kaiga – Guttur circuit - 2 with its up-gradation to 400kV level. For other lines, all necessary materials were available with KPTCL and award towards labour portion was already approved and Work order was to be issued by CE (LD). In the last meeting, KPTCL representative informed the committee that they could not award the contract owing to restrictions on the cost and they were processing for issuing NIT. KPTCL intimated vide letter-dated 19.06.2006 that the work would be taken up in a week’s time and completed in 15 days there afterwards.

Referring to the present status, KPTCL representative informed the Committee that they have completed all the jobs pertaining to other stations and were awaiting for the clearance from Kaiga.

Responding to this Kaiga representative informed the committee that they wanted the carrier protection scheme to be commissioned only after the replacement of distance protection relays with new ones, with resistive reach cards, in all the connected KPCL generating stations. He expressed his concern of Kaiga Units feeding un-cleared faults in this corridor and getting poisoned out.

When it was referred to the replacement of relays with new ones with resistive reach cards, in the KPCL stations, CE, KPCL informed the committee that as already intimated they have scheduled to open the bids for the new relays on 30th August 2006 and they expected processing time for placement of orders to take about 4 months.

The committee pointed out that Kaiga was impressing upon commissioning of carrier aided distance protection for quite some time, as it would help in faster clearance of faults in the up stream i.e in Kaiga – Kadra – Kodasalli – Nagjhari sections. The committee further said that the installation of new relays with resistive reach cards in these stations by KPCL is seen to be taking some more time and requested Kaiga not to club these points at this juncture. It was further informed that most of the faults that are occurring in the line sections would get covered with the extension of reach through carrier, thus covering the full length of the line i.e, for the faults covered under zone 2 (in the balance 20% of its line length) the inter trip scheme through carrier, would help in faster clearance of faults as either end would trip with the
extension of zone 1 reach and need not wait for clearing in zone 2 or through backup over current protection. It was also observed by the committee that the rate of high resistance faults occurring in this corridor has reduced considerably, as indicated in the letters written by Kaiga. After deliberations on the above, representatives of APTRANSCO, Karanataka, TN and SRLDC recommended that Kaiga could agree for the implementation of carrier aided distance protection, without waiting for the replacement of relays at KPCL generating stations as it would solve most of the problems faced by Kaiga. Responding to the above Kaiga representative informed the committee that they would not like to alter the existing over reach settings in the distance protection relays at Kaiga, till such time the new relays are installed at KPCL stations.

In the above circumstances the committee requested KPTCL to commission the carrier aided distance protection scheme between Kadra – Kodasalli – Nagjhari stations. KPTCL agreed to complete the works in about 15 days time.

4.2.2 In regard to the replacement of relays in place of the existing Quadra Mho relays on the lines at Nagjhari, Kodasalli & Kadra stations, KPCL have finalised the proposal for procurement of relays and the budget allocations were tied up station-wise. In the last meeting it was informed that they have received the approval and were planning to issue the NIT during Feb 2006. KPCL vide their letter dated 14.06.2006 intimated that the NIT has been issued and in response to it, firms have furnished the documents for pre-qualification requirements.

In regard to the present status, CE, KPCL as already outlined in the earlier para, informed the committee that they have scheduled to open the bids for the new relays on 30th August 2006 and they expected processing time for placement of orders to take about 4 months.

4.2.3 Regarding removal of trees in the corridor between Kaiga and Nagjhari stations, it was informed by KPTCL in the last meeting that the Forest department had asked for additional deposit towards the cost of the cut trees, for which a proposal has been put up to their Management. KPTCL Corporate office had sought for certain clarifications for granting the funds for depositing to Forest department and they were awaiting the approval after submitting necessary clarifications. KPTCL vide their letter dated 17.06.2006 intimated that approval was accorded by their Corporate office to make the deposit to Forest department. However in the meanwhile, TL&SS Sirsi has pointed out
that the number of trees to be cut is to be revised as some of the trees identified by forest Department need not be cut and they were preparing a revised list to submit to the Forest department.

