Agenda
for
81st PCC Meeting

Date: 18.07.2019
Eastern Regional Power Committee
14, Golf Club Road, Tollygunge
Kolkata: 700 033

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 81ST PROTECTION SUB-COMMITTEE MEETING TO BE HELD AT ERPC, KOLKATA ON 18.07.2019 (THURSDAY) AT 11:00 HOURS

PART – A

ITEM NO. A.1: Confirmation of minutes of 80th Protection sub-Committee Meeting held on 25th June, 2019 at ERPC, Kolkata.

The minutes of 80th Protection Sub-Committee meeting held on 25.06.19 circulated vide letter dated 15.07.2019.

Members may confirm the minutes of 80th PCC meeting.

PART – B

ANALYSIS & DISCUSSION ON GRID INCIDENCES OCCURRED IN JUNE, 2019

ITEM NO. B.1: Disturbance at 400 kV Dikchu S/s on 30.06.2019 at 09:55 Hrs.

At 09:56 hrs, 400 KV Dikchu-Rangpo tripped on Y-B –N fault from both ends.

Subsequently the following elements got tripped.

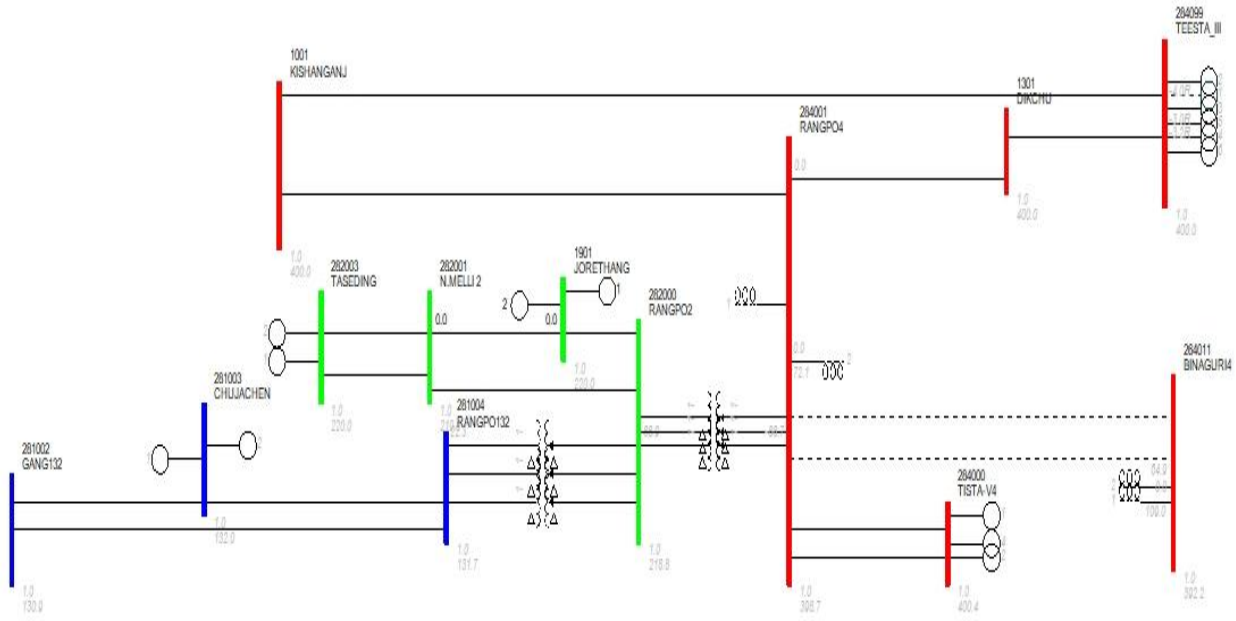
1. 400/132 kV ICT at Dikchu
2. 220 kV Jorethang-New Melli D/C from Jorethang
3. 220 kV Rangpo-New Melli D/C
4. 132 kV Rangpo-Chuzachen from Rangpo end only
5. Unit 1 & 2 of Dikchu due to tripping of ICTs.
6. Unit 1 & 2 of Jorethang due to loss of evacuation path
7. Unit 1 of Chuzachen due to SPS operation

Detailed report of the disturbance is enclosed at **Annexure B1.**

After clearing of fault, Very slow voltage oscillation took place at Teesta III power plant for around 20minute. During this period Teesta III reduced its generation initially to control the voltage fluctuation and then gradually increases again even before the fluctuation settled down.

It was reported that during restoration process, 400 kV Dikchu – Rangpo line could not be synchronised both from Dikchu end as well as Rangpo end due to large angular separation between Rangpo 400 kV bus bar and Dikchu 400 kV bus bar. The line could be synchronised only after opening of 400 kV Teesta III – Dikchu line, thereby isolating Dikchu HEP from the rest of the system.

Generation Loss: 241 MW (Dikchu: 106 MW, Jorethang: 80 MW, Chuzachen: 55 MW)



Dikchu, Jorethang, Chuzachen may explain.

ITEM NO. B.2: Disturbance at 400 kV TSTPS(NTPC) S/s & Talcher HVDC station on 05.06.2019 at 19:01 Hrs.

At 18:53 hrs, 500 KV Talcher-Kolar Pole-1 was hand tripped due to heavy sparking at converter isolator contact at Talcher end resulting sending SPS signal to GMR and JITPL. GMR & JITPL generation reduced by 85 MW and 55 MW respectively.

At 19:01 hrs, jumper protection of 400 kV Talcher (NTPC) - Talcher (HVDC) Q/C operated at NTPC end due to breaking of R phase isolator pole along with BPI. Due to tripping of all incoming feeders, HVDC Talcher Kolar pole 2 at Talcher end got blocked resulting back down of Unit 5 by 160 MW. At 19:03 Talcher stage-II unit#4 tripped on teed protection.

Brief report submitted by Powergrid is enclosed at **Annexure-B2.**

Generation Loss: 300 MW

NTPC & Powergrid may explain.

ITEM NO. B.3: Disturbance at 220 kV Budhipadar(OPTCL) S/s on 12.06.2019 at 00:37 Hrs.

At 00:37 Hrs, Y phase LA of 220 KV Budhipadar-Tarkera-I at Budhipadar failed resulting tripping of all lines emanating from Budhipadar end.

Generation Loss: 350 MW
Load Loss: 252 MW

OPTCL may explain.

ITEM NO. B.4: Disturbance at 400 kV Meramundali (OPTCL) S/s on 03.06.2019 at 01:15 Hrs.

At 01:15 hrs, 400 KV Meramundali-Lapanga-II tripped on B-N Fault (Fault distance 2 KM from Meramundali, Fault current: 30.01 kA). At the same time, both the 400/220 kV ICTs at Meramundali tripped on O/C protection without affecting 220 kV network.

As reported, B phase bushing of 50 MVAr line reactor of 400 KV Meramundali-Lapanga II at Meramundali end failed after the event.

Load loss: Nil

OPTCL may explain.

ITEM NO. B.5: Disturbance at 220/132 kV Dumka(JUSNL) S/s on 19.06.2019 at 13:02 Hrs.

220 KV Maithon-Dumka D/C tripped at 13:02 hrs on single phase to earth fault. At the same time 132 kV Dumka Lalmatia D/C tripped leading to the load loss of 120 MW at Paku, Dumka, Deogarh.

Load loss: 120 MW

JUSNL may explain.

ITEM NO. B.6: Disturbance at 400 kV Darbhanga S/s on 22.06.2019 at 19:17 Hrs.

At 19:17 Hrs, 400 kV Darbhanga - Kishangunj D/C tripped due to Y-N fault. Simultaneously main bus-I at Darbhanga also got tripped.

Load loss: Nil

KPTL may explain.

ITEM NO. B.7: Disturbance at 400 kV Chaibasa S/s on 27.06.2019 at 11:19 Hrs.

Tie CB of 400 KV Kharagpur-Chaibasa-II was working as main CB of bus II at Chaibasa. while taking shutdown of 400 KV Kharagpur Chaibasa-II, Tie CB LBB of 400 KV Kharagpur Chaibasa-II operated at Chaibasa resulting tripping of all the elements connected to Bus-II at Chaibasa.

Load loss: Nil

Powergrid may explain.

ITEM NO. B.8: Tripping Incidences in the month of June, 2019.

Other tripping incidences occurred in the month of June 2019 which needs explanation from constituents of either of the end is given in **Annexure-B8.**

In 36th TCC, all the constituents were advised to use the PDMS on-line portal for uploading the single line tripping details along with DR (comtrade files), EL and other relevant files for all trippings of August 2017 onwards. Otherwise, it will be considered as violation of compliance of clause 5.2(r) & 5.9 of IEGC.

In 74th PCC, all the constituents were requested to submit the disturbance report along with DR through the new version of on-line portal which was implemented from 01st Jan. 2019.

In 80th PCC meeting, all the transmission utilities were advised that they should place the details of transmission line tripping which is not attributable to them such as tripping of a transmission line on zone 3 due to a fault in adjacent line or any such cases related to protection.

PRDC was advised to give necessary access to both end constituents to download other end report, DR, ELs etc in PDMS for all the lines connected between two different control areas.

Members may discuss.

PART- C:: OTHER ITEMS

ITEM NO. C.1: Islanding Scheme at Kanti TPS- KBUNL

In 68th PCC Meeting, it was decided that the islanding of Kanti TPS would be implemented with the following scheme:

1. Stage II units (2x195 MW) of Kanti TPS will be islanded with station load of 40 MW and radial load of 150 MW (approx.) of 220kV Kanti TPS-Gopalganj D/C line.
2. Once the grid frequency falls to 48.2 Hz, the PLC at Kanti TPS would initiate the islanding process with 500 ms time delay.

In 78th PCC Meeting, NTPC suggested that a step wise islanding scheme may be planned considering different grid conditions and unit availability at Kanti TPS.

PCC advised NTPC to prepare a draft plan and submit to ERPC and ERLDC for detailed discussion in next PCC Meeting.

PCC also advised BSPTCL and Powergrid to check the healthiness of PLCC system in coordination with Kanti TPS.

In 80th PCC, NTPC was advised to clarify the inclusion of MTPS stage-I units and 220 kV MTPS-II –Muzzaffarpur(PG) lines in the draft islanding scheme.

BSPTCL was advised to check the healthiness of PLCC system for all the BSPTCL lines connected to MTPS-II.

Members may discuss.

ITEM NO. C.2: Repeated auto-reclose operation of 400 kV Ranchi-RTPS- II at Ranchi end during the tripping at 14:50 hrs on 31.05.2019 - ERLDC

400 kV Ranchi - RTPS - II tripped at 14:50 hrs on 31-05-19 due to fault in the circuit. As per PMU data, A/R of 400 kV Ranchi – RTPS – II started from both ends at 14:50:46.360 hrs (approx) on 31-05-19 on B-N fault. During this, B phase has opened from both ends of the circuit. At 14:50:46.800 hrs (approx), another fault occurred in the R phase and with this the other two poles also opened from both ends thus tripping the circuit. However, it is observed that A/R attempt was again taken at Ranchi end in the faulty R & Y phases at 14:50:47.400 hrs (approx) and Y phase at 14:50:48.800 hrs (approx) even after the three poles opening at 14:50:46.800 hrs (approx). Such repeated auto-reclose operation is not desirable due to vicinity of the generating station for reliability and security.

