भारत सरकार
Government of India
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
पश्चिम क्षेत्रीय विद्युत समिति
Western Regional Power Committee
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सत्यमेव जयते

आई एस ओ ः 9001-2008
IS/ISO: 9001-2008

No.: WRPC/Protection/125_PCM/2015/ 4839A **Date: 29.05.2015**

To

As per list,

Sub. : Agenda notes for 125th Protection Committee Meeting, WRPC – Reg.

Dear Sir / Madam,

Please find enclosed herewith agenda of 125th Protection Committee Meeting of WRPC, to be held at 10:30 Hrs on 05.06.2015 at WRPC, Mumbai.

Agenda notes for the 125th PCM is also available on WRPC website (i.e.www.wrpc.gov.in) and the same may please be downloaded. Presentation on the disturbances under item no.2 may please be given in the meeting by members of concerned utilities.

Kindly make it convenient to attend the meeting.

Yours' faithfully,

Encl: As above

Superintending Engineer (Protection)

Mailing list

1 Chief Engineer (LD), MSETCL, Kalwa. Fax-27601769/65
2 Chief Engr. (Trans O&M), MSETCL, Bandra. Fax No. 022 - 26590808/26598587.
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31 DGM (O.S.), WRLDC, Mumbai Fax-28235434
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37 SME(E), NPCIL , Kakrapara Fax 02626-234266
38 GM (Maint.). TORRENT Power., Ahmedabad.Fax-079-27506679
39 AGM (QAIT), TPC, Trombay. Fax –022-66687088
40 Asst. VP, Dahanu TPS Fax- 952528-222576 / 222039
41 GM (O & M), Reliance Infrastructure Limited, Mumbai Fax-30094488
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44 Vice President, APL, Ahmedabad 079-25557176
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47 GM, CGPL, Mundra Fax.No. 02838 661188
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49 Project Head, GMR Energy Ltd, Raipur. Fax:

AGENDA FOR THE 125th PROTECTION COMMITTEE MEETING OF WRPC TO BE HELD ON 05.06.2015 AT WRPC MUMBAI

ITEM NO.1: CONFIRMATION OF MINUTES OF 124th PROTECTION COMMITTEE MEETING

1.1: Minutes of 124th PCM, held on 21.04.2015 at WRPC, Mumbai were circulated vide WRPC letter No. WRPC/Protection/124 PCM/2015/4683 dated 20.05.2015.

No comments were received. Committee may like to confirm the minutes of 124th PCM.

1.2: Detailed comments on the MoM of 123rd PCM held on 20.01.2015 & 21.01.2015, were received from WRLDC vide letter WRLDC/MO-III/1658/2015/262 dated 26.03.2015.

In the 124th PCM it was decided WRLDC & WRPC would mutually discuss these comments before the 125th PCM. Accordingly the comments were discussed mutually and it was felt that since the comments by and large pertains to SCADA, operational and study related matters, therefore these issues would be taken up at the appropriate fora by WRLDC.

ITEM No. 2: SYSTEM DISTURBANCES

2.1 Occurrence on 12.01.2015 at 400 kV Nagda S/s: MPPTCL have intimated that at 400 kV Nagda S/s on 12.01.2015 at 20:43 Hrs 220 kV Nagda – Ratlam – I (on 220 kV bus – I at 400 kV Nagda S/s) tripped from both ends due to R ph disc flashover. As the fault was not got cleared in time, 220 kV interconnectors – I & II (between 220 kV Nagda S/s and 400 kV Nagda S/s) fed the fault and tripped.

During the above occurrence there was no loss of load. Interconnectors – I & II were restored by 20:56 Hrs. Report received from MPPTCL is enclosed at annexure – 2.1.

Committee may like to discuss.

2.2 Occurrence on 09.02.2015 at 220 kV Bhilai S/s: CSPTCL have representative intimated that at 220 kV Bhilai S/s on 09.02.2015 at 07:05 Hrs busbar protection (ABB make - RADSS) of 220 kV mainbus mal-operated and elements connected to this bus tripped. Subsequently many 132 kV feeders tripped. The total load of Gurur S/s and Bastar region was shifted to 220 kV Bhilai – Siltara and its loading increased to 280 MWs. In order to reduce the loading on 220 kV Bhilai – Siltara line, load shedding was done at Gurur S/s and in Bastar region.

During the above mal-operation of 220 kV busbar protection, 220 kV Bhilai – Gurur – I & 220 kV Bhilai – Siltara didn't trip as the trip command of busbar protection (relay 96) was not

extended to these lines. During the above tripping, the total loss of load was 325 MWs. All elements were restored by 09:10 Hrs. Report received from CSPTCL is enclosed at annexure – 2.2.

CSPTCL may give the reason for mal-operation of busbar protection.

Committee may like to discuss.

2.3 Occurrence on 24.02.2015 at 400 kV Bina S/s & 220 kV Shivpuri S/s: MPPTCL have intimated that on 24.02.2015 at 11:50 Hrs 220 kV Bina (M.P.) – Shivpuri & 220 kV Bina (PG) – Shivpuri lines tripped from both ends. A/R operation was successful for both lines from Shivpuri end only. The complete load of 220 kV Shivpuri S/s & 220 kV Sabalgarh S/s shifted to 132 kV Shivpuri – Pichhori and the line tripped on R ph O/C. Hence power supply was interrupted to nearby sub stations.

Restoration of the system started at 12:04 Hrs by charging of 132 kV Shivpuri – Pichori & followed by restoration of other feeders, by 12:34 Hrs most of the system was restored. At 12:35 Hrs, 220 kV Bina (MP) – Shivpuri tripped again from both ends. Subsequently 132 kV Shivpuri – Pichhore tripped due to over loading. The power supply was lost to nearby S/s.

At 12:43 Hrs, 132 kV Shivpuri – Pichori was restored and subsequently other lines also restored. At 13:08 Hrs 220 kV Bina (MP) – Shivpuri again tripped from both ends but no fault was found during patrolling. Later at 17:18 Hrs 220 kV Bina (MP) – Shivpuri ckt was test charged from 220 kV Shivpuri S/s and synchronized from 400 kV Bina S/s end at 18:16 Hrs.

During this above occurrence, total loss of load was 280 MWs for approximately 50 minutes. Report received from MPPTCL is enclosed at annexure – 2.3.

Committee may like to discuss.

2.4 Load Crash on 28.02.2015 & 01.03.2015 at 400 kV Kard, Kholapur & New Koyna S/ss: MSETCL - Karad have intimated that due to heavy rains, 6000 load crashed on 28.02.2015 & 13000 MWs load crashed on 01.03.2015. High frequency and high voltage observed at 400 kV Karad, Kolhapur & New Koyna S/s and resulted in tripping of 400 kV lines on O/V at 400 kV Karad, Kolhapur & New Koyna S/s. 220 kV source feeders got over loaded and tripped on O/C.

During the above occurrence, total loss of load was 1318 MWs (804 MWs at 400 kV Karad S/s, 353 MWs at 400 kV New Koyna & 261 MWs at 400 kV Kolhapur S/s). All elements were restored by 18:48 Hrs of 01.03.2015. Report received from MSETCL is enclosed at annexure – 2.4.a

WRLDC have also intimated during the above occurrence many 765 kV & 400 kV tripped on O/V. ISGS generation and state generation were reduced to control the situation, however high voltage prevailed in southern Maharashtra & Goa areas. The lines connecting this

area from rest of the grid tripped one by one on O/V. This area got separated from rest of the grid and an island was formed with loads of Karad, Kholapur & Mapusa and with generation of Koyna & Jaigadh, however later this island collapsed. The total loss of generation was 415 MWs and total loss of load was 950 MWs. Report received from WRLDC is enclosed at annexure – 2.4.b

Committee may like to discuss.

2.5 Occurrence on 07.03.2015 at 400 kV SSTPS S/s: MPPTCL have intimated that SSTPS S/s has $1\frac{1}{2}$ breaker scheme. On 07.03.2015, prior to the fault, A/R of 400 kV SSTPS – Julwania was not in service at Julwania end and A/R was in service at SSTPS end. At 11:23 Hrs 400 kV SSTPS – Julwania tripped from both ends on Y ph transient fault. The relays at Julwania end and SSTPS end sensed the fault in Zone – I and Zone – II respectively. The carrier signal was generated at Julwania but couldn't be transfer due to nonoperation of auxiliary relay. The fault was cleared in 65 msec from Julwania end and got cleared in 361 msec from SSTPS end. Subsequently SSTPS unit – 1 tripped on non-directional E/F protection as it was in the same DIA of 400 kV SSTPS – Julwana. SSTPS unit – II tripped on TEE differential protection, this unit was in dia of SSTPS – Pitampura – II ckt.

During the above occurrence, total loss of generation was 763 MWs. Unit – I synchronized at 15:58 Hrs on 07.03.2015, 400 kV SSTPS – Julwania line restored at 11:02 Hrs on 08.03.2015 and Unit – II synchronized at 19:07 Hrs on 10.03.2015. The problem of auxiliary relay has been addressed and its functioning is in order. Report received from MPPTCL is enclosed at annexure – 2.5.

MPPTCL may give the reason for tripping of SSTPS unit – II on TEE protection and the reason for A/R not in service at Julwania end.

Committee may like to discuss.

2.6 Occurrence on 11.03.2015 at 220 kV Lote S/s: MSETCL - Karad have intimated that control cables of 220 kV Lote S/s, are passing through 33/11 kV S/s Lote S/s of MSEDCL. On 11.03.2015 at 03:33 Hrs, CT, CB and control cables of 33 kV feeders caught fire at 33/11 kV Lote S/s (switchyard of MSEDCL). Cable trench of EHV cables of 220 kV Lote S/s caught fire, thus secondaries of CTs got burnt & shorted and led to operation of busbar protection. All elements connected to the bus got tripped.

During the above occurrence, total loss of load was 23 MWs. All elements were restored by 21:40 Hrs of 11.03.2015. Report received from MSETCL is enclosed at annexure – 2.6.

Committee may like to discuss.

2.7 Occurrence on 18.03.2015 at 220 kV Lonand S/s: MSETCL – Karad have intimated that on 18.03.2015 at 08:20 Hrs, at 220 kV Lonand S/s 220/132 kV, 200 MVA ICT – II tripped due to shorting of master trip relay contacts. ICT – I got over loaded and tripped on O/C protection.
During the above occurrence, total loss of load was 187 MWs. Both transformers were restored by 08:37 Hrs of 18.03.2015. Report received from MSETCL is enclosed at annexure – 2.7.
Committee may like to discuss.

2.8 Occurrence on 04.04.2015 at 400 kV GMR EMCO S/s: WRLDC have intimated that on 04.04.2015 at 400 kV GMR EMCO S/s, at 09:19 Hrs, 400 kV EMCO – Bhadravati – I was taken out of service for maintenance. At 09:30 Hrs 400 kV EMCO – Bhadravati – II tripped on R ph to E/F. With the loss of evacuation lines GMR EMCo generating station, unit – I & II tripped.

During the above occurrence total loss of generation was 387 MWs. All elements were restored by 15:28 Hrs of 04.04.2015. Report received from WRLDC is enclosed at annexure – 2.8.
Committee may like to discuss.

2.9 Occurrence on 06.04.2015 at 132 kV Deepnagar S/s: MSETCL **–** Nasik have intimated that on 06.04.2015 at 18:23 Hrs at 132 kV Bableswar S/s, R Ph CT (Alstom make) of 132 kV Bableswar – Muktainagar (connected to 132 kV Bus - I) got burst and caught fire. The fire spread to B ph of 132 kV Deepnagar – Khadka (Connected to 132 kV Bus - II) and caused flashover on this phase. Busbar protection of 132 kV bus I & II operated and all elements connected to these buses tripped.
The fault on 132 kV Bableswar – Muktainagar was in Zone – II from Muktainagar end but couldn't get cleared from Muktainagar and got cleared from Malkapur end in 700 ms (Zone – III). All elements were restored by 15:09 Hrs of 07.04.2015. Report received from MSETCL – Nasik is enclosed at annexure – 2.9.
Committee may like to discuss.

2.10 Occurrence on 11.04.2015 at 400 kV Bableswar S/s: MSETCL **–** Nasik have intimated that at 400 kV Bableswar S/s on 11.04.2015 at 15:05 Hrs R Ph to E/F occurred on 220 kV Bableswar – Deogaon Rangari (connected to bus – I) and its distance protection operated but due to mechanical problem in CB, R ph pole failed to trip. LBB protection of the same operated but its trip command extended to Bus – II instead of Bus – I. All elements connected to Bus – II tripped but the fault fed through 400/220 kV, 315 MVA ICT I & II and these tripped on O/C protection. The other elements connected to bus – I, were hand tripped to isolate the fault.

During the above occurrence power supply was lost to Ahmednagar district. Report received from MSETCL – Nasik is enclosed at annexure – 2.10.

Committee may like to discuss.

2.11 Occurrence on 24.04.2015 at 400 kV Deepnagar S/s: MSETCL **–** Nasik have intimated that 400 kV Deepnagar S/s has $1\frac{1}{2}$ breaker system. On 24.04.2015 at 12:28 Hrs, while synchronizing the unit – 4 at 400 kV Deepnagar S/s, B ph pole of main CB of GT – 4 got burst and damaged B ph bus CT & B ph pole of centre break bus isolator. Busbar protection of zone – I of 400 kV Main Bus – I operated at 12:28:10.518 Hrs and all breakers of this zone tripped. During the above occurrence, GT – 4 tripped, 400 kV Deepnagar – Karad – II (tie CB kept open) and GT – 5 tripped (12:28:04.834 Hrs).

Immediately after synchronization of unit -4, trip command was given from generating station end but Y ph pole of the breaker didn't get open completely and led to arcing. The gas pressure increased, the gas leaked by mechanical damage and pole got burst. It was also intimated that GT – 5 tripped prior to the operation of busbar protection.

MSETCL may give the reason for the tripping of GT – 5 and status of LBB operation at Deepnagar generating station. MSEGCL may give the reason for initiation of trip command from generation end. All elements were restored by 21:05 Hrs. Report received from MSETCL – Karad is enclosed at annexure – 2.11.

Committee may like to discuss.

2.12 Occurrence on 25.04.2015 at 400 kV JPL, Tamnar S/s: JPL have intimated that on 25.04.2015 weather at 400 kV JPL S/s, Tamnar was rainy, lightning and thundering. At 17:32:22 Hrs, 400 kV JPL Tamnar – Raipur – I tripped on 'C' Ph to E/F, A/R was succesful at JPL end but line tripped on receiving DT from remote end. At 17:32:25 Hrs, 400 kV JPL Tamnar – Raipur – II tripped on 'C' Ph to E/F from both ends. Report received from JPL is enclosed at annexure – 2.12.

Committee may like to discuss.

2.13 Occurrence on 05.05.2015 at 400 kV Bableswar S/s: MSETCL – Nasik have intimated that on 05.05.2015 at 09:33 Hrs, grading capacitor of R phase breaker of 400 kV, 80 MVAR reactor got burst and created 400 kV bus fault. Busbar protection operated and all elements connected to bus I tripped. As ICT – I & II, each of 315 MVA capacity, connected to bus - I tripped, ICT – III, 500 MVA (connected to bus - II) got over loaded and its load trimming scheme got operated (Sifang CSC211 make relay) after 1.5 sec (the relay has three functions – HV directional O/C, LBB & Load trimming). Subsequently LBB of ICT – III operated i.e. after 1.7 sec and all elements connected to bus – II tripped.

One of the interrupters of 80 MVAR reactor couldn't get open, led to unequal voltage across grading capacitor and 230 kV appeared across grading capacitor and got burst. All elements were restored by 11:55 Hrs. Report received from MSETCL – Nashik is enclosed at annexure 2.13.a

WRLDC have intimated that during the above occurrence, 400 kV Bableswar – Padge D/C tripped & the power flow on 400 kV Aurangabad (MS) – Pune D/C & 400 kV Wardha – Parli D/C increased. Low voltages were observed at various nodes of Maharashtra System. At 09:44 Hrs, 400 kV Aurangabad (MS) – Pune D/C tripped on B ph to E/F and the power flow on each of 400 kV Wardha – Parli D/C crossed 850 MWs, led to operation of its SPS and resulted load shedding in SR & generation back down in WR.

Attempts were made to increase generation and reduce the load of western Maharashtra, but during this few generators of Western Maharashtra tripped. The angular separation of Korba – Kalwa increased to 83^0 from 53^0. The power flow on 765 kV Pune – Solapur & 765 kV Solapur – Raichur – D/C reversed and inorder to control the situation the power flow was maximized on HVDC Talcher – Kolar. The loading of 400 kV Wardha – Parli D/C reduced. Report received from WRLDC is enclosed at annexure 2.13.b

Committee may like to discuss.

2.14 Occurrence on 08.05.2015 at 400/220 kV Kalwa S/s: MSETCL have intimated that on 08.05.2015 at 14:55 Hrs R ph wave trap of 400 kV Kalwa – Padghe – I (connected to main bus – II) got burnt and its jumper got broken in the vicinity of 400 kV main bus – I at 400 kV Kalwa S/s. Busbar protection of 400 kV main – I operated and all elements connected to this bus got tripped along with bus coupler. Thus 400 kV Kalwa S/s was left with only one feeder i.e. 400 kV Kalwa – Talegaon and 400 kV Kharaghar S/s left with only one feeder i.e. 400 kV Kharghar – Padghe. Load trimming scheme operated at Boisar (M), however load on 220 kV Boisar (PG) – Boisar (M) D/C increased. During this occurrence the total amount of load shedding was 632 MWs. All elements except 400 kV Kalwa – Padghe – I were restored by 16:00 Hrs. Report received from MSETCL – Nashik is enclosed at annexure 2.14.

MSETCL may give restoration time of 400 kV Kalwa – Padghe – I.

Committee may like to discuss.

ITEM NO. 3: Tripping of lines / ICTs: The minor incidences of tripping of lines and ICTs during the period 01-03-2015 to 30-04-2015 are enclosed at **Annexure–3.**

In 123^{rd} & 124^{th} PCMs it was decided that all utilities will furnish the single line trippings & minor trippings to WRPC and indicate whether A/R is provided at both ends of the line or not. It was also decided that constituent shall report whether the A/R operation was successful for

transient faults or not and whether A/R is locked out for permanent faults on the lines or not. Constituents shall provide A/R availability/status for each line at both ends.

Committee may like to discuss.

ITEM No. 4: Occurrence on 29.03.2015 at Akola S/s

On 29.03.2015 at 14:04 Hrs, tripping occurred on many lines of WR due to non-clearance of fault on 400 kV Akola2 – Taptithanda – II. At both (Akola2 & Taptithanda) these sub-stations both main & backup protection of the line failed to operate. It was followed by tripping of 765/40 kV ICT at Akola2 S/s, resulted in isolating the 765 and 400 kV systems at Akola2 S/s. After this, 400 kV Wardha – Akola D/C tripped from Wardha end, 400 kV Koradi2 – Indiabulls from Koradi2 end and 400 kV Akola – Bhusawal from Bhusawal end on distance protection. Further various other lines also tripped on O/V protection and isolated the faulty section from the grid. During this, unit 2, 3 & 5 at Indiabulls (Rattan India) generating station (Gen: 440 MW) and Unit 8 (Gen: 110 MW) at Koradi – II generating station tripped on standby E/F protection. During this event, Indiabulls S/s got block out and 400 kV buses at Akola and Akola2 S/s got dead.

In the 124th PCM, APL representative informed that the 400 kV Akola2 – Taptithanda – II was open from Taptitanda end and was closed from Akola – II end for trail operation. After charging the line at 13:34:45.335 Hrs, 'PT fuse fail' alarm appeared. However the S/s staff didn't pay required attention to this alarm. The DPS (both main I & main II) at Akola – II end got blocked due to PT fuse fail. After 30 minutes i.e. at 14:03:56.610 Hrs a fault occurred on the line and was not cleared from Akola – II end due to blocked DPS. The reason for PT fuse failure was investigated after the occurrence & it was found that PT connection wires loose at terminal block. Patrolling of the line was carried out, flash over marks were observed on insulators. The same would be communicated by APL.

The disturbance was discussed at length in the 124th PCM and the brief on the same is as follows:

(i) The ICT tripped at 14:03:56.610 Hrs on initiation of 51N function of the ABB REL670 relay which is connected to neutral CT of ICT with a setting of 20% of FLC (2165 A) & time delay of 1.5 ses.

(ii) At 14:03:58.329 Hrs, 400 kV Akola 2 – Wadha – II tripped on DT received at Akola 2.

(iii) After around 10 sec other lines tripped on O/V protection & 400 kV Akola 2 – Yelwan (Akola 1) tripped in Zone – 3 (L2 – L3). Also 400 kV Akola 2 – India bulls D/C, Akola2 – Taptitanda – I tripped from remote ends on Zone – II/Zone – III protection. And 400 kV Indiabulls – Koradi 2 tripped in Zone – 3 & 400 kV Akola – Bhusawal tripped at Bhusawal on Zone – 3.

(iv) It was felt that there was a considerable time between the trippings at (i), (ii) & (iii) and therefore it can't be concluded with certainty that there was a single solid fault, since the Zone – II / Zone – III trippings at (iii) would have occurred within one second of tripping at (i) & (ii).

(v) The data made available is therefore inconclusive and all DRs triggered & SOE during the above disturbance needs to be properly examined for arriving at any conclusions.

(vi) It was felt that for complete analysis of above grid disturbance, SOE, all DRs triggered & recorded, relay & window indications (local end & remote end) of nearby S/ss during the occurrence may be required.

(vii) SE (Testing) – MSETCL – Akola was requested to coordinate with Akola S/s, Akola II S/s, Wardha S/s, Koradi S/s, Bhusawal S/s, Indiabulls S/s, Aurangabad S/s, Tirora S/s & Taptitanda S/s and furnish the details.

(viii) Committee felt that after receiving details from above S/ss, a meeting may be called with representatives from WRLDC (Smt. Pushpa Sheshadri), MSETCL (Shri. Tijare), PGCIL (Shri. Anand Dubey & Shri G. Shinde), APL (Shri. Uday Trivedi) & TATA Power (Shri. Jawale) and WRPC to analyze the above disturbance and prepare a report on the same.

Data has been collected and shortly it would be analyzed.

Committee may like to note.

ITEM NO. 5: Hon'ble CERCs orders on the Grid disturbance of 30.07.2012 & 31.07.2012

5.1: Compliance Status observations made in Protection Audit (Petition No. 220/MP/2012)

CERC's vide order dated 21.02.2014 in respect to petition No. 220/MP/2012 filed by POWERGRID have directed that CTU and SLDCs shall submit quarterly Protection Audit Report to the respective RPC latest by 15th day of the first month of next quarter and RPCs shall submit the report to the Commission latest by 15th day of the second month of next quarter. The Member Secretary of Regional Power Committees shall monitor the protection related issues and bring to the notice of the Commission any instance of non-compliance of the Regulation 1.5 of the Grid Code in respect of the protection related issues considered in the instant petition.

The compliance status of observations made during protection audit was reviewed in detail in a special meeting held on 18.12.2014. In this special meeting it was observed that as per the data available with WRPC, few observations made in the protection audit were not pertaining to protection system deficiencies (neither Category A nor Category B) but were of system improvement related. Hence it was decided that all observations of protection audit would be classified as protection system related i.e. Category A, Category B & system improvement related observations, would be furnished separately and shall not be included in the list of category A or B deficiencies.

The data for Q4 of 2014-15 is received from METCL only. Other utilities are requested to submit the updated data at the earliest.

The updated status (MSETCL as on 31.03.2015 and other utilities as on 31.12.2015) is enclosed at Annexure – 5.1.

5.2: Grid Disturbance on 30.07.2012 & 31.07.2012 (Petition No. 167/Suo-Motu/2012)

Back ground: Hon'ble CERC's vide order dated 22.02.2014 in the matter of grid disturbance occurred on 30.07.2012 & 31.07.2012 in petition No. 167/Suo-Motu/2012, have made certain observations and issued directions.

According to this order, all the RPCs have to maintain the relay settings data of all the ISTS lines and lines emanating from interface S/Ss of Utilities to ISTS (400 kV & above and 220 kV interfacing lines). Therefore all utilities were requested to submit relay setting data to WRPC/WRLDC.

In 123rd PCM committee requested all utilities to compile & maintain the data of their system for voltage level of 132 kV & above. The relay setting data in respect of all 400 kV lines and important 220 kV lines (interface lines with ISTS & lines connected to generating stations) shall be submitted to WRPC/WRLDC. Committee requested WRLDC/SLDC to collect and compile the data of all utilities under their control area and submit the same to RPC. The data has been received from MP, GETCO and Maharashtra. Other utilities are requested to furnish the same.

ITEM NO. 6: Status of implementation of recommendations of Report on Grid disturbance on 30th and 31st July 2012 in WR

Back ground: An enquiry committee was set up under the chairmanship of Chairman, CEA to enquire into the grid disturbance on 30th & 31st July, 2012 in NEW grid. As per the recommendations of this committee, all utilities/SLDCs/RLDC were required to submit updated status on implementation of recommendations made by the committee to RPC on 1st & 15th of every month and the same has to be sent to CEA by RPC by 3rd & 17th of every month.

The nodal officers responsible for submission of data to RPC were identified in 120th PCM. In 120th, 121st, 122nd, 123rd PCMs & in a special meeting held on 18.12.2014, nodal officers were requested to forward the data regularly for onward submission of the same to CEA/MoP.

In a special meeting held on 18.12.2014, it was decided that the status shall be submitted year wise separately for FY 2012-13 & 2013-14 and the data may be furnished on quarterly basis for April – 2014 onwards.

In the 123rd PCM, Committee observed that there were discrepancies or mismatch in respect to protection audit data furnished by utilities for submission to CEA in format and to CERC

in format. It was opined that to have a clear picture of implemented status on above recommendations in respect of protection audit, utilities may submit the consolidated and detailed status of all 132 kV, 220 kV, 400 kV and 765 kV S/s. It was also felt that SLDCs and WRLDC would coordinate to get the details.

The updated data was received from MSETCL only. Other utilities are requested to submit the data regularly. The status on implementation of recommendations of above enquiry committee as on 31.12.2015 along with list of nodal officers is enclosed at annexure – 6.

Item No. 7: Report of the Task Force on Power System Analysis Under Contingencies: Ministry of Power, GoI constituted a 'Task Force on Power System Analysis under Contingencies' in December 2012 under the chairmanship of Shri V. Ramakrishna as per the recommendation made by Enquiry Committee headed by Chairman, CEA on grid disturbances that took place in NEW grid on 30th and 31st July 2012. The terms of reference of Task Force broadly cover analysis of the network behavior under normal conditions and contingencies, review of operational philosophy of protection relays, review of islanding schemes and technological options to improve the performance of the grid.

The report of the Task Force was discussed briefly in 122nd PCM and subsequently discussed in detail in a special meeting held on 18.12.2014. A brief on suggestions given by Ramakrishna Committee, discussions/observations of the group and PCM are as follows.

1) Review & correction of relay settings:

a) Zone-3 setting: The task force recommended that Zone-3 settings should be coordinated with lower level voltages (time grading) without compromising reach i.e. settings should reach farthest bus. To achieve this Z-3 time should be increased to 1.5 sec.

Status/existing practices and views of constituents:

GETCO: Z-3 settings cover longest line but doesn't enter lower level network.

MSETCL: They are able to coordinate Z-3 settings with downstream network.

MPPTCL: Proper setting of high set of O/C relay of ICT may give an opportunity to coordinate Z-3 time settings with downstream network.

PGCIL: It may not be possible to coordinate Z-3 with downstream network without increasing its time settings from 1.0 to 1.5 sec.

Decision in PCMs: As per the recommendations of task force, Z – 3 reach can't be compromised. Also increasing Z-3 timings to 1.5 sec may not be good practice as fault feeding for such long period is not good for the health of the equipment. Solutions may be given case to case basis as per the requirement. Therefore constituents may identify the lines where Z-3 setting is over reaching

into the lower voltage system and putup the same in the next PCM. Views/difficulties in implementing this could be put up to NPC/CEA after the exercise of identification is completed.

Constituents may give the status.

b) Zone-1 PSB: The task force recommended to trip if power swing enters Zone – I characteristics and block tripping for other zones during power swing.

Status/existing practices and views of constituents: MSETCL & NTPC representatives intimated that power swing is blocked for 2 secs for all 3 zones i.e. Z-1, Z-2 & Z-3 and if power swing still persist the relay will trip for all 3 zones.

MP, GETCO, CSPTCL & PGCIL: If power swing enters in Z-1, relay trips immediately and when power swing is in Z-2 or Z-3, trip is blocked.

Decision in PCMs : All existing relays may not have feature of delayed tripping for one zone & blocking for other zones i.e. delayed tripping for Z-I and blocking for Z-II & Z-III, hence all utilities shall instantaneously trip for Zone – I power swing and block the tripping for power swing in other zones(Z-II & Z-III). Specific stations where this is not possible may be identified and put up in the next PCM.

Constituents may please give the status.

c) Protection Audit: The task Force recommended for carrying out regular protection audit for relay settings by protection application team. The protection audit shall broadly cover important aspects philosophy, settings, healthiness of fault clearing system etc..,

Discussion in PCMs: First party audit may be carried out every year and third party audit may be carried out once in 5 years. For all new upcoming S/s, the relay settings and all other requirements should be got verified by a third party, before it is connected to grid. Protection audit shall be carried for all S/s of 132 kV & above and the audit should be in line with the recommendations of taskforce report.

2) Formulation of Special groups for studies and protection coordination:

The Task Force recommended forming a group for studies, protection coordination and relay settings. It also recommended that each utility should establish a protection application department with adequate man power & skills. The members of protection team shall undergo regular training to enhance their skills.

Contingency and Stability Studies: The Task Force recommended to form a special group to analyze the grid conditions and factors affecting its operation and simulation of critical system conditions expected for forthcoming season on regular basis and suitable operational strategy worked out.

Tuning of power electronic devices & PSS: The Task Force recommended reviewing & restudying the network at regular intervals (3-4 years) with incorporation of power electronic

devices and the results may be implemented within next 3-4 years. It also suggested that as this requires specialized dynamic modeling, the task may be entrusted to reputed independent agency and implementation of tuning be entrusted to respective manufacturer.

Decision of PCM: It was decided that MSETCL, GETCO, CSPTCL, MPPTCL, WRLDC, POWERGRID and NTPC would nominate one member from studies side and one member from protection side and send the name of the members to WRPC for carrying out studies mentioned above. It was also decided that SLDC would give PSS details format for state generators, WRLDC for IPPS and NTPC for their generators.

In view of the above decision a group was formed and a meeting of the group was held at WRPC on 22.04.2015. Following was decided in the meeting;

(i) Operational & Off line Studies: It was decided to update the PoC Q4 case of 2014-15 with the actual network and set this as a starting point. All utilities would furnish the bi monthly data of planned network, planned generation and anticipated load generation for the period upto March 2016. The study group after updating the network and receipt of the forecast data would take up the operational planning studies.

(ii) **Transient Stability & Short circuit Studies:** Utilities would furnish the machines transient data of their system, wherever data is not available the same shall be assumed as per CEA/CBIP manuals. Training on the same could be arranged with IIT-B.

It was decided that two subgroups could be formed to look into the above recommendations. One subgroup would be headed by Shri R H Satpute, SE (Testing Division – Vashi). This sub group would review the protection system in WR and coordinate the relay settings as per the Ramakrishna recommendations. The other subgroup would be headed by Shri Satyanarayan. S, SE (P&S), WRPC. This subgroup would carry out studies required for coordination of relay settings.

iii) In house training:

Task force strongly recommended that a dedicated group is required to be trained in all utilities to carry out computer aided studies for relay settings.

It was felt that knowledge sharing sessions / discussions, in house training on the fundamentals of load flow studies, contingency studies, stability studies etc.., may be shared with the system study engineers of utilities of WR.

iv) Training by IIT: In order to build a strong team of WR in specialized areas of studies, training sessions may be arranged to team members at IIT Bombay on relevant specialized areas subjects like transient stability, PSS tuning, tuning of FACTs devices, SSR etc..,

The proposal for this training shall be put up for upcoming WRPC board meeting and as the reactive energy account (REA) fund was transferred to PSDF, the funding for this training may be taken up in this meeting.

3) Meeting for appointment of consultant-A to conduct the study/analysis to ensure secure and reliable operation of national grid:

In compliance to MoP order dated 16.07.2014, the process of appointment of consultants to conduct the study/analysis to ensure secure and reliable operation of national Grid, has been under taken by CEA. A meeting to decide the data/inputs for the consultants was held at CEA on 22.05.2015 under the Chairmanship of Member (GO &D), CEA.

Following issues pertaining to protection and system studies and actions required by RPCs and constituents were discussed in the meeting:

(i) The Grid Study Committee will be chaired by Member (GO&D), CEA. GM, NLDC, POSOCO will be the convener. MS RPCs will be the members. One STU from each region would be nominated as member for the committee on rotational basis.

(ii) Identification of 25 nos of critical S/Ss in WR (already audited) for review of protection audit and setting of protection relays thereof. The consultant would carry out Protection Audit and review the protection philosophy adopted.

(iii) Substation wise protection audit reports in respect of all the substations audited in the FY 2012-13.

(iv) Nomination of nodal officers from all power sector entities. A CE level officer from each STU shall be appointed by each State/UTs to co-ordinate with SLDCs. Monthly meeting will be held on VC.

The above information (at i, ii & iii) in the prescribed formats is required to be submitted to CEA. The formats will be circulated after receipt of the same from CEA.

Constituents are requested to keep the information ready.

Committee may please like to discuss

Item No 8: Commissioning of new system protection schemes in connection with synchronization of SR and NEW grid

8.1: Back ground: As per NLDC's letter dated 11.04.2014, the backing down quantum for generators in WR were finalized for various security threats after NEW – SR synchronization with 765kV Raichur-Sholapur Ckt-I. The matter was further deliberated in the 26th WRPC meeting held on 21.06.2014 and decided that as and when the signals are extended to the newer generators, the quantum of backing down of the already participating generators will be reduced on prorate basis. NLDC vide letter dated 07th July 2014 communicated modification in SPS in view of commercial operation of 765kV Raichur-Solapur ckt-II. The same was circulated to all the concerned for necessary action.

Status: In the 123rd PCM, PGCIL was requested to extend the signal to Lanco – Amarkantak at the earliest and requested all newly participating generating stations to complete the wiring for necessary action at their end. It was also decided that mock testing of the modified SPS may be done by WRLDC after completion of signal extension and wiring at all generating stations.

WRLDC may give status on the arrangement of mock testing.

8.2: Tripping of 765 kV Raichur – Solapur D/C: On 24.05.2015 at around 19:13 Hrs 400 kV Chittor – Tiruvalem – I & II tripped. It was followed by tripping of around 1750 MWs generation in SR and subsequently at 19:19 Hrs, HVDC Talcher – Kolar pole I & II tripped on valve cooling problem. The power flow on each circuit of 765 kV Solapur – Raichur D/C touched around 1573 MWs and these line tripped from Raichur end. Flash report received from NLDC is enclosed at annexure – 8.2.

PGCIL may give the reasons for tripping these lines.

ITEM NO 9: IMPLEMENTATION STATUS OF SPS

9.1) SPS for 765 kV Bina – Gwalior – Agra: An SPS has been implemented for Bina – Gwalior – Agra D/C, wherein when sudden reduction in import by NR on Agra-Gwalior I & II ckts by more than or equal to 1500 MWs, 500 MWs generation back down in WR (KSTPS NTPC– 120 MWs, VSTPS NTPC – 200 MWs & CGPL – 180 MWs) and load shedding in NR would take place.

WRLDC representative intimated that mock testing of SPS for 765 kV Bina – Gwalior – Agra D/C was proposed by NRPC on 24.12.2014. The mock testing of the SPS was unsuccessful and in the 124th PCM,

PGCIL representative intimated that the signals were sent to generating stations directly from Agra S/s, under PGCIL - NR.

The mock testing was carried out on 30.04.2015 and the receipt of signals at all the generating stations was confirmed.

Committee may like to note.

9.2) SPS at 400 kV Vapi S/s: The SPS for Vapi ICT O/L was discussed in a special meeting held on 03.09.2013 at TAPS 3 & 4 and further finalized in the meeting held on 11.04.14 between GETCO, DD & DNH representatives i.e. restrict loading on 3 X 315 MVA 400/220 kV ICTs at Vapi (PG).

The SPS was further discussed in the OCCM and it was felt that due to commissioning of 400 kV Kala S/s, the ICT overloading at Vapi was not so critical, therefore the scheme needs to be revised. DNH vide letter No-11(739)/ELE/2013/3382 dated 30.09.2014 have requested that the

conditions earlier envisaged (ICT overloading at Vapi) for SPS may be modified such that load shedding shall take place in DD & DNH system by sensing the overloading/tripping of 220kV Vapi - Kharadpada D/C lines.

Status: In the 124th PCM, GETCO representative intimated that as per MoM of 122nd PCM, the SPS was modified i.e. considering 220 kV Vapi – Kharadpada D/C over loading instead of ICT O/L.

GETCO may please give the status.

9.3) Review of SPS for CGPL Mundra:

Background : In the 123rd PCM, GETCO representative stated that proposal for SPS for CGPL Mundra was reviewed and revised in view of commissioning of 400 kV Bhachau – Versana D/C and following scheme was formulated.

a) When CGPL generation is more than 3300 MWs and any one line of 400 KV D/C CGPL - Bhachau line trips, there shall be immediate reduction of 800 MWs generation.

b) When the loading on any one line out of eight lines (including 400 kV Bhachau – Versana D/C lines) reaches 900 MW irrespective of the generation at CGPL, RBS should activate for reducing generation by 500 MW.

In the 123rd PCM, WRLDC representative opined that commissioning of 400 kV Bhachau – Versana D/C may not ease the flows on evacuation outlets of CGPL Mundra, therefore the existing SPS shall be continued. Committee requested GETCO to convene a special meeting to discuss the above SPS in detail and finalize the same.

Studies were carried out by WRLDC, considering full generation of APL and Essar Vadinar and concluded that in case of n-1 and n-2 of 400kV Bachhau-Ranchodpura, none of the lines from CGPL are loaded more than 900MW. But considering the loading on Hadala-Chorania under D/C tripping of Bachhau-Ranchodpura, automatic backing down to 3300MW can be included in SPS.

The SPS agreed between WRLDC, CGPL and GETCO is as follows;

Sl. No.	SPS triggering condition	Actions required	Comments
i)	If export is more than 3300MW and one ckt of	Backing down automatically to bring down the generation to	**1. One line trips and export is**

	CGPL-Bhachau D/C trips	3100MW.	**between 3300 to 3500MW then runback of unit 40 only.**
ii)	If export is more than 3300MW and if CGPL-Chorania or CGPL-Halvad or one ckt of CGPL-Jetpur D/C trips	Backing down automatically to bring down the generation to 3300MW.	**2. Two lines trip and export is between 3300 to 3500MW then trip unit 40.**
iii)	In case of D/C tripping of CGPL-Bachhau, CGPL-Chorania or CGPL-Jetpur	Trip one unit immediately. Unit running at maximum generation to be selected for tripping to get full 800MW reduction immediately to take care of system stability.	**3. One line trips and export is more than 3500MW then runback of unit 40 and other selected unit.**
iv	In case of D/C tripping of Bachhau-Ranchopura	Backing down automatically to bring down the generation to 3300MW.	**4. Two lines trip and export is m than 3500MW, then trip Unit 40 and runback in other selected unit.**

CGPL vide letter dated 18.05.2015 (copy enclosed at annexure – 9.3) have intimated that the above logics have been implemented at CGPL Mundra since 08.05.2012.

Committee may like to discuss/note.

9.4) Review of automatic tripping of 220kV Gwalior-Mahalgaon lines at Gwalior S/S after tripping of 765kV Bina-Gwalior-I & II:

POWERGRID vide letters dated 17.04.2015 & 22.05.2015 (copy enclosed at Annex.- 9.4) have requested to review the automatic tripping of 220kV Gwalior-Mahalagoan lines at Gwalior S/S after tripping of 765kV Bina – Gwalior –I & II lines.

Further POWERGRID have intimated that the 765kV Satna-Gwalior#1 line has been commissioned on 06.02.2014 and second ckt of 765kV Satna-Gwalior has been planned for commissioning shortly. Therefore parallel path is available for 765kV Gwalior S/S via 765kV Bina & Satna S/Ss.

Committee may like to discuss.

10): **Islanding schemes:**

10.1) KAPS: In pursuance with the decision of a special meeting held on 03.09.2013 at TAPS 3 & 4, SLDC GETCO and KAPS have formulated the islanding for KAPS. The scheme was discussed in 121st PCM and finalized in 122nd PCM.

In 121st PCM it was intimated by KAPS representative that main under frequency relay (MICOM-P-941 numerical relay) would be purchased by KAPS for Vapi Sub-station, since the existing FCX relay is defective. GETCO agreed for procurement of other auxiliary relays and

wiring of the same. GETCO informed that they have planned for PLC based islanding scheme and in near future the same would be incorporated in the Islanding scheme.