In regard to the present status, KPTCL representative informed the committee that TL&SS Sirsi have already identified the number of trees to be cut and taken up with Forest department for their concurrence and they are following it up.

4.2.4

During the last meeting the committee concluded on the System Occurrence in Karnataka system, on 01.11.2005 at 10.45hrs, that the operation of the selective tripping scheme at Nagjhari vis-à-vis that of reverse power protection provided at Kaiga would be reviewed after gaining operational experience on these schemes. The Committee also requested Kaiga authorities to restore the settings provided on reverse power protection at Kaiga to its original values so that both the schemes at Kaiga and Nagjhari will be operational as intended by the Committee.

In this connection, Kaiga vide letter dated 23rd June 2006 have intimated that the settings provided on reverse power protection at Kaiga were reverted back to its original values. However they have again requested the committee to review the issue to enable to lower the settings.

Referring to Kaiga’s request the SRPC stated that Kaiga may kindly take note of system improvements that had taken place over the period compared with the conditions that prevailed during the system occurrence on 07.11.2005.

(i) 400kV Kaiga – Guttur circuit II has already came to 400kV level operation after changing all the defective insulators from 14.07.2006
(ii) Both the ICTs at 400kV Guttur are put into service in parallel from 06.07.2006
(iii) Nagjhari selective tripping scheme has been put into operation from November 2005 subsequent to the occurrence on 07.11.2005
(iv) Kaiga have implemented the inter trip scheme to trip Kaiga – Kadra & Kaiga – Kadasalli lines during over load conditions of Kaiga – Guttr (220kV Circuit I) subsequent to the occurrence on 07.11.2005 &
(v) One circuit of Narendra – Guttur 220kV D/C has been put into service with bypass arrangement at Haveri.

Considering the above, the committee opined that Kaiga may not require to reduce the settings provided on reverse power protection. Kaiga representative agreed with
the above observations of the committee. It was also suggested that Kaiga may consider to restore the scheme for house load operation to save its Units during contingencies.

4.2.5 During the last meeting the committee concluded that the operation of the selective tripping scheme at Nagjhari vis-à-vis that of reverse power protection provided at Kaiga would be reviewed after gaining operational experience. The committee observed that these protection schemes are to be co-ordinated in such a way that the selective tripping scheme at Nagjhari would operate earlier than the operation of reverse power protection provided at Kaiga during exigencies.

After deliberations on the above, the committee observed that as the time setting for the operation of both the schemes are kept at 0.2secs, there could be racing with respect to each other and it was suggested that KPCL could consider reduction of the time setting for selective tripping scheme at Nagjhari, so that the selective tripping scheme at Nagjhari could operate first and save its Units. In response CE, KPCL agreed to the suggestion and informed the committee that they would reduce the time delay for tripping of Units to 0.1 sec. from the existing setting of 0.2 sec. The committee concurred and agreed to review the settings of the schemes after gaining operational experience.

4.2.6 During the last meeting Kaiga informed the committee that they were proposing to trip Kaiga-Kadra & Kaiga-Kodasalli lines whenever Kaiga-Guttur 220 kV line current reaches 750 amp/1.5 sec and they were proposing to interlock this tripping with the availability of one of the 400kV Kaiga-Narendra lines and the committee agreed on the above.

In this connection, Kaiga vide letter dated 23rd June 2006 intimated that they have implemented the inter tripping whenever Kaiga-Guttur 220 kV line senses over loading at 750 amp/1.5 sec with the availability of 400kV Kaiga-Narendra line. The committee took note on the above.