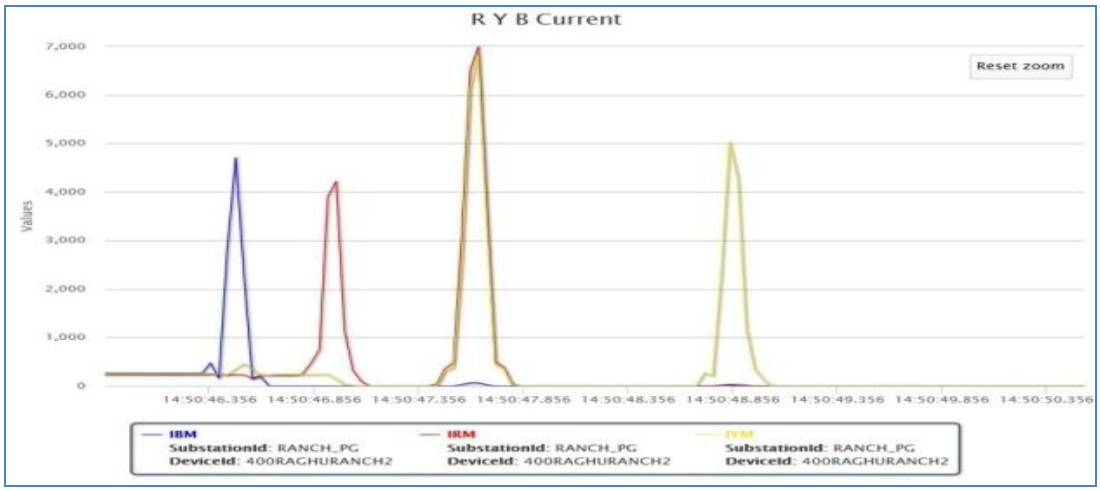


Fig 1: Line Current measured at Ranchi end for 400 kV Ranchi - RTPS – II from PMU indicating multiple reclosure

In 80th PCC meeting, Powergrid informed that repeated autoreclose operations at Ranchi end was due to some issues in autoreclosure scheme. The scheme was referred to OEM for analysis and recommendations.

PCC advised Powergrid to submit analysis report and decided to discuss the agenda in next PCC meeting.

Powergrid may explain.

ITEM NO. C.3: Tripping of 400/132 kV ICTs at Dikchu S/s during the disturbance on 16.04.2019.

At 23:32 Hrs, Resistive fault occurred in the Y phase on 400 kV Rangpo-Kishanganj circuit which led to tripping of the circuit on Directional E/F porotection from Kishanganj end. During this fault, 400/132 kV ICT at Dikchu got tripped on Backup O/C protection.

79th PCC opined that tripping of 400/132 kV ICTs at Dikchu on backup O/C protection need to be explained by Dikchu.

Dikchu representative was not present in the meeting.

Dikchu may explain.

ITEM NO. C.4: Disturbance at 220 kV Patratu S/s on 29.04.19 at 12:37 Hrs

At 12:37 hrs all lines emanating from Patratu tripped resulting total power failure at 220 kV Patratu S/s.

As per PMU data, fault was cleared within 400 ms.

In 79th PCC, the disturbance could not be concluded due to incomplete details (DR and EL records) of the disturbance. PCC took a serious note of it and advised JUSNL to submit disturbance records of all the related lines for the above disturbance to ERPC/ERLDC at the earliest.

PCC further advised JUSNL to submit the relevant details including the DR, EL etc. of any tripping/disturbances before monthly PCC meeting so that proper analysis can be done.
PCC also advised TVNL to configure the DR setting properly for 220 kV TVNL-Patratu line.

JUSNL vide mail dated 12.06.2019 submitted the DR & ELs of the above disturbance.

In 80th PCC, It was informed that ERPC secretariat along with PRDC is analyzing the disturbance.

Members may update.

ITEM NO. C.5: Different A/R timing at two ends of 400 kV Kodarma-Bokaro-I circuit. -ERLDC

400 kV Koderma-Bokaro-I circuit tripped at 18:09 Hrs due to Y phase to earth fault. In the PMU plot for generator voltage, different dead time has been observed at two ends leading to two faults being fed to the system one by one with A/R operation. It may kindly be noted that, both ends of the line is connected to major generating station of Eastern region and the feeding of fault on two occasions due to different A/R timing is not desirable.

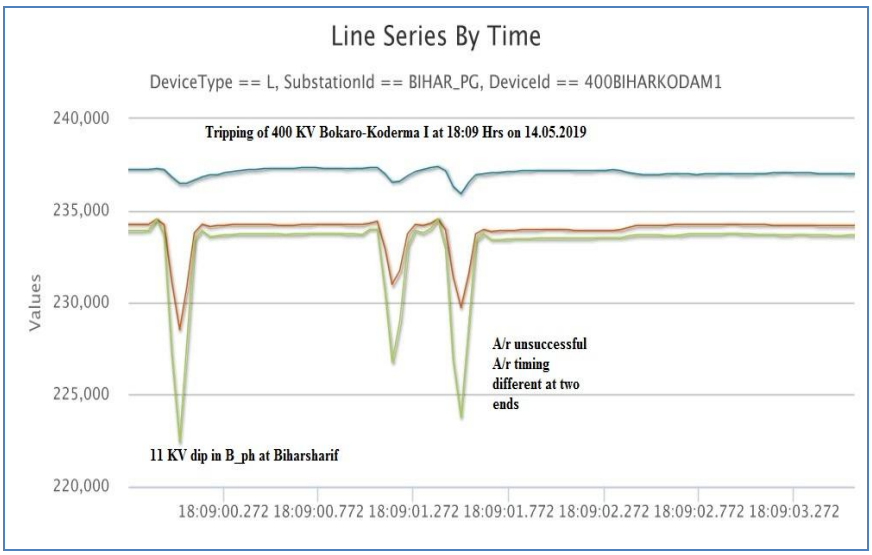


Fig: 400 kV Bihar Sharif Bus Voltage during the event indicating different A/R timing on 400 kV Koderma-Bokaro 1 circuit

In 80th PCC meeting, the agenda item could not be discussed as DVC representative was not present in the meeting.

DVC may explain.

ITEM NO. C.6: FOLLOW-UP OF DECISIONS OF THE PREVIOUS PROTECTION SUB-COMMITTEE MEETING(S)

The decisions of previous PCC Meetings are given at Annexure-C6.

In 73rd PCC, it was observed that latest status on the implementation of the previous PCC recommendations were not updated by the constituents regularly. All the constituents were advised to update the latest status of the recommendations as per the list given in Annexure.

NHPC vide mail dated 10.06.2019 informed that the relay settings has been updated at TLDP-III & TLDP-IV station as per PCC recommendations. The letter from NHPC is enclosed at Annexure C6.1.

Members may update the latest status.

ITEM NO. C.7: Schedule of training program to be conducted by PRDC

PRDC, as per the AMC, is going to conduct 2nd training programme on PDMS and PSCT in state utility premises of Eastern Region. The tentative schedule is given below:

Sl no.	State	Location	Date	Training
1.	West Bengal	NJP	**04.02.2019-05.02.2019**	
		Durgapur	**07.02.2019-08.02.2019**	
2.	Bihar	North Bihar	**08.04.2019-09.04.2019**	
		South Bihar	**11.04.2019-12.04.2019**	**on PDMS**
3.	Sikkim	-	**03.06.2019-04.06.2019**	
4.	Odisha	-	**08.07.2019-09.07.2019**	
5.	Jharkhand	-	**05.08.2019-06.08.2019**	
6.	For All States	ERPC	**02.09.2019-06.09.2019**	**on PSCT**

PRDC informed that the training programme on PDMS has already been completed in West Bengal, Bihar & Sikkim as per the above schedule.

BSPTCL requested to conduct one more training programme for their personnel. PCC advised BSPTCL to coordinate with PRDC for arranging one more training at Bihar.

PRDC further informed that the training programme on PDMS for Odisha is scheduled to be held on 22nd & 23rd July 2019 at Bhubaneswar.

Members may update.

ITEM NO. C.8: Status of Third Party Protection Audit

The compliance status of 1st Third Party Protection Audit observations is as follows:

Name of Constituents	Total Observations	Complied	% of Compliance
Powergrid	54	46	85.19
NTPC	16	14	87.50
NHPC	1	1	100.00
DVC	40	26	65.00
WB	68	49	72.06
Odisha	59	42	71.19
JUSNL	34	25	73.53
BSPTCL	16	5	31.25
IPP (GMR, Sterlite and MPL)	5	5	100.00

** Pending observations of Powergrid are related to PLCC problems at other end.*

The substation wise status of compliance are available at ERPC website (Observations include PLCC rectification/activation which needs a comprehensive plan).

In 77th PCC, BSPTCL has submitted the updated status.

In 79th & 80th PCC, BSPTCL was advised to submit the details of the compliance report.

BSPTCL may update.

ITEM NO. C.9: Non-commissioning of PLCC / OPGW and non-implementation of carrier aided tripping in 220kV and above lines.

According to CEA technical standard for construction of electric plants and electric lines -Clause 43(4) (c), transmission line of 220 KV and above should have single-phase auto-reclosing facility for improving the availability of the lines. However, from the tripping details attached June-August, 2016 it is evident that the some of 220kV above Inter & Intra-Regional lines do not having auto-reclose facility either at one end or at both ends. Out of these for some of the lines even PLCC/OPGW is not yet installed and carrier aided protection including Autorecloser facility is not yet implemented. Based on the trippings of June- August, 2016 and PMU analysis a list of such lines has been prepared and as given below:

List of line where auto reclose facility is not available(Information based on PMU data analysis)							
S. No	**Transmission Lines name**	**Date of Tripping**	**Reason of Tripping**	**Owner Detail**		**Present Status**	
				End-1	**End-2**	**OPGW/PLCC Link available**	**AR facility functional**
13	220KV BUDIPADAR-KORBA-II	23.06.16	Y-N FAULT	OPTCL	CSEB	PLCC available	will be activated in consultation with Korba
17	220 KV TSTPP-RENGALI	17.07.16	EARTH FAULT	NTPC	OPTCL		by March 2018
18	220KV BUDIPADAR-RAIGARH	21.07.16	EARTH FAULT	OPTCL	PGCIL	PLCC defective	
20	220 KV FARAKKA-LALMATIA	03.08.16	B-N FAULT .	NTPC	JUNSL	Yes	Old Relay and not functional. 7-8 months required for auto re-close relay procurement.
23	220 KV MUZAFFARPUR - HAZIPUR - II	10.08.16	B-N FAULT	PGCIL	BSPTCL		Voice established. For carrier required shutdown
24	220 KV ROURKELA - TARKERA-II	11.08.16	B-N FAULT	PGCIL	OPTCL	OPGW available	Expected to install protection coupler by Jan 17
27	220 KV BIHARSARIF-TENUGHAT	07.09.16	B-N FAULT	BSPTCL	TVNL		
33	220KV Jamshedpur-Jindal-SC						

34th TCC advised all the respective members to update the above list along with the last tripping status in next PCC meeting.