In 123rd PCM, GETCO representative intimated that the implementation of islanding scheme is under progress and wiring of the scheme would be completed by March, 2015.

GETCO/KAPS may please give the status.

10.2) Islanding scheme for Sugen: In the 124th PCM, WRLDC representative intimated that a meeting was held at WRLDC, Mumbai on 16.04.2015 to finalize the islanding schemes of Sugen.

i) Islanding of Sugen: The islanding of SUGEN (Sugen generation – 2 X 387.5 MWs) with Surat load was designed and is as follows.

1. **48.5 Hz :** 220 kV Sugen-Kim D/C will be tripped
2. **48.4 Hz:** Load Generation Balance to be monitored with respect to 220 kV feeders for Surat city and generation at Sugen.
3. **48.2 Hz:** 400 kV Sugen-Pirana, 400 kV Sugen-Vapi (PG) to be opened in first Phase one by one. Fine tuning of frequency would be intimated by Sugen at the time of implementation.
4. **48.0 Hz:** 400 kV Sugen-Unosugen and 400 kV Sugen-Gandhar have to be opened in next phase one by one resulting in islanding of Sugen with Surat Load. Fine tuning of frequency would be intimated by Sugen at the time of implementation.
5. **47.5 Hz:** Instantaneous tripping of Units.

It was also decided that while synchronizing the Island with the grid, island has to be connected with 220 kV Sugen – Kim D/C (for extending supply to GSEG, Utran S/s). GETCO agreed to provide necessary synchronizing facilities at 220kV Kim S/s.

The above islanding scheme was in principle agreed in the 124th PCM and M/s Sugen was requested to implement the islanding scheme at the earliest.

GETCO/Sugen may give the status.

10.3) Islanding schemes for TAPS 1 & 2 and TAPS 3 & 4: In the 124th PCM, WRLDC representative intimated that a meeting was held on 16.04.2015 at WRLDC, Mumbai to discuss and finalize the islanding schemes for TAPS-1&2 and TAPS 3&4. In the meeting, it was decided that TAPS 1 & 2 generation be islanded with Bhilad load. The generation capacity of TAPS 1 & 2 is 320 MWs (2 X 160 MWs) and the load at Bhilad S/s is radial load and is of around 90 – 140 MWs.

The islanding scheme for TAPS 3 & 4 with load of Boisar (MSETCL) is under discussion stage. In the 124th PCM, Committee reviewed the proposal and opined that units of TAPS 1 & 2 are very old and fine control of generation is not possible. The governors of TAPS 1 & 2 are such that the generation can either be 160 or 100 MWs. Further the radial loads at Bhilad are variable and fine control of loads may not be possible. Therefore islanding TAPS 1 & 2 with Bhilad load may not survive for long and even if it survives, while restoring the grid it may be very

difficult to synchronize this island with grid as both load and generation of the island are not controllable.

Further it was felt that as the generation of TAPS 3 & 4 can be controlled, it would be better to form an island with generation of TAPS 1, 2, 3 & 4 and loads of Bhilad and Boisar. Committee requested TAPS 1 & 2 to take up the above proposal with higher authorities and revert back to the PCM forum with its proposal.

TAPS 1&2 vide letter dated 12.05.2015 (copy enclosed at annexure – 10.3) have send their comments on the proposed islanding scheme for TAPS 1 & 2.

NPCIL/TAPS may give the status.

Committee may like to discuss.

ITEM NO. 11: Follow up items:

11.1: AUFLS Quantum & Stages

A. **Back ground**: In the 2nd NPC meeting held on 16.07.2013 at Delhi, four (4) stages of automatic under frequency relay operation starting from 49.2 was approved. CEA vide letter No.8/X/MMS/Gm-13/1007-1012 dated 06.08.2013, have intimated that the implementation of load shedding for all the four stages (i.e. 49.2, 49.0, 48.8 and 48.6Hz.) be taken up and completed by 22.10.2013. The updated status of AULFS as on 31.03.2015 is as follows.

AUFLS implementation status in WR									
(figures are in MWs)		49.2Hz		49.0Hz		48.8Hz		48.6Hz	
		Actual	Target	Actual	Target	Actua	Target	Actual	Target
Gujarat	Avg.	773	580	726	580	1117	580	1025	590
	Peak								
MP	Avg.	468	460	450	460	460	460	465	465
	Peak								
Chhattisgarh	Avg.	110	150	114	150	117	155	91	155
	Peak								
Maharashtra	Avg.	1122	805	1215	810	1044	815	1071	820
	Peak								
Goa	Avg.		25		25	25	25	25	25
	Peak								
DD	Avg.		10		15		15		15
	Peak								
DNH	Avg.		30		30		35		35
	Peak								
TOTAL	Avg.	2473	2060	2505	2070	2738	2085	2652	2105
	Peak								

All the constituents were requested to give the list of the feeders connected to UFRs in a soft copy (excel sheet) within 15 days along with other details like peak load (MWs), average load (MWs), kV, substation etc., Utilities were also requested to furnish the details of df/dt relays to WRPC in soft copy.

MSETCL, GETCO, MP & Chhattisgarh have submitted the data for UFR relays. UFR data from DD & DNH is still not received. None of the utilities have submitted list of feeders connected to df/dt relays. SE (P), WRPC intimated that DD have ordered the UFRs and would commission the same shortly.

MSETCL, MPPTCL & GETCO have implemented AUFLS schemes as per the targets. CSPTCL was requested to increase the load shedding quantum for all four stages as per the targets given in above table. Goa has implemented the AUFLS. Implementation of stage wise targeted AUFLS quantum may please be done by DD & DNH, without any further delay.

The details of UFR & df/dt feeders and quantum of LS updated as on 31.03.2015 may be submitted immediately.

DD & DNH may give the implementation status of AULFS.

11.2: Status of Bus Coupler and Bus Bar protections at S/s

Back Ground: In the 118th PCM, Chairman TCC stated that the Bus Bar protection schemes should be implemented by the respective utility, without expecting the funding under R&U from MoP, GoI. In 121st PCM, WRLDC informed that BB protection at 7 Nos of 220kV S/Ss (Single Bus S/Ss) in GETCO system, 3 Nos of 220 kV S/Ss in MSPGCL system, 7 Nos of 220kV S/Ss in MPPTCL system & 5 Nos of 220kV S/Ss in CSPTCL system was pending.

In 123rd PCM, GETCO representative intimated that out of 7 substations, BB protection was commissioned at 5 substations. At Limbdi substation it is under commissioning stage & expected to be completed by May, 2015 and at Navsari substation, it is in tendering stage. MPPTCL representative intimated that BB protection relays were procured and commissioning is under progress.

Constituents are requested to update the status of following substations.

1) Non Availability of Bus Bar protection at 220/132 kV Bhatapara S/s: In the 123rd PCM, CSPTCL representative agreed to give the status in the next PCM. **CSPTCL may please give the status.**

1) Status of Bus Bar protection Scheme at 220/66 kV Magarwada S/s: **DD may please give the status.**

3) Bus Bar protection at 400/220 kV Korba West S/s: Regarding LBB/Bus Bar protection at 400/220 kV Korba West, 200/132 kV Korba East and 220 kV Korba East Extension – In the 123rd PCM, CSPTCL representative intimated that the scheme will be completed by March, 2015. **CSPTCL may please give the status.**

11.3: Time synchronization, non-working of DR & Main-2 of Ranchodpura line-2 at Dehgam S/s:

Back Ground: PGCIL vide letter WR-II/Vadodara/O&M/252/42 dated 15.04.2015, WRTS II/O&M/273/AV/1211 dated 30.03.2013 & WRTS/DEH/SS/385/113 dtd. 28.01.2012, have intimated that the pending protection issues related with GETCO bays at Dehgam S/S have not been attended so far and requested GETCO for configuration of DR for Main-1/Main-2 protection along with wiring of digital inputs & GPS time synchronization.

GETCO vide letter no. CE(TR)/ACE(testing)/OCC/45/ dated .10.2014 intimated that disturbance recorder data is recorded in the numerical relay i.e. ABB makes REL 670. For time synchronization of the relay with GPS, GETCO has done wiring and tried to synchronize the relay using PPM output but the output port (PPM) of GPS unit is not working and spare ports including IRIG-B (TTL) are not available in the GPS unit. The issue will be resolved after attending port problem of GPS unit.

GETCO may please give the status.

11.4: A/R facility at 220 kV Kota and Modak ends of the 220kV Badod-Kota & Badod-Modak lines:

MPPTCL vide their letter No.07-05/RPC-17/3495 dated 14.10.2014 had informed that the PLC cabinets along with protection couplers have been commissioned, checked and ready for use at 220kV Badod S/S (MP) end. However the scheme could not be put to use due to non-availability of carrier equipments with protection couplers for these inter-regional lines at 220 kV Kota (Rajasthan) & 220kV Modak substation (Rajasthan).

In the 123rd PCM, MPPTCL representative informed that the testing of carrier to carrier of A/R was done on 31.10.2014 and the A/R will be put into service during its next opportunistic shutdown i.e. Jan, 2015.

MPPTCL may please give the status.

11.5: Even Logger status

PGCIL – WR – II vide letter WR-II/Vadodara/O&M/252/42 dated 15.04.2015 requested for status of event loggers installation at 400 kV Indore, Bina, Nagda & Bhopal S/s of MMPTCL and 400 kV Satpura & Birsinghpur S/s of MPPGCL stations.

MPPTCL and MPPGCL may give the status.

Committee may like to discuss.

11.6: Status of busbar arrangement at 765 kV Aurangabad S/s

WRLDC vide letter WRLDC/MO-III/1654/15/374 dated 17.04.2015 intimated that 765 kV Aurangabad S/s is a very important S/s, connected to many state generating stations and feeding

Maharashtra load. It is observed that in this S/s, many tie CBs are either not commissioned or not kept in service.

i) 765/400 kV ICT – II, Aurangabad is connected to 400 kV bus – II only
ii) 765 kV Wardha – Aurangabad – I is connected to 765 kV bus – II only
iii) 765 kV Wardha – Aurangabad – II is connected to 765 kV bus – II only
iv) 765 kV Wardha – Aurangabad – III is connected to 765 kV bus – II only
v) 240 MVAR line reactor of 765 kV Aurangabad – Padghe – I charged as bus reactor is connected to 765 kV bus – I only
vi) 240 MVAR line reactor of 765 kV Aurangabad – Padghe – II charged as bus reactor is connected to 765 kV bus – I only

The tie CB is also not provided for 765 kV Aurangabad – Wardha – III & IV lines at 765 kV Wardha S/s.

PGCIL may give the status.

Committee may like to discuss.

11.7: Violation of protection standard

NLDC vide letter POSOCO/NLDC/2015/03/1578 dated 20.03.2015 intimated that on 20.02.2015 at 06:40 Hrs, 220 kV Mudshingi – Chikodi & 220 kV Talangde – Chikodi tripped on R ph to E/F and the fault got cleared in 640 ms.

NLDC vide letter POSOCO/NLDC/2015/24 dated 09.04.2015 intimated that on 11.03.2015 at 11:06 Hrs interregional line 220 kV Ambewadi – Ponda – I tripped on B ph to E/F and the fault got cleared in 360 ms. As per section 3.e. of Grid Standards Regulations of CEA, fault on 220 kV level shall be cleared within 160 ms.

Committee may like to discuss.

NLDC vide letter POSOCO/NLDC/2015/190 dated 21.05.2015 intimated that on 29.04.2015 at 22:53 Hrs interregional line 400 kV Raigarh – Sundargarh (Jharsuguda) tripped on 3 ph fault and the fault got cleared in 360 ms. As per section 3.e. of Grid Standards Regulations of CEA, fault on 400 kV level shall be cleared within 100 ms.

Committee may like to discuss.

WRLDC intimated that during single ph to E/F, following lines tripped without an attempt of A/R.

i) 400 kV Korba – Sipat on 15.03.2015 at 13:59 Hrs
ii) 400 kV Bhadrawati – EMCO – I on 14.03.2015 at 04:37 Hrs
iii) 400 kV Karad – Lonikhand on 10.03.2015 at 19:13 Hrs
iv) 400 kV Vandana – Birsingpur on 24.03.2015 at 13:43 Hrs

v) 400 kV Raigarh – Ibeul on 22.04.2015 at 18:00 Hrs & on 15.03.2015 at 21:56 Hrs

vi) 220 kV Raigarh – Budipadhar on 17.01.2015 at 14:16 Hrs

vii) 400 kV Jejuri – New Koyna on 26.03.2015 at 17:22 Hrs

On 21.02.2015 at 22:56 Hrs 400 kV Aurangabad – Bableshwar line tripped on single ph to E/F due to non-readiness of CB at Aurangabad end (A/R was successful at Bableswar end).

11.8: Follow up of WRLDC agenda items:

Following issues were discussed in 122nd PCM as per the request of WRLDC vide its letter no. WRLDC/MO-III/1658/2014 dated 14.10.2014. These issues were followed up in 123rd PCM.

Healthiness status of protection system at 220/132 kV Mehgaon and Malanpur S/s:

(i) Non-availability of event logger at the Malanpur and Mehgaon sub-station. – In the 123rd PCM, MPPTCL representative intimated that EL with SCADA feature will be taken into service by April, 2015.

MPPTCL may please give the status.

(ii) Non-availability of Auto reclose equipment (PLCC, panel) for 220 kV Auraiya-Malanpur and 220 kV Auraiya – Mehgaon lines (It is available at Auraiya end) – In the 123rd PCM, MPPTCL representative intimated that the equipment has been installed.

MPPTCL may please give the status.

(iii) Bus bar protection scheme at Malanpur is out since 30th may 2014. In the 123rd PCM, MPPTCL representative intimated that the BB protection will be taken into service by April, 2015.

MPPTCL may please give the status.

ITEM No. 12: Any other items

ITEM NO. 13: Date and Venue of the next meeting

The date and venue for next (126th) PCM may be decided.

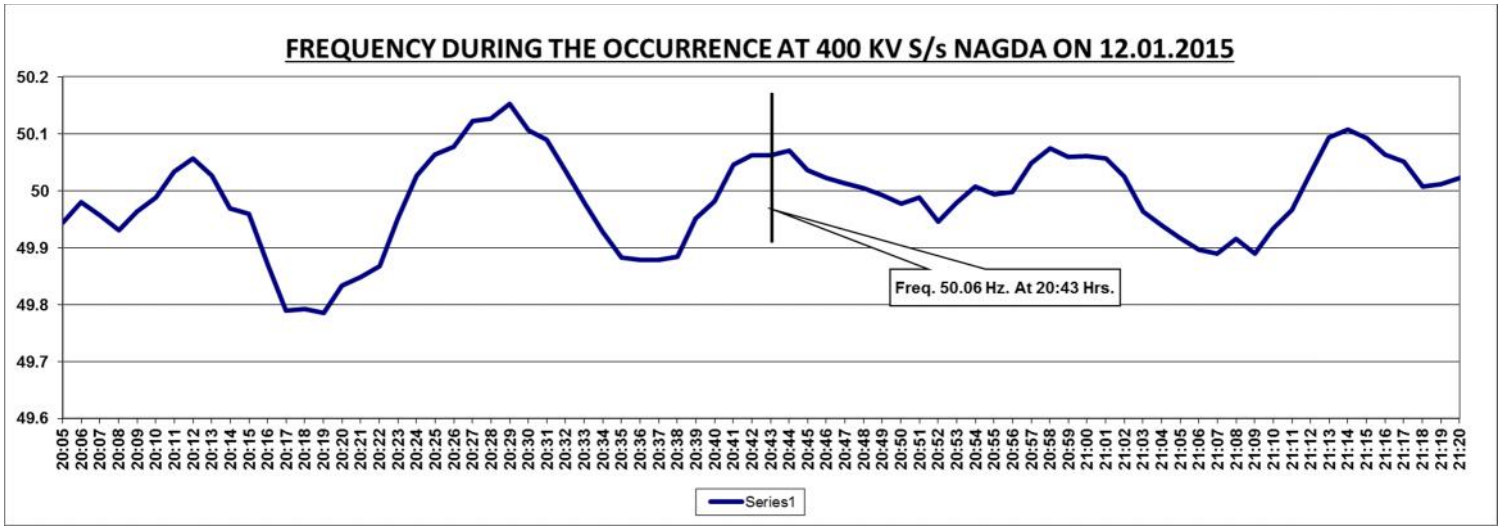
****

Annexure -2.1

Pre-Fault Condition

On dated 12.01.2015 at around 20:40 Hrs MP System was normal and frequency of National Grid was 49.92 Hz.

At 400 KV S/s Nagda, all 220 KV feeders were in charged condition and normally loaded.



Occurrence

At 20:43 Hrs., 220 KV Nagda – Ratlam – I tripped from both end due to 'R'-Phase disc Flash Over at Loc. No.-138.

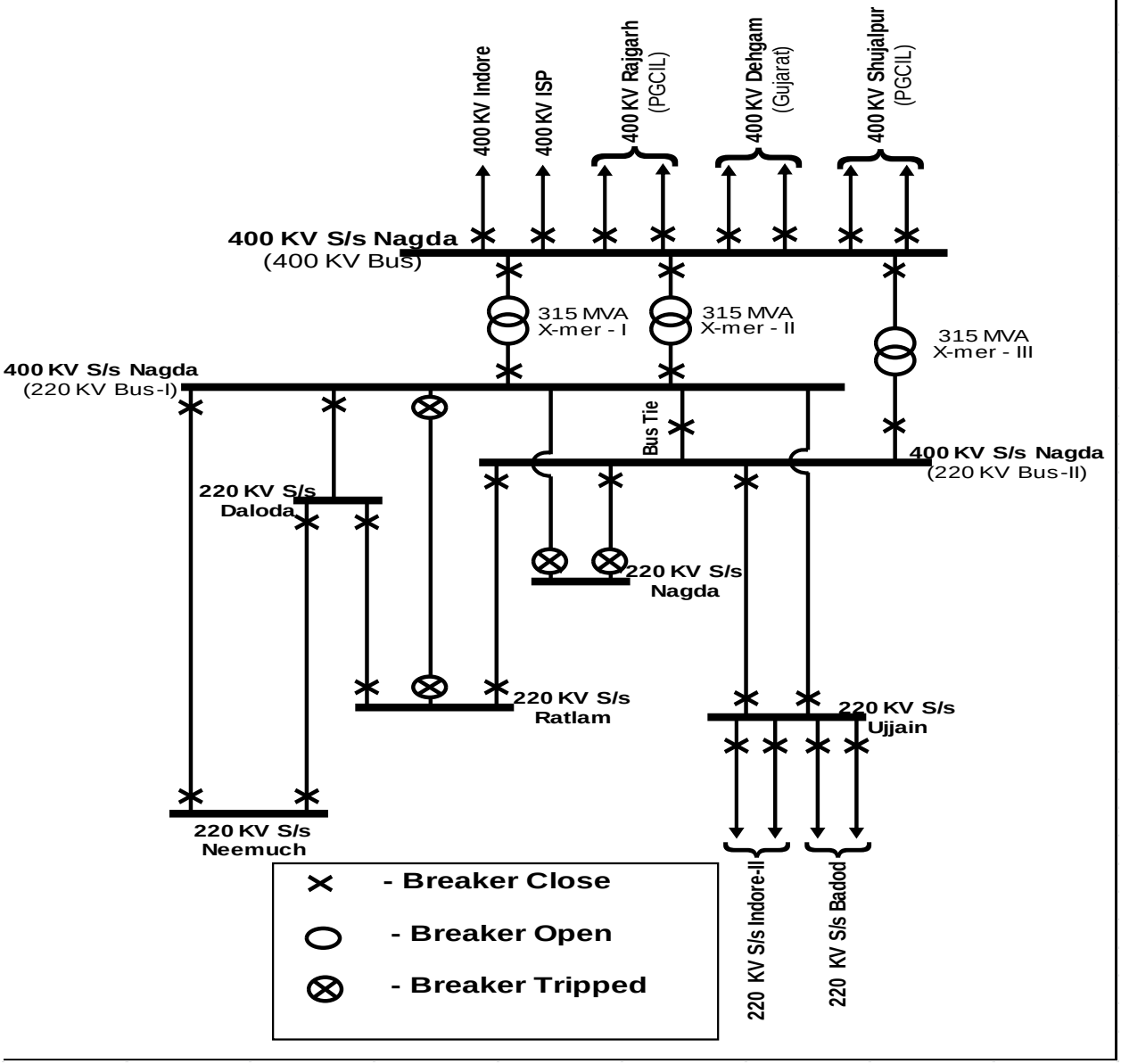
As the fault persisted for longer duration (80sec), fault was fed through 220 KV Interconnector – I & II resulting in tripping of 220 KV Interconnector – I & II.

Due to above tripping there was no interruption in any area.

The relay indications appeared in various transmission elements provided by Executive Engineer Testing Division, MPPTCL, Nagda is enclosed as **Annexure – I & II.**

SINGLE LINE DIAGRAM OF OCCURRENCE AT 400 KV S/s NAGDA

TRIPPING OCCURRED ON DATE - 12.01.2015



Remedial Measures

System was normalized by charging following circuits:-

S.No.	Name of Feeders/Transformers Charged	Time Of Charging
1.	220 KV Nagda – Nagda Interconnector – I	20:56 Hrs.
2.	220 KV Nagda – Nagda Interconnector – II	05:46 Hrs.

Conclusion:-

The above tripping occurred due to 'R'-Phase disc Flash Over at Loc. No.-138.

Load Loss

There was no load loss during the above tripping.

CIN- U40108CT2003SGC015820

CHHATTISGARH STATE POWER TRANSMISSION CO.LTD.
(A Government of Chhattisgarh undertaking)
OFFICE OF EXECUTIVE ENGINEER MRT DIVISION BHILAI
Bijalee Nagar, Bhilai 3, Pin 490021
E-mail- eemrt.bhilai@cseb.gov.in, Phone/Fax No. 0788-2278219

No.10-71/MRT/ Bhilai, dtd.

To

The Suptdg. Engineer(T&C),
C.S.P.T.C.L. Bhilai.

Sub: Detailed analysis report on trippings of various 220KV and 132KV feeders/Xmer at 220KV S/S Bhilai on dtd.09.02.2015, 07:05 Hrs on account of mal-operation of 220KV Bus Bar Protection - interruption of supply in different EHV Substations thereof.

Timing (GPS based) of Initiation of tripping / Interuption: 07:05 Hrs

System Configuration and Load pattern prior to the Trippings:-

The system configuration , interconnectivity on 220KV and 132 KV level and loading on various associated lines and Transformers prior to the event was as per **annexure A** attached alongwith.

Details of events occurred and area affected:
On dtd. 09.02.2015 at 07:05 Hrs. following 220KV feeders and 220/132kv ,125 MVA Xmers at 220KV Sub-station, Bhilai tripped due to mal operation of Busbar differential protection relay (Make ABB, Model : RADSS) :

i. 220KV Bhilai-Khedamara I
ii. 220KV Bhilai-Khedamara-II
iii. 220KV Bhilai-PGCIL
iv. 220KV Bhilai-Gurur II
v. 220/132kV 125 MVA Transformer no.-1
vi. 220/132kV 125 MVA Transformer no.-2
vii. 220/132kV 125 MVA Transformer no.-3
viii. 220/132kV 125 MVA Transformer no.-4

The 220 KV Siltara feeder (Source) and 220kV Gurur-1 Feeder did not trip on account of above mal-operation of bus bar relay as the trippings through bus bar protection relays(96) of these bays were found un-connected.

On account of above trippings , cascaded trippings occurred in 132KV feeders having interconnection with other source substations resulting in total loss of supply(approximately 150 MW) at following 132/33kV Substations.-

i. 132/33kV S/s Bhilai,
ii. 132/33kV S/s Kurud,
iii. 132/33kV S/s Sector-C Raipur.

Further , after the above occurrence, the total load shifted on the 220 KV Siltara feeder (the only source feeder which remained live),and the loading increased upto 280 MW which was the total load of Gurur S/s and whole Bastar Region. Looking to this over loading of 220KV Siltara feeder and to avoid the total interruption in the area, the 132kV feeders namely132 kV Dhamtari-1 & 2 feeder, 132 kV Balod Feeder, 132kV Dallirajhara feeder and 132kv Kurud feeder at 220 KV Gurur S/s were hand tripped . In the mean time some 33kV feeders at different EHV S/s in Bastar region like 132/33kV S/s Kanker and Bhanupratappur etc. were also hand tripped. Also some 33kv feeders at 132kv S/s Rajnandgaon, 132kv S/s Ruabandha and 132kv S/s Pulgaon were hand tripped to avoid the tripping of Thelkadih-Rajnandgaon link on overload.

The manual trippings of above feeders has further resulted in total loss of supply at following EHV Substations resulting in further relief of approximately 175 MW.

i. 132 kV/33kV S/s Dhamtari
ii. 132 kV33kv S/s Balod
iii. 132kV/33 KV S/s Dallirajhara
iv. 132kv/33KV S/s Kurud

The total load loss in the associated system was approximately 325 MW.The details of tripping and re-charging of various EHV feeders and Transformers is enclosed herewith as **Annexure-B**.

The Disturbance records as captured by various associated relays were also got extracted and the respective comtrade files (file extension ".dat", ".cfg") are being e-mailed to SLDC.

Post Fault Analysis:

The existing 220kV bus –bar protection relay (Make ABB, Model : RADSS) was commissioned in 1990 at 220 KV S/s Bhilai and has already given a fair service of about 25 years. The reasons for mal-operation of the bus bar protection relay is unknown . The 220KV Siltara feeder and 220kV Gurur-II feeder did not trip as the associated trippings through tripping relays (96) were found un-connected , a status probably since beginning. The reasons being the fact that, earlier the Gurur-II line was Bhilai –Barsoor line which feeded Bastar region radialy and hence there was no possibility of backfeeding to fault. The trippings of 220KV Siltara (old 220kV Korba-E line) was not connected probably to avoid the total interruption in the whole Bastar region due to any such mal-operation of Busbar relay with least possibility of stress on system in case of actual fault on 220 KV Bus as in such case the fault would have been fed for elongated period (Zone- 2 timing) by 220 KV Korba feeder only.

Remedial Action:

The existing Bus-Bar protection has been kept out of service on dtd 09.02.2015 to avoid any possible repetition of such an event. Further the survey – off and estimate for replacement of above relay/panel has already been got sanctioned by the competent authority in 2014 only and the procurement of new Busbar differential protection panel is already in process by Transmission office. The new panel will be commissioned at the earliest on availability after its procurement.

This is for information and needful please.

Encl:-
As above

Executive Engineer
MRT Dn. CSPTCL, Bhilai.

CC to:
1. The CE (T&C)/CE (SLDC),CSPTCL, Raipur.

2. The EE S/s Dn. CSPTCL Bhilai.
3. The Advisor, O/o M.D., CSPTCL, Raipur.

ANNEXURE B.

TRIPPING AND CHARGING DETAIL AT 220KV S/S BHILAI AND GURUR DATED 09.02.2015

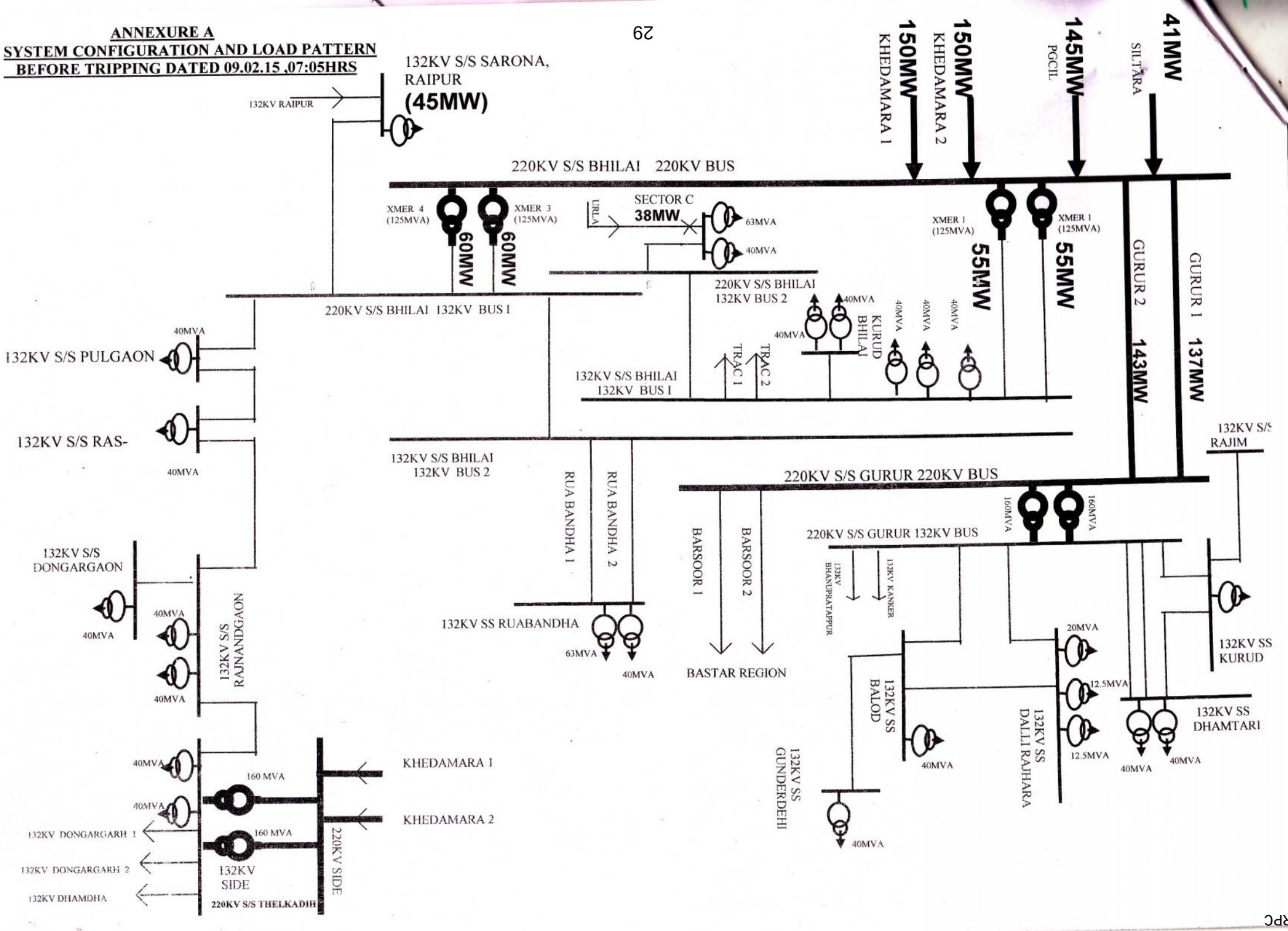
220kv Substation Bhilai

FEEDER NAME	TRIPPING TIME		CHARGING TIME	
220 KV Bhilai – Khedamara ckt. no.1	0705	HRS	0800	HRS
220 KV Bhilai – Khedamara ckt. no.2	0705	HRS	0742	HRS
220 KV Bhilai – PGCIL	0705	HRS	0820	HRS
220 KV Bhilai – Gurur ckt. no. 2	0705	HRS	0805	HRS
125 MVA X-mer no. 1	0705	HRS	0725	HRS
125 MVA X-mer no. 2	0705	HRS	0731	HRS
125 MVA X-mer no. 3	0705	HRS	0732	HRS
125 MVA X-mer no. 4	0712	HRS	0726	HRS

220kv Substation Gurur

FEEDER NAME	**TRIPPING TIME**		**CHARGING TIME**	
132 KV Gurur – Dhamtari 1	0725	HRS	0820	HRS
132 KV Gurur – Dhamtari 2	0725	HRS	0820	HRS
132 KV Gurur – Kurud	0725	HRS	0910	HRS

ANNEXURE A
SYSTEM CONFIGURATION AND LOAD PATTERN
BEFORE TRIPPING DATED 09.02.15 ,07:05HRS



Pre-Fault Condition

On dated 24.02.2015 at around 11:40 Hrs MP System was normal and frequency of National Grid was 49.99HZ.

At 400 KV S/s Bina all 220 KV & 400 KV feeders were in charged condition. Prior to fault complete load of 220 KV S/s Shivpuri, 220 KV S/s Sabalgarh, 132 KV S/s Shivpuri, Sheopur, Vijaypur, Kolaras, and Mohana was radially fed through 220 KV Bina(MP) – Shivpuri Ckt, 220 KV Bina(PGCIL) – Shivpuri Ckt, and 132 KV Shivpuri – Pichhore Ckt. 132 KV Motijheel – Banmore Ckt – I & II is kept open from 132 KV S/s Banmore end for load management.

132 KV Sabalgarh – Sheopur Ckt – II (*Tap Kandhar Rajasthan*) was ideallyl charged from 132 KV S/s Sabalgarh end only.

For load management due to shut down on 220/132 KV, 160 MVA X'mer (*for attending oil leakage*) at 220 KV S/s Mahalgaon, following actions were taken:-

1. 132 KV Motijheel – Sabalgarh Ckt charged at 09:45 Hrs.
2. 132 KV Motijheel – Tigra Ckt charged at 09:45 Hrs.
3. 132 KV Motijheeljeel – Mahalgaon Ckt opened from 220 KV S/s Mahalgaon end at 09:45 Hrs.
4. 132 KV Tigra – Mahalgaon Ckt open from 220 KV S/s Mahalgaon end at 09:45 Hrs.

After making the above arrangements complete load of 132 KV S/s Motijheel and 132 KV S/s Jora also came on 220 KV S/s Sabalgarh. There after 220/132 KV, 160 MVA X'mer at 220 KV S/s Mahalgaon hand tripped at 11:01 Hrs.

Prior to fault loading of feeders at Shivpuri were as follows:-

S.No.	Name of feeders/Tansformer	Loading in MW at 11:40 Hrs.
1.	220 KV Bina(MP) – Shivpur Ckt	-155
2.	220 KV Bina(PGCIL) – Shivpuri Ckt	-156
3.	132 KV Shivpuri – Pichhore Ckt	-38

Occurrence and Remedial Measures

At 11:50 Hrs., 220 KV Bina(M.P) – Shivpuri Ckt & 220 KV Bina(PGCIL) – Shivpuri Ckt tripped from both end and both the Ckt Auto Reclosed successfully from 220 KV S/s Shivpuri end only. Due to the tripping of these two feeders complete load of 220 KV S/s Shivpuri and 220 KV S/s Sabalgarh came on 132 KV Shivpuri – Picchore Ckt, consequently the Ckt tripped on 'R'-Phase, O/C indication and interruption occurred at following S/s

1. 220 KV S/s Shivpuri
2. 220 KV S/s Sabalgarh.
3. 132 KV S/s Shivpuri.
4. 132 KV S/s Kolaras.
5. 132 KV S/s Mohna.
6. 132 KV S/s Sheopur.
7. 132 KV S/s Vijaypur.
8. 132 KV S/s Motizeel.
9. 132 KV S/s Jora.

Supply at 132 KV S/s Shivpuri was resumed by charging 132 KV Shivpuri – Pichhore Ckt at 12:04 Hrs. subsequently 132 KV supply at 220 KV S/s Shivpuri was resumed by charging 132 KV Interconnector – I & II at 12:04 Hrs. and supply was extended to 132 KV S/s Mohna & Kolaras by 12:04 Hrs.

Thereafter 220 KV supply at 220 S/s Shivpuri was resumed by charging 220 KV Bina(MP) – Shivpuri Ckt at 12:16 Hrs. subsequently following feeders were charged:-

S.No.	NAME OF FEEDERS/TRANSFORMERS	TIME	
		TRIPPING (in Hrs.)	CHARGING (in Hrs.)
1.	220/132 KV, 160 MVA X'mer at 220 KV S/s Shivpuri.	H/T at 11:50	12:17
2.	220 KV Shivpuri – Sabalgarh Ckt – I	H/T at 11:50	12:20
3.	220 KV Shivpuri – Sabalgarh Ckt – II	H/T at 11:50	12:20
4.	220/132 KV, 160 MVA X'mer – I at 220 KV S/s Sabalgarh.	H/T at 11:50	12:20
5.	220/132 KV, 160 MVA X'mer – II at 220 KV S/s Sabalgarh.	H/T at 11:50	12:20
6.	132 KV Sabalgarh – Sheopur Ckt – I	H/T at 11:50	12:20
7.	132 KV Sabalgarh – Motijheel Ckt	H/T at 11:50	12:30
8.	132 KV Sabalgarh – Jora Ckt	H/T at 11:50	12:30
9.	132/33 KV, 40 MVA X'mer 220 KV S/s Sabalgarh	H/T at 11:50	12:30
10.	132/33 KV, 20 MVA X'mer 220 KV S/s Sabalgarh	H/T at 11:50	12:30
11.	132 KV Sabalgarh – Vijaypur Ckt	H/T at 11:50	12:30
12.	132/33 KV, 63 MVA X'mer at 132 KV S/s Motijheel	H/T at 11:50	12:31
13.	132/33 KV, 40 MVA X'mer – I at 132 KV S/s Motijheel	H/T at 11:50	12:32
14.	132/33 KV, 40 MVA X'mer – II at 132 KV S/s Motijheel	H/T at 11:50	12:33

At around 12:35 Hrs. 220 KV 220 KV Bina(MP) – Shivpuri Ckt again tripped from both end and , and till then 220 KV Bina (PGCIl) – Shivpuri Ckt was not charged. Resulting 132 KV Shivpuri – Pichhore Ckt tripped due to over loading resulting interruption again occurred at following S/s:-

1. 220 KV S/s Shivpuri
2. 220 KV S/s Sabalgarh.
3. 132 KV S/s Shivpuri.
4. 132 KV S/s Kolaras.
5. 132 KV S/s Mohna.
6. 132 KV S/s Sheopur.
7. 132 KV S/s Vijaypur.
8. 132 KV S/s Motizeel.
9. 132 KV S/s Jora.

After the failure of supply at 12:35 Hrs. 132 KV supply at 132 KV S/s Shivpuri was resumed by charging 132 KV Shivpuri – Pichhore Ckt at 12:43 Hrs. subsequently 132 KV supply at 220 KV S/s Shivpuri was resumed by charging 132 KV Interconnector – I & II at 12:43 Hrs. and supply was extended to 132 KV S/s Mohna & Kolaras by 12:43 Hrs.

Supply at 132 KV S/s Motijheel was resumed by charging 132 KV Motijheel – Mahalgaon Ckt at 12:40 Hrs. similarly supply at 132 KV S/s Tigra was resumed by charging 132 KV Tigra – Mahalgaon Ckt at 12:40 Hrs.

220 KV Supply at 220 KV S/s Shivpuri was resumed by charging 220 KV Bina (MP) – Shivpuri Ckt at 12:49 Hrs. after confirming from both end that there is no fault/problem in the Ckt. subsequently following feeders were charged:-

S.No.	NAME OF FEEDERS/TRANSFORMERS	TIME	
		TRIPPING (in Hrs.)	CHARGING (in Hrs.)
1.	220/132 KV, 160 MVA X'mer at 220 KV S/s Shivpuri.	H/T at 12:35	12:52
2.	220 KV Shivpuri – Sabalgarh Ckt – I	H/T at 12:35	12:52
3.	220 KV Shivpuri – Sabalgarh Ckt – II	H/T at 12:35	12:52
4.	132 KV Sabalgarh – Sheopur Ckt – I	H/T at 12:35	12:53
5.	220/132 KV, 160 MVA X'mer – I at 220 KV S/s Sabalgarh.	H/T at 12:35	12:54
6.	220/132 KV, 160 MVA X'mer – II at 220 KV S/s Sabalgarh.	H/T at 12:35	12:54
7.	132 KV Sabalgarh – Motijheel Ckt	H/T at 12:35	12:55
8.	132 KV Sabalgarh – Jora Ckt	H/T at 12:35	12:55
9.	132/33 KV, 40 MVA X'mer 220 KV S/s Sabalgarh	H/T at 12:35	12:55
10.	132/33 KV, 20 MVA X'mer 220 KV S/s Sabalgarh	H/T at 12:35	12:55
11.	132 KV Sabalgarh – Vijaypur Ckt	H/T at 12:35	12:55
	132/33 KV, 63 MVA X'mer at 132 KV S/s Motijheel	H/T at 12:35	12:41
12.	132/33 KV, 40 MVA X'mer – I at 132 KV S/s Motijheel	H/T at 12:35	12:42
13.	132/33 KV, 40 MVA X'mer – II at 132 KV S/s Motijheel	H/T at 12:35	12:43
14.	220 KV Bina(PGCIL) – Shivpuri Ckt	H/T at 12:35	13:02
15.	132 KV Shabalgarh – Sheopur Ckt – II (*Tap Kandhar Rajasthan*)	H/T at 12:35	15:26

At around 13:08 Hrs. 220 KV Bina (MP) – Shivpuri Ckt again tripped from both end and was declared faulty. On paterolling by EHT (Maintenance) no fault was found on the Ckt and later Ckt was test charged from 220 KV S/s Sshivpuri end at 17:18 Hrs. and synchronised at 18:16 Hrs. from 400 KV S/s Bina end.