4.3 Up-gradation of Kaiga – Guttur line for 400kV operation:
Regarding the present status KPTCCL representative informed the committee that 400kV Kaiga – Guttur circuit II has been put into regular operation from 14.07.2006 after changing all the defective insulators.
4.4 **Islanding scheme for Kaiga generating station:**

NPCIL vide their letter dated 7th October 2005 proposed an Islanding scheme for Kaiga I & II taking into consideration 250 MW of KPTCL load. The Islanding scheme proposed by NPCIL and concurred by KPTCL was discussed in detail in the 77th PCC. The following points were identified for further study and tie up:

i) NPCIL to decide on the setting of frequency for Islanding operation since the setting of 47.8 Hz proposed by NPCIL was left with a very small margin with the Under frequency trip setting for Kaiga generators set at 47.77Hz/4sec & 47.5 Hz instantaneous.

ii) KPTCL to provide the details on peak and off-peak variations in loads on the identified loads of 250 MW incident at Narendra bus.

iii) KPTCL to confirm the tripping of Tata Diesel generation injection during the operation of islanding scheme.

iv) KPTCL may indicate the quantum of radial load in Western Region incident on Chikkodi-Kolhapur link to assess the load availability during islanding.

Referring to point i) pertaining to Kaiga, Kaiga representative informed the committee that they have referred the issue to their higher authorities and would respond in about a month.

Referring to point ii), iii) & iv) KPTCL representative informed the committee that they have furnished the load particulars for peak / off-peak at Narendra bus during the formation of island. He added that Tata generation is set to trip at 47.6 Hz on under frequency and would take up with them for revising this setting once after taking a decision on the islanding frequency so as to trip Tata Diesel Unit before the formation of island.

In regard to identification of UFR load relief at some other locations in the system, as the UFR relays set for flat UFR load shedding scheme at Narendra, Chikkodi and Belgaum stations would be disabled for giving necessary loads in the Island, KPTCL representative informed the committee that they would identify locations suitably for UFR relief purposes after firming up the scheme.
5. **Review on the operation of df/dt relays in the constituent systems:**

5.1 The df/dt protection system is in operation in the constituent systems with the following two settings:

- 49.5Hz with rate of fall of 0.3Hz / sec. - **for alarm** &
- 49.3Hz with rate of fall of 0.3Hz / sec. instantaneous - **for trip**.

5.2 The details on the df/dt relays installed in the constituent systems, along with feeder-wise load relief is furnished at Annexure IV.

Constituents were requested to furnish in case of change, if any, in feeder / load relief with respect to their system.

5.3 In the last Protection committee meeting constituents were requested to furnish the details as and when the alarms get initiated at 49.5Hz on the operation of df/dt relays to enable to review the upward revision of alarm setting from the present setting of 49.5Hz with rate of fall of 0.3Hz / sec. based on the data.