TCC further advised all the constituents to give the latest status of PLCC of other 220kV and above lines under respective control area.

OPTCL:

1. 220kV Rengali(PG)-Rengali S/Y (Proposal for Commn. in OPGW is pending): *PSDF appraisal committee accepted the proposal*
2. 220kV Indravati(PG)-Indravati(PH) (Proposal for Commn. in OPGW pending): *PSDF appraisal committee accepted the proposal*
3. 132kV Baripada(PG)-Baripada (Tendering in Progress for OPGW): *Contract awarded*
4. 132kV Baripada(PG)-Rairangpur (Tendering in Progress for OPGW): *Contract awarded*

BSPTCL:

Sl No.	***Lines***	***Status***
1	*220 kV Purnea(PG)-Madhepura*	*Protection through PLCC is working properly*
2	*220 kV Biharsharif-BTPS new*	*Commissioning of PLCC is under progress.*
3	*220 kV BTPS new- Begusarai*	*Commissioning of PLCC is under progress.*
4	*220 kV Biharshariff-Bodhgaya line LILO at Khizersarai*	*OPGW is present. Protection is done through DPC.*
5	*220kV MTPS-Motiari line*	*OPGW is installed.*
6	*220KV Madhepura-New Purnea D/C*	*Protection through PLCC is working properly*
7	*220KV Muzaffarpur-Hajipur D/C line*	*Protection through PLCC is working properly*
8	*220KV Patna-Khagaul-SC*	*PLCC Panel working properly.*
9	*220 kV DMTCL(Darbhanga)-Laukhi Circuit-I*	*PLCC Panel working properly*
10	*220 kV Tenughat-Biharsharif S/C*	*PLCC to be commissioned*
11	*220 kV Gaya-Sonenagar New circuit-I*	*Communication through OPGW*
12	*220 kV Pusauli-Dehri S/C*	*PLCC not working*
13	*220 kV Begusarai-Purnea(PG) D/C*	*PLCC working properly*
14	*220 kV DMTCL-Motipur ckt-II*	*PLCC to be commissioned.*
15	*220 kV Dehri- Gaya D/C*	*PLCC working properly*
16	*220 kV Kishanganj(PG)-Kishanganj(B)-II*	*PLCC working properly*

In 79th PCC, BSPTCL submitted PLCC status of some of the lines. The details have been updated in above table.
In 80th PCC meeting, BSPTCL was advised to rectify the PLCC & Autoreclose issues in coordination with their communication wing.

Members may update.

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Report on GD-1/GI-II Event of Dikchu on 30th June 2019 at 09:55 Hrs

Event Category: GD-1

Date and Time: 30th June 2019 09:55 Hrs.

Summary of the Event:

On 30th June 2019, at 09:55:55.563 400 kV Dikchu-Rangpo tripped due to Y-B phase fault at a distance of 18.74 km from Rangpo end and 16.5 km from Dikchu end as reported. Fault was very high resistive in nature so it persisted around 1.25 sec before it was clear by zone protection of the 400 kV Dikchu-Rangpo line. Within this interval following elements also tripped:

1. 400/132 kV ICT at Dikchu
2. 220 kV Jorethang-New Melli D/C from Jorethang
3. 220 kV Rangpo-New Melli D/C
4. 132 kV Rangpo-Chuzachen from Rangpo end only
5. Unit 1 & 2 of Dikchu due to tripping of ICT
6. Unit 1 & 2 of Jorethang Due to loss of evacuation path
7. Unit 1 of Chuzachen due to SPS operation

So generation loss of 241 MW took place (55 MW Chuzachen, 80 MW Jorethang and 106 MW Dikchu).

After clearing of fault, Very slow voltage oscillation took place at Teesta III power plant for around 20 minute. During this period Teesta III reduced its generation initially to control the voltage fluctuation and then gradually increases again even before the fluctuation settled down.

Then During the restoration of 400 kV Dikchu-Rangpo line difficulty faced due to high phase angle difference between Rangpo and Teesta III.

Pre -Incident Condition at 23:54 Hrs on 12th April 2019:

Generating Station	Generation (MW)
Teesta V	516
Teesta 3	1315
Jorethang	80
Tashiding	64
Chujachen	113
Dikchu	106

Transmission Line	Line Flow (MW)
400 kV Teesta 3-Kishanganj	565
400 kV Rangpo-Kishanganj	394
400 kV Rangpo-Binaguri D/C	555
400 kV Teesta 3-Dikchu	742
400 kV Dikchu-Rangpo	848
400 kV Teesta V-Rangpo D/C	256

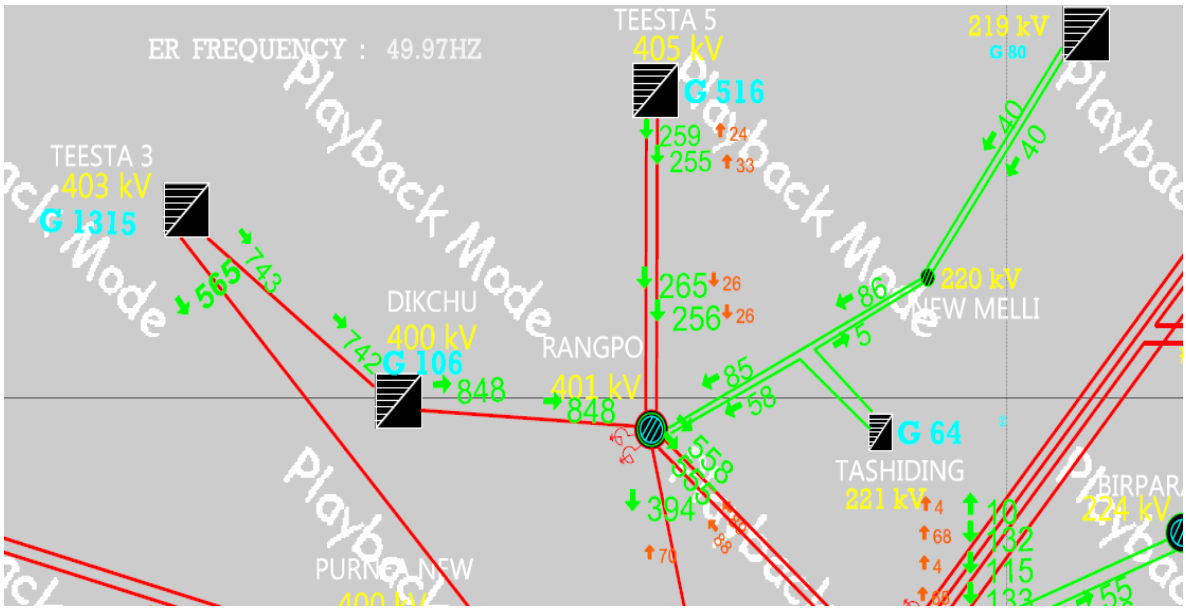


Figure 1: SCADA Snapshot of Sikkim Hydro Complex at 09:54 Hrs on 30th June 2019

Event Overview:

Time	Events
09:55:54:416	Extremely High resistance fault almost equivalent to load appeared in the B phase to neutral of the 400 kV Rangpo –Dikchu line. And DEF protection started but no zone pick up.
09:55:54:479	400/132 kV ICT at Dikchu tripped from 132 kV end ; But on which protection is not clear in the DR
09:55:54:545	400/132 kV ICT at Dikchu tripped from 400 kV end on IN>2 protection
09:55:54	Both Unit of Dikchu tripped on low forward power after tripping of the ICT
09:55:55:071	220 kV Jorethnag –New Melli D/C tripped from Jorethang end on DEF protection
09:55:55:156	132 kV Chuzachen Rangpo at Chuzachen end tripped in zone 3
09:55:55:192	Unit 1 of Chuzachen tripped in SPS
09:55:55:527	High resistive fault of B phase converted in Y-B fault and 400 kV Rangpo –Dikchu line distance protection picked in Zone-1 from Rangpo end and tripped immediately
09:55:55:533	High resistive fault of B phase converted in Y-B fault and 400 kV Rangpo –Dikchu line distance protection picked in Zone-1 from Dikchu end also and tripped immediately
09:55:58	Unit 1 & 2 of Jorethang tripped on Over frequency
*09:55	220 kV Rangpo-New Melli tripped from both end as per SCADA SOE

Event Chronology is from DR except 220 kV Rangpo-New Melli tripping time which is from SCADASOE.

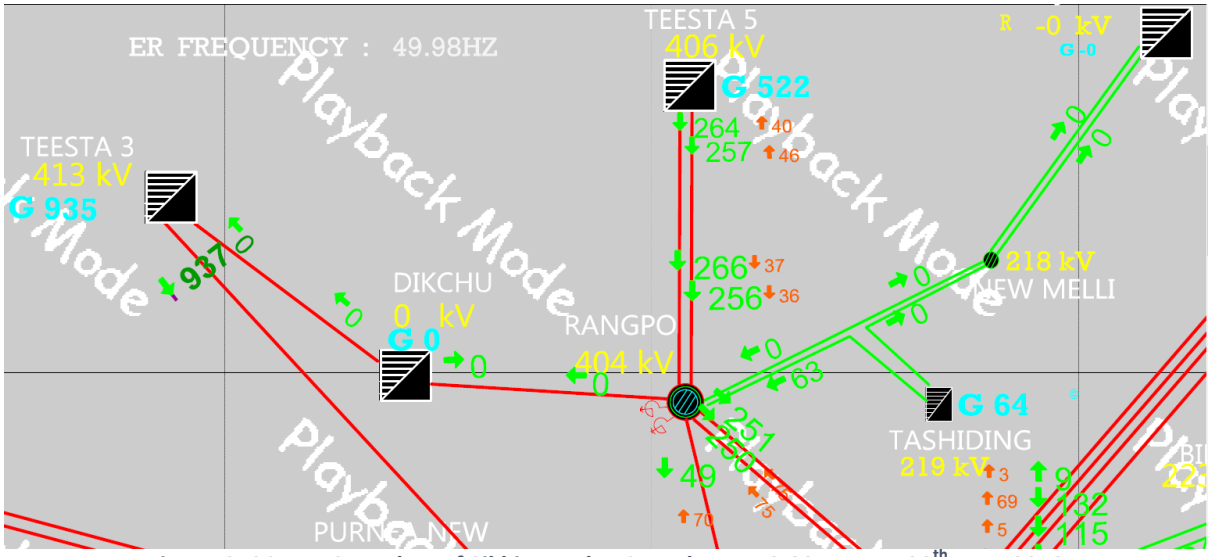


Figure 2: SCADA Snapshot of Sikkim Hydro Complex at 10:00 Hrs. on 30th June 2019

Relay Indication:

Transmission line/ Unit	Time	End 1 Relay Indication	End 2 Relay Indication
400 kV Rangpo-Dikchu	09:55:55:533	IY: 9.5kA, IB: 8.77 kA, Zone 1, Zone 1 trip, Fault Loc: 18.74 km	IY: 6.7kA, IB: 5.1kA, Zone 1, Zone 1 trip, Fault Loc : 16.5 km
220 kV Jorethang-New Melli D/C	09:55:55:071	Tripping in DEF	No Tripping Reported
132 kV Rangpo-Chuzachen	09:55:55:156	No Tripping	Zone-3
400 kV /132 kV ICT at Dikchu	09:55:54:545	Earth fault over current Stage 2	Tripped but Which protection operated is not captured
220 kV Rangpo-New Melli		From utility no tripping is reported but as per SCADA SOE and Flow data (annexure III) it is clear that line tripped	

Load/Generation Loss and Frequency Drop:

Two running unit of Dikchu generating total106 MW ,two running unit of Jorethang generating total 80 MW tripped and Unit 1 of Chuzachen generating 55 MW tripped . So Total 241 MW generation loss took place.

Area/substation affected:

Jorethang, Chuzachen and Dikchu generating station. Also Teesta II Generating station faced very slow voltage fluctuation during the event and minimum 365 kV steady state voltage is recorded during the event.

Restoration:

1. During restoration 400 kV Dikchu-Rangpo line at Dikchu it was not successful. As the actual phase angle difference between Rangpo and Dikchu was greater than 20 degree but the setting in the synchro check relay was 15 degree. Same thing happened when Rangpo end take the charging attempt (setting of Rangpo end yet to received). Finally at 12:31 hrs at Teesta III, Rangpo-Dikchu- Teesta III section, synchronized by increasing the synchro check

relay phase angel difference setting as well as by reducing actual phase angle difference (between Rangpo and Teesta III) by reducing generation at Teesta III.

2. 400/132 kV ICT at Dikchu restored at 10:34
3. 220 kV Jorethang –New Melli I & II restored at 10:13 hrs and 10:14 hrs respectively
4. 132 kV Rangpo Chuzachen line restored at 10:16 hrs.
5. Dikchu Unit 1 & 2 synchronized at 17:06 hrs and 17:09 hrs respectively.
6. Jorethang Unit 1 synchronized at 10:17 hrs and Unit 2 kept in standstill.
7. Chuzachen Unit 1 restored at 10:17 hrs.

Analysis of PMU data:

1. **Line Current and Line voltage of 400 kV Dikchu-Rangpo from Rangpo End and 400 kV Teesta III-Kishanganj from Kishanganj end:** Figure 3 shows the line voltage of 400 kV Rangpo-Dikchu line at Rangpo end and Figure 4 show the line current. Figure 5 shows the line Voltage of 400 kV Teesta III-Kishanganj line at Kishanganj end and Figure 6 show line the current. It is seen from the figure that initially very less voltage drop in B phase took place due to high resistance fault and it persisted for 1.1 sec as distance protection could not clear the fault. Then finally fault converted into Y-B fault and distance protection operated and line tipped in zone 1.

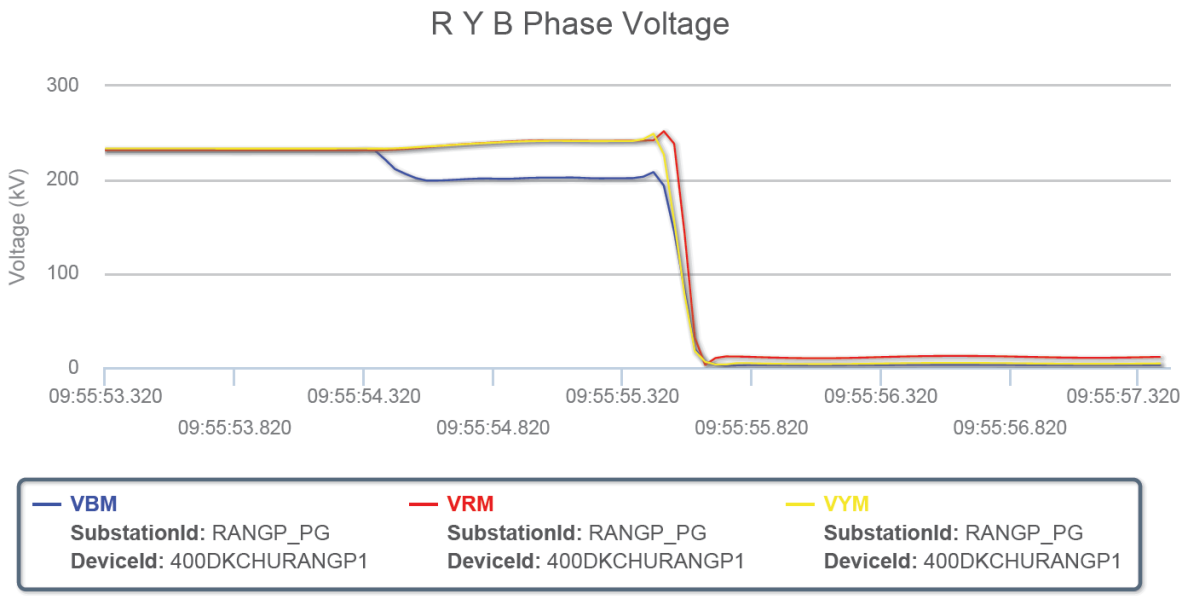


Figure 3: Phase voltage of 400 kV Rangpo Dikchu line at Rangpo

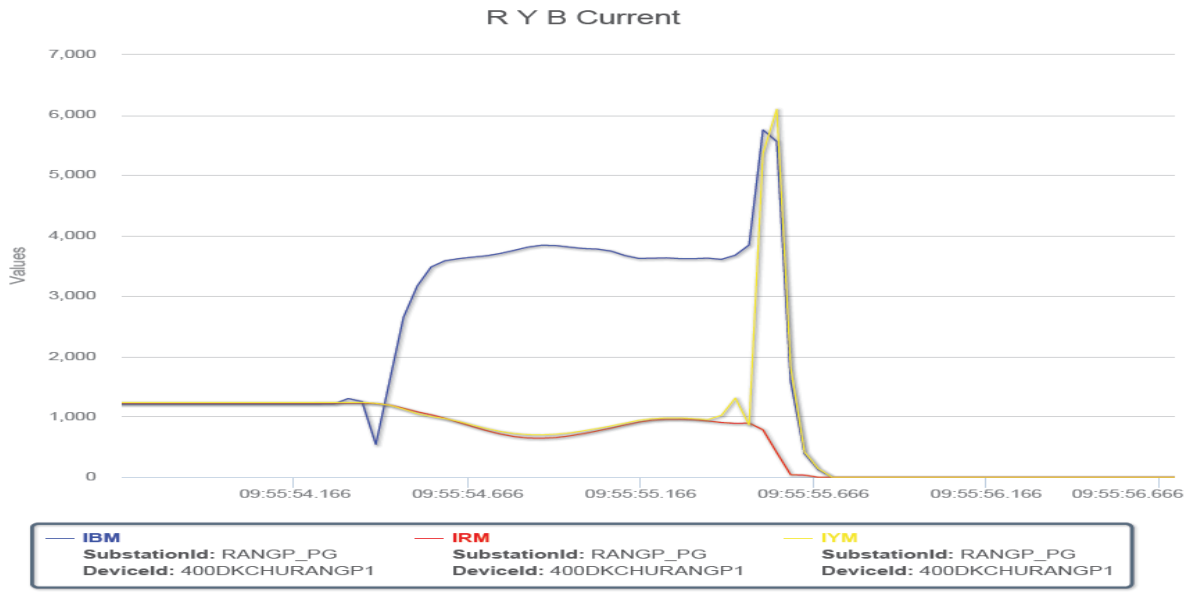


Figure 4: **Phase current of 400 kV Rangpo Dikchu line at Rangpo**

In the 400 kV Teesta III Kishanganj Line after transient current settled just above 2000 Amp and stayed there for 50 sec but no SPS operation at Teesta III reported.