The relay indications appeared in various transmission elements provided by the Executive Engineer (T&C), MPPTCL, Shivpuri is enclosed as Annexure – I to IV and report provided by Superintending Engineer (400 KV S/s, Circle), MPPTCL, Bina is enclosed as Annexure – V, VI & VII.

Conclusion

The above incident occurred due to repeated tripping of 220 KV Bina(MP) – Shivpuri Ckt. and it was informed by EHT (M) that no fault was found on the Ckt.
Due to repeated tripping of 220 KV Bina(MP) – Shivpuri Ckt directly emanating from 400 KV S/s Bina which is lying on inter-regional corridor can result in large Grid Disturbance. Hence it is suggested that thorough checking/testing of relays of 220 KV Bina(MP) – Shivpuri Ckt shall be done at both end and actual cause of tripping shall be investigated and brought to notice so that such false tripping can be avoided in future.

Load Loss

Total Load Loss was approx. 280 MW, 288MWH and duration of outage was approx. 50 Minutes.

Annexure – 2.4.a

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
CIN No. U40109MH2005SGC153646

From:	To
The Superintending Engineer, Testing & Communication Circle, Administrative Bldg, Ground Floor, At-Vijaynagar, Post - Supane. Tal-Karad, Dist: Satara.– 415 114. Contact No.: 02164-255211, 255155 E-mail: - E-mail:se3500@mahatransco.in	The Chief Engineer Trans (O&M) C.O., Mumbai.

Ref No. SE/TCC/KRD/T-93/**63** Date: **03.03.2015**

Sub :- Occurrence analysis report of tripping in Karad, Kolhapur on overvoltage due to sudden demand crash on 01.03.2015 at 3.33 hrs.

On 01.03.2015 at 3.33 hrs. all the 400KV lines tripped on overvoltage. Subsequently the 220KV lines feeding the load tripped on O/C leading to failure of supply in Karad, Sangli and Kolhapur District. The details of tripping and restoration is mentioned in Annexure-I and SLD is enclosed.

Analysis –

1) Due to sudden heavy rainfall there was tremendous demand crash resulting into tripping of 400 KV lines on overvoltage at 400 KV Karad, Kolhapur, New Koyna.
2) The source lines 220KV Pedambe, Pophali, KDPH tripped made Liloed at Nerle, Dasgaon & Satara MIDC tripped on O/C, resulting in no supply to Karad, Kolhapur, Goa, Sangli from 220 KV lines.
3) The remaining part of Satara, Ratnagiri, Sindhudurg districts. were fed from 220 KV KDPH, Pophali ,Pedambe generation & their connected link lines.

Remedial Action:-

1) The necessary steps to be taken to control the overvoltage situation on top priority.
2) Proper time as well as voltage gradation to be done for 400 KV lines.

Submitted for favour of information & needful please.

Encl. :- 1) Annexure-I
2) SLD
3) DR & Event logger.

Superintending Engineer
Testing & Commun. Circle, Karad

Copy s.w.rs.to : 1) The Executive Director (Operations), C.O. Mumbai.
2) The Chief Engineer, EHV (O&M) Zone, Karad.
3) The Chief Engineer, LD, Kalwa.
4) The Chief Engineer, WRLDC, Mumbai.

Copy f.w.cs.to. 1) The Superintending Engineer, EHV (O&M) Circle, Karad/ Kolhapur.
2) The Superintending Engineer (Protection), WRPC, Mumbai.

Copy to. 1) The Executive Engineer, Testing Dn. Karad / Kolhapur
2) The Executive Engineer, 400 KV R.S. Karad/New Koyna/Talandage.

M/F(T)

My Comp./E/TCC15/ Letters-15./Mar-15

Annexure -I

At 400 KV R.S. Karad (Load Affected -804 MW)

Sr. No.	Name of feeder /TF	Window Indication	Relay Indication	Tripping Date & Time	Restoration Date & Time	Generation Affected	Remark
1	400KV Talandge-II	NIL	NIL	28.02.15 16.07	---		H/T for O/V control
2	400KV Jaigad-I	NIL	NIL	28.02.15 16.32	---		H/T for O/V control
3	400KV Solapur (PGCIL)	Over Voltage Trip	REL 670, TOV.	01.03.15 1.44	01.03.15 9.47		Tripped on O/V.
4	400KV Talandge-I	Over Voltage Trip		01.03.15 1.54	01.03.15 9.00		Tripped on O/V.
5	220KV Vita-II	Distance Protection operated.	Distance Relay REL 511	01.03.15 3.04	01.03.15 11.28		Tripped on distance protection. Dist. -2.2KM,IB -18.204 KA
6	400KV Lonikand	Over Voltage Trip	P442, O/V Stage I	01.03.15 03.24	01.03.15 4.22		Tripped on O/V.
				01.03.15 4.24	01.03.15 4.33		As per LD Instruction Line Charged and tripped on O/V
				01.03.15 4.35	01.03.15 7.11		As per LD Instruction Line Charged and tripped on O/V
7	400KV Jaigad-II	Over Voltage Trip	MVT 59	01.03.15 03.24	----		Tripped on O/V.
8	400KV N.Koyana-I	DT Received	NIL	01.03.15 03.24	----		DT Received
9	400KV N.Koyana-II	DT Received	NIL	01.03.15 03.36	01.03.15 6.45		DT Received. As per LD's instruction line charged.
				01.03.15 06.57	01.03.15 8.23		DT Received
10	220KV Dasgaon	NIL	NIL	01.03.15 3.31	01.03.15 4.42		Tripped on O/C at Dasgaon end.
11	220KV Nerle	NIL	NIL	01.03.15 3.34	01.03.15 4.4		Tripped on O/C at Nerle end.
12	220KV M'Peth	Distance Protection operated.	Distance Relay REL 511	01.03.15 4.42	01.03.15 13.15		While charging B Ph L.A. Burst due switching surge. Line tripped on distance protection.
13	400/220KV, 315 MVA ICT-I	NIL	NIL	01.03.15 5.06	01.03.15 10.39		H/T from HV only as per LD's instructions.
14	400/220KV, 315 MVA ICT-II	NIL	NIL	01.03.15 5.07	01.03.15 7.15		
15	400/220KV, 315 MVA ICT-III	NIL	NIL	01.03.15 5.07	01.03.15 7.11		
16	220KV Mudshingi-IV	NIL	NIL	01.03.15 4.1	01.03.15 4.48		H/T for Load management
17	220KV Mudshingi-II	NIL	NIL	01.03.15 4.1	01.03.15 4.5		
18	220KV Kiniwathar	NIL	NIL	01.03.15 4.11	01.03.15 6.04		
19	220KV Nigade	NIL	NIL	01.03.15 4.13	01.03.15 4.5		
20	220KV Vita-I	NIL	NIL	01.03.15 4.13	01.03.15 6		
21	220KV Kadegaon	NIL	NIL	01.03.15 4.13	01.03.15 4.46		
22	220KV S'waghapur - I	NIL	NIL	01.03.15 04.18	01.03.15 12.46		
23	220KV S'waghapur- II	NIL	NIL	01.03.15 04.15	01.03.15 13.58		

At 400 KV R.S. New Koyna (Load Loss in Area = 353 MW)

Sr. No.	Feeder	Relay Indications	Window Indications	Tripping time	Restoration time	Generation Affected	Remark
1	400 KV New Koyna-Stage 4-Ckt-2	186-3,286-3,79,79/186X2	DT carrier recieved, Definite trip A/R Lock out	3:22	7:30		
2	400 KV New Koyna-Karad-Ckt-1	186-3,286-3,59IR,59IY,79,79/186X2	O/V trip, Definite trip A/R Lock out	3:24			
3	400 KV New Koyna-Stage 4-Ckt-1	186-3,286-3,59IY,79,79/186X2	DT carrier recieved, Definite trip A/R Lock out	3:24	9:18		
4	400 KV New Koyna-Jaigad-Ckt-1	86A,DTX-1,86B,DTX-2,o/v relay 59RY,59X	DT carrier recieved, A/R Lock out	3:24	7:43		
5	400 KV New Koyna-Jaigad-Ckt-2	86A,DTX-1,86B,DTX-2,o/v relay	O/V trip , Definite trip A/R Lock out	3:24	9:33		
6	400 KV New Koyna-Karad-Ckt-2	186-3,286-3,59IR,79,79/186X2	O/V trip, Definite trip A/R Lock out	3:33	8:22		

Sr. No.	Name of feeder /TF	Window Indication	Relay Indication	Tripping Date & Time	Restoration Date & Time	Generation Affected	Remark
7	400 KV New Koyna-Dabhol-Ckt-2	Line trippped at Dabhol end but did not trip at NK hence handtripped at NK at 03:54 hrs		3:24	7:53		

At 400 KV R.S. Kolhapur (Load Loss in Area = 261 MW)

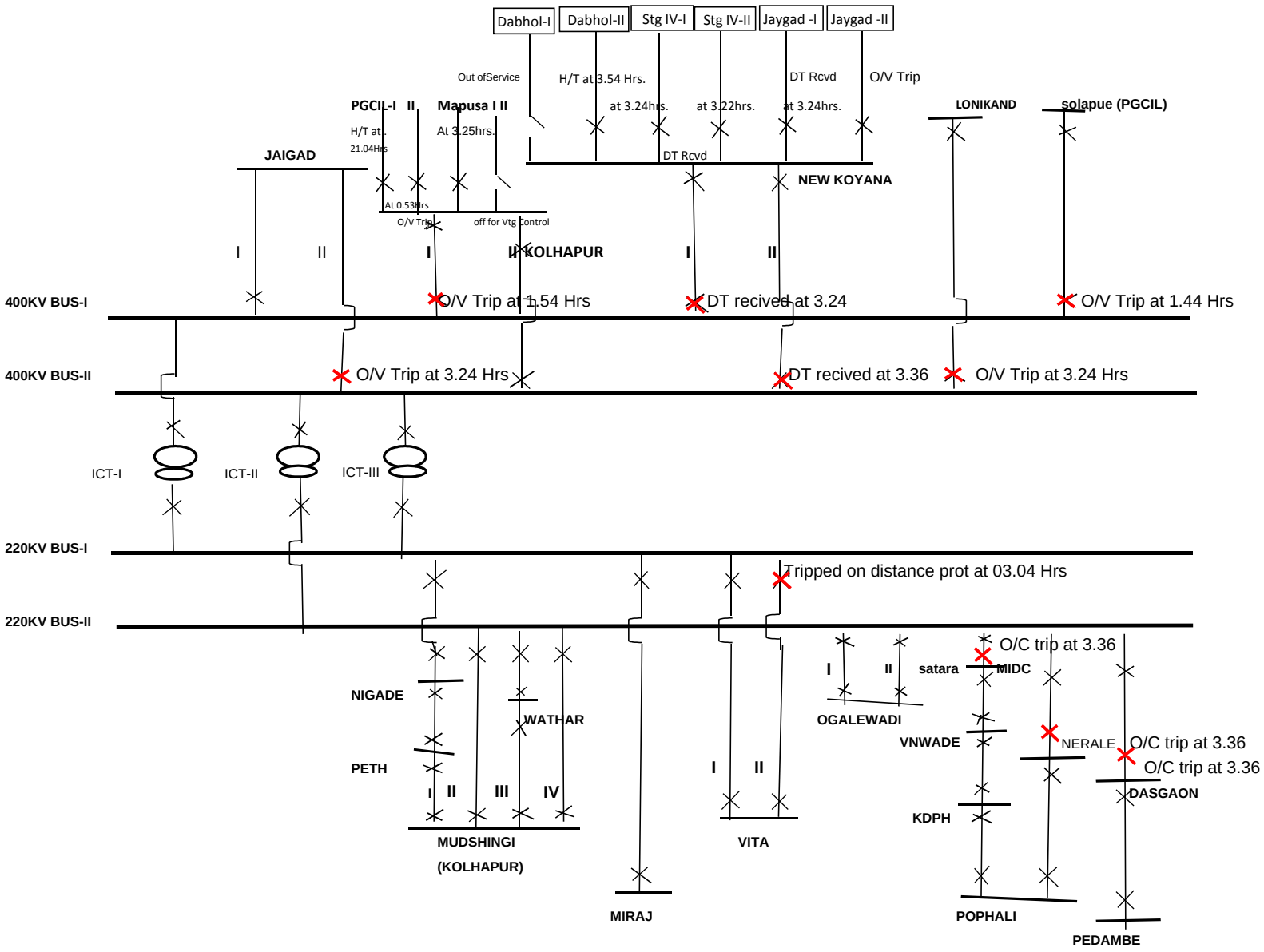
Sr. No.	Feeder	Relay Indications	Window Indications	Tripping time	Restoration time	Generation Affected	Remark
1	400 KV Talandge- Karad Ckt 1	Overvoltage relay operated,	Overvoltage operated.	01.03.2015 1.54	1.3.15 at 9.00 hrs		DR attached
2	400 KV Talandge- Karad Ckt 2	NA	NA	28.02.2015 16.17	Presently off		Out for voltage control
3	400 KV Talandge- Mapusa Ckt 1	NA	NA	01.03.2015 3.25	All 400 KV source line was off so supply was available from 220 KV Mudshingi S/Stn. by step up. On 1.3.15 at 6.02 hrs couldnot stand due to overvoltage. Charged at 7.23Hrs		DR attached
4	400 KV Talandge- Mapusa Ckt 2	NA	NA	25.02.2015 09:00:00	Charged on 02.03.2015 at 09:38 Hrs		
5	400 KV Talandge- Solapur Ckt 1	NA	NA	28.02. 2015 21.04	Hand trip for over voltage control. On 1.3.15 at 5.20 hrs again tripped at 6.44 on overvoltage.Charged at 7.21Hrs		
6	400 KV Talandge-Solapur Ckt 2	Overvoltage relay operated,	Overvoltage operated.	01.03.2015 0.53	Presently kept off for voltage control		unable to communicate with ABB relay
7	220KV Talandge- Mudshingi Ckt 1	--	--	01.03.20153.25	Supply resumed 1.3.15 at 4.44 hrs		All 400 KV source line was off so supply was available from 220 KV Mudshingi S/Stn.
8	220KV Talandge- Mushingi Ckt 2	--	--	01.03.20153.25	Supply resumed 1.3.15 at 4.44 hrs		
9	220KV Talandge-Ichalkarnji Ckt 1	--	Dist.protection optd. Dist. Relay (Micom P442):- started phase AN,Tripped phase ABC, IA=4.471KA, IB=5.945A, IC=5.70A, VAN=22.99KV, VBN=133.0KV, VCN= 137.7 KV, fault Dist=7.397Km	01.03.20153.25	Charged & tripped on distance at 1.3.15 at 8.33 hrs & after attending fault line charged at 18:48Hrs. DR attached		
10	220KV Talandge-Ichalkarnji Ckt 2	--	--	01.03.2015 3.25	Supply resumed 1.3.15 at 4.44 hrs		
11	220KV Talandge- Five Star Ckt 1	--	--	01.03.2015 3.25	Supply resumed 1.3.15 at 4.44 hrs		
12	220KV Talandge- Five Star Ckt 2	--	--	01.03.2015 3.25	charged dt. 1.3.15 at 14.48 hrs		
13	220KV Talandge- Hamidwada	--	--	01.03.2015 3.25	Charged dt 1.3.15 at 5.28 hrs		
14	220KV Talandge- Sawantwadi Ckt 1	--	--	01.03.2015 3.25	Supply resumed 1.3.15 at 4.44 hrs		
15	220KV Talandge- Sawantwadi Ckt 2	--	--	01.03.2015 3.25	Supply resumed 1.3.15 at 4.44 hrs		
16	220KV Talandge- Chikodi	--	--	01.03.2015 3.25	Charged dt. 1.3.15 at 6.32 hrs		
17	Ict 1 & 2	--	--	01.03.2015 3.25	Charged dt. 1.3.15 at 7.23 hrs		

Note :- 1) There is no event or DR recorded on 01.02.2015 in PMU unit of WAMS project

2) Load loss in Area= 261 MW

3) DR of lines attached with this Email

OCCURRENCE ON DATED 01.03.15 AT 3.24 Hrs AT 400KV KARAD SUB-STATION



Annexure - 2.4.b

Report on Load Crash in Western region on 28th Feb- 1st March 2015 and load Loss in Southern Maharashtra and Goa on 1st March 2015

Summary: Due to rains in the Western region since the afternoon of 28th February'15 clubbed with the weekend effect, load crash of 6000-13000 MW has occurred in the western Region on 28th feb-1st March 2015. This has resulted in high frequency and high voltage operation in the grid. Several 400/765 kV lines were opened in Western region and several others have tripped on overvoltage during the period. The situation was controlled with reduction in ISGS and State generation, yet the high voltage scenario prevailed in the Southern Maharashtra (Karad, Kolhapur area) & Goa. The lines that were interconnecting these areas from the Western grid tripped one by one since the late night hour of 28th February'15. At 03:35 Hrs of 1st March 2015, the remaining few 400 and 220 kV interconnection circuits have also tripped on over voltage resulting in islanding of 400/220 kV New Koyna, Karad, Kolhapur, Jaigad and Mapusa and 220 kV stations in the area from the grid. The islad consisting these stations collapsed immediately. This led to Load loss in tune of around 950 MW (Southern Maharashtra and Goa) and generation loss of 415 MW (Jaigad and Koyna) resulting in frequency rise by 0.0775 Hz.

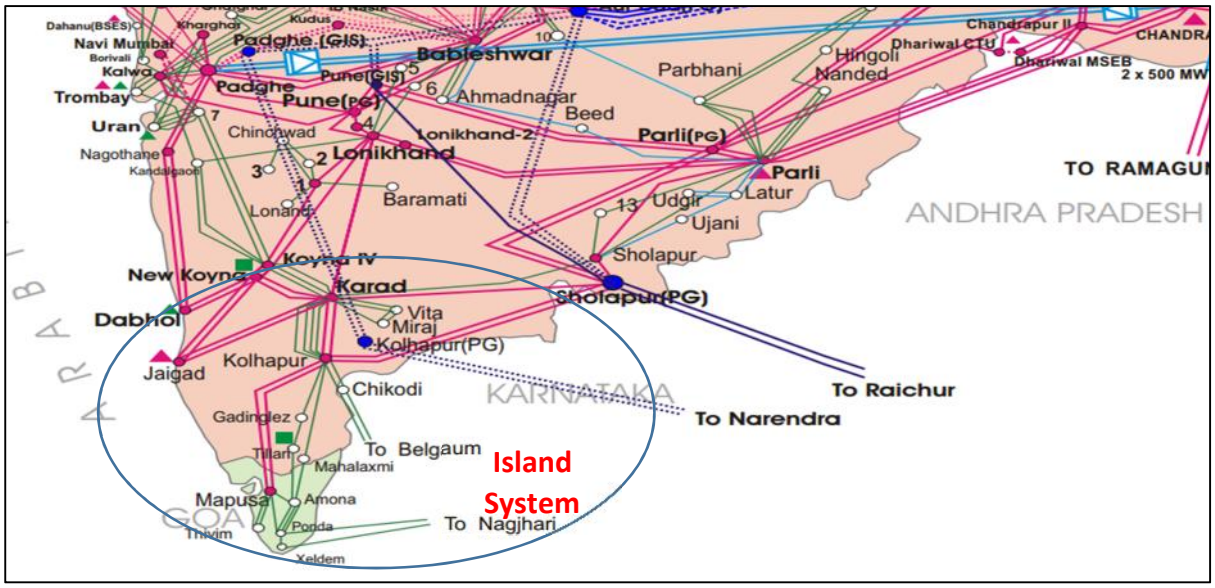


Figure 1: Schematic Diagram

Event Description: IMD has predicted the inclement weather in Western regional grid with rains on 28th February and 1st March 2015. The adverse weather with rainfall started since the afternoon of 28th February 2015 in the Maharashtra, Madhya Pradesh and Parts of Gujarat that was followed with by the load crash in the Western Grid of India. The demand in Western region has started decreasing from 13:30 Hrs of 28th February onwards and the demand quantum reduction has increased significantly after 18:30 Hrs. At 00:00 Hrs on 1st March the Western Region demand has reduced by around 6000 MW compared to 27th and 28th February 2015 that kept on decreasing. On 1st March'15 at 11:00 Hrs, the Western region demand has reduced by a quantum 13000 MW compared to 27th and 28th Feb'15. The Demand plot of Western region for 27th & 28th Feb and 1st

march 2015 is shown in figure 2. This load crash event was accompanied by high frequency in the system and high voltage scenario across the Western Grid especially in Maharashtra. The frequency of 27th & 28th Feb and 1st March 2015 is shown in figure 3 and the voltage of various nodes in Maharashtra from 14:00 Hrs on 28th feb -14:00 Hrs 1st March is given in figure 4, 5 & 6.

From the frequency plot, it can be observed that, excess generation was prevailing in the grid due to the load crash event. The frequency has touched 50.53 Hz on 1st March 2014 at 03:37 Hrs and 50.51 Hz at 21:51 on the same day.

The voltage plots indicate that voltage of 765 kV buses i.e. Wardha, Durg, Solapur and Raichur were more than 790 kV throughout the period. While at 400 kV levels, Bhusawal, Koradi, Akola, Akola2, Kolhapur, Dhule, Lonikhand,Chakan, Solapur (MS), New Koyna, RGPPL, Solapur and Parli (PG) were more than 420 kV during the period which was alarming. The voltage was more than 430 kV for New Koyna, RGPPL, Chakan, Solapur (MS), Bhusawal S/s for most of the duration of time causing lines tripping on over voltage protection.

WRLDC/SLDC Control Room operators have opened several lines one by one to control the high voltage situation keeping the grid reliability in view. The detailed list of lines, which were opened on H/V, tripped on O/V, tripped on fault, planned outage are given below.

List of lines opened/tripped Prior to 21:00 Hrs on 28th February 2015						
S.No	**Name of Line/ICTs/Units**	**Out Date**	**Out Time**	**Synch Date**	**Synch Time**	**Reason**
1	400 kV Dabhol-New Koyna I	08-02-2015	18:18	S/O	S/O	Open to control H/V
2	400 kV Dabhol Nagothane II	13-02-2015	18:02	S/O	S/O	Tripped on O/V and Kept out.
3	765 kV Seoni-Wardha II	24-02-2015	18:00	S/O	S/O	Tripped on O/V and Kept out.
4	400 kV Kolhapur-Mapusa II	26-02-2015	08:43	01-03-2015	11:38	Insulator Replacement Work. Ready at 19:19 but kept open to control H/V
5	400 kV Khandwa-Rajgarh II	26-02-2015	17:37	S/O	S/O	Open to control H/V
6	400 kV Taptithanda-A'bad(MS)	27-02-2015	18:20	S/O	S/O	B Phase Jumper Open
7	400 kV Taptithanda-Bab'war I	27-02-2015	19:56	S/O	S/O	To control Overloading of Bableshwar ICTs
8	400 kV Bhusawal-Koradi	28-02-2015	08:45	S/O	S/O	Planned Outage
9	400 kV Parli(MS)-lonikhad2 II	28-02-2015	16:29	01-03-2015	11:29	Tripped on Fault
10	400 kV SSP-Dhule I	28-02-2015	17:14	01-03-2015	08:40	Open to control H/V
11	400 kV Karad-Kolhapur II	28-02-2015	16:07	S/O	S/O	Open to control H/V
12	400 kV Karad-Jaigad I	28-02-2015	16:35	S/O	S/O	Open to control H/V
13	400 kV AKola2-Taptithanda	28-02-2015	19:01	01-03-2015	08:32	Sparking on R-Ph CVT jumper at Taptithanda end
14	400 kV Damoh-Bhopal II	28-02-2015	19:10	S/O	S/O	Open to control H/V
15	400 kV Pune(PG)-Pune(GIS) II	28-02-2015	19:37	01-03-2015	12:38	Tripped on Fault
16	400 kV Lonikhand - Koyna IV	28-02-2015	20:05	01-03-2015	09:25	To control Overloading
17	400 kV Solapur-Kolhapur I	28-02-2015	21:04	01-03-2015	05:20	Open to control H/V

Further, the generation in ISGS and State generation were reduced in Western region to control the high frequency scenario. ISGS Generation was reduced from 21000 MW to 12877 MW as per the given details:

- 16:00 Hrs 28th February 2015: 21000 MW
- 20:00 Hrs 28th February 2015: 19579 MW
- 00:00 Hrs 1st March 2015: 17758 MW
- 03:00 Hrs 1st March 2015 : 12877 MW

Following units from ISGS were withdrawal:

- VSTPS Unit 5 : 00:28 Hrs 1st March 2015
- VSTPS Unit 10 : 05:24 Hrs 1st March 2015
- VSTPS Unit 3 : 09:26 Hrs 1st March 2015

In addition, the CGPL, VSTPS, Sipat, Korba generation were reduced to run at technical minimum and generation reduction at GMR Chhattisgarh, KWPCL has also been undertaken. Figure 8 shows the generation at Vindhyachal, Korba, Sipat, CGPL and Sasan in Western Region.

Maharashtra, Gujarat and Madhya Pradesh also have reduced their own generation, which is shown in figure 9, 10 and 11. Two units of Ghatgar (2X125 MW) were running in Pumping Mode.

Yet after taking these actions, the voltage remained high in the Southern Maharashtra and Goa and lines were tripping one after another on overvoltage protection. Due to high wind generation in Karad area and inadequate reactive power support at 400 kV levels at the Karad and Kolhapur area, the voltage remain very high in the area (Wind energy is Maharashtra is concentrated around Karad and Akola S/s which due to absence of inadequate bus reactors leads to high voltage on these nodes).

- High wind generation in the Karad area can be seen from the wind generation in Maharashtra on these days.
  - 26 Feb : 7.93 MUs,
  - 27 Feb: 5.91 MUs,
  - **28 Feb : 8.16 MUs**
  - **1 March 13.108 MUs**

Further adding to details, it was found that Koyna complex generation has been reduced to 34 MW resulting once again in lack of reactive power absorption in the area. In addition, only two units of Koyna were running in condenser mode that was not able to control the reactive power compensation in the area.

The prevailing high voltage led to tripping of a several number of lines between 00:00 Hrs-03:35 Hrs on 1st march whose details are given below:

List of Line which tripped after 21:00 Hrs of 28th February till 03:35 Hrs of 1st March 2015						
1	400 kV Dabhol Nagothane I	01-03-2015	00:44	S/O	S/O	Tripped on O/V
2	765 kV Seoni-Wardha I	01-03-2015	00:44	S/O	01:16	Tripped on O/V
3	765 kV Durg -Wardha II	01-03-2015	00:44	S/O	S/O	Tripped on O/V
4	400 kV Mouda-IEPL	01-03-2015	00:44	S/O	S/O	Tripped on O/V
5	400 kV Solapur-Kolhapur II	01-03-2015	00:55	S/O	S/O	Tripped on O/V
6	400 kV Solapur-Solapur(MS)	01-03-2015	01:33	S/O	07:21	Distance protection
7	400 kV Parli(MS)-Solapur(MS)	01-03-2015	01:33	S/O	S/O	Tripped on O/V
8	400 kV Karad-Solapur	01-03-2015	01:44	01-03-2015	09:47	Tripped on O/V
9	400 kV Karad-Kolhapur I	01-03-2015	01:54	01-03-2015	09:00	Tripped on O/V
10	400 kV Chandrapur-Parli(MS)	01-03-2015	02:18	01-03-2015	18:51	Tripped on O/V
11	220 kV Karad-Vita II	01-03-2015	03:04	01-03-2015	11:28	Distance protection , B Phase fault
12	400 kV New Koyna-Koyna IV II	01-03-2015	03:22	01-03-2015	07:30	Tripped on O/V
13	400 kV Dabhol-New Koyna II	01-03-2015	03:24	01-03-2015	07:53	Tripped on O/V
14	400 kV Karad-New Koyna I	01-03-2015	03:24	01-03-2015	07:43	Tripped on O/V
15	400 kV Karad-Lonikhand	01-03-2015	03:24	01-03-2015	07:00	Tripped on O/V
16	400 kV Jaigad-New Koyna I	01-03-2015	03:24	01-03-2015	07:43	Tripped on O/V
17	400 kV Jaigad-New Koyna II	01-03-2015	03:24	01-03-2015	09:33	Tripped on O/V
18	220 kV Karad Vita 2	01-03-2015	03:24	01-03-2015	07:43	Tripped on O/V
19	400 kV Karad-Jaigad II	01-03-2015	03:24	S/O	S/O	Tripped on O/V
20	400 kV New Koyna-Koyna IV I	01-03-2015	03:24	01-03-2015	09:18	Tripped on O/V
21	220 kV Karad-Dasgaon	01-03-2015	03:31	01-03-2015	04:42	Tripped on O/C from Dasgaon
22	400 kV Karad-New Koyna II	01-03-2015	03:33	01-03-2015	08:22	Tripped on O/V
23	400 kV SSP-Dhule I	01-03-2015	03:35	S/O	S/O	Tripped on O/V
24	400 kV Bableshwar-Padghe II	01-03-2015	03:35	01-03-2015	07:52	Tripped on O/V
25	220 kV Karad-Nerle	01-03-2015	03:35	01-03-2015	04:40	Tripped on O/C from Nerle
26	22 kV Satara MIDC-M'peth	01-03-2015	03:35	01-03-2015	04:09	Tripped on O/C from Satara MIDC
27	765 kV Pune-Solapur	01-03-2015	04:34	S/O	S/O	Open to control H/V

From the above table, it is observed that the RGPPL station has blackout at 03:24 Hrs with the tripping of 400 kV Dabhol-New Koyna II circuit. While at 03:35 Hrs, the lines connecting Karad and New-Koyna with WR grid tripped resulting in islanding of Karad, New Koyna, Kolhapur, Mapusa , Jaigad and lower voltage level Stations in Southern Maharashtra and Goa. The Islanded portion of the system is shown in figure 12 that has collapsed immediately as intimated by Maharashtra SLDC, Goa SLDC, and Karad S/s. The list of Dead line in the area is given below.

List of Lines/ICT/Units in the Island which became Dead						
1	400/220 kV Karad ICT 3	01-03-2015	03:35	01-03-2015	07:11	Island Collapsed
2	400 kV Kolhapur-Mapusa I	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
3	220 kV Mapusa-Tivim I	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
4	220 kV Mapusa-Tivim II	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
5	220 kV Mapusa-Ponda	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
6	220 kV Mapusa-Amona	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
7	400/220 kV Mapusa ICT 1	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
8	400/220 kV Mapusa ICT 2	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed

9	400/220 kV Mapusa ICT 3	01-03-2015	03:35	01-03-2015	07:22	Island Collapsed
10	400/220 kV Karad ICT 2	01-03-2015	03:35	01-03-2015	07:25	Island Collapsed
11	400/220 kV New Koyna ICT 1	01-03-2015	03:35	01-03-2015	07:39	Island Collapsed
12	400/220 kV New Koyna ICT 2	01-03-2015	03:35	01-03-2015	07:49	Island Collapsed
13	400/220 kV Kolhapur ICT 1	01-03-2015	03:35	01-03-2015	09:20	Island Collapsed
14	400/220 kV Kolhapur ICT 2	01-03-2015	03:35	01-03-2015	09:22	Island Collapsed
15	220 kV Kolhapur-Chikodi	01-03-2015	03:35	01-03-2015	10:25	Island Collapsed
16	400/220 kV Karad ICT 1	01-03-2015	03:35	01-03-2015	10:39	Island Collapsed
17	Jaigad Unit 4	01-03-2015	03:35	01-03-2015	14:40	Island Collapsed
18	220 kV Muhsungi-Chikodi	01-03-2015	03:35	01-03-2015	22:25	Island Collapsed
19	Jaigad Unit 2	01-03-2015	03:35	S/O	S/O	Island Collapsed

Loss of generation and Load: The loss of Island comprising Thermal generation of 380 MW at Jaigad, 35 MW of Koyna hydro generation and Wind generation at Karad along with the loads at Karad, Kolhapur, Mapusa and New Koyna led to rise of frequency by 0.0775 Hz as shown in figure 13. The load loss in Goa was as informed by SLDC was in tune of 250 MW. While the load loss in Maharashtra was around 700 MW with generation loss 415 MW (380 MW Jaigad Unit 2,4 and Koyna 34 MW). The islanding has resulted in effective load loss in tune of 545 MW (This exclude the wind generation at Karad) leading to increase in power flow on 765 kV Solapur Raichur D/C ckts from 400 MW to 620 MW on each circuit shown in figure 14. The power number during the tripping for Indian grid was 545/0.0775 = 7000 MW.

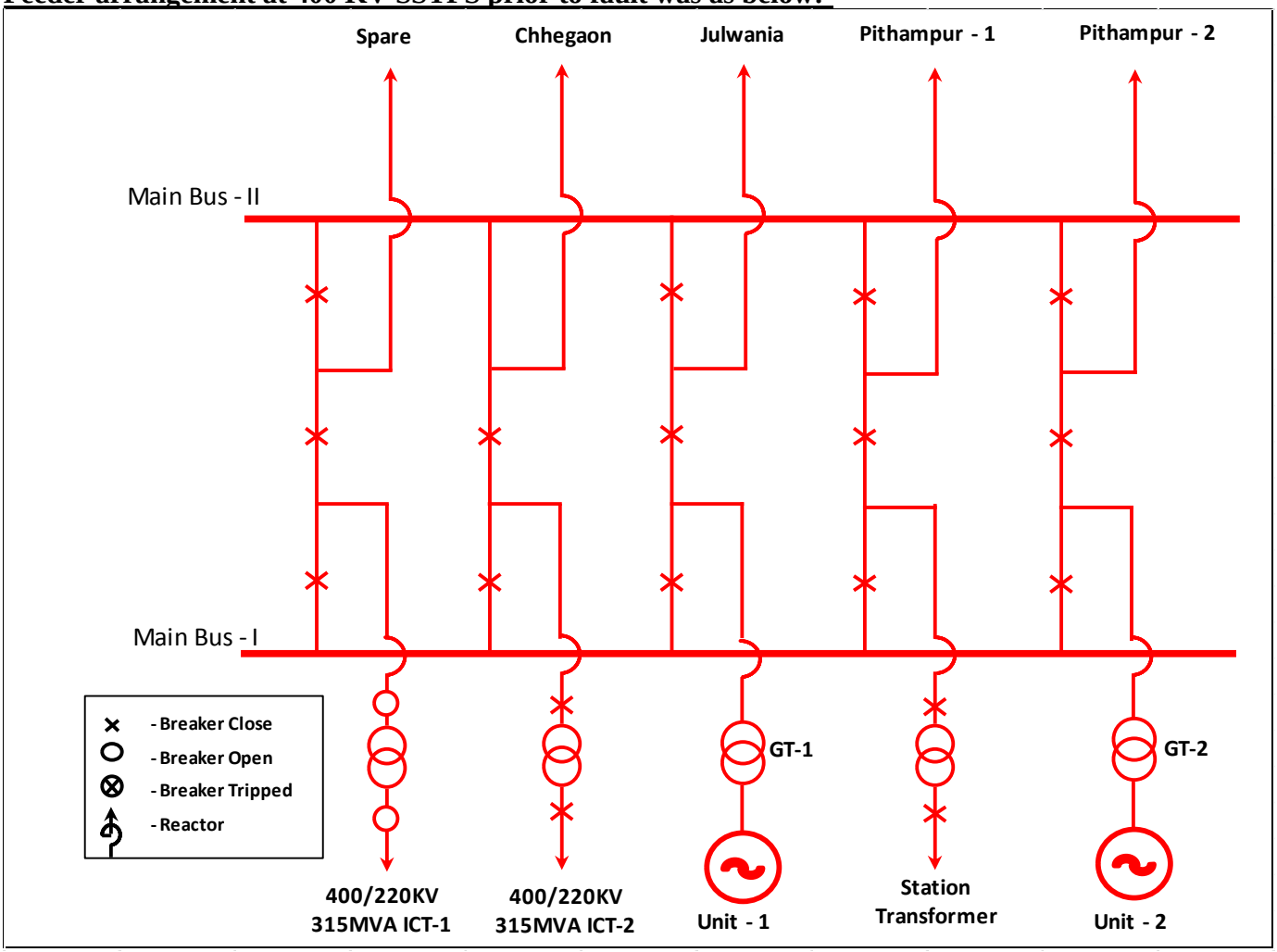
Restoration: Restoration attempts were started immediately by charging of 220 kV Karad Bus 220 kV lines from pophali and KDPH generation, which was extended to 220 kV Mudhsungi through 220 kV circuit and Mudhsungi, extended the supply to 220 kV bus of Kolhapur. SR supply was extended to Goa to cater around 70 MW load in their system and starting of GEPL and SSL unit. Further the loads were restored in goa with 400 kV Mapusa revival at 07:22 Hrs. 400 kV Kolhapur Bus was charged with supply extension from Solapur through 400 kV Solapur-Kolhapur 1 line. Then, Goa supply was restored by 07:22 Hrs by charging 400 kV Kolhapur-Mapusa I circuit. Supply to RGPPL sub-station resumed by charging 400 kV Dabhol-New Koyna 2 circuit by 07:53 Hrs. After reduction in voltage, other lines were taken one by one to restore the complete system.

Pre-Fault Condition

On dated 07.03.14 at around 11:15Hrs. MP System was normal and frequency of National Grid was 49.84 HZ.

At SSTPS all 400 KV & 220 KV feeders were in charged condition and normally loaded. At 400 KV SSTPS one & half breaker scheme exists.

Feeder arrangement at 400 KV SSTPS prior to fault was as below:-



Prior to fault Auto Reclose scheme of 400 KV SSTPS – Julwania Ckt was not in service from 400 KV S/s Julwania end. At SSTPS Auto Reclose scheme was in service.

Loading of feeders/transformers at SSTPS prior to fault (*at 11:15 Hrs.*) was as below('+ive' export & '-ive' import)

S.No.	Name of feeder/transformer	MW Loading
1.	400 KV SSTPS – Chhegaon Ckt	143
2.	400 KV SSTPS – Julwania Ckt	172
3.	400 KV SSTPS – Pithampur Ckt – I	139
4.	400 KV SSTPS – Pithampur Ckt – II	139
5.	400/220 KV, 315 MVA ICT - I	0
6.	400/220 KV, 315 MVA ICT – II	129

7.	Unit – 1 (600 MW)	377
8.	Unit – 2 (600 MW)	386

Occurrence

At 11:23Hrs., due to transient fault in 'Y'- Phase, 400 KV SSTPS – Julwania Ckt tripped from both end and simultaneously SSTPS Unit - 1 & 2 also tripped. The indications were as follows

S.No.	Name of Feeder/transformer	Tripping End	Tripping Time	Indication
1.	400 KV Julwania – SSTPS Ckt.	Both End	11:23 Hrs.	**Julwania end:**- DPR optd., Zone-I, Y-Phase, Dist-14.8 Km.
				SSTPS end:- Zone-II, Y-Phase, 80.7% of line.
2.	SSTPS Unit - 1	-	11:23 Hrs.	Electrical Fault
3.	SSTPS Unit - 2	-	11:23 Hrs.	Electrical Fault

The report & relay indications provided by SE (T&C), MPPTCL, Indore is enclosed as Annexure – I to VI and the MOM of MPPGCL & MPPTCL Engineers visit on 09.03.2015 to SSTPS for discussion and analysis of the above occurrence is enclosed as Annexure – VII. The DR Files and setting files of the relays provided by MPPGCL & MPPPTCL shall be e-mailed in soft copy.

As per the DR findings, total fault current was about 5.03 KAmp. 400 KV SSTPS – Julwania Ckt tripped from 400 KV Julwania end in Zone – I and the fault was cleared in 65Milisecons from Julwaniya end. It can be gathered from the event logger file that carrier send signal was generated at Julwania end but the carrier send signal was not transmitted, due to non-operation of one of the auxiliary relays at 400 KV Julwania end. This resulted in clearance of fault from SSTPS end in Zone-II time (*fault was cleared in 361miliseconds from SSTPS end*) consequently fault was being fed by SSTPS Unit – 1 which is in same Dia with 400 KV SSTPS – Julwania ckt at SSTPS. Resulting in tripping of SSTPS Unit – 1 on Non-directional E/F signal on definite time delay E/F feature.

SSTPS Unit – 2 tripped on TEE differential signal which is undesirable and cannot be linked with the above occurrence.

Due to the above tripping there was no interruption or load loss.

Remedial Measures

1. 400 KV Julwania – Chhegaon Ckt was chatged at – 12:10 Hrs.
2. SSTPS Unit – 1 (600MW) was synchronized at – 15:58 Hrs. on 07.03.2015.
3. 400 KV SSTPS – Julwania Ckt charged at – 11:02 Hrs. on 08.03.2015.
4. SSTPS Unit -2 (600MW) was synchronized at – 19:07 Hrs. on 10.03.2015.