The following df/dt tripping have been reported by the constituents:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Date &amp; Time</th>
<th>Substation</th>
<th>Relief in MW</th>
<th>Normalisation Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TAMIL NADU: 412 MW Relief obtained</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>05.07.2006 at 0612 hrs</td>
<td>Unjaini 230 kV SS</td>
<td>60</td>
<td>05.07.06, 0618 to 0620 hrs</td>
</tr>
<tr>
<td>2</td>
<td>-do-</td>
<td>Thudialur 230 kV SS</td>
<td>33</td>
<td>0619 hrs</td>
</tr>
<tr>
<td>3</td>
<td>-do-</td>
<td>Arasur 230 kV SS</td>
<td>133</td>
<td>0619 hrs</td>
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<tr>
<td>4</td>
<td>-do-</td>
<td>Salem 400 kV SS</td>
<td>34</td>
<td>0615 hrs</td>
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<td>5</td>
<td>-do-</td>
<td>Gopi 230 kV SS</td>
<td>10</td>
<td>0615 hrs</td>
</tr>
<tr>
<td>6</td>
<td>-do-</td>
<td>Thiruvanamalai 230 kV SS</td>
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<td>7</td>
<td>-do-</td>
<td>Pudukkottai 230 kV SS</td>
<td>72</td>
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<td>8</td>
<td>-do-</td>
<td>Sriperumbur 400 kV SS</td>
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<td>0618 hrs</td>
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<td>9</td>
<td>-do-</td>
<td>Vellupuram 230 kV SS</td>
<td>20</td>
<td>0628 hrs</td>
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<tr>
<td>10</td>
<td>-do-</td>
<td>Arani 230 kV SS</td>
<td>12</td>
<td>0618 hrs</td>
</tr>
<tr>
<td>11</td>
<td>-do-</td>
<td>SP Koil 230 kV SS</td>
<td>6</td>
<td>0621 hrs</td>
</tr>
<tr>
<td><strong>ANDHRA PRADESH: 131 MW Relief obtained 05.07.2006 at 0615 hrs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>05.07.2006 at 0615 hrs</td>
<td>Bhootpur 220 kV SS</td>
<td>36</td>
<td>05.07.2006 at 0630 hrs</td>
</tr>
<tr>
<td>2</td>
<td>-do-</td>
<td>Nirmal 220 kV SS</td>
<td>4</td>
<td>0625 hrs</td>
</tr>
<tr>
<td>3</td>
<td>-do-</td>
<td>Bhimgal 220 kV SS</td>
<td>28</td>
<td>0650 hrs</td>
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<tr>
<td>4</td>
<td>-do-</td>
<td>Medchal 132 kV SS</td>
<td>14</td>
<td>0630 hrs</td>
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<tr>
<td>5</td>
<td>-do-</td>
<td>N.V.Garden 132 kV SS</td>
<td>38</td>
<td>0645 hrs</td>
</tr>
<tr>
<td>6</td>
<td>-do-</td>
<td>K.V.Kota 132 kV SS</td>
<td>11</td>
<td>0700 hrs</td>
</tr>
<tr>
<td><strong>ANDHRA PRADESH: 73 MW Relief obtained 09.02.2006 at 1000 hrs</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
5.4 The committee requested the constituents to ensure that the load relief obtained from the identified feeders for UFR and df/dt relays are nearer to projected load relief, with respect to their system.

6. **SPS for 2x1000 MW Kudankulam project:**

In the 77th PCC held on 30.01.2006, Shri M.M Patro Deputy Chief Engineer, NPCIL Mumbai, made a presentation on the salient features of Kudankulam Nuclear Power Project. In the meeting following were concluded:

- **A** SRLDC would furnish the list of data required to be transmitted from Kudankulam (i) to SRLDC & (ii) for the inter trip scheme
- **B** SRLDC would furnish the various options for providing start-up power for Kudankulam, in the context of black start procedure.
- **C** SRLDC would also provide the logics for the inter trip scheme in the event of tripping of units at Kudankulam in line with Talcher – Kolar inter-tripping scheme.
- Constituents would identify the loads to be shed for compensating the sudden loss of generation at Kudankulam, with respect to their system
- Tamil Nadu would identify the hydel generation availability for providing the start-up power to Kudankulam during blackout.

The committee further decided that SRLDC would convey the details at A, B & C to NPCIL and to other Constituents, with a copy to SRPC. Basing on this, NPCIL would workout the details to be completed at their end and intimate SRPC, to enable holding a Protection Committee meeting appropriately.

Accordingly SRLDC furnished the details required at A (i) to NPCIL and circulated a Concept paper on the proposed logics at Kudankulam with reference to Point C, to the PCC members vide letter dated 10.03.2006. The copy was also enclosed as an annexure to the Agenda for this meeting.