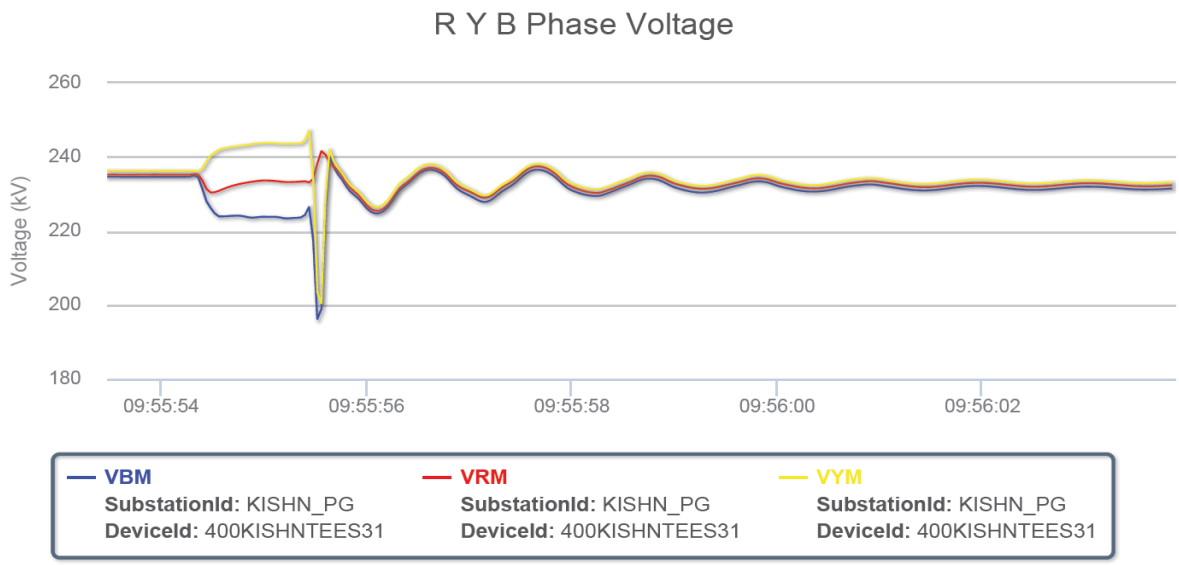


Figure 5: Phase voltage of 400 kV Teesta III Kishanganj line at Kishanganj

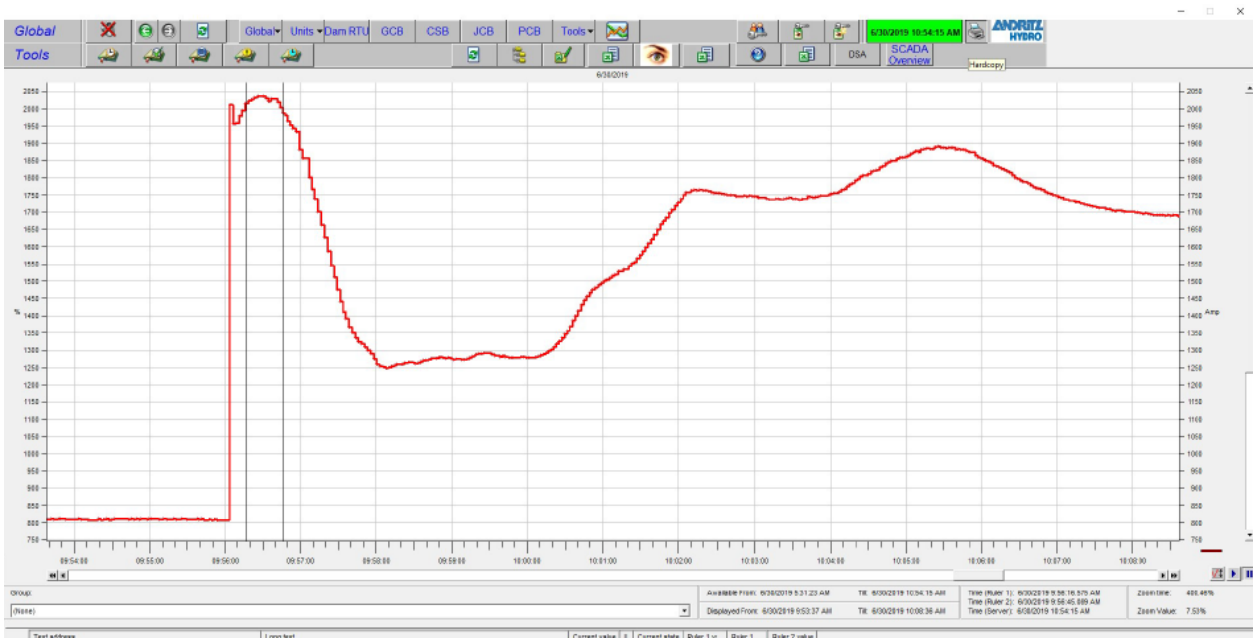


Figure 6: **Current of 400 kV Teesta III Kishanganj line at Kishanganj**

2. MW and of 400 kV Dikchu-Rangpo line at Rangpo End:

Figure 7 is showing the MW flow of the 400 kV Dikchu-Rangpo line at Rangpo End. Initially power 850 MW was flowing towards Rangpo. Then During the fault around 400 MW was flowing towards the fault. Then finally line tripped.

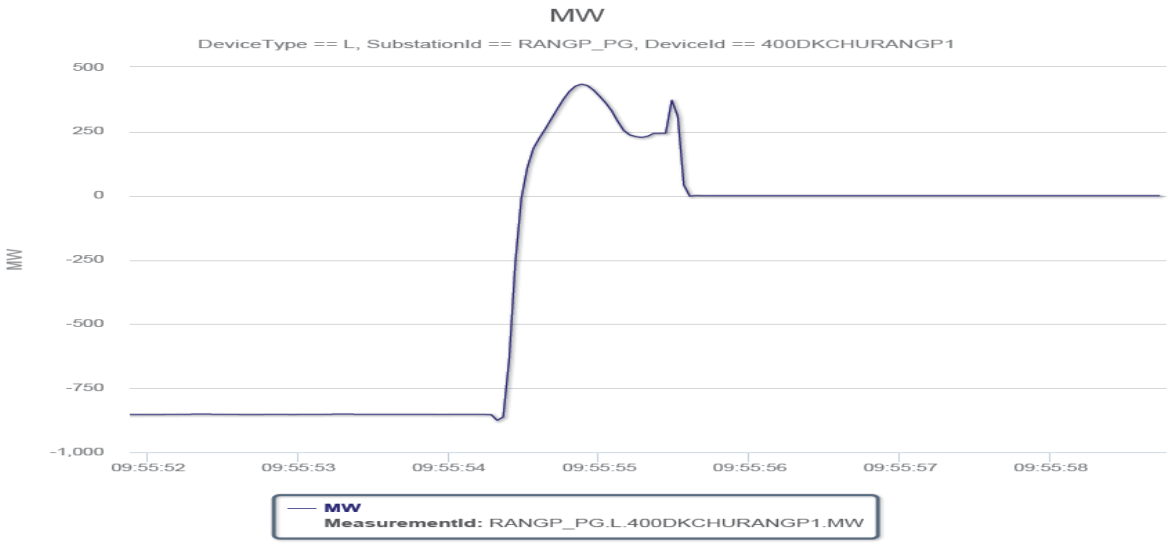


Figure 7: MW Flow of 400 kV Dikchu Rangpo at Rangpo

Analysis of Disturbance Recorder and event logger file:

The DR from the various ends were analysed the observation are as follows:

1. Analysis of DR of 400 kV Dikchu-Rangpo at Rangpo and Dikchu end:

From the DR of Dikchu as well as Rangpo end it is seen that the Phase angle between B phase voltage and current is nearly zero both during pre-fault and fault condition (for the

first 1.1 sec). Only magnitude of the current increases from 1.2 kA during pre-fault condition to 3.5 kA during fault condition. **Also calculating active power supplied to the fault from Both Rangpo and Dikchu end it is seen that almost 1300 MW was consumed by the fault. The same is evident from the PMU measurements also.** Physical nature of such high resistive fault needs to be investigated with due diligence.

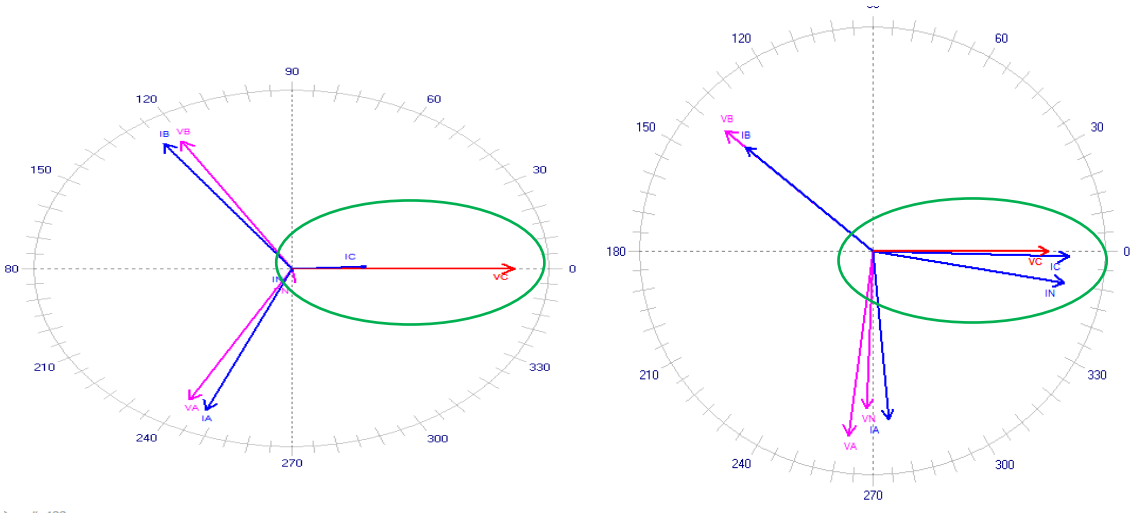
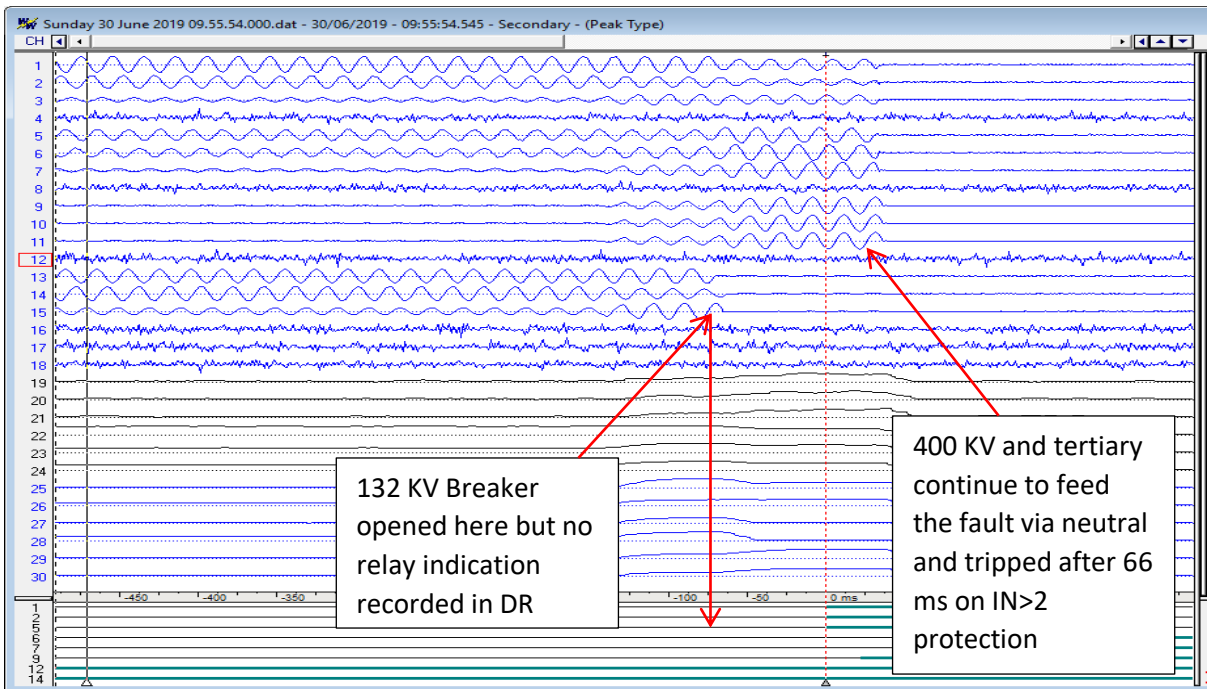