Conclusion

- The tripping of 400 KV SSTPS – Julwania Ckt occurred due to transient fault in 'Y'- Phase and due to non-operation of auxiliary relay responsible for sending the carrier signal fault at SSTPS end was detected in Zone-II.
- The general observations and the findings of the engineers of MPPTCL & MPPGCL to be reviewed is as below:-
  "

1. *400 KV SSTPS – Julwaniya feeder tripped on B phase Zone I from 400 KV S/s Julwaniya and on B phase Zone II from SSTPS end. The DPR of 400 KV S/s Julwaniya issued Carrier Send signal as seen in the event records and DR of this relay, But not transmited to SSTPS due to non-operation of a auxiliary relay, hence tripping at SSTPS end occurred in Zone II time.*
2. *Generator I at SSTPS is with the 400 KV Julwaniya circuit in same DIA. It tripped on non-directional E/F signal from MICOM P141 relay on definite time delay E/F feature. The settings of this relay are 520 milliAmp with 100millisecond. The tripping time as seen from the DR of this relay is 125 millisecond for this tripping.*
3. *Generator II at SSTPS is with the 400 KV Pithampur circuit II in same DIA. It was tripped on TEE Differential signal, which was undesirable.*
4. *As per discussions and findings, the relay setting of non-directional E/F element of generator is required to be revised, it should be in time coordination with earlier stages of protection, and at least as back up to Zone II timings. Existing settings are given as per the recommendation of M/s Schneider and approved from design cell Jabalpur.*
5. *The analysis of Prefault & fault values as seen from the DR of Tee differential relay operated suggested that the CT circuit connections of all the CTs involved in Tee Differential circuit should be checked for any mismatch of secondary core or wiring termination. However these connections checked by MPPGCL engineers as per drawings at CT Junction Box.***"**

- The settings of MICOM P141 relay of SSTPS Unit – 1 and TEE differential relay shall be reviewed to avoid such trippings and outage of large generating units in future.

Generation Loss:- Due to tripping of SSTPS Unit - 1 & 2 there was generation loss of about 763 MW

Load Loss:- NIL

Annexure – 2.6

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
CIN No. U40109MH2005SGC153646

From:	To
Superintending Engineer, Testing & Communication Circle, Administrative Bldg, Ground Floor, At-Vijaynagar, Post - Supane. Tal-Karad, Dist: Satara.– 415 114. Contact No.: 02164-255211, 255155 E-mail: - E-mail:se3500@mahatransco.in	The Chief Engineer EHV CC (O&M) Zone, Karad.

Ref No. SE/TCC/KRD/T-93/**78** Date: **16.03.2015**

Sub :- Occurrence analysis of 220 KV Busbar protection operated at 220 KV Lote S/Stn. on Dtd. 11.03.2015 at 03.33Hrs.

Ref :- EE / TEST / KOP/TECH/ Dtd. 13.03.2015

On Dt. 11.03.2015 at 3.33 Hrs. at 220 KV Lote S/Stn.. the cable trench of EHV cables caught fire because of burning of DISCOM cable. This led to burning of CT secondary cable and 220KV Busbar protection was operated .

The Window & Relay indication at time of occurrence is as given below:

Sr. No.	Name of S/Stn.	Name of feeder /TF	Window Indication	Relay Indication	Tripping Date & Time	Restoration Date & Time	Load Affected
1	220 KV Lote	220KV New Koyna	Bus bar Protection optd	NR Scope 220 KV Busbar operated.	11.03.2015 03:33Hrs.	11.03.2015 21:25Hrs.	23MW
2		220 KV Dasturi			11.03.2015 03:33Hrs.	11.03.2015 21:30Hrs	
3		220/33KV, 50MVA T/F(I&II)			11.03.2015 03:33Hrs.	11.03.2015 21:40Hrs	

Analysis:

1) On 11.03.2015 at 3.33 hrs. MSEDCL 33KV yard control cables caught fire while giving trial on 11KV indoor incomer.
2) The 33KV USV feeders CT, CB and control cables got burnt in DISCOM yard and caught fire at each and every point where earthing or earth mat was crossing.
3) The MSEDCL 33/11KV switchyard is located close to 220KV Lote S/Stn. of MSETCL which is situated in old 33KV Lote S/Stn. (erstwhile MSEB)control room. All the control cable of MSETCL from control room to switchyard are passing through MSEDCL 33/11KV switch yard.
4) Hence due to the burning of DISCOM cable , the 220KV EHV cables also caught fire leading to burning & shortening of CT secondary cable and further operation of 220KV Busbar protection which is in order.
5) The 220KV Lote - Dasturi and 220KV Lote - NewKoyna line alongwith 220/33KV transformer tripped and S/Stn. went into dark.

Remedial Action:-

1) The DC supply was made off as there was heavy DC leakage after the occurrence.
2) The cables which were totally burnt were taken into temporary marshalling box and those which are slightly burnt were cleaned and reinsulated with insulation tape.
3) After cable termination the 220KV Lote - Dasturi and 220KV Lote- New Koyna line alongwith 220/33KV transformer (I &II) were taken into service.

Remarks

1) Burnt cables need to be replaced on urgent basis before monsoon.
2) Earth mat of MSETCL and MSEDCL substations should be separate. (There is frequent failure of equipments like PC, battery charger etc. while 11KV or 33KV close fault from DISCOM substation yard).
3) Presently MSETCL and MSEDCL substations 440V AC station supply is on same 33/0.44KV T/F which is powered at MSETCLs switch yard. This should be separate.
4) Presently MSETCL control room is located in 30*30 ft area. This is very congested for 2 Nos of 220KV lines, 2 Nos of 220/33KV Transformers and 9 Nos of outgoing lines. It is very inconvenient for operating staff. Also it is situated very close to 33/11KV switchyard of MSEDCL.
5) It is therefore very necessary and indispensable to construct new control room for 220/33KV Lote S/Stn. on top priority and shift all the panels to new control room to avoid such occurrences in future

Submitted for favour of information & needful please.

Superintending Engineer
Testing & Commun. Circle, Karad

Copy s.w.rs.to : 1) The Executive Director (Operations), C.O. Mumbai.
2) The Chief Engineer, Trans (O&M) C.O.Mumbai.
3) The Chief Engineer, LD, Kalwa

Copy f.w.cs.to : 1) The Superintending Engineer, EHV (O&M) Circle, Kolhapur
2) The Superintending Engineer, Civil circle ,Kolhapur
} for necessary action please.

Copy to. 1) The Executive Engineer, Testing Dn., Kolhapur.
2) The Executive Engineer, EHV (O&M) Dn., Ratnagiri
3) The Executive Engineer, Civil Dn. Karad
} for necessary action.

M/F(T)

Annexure – 2.7

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD.
CIN No. U40109MH2005SGC153646

From:	To
Superintending Engineer, Testing & Communication Circle, Administrative Bldg, Ground Floor, At-Vijaynagar, Post - Supane. Tal-Karad, Dist: Satara.– 415 114. Contact No.: 02164-255211, 255155 E-mail: - E-mail:se3500@mahatransco.in	The Chief Engineer EHV CC (O&M) Zone, Karad.

Ref No. SE/TCC/KRD/T-93/**84** Date: **20.03.2015**

Sub :- Occurrence analysis of 220 KV Lonand S/Stn. on Dtd. 18.03.2015 at 8.20 Hrs.

Ref :- Addl.E.E. / T.U / STR/No. 93 Dtd. 19.03.2015

On Dt. 18.03.2015 at 8.20 hrs. at 220 KV Lonand S/Stn., 220/132 KV, 200 MVA ICT-II is tripped without any indications. Due to overloading, another ICT-I also tripped.

The Window & Relay indication at time of occurrence is as given below:

Sr. No.	Name of S/Stn.	Name of feeder /TF	Window Indication	Relay Indication	Tripping Date & Time	Restoration Date & Time	Load Affected
1	220 KV Lonand	220/132KV 200MVA ICT-II	Nil	Nil	18.03.15 8:20 hrs.	18.03.15 08:37 hrs.	187 MW part of Satara & Pune
2		220/132KV 200MVA ICT-I	O/C, E/F Protn. (LV) operated.	Master Trip,Back up Relay operated.	18.03.15 8:20 hrs.	18.03.15 8:37 hrs.	

Analysis: The 220/132 KV, 200 MVA ICT-II may be tripped due to shorting of 86 Relay contact No. 1 & 2 by external mean. Hence 86X operated & transformer HV & LV CB opened.

Remedial Action: 86 relay (Master trip) was checked and found OK. However, coil of 86X (Auxiliary relay) found burnt. Hence same is replaced by healthy one.

Submitted for favour of information & needful please.

Superintending Engineer
Testing & Commun. Circle, Karad

Copy s.w.rs.to : 1) The Executive Director (Operations), C.O. Mumbai.
2) The Chief Engineer, Trans (O&M) C.O.Mumbai.
Copy f.w.cs.to : The Superintending Engineer, EHV (O&M) Circle, Karad
Copy to. 1) The Executive Engineer, Testing Dn., Karad.---For preparing load trimming scheme to avoid the tripping of the transformer due to overloading of another transformer.
2) The Executive Engineer, EHV (O&M) Dn., Karad.

M/F(T)

My Comp./E/TCC15/ Letters-15./Mar-15

Annexure – 2.8

Detailed report on the occurrence at EMCO Sub-station on 4th April 2015

1. **Event Category :** GD-1
2. **Event Date and Time:** 4th April 2015, 09:30 Hrs.
3. **Event :** At 09:30 Hrs, 400 kV EMCO-Bhadrawati circuit 2 tripped on R Phase to earth fault resulting in loss of evacuation system for EMCO causing tripping of Unit 1 and 2. Prior to the event 400 kV EMCO-Bhadrawati 1 was take out for Maintenance activity at 09:19 Hrs. The generation loss during the event was 387 MW.

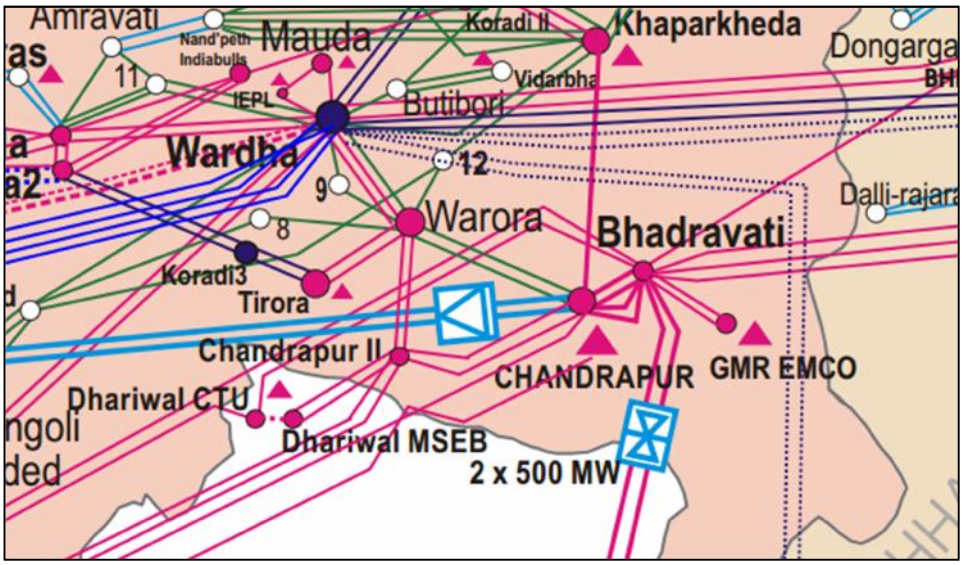


Figure 1 : Geographical Network Diagram

Restoration: 400 kV EMCO-Bhadrawati 2 was taken back in service at 10:12 Hrs. Unit 1 was synchronized at 13:19 Hrs and Unit 2 at 15:28 Hrs.

4. **Analysis:** 400 kV Bhadrawati-EMCO 2 has tripped on R phase to earth fault .Fault location was 32.34 km from EMCO and 0.7 km from Bhadrawati.

5. **Suggestion: During the analysis of event, it was found that A/R has not been attempted for this line on either end.** EMCO is advised to take the A/R of the line in service to improve the line availability. Further the auto-reclosure on lines from generating station can be set as per the recent discussion in 123rd PCM meeting of Western region where generating end can auto-reclose the circuit for single phase fault aster sensing the voltage in faulty phase with successful A/R at remote

end. The same was also advised to EMCO vide letter WRLDC/MO-III/1737/2015/265 dt 25th March 2015.

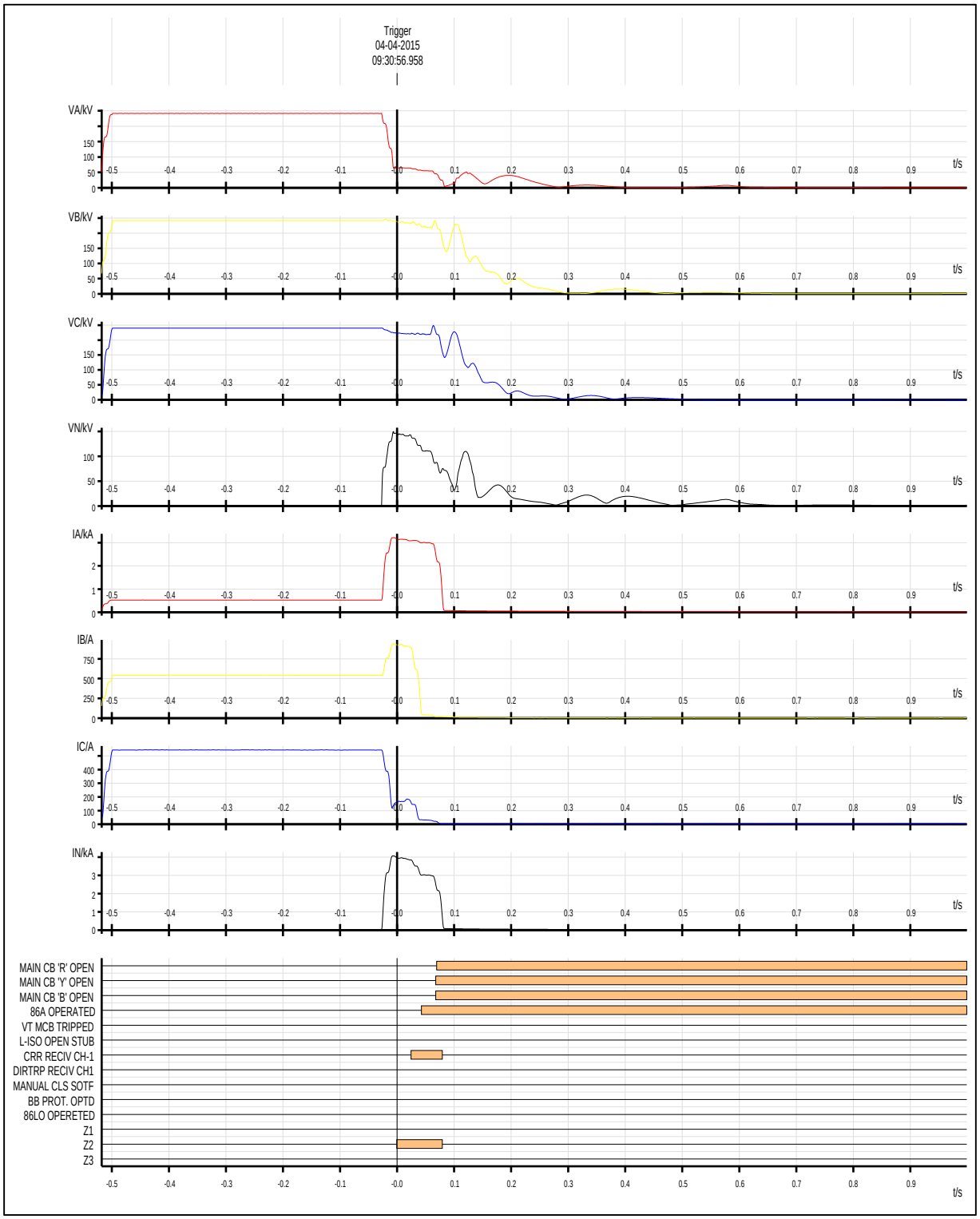


Figure: DR of EMCO –Bhadrawati 2 from EMCO end.

Annexure – 2.9

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.

From:	To,
Name of Office: Superintending Engineer Office address: Testing and Telecommunication Circle Block No.12 MSETCL Admin, Bldg. Racca Plot, Old Saykheda Road, Jail Road, Nashik (422101) Phone No : 0253-2403181 Email Id : se5500@mahatransco.in	The Chief Engineer, Trans O&M, MSETCL, C.O. Mumbai.

Ref. No. SE/TCC/NSK/T-9/142 Date: 14.05.2015

Sub: - Occurrence report of Bus Bar operation at 132kV Deepnagar on Dt: 06.04.2015.

Ref:- EE/TD/NSK/TECH/T-4/247 Date:13.11.2014

On Dt:06.04.2015 at 18:23 Hrs, at 132kV Deepnagar, R-Ph CT of 132 KV Muktainagar feeder which was connected to Bus-1 burst and caught fire due this smoke and fumes of fire were spread up to adjacent B-ph CT and isolator of 132kV Khadka which was connected to Bus-2 bay. This resulted into operation of Bus Bar Zone A first and then Bus Bar Zone B correctly. The WI and RI are as below.

Bus wise feeders position at 132 kV Deepnagar S/s before occurrence:-

BUS - 1	BUS - 2
132 kV Muktainagar	132 kV Khadka – 2
132 kV Khadka 1	210 MW GT Unit- 3
132 kV Station transformer – 1	132 kV Station transformer – 2
132 kV Interconnector -1	132 kV Interconnector-2
132 kV New MIDC Jalgaon	132 kV Nimbhora
132 kV Yawal	132 kV Old MIDC Jalgaon
132 kV Pachora	132 kV Supreme

132 kV Bus coupler was in service And 132 kV TBC was free.

Bus Bar Zone A:

Name of feeder	At local end		At Remote end
	W.I.	R.I.	W.I.
132 kV BUS BAR	Bus Bar Zone- A Prot. optd.	In BB PANEL (REB) 96 Relay of 132 kV Muktainagar 96 Relay of 132 kV Khadka 1 96 Relay of 132 kV ST – 1 96 Relay of 132 kV Interconnector-1 96 Relay of 132 kV New Jalgaon MIDC 96 Relay of 132 kV Yawal 96 Relay of 132 kV Pachora 96 Relay of 132 kV Bus Coupler	NA
132 kV Khadka 1	NIL	96	(Line was in charged condition from Khadka end)
132 kV Station transformer – 1	NIL	96	NA
132 kV Interconnector -1	NIL	96	NA
132 kV New MIDC Jalgaon	NIL	96	(Radial feeder and the CB was in closed condition at remote end)

132 kV Yawal	NIL	96	(Radial feeder and the CB was in closed condition at remote end)
132 kV Pachora	NIL	96	Due to system constraint and as per the LD instructions the line was charged from Deepnagar end only.
132 kV Muktainagar	Distance Prot. Optd.	96, 86 trip relay 86 L/O relay Distance prot.REL 511 optd:- fault in R ph, Zone -1 trip, Bus bar optd, Fault locator-L1-L2, Distnace -8.3 km, fault current-20792 Amp	The Zone-3 start in relay

Bus Bar Zone B:R-ph CT of 132 kV Muktainagar was burst and caught fire due to this smoke and fumes of fire spread up to adjacent bay 132 kV Khadka – 2 bay which was on Bus-2 causes flashover between B ph Line Isolator Jaw (towards CT side) and earth blade (which was inclined at 45 deg. from line isolator). This resulted into operation of Bus Bar Zone B correctly

Name of feeder	At local end		At Remote end	
	W.I.	R.I.	W.I.	R.I.
132 KV BUS BAR	Bus Bar Zone- B Prot. optd.	In BB PANEL (REB) 96 Relay of Supreme 96 Relay of Khadka 2 96 Relay of Station TF-2 96 Relay of Interconnector-2 96 Relay of Old Jalgaon MIDC 96 Relay of Nimbhora 96 Relay of GT Unit - 3 96 Relay of Bus Coupler	NA	NA
132 kv Khadka 2	Back up O/C & E/F prot. Optd	96, 86 Lock out optd.	Distance Prot. Optd. Back up O/C Prot. Optd.	REL511 OPTD Back Up Protection optd 86 A/R L/O
132 kv Station transformer – 2	NIL	96	NA	NA
132 KV Interconnector -2	NIL	96	NA	NA
132 KV Old Jalgaon MIDC	NIL	96	Due to system constraint and as per the LD instructions the line was charged from Deepnagar end only.	NA
132 KV Supreme	NIL	96	(Radial feeder and the CB was in closed condition at remote end)	NA

132 kv Nimbhora	NIL	96	(Radial feeder and the CB was in closed condition at remote end)	NA
132 KV GT Unit -3	NIL	96	BB Diff. Prot. Optd	86T, 86GT, 86TT, Low FWD. power

LBT:

Sr. No.	Name of Bay	LBT in MW	TRIPPING TIME	Restoration time
1	Mukataingar	32	18:23 Hrs	15:09 Hrs. (on 07-04-15)
2	Khadka-1	18(I)	18:23 Hrs	20:08
3	Khadka-2	18(I)	18:23 Hrs	18:56
4	BusCoupler	--	18:23 Hrs	19:21
5	Station-1	9	18:23 Hrs	19:00
6	Station-2	2	18:23 Hrs	19:29
7	New MIDC Jalgaon	59	18:23 Hrs	19:40
8	Yawal	33	18:23 Hrs	19:35
9	Interconnecter-1	2	18:23 Hrs	19:22
10	Interconnecter-2	25	18:23 Hrs	19:03
11	Nimbhora	5	18:23 Hrs	19:09
12	GT-3	170(I)	18:23 Hrs	00:41
13	Old MIDC Jalgaon	00	18:23 Hrs	19:39
14	Pachora	00	18:23 Hrs	19:38

Sequence of operation

a) 132KV Deepnagar – Muktainagar Feeder R-Ph CT Burst and caught fire
b) All feeders on Bus -1 were tripped along with Bus Coupler on BusBar Protection ZONE A operated. However the fault remains persisted as there was fault feeding from remote end i.e. Muktainagar although it was Z2 fault it is not cleared by Muktainagar end instead get cleared by Malkapur substation within @ 700msec.
c) Due to fire, smoke and fumes spread up to adjucent 132kV Khadka-2 bay which was on BUS-2. This resulted to operation of Bus Bar zone B and all feeders on BUS -2 with GT-3 were tripped.
d) After isolating Muktainagar Feeder and resetting all Relay and Window Indication and LD Nagpur Instructions Feeders are Charge and stood ok.

Analysis: On Dt:06.04.2015 at 18:23 Hrs, at 132kV Deepnagar, R-Ph CT of 132 KV Muktainagar feeder burst and caught fire due this smoke and fumes of fire were spread up to adjacent CT and isolator of 132kV Khadka bay. This causes flashover between B ph Line Isolator Jaw (towards CT side) and earth blade (which was inclined at 45 deg. from line isolator). This resulted into operation of Bus Bar Zone A and B.

1) Bus Bar protection was operated correctly at Deepnagar and fault was get isolated from Deepnagar end but still the fault feed from Muktainagar side that is from Malkapur end.
2) The distance relay at 132kV Muktainagar end could have to operate but only zone 3 started.
3) Also back up protection could have to operate at Muktainagar end as the fault current recorded at M-nagar end 612.5 A. On dt 02/05/15 the parameters for back up relay checked and it was found that B-ph PT voltage was absent to relay and relay is directional hence it is not operated.

4) As 132kV Malkapur substation contribute load current at 132kV Muktainagar, 132kV Bodwad SS and fault at 132kV Deepnagar. Hence the fault cleared from 132kV Malkapur ss.

Equipment Failure and earlier testing result:

132 KV Deepnagar-Muktainagar Feeder R-Ph CT Burst.
Make: Alsthom
Date of testing 11/03/2015
Tan Delta value:- 2.7% Capacitance Value:-1.017 nf
(As tandelta point was not available above results are in GST mode)

+Remedial Measures:

1) There are 6CT's at 132kV Deepnagar having tandelta values more than 0.7%. These CT's needs to be replaced on priority.
2) Necessary directives given to EE(T) Nashik and Dhule for monitoring B/U relay voltages and to submit the report in view of non-tripping of B/U relay of Muktainagar-Deepnagar line during a month.

Submitted for information and necessary action please.

Encls: (1) & (2) SLD

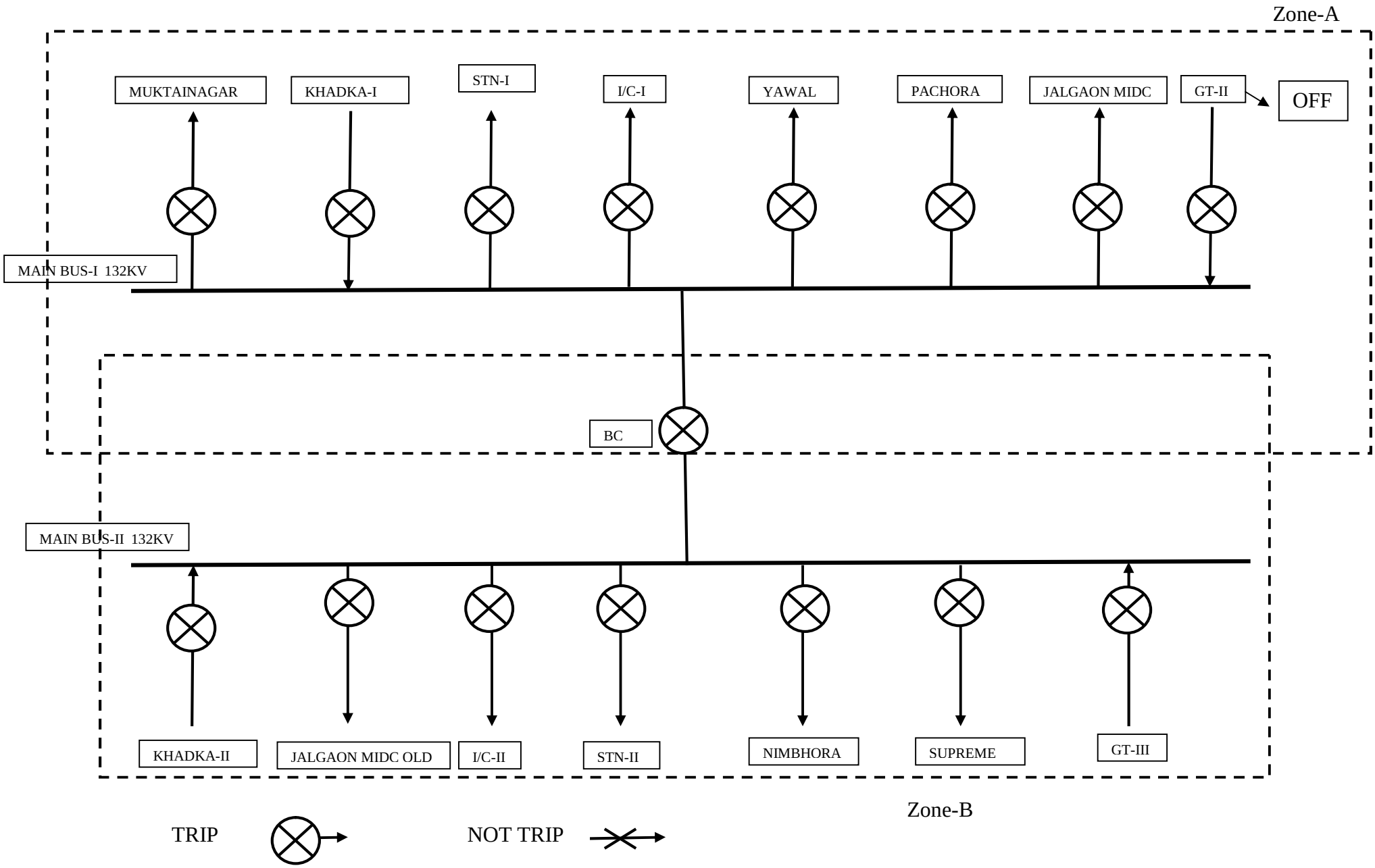
Superintending Engineer (TCC),
MSETCL, Nashik.

Copy s.w.rs.to :
1) The Chief Engineer, EHV CC O&M Zone, MSETCL,Nashik/Amravati.
2) The Chief Engineer, SLDC, MSETCL,Kalwa.

Copy f.w.cs.to :
1) The S.E., EHV O &M, Circle, MSETCL, Bhusawal.

Copy to:
1) The E.E., Testing Dn., MSETCL, Dhule.
2) The E.E., EHV O&M Dn., MSETCL, Jalgaon.

SLD OF 132KV DEEPNAGAR SUBSTATION ON DATED 06.04.15



Annexure – 2.10

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.

From:	To,
Name of Office: Superintending Engineer TCC Office address: Block No.12 MSETCL Admin Bldg. Racca Plot, Old Saykheda Road, Jail Road, Nashik (422101) Contact No: 2403181 Email Id: se5500@mahatransco.in	The Chief Engineer, Trans O&M, MSETCL, C.O. Mumbai.

Ref. No. SE/TCC/NSK/T/No. 114 Date: 13/04/15

Sub: Occurrence report of 220kV LBB protection on 220kV D'rangari feeder at 400kV BBLR

At 400kV BBLR s/s, on dtd 11/04/2015 at 15:05 Hrs, breaker at Babhaleshwar end didn't operated and fault get resulted into operation of LBB protection. The window and relay indication is as below

SN	Name of Bay	R.I	LBT MW	Restoration
1	220 kV Nashik 2	LBB Protection,96	171E	15:55 Hrs
2	220 kV BBLR 2	LBB Protection,96	100E	16:20Hrs
3	220 kV D'gaon rangari	LBB Protection,96	0	
4	220 kV Nagar 2	LBB Protection,96	73E	17:05 Hrs
5	220kV Nagar 1	Under outage	0	19:30 Hrs
6	400/220kV ICT 1	O/C protection	187	16:09Hrs
7	400/220kV ICT 2	O/C protection	174	16:36Hrs
8	400/220kV ICT 3	LBB Protection,96	277	15:38Hrs
9	220 kV Bus coupler	LBB Protection,96	-	16:03Hrs
10	220 kV C'gaon	LBB Protection,96	74I	15:57Hrs
11	220kV Bhenda	LBB Protection,96	67I	16:00 Hrs
12	220kV Ranjangaon	H/T	151E	18:25Hrs
13	220 kV Nashik 1	H/T	170E	15:57 Hrs
14	220 kV BBLR 1	H/T	104E	15:40Hrs
15	220kV Alephata	H/T	0	Outage

Analysis:

On date 11/04/15 at 400kV Babhaleshwar S/S there was R-Ph-N 2.1 kA fault on 220kV Deogaon-Rangari feeder, this fault resulted into operation of distance scheme of above feeder correctly, but due to mechanical problem in CB, R Pole failed to trip. This non-tripping of CB resulted into operation of LBB protection.

CB Make: Spring-Spring
Date of commissioning 2011
Last operation 31/03/15 for outage
Last date of breaker timing measurement 23/01/15

The 220kV Deogaon-Rangari feeder was connected to Bus-1 however upon operation of LBB it extended the tripping command to Bus-II 96 relays instead of Bus-I and all the 220kV feeders and 500 MVA ICT-III connected to Bus-II tripped (As shown in SLD).

However even after tripping of these feeders fault didn't get cleared because actually this feeder was connected to Bus-I. The fault get cleared after tripping of 315 MVA ICT-I and ICT-II which was connected to Bus-I. This is evident from the fault current recorded in ICT-I and II (As shown in SLD)

This may happen due to in-correct operation of CT switching relay which remained un-noticed or any problem in its DC wiring. Before to this occurrence there is correct tripping of breaker of Deogaon-Rangari (erstwhile Waluj)

However correctness of wiring will be re-confirmed by DC testing of Bus-bar panel

Load affected and restoration sequence as given below

Area affected: Ahmednagar District

Remedial Measures:

It is necessary to ensure the correct operation of CTCO relay before to closing of any breaker

Submitted for your kind information please.

Encls: SLD

Superintending Engineer
TCC, MSETCL, Nashik

Copy s.w.rs.to :

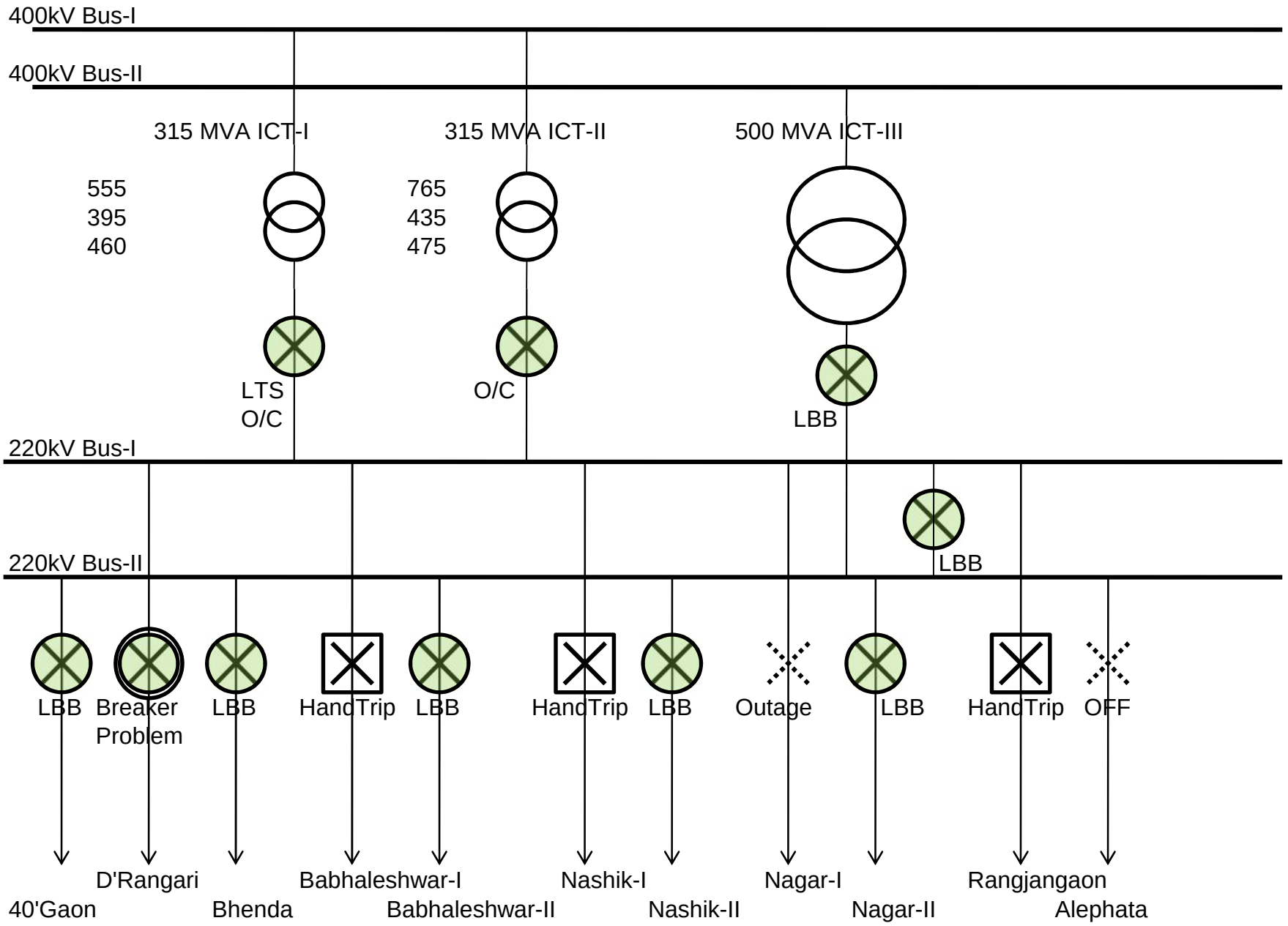
1) The Chief Engineer, EHV CC O&M Zone, MSETCL,Nashik.
2) The Chief Engineer, SLDC, MSETCL,Kalwa.

Copy f.w.cs.to :

1) The S.E., EHV O &M, Circle, MSETCL, Nashik.
2) The S.E., ALDC, MSETCL, Ambazari.

Copy to:

1) The E.E., Testing Dn., MSETCL, Nashik/Dhule.
2) The E.E., 400kV R.S., O&M Dn., MSETCL, BBLR.


400kV Bus-I
400kV Bus-II
315 MVA ICT-I
315 MVA ICT-II
500 MVA ICT-III
555
395
460
765
435
475
LTS
O/C
O/C
LBB
220kV Bus-I
220kV Bus-II
LBB
LBB
Breaker
Problem
LBB
HandTrip
LBB
HandTrip
LBB
Outage
LBB
HandTrip
OFF
D'Rangari
Babhaleshwar-I
Nashik-I
Nagar-I
Rangjangaon
40'Gaon
Bhenda
Babhaleshwar-II
Nashik-II
Nagar-II
Alephata

Annexure -2.11

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.

From:	To,
Name of Office: Superintending Engineer Office address: Testing and Telecommunication Circle Block No.12 MSETCL Admin, Bldg. Racca Plot, Old Saykheda Road, Jail Road, Nashik (422101) Phone No : 0253-2403181 Email Id : se5500@mahatransco.in	The Chief Engineer, Trans O&M, MSETCL, C.O. Mumbai.

Ref. No. SE/TCC/NSK/T-9/143 Date: 14.05.2015

Sub: - Occurrence report of operation of Bus bar due to bursting of GT-4 Main CB while synchronizing at 400kV Deepnagar substation**.**

Ref:- Ad.EE/400KV/T/Deepnagar-BSL-II/30Date: 24.04.2015

On Date: 24/04/15 at 12:28Hrs, GT4 main CB B-ph Pole burst while synchronizing from Generation end, resulted subsequent damage to B-Ph Bus CT and B-ph Pole of Centre Break Bus Isolator 89A. This resulted into operation of Bus Bar Zone-1 for 400kV Main Bus I. Relay indication as below

Sr. No.	Name of feeder	Indications on SCADA	R.I.	Remark
1	400kV Bus Bar Relay	Bus Bar CSC 150 1. Diff Start up 2. CBF strat up 3. Iso. Failure BUS I side Busbar BZ1 Diff optd ph C	BZ1 Diff.B Ph	Bus Bar protection operated for 400kV Main Bus I
2	21.75/400kV 600MVA GT-4 Main CB	BCU – 1. Bus bar prot. Relay optd. 2. Class A prot. Optd. 3. CB Loss of SF6 Alarm 4. CB SF6 Low L/O -1 5. CB SF6 Low L/O - 2 6. TC – 1 R Ph, TC – 2 R Ph 7. TC – 1 Y Ph, TC – 2 Y Ph 8. TC – 1 B Ph, TC – 2 B Ph	Bus Bar Protection Relay 96 Operated. SF6 Alarm SF6 L/O 1 SF6 L/O 2	Main CB B ph Pole Burst while synchronizing.
3	21.75/400kV 600MVA GT-5 Main CB	BCU – 1. Bus bar prot. Relay optd. 2. Class A Prot optd CSC326- Ext CBF-1 start	Bus Bar Protection Relay 96 Operated. 186X/286X	Main CB of GT – 5 Tripped.
4	21.75/400kV 600MVA GT-5 Tie CB	NIL	NIL	Tie CB of GT-5 Tripped.
5	400kV Deepnagar – Khadka Ckt – 2 Tie CB	BCU – 96 Bus Bar Trip Relay Optd Tie Half	Bus Bar Protection Relay 96 Operated.	Ckt tripped as Main CB was not available. Tie CB tripped & line become dead. (LBT: 95MW/150)

Indications at MSPGCL End –

Sr.No.	Name of Equipment	Indication at PCR MSPGCL
1	21.75/400kV 600MVA GT-4	1) Class A Protection Optd. 2) Differential Protection R & B Ph 3) Overcurrent R Y B Ph
2	21.75/400kV 600MVA GT-5	1) Class A Protection Optd. 2) Earth fault Trip Relay Optd.

PLCC Counters of 400kV Deepnagar – Khadka Ckt -2 –

	Before Tripping															
	Main I+DT								Main II+DT							
	Position A		Position B		Position C		Position D		Position A		Position B		Position C		Position D	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
At 400kV Deepnagar	82	79	33	76	53	20	46	19	33	71	82	71	10	02	93	23
At 400kV Khadka	81	78	80	32	02	25	12	32	80	34	81	76	02	25	23	75

	After Tripping															
	Main I+DT								Main II+DT							
	Position A		Position B		Position C		Position D		Position A		Position B		Position C		Position D	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
At 400kV Deepnagar	82	79	33	76	54	20	47	19	33	71	82	71	11	02	94	23
At 400kV Khadka	81	78	80	32	02	27	12	33	80	34	81	76	02	27	23	76

Following Feeder's 96 operated for Bus-I

1) Bay 4 CB Open action (Khadka-2 Tie CB)
2) Bay 6 CB Open action (Khadka-1 Tie CB)
3) Bay10 CB Open action (Thaptitanda Tie CB)
4) Bay12 CB Open action (Stn 4A Main CB)
5) Bay14 CB Open action (Stn 4B Main CB)
6) Bay16 CB Open action (GT-5 Main CB)

Restoration of Tripped Feeders/ Equipments: -

Sr. No	Name of Feeder / Equipment	Tripping Date	Tripping Time	Restoration Date	Restoration Time
1	400kV Main Bus – I (Through Tie CB of 400kV Khadka I)	24.04.2015	12:28	24.04.2015	14:51
2	400kV Deepnagar-Khadka Ckt-2	24.04.2015	12:28	24.04.2015	14:55
3	21.75/400kV 600MVA GT-4	24.04.2015	12:28	24.04.2015	21:05
4	21.75/400kV 600MVA GT-5	24.04.2015	12:28	24.04.2015	17:30

7) Sequence of operation:-

On dt. 24/04/15 at 12:28Hrs, while synchronizing of GT4 on Main CB from Generation end, Bph Pole burst and resulted subsequent damage to B Ph Bus CT and B Pole of Centre Break Bus Isolator 89A. Hence Bus Bar protection operated for 400kV Main Bus I and all 400 KV Feeders/Bays connected to main Bus I and GT5 TIE CB were tripped.