The members discussed on various queries such as PLC inputs, requirement of load relief for different loss of power, transmission of signal, time required for operation, CT / PT inputs or through Transducers, communication through PLCC or any other link and the
cost implications etc. After detailed interaction on the above points the following were decided by the committee and also identified for further action:

i) The committee agreed to implement Proposal No.1 in principle furnished in the concept paper. Copy enclosed at Annexure V.

ii) The committee decided as the design of the logic scheme is to be finalised with various micro level engineering options, it will be entrusted to a Special Working group comprising the following Members from the Constituent systems:
- Shri P.R.Raghuram, AGM, SRLDC, Bangalore
- Shri M.M Patro Deputy Chief Engineer, NPCIL Mumbai
- Shri T.N.Subbaraju, Asst. Executive Engineer, KPTCL, Bangalore
- Shri N.Shahul Hameed, Executive Engineer, P&C, TNEB, Chennai
- Shri M.R.V.Holla, DGM, PGCIL, SRTS II, Bangalore

It was also agreed that Shri P.R.Raghuram, AGM, SRLDC, would be the convener for the above committee. The Special Working group would meet as many times as it is deemed necessary and firm up the proposal and put up for approval of the committee during the next Protection Sub-Committee meeting, tentatively to be held during end October 2006.

iii) The committee agreed to connect the same load feeders for the load relief, (700MW + 800 MW through trip signal 1 &2) identified & adopted for the operation of load shedding scheme during tripping of Talcher – Kolar HVDC link. After finalizing the SPS for Kudankulam PGCIL, SRTS II would workout cost / Technical details associated with the engineering of the scheme to be taken to SRPC for approval.

iv) SRLDC would further review the Start-up power for Kudankulam during the meeting for black start procedure in association with TN and Kerala.

v) EE, TNEB stated that only after the start-up of TTPS extension of power to Kudankulam would be feasible in the context of the Start-up power requirement for Kudankulam. However, SRLDC would appropriately consider this aspect in the meeting for black start procedure.

7. Islanding scheme for NTPC, Ramagundam STPS:
In the 76th Protection Committee meeting, the Committee was apprised of earlier deliberations on islanding scheme / house load operation of Units for NTPC, Ramagundam STPS. SRLDC informed the Committee that while reviewing black-start procedure it was felt that an islanding scheme for NTPC, RSTPS could help in survival of one or two units and avoidance of total shutdown of station during grid disturbances. Improved levels of frequency of operation would justify providing islanding schemes for operation during emergent low frequency situations.

During the above meeting APTRANSCO informed the Committee that a load of 400 – 500 MW could be identified for islanding with the ICTs at Ramagundam STPS. NTPC informed that the suggested scheme of islanding with ICTs would involve splitting of Bus I & Bus II at RSTPS by tripping all the Tie breakers and the issue will have to be referred to NTPC authorities before proceeding further on this.

As no representation was available from NTPC during 77th PC meeting, the agenda point could not be taken up for discussion. Subsequently AGM, NTPC, RSTPS vide letter dated 11.07.2006 conveyed that owing to 400kV bus bar sectionalisation and conversion of ICT – 5 bay to 400kV feeder (Ditchpally) at RSTPS, the discussions on the islanding scheme may not be taken up in the 1st Protection Sub-Committee meeting. In the above connection, Member Secretary, SRPC, in the first meeting of Protection Sub Committee requested RSTPS representative to provide technical details of the bus configuration at RSTPS Switch Yard.

Shri G.Yella Reddy, Sr.Supintendent, RSTPS explained the 400kV bus configuration at RSTPS and the details on bus sectionalisation and the options available for islanding with one 200MW & one 500MW Unit.

It was seen by the committee that possibility existed for design and implementation of islanding scheme even before bus sectionalisation work could be completed. In other words, the islanding could be formed, as envisaged earlier, with one Unit of 500 MW and one Unit of 200 MW along with radial loads of AP connected to the ICTs at RSTPS. During the discussions of the details of the scheme, it was seen that in addition to frequency setting of 47.6 Hz with 2.0 seconds time delay, df/dt feature also could be added, similar to the proposal made for Talcher STPS. This suggestion was given by the GM (OS) and DGM (PE-E), NTPC. While the committee was in agreement with the frequency setting and time delay (47.6Hz, 2.0 sec) for islanding, NTPC was requested to come out with the proposal for df/dt setting for consideration by the Protection
Committee. APTRANSCO representative furnished the details of loads for islanding and informed that 62.5 MW Unit of RTS-B station would have to be a part of the islanding. The committee further requested NTPC and APTRANSCO to work out the details of the scheme in coordination.