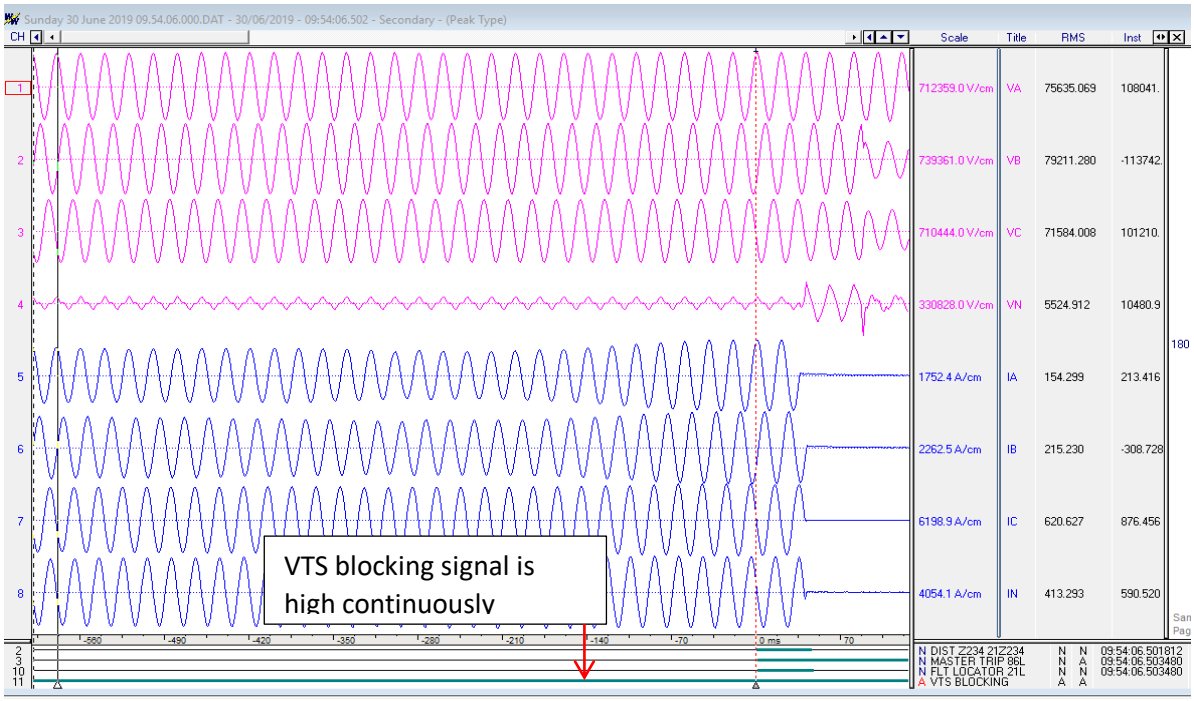
Figure 8: Dikchu end Pre and during fault Voltage and Current Phasor

2. Analysis of Dikchu ICT DR:

132 kV current opened 1st but which protection operated is not clear from the DR then after 66 ms 400kV barker tripped on IN>2 protection as fault was continued to fed via neutral.

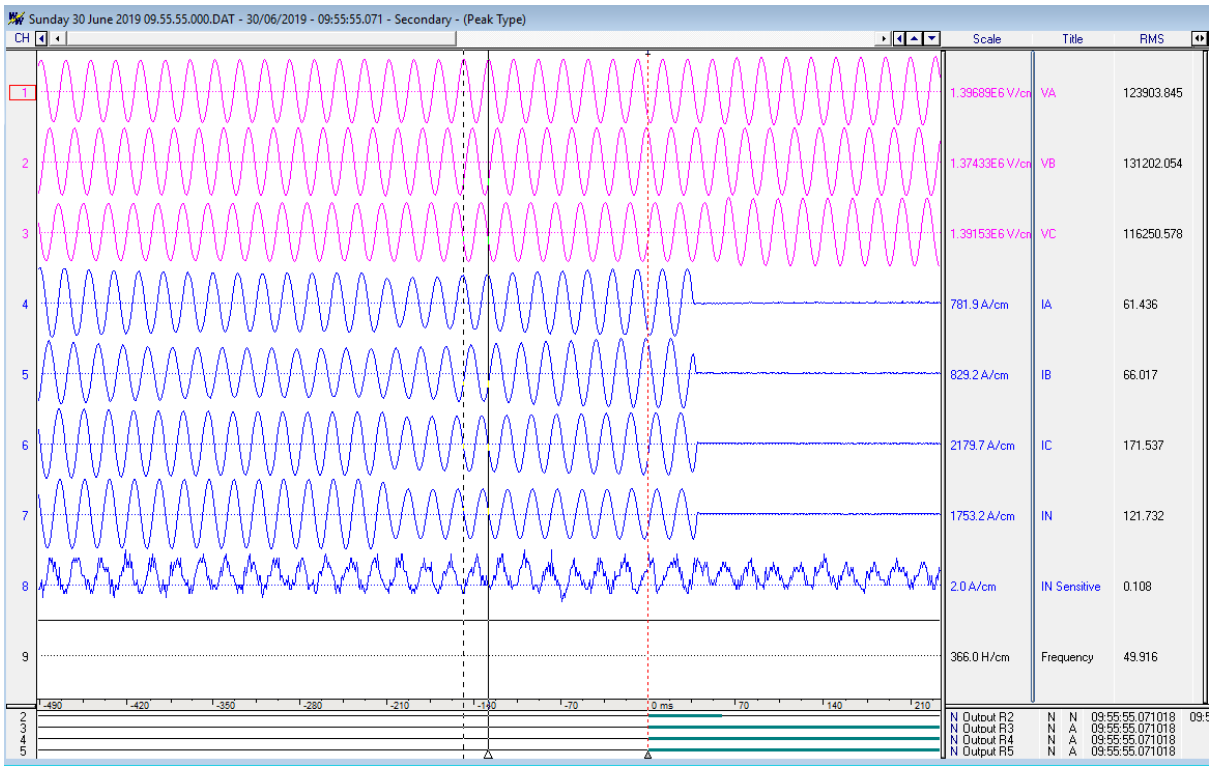


3. DR analysis of 132 kV Rangpo-Chuzachen at Chuzachen:



From Chuzachen end distance protection zone-3 operated as reported by them. But in the DR VTS blocking signal was high, which blocks zone protection. Chuzachen may explain the why VTS blocking was high and then how DP operated. Even if DP operated, then how zone-3 of the line encroached two voltage levels is not clear. Zone-3 setting may be reviewed.

4. DR analysis of Jorethang-New Melli at Jorethang:



DR Digital channels are not properly configured. So it is not clear which protection operated. Operation of DEF within 650 ms suggests that DEF setting need to be reviewed.

Analysis of SPS

1. **SPS at Teesta III:**
   Flow of Teesta III –Kishanganj Line remain above 2000 AMP for 1 minute but as per SPS action at Teesta III unit 1 not tripped. Teesta III needs to explain the same. As per PMU data value of the current was 2040 Amp so whether SPS fails to detect the condition or not needs to be confirmed by Teesta III.
2. **SPS at Chuzachen:**
   Operation of SPS at Chuzachen is in order.

Analysis of SOE:

TIME	MILLI_SEC	OSI_KEY	STATION	DESCRIPTION	STATUS
30-06-19 9:15	511	2222036	ARRAH_PG	220_ICT3_CB	Open
30-06-19 9:15	867	2222036	ARRAH_PG	220_ICT3_CB	Closed
30-06-19 9:26	51	0220A041	MAITH_PG	220_DUMKA_JH_1_CB	Open
30-06-19 9:27	109	2239145	NRANC_PG	MSR2_CB	Open
30-06-19 9:41	133	0221B032	PURNW_PG	400_BIHAR_PG_1_FARAK_PG_Tie	Travel
30-06-19 9:41	143	0221B033	PURNW_PG	400_BIHAR_PG_1_Main_CB	Open
30-06-19 9:43	411	2222036	ARRAH_PG	220_ICT3_CB	Open
30-06-19 9:43	89	2222036	ARRAH_PG	220_ICT3_CB	Closed
30-06-19 9:45	565	2239144	NRANC_PG	MSR1_CB	Closed
30-06-19 9:49	246	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Closed
30-06-19 9:49	335	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Open
30-06-19 9:50	512	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Travel
30-06-19 9:51	474	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Open
30-06-19 9:51	696	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Travel
30-06-19 9:55	777	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Open
30-06-19 9:55	673	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Travel
30-06-19 9:55	757	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Open
30-06-19 9:55	987	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Travel
30-06-19 9:55	632	2219022	SI400_PG	400_TALA__PG_1_Main_CB	Open
30-06-19 9:55	583	2241013	DKCHU_PG	400_ICT_1_Pri_Main_CB	Open
30-06-19 9:55	583	2241020	DKCHU_PG	400_FUTURE_1_Main_CB	Open
30-06-19 9:55	861	0223A001	MELNW_PG	220_RANGP_PG_1_CB	Open
30-06-19 9:55	926	2232071	RANGP_PG	220_MELNW_PG_2_CB	Open
30-06-19 9:55	161	2.22E+18	CHEP__PG	132_RANGP_PG_CB	Open
30-06-19 9:55	318	2239144	NRANC_PG	MSR1_CB	Open
30-06-19 9:55	563	2241006	DKCHU_PG	400_TEES3_PG_RANGP_PG_Tie	Open
30-06-19 9:55	564	2241010	DKCHU_PG	400_RANGP_PG_Main_CB	Open
30-06-19 9:55	569	2232135	RANGP_PG	400_DIKCHU_PG_CB	Open
30-06-19 9:55	572	1241012	DKCHU_PG	400_RANGP_PG_MP2	Operated
30-06-19 9:55	576	1241011	DKCHU_PG	400_RANGP_PG_MP1	Operated
30-06-19 9:55	995	0222B003	JORET_PG	220_UNIT_H_2_CB	Invalid
30-06-19 9:55	198	2.22E+08	CHEP__PG	132_Unit1_CB	Open
30-06-19 9:55	432	0222B001	JORET_PG	220_MELNW_PG_2_CB	Invalid
30-06-19 9:55	432	0222B001	JORET_PG	220_MELNW_PG_2_CB	Open
30-06-19 9:55	432	0222B002	JORET_PG	220_UNIT_H_1_CB	Open
30-06-19 9:55	432	0222B002	JORET_PG	220_UNIT_H_1_CB	Invalid
30-06-19 9:55	432	0222B003	JORET_PG	220_UNIT_H_2_CB	Open
30-06-19 9:55	432	0222B004	JORET_PG	220_MELNW_PG_1_CB	Invalid
30-06-19 9:55	432	0222B004	JORET_PG	220_MELNW_PG_1_CB	Open
30-06-19 9:55	111	2241027	DKCHU_PG	132_ICT_1_Sec_CB	Open
30-06-19 9:55	126	2241031	DKCHU_PG	132_UNIT_H_1_CB	Open
30-06-19 9:55	126	2241035	DKCHU_PG	132_UNIT_H_2_CB	Open
30-06-19 9:56	880	0223F053	ALIPU_PG	400_PUNAT_NE_1_PUNAT_NE_2_Tie	Open
30-06-19 9:56	880	0223F057	ALIPU_PG	400_PUNAT_NE_2_Main_CB	Open
30-06-19 9:58	511	2222036	ARRAH_PG	220_ICT3_CB	Open
30-06-19 9:58	329	2222036	ARRAH_PG	220_ICT3_CB	Closed
30-06-19 10:01	511	2222036	ARRAH_PG	220_ICT3_CB	Open
30-06-19 10:01	460	2222036	ARRAH_PG	220_ICT3_CB	Closed
30-06-19 10:06	196	0222B001	JORET_PG	220_MELNW_PG_2_CB	Open
30-06-19 10:06	196	0222B002	JORET_PG	220_UNIT_H_1_CB	Open
30-06-19 10:06	196	0222B003	JORET_PG	220_UNIT_H_2_CB	Open
30-06-19 10:06	196	0222B004	JORET_PG	220_MELNW_PG_1_CB	Open
30-06-19 10:06	196	0222B005	JORET_PG	220_MELNW_PG_2_MB1_ISO	Closed
30-06-19 10:06	196	0222B006	JORET_PG	220_MELNW_PG_2_L_ISO	Closed
30-06-19 10:06	196	0222B007	JORET_PG	220_UNIT_H_1_MB1_ISO	Closed
30-06-19 10:06	196	0222B008	JORET_PG	220_UNIT_H_2_MB2_ISO	Closed
30-06-19 10:06	196	0222B009	JORET_PG	220_MELNW_PG_1_MB2_ISO	Closed
30-06-19 10:06	196	0222B010	JORET_PG	220_MELNW_PG_1_L_ISO	Closed