400 KV main Bus II were remaining in service and ICT I and II, 400KV Thapti Tanda. 400KV Aurangabad, 400 KV Khadka I lines, STN T/F 4A, STN T/F 4B and Sp. ICT were in service. Event logger as below

Index	Alarm Content in GT-4 Bay
1	SOE: 04-24-2015 12:27:57.074 400KV_GEN_TRAFO_4(410)GT4 CLASS A PROT OPTD FROM GENCO [61]action
2	SOE: 04-24-2015 12:28:01.720 400KV_GEN_TRAFO_4(410)CB SPRING CHARGED [35]action
3	SOE: 04-24-2015 12:28:01.778 400KV_GEN_TRAFO_4(410)CB LOSS OF SF6 ALARM [31]action
4	SOE: 04-24-2015 12:28:01.782 400KV_GEN_TRAFO_4(410)CB SF6 LOW LOCKOUT-2 [34]action
5	SOE: 04-24-2015 12:28:01.788 400KV_GEN_TRAFO_4(410)CB SF6 LOW LOCKOUT-1 [32]action
6	SOE: 04-24-2015 12:28:10.313 400KV_GEN_TRAFO_4(410)TC1 RPH FAULTY IND FROM GENCO [75]action
7	SOE: 04-24-2015 12:28:10.317 400KV_GEN_TRAFO_4(410)TC1 BPH FAULTY IND FROM GENCO [77]action
8	SOE: 04-24-2015 12:28:10.345 400KV_GEN_TRAFO_4(410)TC1 YPH FAULTY IND FROM GENCO [76]action
9	SOE: 04-24-2015 12:28:10.359 400KV_GEN_TRAFO_4(410)TC2 RPH FAULTY IND FROM GENCO [78]action
10	SOE: 04-24-2015 12:28:10.422 400KV_GEN_TRAFO_4(410)TC2 YPH FAULTY IND FROM GENCO [79]action
11	SOE: 04-24-2015 12:28:10.508 : 400KV_BUSBAR_DIFFERENTIALBZ1 Diff Op: PhC action
12	SOE: 04-24-2015 12:29:07.277 400KV_GEN_TRAFO_4(410)TC2 BPH FAULTY IND FROM GENCO [80]action

SOE: 12:28:04.834-GT-5 Tie CB Tripped on Class-A protection optd from GENCO end.

Analysis:-

1) From above event logging, it observes that just after synchronization there is tripping command from generation side. Due to this breaker trip but its B-ph contact didn't get completely open, this resulted into arcing inside breaker pole. This arcing increased the gas pressure and finally gas gets escaped by mechanical damage. Finally this breaker pole bursting resulted into operation of Busbar.
2) There shall be LBB operation. LBB relay is at generation end, hence analysis for non-operation of LBB needs to be carried out by generation authorities.
3) GT-5 Tripped on CLASS-A Protection operated from Genco end at 12:28:04.834. GT5 main & tie CB Tripped before busbar protection operation.

Restoration of main BUS I by Tie/Main CBs of Feeders/ Equipments which remained charged: -

Sr.No	Name of Feeder / Equipment	Tripping Date	Tripping Time	Restoration Date	Restoration Time
1	400kV Deepnagar Khadka I Tie CB	24.04.2015	12:28	24.04.2015	14:51
2	400kV Deepnagar – ThaptiTanda Ckt Tie CB	24.04.2015	12:28	24.04.2015	14:57
3	400/11/6.6kV 80MVA Station Transformer 4A Main CB	24.04.2015	12:28	24.04.2015	14:58
4	400/11/6.6kV 80MVA Station Transformer 4B Main CB	24.04.2015	12:28	24.04.2015	14:58

Equipment failed: -

1) GT-4, Main CB, B ph Pole Burst.
2) GT-4, B ph Bus CT damaged.
3) GT-4, Main Bay, B ph Pole of Bus Isolator 89A damaged.

Remedial measures:
Matter regarding breaker failure analysis taken up with manufacturer.

Submitted for information and necessary action please.

Encls: 1) SLD

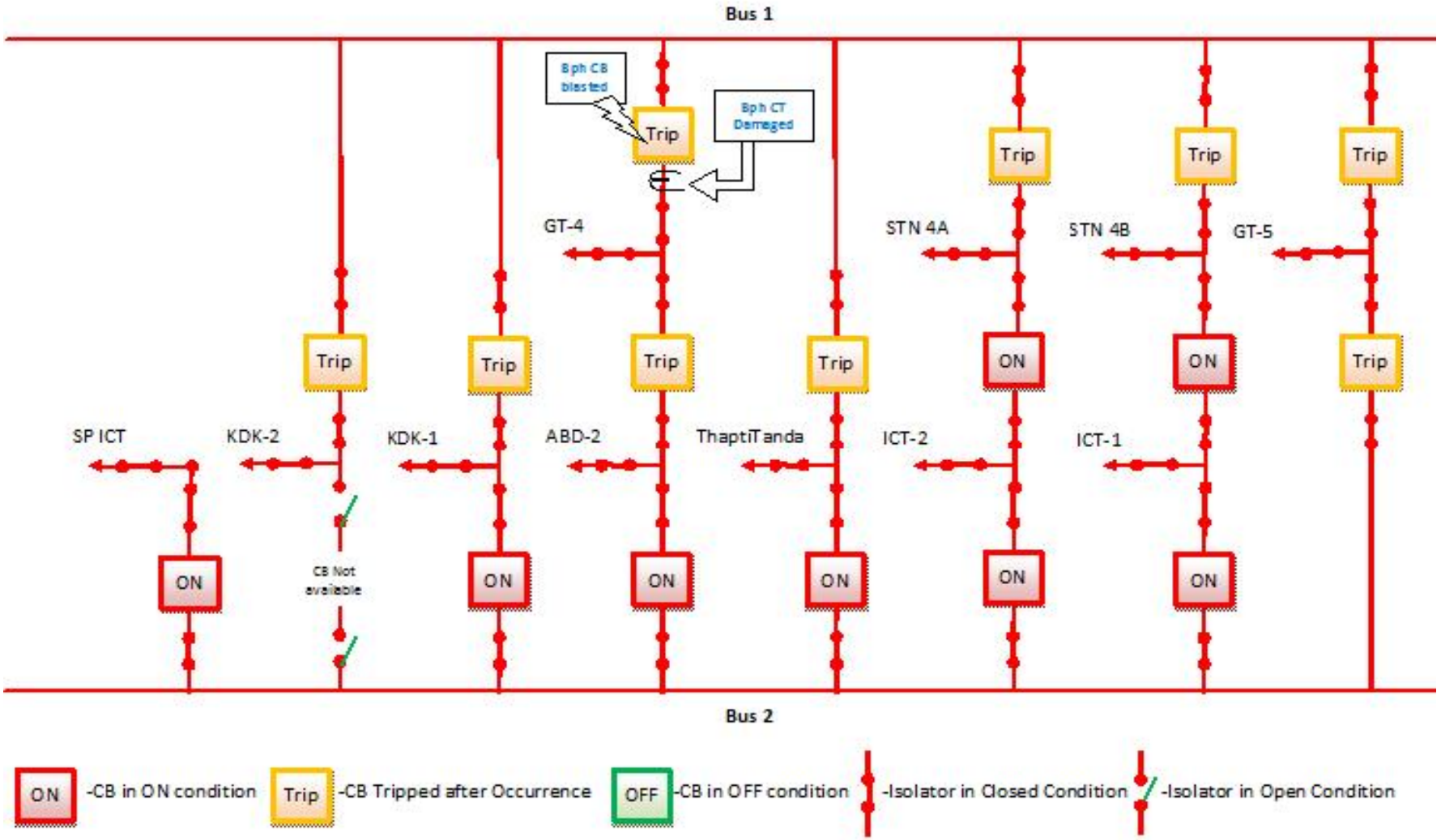
Superintending Engineer (TCC),
MSETCL, Nashik.

Copy s.w.rs.to :
1) The Chief Engineer, EHV CC O&M Zone, MSETCL,Nashik.
2) The Chief Engineer, SLDC, MSETCL, Kalwa.

Copy f.w.cs.to :
1) The S.E., EHV O&M, Circle, MSETCL, Bhusawal.

Copy to:
1) The E.E., Testing Dn., MSETCL, Dhule.
2) The E.E., 400kV RS O&M Dn., MSETCL, Deepnagar.

SLD: Position of 400KV switchyard after Occurrence on dtd: 24/04/2015 at 12:27 Hrs
(GT-4 Bph CB pole burst while synchronizing from GENCO End)



O.P. Jindal Super Thermal Power Plant 4*250 MW

Preliminary Report of 400KV Tamnar –Raipur Line #1 & Line#2 tripping on dtd 25.04.2015

Name of Sub-Station **:** 400 KV Switchyard (Stage-1)

Date & Time **:** 25.04.2015
Line-1 - 17:32:22 Hrs.
Line-2 – 17:32:25 Hrs

Weather Condition **:** Heavy rainfall with thunder and lightning

Trip Line **:** 400KV Raipur-Tamnar Line # 1 &
400KV Raipur-Tamnar Line # 2

Pre Fault Condition & Parameters **:** **Line #1-**Load- 124 MW, Voltage- 415 KV
Line#2-Load- 125 MW, Voltage- 414 KV

Generator Details & Load **:** Nil

Relay Indication & Fault parameter-

At JPL, Tamnar End:

400KV Raipur- Tamnar Line#1:

C- N Phase, Zone-1, Fault Distance –193.8 Km,
Fault Current R/Y/B- 155/294/1248 A.
Fault voltage R/Y/B-N – 236/234/216 KV

CHANNEL-1						CHANNEL-2					
CODE-1		CODE-2		CODE-3		CODE-1		CODE-2		CODE-3	
TX1	RX1	TX2	RX2	TX3	RX3	TX1	RX1	TX1	RX1	TX2	RX2
3	2	3	2	0	1	0	3	3	2	0	1

400KV Raipur- Tamnar Line#2: C- N Phase, Zone-2, Fault Distance –245.1 Km,
Fault Current R/Y/B- 174/250/1340 A.
Fault voltage R/Y/B-N – 238/228/217KV

CHANNEL-1						CHANNEL-2					
CODE-1		CODE-2		CODE-3		CODE-1		CODE-2		CODE-2	
TX1	RX1	TX2	RX2	TX3	RX3	TX1	RX1	TX1	RX1	TX2	RX2
0	2	0	2	0	0	0	2	0	2	0	0

400KV Raipur-Tamnar-1 tripped at 17:32:22 hrs due to C-N phase fault. Auto-executed but 3 pole tripped due to DT received from remote end.
400KV Raipur-Tamnar-2 also tripped at 17:32:25 hrs due to C-N phase fault. Auto re-close locked due to persisting fault resulting line tripped from both ends.
Ground patrolling of line is under progress. Detailed report will be furnished after completion of patrolling of line.

Regards,
R K Srivastava

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

Annexure - 2.13.a

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.

From:	To,
Name of Office: Superintending Engineer Office address: Testing and communication Circle, Block No.12 MSETCL Admin Bldg. Racca Plot, Old Saykheda Road, Jail Road, Nashik (422101) Contact No: 2403181 Email Id: se5500@mahatransco.in	The Chief Engineer, Trans O&M, MSETCL, C.O. Mumbai.

Ref. No. SE/TCC/NSK/T-9/No. 1473 Date: 18 MAY 2015

Subject: Occurrence report of 400kV BB protection operation on 400kV CBs Grading Capacitor failure at 400kV BBLR SS.

At 400kV BBLR SS on date 05/05/2015 at 09.33 Hrs, 400kV Bus 1 reactor's R pole grading capacitor burst and material inside capacitor spread away on adjacent 29D isolator causing 400kV Bus fault. Due to this fault Bus bar Protection Zone 1 operated and all feeders and ICTs connected to bus 1 tripped.

SN	Name of Bay	Relay Indications	LBT MW	Restoration
1	400kV ICT-I	Bus Bar trip, 96	270	11.04 Hrs
2	400kV ICT-II	Bus Bar trip, 96	252	11.11 Hrs
3	400kV ICT-III	LBB Protection, 96, 186 & 286	395	11.14 Hrs.
4	400kV Buscoupler	BB trip, 96A & 96B		10.37 Hrs
5	400kV Dhule-I	Bus Bar trip, 96	192 I	10.44 Hrs
6	400kV Dhule-II	Bus Bar trip, 96	191 I	10.45 Hrs
7	400kV Thapti-Tanda-II	Bus Bar trip, 96	650 I	11.55 Hrs
8	400kV Bhusawal	BB trip, 96	381 I	11.39 Hrs
9	400kV Padghe-I	Bus Bar trip, 96	508 E	11.49 Hrs
10	400kV Padghe-II	Bus Bar trip, 96	513 E	11.49 Hrs
11	400kV Aurangabad	Bus Bar trip, 96	496 I	10.39 Hrs
12	400kV Thapti-Tanda-I	-	-	Outage
13	220kV Ahmadnagar-I	Load trimming optd.	91E	11.13 Hrs
14	220kV Ahmadnagar-II	Load trimming optd.	180E	11.09 Hrs
15	400 KV Bus 2 Reactor	-	-	Outage

Analysis:

On date 05/05/15 at 400kV Babhaleshwar SS, 400kV Bus-1 reactor-R phase CB grading Capacitor burst during instant the breaker was in off condition. Due to bursting the material inside capacitor were thrown out on adjacent post insulator of 29D isolator and this resulted into operation of Bus bar zone-1 protection and all feeders connected to bus-1 tripped at local as well as remote end correctly. The ICT-I and II was connected to bus-1 and tripped on Bus bar protection.

As the ICT-I and II tripped, ICT-III get overloaded which was connected to bus-2. The overload function for load trimming scheme incorporated in HV O/C relay make Sifang CSC211 and operated correctly by trimming load of 220kV A'nagar substation after 1.5Sec. In this relay there are three functions viz i) HV directional O/C ii) LBB iii) Load trimming. Along with load trimming operation, there is LBB initiation internally and subsequently LBB for ICT-III get operated after 1.7Sec. This resulted into isolation of all 400kV lines connected to Bus-2 also.

Accordingly outage was availed on 07/05/15 on ICT-3 to confirm the LBB operation with load trimming. During testing it is observed that LBB function get initiate with triggering of any function viz O/C, E/F or overload. Hence now load trimming function in this relay kept off and external O/C relay installed for load trimming scheme. The load trimming scheme taken into service on Dt:18.05.2015.

After detail analysis of breaker, it was concluded that one of the interrupter out of two of breaker was remained close condition (Bus side) as mechanical rod to open it was found break. Due to this there was unequal distribution of voltage across grading capacitor i.e. full voltage 230kV came across the grading capacitor and this resulted into bursting of grading capacitor.

The CB details are:-
CB Make: Crompton- Greaves.
Type: Pneumatic- Spring. (400SFM)
Date of manu. 2006.
Date of commissioning: 2007
Last operation: 05/05/15 at 06.49 Hrs.

Area affected: Ahmadnagar District

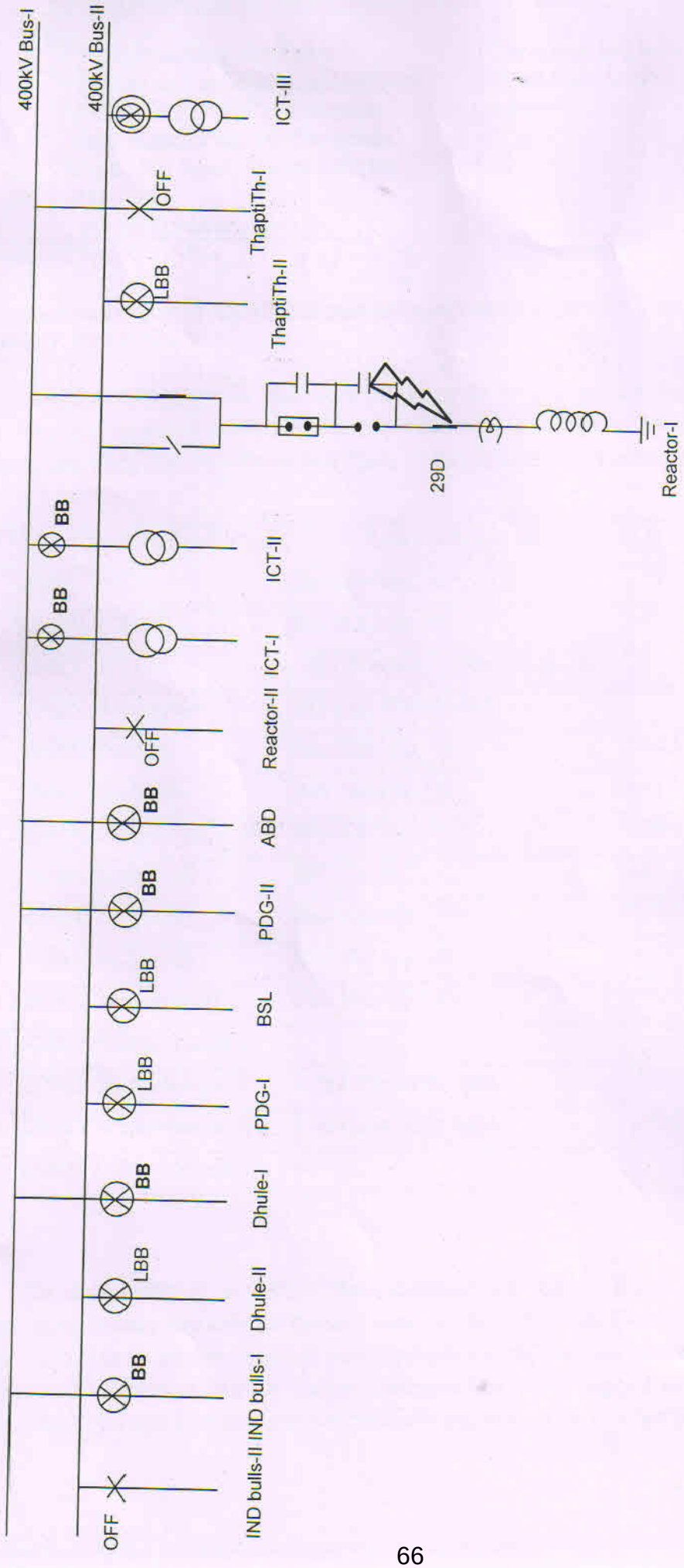
Submitted for your kind information please.

Encls: Single Line Diagram.

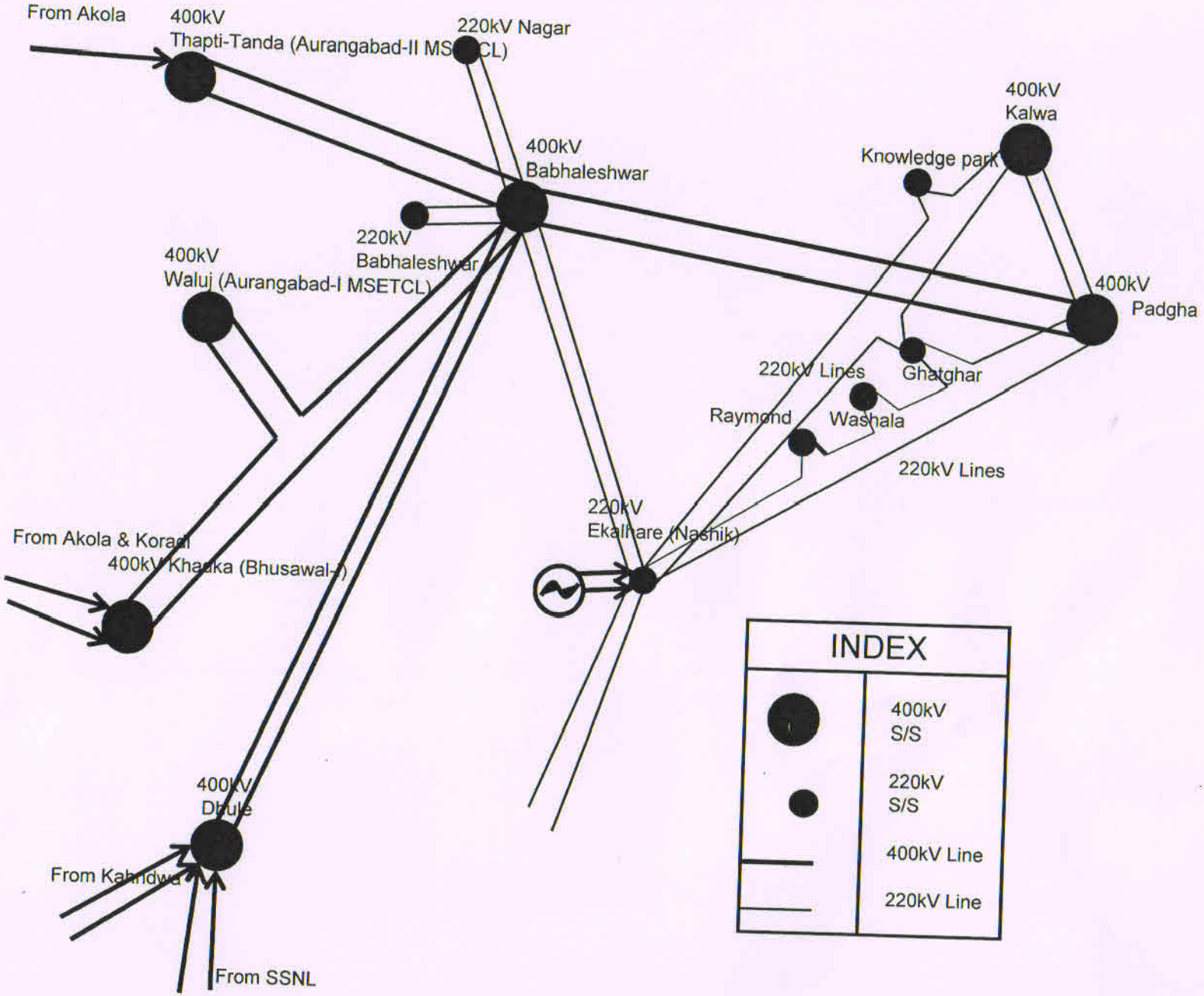
Superintending Engineer (TCC),
MSETCL, Nashik

Copy s.w.rs.to :
1) The Chief Engineer, EHV CC O&M Zone, MSETCL, Nashik.
2) The Chief Engineer, SLDC, MSETCL, Kalwa.
Copy f.w.cs.to :
1) The S.E., EHV O &M, Circle, MSETCL, Nashik.
Copy to:
1) The E.E., Testing Dn., MSETCL, Nashik.
2) The E.E., 400kV R.S., O&M Dn., MSETCL, BBLR.

Occurrence on Dt:05.05.2015 at 400kV BBLR substation.



400 and 220kV S/S in the vicinity of 400kV Babhaleshwar S/S where load and flows get affected during the occurrence on date 05/05/15



Annexure -2.13.b

Detailed report on the occurrence at 400/220 kV Bableshwar on 5th May 2015

1. **Event Category : GD-1**
2. **Event Date and Time : 09:33 Hrs , 5th May 2015**
3. **Event Summary:** At 09:33 Hrs, Grading capacitor of R phase breaker of 80 MVAR Bus Reactor at 400/220 kV Bableshwar station (which was in off condition) got burst. The pieces of the grading capacitor flew due to burst and thus damaged the adjacent 29D post insulator, which created the Bus fault on 400 kV Bus 1 at Bableshwar. With this bus bar protection operated for 400 kV Bus 1 at Bableshwar and all elements connected to this bus tripped along with bus coupler. This included the 400/220 kV ICT 1 and ICT 2 of 315 MVA capacity. This led to overloading of 500 MVA ICT 2 which was connected by 400 kV Bus 2. The load-trimming scheme for ICT 3 activated and acted but after few seconds its LBB has also initiated which led to tripping of all 400 kV elements on Bus 2 at Bableshwar. This has led to tripping of 400 kV Bableshwar-Padghe D/C (major infeeds to Load of Padghe and Mumbai apart from 400 kV Aurangabad (MS)-Pune D/C) from the grid causing weak connectivity in the Maharashtra Western Part. This led to increased power flow on 400 kV Aurangabad (MS)-Pune D/C and 400 kV Wardha-Parli D/C. The flow of 400 kV Wardha-Parli D/C each crossed 850 MW each resulting in SPS operation causing load shedding in Southern grid and generation loss in Western Region. Further, several 220 kV lines has also tripped on overcurrent protection due to loss of 400 kV infeeds in Bableshwar area. The event has led to loss of supply of 220 kV Bableshwar, 220 kV Ahmednagar and nearby stations. The 400 kV voltage at Lonikhand, Padghe, Kalwa, Khargar, Parli(MS),Parli(PG), Solapur(MS), Solapur(PG) went very low which was threatening in absence of the under voltage load shedding(UVLS) scheme.

After this event, the operators of NLDC/WRLDC/SLDC were taking actions for controlling the above severe impact of the above incident. At 09:44 Hrs, the 400 kV Aurangabad-Pune D/C tripped from Aurangabad (MS) end which has worsened the situation putting grid security in ALARM state. The only connectivity that were now linking the Western and Eastern Maharashtra was 400 kV Wardha-Parli D/C causing its overloading and frequent SPS operation. The voltage further went low at various nodes in the Maharashtra system.

Koyna generation were increased to full capacity (from 1330 to 1850 MW) followed by attempt to go for load shedding in Western Maharashtra but the actions were not prompt. The situation was further worsened with the tripping of 120 MW Uran A0 unit at 09:56 Hrs, 300 MW Jaigad Unit 4 at 09:57Hrs followed by tripping of 108 MW Uran Unit 5 at 10:02 Hrs. This resulted in Grid security at threat with Korba-Kalwa angular separation increasing from 53^0 to 83^0 i.e. a change of 30^0 which itself depict the real time grid condition with these events.

The relief during these period came from 765 kV Solapur-Raichur D/C and 765 kV Solapur-Pune(GIS) circuit on which line flows reversed and thus controlling the overloading of 400 kV Wardha-Parli D/C. HVDC Talcher-Kolar bipole were maximized to 2500 MW to improve the grid operation during these period to reduce flow through the ER-WR-SR corridor.

The restoration activities were started after inspection of sub-station at Bableshwar. 400 kV Bableshwar-Aurangabad (MS) circuit was taken in service to charge the 400 kV Bus at Bableshwar at 10:36 Hrs. After this 400 kV Bableshwar-Padghe 2 was charged at 10:37 which led to very high flow on 400 kV Auranagabd-Bableshwar circuit due to non-availability of parallel paths and was immediately tripped. After this 400 kV Bableshwar-Dhule D/C were restored. At 11:49 Hrs 400 kV Bableshwar-Padghe D/C were taken back in service, which reduced the Korba-Kalwa corridor angle from 65^0 to 52^0. This was followed by other elements restoration at Bableshwar sub-station to improve the grid stability.

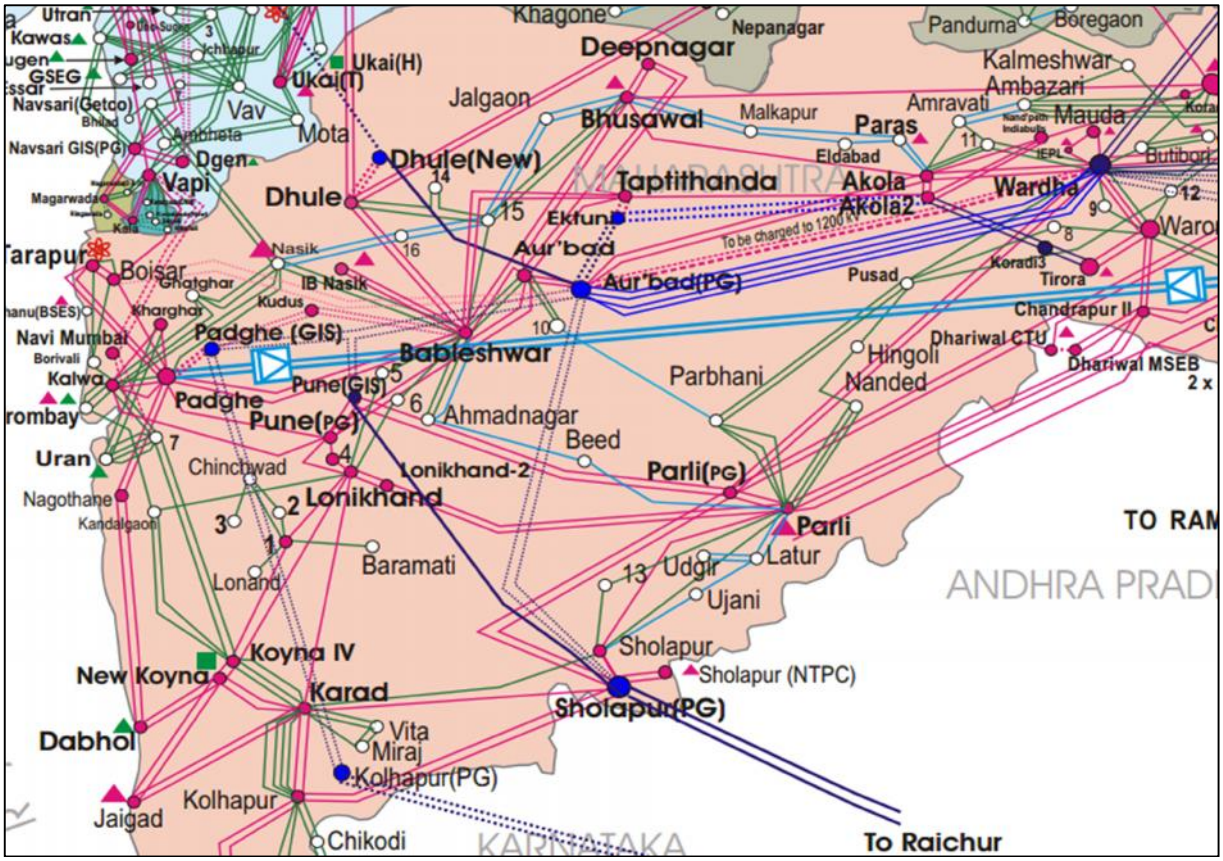


Figure 1 : Geographical Network Diagram

4. The antecedent conditions

The antecedent conditions at 09:30 Hrs for the incident is given under as per WRLDC SCADA data:-

- Indian Grid Frequency: 49.925 Hz.
- WR Demand Catered: 40303 MW
- Net Inter Regional Export: 4467 MW

Constituent-wise generation and demand details:

Power flow on major lines/ICT in the area:

Sl. No	ne of the line/ICT	ver Flow (in 09:30 Hrs	ver Flow (in MW) At ((Lo leshwar 400 kV Circui	ver Flow (in MW) at (ss of 400 kV A'Bad(e D/C)
1	kV Seoni-Wardha D/C	858	618	344
2	kV Durg-Wardha D/C	1850	1560	1350
3	kV Wardha-A'Bad 1,2 &4	1889	1361	450
4	kV Tirora-Koradi3-Akola2 D/C	949	794	277
5	kV Pune GIS-Solapur S/C	-52	-76	-347
6	kV Solapur-Raichur D/C	413	223	-36
7	kV Wardha-Parli D/C	1511	1658	2028
8	kV Raipur-Wardha D/C	1002	786	778
9	kV B'wati-Parli (PG) and B'wati O at Dhariwal)	802	848	1009

10	kV C'Pur2-Parli D/C	812	864	1024
11	kV C'Pur-Parli S/C	416	444	525
12	kV K'Kheda-C'Pur	265	312	400
13	kV Koradi-Bhusawal	349	216	108
14	kV RPL-Akola	174	143	108
15	kV Akola2-Taptithanda 1	581	308	Data Not Available
16	kV Wardha-Akola D/C	262	8	-223
17	kV Akola-A'bad(PG) D/C	437	389	127
18	kV Akola-Bhusawal S/C	484	309	186
19	kV A'Bad(MS)-Bableshwar	519	0	0
20	kV A'Bad(MS)-Pune D/C	1138	1655	0
21	kV Bableshwar-Padghe D/C	1017	0	0
22	kV Parli(PG)-Pune GIS D/C	579	672	994
23	kV Parli(MS)-Lonikhand2 D/C	727	838	1164
24	kV Pune GIS-Pune D/C	512	732	1346
25	kV Pune –Kalwa	-330	309	460
26	kV Pune -Padghe	91	495	218
27	kV Boisar-Padghe S/C	-21	42	172
28	kV Vapi-Boisar	-135	50	342
29	kV Sugen-Vapi S/C	447	567	758
30	kV Kala-Vapi D/C	-56	26	160
31	kV SSP-Dhule D/C	18	-292	-400
32	kV Khandwa-Dhule D/C	831	615	576

Generation in the area:

Sl. No.	Units	Power Flow(in MW) at 09:30 Hrs
1	Parli	426
2	Chandrapur	821
3	Koradi	288
4	Deepnagar	727

Prior to the Incident at Bableshwar , Tripping has occurred at 400 kV Warora S/s on 21:50 Hrs on 4th May 2015 where Warora Sub-station has blackout causing SPS operation at Tirora leading to tripping of Tirora Unit 3,5 and Backing down in Tirora 1 & 2 unit. Further at 22:01 Hrs on 4th May 2015, 400 kV Wardha-Mouda circuit tripped on fault (Already IEPL-Mouda has tripped on same day on fault at 20:2 Hrs) causing blackout at Mouda and tripping of Mouda Unit 1.

Bus Bar Arrangement at 400 kV Bus (DMT scheme) at Bableshwar

400 kV Bus 1	400 kV Bus 2
80 MVAR Bus reactor 1	80 MVAR Bus Reactor 2 (OFF)
400 kV Bableshwar-Dule 1	400 kV Bableshwar-Dule 2
400 kV Bableshwar-Padghe 2	400 kV Bableshwar-Padghe 1

400 kV Bableshwar-Aurangabad (MS)	400 kV Bableshwar-Bhusawal
400/220 kV 315 MVA ICT 1	400/220 kV 500 MVA ICT 3
400/220 kV 315 MVA ICT 2	400 kV Bableshwar-Taptithanda 2
400 kV Bableshwar-Taptithanda 1 (OFF)	

5. Event Overview:

At 09:33 Hrs, 400 kV Bus Reactor 1 (on 400 kV Bus) R Phase Pole grading capacitor burst and material inside the capacitor has spread away on the adjacent 29 D isolator on the reactor side leading to the 400 kV Bus 1 fault at 400/220 kV Bableshwar Sub-station. With this bus bar protection for Bus 1 operated and tripped all the elements connected to 400 kV bus 1 and Bus coupler. The tripping of ICT 1 and ICT 2 resulted in overloading of ICT 3 and its load trimming scheme got activated which is incorporated in the H/V Over current relay (make Sifang CSC211) and operated correctly trimming the load of Ahmednagar by tripping the 220 kV Bableshwar-Ahmednagar D/C after 1.5 Seconds. In this relay, three functions are there i.e. H/V directional over current, LBB and load trimming. Along with the load trimming, the LBB has also initiated internally for this relay, which operated after 1.7 seconds causing bus bar protection operation for 400 kV bus 2 also. This has led to loss of all the 400 kV Circuits from Bableshwar Sub-station. This has led to overloading of 400 kV Wardha-Parli D/C beyond 850 MW causing SPS operation. Annexure 1 includes the SPS operation event log from Wardha that indicated that SPS has operated 3 time as even after SPS operation loading of these circuits were not reducing below 850 MW. The Tirora generation has reduced by 402 MW during the period.

With this the 220 kV system also got overloaded causing tripping of lines on overcurrent protection. Details of 220 kV lines tripping were not send by the MSETCL. Based on the daily report of Maharashtra SLDC and after performing simulation, it is observed that 220 kV Aurangabad-Bhenda circuit (220 kV Aurangabad-Bableshwar is generally kept out for load management) should have tripped first on backup overcurrent protection as the loading on this circuit would be more than 250 MW. This has led to shifting of Bhenda load on Bableshwar sub-station. This would overload the 220 kV Bableshwar-Challisgaon whose loading would also go above 250 MW and it also tripped on backup overcurrent protection. This has resulted in overloading of 220 kV Nasik – Bableshwar D/C and its tripping. The 220 kV loads of Bableshwar got shifted to Lonikhand via Rajnandgaon and Alepheta circuits.

WRLDC advised immediately to Maharashtra SLDC to pick up Koyna Generation and perform load shedding in the area but the response were quite delayed which has not relieved the higher loading of 400 kV A'bad (MS)-Pune D/C which has increased to 841 MW each after the incident. At 19:44 hrs, 400 kV A'Bad (MS)-Pune 2 circuit has observed B phase to earth fault in zone 2 from A'Bad end due to jumper opening near to pune when the line loading was 814 MW. Simultaneously 400 kV A'Bad (MS)-Pune 1 also tripped on B Phase to earth fault indication from A'Bad(MS) end due to operation of Main 2 relay Siemens make in zone 2 distance protection while there was no fault in the circuit. **This has resulted in ALERT power system in the Western and Eastern Maharashtra due to loss of four major 400 kV Infeed between the areas.**

The generation of Bhusawal, Deepnagar, Koradi, Khaparkheda, Tirora, RPL Amravati and other generating station got routed through 400 kV Wardha-Parli D/C, 400 kV Chandrapur2-Parli D/C, 400 kV Chandrapur-Parli, 400 kV Bhadrawati-Parli(PG), 400 kV Bhadrawati-Dhariwal-Parli(PG). This has led to further overloading of 400 kV Wardha-Parli D/C going beyond 1000 MW each and SPS activation. As Already SPS has acted at 09:33 Hrs so no further backing down has occurred at AMPL Tirora. It can be observed that the 400 kV Wardha-Parli D/C line loading remain above 850 MW till 11:50 Hrs. The power also got routed through 400 kV Sugen-Vapi which got loaded up to 781 MW.

The situation was further worsened with the tripping of 120 MW Uran A0 unit at 09:56 Hrs on rotor earth fault, 300 MW Jaigad Unit 4 at 09:57 Hrs on generator protection followed by tripping of 108 MW Uran Unit 5 at 10:02 Hrs on rotor earth fault. The delayed response in picking up generation at Koyna and load shedding acted as catalyst to worsen the system reliability and security putting the system on system state near to EMERGENCY.

The System ALERT state can also be seen from two other parameters which are Korba-Kalwa Angular separation and 400 kV Bus Voltage of Maharashtra Nodes. It can be seen from figure 3 that prior to the event i.e. at 09:33:35 Hrs, Korba-Kalwa angular separation was 54 degrees which is observed in general. With the tripping of 400 kV Padghe-Bableshwar D/C , the angular separation went to 65 degrees and after the tripping of 400 kV A'bad(MS)-

Pune D/C it has went to 83 degrees which was a real concern and immediate action on generation increment in and load shedding in Western Maharashtra were taken up.

The second parameter i.e. voltage of important WR nodes shown in figure 4 and 5. It can be seen that with the event, voltage of load centers in Maharashtra i.e. Lonikhand, Padghe, Pune, Parli (MS), Parli(PG), Khargar has went below 380 kV and few have gone below 360 kV which has worsened the situation in view of voltage collapse and poor power quality. ***Immediately the Bus reactor of 400 kV Kolhapur was opened at 09:41 Hrs, Bus Reactor of 400 kV Solapur (PG) opened at 09:50 Hrs and Bus reactor of 765 kV Solapur was opened at 09:53 Hrs. Further 400 kV Solapur-Kolhapur 2 circuit which was taken out at 09:36 as per outage plan was taken back in service to improve the voltage in the area at 10:19 Hrs.*** The availability of UVLS scheme at these load centers would have helped the automatic voltage improvement during such contingency and would have helped real time operator in further improving real time system operation.

The low voltage in the area could have resulted in commutation failure at HVDC C'pur-Padghe and tripping of Units near these areas on auxiliary units tripping. However, this risk has not occurred otherwise system could have went to EMERGENCY state.