In regard to the time for implementation for the scheme, it was informed that necessary relays have to be procured and the work was anticipated to be completed by the first week of November, 2006.

8. **Operation of inter-trip scheme in the event of tripping of Talcher – Kolar HVDC Transmission system**

   **Operation of Inter-trip scheme:**

   8.1 The details on the operation of inter trip scheme during the period under review is furnished at Annexure –VI.

   8.2 **Inter-trip signal & GRM operation of Talcher – Kolar HVDC link:**

   During the last meeting PGCIL informed that they have taken up with M/s BPL for corrective action, as there was transmission of inter-trip signal on 17.12.2005 at 23.40 hrs to APTRANSCO due to mal-operation PLCC of BPL make. Referring to the above, PGCIL representative informed the committee that they have rectified the above problem and added that with the implementation of revised inter trip scheme the trip signal is being transmitted through wide band network.

   8.3 Revised Inter-trip scheme: GM SRLDC vide message dated 29.03.2006 have informed that the revised inter-trip scheme with graded signals / wide band medium & associated with the defense mechanism on tripping of Talchar-Kolar HVDC link has been commissioned and the scheme has been put into continuous operation.

   8.4 TN vide letter dated 26.06.2006 have intimated the non-receipt of Inter-trip signal at Sriperumbudur station during the tripping of Talcher – Kolar HVDC link. The issue was referred to SRTS-II, PGCIL, who had verified the problem and found that the input card of Digital Tele Protection Coupler (DTPC) pertaining to Sriperumbudur station at Kolar was defective. The defective card was replaced and DTPC was checked in coordination with TNEB and proper operation was ensured.

   8.5 KPTCL vide their letter dated 03.07.2006 have intimated about the non-receipt of Inter-trip signals at Somanahalli station during tripping of Talcher – Kolar HVDC link on 31.05.2006 at 06.34 hrs. The reason for non-receipt of signal may have to be verified by PGCIL.
Referring to the above AGM, HVDC Kolar, PGCIL informed the committee that they would verify the problem along with KPTCL at the earliest. He requested the constituents to intimate such problems immediately, so that necessary corrective measures could be taken without delay. In this connection AGM, SRLDC suggested that PGCIL might verify the transmission of signal to all the identified stations periodically, in coordination with the respective constituents to confirm its readiness. This was agreed. The above points were noted by the Protection Sub-Committee.

9. **Islanding scheme for NTPC, Talcher STPS:**

GM (OS), NTPC, SRHQ intimated vide Fax message dated 11.07.2006 that an islanding scheme had been proposed for Talcher STPS during under frequency conditions and sought the comments of SR constituents.

Shri Pramod Kumar, DGM (PE-E), NTPC, EOC, Noida explained the details of the scheme along with bus configuration at 4x500 MW NTPC, Talcher Stage – II. He said the islanding would take place at 47.6 Hz 2.0 secs time delay with the opening of interconnection between Stage – I & Stage – II and the HVDC would change over to frequency control mode.

Considering varying time constants of different associated subsystems, the committee sought the clarification on the points such as (i) time required for changeover from power control to frequency control in HVDC system (ii) the ramp up of power level in HVDC system during various level of power transfer to ER through Stage-II – Stage-I Interconnection (iii) the limit of additional injection to SR on islanding, during which time the power transfer was taking place towards ER (iv) the response time of governor & (v) any other logics to be developed for the survival of Units on islanding for different conditions of generation level.