Operation Issues Observed:

1. **Voltage stability of Teesta III:**

   After clearing of the fault all the power of Teesta III was evacuated via 400 kV Teesta III-Kishanganj Line. And a slow and high voltage fluctuation was triggered at Teesta III which persisted for around 20 minute the stabilized. Figure 9 shows the fluctuation.

From the excitation data submitted by the Teesta III it is seen that its excitation system is Andritz hydro make. There is “reactive power regulation” mode in the exciter and its setting is shown in the Figure 10. But as per IEEE standards reactive power regulation mode of operation for grid connected generators are not allowed. Extract from the” IEEE Std 421.5™-2016” is quoted below:

“On the other hand, large generators connected to bulk power systems are usually required to operate on automatic voltage control and the use of these power factor or reactive power controllers is forbidden, either by reliability standards (e.g., North American Electric Reliability Corporation [B45]) or grid interconnection agreements (e.g. Independent Electricity System Operator [B30]).”

This mode of operation can cause voltage stability issue for Gird connected generators as it has a slower outer control loops which vary the voltage set point of the generators to maintain the reactive power output.

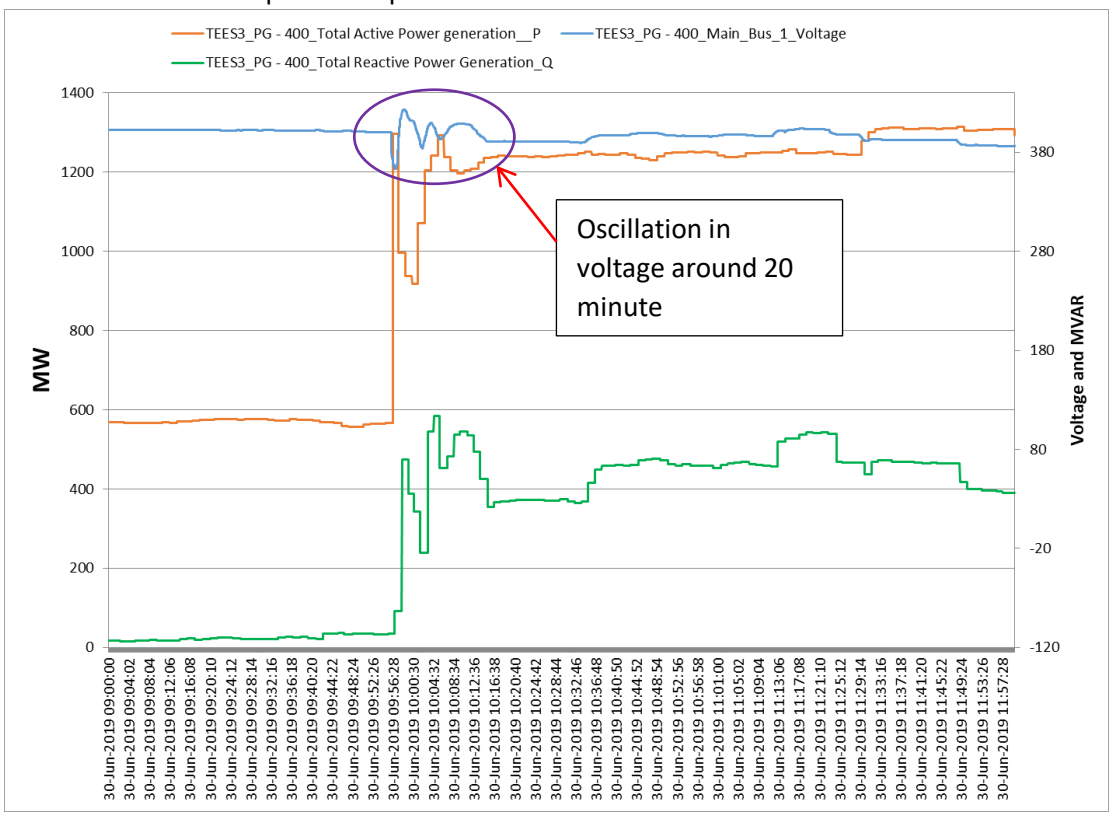


Figure 9: Active Reactive generation of Teesta III and Teesta III Bus voltage

Reactive Power Regulator

V1834	SWPQ	max. set value reactive power regulator	0.1001 = 22 MVAr

ANDRITZ Hydro

Excitation		Teesta Unit # 1+2+3+4+5+6	P AT QC3 300/3
V1836	SWNQ	min. set value reactive power regulator	-0.0498 = -11 MVAr
V1838	SWAQ	start set value reactive power regulator	0.0000 = 0 MVAr
V1835	SWPC	max. set value power factor regulator	1.0000 = 0.71 pf
V1837	SWNC	min. set value power factor regulator	-1.0000 = 0.71 pf cap
V1839	SWAC	start set value power factor regulator	0.0000 = 1 pf
V1877	KPQRF	feed back amplification reactive power regulator	15.9995
V1957	TIQRF	feed back integration time reactive power regulator	0.0098

Figure 10: Reactive Power Regulator setting of Teesta III Units

2. Synchronization Issue:

During restoration the phase angle difference between 400 kV Rangpo and Dikchu (or Teesta III) was more than 20 degree. Also in the study done by ERLDC and NLDC in PSSE similar angle difference is observed.

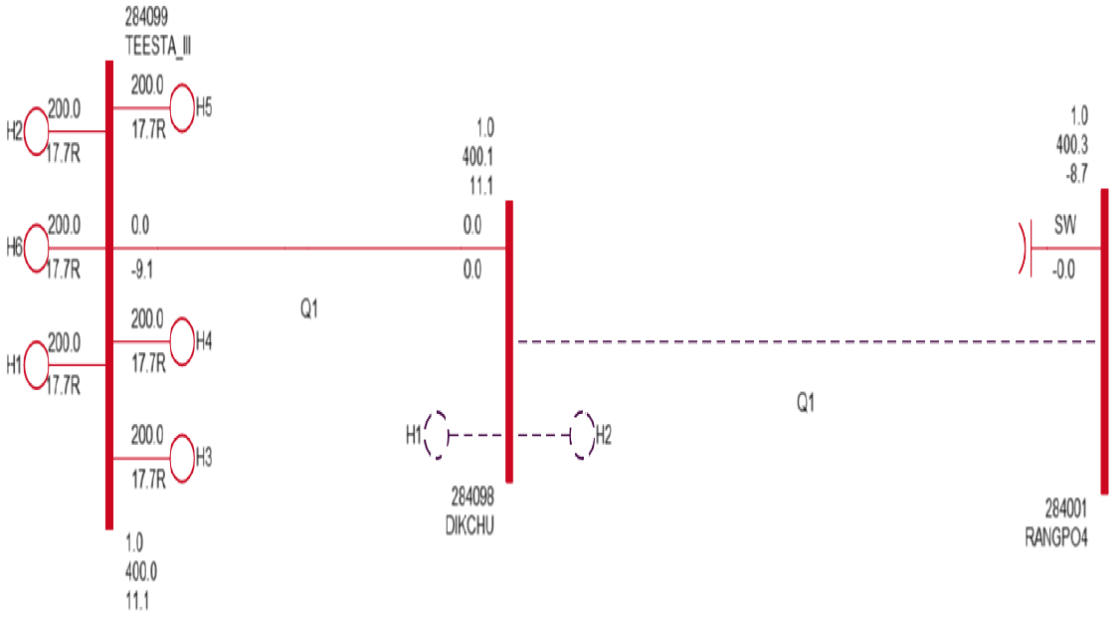


Figure 11: PSSE study for calculating Phase angle difference between Rangpo and Teesta III

In this matter the issue is synchro check relay setting:

a. At Teesta III end the phase angle difference setting is +-10 degree
b. At Dikchu it was +- 15 degree

Now in IEEE Std C37.104™-2012 of Auto reclosing the setting guideline for synchro check is discussed. And up to 60 degree it could be allowed but no general standard is there but it needs to be studied considering impact on generator-turbine shaft. Different consideration for accessing the right setting is also discussed. But setting between 20-30

degree is considered to be safe and conservative. So any setting even below this range by any utility or Generators will be acceptable only when supported by studies as mentioned in the standard. Members may discussed the issue and share their experience.