Further, the major challenge faced by WRLDC Real time operator was due to non-availability of various 400 kV Major Lines of Maharashtra System, Various 400/220 kV ICTs, Majority of the 220 kV Maharashtra 220 kV System, Various Generating stations. This problem is being faced by operator since a long time yet the improvement is very slow and causing a lot of concern during real time operation due to non-observability of the system. The state Estimator is also not giving good results due to lack of the data from Maharashtra system. The problem is multiplied with absence of the sequence of event (SOE) from Maharashtra SLDC. Without these details, WRLDC operator are unable to access the system reliability and security in real time and many a time it has been seen that Maharashtra SLDC has run the system by compromising the N-1 criteria. Various major incidences has occurred in the past which includes events in Pune Ring Main, Bableshwar-Auranagabad, Blackout of Southern Maharashtra system along with Goa etc.

One more challenge that operator observed was the reluctance by Maharashtra system operator in shedding load in Padghe, Pune ,Mumbai area to improve the system reliability. The system was in alert state continuously for more than 2 hours yet the action taken by Maharashtra SLDC were slow and not prompt. **During the N-12 contingency** (10 elements from Bableshwar and 2 from Aurangabad (MS) system security was at great stake as can be observed from the Line loading, angular separation and voltage plot. **Any tripping of 400 kV Wardha-Parli or 400 kV Vapi-Boisar section could have resulted in a major disturbance in Western Maharashtra system that includes the Mumbai system.**

Table 1 : The sequence of tripping and restoration

Sl No.	ne of the transmission element/	ime of Trippi (hh:mm)	Relay indication End 1	elay Indication En	ime of restorati (hh:mm)
1	MVAR Bus Reactor 1	Kept off	Bus Bar protection operate	-	-
2	kV Bableshwar-Dule 1	09:33	Bus Bar protection operate	-	10:44
3	kV Bableshwar-Dule 2	09:33	Bus Bar protection operate	-	10:45
4	kV Bableshwar-Padghe 1	09:33	Bus Bar protection operate	-	11:49
5	kV Bableshwar-Padghe 2	09:33	Bus Bar protection operate	-	11:49
6	kV Bableshwar-Aurangabad (MS	09:33	Bus Bar protection operate	-	10:37
7	kV Bableshwar-Taptithanda 2	09:33	Bus Bar protection operate	-	11:55
8	kV Bableshwar-Bhusawal	09:33	Bus Bar protection operate	-	11:39

Sl No.	ne of the transmission element/	ime of Trippi (hh:mm)	Relay indication End 1	elay Indication En	ime of restorati (hh:mm)
9	/220 kV 315 MVA ICT 1	09:33	Bus Bar protection operate	-	11:04
10	/220 kV 315 MVA ICT 2	09:33	Bus Bar protection operate	-	11:11
11	/220 kV 500 MVA ICT 3	09:33	B, Bus Bar protection oper	-	11:14
12	0 kV Bus Coupler at Bableshwar	09:33	Bus Bar protection operated		10:37
13	kV Bableshwar-Ammednagar 1	09:33	pped with ICT III load trimr scheme	-	11:13
14	kV Bableshwar-Ammednagar 1	09:33	ped with ICT III load trim eme	-	11:19
15	kV Aurangabad-Bhenda	09:33	ped on backup O/C prote n A'bad	-	12:04
16	kV Bableshwar-Challisgaon	09:33	ped on backup O/C prote n Challisgaon	-	11:06
17	kV Bableshwar –Nasik 1	09:33	ped on Backup O/C from N	-	12:05
18	kV Bableshwar –Nasik 2	09:33	ped on Backup O/C from N	-	12:05
19	kV A'Bad(MS)-Pune 1	09:44	pped due to Siemens relay operation	-	11:54
20	kV A'Bad(MS)-Pune 2	09:44	R operated , Zone 1 carrie Phase to E/F	-	06-04-15 18:36
21	kV Bableshwar-Bableshwar I/C 1	10:53	and trip to Control loading bableshwar	-	11:!2
22	kV Bableshwar-Bableshwar I/C 2	10:53	and trip to Control loading bableshwar	-	11:05
23	kV A'Bad-Wardha 3	10:30	Tripped on O/V	-	Kept off

Restoration Activity: After accessing the sub-station healthiness at Bableshwar, station was given supply via 400 kV A'Bad-Bableshwar circuit. After this 400 kV Bableshwar-Padghe 2 was taken in service at 10:37 Hrs and 400 kV Bableshwar Bus 1 & 2 were charged. This was followed by taking 400 kV Bableshwar-Padghe 2 at 10:37 Hrs which has resulted in quite high loading on 400 kV Aurangabad-Bableshwar circuit. Therefore, the 400 kV Bableshwar-Padghe was hand tripped at 10:42 Hrs. It was decided that after restoration of other circuit of Bableshwar, both 400 kV Bableshwar-Padghe circuit would be taken simultaneously. After this 400 kV Bableshwar-Dhule 1 & 2 were taken one by one at 10:44 hrs and 10:45 Hrs respectively. This was followed by taking Bableshwar ICT 1, 2 & 3. At 11:49 Hrs, 400 kV Bableshwar-Padghe D/C was taken in service followed by taking 400 kV Bableshwar-Taptithanda 2 circuit. Further at 11:54 Hrs , 400 kV A'Bad(MS)-Pune 1 was taken in service. The angular separation between Korba –Kalwa has reduced to 52 degrees with these three circuits.

Load / Generation affected to access the load during the disturbance period WRLDC has used three different parameters i.e. Maharashtra demand reduction, Maharashtra drawal reduction from ISTS and frequency-power number.

Based on Maharashtra Demand Data from WRLDC SCADA as being received from SLDC :

1. Load loss at 09:33 : 17479-16741 = 738 MW
2. load Loss at 09:44 : 16799-16311 = 488 MW

Based on Maharashtra Drawal from Grid:

1. Load Loss at 09:33 : 5505-4687 = 818 MW

2. Load Loss at 09:44 : 5217-4891 = 326 MW (SPS has also acted causing generation reduction at Tirora during period so U/D from grid varies here)

Based on frequency rise and power number:

1. Load Loss at 09:33 : 6000* 0.14 = 840 MW
2. Load Loss at 09:44 : 6000* 0.10 = 600 MW

As the three results are near to each other the load loss is approximated as 738 + 488 MW = 1226 MW during the event. Further generation loss due to SPS action at APML was 402 MW. Further 451 MW load relief was given in the Pune and lonikhand area as informed by MSETCL between 09:51-11:57 Hrs that has also helped in improving the voltage in the area.

Energy Unserved during the event was calculated by area under the demand on 4 and 5 may 2015 and comes out to be 3.498 MU (3498 MWhr).

6. Analysis: So there were two separate events i.e. event 1 at Bableshwar at 09:33 Hrs and Event 2 at 09:44 Hrs where 400 kV A'bad (MS)-Pune D/C tripped.

Event 1: The fault at Bableshwar started due to the bursting of grading capacitor for the R phase breaker pole of bus reactor 1 that has hit the Isolator on reactor side. The Breaker is having double interruption chamber and after analysis at the site it was concluded that one of the interrupter (on Bus side) out of the two breakers remained closed as the mechanical rod to open it was found to be broken. This has resulted in the unequal distribution of voltage across the grading capacitor i.e. full 230 kV voltage came across the grading capacitor causing its bursting. The DR files are attached as annexure 2.

Further, after this ICT III was getting overloaded which resulted in activation of the load trimming function incorporated in the O/C E/F relay, which has three functionality i.e. H/V Directional Overcurrent, LBB and Load trimming. It was found during testing of the above relay that the LBB function is getting initialised with triggering of any of the function i.e. O/C, E/F or Overload. In view of this MSETCL has informed that the load trimming function has been kept off for this relay. In addition, an external O/C relay has been installed for load trimming function and was taken in service on 18th May 2015. The DR files are attached as annexure 2.

Event 2: At 09:44 Hrs, 400 kV A'Bad (MS)-Pune D/C has also tripped. On analysis of DR and as information from WRTML it was found that circuit 2 has B phase jumper has opened near to pune end (12 km from Pune) created a single phase to earth fault. The fault was cleared by carrier-aided protection and A/R operated after 1 second, which was not successful, and line tripped with the permanent nature of the fault. Further, at the same time 400 kV A'Bad-Pune 1 also tripped from A/Bad end in zone 2 trip (instantaneous in nature as observed from DR) from Main2 Siemens Relay when the A/R on the 400 kV A'Bad(MS)-Pune 1 was attempted after 1 second of actual fault. The DR has been attached as annexure 3. The relay malfunction has been reported to the vendor.

The tripping of line during a loading of 848 MW for 12 minutes after the event is of great concern in view of system operation. The thermal limit for this conductor is 1079 MW for 75^0 C conductor. In addition, the concern is the opening of jumper rather than breakdown of the conductor. WRTPL is looking into the incident and will be submitting the details for this event.

Annexure 2.14

126 th pcm

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.

Office of The Chief Engineer
Maharashtra State Load Dispatch Center, Thane-Belapur Road, P.O. Airoli,
Navi Mumbai Pin – 400 708.
Tele :91-22-27601765 / 1766
Fax :91-22-27601769
Email : cesldc@mahasldc.in
Website : http://www.mahasldc.in

Ref: MSLDC/TECH/SO/ 240

08 MAY 2015

The Director (Operations)
MSETCL,Mumbai

Sub: Bus fault at 400/220kV Kalwa S/s on dated 08.05.2015 at 14:55Hrs.

As per SCADA scheme

Today On 08.05.2015 at 14:55 Hrs, bus Bar Protection Operated on 400 KV Main Bus -1 At Kalwa sub Station

Submitted please.

The reason of operation recorded is burning of R phase Wave Trap of Padgha-1 line and broken conductor was in the vicinity of B-ph of Main Bus-1 at Kalwa sub-station, affecting bus.

Maharashtra load was reading 18200 MW, MSEDCL load of 15000 MW, and Mumbai load of 3200MW.

The 400kV bus configuration at Kalwa substation is as follows prior to fault.

A) Main Bus-I

1) 400kV Padgha – II (Tripped)
2) 400KV Kharghar (Tripped)
3) 400/220KV ICT-II 600MVA (Tripped)

B) Main Bus-II

1) 400kV Padgha-I (Tripped & Faulty)
2) 400 kV Talegaon
3) 400/220 kV ICT-I 500 MVA
4) 400/220 kV ICT-III 500MVA

400kV Bus coupler tripped.

Subsequent to tripping, 400 kV Kalwa sub- station was being fed on single Talegaon line and Kharghar sub- station was being fed on single Padgha line only which was carrying 700 MW and 650 MW post fault.

The 220KV Boisar (PG)-Boisar (M) double circuit lines were further stressed even after operation of trimming scheme at Boisar(M)

EE-I
Bus
Shri Suman
Get the
details of this
event (DR, EL
etc), analyse
& Submit
report within
by 12.05.15
11/05/15 11 mths.

Restoration

1) 400kV Padgha – II (restored) at 15.55 hrs
2) 400KV Kharghar (restored) at 16.00 hrs
3) 400/220 KV ICT III 600MVA (restored) at 15.57 hrs
II

All the above lines and ICT were taken on Main Bus-I.

In order to control over loading of lines, distress load shedding was carried out at following substations.

1. Kharaghar -	67 MW
2. Nerul -	52 MW
3. Sonkhar -	65 MW
4. R-INFRA Mumbai suburban area	230 MW
5. Kalwa-	43 MW
6. Boisar (M) -	93 MW
7. Boisar (M) -	(82 MW trimming)

A total load shedding of about 632 MW is reported from 15.10 hrs to 16.00 hrs including trimming scheme.

Submitted, please.

08.05.15
Chief Engineer
MSLDC, Kalwa

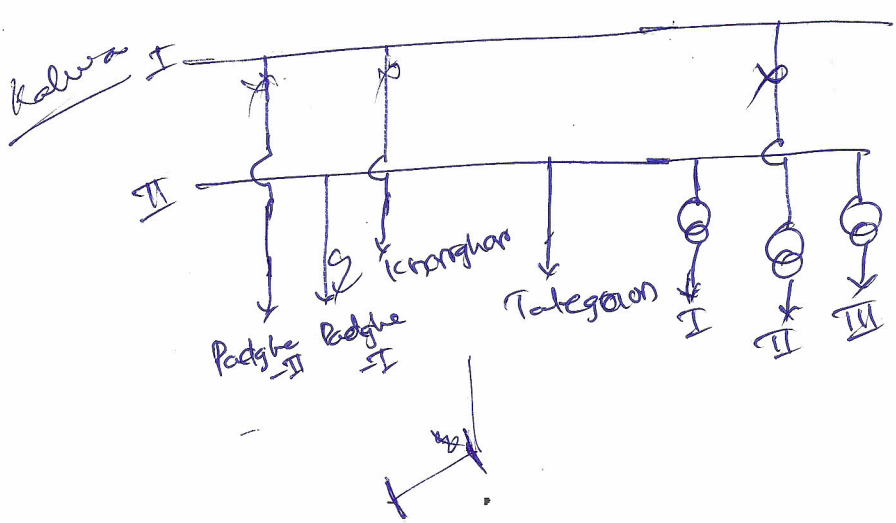
Copy submitted w.r.to:-

The Chairman and Managing Director, MSETCL, Mumbai.
The Member Secretary WRPC, Mumbai
The General Manager, WRLDC, Mumbai

Copy f.w.c. to :

The Chief Engineer (Trans O&M)/(STU), MSETCL C-O. Mumbai

what about padghe I ?



Annexure - 3

Single line trippings from 01.03.2015 to 30.04.2015

S. No.	kV	Element	Trip		Restored		A/R Status	Reason
			Date	Time	Date	Time		
1	400	SARNI - SEONI LINE	30.04.15	21:16	30.04.15	22:38	YES	Line tripped due to 'B' phase Earth fault. Main -II protection, A/R Definite trip operated.
2	400	SARNI - ASHTA LINE -I	09.04.15	15:28	12.04.15	22:51	YES	Line tripped due to 'B' phase fault. Distance protection, Zone-1 optd, distance 22.20 Km.
3	400	SARNI - ASHTA LINE -I	18.04.15	15:34	19.04.15	16:40	YES	Line tripped due to 'R' phase fault. Distance protection, Zone-1 optd, distance 128.30 Km.
4	400	SARNI - ASHTA LINE -I	24.04.15	15:05	24.04.15	16:50	YES	Line tripped due to 'R' phase fault. Distance protection, Zone-1 optd, distance 128.60 Km.
5	400	SARNI - ASHTA LINE -I	25.04.15	13:12	29.04.15	22:30	YES	Line tripped due to 'R' phase fault. Distance protection, Zone-1 optd, distance 128.3 Km.
6	220	AMK-JABALPUR FDR No.1	15.04.15	13:14	15.04.15	13:29	YES	Line tripped due to `C` Phase fault, Z-1, DPR optd.
7	220	AMK-PANAGAR FDR	19.04.15	11:41	19.04.15	11:52	YES	Line tripped due to `A` Phase fault, Z-2, L/O, DPR optd, 86 A, 86 B.
8	220	AMK-JABALPUR FDR No.2	19.04.15	12:15	19.04.15	19:34	YES	Line tripped due to `B` Phase fault, Z-1,DPR optd, Trip ABC, L/o,86 X.
9	220	AMK-ANUPPUR FDR No.2	24.04.15	12:51	24.04.15	13:31	YES	Line tripped due to `B` Phase fault, Z-1, 186 A, 186 B.
10	220	AMK-SIDHI FDR	25.04.15	15:16	25.04.15	15:35		Line tripped due to phase `C-N` fault, Z-1, Z-2, Bkr auto trip, ABC, 186 M1A, 186 M1B,186 M1C.
11	220	AMK-JABALPUR FDR No.2	28.04.15	13:08	28.04.15	13:21	YES	Line tripped due to phase `C-N` fault, Z-1, 86X.
12	220	BRS-PANAGAR	20.04.15	12:01	20.04.15	12:37	YES	67 BX, 186A, 186 B, A/R Lock out optd.
13	220	SINGAJI - CHHEGAON-I,	22.04.15	19:06	24.04.15	21:36	YES	Line tripped due to `R` Phase fault, 21 M1 Optd., Z-2, 86 A & B.
14	220	SINGAJI - CHHEGAON-I	24.04.15	21:44	24.04.15	22:08	YES	DT received.
15	220	SARNI- HANDIYA FDR.	15.04.15	12:24	15.04.15	12:55	NO	Z-2 Protection optd.
16	220	TONS - KOTAR FDR.	18.04.15	13:04	18.04.15	15:01	NO	Line tripped due to phase`A -N` fault, Z-2,
17	400	SINGAJI - JULWANIA	07.03.15	11:23	08.03.15	11:15	YES	Line tripped due to Ph. `B` fault , 21 M1 , Zone-II, DPR optd.
18	400	SINGAJI - PITHAMPUR	14.03.15	20:55	14.03.15	22:25	YES	Line tripped due to `Y` Phase fault, Zone-II, 21 M1 optd.
19	400	SARNI-ISP LINE	25.03.15	17:17	25.03.15	18:15	YES	Line tripped due to `R` Phase fault, Main I & II Protection optd.
20	400	SARNI-ITARSI LINE	30.03.15	5:15	30.03.15	5:52	YES	Line tripped on CB Gr.`A` Pole Discrepancy relay.
21	220	AMK-JABALPUR FEEDER No.1	09.03.15	15:56	09.03.15	16:47	YES	Line tripped due to `A` Phase fault, Z-1, DPR optd.
22	220	AMK-PANAGAR FEEDER	15.03.15	8:02	15.03.15	8:45	YES	Line tripped due to `B` Phase fault, Z-1.
23	220	AMK-PANAGAR FEEDER	29.03.15	15:38	29.03.15	16:06	YES	Line tripped due to `A` Phase fault, Z-1.
24	220	BRS-SHUKHA (PANAGAR)	26.03.15	11:01	26.03.15	11:46	YES	Line tripped due to Earth Fault
25	220	SARNI S/S ICT. NO.I	14.03.15	2:28	14.03.15	3:17	NO	Line tripped due to inst. Earth Fault , PAR, P+H25D optd.
26	220	SARNI- HANDIYA FDR.	21.03.15	15:01	21.03.15	16:47	NO	Line tripped due to Overcurrent, Z-1
27	220	TONS- REWA FEEDER-II	16.03.15	4:05	16.03.15	5:39	YES	Line tripped due to `C` phase fault, DPR optd., Z-1, Distance 12.9 Km
28	220	SINGAJI - CHHEGAON-I	12.03.15	5:03	12.03.15	7:03	YES	Line tripped due to `R` Phase fault, 21 M1, 24M2 Optd., Z-1, 86 A & B
29	400	BHADRAVATI-PARLI I	1-Mar-15	21:45	1-Mar-15	22:00		LINE TRIPPED DUE TO B PHASE TO E FAULT. F/L=65KM FROM PARLI.HEAVY RAIN, WIND AND LIGHTENING ALSO OBSERVED
30	400	AURANGABAD-AKOLA I	14-Mar-15	23:26	15-Mar-15	0:02		LINE TRIPPED AT AKOLA END ONLY DUE TO Y-E FAULT, F.L.94KM FROM A'BAD.

31	400	PARLI-PUNE(GIS)_2	8-Mar-15	17:11	8-Mar-15	18:37		TRIPPED DUE TO LR PRD OPERATION AT PUNE END
32	400	RAIPUR-WARDHA II	15-Mar-15	16:10	15-Mar-15	16:15		LINE TRIPPED DUE TO REACTOR BUCHHOLZ PROTECTION OPERATED AT WARDHA END.
33	765	SWITCHABLE LR__A'BAD 2_WARDHA	11-Feb-15	11:10	9-Apr-15	17:13		REACTOR H/T FOR DISMANTLING AND ERECTION OF NEW REACTOR DUE TO VIOLATION OF DGA GASES.
34	400	KOLHAPUR-MAPUSA I	4-Apr-15	12:35	4-Apr-15	12:51		TRIPPED ON STUB PROTECTION OPEARATED AT MAPUSA END
35	765	WARDHA - AURANGABAD(PG) IV	9-Apr-15	13:35	9-Apr-15	13:45		TRIPPED DUE TO LINE REACTOR PRV OPERATION AT AURANGABAD SS
36	765	SEONI-WARDHA I	9-Apr-15	17:00	9-Apr-15	21:35		LINE TRIPPED ON B-PH TO E FAULT. F/L=103KM FROM SEONI.
37	765	DURG PS -WARDHA_2	12-Apr-15	22:44	12-Apr-15	23:51		LINE TRIPPED DUE TO R-Y PHASE TO PHASE FAULT F/L= -34 KM, FROM WARDHA.
38	765	SEONI-BILASPUR II	15-Apr-15	15:57	15-Apr-15	18:28		OUTAGE AVAILED FOR TAKING SPARE L/R IN SERVICE AS PER CC GUIDELINES AT BILASPUR S/S
39	400	WARDHA-PARLI I	16-Apr-15	15:14	16-Apr-15	15:53		LINE TRIPPED DUE TO B PHASE - E FAULT AFTER SUCESSFUL A/R. F/L= 111 KM FROM WARDHA & 206.74 PARLI END.
40	400	RAIPUR-WARDHA II	26-Apr-15	19:14	26-Apr-15	19:56		LINE TRIPPED ON B PH TO E, 18.6KM, FROM RAIPUR & 356.9KM FROM WARDHA. FAULT IN CG PORTION.
41	400/220	ICT1_/_SEONI	30-Apr-15	21:20	31.04.2015	0:00		ICT TRIPPED DUE TO FAILURE OF HV SIDE B PHASE BUSHING.
42	400	Stage-IV Jejuri	01.03.15	17.15	01.03.15	19.06		decapping
43	400	Karad - Lonikhand	10.03.15	19:13	10.03.15	19:43		Transient tripping
44	400	Stage- IV Jejuri	26.03.15	17.21	26.03.15	18.25		decapping
45	400	Stage IV Lonikand	27.03.15	12.37	27.03.15	13.3		Transient tripping
46	400	Raipur-Tamnar Line -1	22.04.2015	15:07				A/R successful both ends
47	400	Raipur-Tamnar Line -2	22.04.2015	15:30				A/R successfully operated from Tamnar end only and breaker tripped from PGCIL Raipur end
48	765	Koradi - Tirora - II	22.03.2015	14:09	22.03.2015	15:11		The line triped on Y ph to E/F in zone - II. A/R was successful
49	765	Koradi - Tirora - II	23.03.2015	14:32	22.03.2015	16:27		The line triped on Y ph to E/F in zone - II. A/R was successful
50	40	SARNI SEONI LINE	30/04/2015	21.16	30/04/2015	22:38		line tripped on Main-II protection
51	40	Sarni I.S.P. Line	25.03.2015	14:42				Line Tripped on R-Ph.Fault from Sarni end RN-41.9 % & main I & II protection. Carrier received.
52	40	Sarni Itarsi Line	30.03.2015	5:15				Line tripped on CB Pole Discrepency window from sarni end and C.B. Local control box CB Gr.A pole discrepancy relay flag , After checking the pole discrepa ncy circuit no abnormalities found.
53	400	Parli-Wardha II	09.03.2015	19:27	10.03.2015	16:37		Line tripped on permanent fault after A/R attempt in R-Ph
54	400	Waluj - Deepnagar	20.03.2014	14:33	21.03.2014	1:11		Line triped due to conductor snapping

Present Status of Protection Audit Deficiencies (A & B type) in MSETCL for the year 2012-13 as on 15.04.2015

1	2	3	4	5	6	7	8	9	10	11
Sr. No.	Name of S/s identified for Protection Audit	S/s voltage (kV)	Observations of protection Audit	Deficiencies that can be corrected without procurement (Category-A)			Deficiencies involving procurement (Category-B)			Present Status as on 15.04.2015
				Yes/ No	Whether attended Yes/No	If not attended, reason	Yes/ No	Whether attended Yes/No	If no, expected date to attend	
1	Wardha	220	Faulty Annuciators shall be replaced immediately				Yes	Yes		Replaced on dt. 15.09.2014
2	Hinganghat	220	The annunciator of 220kV TSS-I & Warora are out of service which need to be replaced immediately.				Yes	Yes		Replaced on dt. 09.08.2014
3	Warora	220	The Differntial relay of 220/33kV 50MVA T/F-II shall be replaced				Yes	Yes		Replaced on dt. 16.09.2013
4	Khaperkheda	400	The NDR relay shall be replaced				Yes	Yes		Replaced on dtd. 07.06.2014
5	Koradi	400	The NDR relay shall be replaced				Yes	Yes		Replaced on dtd. 11.06.2014
6	Deepnagar GCR	220	LBB scheme is not in service				Yes	No	30.06.2015	work is in progress
7	Girwali	400	400kV PGCIL CKT I & II - Broken Conductor Detection is off.	Yes	No					Pertains to PGCIL
8	Girwali	400	400kV PGCIL CKT I & II - ZONE 3 & ZONE 4 trip time is same to 1S .	Yes	No					Pertains to PGCIL

Present Status of other issues identified during Protection Audit for system improvement in MSETCL for the year 2012-13 as on 15.04.2015

Sr. No.	Name of S/s identified for Protection Audit	S/s voltage (kV)	Observations of protection Audit	Expected date to attend	Present Status as on 15.04.2015
1	VASAI	220	The ABB make SCADA is in service with standby PC not in working condition. The GPS & SCADA timing is not matching due to problem in GPS clock & system.		ABB representative visited site on 23/07/2014 & survey work done.
2	VASAI	220	TF LV side data is not available at SCADA due to communication failure problems.		
3	VASAI	220	The 100kV Busbar protection scheme is not in service.		Work is in progress. However 220kV Busbar scheme is in service.
4	PADGHE	400	Commissioning of 2 Nosof 220kV Hybrid PASS (GIS Bus-sectionalizer) at Padghe alongwith additional 220kV TBC, 2 sets of PTs & shifting of 220kV side bay of ICT3 & strenthening of 400kV & 220kV Bus	Within 1 Year (After receipt of material at site)	Foundation work Completed. Erection of C & R panel completed.
5	PADGHE	400	Replacement of 220kV & 100kV static Busbar schemes by Numerical Busbar schemes.		Existing schemes are in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
6	BOISAR	220	Replacement of 132kV Busbar protection schemes by Numerical Busbar schemes.		Existing scheme is in service. However, replacement by Numerical scheme is planned**. Pl. ref. ****
7	KALWA	400	Replacement of 400kV Static Busbar protection schemes by Numerical Busbar schemes		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
8	KALWA	400	Shifting of 500 MVA, 400/220kV ICT 1 from 400kV Kalwa II ss to 220kV Kalwa I ss		Completed.
9	URAN	220	All 220kV Control panels needs to be replaced.		The Control panels are very old & need replacement. The scheme is prepared by field office. However, as existing panels are in service, there is no urgency & will be replaced in a phased manner.
10	APTA	220	Replacement of 100kV Busbar protection schemes by Numerical Busbar schemes.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****

Sr. No.	Name of S/s identified for Protection Audit	S/s voltage (kV)	Observations of protection Audit	Expected date to attend	Present Status as on 15.04.2015
11	APTA	220	The C & R panels needs replacement with new Control Room.		The Control panels are very old & need replacement. The scheme is prepared by field office. However, as existing panels are in service, there is no urgency & will be replaced in a phased manner.
12	KANDALGAON	220	Replacement of 220kV Busbar protection schemes by Numerical Busbar schemes.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
13	KANDALGAON	220	Replacement of 100kV C & R panels, also replacement of TF C &R panels.		Completed on 31.03.2015
14	KANDALGAON	220	Making LILO of 220kV Nagothane - Mahad line at Kandalgaon.		WIP. Erection of equipments has already been completed.
15	NAGOTHANE	400	Replacement of 400kV & 220kV Busbar protection schemes by Numerical Busbar schemes.		Existing schemes are in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
16	KHARGHAR	400	Replacement of 400kV & 220kV Busbar protection schemes by Numerical Busbar schemes.		Existing schemes are in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
17	TROMBAY	220	The work of shifting of 220kV C & R panels from old CR to newly constructed CR by REL is to be taken on priority.	May-15	Out of 9 Nos. of CRP panels, 4 Nos. of Pannels commissioned.
18	Kaulewada	220	Internal module problems in the exisitng Busbar scheme (ALSTOM-PBLSB). The scheme is maloperated in the past hence needs to be replaced.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
19	Bhandara	220	The exisitng Busbar scheme (ABB-RADSS) has maloperated in the past due to RQDA module problem and hence needs to be replaced.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
20	Kanhan	220	48V DC battery set must be replaced immediately		Replacement planed. However, in the mean time set reconditioned between 25.03.2014 to 31.03.2015
21	Ambazari	220	The deffective 220V DC battery sets shall be replaced		Capacity Test being carried out once again in Apr. 2015 to ascertain the need of replacement
22	Ambazari	220	48V DC set no:-1 efficiency observed as 60%. Battery set needs replacement.		Replaced in March 2015

Sr. No.	Name of S/s identified for Protection Audit	S/s voltage (kV)	Observations of protection Audit	Expected date to attend	Present Status as on 15.04.2015
23	Ambazari	220	The exisitng Busbar scheme (ABB-RADSS) has maloperated in the past due to RQDA module problem and hence needs to be replaced.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
24	Khaperkheda	220	The exisitng Busbar scheme (ABB-RADSS) has maloperated in the past due to RQDA module problem and hence needs to be replaced.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
25	Butibori-I	220	The exisitng Busbar scheme (ABB-RADSS) has maloperated in the past due to RQDA module problem and hence needs to be replaced.		Existing scheme is in service. However, replacement by Numerical scheme is planned. **Pl. ref. ****
26	Khadka	400	Electromechanical Relays of ICT to be replaced by numerical one	30.06.2015	Tender finalised & LOA issued.
27	Chalisgaon	220	Electromechanical Relays of ICT to be replaced by numerical one.	30.06.2015	Tender finalised & LOA issued.
28	BBLR	400	02 number of Distance Protection scheme to be commissioned	Will be done in next immediate outage	Non-availability of outage is a major constraint. Relays are available
29	Waghala	220	Line B/U electromechanical relays - 10	31.10.2015	Order for retrofit of Back up relays is issued.
30	Akola	220	Followg relays are non numerical: *Dist relays (132kV feeders)- 5 nos. *B/U relays-5 nos *Diffl relays-3 nos.	31.10.2015	Disatnce Relay retroffited. Order placed by C.O. for Back up & Differential relays. Relays received at store and will be retrofitted shortly.
31	Amravati	220	Followg relays are non numerical: *Dist relays- 2 nos. *B/U relays- 4 nos *Diffl relays-3 nos.	31.10.2015	Disatnce Relay retroffited. Order placed by C.O. for Back up & Differential relays. Relays received at store and will be retrofitted shortly.
32	Badnera	220	Followg relays are non numerical: *Dist relays- 2 nos. *B/U relays- 2 nos	31.08.2015	Disatnce Relay retroffited. Order placed by C.O. for Back up & Differential relays. Relays received at store and will be retrofitted shortly.
33	Akola	220	Busbar scheme for 132kV bus is not provided		**Pl. ref. **** However 220kV Busbar scheme is in service.

Note: ** Tender has been finalized and order placed for procurement of 76 Nos. of Busbar protection schemes at various EHV substations in

PROTECTION AUDIT DEFFICIENCIES/OBSERVATIONS COMPLIANCE [As on 30.06.2014]									
Name of S/S identified for protection audit	S/S voltage (kV)	Observations of protection audit	Deficiencies that can be corrected without procurement (Category-A)			Deficiencies involving procurement (Category-B)			Remarks
			Yes / No	Whether attended Yes/No	If not attended, reason	Yes / No	Whether attended Yes/No	If no, expected date to attend	
Khedamara	**400/ 220**	Main-II protection of 220 KVBRSS-I &II,220 KV Urla & 220 KV PGCIL feeders not available.				Yes	No		Estimate submitted
Bemetara	**220/ 132**	1. Carrier protection is not available. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available.			-	Yes	No	14.08.14	-
Gurur	**220/ 132**	1. Carrier protection is not available.. 2. M II protection for 220 KV feeder not available.			-	Yes	No	14.08.14	-
Sohela	**220/ 132**	1. Carrier protection is not available.. 2. GPS time synchronizing facility is not available. 3. M II protection for 220 KV feeder not available.			-	Yes	No	14.08.14	-
Bhatapara	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available.			-	Yes	No	14.08.14	-
Mopka	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available. 7. Synchronization trolly not available.			-	Yes	No	14.08.14	-

Banari	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available.			-	Yes	No	14.08.14	-
Siltara	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available. 7. Synchronization trolly not available.			-	Yes	No	14.08.14	-
Doma, Raipur	**220/132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available.			-	Yes	No	14.08.14	-
Paraswani	**220/132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available.			-	Yes	No	14.08.14	
Urla	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available.			-	Yes	No	14.08.14	-
Thelkadih	**220/132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available.			-	Yes	No	14.08.14	-
Barsoor	**220/132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available.			-	Yes	No	14.08.14	-

Bhilai	**220/132**	1. Carrier protection is not available. 2. M II protection for 220 KV feeder not available. 4. LBB protection not available.			-	Yes	No	14.08.14	-
Kotmikala	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available. 7. Synchronization trolly not available.			-	Yes	No	14.08.14	-
Raigarh	**220/ 132**	1. Carrier protection is not available.. 2. 2nd DC battery set is not available. 3. GPS time synchronizing facility is not available. 4. M II protection for 220 KV feeder not available. 6. LBB protection not available. 7. Synchronization trolly not available.			-	Yes	No	14.08.14	-
KTPS, Korba (E)	**220**	**1**. Separate two sets DC system is recommended for switchyard protection	No			Yes			Estimate and Requisition for separate DC source has been send for approval.
		2. Carrier Protection is out of service.	Yes	Yes, for 220 kV Korba East-West I/C No. I&II	Rest feeder's carrier prot. ckt will be checked				In E-W I/C No. I & II Carrier protection checked & taken in service.
		3. Disturbance Recorder and SERs are not available.				Yes			Estimate processed for approval.
		4. Old THR make Static DPR relays needs to be replaced by numerical relays				Yes	NA	NA	Tender to be opened on 13.08.2014
		5. Auto re-closer is not available.	Yes	No	ckt will be checked				
		6. Bus Bar Differential scheme is not available.				Yes			
DSPMTPS, Korba	220	3)Dual channel carrier protection is available in all 220 KV feeders but kept out	YES	No	Due to non availability of Panel at remote end.				
		8) Auto reclose is available but presently kept out.	YES	No	As carrier protection is out.				
		9) Bus Bar differential scheme is available but presently kept out.	YES	No	To be checked before put in service				

Korba West TPS	400	3) Non availability of B/B differential & LBB protection				Yes	No	31.10.2014	Bus Bar protection panel has been received
		4)GPS is available however no relay is synchronised with it.				Yes	No	31.05.2014	Relays have been synchronised with new GPS.
		5) Replacement of ABCB with SF6 breakers & commissioning of isolator sequential operation with ABCB opening.				Yes	No	31.03.2016	Replacement of ABCB with SF6 breakers is included in the scope of work of R&M of station proposed in year 2015-16
Korba West TPS	220	1) Second DC system is recommended .				Yes	No	31.03.2015	In R&M
		2) To renovate/retrofit Main-I & Main-II Protection with numeric relays in all out going feeders.				Yes	No	30.09.2014	05 no. Numeric Relays have been retrofitted as MainI/II protection in the following feeders: KW-Churi I & II,KW-DSPM, KW-KE I & II . Rest will be fitted after the receipt of ordered material.
		3) Carrier Protection is not in service.		02 no. have been commissioned in KEB-KWB inter connectors		Yes	No	31.03.2016	for other 4 feeders procurement is required
		4) Disturbance Recoder and SER s are not available.				Yes	No	31.09.2014	Bay control panels for SCADA system have been received .M/s ABB is being persuaded to commission the same as early as possible.
		5) Non availability of Auto reclose scheme.				Yes	No	30.09.2014	After the commissioning of the numeris relays will be put in service
		6) Non availability of B/B differential				Yes	No	31.03.2015	Old scheme to be replaced by new one.Estimate is being sent for approval.
		8)GPS is available however no relay is synchronised with it.				Yes	No	31.03.2015	After commissioning of SCADA panel, Relays will be synchronised.GPS facility is available in SCADA.

MPPTCL

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Annexure - I

Sl. No.	Name of Sub-Station identified for Protection Audit	S/S Voltage kV	Observation of Protection Audit	Deficiencies that can be corrected without procurement (Category-A)			Deficiencies involving procurement (Category-B)			Remark
				Yes / No	Wether attended Yes/No	if not attended reason	Yes / No	Wether attended Yes/No	if no, expected date to attend	
1	Bhopal	400	Providing of Separate Event Logger				Yes	No	4 months	Order placed. Panel not received at substation
2	Bhopal	400	Replacement of 220KV Static Bus Bar system with Numeric				Yes	No	2 months	220 KV Numerical Bus bar panel received at Substation
3	Mandideep	220	Providing of 220KV Bus Bar Protection Scheme				Yes	No	2 months	220 KV Numerical Bus bar panel received at Substation
4	Gwalior	220	220KV Bus Bar scheme to be provided				Yes	No	4 months	221 KV Numerical Bus bar panel received at Substation
5	Gwalior	220	Providing of NIFPS on 3x40MVA 220/132KV Transformer				Yes	No	6 months	
6	Gwalior	220	Providing of DG set				Yes	No	6 months	
7	Bina	400	Providing of Separate Event Logger				Yes	No	4 months	Under process
8	Katni	400	DG set not provided				Yes	No	4 months	
9	Malanpur	220	Providing of DG set				Yes	No	-	Under process
10	Malanpur	220	Providing of NIFPS on 160MVA 220/132KV Transformer-II				Yes	No	-	Under process
11	Mehgaon	220	Providing of NIFPS on 160MVA 220/132KV Transformer-II				Yes	No	-	Under process
12	Shujalpur	220	220KV Bus Bar scheme to be provided				Yes	No	4 months	Under process
13	South Zone Indore	220	220KV Bus Bar protection scheme is ASEA make needs to be replaced with numerical scheme				YES	NO	2 months	BEING COMMISSIONED, TO BE TAKEN IN SERVICE
14	South Zone Indore	220	Providing of DG set				YES	NO	6 MONTHS	UNDER PROCESS
15	Pithampur	220	Providing of DG set				YES	NO	6 MONTHS	UNDER PROCESS
16	Barwaha	220	220KV Bus Bar protection scheme is ASEA make needs to be replaced with numerical scheme				Yes	No	4 months	
17	Barwaha	220	Providing of DG set				Yes	No		Under Process
18	Jabalpur	220	Air Conditioning system should be provided in the Control Room				Yes	No		Matter is under consideration.
19	Rewa	220	Automatic Fire Protection System (NIFPS)to be installed on all Transformers				Yes	No		Matter is under consideration.
20	Rewa	220	Synchronising scheme must be provided as many Hydel Generators are connected to the 220KV and 132KV Bus.				Yes	No		
21	Satna	220	Automatic Fire Protection System(NIFPS) to be installed on 160MVA AREVA Transformer				Yes	No		Matter is under consideration.
22	Sagar	220	Automatic Fire Protection System (NIFPS)to be installed on both Transformers				Yes	No		Matter is under consideration.

Sl. No.	Name of Sub-Station identified for Protection Audit	S/S Voltage kV	Observation of Protection Audit	Deficiencies that can be corrected without procurement (Category-A)			Deficiencies involving procurement (Category-B)			Remark
				Yes / No	Wether attended Yes/No	if not attended reason	Yes / No	Wether attended Yes/No	if no, expected date to attend	
23	Sagar	220	220KV Bus Bar scheme to be provided				Yes	No	4 months	
24	Julwaniya	220	220KV Bus Bar scheme to be provided				Yes	No	4 months	
25	Nimrani	220	220KV Bus Bar scheme to be provided				YES	NO	2 months	
26	Nagda	400	Separate event logger for S/S is not available and needs to be provided.				Yes	No	6 Month	Under process
27	Indore	400	Tertiary Reactor of 315MVA Tr-I & II are not being taken in service due to high Tan delta values of Bushings, which should be replaced and reactors should be taken in to service.				YES	NO	-	Under process
28	Indore	400	On 400KV side Bus Bar relay make EE type FAC is electromagnetic type relay and it is very old and obsolete. Its spares are not available,This scheme may be replaced with the numerical Bus Bar protection scheme.				YES	NO	2 months	COMMISSIONED TO BE TAKEN IN SERVICE

INDIRA SAGAR POWER STATION (8X125=1000MW)

PROTECTION AUDIT DEFICIENCIS AND OBSERVATION COMPLIANCE

SUBSTATION VOLTAGE	400 KV
NAME OF PROCTECTION AUDIT AGENCY	MPPTCL & MPSLDC member
Category-A	22-23- Feb-2013

Sr. No.	Observations of Protection Audit	Deficiencies that can be corrected without procurement (Category-A)			Remarks
		Yes/No	Where Attended Yes/No	if not attended reason	
1	Time delay setting for Zone-3 is given as 500ms, which is very low and it should be revised as per CBIP recommendation or in co-ordination with MPPTCL setting for Zone-3 that is 700ms.	YES	YES	Non Applicable	Time delay settings changed from 500ms to 700ms on 20.09.2013.
2	Thermovision survey/thermal scanning is being done annually, it should be done monthly.	YES	YES	Non Applicable	Thermovision scanning is being done regularly.
3	As per latest guidelines directional Earth fault Protection is to be provided on 400 KV Lines. It can be provided through existing numirical DPRs. It is suggested to provide the same	YES	YES	Non Applicable	Matter is under communication with other end substations and their suggestion are sought for the setting for directional E/F Protection. Reply is still awaited.
4	Partial DC leakage observed in battery sets of power plant. It is suggested to rectify the same.	YES	YES	Non Applicable	Problem rectified.