Responding to the above AGM, HVDC Kolar, PGCIL informed that the change over to frequency control mode in HVDC system is already available in the design and it is to be checked for its performance. He added that the ramp up rate could be varied as per requirement.

DGM (PE-E), NTPC, requested that the committee could consider setting of df/dt feature along with flat UFR for the operation of the islanding scheme.

After deliberations on the above, the committee requested the representatives of NTPC & POWERGRID to ensure that respective Engineering groups of both NTPC and PGCIL jointly firm up the scheme with due consideration to all the points emerged during the
discussion and to put up the same for further consideration by the Protection Sub-Committee.

10. **Furnishing the data on the status of availability of Bus bar protection, SERs, DRs & time synchronization through GPS in 400kV & 220kV grid sub-stations:**

Constituents were requested to furnish the data on the status of availability of Bus bar protection, SERs, DRs & time synchronization through GPS in 400kV & 220kV grid sub-stations with respect to their system.

Constituents were also requested to furnish the relay/protection data, as and when there is an addition of station / feeder in their system.

11. **Follow up points:**

   a) KPTCL was to install B/B protection at 220kV Somanahalli substation. KPTCL had placed the orders for providing Bus bar protection at 220kV Somanahalli station in June 2003 itself but there has been delay.

   KPTCL representative informed the committee, that they have completed all the works of Bus bar protection including testing except for the isolator contact. They expect to complete these jobs in about a month. In regard to the provision of Bus bar protection for 220kV Hoody station he said that they are following it up.

   b) KPTCL was to provide B/B protection at 220kV Hubli substation and also in all other 220kV grid substations. KPTCL have acquired necessary land for shifting 220kV Hubli station to the new location. They have also replaced the distance relays with new ones in all the 220kV lines at 220kV Hubli station and were replacing ABCBs & BOCBs with SF6 circuit breakers in a phased manner as per requirement. In regard to Shimoga station the works were under progress while the proposal for Mangalore station was under consideration of KPTCL management. For Peenya station works were being proposed under R&M works and they have replaced some of the Relays and Breakers considering the priority.

   KPTCL representative informed the committee, that the Hubli station works are in progress, which was awarded to L&T . In regard to Shimoga station he said they have completed the works. The revised proposal for Mangalore and the revised estimate for Peenya station were sent to Corporate office and they are following it up for approval.

   c) KPCL & KPTCL were to segregate the loads on both the buses wherever double bus bar arrangement was provided in their system. They have expressed difficulty in segregating the loads on both the buses and preferred to maintain single bus operation and to use the other as reserve bus. To meet the requirements of Grid disturbance enquiry Committee's recommendation KPCL & KPTCL were requested to adopt double bus operation at least in their 400kV stations immediately.

   KPTCL have already taken both buses into service at 400kV Hoody & 220kV Hoody stations and in the case of 400kV Nelamangala & 400kV Talaguppa stations they were provided with one and half breaker system. As some equipments were still under repairs they were unable to take both the buses into service at 400kV Guttur station. KPTCL
representative informed the Committee that they have taken up the overhauling / repairs of breakers at Guttur and expect to complete it in about two months.

KPCL informed that at 400kV Raichur station it was of one and half breaker system and wherever they have the facility of the sectionaliser breaker it was used to enable double bus operation. They were unable to use both the buses at 220kV Raichur station as they were using the other bus as reserve bus due to non-availability of bay equipments. KPCL informed the committee as intimated earlier they have completed all the works and still following up with the site authorities to implement double bus operation.

d) KPCL was to implement a scheme for automatic reduction of generation, by tripping / by taking on house load, one of the selected generators in the 400kV side at Raichur generating station by sensing over load conditions with time delay on the 400kV Raichur – N'sagar line, so as to avoid over loading of the 400kV Raichur – N'sagar line due to tripping of evacuation facility in the 400kV Raichur - Guttur - Nelamangala - Hoody & Munirabad sections.