(Categaory-B)

S. No.	Observations of Protection Audit	Deficiencies that can be corrected without procurement (Category-A) B			Remarks
		Yes/No	Where Attended Yes/No	if not attended reason	
1	In general voltages observed around 420KV to 430KV when generating machines are off. Therefore to control overall high voltage problem it is suggested to provide either 2x50 MVAr shunt reactors on 400KV Bus at ISP or 50 MVAr line reactors should be provided on 400KV ISP-Sarni (200 Kms) line and on 400KV ISP-Nagda (189 Kms) line on both the ends.	YES	YES	2015	Case for installation of 125 MVAr Bus reactor is under pre tendering stage.
2	On observation of higher voltages on R-phase of 400 KV Sarni circuit, as a precautionary measure it is suggested to replace the R-phase CVT of Sarani circuit by spare CVT available at site to eliminate the possibility of equipment error.	YES	YES	Non Applicable	CVT of R-phase of ISP-Sarni feeder at ISP end replaced by spare CVT on 06.06.2013.
3	Battery capacity test carried out by keeping battery charger off for 1 hours a voltage drop of 6 percent observed three battery set were commisioned in 2003 and have completed almost 10 years Further suitability of these battery sets should be confirmed by consulting manufactureer and by conducting long drtation high current discharge capacity test	YES	YES	Under Process	The complite battery bank were overhauled in 2010- 11 by the manufacturer and it gauatanteed the battery life for another five years. Matter of conducting long duration high current discharge capacity test is under process.
4	Tandelta and capacitance test of transformer bushings is being done once in three year. It should be done once in a year.	YES	YES		Matter is taken up with the manufacturer Reply is awaited. Action shall be taken up accordingly on receipt of OEM reply.

Sd/- M(E)

JP Bina.

Gmail by Google

Sldc Mpseb <sldcmpjbp@gmail.

FOLLOW UP REGARDING IMPLEMENTING PROTECTION AUDIT RECOMMENDATIONS AND CERC - Reg

1 message

sk.chakraborty <sk.chakraborty@jalindia.co.in> Sun, Aug 3, 2014 at 11:25 AM
To: sldcmpjbp@gmail.com
Cc: "s.sen" <s.sen@jalindia.co.in>, "rs.sharma" <rs.sharma@jalindia.co.in>, "rajneesh.gaur" <rajneesh.gaur@jalindia.co.in>

This has reference to your message dated 31-07-14 on the above subject . The point and extract of the remarks from our consultant M/S TCE forwarded to you long ago are given below once again . However initial data compilation and studies by M/S CPRI ,Bangalore for the protection co ordination by third party as per recommendation from grid failure committee has already been conducted in the 4th week of july 2014 and there draft report will be available by 2 months . Discussion regarding all these point will be held at that time and a conscious decision will be taken at that time

Sl. No.	Name of Sub-Station identified for Protection Audit	S/S Voltage kV	Observation of Protection Audit	Deficiencies that can be corrected without procurement (Category-A)			Deficiencies involving procurement (Category-B)			Remark	
123	Jaypee Bina TPS	400	2no. Of High Mast tower installed near 400 kV transfer bus in the switchyard	No	Yes					Two no high mast has been erected at the corner of s/s	
124	Jaypee Bina TPS	400	Directinal E/F relay setting 1 sec. for PGCIL 1.2 Sec for MPPTCL line is provided. This is on higher side, to be reviewed& revise	Yes						Answer from our consultant M/S TCE : Directional ef is provided to protect the system from high impedance line faults where fault currents are low. So 1 sec operating time is sufficient and can be used for both the lines. Decrease in the operating time may cause it to interfere with 3rd zone time settings.	Comments from our consultant M/S TCE is given
125	Jaypee Bina TPS	400	Over voltage satting for 400kv PGCIL&MPPTCL line are not as per CBIP recomendation(CBIP REV 274).	Yes						Our consultant TCE's reply :Please note that an instantaneous overvoltage setting of 130% phase to phase can be used. As per standard practice lines are capable of withstanding 150% of highest system voltage at power frequency for 1 minute. So above settings are ok.	Comments from our consultant M/S TCE is given
126	Jaypee Bina TPS	400	GT&ST fifth harmonics blocking is done for 20%. This may be studies & revised.	Yes						Reply from consultant TCE ;As per recommendation from relay manuals, setting of 15 to 30 % is used for fifth harmonic blocking. As per our standard 20% is used fifth harmonic blocking.	Comments from our consultant M/S TCE is given
127	Jaypee Bina TPS	400	It is observed that for ganretor protection under frequency relay trip setting 48.5Hz for 5sec.& over frequency relay trip setting 51.0Hz for 5sec. Is taken, the same may be reviewed.	Yes						Our consultant reply Frequency protection is used mainly for alarm and as per our practice a time delay of 5 sec is adequate.	Comments from our consultant M/S TCE is given
128	Jaypee Bina TPS	400	In turn proection has not been provided, through it is recommended for Generator more than 100 MVA.	Yes						Our consultant TCE's reply ; As per our standard practice, inter-turn protection is provided only when specifically recommended by the manufacturer.	Comments from our consultant M/S TCE is given
129	Jaypee Bina TPS	400	Periodical testing of relays & yard equipment must be done.	Yes						Periodical testing of relay & yard equipments - it will be athive too.	

Regards,

S.K. Chakraborty

Jaypee Bina Thermal Power Plant
(A Division of Jaiprakash Power Ventures Limited)
Rajiv Nagar, Post Box No. 1,
Sub P.O. Agasod
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Distt. Sagar (M.P)
Phone: 07580-277101-3

Part-1

Logic Check (Protection Audit Report) during year 2008-09-10

Sr. No.	Particular	Year of Audit	No. of SS Audited	No. of Defects observed	No. of defects attended	Pending Defects	No. of defects Category A	No. of Defects Category B
1	Logic check of 220/132 KV class substations	2008-09	112 (132 KV -48 220 KV-64)	2652	2652	nil	2652	Nil
2	Logic check of 400 KV class substations	2009-10	9	1129	1129	nil	1129	Nil

Remark:- Audit was conducted during period 2008 to 2010 . All the defects have been successfully resolved.

Part-2

Logic Check (Protection Audit Report) during year 2013-14

1	Logic check of 220/132 KV class substations	2012-13	121 (132 KV -47 220 KV-74)	1191	1191	nil	1191	Nil
2	Logic check of 400 KV class substations	2013-14	11	611	377	234	611	Nil

Remark:-(1) Audit of 121 nos. of 220/132 KV class substations is completed. All pending defects are atttended which falls in category A.

(2) Audit of 11 nos. of 400 KV substations is completed. Following nos. of bays are pending at SS.

(i) 400 KV Asoj- 10 nos.

(ii) 400 KV Kosamba:- 3 nos.

(III) 400 KV Vadavi- 1 nos.

Format for Protection Audit

Name of Utility: Gujarat Energy Transmission Corporation Ltd.

Sr. No.	Name of Circle	Name of the Substation identified for audit	S/S Voltage (KV)	Observations of Protection Audit	Date on which audit conducted/completed	Deficiences that can be corrected without procurment (Category A)			Deficiences that involves procurment (Category B)			Remark (Defect)
						No. of Defects in Category A	Attended Yes/NO	Reason for not attended	No. of Defects in Category A	Attended Yes/NO	Reason for not attended	
1	Amreli	132KV Barwala	132	Circle/ substaion wise observation report enclosed herewith.	22/6/12	77	77		Nil	NA	NA	No. of Defects:-77 Attended(nos.):-77 Pending(nos.):- 0
2		132KV Paliyad	132		19-20/6/12							
3		220KV Dhasa	220		07/12/2012							
4		220 KV Botad	220		17/7/2012							
5		132KV Vallabhipur	132		21/6/12							
6		220KV Otha	220		07/05/2012							
7		220KV Savarkundla	220		16/7/2012							
8		220KV Sagapara	220		07/06/2012							
9		220KV Vartej	220		07/10/2012							
10	Anjar	220KV Anjar	220	Circle/ substaion wise observation report enclosed herewith.	22/11/2013	97	97		Nil	NA	NA	No. of Defects:-97 Attended(nos.):-97 Pending(nos.):- 0
11		132 KV Samakhiyali	132		23/05/2012							
12		220KV Shivlakha	220		26/12/2013							
13		220 KV Kukma	220		25/12/2013							
14		220KV Nakhatrana	220		20/12/2013							
15		220KV Nanikhakhar	220		27/12/2013							
16		220KV Tappar	220		23/12/2013							
17	Bharuch	132KV Ankleshwar	132	Circle/ substaion wise observation report enclosed herewith.	24/9/12	78	78		Nil	NA	NA	No. of Defects:-78 Attended(nos.):-78 Pending(nos.):- 0
18		132KV Valia	132		23/8/12							
19		220KV Acchalia	220		29/9/12							
20		220 KV Wagra	220		09/06/2012							
21		220KV Dahej	220		20/9/12							
22		220KV Kim	220		09/05/2012							
23		220KV Zagadia	220		22/9/12							
24		220KV Haldarwa	220		09/07/2012							
25		132KV Bharuch	132		18/9/12							
26	Gondal	132KV Wankaner	132	Circle/ substaion wise observation report enclosed herewith.	14/02/2014	35	35		Nil	NA	NA	No. of Defects:-35 Attended(nos.):-35 Pending(nos.):- 0
27		220KV Lalpar	132		02/07/2014							
28		132KV Jasdan	132		15/02/2014							
29		132KV Dhrol	132		02/04/2014							
30		220KV Gondal	220		22/02/2014							
31		132KV Vajdi	132		03/05/2014							
32		220KV Nyara	220		26/02/2014							
33		132KV Vikram	132		02/07/2014							
34		220KV Morbi	220		02/05/2014							
35		132KV Idar	132		19/6/12							
36		132KV Visanagar	132		20/6/12							

Sr. No.	Name of Circle	Name of the Substation identified for audit	S/S Voltage (KV)	Observations of Protection Audit	Date on which audit conducted/completed	Deficiences that can be corrected without procurment (Category A)			Deficiences that involves procurment (Category B)			Remark (Defect)
						No. of Defects in Category A	Attended Yes/NO	Reason for not attended	No. of Defects in Category A	Attended Yes/NO	Reason for not attended	
38	Himmatnagar	220KV Agiyol	220	Circle/ substaion wise observation report enclosed herewith.	06/10/2012	93	93		Nil	NA	NA	No. of Defects:-93 Attended(nos.):-93 Pending(nos.):- 0
					06/10/2012							
39		220KV Bhutiya	220		27/6/12							
40		220KV Jamla	220		30/6/12							
41		220KV Vijapur	220		22/6/12							
42		220KV Dhansura	220		07/04/2012							
43		132KV Talod	132		23/6/12							
43	Jambuva	132 KV Tilakwada	132	Circle/ substaion wise observation report enclosed herewith.	30/4/13	125	125		Nil	NA	NA	No. of Defects:-125 Attended(nos.):-125 Pending(nos.):-
44		132 KV Vasedi	132		05/03/2013							
45		220KV Godhra	220		22/5/13							
46		132KV Dahod	132		05/07/2013							
47		220KV Jambuva	220		24/05/2013							
48		220KV Chandrapura	220		24/5/13							
49		220KV Gavasad	220		25-6-2013							
50		132KV Gotri	132		07/02/2013							
51		220KV Waghodia	220		30/6/2013							
52		132KV J' Nagar	132		31-6-2013							
53		132KV F"Nagar	132		06/11/2013							
54		132KV Karjan	132		07/03/2013							
55		132KV Manjusar	132		30-6-2013							
56		132 KV Limkheda	132		06/02/2013							
57		132KV Nandesari	132		07/04/2013							
57	Jamnagar	220KV Ranavav	220	Circle/ substaion wise observation report enclosed herewith.	20/02/2014	28	28		Nil	NA	NA	No. of Defects:-28 Attended(nos.):-28 Pending(nos.):- 0
58		132KV Bhatia	132		21/02/2014							
59		220KV Jamnagar	220		14/02/2014							
60		132KV Khambhalia	132		14/02/2014							
61		132KV Naghedi	132		14/02/2014							
62	Junagadh	132 KV Bhayavadar	132	Circle/ substaion wise observation report enclosed herewith.	18/8/12	89	89		Nil	NA	NA	No. of Defects:-89 Attended(nos.):-89 Pending(nos.):- 0
63		132KV Junagadh	132		09/07/2012							
64		220KV Keshod	220		09/08/2012							
65		132 KV Dhoraji	132		22/8/12							
66		220KV Motipaneli	220		24/08/2012							
67		220KV Sardargadh	220		09/07/2012							
68		220KV Visavadar	220		25/6/12							
69		132KV Haripur	132		26/6/12							
70		132KV Talala	132		27/6/12							
71		220KV Timbdi	220		07/02/2012							
72		220 KV Kansari(Dhokalva)	220		07/04/2012							

Sr. No.	Name of Circle	Name of the Substation identified for audit	S/S Voltage (KV)	Observations of Protection Audit	Date on which audit conducted/completed	Deficiences that can be corrected without procurment (Category A)			Deficiences that involves procurment (Category B)			Remark (Defect)
						No. of Defects in Category A	Attended Yes/NO	Reason for not attended	No. of Defects in Category A	Attended Yes/NO	Reason for not attended	
73	Mehsana	132 KV Patan	132	**Circle/ substaion wise observation report enclosed herewith.**	12/02/2013	41	41		**Nil**	**NA**	**NA**	No. of Defects:-41 Attended(nos.):-41 Pending(nos.):- 0
74		132 KV Siddhpur	132		27/11/2013							
75		220KV Kheralu	220		26/12/2013							
76		220KV Sankhari	220		29/11/2013							
77		220KV Chhatral	220		21/11/2013							
78		220KV Mehsana	220		21/12/2013							
79		220KV Mitha	220		12/10/2013							
80	Nadiad	132 KV Sabarmati	132	**Circle/ substaion wise observation report enclosed herewith.**	05/12/2012	266	266		**Nil**	**NA**	**NA**	No. of Defects:-266 Attended(nos.):-266 Pending(nos.):-0
81		220KV Salejada	220		30/5/12							
82		132KV Ode	132		30/4/12							
83		132KV Undel	132		20/05/12							
84		220KV Kapadwanj	220		06/09/2012							
85		220 KV Bhat	220		31/05/12							
86		132KV Narol	132		22/05/12							
87		132KV Chiloda	132		24/7/12							
88		220KV Karamsad	220		29/4/12							
89		220KV Ranasan	220		17/05/12							
90		132KV Mahemdabad	132		19/05/12, 15/7/2012							
91		220KV Khanpur	220		19/7/12							
92		132KV Nadiad	132		18/05/12							
93	Navsari	220KV Bhilad	220	**Circle/ substaion wise observation report enclosed herewith.**		90	90		**Nil**	**NA**	**NA**	No. of Defects:-90 Attended(nos.):-90 Pending(nos.):- 0
94		220KV Talangpore	220		08/06/2013							
95		220KV Ambheta	220		25/5/13							
96		132KV Atul	132		16/05/12							
97		132 KV Bhestan	132		06/10/2013							
98		220KV Ichhapore	220		06/07/2013							
99		220KV Mota	220		05/11/2013							
100		220KV Navasari	220		22/5/13							
101		220KV Vapi	220		09/02/2013							
102		220KV VAV	220		05/09/2013							
103	Palanpur	220 KV Thavar	220	**Circle/ substaion wise observation report**	09/05/2012	52	52		**Nil**	**NA**	**NA**	No. of Defects:-52 Attended(nos.):-52 Pending(nos.):- 0
104		220KV Tharad	220		09/01/2012							
105		132 KV Deesa	132		09/06/2012							
106		220KV Deodar	220		09/11/2012							
107		220KV Jangral	220		25/8/12							

Sr. No.	Name of Circle	Name of the Substation identified for audit	S/S Voltage (KV)	Observations of Protection Audit	Date on which audit conducted/completed	Deficiences that can be corrected without procurment (Category A)			Deficiences that involves procurment (Category B)			Remark (Defect)
						No. of Defects in Category A	Attended Yes/NO	Reason for not attended	No. of Defects in Category A	Attended Yes/NO	Reason for not attended	
108		220KV Palanpur	220	**enclosed herewith.**	22/8/12							
109		220KV Radhanpur	220		14/9/12							
110		220KV Agarthala	220		29/8/12							
111	Surendranagar	132KV Dhandhuka	132	**Circle/ substaion wise observation report enclosed herewith.**	29/1/2013	120	120		**Nil**	**NA**	**NA**	No. of Defects:-120 Attended(nos.):-120 Pending(nos.):-0
112		132KV Sitagadh	132		30/1/2013							
113		132KV DHANKDHRA	132		23/1/2013							
114		220KV Halvad	220		25/1/2013							
115		220KV Limbdi	220		31/1/2013							
116		220KV Viragam	220		28/02/2013							
117		220 KV DUDHREJ	220		02/02/2013							
118		220 KV RAJPAR	220		02/05/2013							
119		220 KV BALA	220		02/06/2013							
120		220 KV ADALSAR	220		23/01/2013							
121		220 KV DHANKI	220		03/05/2013							

FORMAT FOR PROTECTION AUDIT DEFFICIENCIES / OBSERVATIONS COMPLIANCE

Name of Utility	Powergrid Corporation of India Ltd, Region (WR - II)											
Name of S/S identified for protection Audit	S/S voltage (kV)	Name of Third Party Protection Audit Agency	Date on which Audit Conducted	Observations of protection Audit	Deficiences that can be corrected without procurement (Category - A)			Deficiences that can be corrected without procurement (Category - B)			If not tentative date for protection audit	Remarks
					Yes / No	Whether attended Yes / No	If not attended, reason	Yes / No	Whether attended Yes / No	If not attended, reason		
Jabalpur	400	WRLDC, MPPTCL	16/04/2013	Nil	Not Applicable							
Itarsi	400	WRLDC, WR-I	9/2/2013	Nil	Not Applicable							
Dehgam	400	WRLDC, WR-I, GETCO	6/4/2013	1. Non working of Main II Relay of Ranchodpura 2 Line of GETCO 2. Non Time Synchronisation of Relays of all the GETCO Lines	Defect pertains to GETCO							Point no. 1. has already been resolved Point no. 2 - GETCO has informed that they will rectify the same at the earliest
Satna	765	WRLDC, WR-I	18/01/2013	Nil	Not Applicable							
Khandwa	400	WRLDC	16/04/2013	Nil	Not Applicable							
Vapi	400	WRLDC, WR-I	18/01/2013	Nil	Not Applicable							
Bina	765	CPRI, SR-I, SR-II	13/08/2012	Earth resistance meaurement to be done in peak summer	Already done in 16/05/2013. Completed			Not Applicable				
Gwalior	765	WRLDC, WR-I	8/12/2012	PLCC Commissioning at MPPTCL end, for 220kV MPPTCL's Lines	Defect pertains to MPPTCL							Matter has been referred to MPPTCL. MPPTCL has commissioned the same in one ckt and intimated that it will be commissioned in second ckt shortly.
Rajgarh	400	WRLDC	25/04/2013	Nil	Not Applicable							
Damoh	400	WRLDC, WR-I	16/01/2013	Nil	Not Applicable							
Pirana	400	WRLDC, WR-I	16/01/2013	Nil	Not Applicable							
Shujalpur	400	WRLDC	25/04/2013	Nil	Not Applicable							
Bhachau	400	WRLDC, WR-I	9/4/2013	Nil	Not Applicable							
Navsari	400	WRLDC, WR-I	4/4/2013	Nil	Not Applicable							

Annexure - 6

The nodal officers were identified responsible for submission of data to RPC. They are

1. WRLDC: GM WRLDC
2. PGCIL-I: DGM(OS)
3. PGCIL-II: DGM(OS)
4. NTPC WR-II: AGM(OS) & DGM(OS)
5. GETCO STU: SE (Testing).
6. GETCO SLDC: CE SLDC.
7. MSETCL STU: SE, MSETCL
8. MSETCL SLDC: CE, SLDC
9. MPPTCL STU: CE, (T&C)
10. MPPTCL SLDC: CE, SLDC
11. CSPTCL STU: SE(T&C)
12. CSPTCL SLDC: CE, SLDC.

FORMAT -1 (PROTECTION AUDIT)

Agency	**Recommendation 9.1.1:** There is a need to review protection schemes. This Committee concurs with recommendation of previous enquiry committee that a throrough third party protection audit need to be carried out in time bound manner. This exercise should be repeated periodically and monitored by RPC's. Action : RPCs, CTU, STUs.																				
	State	(A) Total No. of S/S in region.						(B) No. of S/S identified for audit.						(C) No. of S/S yet to be audited						(D)Target date for completion of audit.	(E) No. of S/S where deficiencies detected.
		132 kV	220 kV	400 kV	765 kV	HVDC	Total	132 kV	220 kV	400 kV	765 kV	HVDC	Total	132 kV	220 kV	400 kV	765 kV	HVDC	Total		
	Maha 2013	**334**	**183**	**24**		2	543	11	76	22		0	109	0	0	0		0	0	NA	NA
	maha 2014	**335**	**186**	**24**		2	545	49	89	12		0	150	0	0	0		0	0		
	Guj	**47**	**81**	**11**				**47**	**74**	**0**				**11**	**20**	**11**				**30.9.2013 for 132 & 220 kV**	**80 (30+ 50)**
	CG																				
	MP gen	**9**	**4**	**2**			**15**	**9**	**4**	**2**				**0**	**4**	**2**			**6**	**01/11/2014**	**NA**
1. RPCs	Trans+JP		**54**	**8+1**					**54**	**8+1**					**54**	**0+0**				**31/12/2014**	
(State	OSP		**1**						**1**						**1**					**30/09/2013**	**Tendered**
wise)	ISP			**1**						**1**						**1**				**30/09/2013**	**Under Tendering**
	WR-I (PG)	**0**	**0**	**8**	**3**	**1**		**0**	**0**	**8**	**3**	**1**		**0**	**0**	**0**	**0**	**0**	**0**		**NA**
	WR-II (PG)			**11**	**3**					**11**	**3**										**4**
2. CTU	WR-I (NTPC)																				
(Region	WR-II (NTPC)																				
wise)	Total																				
		(F) Action plan (on observation of third party protection audit) finalization date/Target date for finalizing plan						(G) Detail of S/S where no procuremnet is required for removal of deficiencies. No. of S/S Target date for removal of deficiencies						(H) Detail of S/S where procurement is required. No. of SS Target date of removal of deficiencies.						(I) Reason/remarks for rectification of deficiencies requiring period of more than one year.	(J) Cost estimates for removal of deficiencies.
		132 kV	220 kV	400 kV	765 kV	HVDC	Total	132 kV	220 kV	400 kV	765 kV	HVDC	Total	132 kV	220 kV	400 kV	765 kV	HVDC	Total		
	Maha 2013	**1**	**2**	**3**			**6**	**7**	**22**	**7**			**36**	**6**	**23**	**6**			**35**		**NA**
	Maha 2014	**0**	**4**	**4**			**8**	**4**	**30**	**4**			**38**	**13**	**24**	**9**			**46**		
	Guj																				
	CG																				
	MP																				
	WR-I (PG)																				**NA**
	WR-II (PG)									**1**	**3**										
	WR-I (NTPC)																				
	WR-II (NTPC)																				

FORMAT -2 (REVIEW OF ZONE - 3 PHILOSOPHY)

Recommendation 9.1.2: Till protection audit is taken up, there is a need to take immediate review of zone 3 philosophy in paticular. Techniques are available to modify characteristics of the relay so that it can distinguish between load encroachment and faults. These techniques and other alternatives should be explored immediately. Action : RPCs, CTU, STUs.:

WRPC	Total No. of S/S at 220 kV & above (132 KV & above in NER states, J&K, Uttarakhand, HP, Sikkims, etc)				No. of sub-stations covered at each voltage level.				No. of S/S where revised Z-III setting have been implemented.				Month and year by when revised Z-III settings would be implemented at remaining sub-station.			
Constituent \ kV	**765**	**400**	**220**	**Total**	**765**	**400**	**220**	**Total**	**765**	**400**	**220**	**Total**	**765**	**400**	**220**	Total
Maha		**186**	**27**	**213**		**18**	**93**	**111**		**15**	**65**					
Guj				**92**				**92**								NA
CG																
MP gen		**2**	**4**			**2**	**4**									NA
MP tran		8	54			8	54									NA
WR-I (PG)	3	9	0		3	9	0					NA				NA
WR-II (PG)				14				14				NA				NA
WR-I (NTPC)																
WR-II (NTPC)																

Format -3

S No.	Constituent	Details of existing PMUs				Additional PMUs planned to be insatlled			Total No. of PMUs in the State
		No. of PMUs installed	Locations	No. of PMUs functional and time syndchronised	Target date for making defective PMU functional	No. of PMUs	Locations	Target date for commissioning	
	Maha	**15**				**35**			50
	Guj	**0**				**25**			25
	CG								
	MP	**2**		**2**					
	WR-I (PG)								
	WR-II (PG)	**8**		**8**					
	WR-I (NTPC)								
	WR-II (NTPC)								

S No.	Constituent	SPS is already operational at present			SPS under Implementation				
		Purpose of SPS	Trigger for SPS operation	result of SPS operations (detailof load shedding/backing down)	Details of SPS Being Planned / Under study			Target date of Finalization of SPS	Target date for commissioning of SPS
					Purpose	Trigger for SPS operation	Result of SPS operations		
	Maha								
	Guj	6							
	CG								
	MP								
	WR-I (PG)								
	WR-II (PG)	2							
	WR-I (NTPC)								
	WR-II (NTPC)								

WR

S.No	Under	Sub-station	Date of Commissioning	CT Connection (Feeders)	PT Connection
1	WRTS-I	Boisar	10.04.2013	Phadghe, Tarapur-2	Bus-1
2	WRTS-I	Bhadravathi	16.04.2013	Raipur-2, Raipur-3	Bus-1
3	WRTS-I	Solapur 400kV	18.04.2013	Kolhapur-1, Parli-1	Bus-1
4	NTPC	Korba	10.09.2013	Bhatupara, Generator-6	Bus-2
5	NTPC	Vindhyachal	18.09.2013	Jabalpur-1, Korba-1	Bus-1
6	WRTS-I	Solapur 765kV	26.12.2013	Raichur- 1 & 2	Bus-1
7	WRTS-II	Dehgam	13.04.2013	Gandhar-2, Pirana-2	Bus-1
8	WRTS-II	Itarsi	20.04.2013	Jabalpur-2, Indore-2	Bus-1
9	WRTS-II	Satna	23.04.2013	Bina-3, Vindyachal-3	Bus-1
10	MPPTCL	Bina MP	13.09.2013	PGCIL-1, Bhopal-1	Bus-1
11	CGPL	CGPL Mundra	06.09.2013	Limbdi-2, GT-3	Bus-2
12	WRTS-II	Jabalpur	02.11.2012	Itarsi-2, Vindyachal-4	Bus-1, Bus-2
13	WRTS-I	Raipur	08.11.2012	Korba-3, Raigarh-1	Bus-1, Bus-2
14	GETCO	Asoj	1.11.2013	Indore-1	Bus-1
15	MSETCL	Kalwa	9.11.2013	Padghe-II, Kharghar	Bus-1, Bus-2
16	WRTS-II	Itarsi		Jabalpur-1	Bus-1
17	WRTS-II	Jabalpur		Itarsi-1	Bus-1
18	APL	APL Mundra (Siemens)		Dehgam-2, Hadala	Bus-1
19	WRTS-I	Dhariwal (NI)		Bhadrawathi-2,Dhariwal-2	Bus-1

Maharastra

S. NO.	Voltage (kV)	PMU Location
1	**400**	Chandrapur
2	**400**	Bhusawal
3	**400**	New Koyna
4	**400**	Padghe
5	**400**	Dhule
6	**400**	Kalwa
7	**400**	Kolapur
8	**400**	Aurangabad
9	**400**	Lamboti
10	**400**	Lonikand
11	**400**	Girwali
12	**220**	Trombay
13	**220**	Eklahare
14	**220**	Boisar

WR II		
No. of PMUs	**Location**	**No. of units functional & Time Synchronised**
1	Vapi	1

S. No.	Name of the SPS	Aim	Description	Commissioned on	Agency
1	Ukai - Mota D/C	To restrict overloading on 220 KV Ukai-Mota- D/C lines	Stage-1:-700 A, 5 Minutes. Stage-2 : 750 A, Instantaneous (It will cut off load of 66 kV System at 220 KV Mota and Ambheta S/s)		
2	Amreli - Savarkindla D/C	To restrict overloading on 220 KV Amreli-Savarkundla D/C lines	Stage-1:-660 A,5 Minutes. Stage-690 A, Instantaneous (It will cut off load of 66 kV System at 220 KV Savarkundla S/s)		
3	Asoj ICT	To restrict the loading on 150 MVA, 220/132 KV ICT at 400 KV Asoj S/s in case of the sudden loss of GIPCL generation .	Setting HV current :- 360 A Rated HV Current: 394 A (It will trip 132 KV Asoj-Manjusar line no. 1 &2.	23/07/2013	
4	Jambhuva	To restrict the loading on 220/132 KV transformers at 220 KV Jambuva S/s in case of the sudden loss of GIPCL generation	Setting HV current :- 231 A Rated HV Current: 262 A (It will trip 132 KV Karjan, Tilakwada. 66 KV Dabhoi, 66KV Tarsali 1 &2) Commissioned on 29/7/13		
5	APL Mundra SPS (W/O FSC)	400KV Mundra-Sami 1& 2 and Sami-Dehgam 1 & 2 lines loading	If Both lines in service without FSC or Single Line is in service without FSC : Stage 1: If Current in either of these circuits exceeds 715 Amp, Alarm in 10 Sec. Stage 2 : if Line loading on these circuits exceeds 850 MW for 1.5 seconds : Tripping of Unit 5 or 6 Stage 3 : If Line loading on these circuits is greater than 700 MW and less than 800 MW for 1.5 seconds : Trip one unit from Unit 3 or 4 Stage 4 : If Line loading on these circuits is more than 650 MW for 15 seconds: 200 -300 MW Generation Reduction at APL.	Implemented	APL
6	APL Mundra SPS (With FSC)	400KV Mundra-Sami 1& 2 and Sami-Dehgam 1 & 2 lines loading	If Both lines in service with FSC or Single Line is in service with FSC : Stage 1: If Current in either of these circuits exceeds 715 Amp, Alarm in 10 Sec. Stage 2 : if Line loading on these circuits exceeds 1000 MW for 1.5 seconds : Tripping of Unit 5 or 6 Stage 3 : If Line loading on these circuits is greater than 850 MW and less than 1000 MW for 1.5 seconds : Trip one unit from Unit 3 or 4 Stage 4: If Line loading on these circuits is more than 750 MW for 15 seconds: 200 -300 MW Generation Reduction at APL.	Implemented	APL
7	APL Mundra SPS	400KV Mundra-Versana/ Hadala line Loading	**Stage 1 :** If Current in either of these circuits exceed 715 Amp , Alarm in 10 Sec. Stage 2 : if Line loading on these circuits exceed >600MW + Non availability of both APL-Sami or Sami-Dehgam lines : After delay of 4 second trip Unit 3 or 4 Stage 3 : if Line loading on these circuits exceed >600MW + Availability of any one or both APL-Sami or Sami-Dehgam lines : After Delay of 4 seconds Generation backing down @200 MW from unit 3, 4, 5, or 6.	Implemented	APL
8	APL Mundra SPS	220KV Mundra-Nanikhakar D/C and Mundra-Tappar D/C Line Loading	**Stage 1:** Current Setting 500 Amp , Time Delay : 5 Sec, Relay setting : 0.63 : Alarm to operator Stage 2: Current Setting 550 Amp , Time Delay : 2 Sec, Relay setting : 0.69, Tripping of ICT 1,2 Stage 3: Current Setting 605 Amp , Time Delay : 5 Sec, Relay setting : 0.76, Tripping of ICT 1,2 : Generation Back down Stage 4: Current Setting 670 Amp, Time Delay: 2 Sec, Relay setting: 0.84, Tripping of ICT 1, 2: Generation tripping of Unit 1 or 2.	Implemented	APL

9	HVDC Mundra Mohindergarh SPS	Loss of Both Poles of HVDC Mundra Mohindergarh	In Case of Loss of both Poles of HVDC Mundra Mohindergarh : · In case all units are running, trip two units of Stage-III. · Backup 1 : If dp/dt exceeds 150MW in 100 milliseconds and incremental flow on sectionaliser between stage-II&III has exceeded 150MW after two seconds, trip one unit from 7-9 · Backup 2: If steady state power on sectionalizer is greater than 1000 MW in 3.5 seconds, trip another unit from 7-9. Apart from that Reverse Power Protection (Power flow from stage II to Stage-III) · In case of reverse flow from stage I&II to stage-III, due to tripping of units from 7-9 of stage-III, reduce the power order on HVDC to match generation of Stage-III. · In case of tripping of all the units of Stage-III, pick up setting for the reverse power protection is 700 MW. The HVDC power order would be reduced to 700 MW in 1 minute. · Steady state limit for reverse power would be 500MW. This flow shall not exceed 500MW under steady state and regulatory directives in this matter shall be adhered to by M/s APL.	Implemented	APL
10	Gwalior (PG) - Gwalior (MP)	Gwalior S/S - 220kV Gwalior(PG)-Gwalior(MP) & Malanpur-For Tripping of 220 kV lines at Gwalior (PG) S/s in case of tripping of 765kV lines			WR II
11	LANCO SPS	To control Loading on 400 kV Korba-Pathadi circuit	The SPS is now not in service as the LANCO is now connected with 400 kV LANCO-Bilaspur D/C dedicated line.	Decommissioned	LANCO
12	JPL-Tamnar	If one ckt of 400kV Tamnar-Raipur trips, I unit of 250MW will trip and other 3 units would reduce by 60MW as one coal mill trips. When DCPP units are on bar, 220kV DCPP-JPL line will also trip.		Sep-11	M/s JPL
13	JPL SPS	For N-1-1 stability of Jindal and Jindal Extension Station	1. If Generation at JPl is full (4 * 250 + 2 * 135 MW) and one circuit of 400 kV JPL-Raipur D/C and 400 kV JPL-JPL Extension trip or One of the line is out of service and other circuit trips :Ex Bus Generation at JPl to be brought to 590 MW (One unit of 250 MW and 2 Unit of 135 MW along with 60 MW of Generation reduction in 3-4 Minutes. 2. Sudden Reversal of Power on JPl-JPl Extension due to N-1-1 contingency of 765 kV Tamnar-Kotra lines : Trip one unit of 600 MW and immediate backing down at other Unit in JPl extension so that Ex Bus generation of JPl+JPl Extension should not exceed 1160 MW. 3. All four 400 kV lines from JPL Extension-Tamnar to be in service if JPl Extension generation is more than 600 MW.	In Progress	JPL
14	Agra-Gwalior SPS	Sudden reduction of import by NR on Agra-Gwalior I& II by more than or equal to 1500MW	Automatic back down of 500 MW Generation in WR : · CGPL : 180 MW · Korba : 120 MW · Vindhyachal :200 MW	21/03/2014	CTU

15	BALCO SPS	Restriction of BALCO generation due to LILO arrangement	**Case 1 :** When 400 kV BALCO – Birsinghpur line trips OR the breaker position at BALCO is OPEN for Birsighpur line : Tripping 300 MW unit at BALCO Case 2 : Case B:-When flow on BALCO-Birsighpur line exceeds 550MW : Automatic Reduction of Generation at BALCO by 100 MW.	Implemented	BALCO
16	Korba Complex	Total flow on Korba(E)-Raigarh + Korba(W)-Kotmikla<525MW			CSPTCL
17	SIPAT SPS	To control overload of the 765/400 kV ICTs in view of tripping of 765 kV Sipat-Bilaspur D/C or 765 kV Bilaspur-Seoni D/C	· Alarm in case of ICTs loading exceeds 100 % for 5 seconds. · if any ICTs load exceeds 130% of the rated load for more than 4 sec : unload unit 1,2,4 and 5 each by 150MW (subject to minimum loading of 500MW in stage-1 units and subject to minimum loading of 350MW in stage-2 units). · if any ICTs load remains above 130% even after unloading unit 1,2,4 and 5 : Unload Unit 3 by 150 MW after 300 sec (subject to minimum loading of 500 MW. · Once the load has reduced below 130% manual action to reduce to bring down ICT loading below 100%	Implemented	NTPC
18	CGPL SPS	For Improving Steady state and Transient Stability at CGPL during N-1 and N-1-1 Contingency	1. In Case of Export of CGPL is more than 3100 MW and any one line out of eight lines (Including Bhachau-Ranchorpura D/C) or Line loading on any line exceeds 900 MW. : Reduce Generation in two Units of GPL to tune of 800 MW. 2. If Export of CGPL is more than 3100 MW and If 400 kV CGPL/Bhachau D/C trip: Trip one unit immediately. 3. In case of D/C tripping of CGPL-Choronia, CGPL-Jetpur or combination of one circuit of each of Bhachau, Choronia, or Jetpur: Trip one unit immediately.	Implemented	CGPL
19	SASAN SPS	To control overload of the following critical 765 kV transmission lines and ICT when more than four units of 660 MW of SPL are running on full load: 1) 765 kV Sasan – Satna Line 1 2) 765 kV Sasan – Satna Line 2 3) 765 / 400 kV, 1000 MVA ICT-1 4) 765 / 400 kV, 1000 MVA ICT-2	· If generation at Sasan is more than 2700 MW and current in one of the 765 kV Sasan-Satna Circuit exceeds 2000 Amp while other circuit has tripped: Trip 1 Unit immediately and if above condition is still satisfied then trip another Unit. · If generation at Sasan is more than 1970 MW and current in either of 765/400 kV ICT is more than 800 amp and both the 765 kV Lines have tripped: Trip one Unit followed by tripping of another unit in next 5 second if condition is still satisfied. If after tripping of two units, yet the condition is satisfied trip the third unit in next 5 seconds.	Implemented	SASAN
20	ESSAR MAHAN SPS	Restriction of Essar Mahan generation due to LILO arrangement	When the breaker position at Mahan is OPEN for Vindhyachal line “OR” Power flow towards Vindhyachal less than 12MW for at least 1 sec : Trip 600MW unit at Mahan immediately so that there is no injection towards Korba	Implemented	ESSAR MAHAN
21	ESSAR Steel Plant	ICT Overloading	‘OFF’ position of 400 KV side breaker of ICT’s “OR” ICT’s 220 kV, side current of ICTs more than 1100 ampere: Tripping of running Furnace’s at ESIL Plant-1 and 2.	Implemented	ESSAR Steel
22	VAPI(PG) ICT SPS	To Avoid overloading of 400/220 kV ICTs at Vapi(PG) S/s	· If anyone ICT trip and loading on remaining ICTs crosses 95 % at that Time: Tripping of Defined loads in DD and DNH. · If at any time ICT loading exceeds 85 % then Alarm to be generated at Vapi (PG) and Manual load shedding to be carried out.	In Progress	DD and DNH