KPCL have referred the matter to their Thermal design and to Raichur TPS authorities and the same was under examination. As an interim measure KPCL have implemented a scheme for audiovisual alarm in the UCBs when loading on 400kV Raichur – N'sagar line reached 600MW with 1.0secs time delay so that the operator could reduce the generation in their Units without awaiting LD's instructions.

In the last meeting the committee requested KPCL for early implementation of permanent scheme. KPCL informed the committee that they are following it up with Raichur station authorities.

e) KSEB was to install Bus bar protection at 220kV Sabarigiri generating station and other grid substations viz Edamon, Madakkathara and Brahmapuram stations, as recommended by the Protection committee. KSEB had already commissioned bus bar protection at Madakkathara, Brahmapuram and Edamon stations. In regard to the bus bar protection at 220kV Sabarigiri generating station it was informed that the renovation and modernization works at 220kV Sabarigiri generating station was in progress with which the bus bar protection works would also be completed.

KSEB representative informed the committee that the renovation and modernization works at 220kV Sabarigiri generating station is in progress and they would complete the bus bar protection works along with R&M in about one year period.

f) PGCIL was to commission the bypass arrangement for LV breakers of the 500 MVA ICTs at Somanahalli (so as to duplicate the protection function of the LV breaker whenever the LV breaker was not in service), in coordination with KPTCL. KPTCL/POWERGRID informed the committee in the last meeting that they have completed the work on ICT 1 on 21.12.2005 and are planning to take up the works on ICT-2 shortly.

KPTCL/POWERGRID representative informed the committee that they have completed the works on ICT – 2 and are awaiting for a shutdown for testing and commissioning.

g) With respect to the system occurrence in AP system on 31.08.2005 at 17.55 hrs, the setting of the distance protection (ABB-RAZOA) on NTPC-RSS line 3 was found to be over reaching. APTRANSCO representative informed the committee in the last meeting that the problem of over reaching during fault condition was due to auxiliary CTs and they were proposing to replace it with Siemens Make numerical relay, which are being procured shortly.
In regard to the present status APTRANCO representative informed the committee that they have replaced it with new Numerical relay (Siemens Make Type 7SA610) on NTPC-RSS 220kV line 3, duly disconnecting the auxiliary CTs, on 30.01.2006.

h) PGCIL vide letter dated 12.12.2005 informed that due to the breaker problem on 220kV Hiriyur (KPTCL) – Gowribidanur & 220kV Hiriyur (KPTCL) – 220kV Hiriyur (PGCIL) lines the breakers at 220kV Hiriyur (KPTCL) station are permanently kept closed. Due to this any line fault on 220kV Hiriyur (KPTCL) – Gowribidanur is getting cleared on distance protection in zone 2 or zone 3 at 220kV Hiriyur (PGCIL) station and the ICT at PGCIL station is feeding the fault current for excessive duration. PGCIL have requested KPTCL to restore the breakers on these lines at the earliest at 220kV Hiriyur (KPTCL) station.

In the last meeting SE, KPTCL informed the committee that they have replaced 2 Breakers in January 2006 and are planning to replace the remaining 3 breakers in March 2006.

KPTCL representative informed the committee that they have completed the works.

i) With respect to the system occurrence in Karnataka system on 23.12.2005 at 09.21 hrs, KPTCL were proposing to test the distance protection relays provided on 400kV Guttur – Hiriyur line 1 and 400kV Hoody – Nelamangala line as they have mal-operated during the above occurrence.

KPTCL representative informed the committee that they have tested the relays and found to be OK.

12. Dates and Venue of the 1st Meeting of the Working Group on Protection & 2nd Meeting of the Protection Sub-Committee.

Next meeting was due during October 2006 as per SRPC Conduct of Business rules. Date and venue would be intimated.

Annexure-I
Annexure-II
Annexure-III
Annexure-IV
Annexure-V
Annexure-VI