23	WR-SR SPS 1	765 kV Solapur-Raihcur D/C Line loading	1. The total flow on the two circuits crosses 1500 MW and remains above 1500 MW for 2.5 seconds in Sholapur to Raichur direction sensed by both at Sholapur and Raichur : 800 MW Backing of Generation in WR (JPL, JPL Extension, KSK, DB Power, LANCO, KWPCL, BALCO, NSPCL) and 500 MW load Shedding in SR Grid 2. The total flow on the two circuits crosses 2000 MW (Instantaneous Nature): 800 MW Backing of Generation in WR (JPL, JPL Extension, KSK, DB Power, LANCO, KWPCL, BALCO, NSPCL) and 500 MW load Shedding in SR Grid. 3. If only one circuit is in operation and power flow on it crosses 1000 MW and remains above 1000 MW for 2.5 seconds in Sholapur to Raichur direction sensed by both at Sholapur and Raichur : 800 MW Backing of Generation in WR (JPL, JPL Extension, KSK, DB Power, LANCO, KWPCL, BALCO, NSPCL) and 500 MW load Shedding in SR Grid 4. If only one circuit is in operation and	Implemented	CTU
24	WR-SR SPS 4	400 kV Raipur-Wardha D/C Line loading	Flow on either circuit of 400 kV Raipur-Wardha D/C (sensed at Raipur) crossing 850 MW and remaining above this value for 2.5 seconds "OR" Tripping of any one circuit of 400 kV Raipur-Wardha D/C carrying 700 MW or above, sensed at Raipur (instantaneous) : 800 MW Backing of Generation in WR (JPL, JPL Extension, KSK, DB Power, LANCO, KWPCL, BALCO, NSPCL) and 500 MW load Shedding in SR Grid	Implemented	CTU
25	WR-SR SPS 5	400 kV Wardha-Parli D/C Line loading	Flow on either circuit of 400 kV Wardha-Parli D/C (sensed at Wardha) crossing 850 MW and remaining above this value for 2.5 seconds "OR" Tripping of any one circuit of 400 kV Wardha-Parli D/C carrying 750 MW or above, sensed at Wardha (instantaneous): 800 MW Backing of Generation in WR (JPL, JPL Extension, KSK, DB Power, LANCO, KWPCL, BALCO, NSPCL) and 500 MW load Shedding in SR Grid	Implemented	CTU
26	WR-SR SPS 6	400 kV Parli(PG)-Solapur(PG) D/C Line loading	Flow on either circuit of 400 kV Parli-Sholapur D/C (sensed at Sholapur) crossing 800 MW and remaining above this value for 2.5 seconds "OR" Tripping of any one circuit of 400 kV Parli-Sholapur D/C carrying 600 MW or above, sensed at Sholapur (instantaneous) : 800 MW Backing of Generation in WR (JPL, JPL Extension, KSK, DB Power, LANCO, KWPCL, BALCO, NSPCL) and 500 MW load Shedding in SR Grid	Implemented	CTU
27	HIGH FREQUENCY SPS	Automatic generation tripping at high frequency (51.5 Hz)	Automatic generation tripping in Western Region at high frequency (51.5 Hz) to help arresting the rise of frequency in case of islanding of WR from rest of NEW grid after delay of 30 seconds : Korba Unit 7 , Vindhyachal Unit 7, CGPL Unit 40	Implemented	CGPL/ NTPC
28	Wardha Flow gate				MSETCL
29	KAPS - Vapi	To restrict overloadding of 220 KV D/C KAPP-Vapi line		By the end of September-2013	GETCO
30	Hadal - Jetpur & Hadal - Chorania	To restrict overloadding of 400 KV S/C Hadala-Jetpur & 400 KV Hadala -Chorania		By the end of September-2013	GETCO

Format - 4 (Enabling UFR and df/dt relay)

Action: STUs, RPCs, Posoco, Time frame: immediate

RPC (State)	State wise details of UFR (as on date)						
	Total No. of UFRs installed	No. of UFRs functional	No. of UFRs nonfunctional	action being taken to make them functional	month and year to complete the remedial action	Details of additional UFRs under implementation/planned	
						No.	Target date of commissioning
Maha	272	271	1	Defective Relay Being	15/10/2013	_	_
Guj	149	145	4	OEM is contacted for repairing scheme	NA	TBD	TBD
CG							
MP	283	283	0				
OSP	8	8	0				
ISP	12	12	0				
WR-I (PG)							
WR-II (PG)							
WR-I (NTPC)							
WR-II (NTPC)							
	RPC (State)State wise details of df/dt (as on date)						
	Total No. of df/dt relayss installed	No. of df/dt relays functional	No. of df/dt relays nonfunctional	action being taken to make them functional	Month and year to complete the remedial action	Details of additional df/dt relays under implementation/planned	
						No.	Target date of commissioning
Maha	30	30	_	_	_	_	_
Guj	149	145	4	OEM is contacted for repairing scheme	NA	TBD	TBD
CG							
MP+JP	33+2	33+2	0			1	Dec-14
OSP	0	0	0				
ISP	12	12	0				
WR-I (PG)							
WR-II (PG)							
WR-I (NTPC)							
WR-II (NTPC)							

POSOCO (Petition wise)	No. and details of petitions filed with CERC for non-compliance of various regulations, issued under the act, by the states	Brief of petitionfiled in CERC	Status of Petition
WRLDC	22		22
Maha			
Guj			
CG			
MP			
WR-I (PG)			
WR-II (PG)			
WR-I (NTPC)			
WR-II (NTPC)			

In detail						
S. No.	**Petition No.**	**Petitioner**	**Respondent**	**Presently case is with**	**Allegation**	**Present Status**
1	HERC/PRO-01 of 2012	Lanco Amarkantak Power Ltd.	1. PTC India Ltd., 2. HPGCL 3. Chhattisgarh State Power Trading Co. Ltd. 4. Western Regional Load Dispatch Centre 5. Central Electricity Regulatory Commission	HERC	Application to fix/approve tariff for sale and purchase of power for the dispute period from Unit-2 of Lanco Amarkantak Power Ltd. to PTC as per Hon'ble Supreme Court Order dated 16.12.2011. Currently stay by Supreme Court	Pending. Supreme Court stayed the proceedings at HERC
2	Civil Appeal.No.10329/2011	Lanco Amarkantak Power Ltd.	1.Haryana Electricity Regulatory Commision 2.WRLDC 3.CSPTCL 4.Union of India,Ministry of Law	Supreme Court of India	Dispute over termination of PPA/revision of tariff/APTEL order	Pending
3	Pet.19/2013(M)	CSPDCL	PGCIL,POSOCO,WRLD	CSERC	CSPDCL has filed a petition at CSERC against WRLDC& PGCIL on allowing generators within geographical area of Chhattisgarh state to draw power for startup and commissioning activities in line with CERC Regulation	Pending. PGCIL,POSOCO&WRLDC Respondent N0 1,2,& 3 had filed an Appeal (Appeal.No.233/2013 & IA.No.318/2013) at APTEL against the jurisdiction of CSERC in the present petition. Hearing held on 23/05/13 & 16/07/13 & 03/05/2014. Last hearing at APTEL on 28.04.2014 (matter clubbed with another appeal - **86/2014**, wherein EMCO & WRLDC have been impleaded as parties.) **APTEL had stayed the proceedings at CSERC till further order from APTEL.** CSERC had scheduled the matter on **06.02.2015** to observe
4	Appeal.No.233/2013 & IA.No.318/2013	WRLDC/PGCIL	CSPDCL	APTEL	PGCIL,POSOCO&WRLDC Respondent N0 1,2,& 3 had filed an Appeal challenging the jurisdiction of CSERC in pet no. 19/2013	Pending. The appeal has been clubbed with appeal no. 86/2014, whenein WRLDC and EMCO have been impleaded as parties. Last date of hearing was 02.09.2014. The proceedings have concluded and the case is reserved for orders.
5	Appeal No.86/20	CSPDCL	13 respondents including: PGCIL, POSOCO & WRLDC	APTEL	An appeal has been filed by CSPDCL against a c	WRLDC along with EMCO has been impleaded as parties in the said appeal. Detailed arguments were heard on 21/8/2014. The case is scheduled for hearing on **15.01.2015.**
6	Pet.No.85/MP/20	WRLDC	SASAN, IE, 14 beneficiaries of SASAN UMPP	CERC	Declaration of CoD by SASAN UMPP at a derated capacity	As per thr order a report was to be submitted to CERC by 08.08.2014 in consultataion with CEA. A letter along with detailed report has been sent to CEA requesting them to convene a meeting to discuss and finalise the report to be submitted to the Hon'ble Commission

7	Appeal No. 233/2014 and I.A. Nos. 370, 371 & 371 of 2014	Sasan	CERC, WRLDC, Lahmeyer, MP Power and 14 others	APTEL	An appeal has been filed by Sasan against the against the order (dated 08.08.2014) of CERC in pet no. 85/MP/2014. The case is related to declaration of COD by Sasan UMPP at a declared capacity.	Replies to the IAs and the appeal have been filed respectively on behalf of WRLDC . The case was last heard on 12.12.2014 wherein the counsel for the appellant argued extensively and the aruments were followed by a technical presentation. The case is scheduled for hearing on **21/01/2015**. A **counter technical presentation** needs to be prepared for the hearing on 21.01.2015.
8	Appeal No. 266/2014	Lahmeyer Internatio	CERC, WRLDC, Sasan, MP Power and 14 others	APTEL	An appeal has been filed by the Independent Engineer against the order (dated 08.08.2014) of CERC in pet no. 85/MP/2014. The case is related to declaration of COD by Sasan UMPP at a declared capacity.	This appeal has been scheduled for hearing on 21.01.2015. The pleading of the appeal are yet to be completed. WRLDC is yet to file a reply in the present Appeal.
9	Pet.No.3125/2014	MPPMCL	Ministry of Power, CEA, CERC, WRLDC, WRPC, SLDC(MP)	M P High Court , (Jabalpur Seat)	MPPMCL has filed the petition at High Court, J	Pending. Last heard on 20/03/14. Reply has been filed by us. Case is yet to be listed for final hearing.
10	Pet.No.14/2014	APDISCOMS:APCPDCL, APEPDCL,APNP	KSK Mahanadi, SRLDC, WRLDC, AP SLDC, M/S. Shading Electric	APERC, Hyderabad	A petition has been filed on behalf of the APDISCOMS for directions on illegal claim of Rs. 66.31 Crores towards transmission charges	WRLDC & SRLDC are not direct parties to the petition and have pleaded to be removed from the list of parties. Last heard on 26/04/2014. The case was
11	Appeal.No.58/2014	Jindal Power Ltd.	CERC,PGCIL,NLDC,WRLDC	APTEL	JPL had challenged the Open Access Regulation 2009 stating that against an LTA of 500MW JPL is not getting any prefernce in STOA applicatons by JPL.	Pending. Appeal was admitted on 10/3/2014 . Reply has been filed by WRLDC & NLDC.Case was scheduled for hearing on 16.12.2014 and got adjourned. The case is listed for hearing on 22.01.2015.
12	*Petition No. 2/RP*	*Steel Authority of India Ltd.*	*WRLDC*	*CERC*	*SAIL had filed a review petition of the order dated 20.11.2013 in petition no. 211/MP/2011.*	***case over** . The order in pet. 211/MP/2011 was upheld by the commission, thus dismissing the review petition.*
13	Appeal no. 41/2014	SAIL/BSP	CERC & WRLDC	APTEL	An appeal has been preferred by SAIL against the order dated 20.11.2013 in pet no 211/MP/2011	Reply has been filed by WRLDC. The case is listed for hearing on 07.01.2015.
14	Appeal No. 95/2014	CSPDCL	CERC,MP Power Management Co., WRPC & WRLDC	APTEL	An appeal has been filed against CERC order in petition no. 193/MP/2012 (order dt. 20/02/2014).	The case was last listed for hearing on 11.12.2014. The appellant has been heard. One affidavit has been filed but WRLDC is yet to file the detailed reply. The case was last heard on **05.01.2015 and is now reserved for order.**
15	Pet.No.114/MP/2013	NTPC	WRPC,WRLDC all beneficiaries of NTPC in WR	CERC	Dispute between NTPC & WR beneficiaries on scheduling under fuel shortage conditions and interpretation of clause 21.4 of TCT Regulation 2009-14	The case is **reserved for order** vide ROP dated 19.11.2014.

16	Petition no. 53/M	EMCO	DNH Power Distribution Corporation ltd., Power Grid, GETCO & WRLDC	CERC	EMCO has filed a petition against DNH Corp. for recovery of capacity charges arising due to non-scheduling of Power as per tye terms of the PPA executed between EMCO & electricity department dadra and Nagar Haveli	The case is **reserved for order** vide ROP dated 10.12.2014.
17	Petition no. SM/008/2014	CERC	WRLDC, NRLDC, PGCIL & 10 others	CERC	Suo motu petition by CERC on northern grid failure. Wherein WRLDC is accused of violating R. 5.7.4 (g) (iv) , R. 6.5.20 and R. 6.5.27 of the IEGC.	Reply by WRLDC has been filed. Case is scheduled for hearing on **08.01.2014.**
18	Civil Appeal no. 8896 of 2013	Powergrid	CERC, NTPC, WRPC, POSOCO, WRLDC, MPPTCL, MSEDCL, GUVNL,CSPDCL, Goa govn., D& D, DNH.	Supreme Court of India	An appeal has been preferred under s.125 of Eleactricity act,2003 against the order of APTEL (dt. 16.01.2013) in appeal no. 78/2012. In the said order APTEL has rejected the appeal on the grounds of expiry of limitation period.	Matter is related to condonation of delay in filing appeal.
19	Ordinary Original Civil jurisdaiction	MSEDCL	AEL; WRLDC; ERLDC;	Bombay high court	The dispute is mainly between MSEDCL and AEL regarding breach of contract of supplying power and the damages arising therefrom. MSEDCL had filed a suit (dated year 2008) before the Bombay High court praying that AEL	We are not a necessary party to the suit. A reply was been filed by WRLDC and ERLDC for removal from the list of parties (dated november, 2009). The issue was listed for framing of issues on **6/8/2014.**
20	Petition no. 112/M	DGVCL	ESIL & WRLDC	CERC	The matter is regarding payment of cross subsidy surcharge owed by ESIL to DGVCL. DGVCL had requested WRLDC to withdraw STOA in lieu of non-payment of cross subsidy surcharges from ESIL to DGVCL.	We have already submitted a reply, wherein we have stated that we cannot withdraw STOA on application of R 25 A of the Open Access (2nd amendment) regulations 2013 and unless the commissions directs us. Case is listed for hearing on **29.01.2014**.
21	Petition no. 310/MP/2014	Sasan Power Limited	WRLDC, NRLDC and 14	CERC	The petition has been filed seeking allowance of change of schedule for allocation of URS power for Sasan UMPP in accordance with the provisions of PPA without requiring the procurers and third parties to take STOA.	The commission vide ROP dated 12.12.2014 has directed WRLDC to file some additional information by way of an affidavit. The same has been filed and the **ROP is awaited**
22	Petition no. MP/211/2014	D B Power ltd.	WRLDC and WRPC	CERC	Petition filed seeking extension of period for injection of power for testing for Unit #2	The extension has been given by the hon'ble commission upto December 31, 2014.
23	Petition no. 267/MP/2014	TEL	WRLDC, WRPC, TPL(ahemdabad & surat) , PTC	CERC	Petition filed seeking extension of period for injection of infirm power for testing of Unit #51, 52 & 53 up to COD	The hon'ble commission has given extension upto 31.10.2014 or actual date of commercial operation, whichever is earlier.
24	Petition no. 423/MP/2015	TEL	WRLDC, WRPC, TPL(ahemdabad & surat) , PTC	CERC	Petition filed seeking extension of period for injection of infirm power for testing of Unit #51, 52 & 53 up to COD	The hon'ble commission has given extension upto 30.11.2014 or actual date of commercial operation, whichever is earlier.
25	Pet no. 284/MP/2014	JPL	WRLDC	CERC	Petition filed seeking extension of time for injection of infirm power for testing including full load testing by Unit 3 beyond 30.09.2014.	The hon'ble commission has given extension upto 31.12.2014 or actual date of commercial operation, whichever is earlier.
26	Pet no. 566/MP/2014	JPL	WRLDC	CERC	Petition filed seeking extension of time for injection of infirm power for testing including full load testing by Unit 3 beyond 31.12.2014.	The hon'ble commission has given extension upto 31.01.2015 or actual date of commercial operation, whichever is earlier.

Format -5 Real time Security Desk

Status	Details of real time security desk at each RLDC and NLDC	Details ofoutage scenarios built to be used by despatcher in real time for revising TTC calculations	Status of development of faster algorithm for real time updation of TTC calculations by load despatcher under outage conditions
	Provided in WRLDC control room	Seurity Desk person prepares the Base case in the moring as per the Load generation balance on the day available from WRLDC SCADA. After that Contigency ranking is done by PSS/E and accordingly top contigency is performed. Also all the emergency outage simulation is performed for making system N-1 secure after contingency.	

FORMAT - 6 (ADUIT OF HVDC, TCSC SVC AND PSS TUNING)

	Recommendation: 9.9.2.: An audit of devices such as HVDC, TCSC, SVC and PSS should be done immediately to enusre that their stability features are enabled. Further exercise of PSS tuning should be planned and implemented. Settings of these dynamic stabilizing devices should be reviewed at appropriate intervals. Action : CTU, STUs, Generators: Time Frame : 6 months.

(A) Audit of HVDC

	Location of HVDC	Audit status (completed on dd/mm/yyyy)	Observations of the aduit and the name of audit agency	Action plan with timeline to remove deficiencies as per audit.
Maha	HVDC Chandrapur	**Not Yet Audited**		
	Padghe	**Not Yet Audited**		
Guj				
CG				
MP				
WR-I (PG)	**BHADRAVATI HVDC Back to Back**	**22.01.2013**	**WR-II and WRLDC Representative**	**No discrepancy Found.**
WR-II (PG)				
WR-I (NTPC)				
WR-II (NTPC)				

(B) Audit of TCSC

	Location of TCSC	Audit status (completed on dd/mm/yyyy)	Observations of the aduit and the name of audit agency	Action plan with timeline to remove deficiencies as per audit.
Maha				
Guj				
CG				
MP				
WR-I (PG)	**Raipur TCSC**	**06.02.2013**	**WR-II and WRLDC Representative**	**No discrepancy Found.**
WR-II (PG)				
WR-I (NTPC)				
WR-II (NTPC)				

(C) Audit of SVC

	Location of SVC	Audit status (completed on dd/mm/yyyy)	rvations of the aduit and the name of audit a	Action plan with timeline to remove deficiencies as per audit.
Maha				
Guj				
CG				
MP				

WR-I (PG)	NA	NA	NA	NA
WR-II (PG)				
WR-I (NTPC)				
WR-II (NTPC)				
	(D) Status of PSS Tuning			
RPC (state wise)	**Name and Location of generator identified for PSS tuning.**	**Audit status (completed on dd/mm/yyyy)**	**Action plan with time line to complete PSS tuning.**	**Remarks**
Maha	**23**			
Guj				
CG				
MP				
OSP	1			
ISP	1			
WR-I (PG)	NA	NA	NA	NA
WR-II (PG)				
WR-I (NTPC)				
WR-II (NTPC)				

Constituents	**Station**	**Unit**	**No.**	**Capacity (MW)**
Gujarat	Wanakbori	TPS	1	210
	Wanakbori	TPS	3	210
Chattisgarh	Korba (W)	TPS	1	210
	Korba (W)	TPS	3	210
	Korba (W)	TPS	2	210
Madhya Pradesh	Satpura	STPS	8	210
	Satpura	STPS	9	210
	SGTPS	Birsinghpur	1	210
	SGTPS	Birsinghpur	2	210
	SGTPS	Birsinghpur	3	210
	SGTPS	Birsinghpur	4	210
Maharashtra	Nasik	TPS	3	210
	Nasik	TPS	5	210
	Parli	TPS	2	210
	Parli	TPS	3	210
	Parli	TPS	4	210
NTPC	Korba	STPS	2	210
	Korba	STPS	3	210
	Korba	STPS	4	210
	Korba	STPS	5	500
	Korba	STPS	6	500
REL	Dahanu	TPS	1	250
	Dahanu	TPS	2	250

Format-7 Voltage collapse prediction relay

Status of exploration of voltage collapse prediction relay	Action: RPCs, Time Frame: 1 year
Status	In Boisar, A-eberlay Collapse Prediction relay was installed on 17 Oct,12 as a demo project. Currently Offline analysis is carried out regularly by WRLDC,exploring the opportunities for integration with Real time Visualization Software. The collapse prediction relay is funtional at Seoni Substations also. WRLDC is collecting data in offline mode. However, these projects are demo in nature. Now the A-Eberle has opted to decommison the relay.

Format-8 Telemetry facilities

Action: RPCs, Posoco, Time frame: 6 months

POSOCO (Region /State/CPSU Wise)	Name and location of Generating station / transmission element without telemetry faclity (A)		Fault in the telemetry / Reason for non-availability of telemetry(B)	Nature of the communication link for required telemetry in column(A) (Microwave/FO/PLCC) C	Action plan with time line to oerationalize the required telemetry facility (D)
GETCO	Bhatiya (3rd Trf.)	220	Not Integrated Yet		Sub-Station is ready but all lines are under construction stage
	Mokha	220	Not Integrated Yet		
MPPTCL	CHICLI	220	Not Integrated Yet		
	DHAR	220	Not Integrated Yet		
	PANAGAR	220	Not Integrated Yet		
	Khaparkheda GS	500	Telemetry Not availble		Maharastra have informed that they are taking up for alternate communication system from TTSL
	Deepnagar GS	1000	Telemetry Not availble		
	WARORA	400	New Stations Added , Integration still pending		
	LONIKAND NEW	400			
	Taptitanda	400			
	GHATGHAR	400	These stations are not availbale in New SCADA and thus not available at RLDC/NLDC		
	CHANDRAPUR 2	400	These stations are not availbale in New SCADA and thus not available at RLDC/NLDC		
	HARANGUL	220	Maharastra have informed		
	KDPH	220			
	KOLSHET	220			

MSETCL	LATUR	220	that they are taking up for alternate communication system from TTSL		
	MAHAD	220			
	TEMGHAR	220			
	TILLARI	220			
	GHATGHAR	220			
	Lokmangal Shugar Ethanol,	IPP			
	Yash Agro & Energy Ltd.,	IPP			
	Gangakhed Sugar & Energy Ltd.,	IPP	Maharastra has informed that 4 major IPP and 8 small IPP have been integrated. The balance 18 small IPP in the state are taking up for integration for complete grid visibility		Maharastra have informed that they are taking up with IPP for integration
	A A Energy,	IPP			
	JSW Steel Ltd.,	IPP			
	Shree Sidhbali Ispat Ltd,	IPP			
	RPL Urja	IPP			
	M/s ISMT Ltd.	IPP			
	M/s Vasantrao Dada Patil Sahakari Sakhar Karkhana (SSK) Ltd.	IPP			
CSPTCL	NIL	NIL	NIL	NIL	NIL
DD	MAGARWAD	220	SCADA not Available	PLCC	New RTU Envisaged in New SCADA
DNH	KARARPAD	220 kV	SCADA not Available	PLCC	New RTU Envisaged in New SCADA
	NEW KHARADPARA	220 kV	SCADA not Available	PLCC	New RTU Envisaged in New SCADA
	SAYALI	220 kV	SCADA not Available	PLCC	New RTU Envisaged in New SCADA
	KHADOLI	220 kV	SCADA not Available	PLCC	New RTU Envisaged in New SCADA
GOA	CUNCOLIM	220KV		PLCC	To be done as part of new SCADA
	AMONA	220KV		PLCC	

Format-09

STATUS OF OPERATION OF POWER STATIONS UNDER FGMO/RGMO

Name of Region: Western Region

Description	Total No. units/stations in the region	Units required co operate under RGMO/FGMO as per IEGC	Units operating under RGMO	Units operating in FGMO with manual intervention to archive RGMO	Total No. of units under FGMO/RGMO (4+5)	Units Exempted from FGMO/ RGMO by CERC	Units applied to CERC for exemption/ extension	Units operating with locked governors	Units whose status is not available	Remarks especially regarding entries, if any, in column (9) or (10)
1	2	3	4	5	6	7	8	9	10	11
No of units (CS)	51	39	24	0	24		5	No info		
No of units (SS)	255	139	46	23	69		8	No info		
No of units (Pvt Sector)	115	87	38	8	46		0	No info		
No. of stations (CS)	17	11	10	0	10	--	--	No info		
No. of stations (SS)	84	41	16	9	25	--	2	No info		
No. of stations (Pvt Sector)	46	40	19	3	22	--	--	No info		
Installed capacity CS (MW)	18210.67	12630	9320	0	9320		250	No info		
Installed capacity SS (MW)	29943	22845	8070	850	8920		540	No info		
Installed capacity PS (MW)	35233	28352	12537	4186	16723		0	No info		

National Load Despatch Center

Annexure - 8.2

Power System Operation Corporation Ltd,
B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi110016.

Flash Report

Date: 24.05.2015

1. **Date and Time of the Event**: 24th May 2015 and 1919hrs
2. **Antecedent Conditions**:

   Frequency:

   Pre Incident: 49.90 Hz

   Post Incident: NEW Grid-50.37 Hz and SR Grid- 49.85 Hz

   Demand Met:

   Pre Incident: NEWS Grid: 124700MW (New Grid-91850MW, SR Grid- 32200MW)

   Post Incident: NEW Grid- 94226MW and SR Grid- 31100MW

3. **Major Lines under Shutdown/Outage**:

   *Ramagundam Bus-I tripped at 1718hrs as result Ramagundam-Bhadrawati-1 was out of service.

   *Power order in Bhadrawati-600MW

   *Power Order of HVDC Talcher-Kolar-2300MW

4. **Details of Trippings**:

   - 1913: 400KV Chitoor-Thiruvalem-I &II tripped due to CT Blast at Thiruvalem end (TNEB end)
   - 1913: Meenakshi U#1 (150MW) tripped due to Boiler side problem.
   - 1915: SDS TPS U#1 (800MW) tripped on Generator Protection Operated.
   - 1918: HVDC Talcher-Kolar Ploe-I & II Power Order was reduced on its own to 2000MW from 2300MW, due to High Valve Temperature (Auto Reduction).
   - 1919: Raichur TPS U#8 (210MW) and NCTPS ST2 U#1 (600MW) tripped. (Reason Awaited).
   - 1919: HVDC Talcher-Kolar Pole-I & II tripped due to Valve Cooling Problem.
     *SPS at Talcher Stage-2 operated except Unit-6 tripping & JITPL unit back down.
     *SPS at Kolar SPS-1 & 2 operated.
     *Due to SPS operation 100MW in NSPCL, 145MW in JPL ,40MW in KSK was back down
   - 1919:765KV Raichur-Sholapur-I & II Tripped at Raichur end only (Power flow in each circuit before tripping was 1573MW as per PMU data), detail awaited.

5. **Action Taken**:

   - Ramagundam-Bhadrawati-1 was normalized at 1931hrs.
   - Power Order of Bhadrawati was increased from 600MW to 1000MW.
   - NR Hydro generation was back down by 500MW to compensate High frequency situation.
   - HVDC Talcher-Kolar Pole-I & II was de-blocked at 1946hrs & 1948hrs respectively.
   - 765KV Raichur-Sholapur-I was charged from Raichur end at 2010hrs.
   - NEW Grid & SR Grid synchronized at 2049hrs.
   - 765KV Raichur-Sholapur-II was normalized 2119hrs.

Coastal Gujarat Power Limited

Annexure - 9.3

CGPL/UMPP/O&M/WRPC/4210

18th May 2015

To,
The Member Secretary
Western Region Power Committee
F-3, MIDC Area Marol
Opp. to SEEPZ, Central Road
Andheri (East)
Mumbai - 400 093

प. क्ष. वि. स. मुंबई /WRPC
आवक संख्या /Inward No. 920
दिनांक /Date: 21/05/15

Kind Attn.: Mr. S. D. Taksande

Sub: Implementation of modified SPS of CGPL, Mundra

Ref:1) CE SLDC, Gujarat letter dtd. 13th Jan 2015 reg. revision in CGPL SPS addressed to MS, WRPC
2) Discussion on SPS in 123rd PCM Meeting on 20th Jan 2015
3) E-mail from WRLDC about SPS dtd. 1st Apr 2015

Dear Sir,

With reference to above, this is to inform you that (CGPL has implemented SPS logic on one/two lines out of seven Lines (two Bhachau, two Limbdi , two Jetpur lines and Vadavi as one line) tripping as per attached table on 8th May 2015) and in service since then.

Thanking you,

Yours Sincerely,
For **Coastal Gujarat Power Limited**

18/5/18

Dinesh Kudalkar
Chief - O&M

Encl.: A/a.

Copy to:-

1. **Mr. P. Mukhopadhyay, General Manager,** Western Regional Load Despatch Centre, F-3, M.I.D.C. Area, MAROL, Andherai (East), Mumbai – 400 093, Email: prithwish.pmukh@gmail.com

2. **Mr. B. B. Mehta, Chief Engineer,** State Load Despatch Center, Gujarat Energy Transmission Co. Ltd., 132kV Gotri Sub Station Compound, Near TB Hospital, Gotri Road, Vadodara – 390 021, Tel.: 0265-2353171, Email: celd@gebmail.com

Coastal Gujarat Power Limited

Attachment to Letter No.: CGPL/UMPP/O&M/WRPC/4210 dated 18th May 2015

SPS Revised: SPS to be armed when generation at CGPL is more than 3300MW

Sl. No.	SPS triggering condition	Actions required	SPS as implemented
i)	If export is more than 3300MW and one ckt of CGPL-Bhachau D/C trips	Backing down automatically to bring down the generation to 3100MW.	1. One line trips and export is in between 3300 MW and 3500 MW, then runback in Unit 40 only. 2. Two lines trip and export is in between 3300 MW and 3500 MW, then trip Unit 40. 3. One line trips and export is more than 3500 MW, then run back in Unit 40 and the other selected Unit 4. Two lines tripping and export more than 3500 MW, then trip Unit 40 and runback in other selected Unit.
ii)	If export is more than 3300MW and if CGPL-Chorania or CGPL-Halvad or one ckt of CGPL-Jetpur D/C trips	Backing down automatically to bring down the generation to 3300MW.	
iii)	In case of D/C tripping of CGPL-Bhachau, CGPL-Chorania or CGPL-Jetpur	Trip one unit immediately. Unit running at maximum generation to be selected for tripping to get full 800MW reduction immediately to take care of system stability.	
iv)	In case of D/C tripping of Bhachau - Ranchopura	Backing down automatically to bring down the generation to 3300MW.	

POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)
पावरग्रिड
आय.एस.ओ. 9001 : 2000 प्रमाणित कंपनी" - "I.S.O. 9001 : 2000 Certified Company"
पांचवां व छठा तल, वुडा भवन, करेलीबाग, वडोदरा – 390018(गुजरात)
5th & 6th Floor, VUDA Bhavan, Karelibaug, Vadodara – 390018(Gujarat)
दूरभाष:/Phone: (O) 0265-2488563, फैक्स:/Fax: 0265-2487542
पश्चिम क्षेत्र पारेषण प्रणाली-II, क्षेत्रीय मुख्यालय
Western Region Transmission System – II, Regional Headquarters

Ref: WRTS-II/VDR/O&M/AV/260/

Date: 20 May 2015

Annexure - 9.4

To,

General Manager
Western Regional Load Despatch Centre,
Plot No. F-3, MIDC Area, Marol,
Opp. Seepz, Andheri (East), Mumbai 400093
FAX: **022-28202630**

Sub: Review of SPS for tripping of 220kV Gwalior Mahalgaon Lines at Gwalior S/s after tripping of 765kV Bina Gwalior 1&2.

Dear Sir,

Vide letter dtd 17/04/14, it was requested to please review the automatic tripping of 220kV Gwalior-Mahalgaon D/c Lines at Gwalior S/s after tripping of 765kV Bina Gwalior 1&2 (copy of the same enclosed at Annexure-A1). However, reply regarding the same has not been received yet.

Herein, it is pertinent to mention that now 765kV Satna Gwalior 1&2 and 765kV Bina Gwalior#1,2&3 are available to Gwalior S/s from Bina & Satna. In view of the same, it is once again requested to please review the need of tripping of 220kV Gwalior – Mahalgaon D/C lines after tripping of 765kV Bina Gwalior 1&2.

Thanking you,

Yours faithfully,

20/5/15

(Abhinav Verma)
DGM (AM)

Copy to: -
For kind information please:
1. GM (AM), WRTS – II, Vadodara
2. GM (AM-I/c), Sh. P N Dixit, CC - Gurgaon
3. SE (Protection) WRPC, Plot No.F-3, MIDC Area, Marol, Mumbai – 400093

Encl: A/a

POWER GRID CORPORATION OF INDIA LIMITED
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पावरग्रिड
"आय.एस.ओ. 9001 : 2000 प्रमाणित कंपनी" - "I.S.O. 9001 : 2000 Certified Company"
पांचवां व छठा तल, वुडा भवन, करेलीबाग, वडोदरा – 390018(गुजरात)
5th & 6th Floor, VUDA Bhavan, Karelibaug, Vadodara – 390018(Gujarat)
दूरभाष:/Phone: (O) 0265-2488563, फैक्स:/Fax: 0265-2487542
पश्चिम क्षेत्र पारेषण प्रणाली-II, क्षेत्रीय मुख्यालय
Western Region Transmission System – II, Regional Headquarters

Ref: WRTS-II/VDR/O&M/AV/260/ 1563.

Date: 17 April 2014

To,

General Manager
Western Regional Load Despatch Centre,
Plot No. F-3, MIDC Area, Marol,
Opp. Seepz, Andheri (East), Mumbai 400093
FAX: **022-28202630**

Sub: Review of automatic tripping of 220kV Gwalior Mahalgaon Lines at Gwalior S/s after tripping of 765kV Bina Gwalior 1&2.

Dear Sir,

With reference to the letter from NLDC dtd 08/05/2013, automatic tripping of 220kV Gwalior (PG) – Mahalgaon was configured in case of tripping of both the circuits of 765kV Bina Gwalior 1&2 (copy of the letter enclosed as Annexure 1).

In this regard, it is to bring in your knowledge that as 765kV Satna Gwalior#1 line has been commissioned on 06/02/2014 and further second 765kV line between Satna & Gwalior is planned for commissioning shortly. Therefore, parallel path is now available for 765kV Gwalior S/s via 765kV Bina & 765kV Satna S/s.

Therefore, in view of above, it is requested to review the requirement of automatic tripping of 220kV Gwalior Mahalgaon Lines at Gwalior S/s after tripping of 765kV Bina Gwalior 1&2.

Thanking you,

Yours faithfully,

(Mahesh Tewari)
Dy. General Manager (O&M)

Copy to: -
For kind information please:
1. GM (O&M), WRTS – II, Vadodara
2. GM (OS), Sh. Kamal Sarkar, CC - Gurgaon
3. SE (Protection) WRPC, Plot No.F-3, MIDC Area, Marol, Mumbai – 400093

पावर सिस्टम ऑपरेशन कारपोरेशन लिमिटेड
(पावरग्रिड की पूर्ण स्वामित्व प्राप्त सहायक कंपनी)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A wholly owned subsidiary of POWERGRID)

प्रोजेक्ट एवं केन्द्रीय कार्यालय : बी - 9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110 016
Registered & Corporate Office : B - 9, Qutab Institutional Area, Katwaria Sarai, New Delhi - 110 016
Website : www.nldc.in, www.nldcindia.in, Tel. : 011-26536832, 26524522, Fax : 011-26524525, 26536901

NLDC/765 kV

Dated: 8th May 2013

Sub: Operation of 765 kV transmission system in the NEW grid in the coming months

Reliable operation of the high capacity corridor from Sipat in Chhattisgarh to Moga in Punjab over the 765 kV Sipat-Bilaspur-Seoni-Bina-Gwalior-Agra-Jhatikara-Bhiwani-Moga route is very important in the coming months, particularly up to the end of September when Northern Region demand is expected to be high. This high capacity corridor would no doubt enhance the transfer capability from the West to North direction; however outage of any of the following links would significantly impact the transfer capability.

- 765 kV Agra-Jhatikara
- One of the 765/400 kV 1500 MVA ICT at Agra
- 765 kV Gwalior-Agra one circuit
- 765 kV Bina-Gwalior one circuit

A self- contained note on the subject along with the details of the actions to be taken by the different agencies under varied conditions is enclosed.

Following actions are expected from RLDCs/NLDC:

i. Sensitizing stakeholders to the nature of the above operation of 765 kV corridors.
ii. Taking all precautions both for planned and emergency outages of the above sections including arrangements for quick curtailment of transactions and manual actions for feeder opening.
iii. Monitoring the quantum of loads wired for SPS action and taking up the issue of optimizing it appropriately.
iv. Voltage control through suitable actions of reactor switching, reactive power absorption by generators, line switching.
v. Handling special situations such as load crash.

The following actions are expected from POWERGRID end:

i. Preventive maintenance and minimizing both planned and emergency outages on the above corridor (lines as well as bay shutdowns) so as to improve reliability as well as enhanced transfer capability.
ii. Ensuring that overvoltage settings on the system are properly graded both in terms of magnitude and time delay. Details of settings to be forwarded to NLDC.
iii. Commissioning automatic tripping of the 220 kV Gwalior (PG)-Malanpur (PG) D/C from Gwalior(PG) end in case of tripping of both circuits of 765 kV Gwalior-Agra and automatic tripping of the 220 kV

Gwalior(RG)-Gwalior(MP) D/C from Gwalior(PG) end in case both the 765 kV Bina-Gwalior lines trip. This feature would generally be of importance from June to September and is to avoid a situation of Western Region load acting as a drag on Northern Region in case of any tripping.

iv. In situ testing of System Protection Schemes (SPS) at Agra(PG) and Gwalior(PG) and continuously keeping it armed and healthy condition.

v. Sensitizing the operators at the different 765 kV substations on the strategic importance of the 765 kV network and the availability of real time data at the RLDCs/NLDC.

Following actions are required at Regional Power Committee level.

i) Sensitizing stakeholders to the strategic importance of 765 kV corridors.

ii) Ensuring that the outage plan is properly co-ordinated so that the system is able to operate in a reliable fashion.

iii) Monitoring the relief obtained through 765 kV Gwalior-Agra SPS actions and taking up with constituents for any shortfall in load relief.

iv) Ensure that all trippings in the transmission system are discussed at the Protection Committee level and the lessons learned and actions taken disseminated across all utilities and its implementation monitored.

v) Ensure that all defence plans such as Under Frequency Load Shedding (UFLS) scheme, df/dt and SPS are in place.

Encl: as above

(V. K. Agrawal)
Executive Director, NLDC

Copy for kind information and necessary action to:

1) Member Secretary NRPC/WRPC/ERPC/SRPC/NERPC
2) ED (OS), POWERGRID, Gurgaon
3) ED (NR-1), POWERGRID, New Delhi
4) ED (WR-II), POWERGRID, Vadodara
5) ED (WR-I), POWERGRID, Nagpur
6) ED SRLDC, Bengaluru
7) GM WRLDC/NRLDC/ERLDC/NERLDC

Copy for kind information to:

8) Member (GO & D), CEA, New Delhi
9) CMD POWERGRID
10) Director (Operations), POWERGRID, Gurgaon
11) CEO POSOCO

Annexure - 10.3

न्यूक्लियर पॉवर कॉरपोरेशन ऑफ इंडिया लिमिटेड
NUCLEAR POWER CORPORATION OF INDIA LIMITED
(भारत सरकार का उद्यम A Government of India Enterprise)
तारापुर परमाणु विद्युत केंद्र TARAPUR ATOMIC POWER STATION 1&2
तारापुर महाराष्ट्र स्थल Tarapur Maharashtra Site
डाक : टीएपीपी, बोईसर (प.रे.), जिला : पालघर (महाराष्ट्र) 401 504
PO : TAPP,Boisar (WR),Dist.Palghar,Maharashtra – 401504
CIN:U40104MH1987GOI149458,
web:www.npcil.nic.in Tele: 02525 244101
Email : vsdaniel@npcil.co.in Fax : 02525 244121

FAX MESSAGE

From : V.S Daniel, Station Director,
NPCIL, TAPS 1&2, Tarapur - 401 504.

For : The General Manager, WRLDC, Mumbai
(Fax no. 022-28235434,28202630)

Rpt. to : The Member Secretary, WRPC,
Mumbai. (Fax no. 022-28370193)

Sub:- Review and Response to Islanding scheme for TAPS.

Ref:- 1) Draft MOM held on 26.02.2015 at WRLDC, Mumbai.
2) MOM held on 16.04.2015 at WRLDC, Mumbai

With reference to the above, meetings at WRLDC for discussing the islanding scheme for TAPS 1&2, the proposed islanding scheme was further reviewed. The response and the concerns related to TAPS 1&2 units are enclosed herewith as Annexure-I. It is requested to further review this scheme with respect to the TAPS 1&2.

Regards.

TAPS/SD/T-4-1 May 12, 2015.

12/5/15

(V.S Daniel)
Station Director
TAPS 1&2

Annexure-I

Review and response regarding to islanding scheme for TAPS 1&2

The proposed islanding scheme is based on the logic disconnecting the feeders on which load variation is on the larger side and keeping connected with only those feeders on which loads are generally constant. Subsequent to island formation fast acting control of generating units in the island adjust the generation to balance the load and regulate the frequency of the islanded system.

Response -

1.1 TAPS 1&2 is proposed to island with Bhilad substation which is having variable 66kv radial load of Max. 141- MW and Min.-57MW, the average load was around 110MW over the last three months records.

1.2 With both the TAPS 1&2 units are running, tripping of the recirc. pump 'A' of both the units will lead to ex TAPS bus power flow of 170 MWe. With one of TAPS 1&2 units is running, without tripping of recirc. pump 'A' the ex TAPS bus power flow of 145 MWe.

1.3 As a nuclear power station its operation is base load station design and cannot work with large variation of loads. It is very important that the islanded sub-system achieves its load generation balance immediately following its separation from rest of the grid. This required automated mechanism must control its frequency on its own.

1.4 TAPS 1&2 turbine governor is not in free mode operation and also not fast acting, which cannot control the frequency depending upon the load.

1.5 In case of over frequency of the islanded system can lead to the tripping of TAPS 1&2 turbine which in turn will trip the reactor. TAPS 1&2 units cannot survive on house load conditions.