Protection Issues Observed:

In the DR analysis section Protection issues are discussed in details. Here the same points are listed in a consolidated manner:

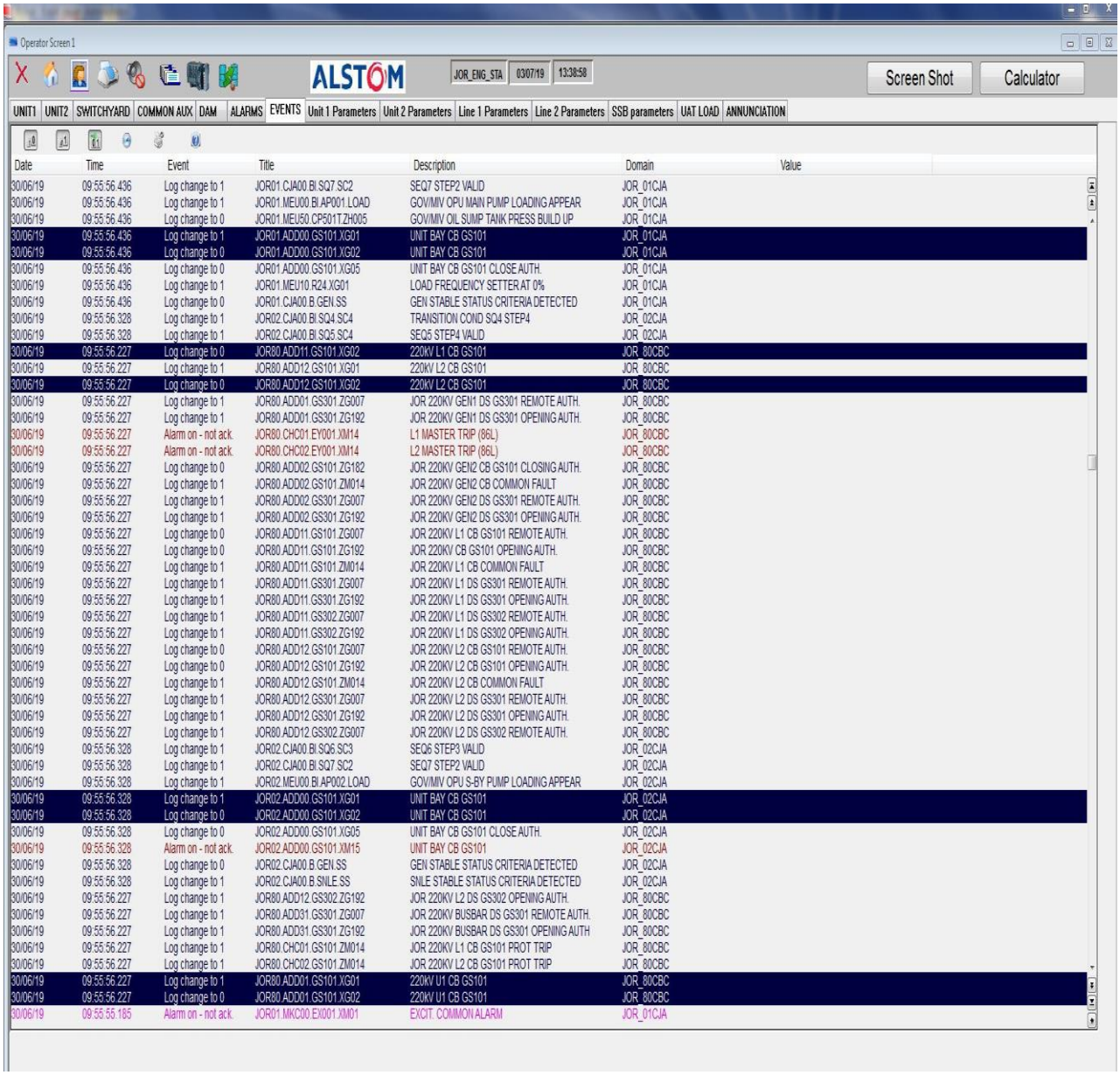
1. Physical Nature of Such high resistance fault needs to be investigated in details by the transmission utility.
2. Which protection operated for Opening of Dikchu ICT from 132 kV side is not clear.
3. 132 kV Rangpo-Chuzachen line tripped in zone-3 for a fault at 400 kV level. So this is a encroachment to higher voltage level. Zone 3 setting needs to be reviewed
4. Operation of DEF at Jorethang for 220 kV Jorethang –New Melli line within 650 ms suggest that it needs to be reviewed

Suggested Course of Action for Improvement of System Reliability

1. Teesta III needs to immediately operate its all machine in voltage control mode only rather than reactive power regulation mode.
2. As the situation that happed is very much probable to repeat so the synch check relay setting at Rangpo, Dikchu, Teesta III and Kishanganj substation the lines evacuating Sikkim hydro power needs to be finalized with supporting study. Generators may carry their own study by their vendor while a study committee may be formed to review and finalize the setting.

Annexure I:

Jorethang Event logger:



Date	Time	Event	Title	Description	Domain	Value
30/06/19	09:55:56.436	Log change to 1	JOR01.CJA00.BI.SQ7.SC2	SEQ7 STEP2 VALID	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 1	JOR01.MEU00.BI.AP001.LOAD	GOV/MIV OPU MAIN PUMP LOADING APPEAR	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 0	JOR01.MEU50.CP501T.ZH005	GOV/MIV OIL SUMP TANK PRESS BUILD UP	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 1	JOR01.ADD00.GS101.XG01	UNIT BAY CB GS101	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 0	JOR01.ADD00.GS101.XG02	UNIT BAY CB GS101	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 0	JOR01.ADD00.GS101.XG05	UNIT BAY CB GS101 CLOSE AUTH.	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 1	JOR01.MEU10.R24.XG01	LOAD FREQUENCY SETTER AT 0%	JOR_01CJA	
30/06/19	09:55:56.436	Log change to 0	JOR01.CJA00.B.GEN.SS	GEN STABLE STATUS CRITERIA DETECTED	JOR_01CJA	
30/06/19	09:55:56.328	Log change to 1	JOR02.CJA00.BI.SQ4.SC4	TRANSITION COND SQ4 STEP4	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 1	JOR02.CJA00.BI.SQ5.SC4	SEQ5 STEP4 VALID	JOR_02CJA	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD11.GS101.XG02	220KV L1 CB GS101	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD12.GS101.XG01	220KV L2 CB GS101	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD12.GS101.XG02	220KV L2 CB GS101	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD01.GS301.ZG007	JOR 220KV GEN1 DS GS301 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD01.GS301.ZG192	JOR 220KV GEN1 DS GS301 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Alarm on - not ack.	JOR80.CHC01.EY001.XM14	L1 MASTER TRIP (86L)	JOR_80CBC	
30/06/19	09:55:56.227	Alarm on - not ack.	JOR80.CHC02.EY001.XM14	L2 MASTER TRIP (86L)	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD02.GS101.ZG182	JOR 220KV GEN2 CB GS101 CLOSING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD02.GS101.ZM014	JOR 220KV GEN2 CB COMMON FAULT	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD02.GS301.ZG007	JOR 220KV GEN2 DS GS301 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD02.GS301.ZG192	JOR 220KV GEN2 DS GS301 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD11.GS101.ZG007	JOR 220KV L1 CB GS101 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD11.GS101.ZG192	JOR 220KV CB GS101 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD11.GS101.ZM014	JOR 220KV L1 CB COMMON FAULT	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD11.GS301.ZG007	JOR 220KV L1 DS GS301 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD11.GS301.ZG192	JOR 220KV L1 DS GS301 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD11.GS302.ZG007	JOR 220KV L1 DS GS302 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD11.GS302.ZG192	JOR 220KV L1 DS GS302 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD12.GS101.ZG007	JOR 220KV L2 CB GS101 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD12.GS101.ZG192	JOR 220KV L2 CB GS101 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD12.GS101.ZM014	JOR 220KV L2 CB COMMON FAULT	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD12.GS301.ZG007	JOR 220KV L2 DS GS301 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD12.GS301.ZG192	JOR 220KV L2 DS GS301 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD12.GS302.ZG007	JOR 220KV L2 DS GS302 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.328	Log change to 1	JOR02.CJA00.BI.SQ6.SC3	SEQ6 STEP3 VALID	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 1	JOR02.CJA00.BI.SQ7.SC2	SEQ7 STEP2 VALID	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 1	JOR02.MEU00.BI.AP002.LOAD	GOV/MIV OPU S-BY PUMP LOADING APPEAR	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 1	JOR02.ADD00.GS101.XG01	UNIT BAY CB GS101	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 0	JOR02.ADD00.GS101.XG02	UNIT BAY CB GS101	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 0	JOR02.ADD00.GS101.XG05	UNIT BAY CB GS101 CLOSE AUTH.	JOR_02CJA	
30/06/19	09:55:56.328	Alarm on - not ack.	JOR02.ADD00.GS101.XM15	UNIT BAY CB GS101	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 0	JOR02.CJA00.B.GEN.SS	GEN STABLE STATUS CRITERIA DETECTED	JOR_02CJA	
30/06/19	09:55:56.328	Log change to 1	JOR02.CJA00.B.SNLE.SS	SNLE STABLE STATUS CRITERIA DETECTED	JOR_02CJA	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD12.GS302.ZG192	JOR 220KV L2 DS GS302 OPENING AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD31.GS301.ZG007	JOR 220KV BUSBAR DS GS301 REMOTE AUTH.	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD31.GS301.ZG192	JOR 220KV BUSBAR DS GS301 OPENING AUTH	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.CHC01.GS101.ZM014	JOR 220KV L1 CB GS101 PROT TRIP	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.CHC02.GS101.ZM014	JOR 220KV L2 CB GS101 PROT TRIP	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 1	JOR80.ADD01.GS101.XG01	220KV U1 CB GS101	JOR_80CBC	
30/06/19	09:55:56.227	Log change to 0	JOR80.ADD01.GS101.XG02	220KV U1 CB GS101	JOR_80CBC	
30/06/19	09:55:55.185	Alarm on - not ack.	JOR01.MKC00.EX001.XM01	EXCIT. COMMON ALARM	JOR_01CJA	

Annexure II:

Chuzachen Disturbance report:

SYSTEM DISTURBANCES REPORT
(Detailed Report)

OCCURRENCE REPORT

(1) Date & Time of Occurrence

30-Jun-19 09:55:55.123

(2) Name of the Sub / Generating Station

Chuzachen Hydroelectric Power Project

(3) Detail of Occurrence

1. CHZ-Rangpo Line Zone-3 Distance Fault detected. **2. CHZ-Rangpo Line CB opened.** **3. Unit-1 SPS triped Detected.** **4. Unit-1 CB Opened**

(4) Connection arrangement of lines and other equipment (Attach SLD of the sub-station / power stationindicating status of all CBs and isolators of lines / ATRs / Reactors / Generators connected to the busbars)

At the time of occurrence the disposition of feeders was as below
(for 1-Main / 2-Main + 1 Transfer Scheme)

Main Bus 1	Main Bus 2
Not In Service	In Service

MAIN BUS COUPLER BREAKER WAS "ON" / "OFF" -	**OFF**

Line / Transformer on Transfer Bus (if any): NA

For one and half breaker scheme

	Feeder I	Feeder II	Tie-Breaker (On/Off)
Diameter 1			
Diameter 2			
Diameter 3			
……			

(5) Antecedent conditions

Bus-1	**NA**	**NA**
Bus-2	**132.36 KV**	**50.06 Hz**
CHZ-RANGPO	**63.63 MW(EXP)**	**-3.85 MVAR**
CHZ-GTK	**49.27 MW(EXP)**	**-8.15 MVAR**
…		
ATR-1	**NA**	**NA**
ATR-2	**NA**	**NA**
…		
Unit-1 (at GT primary)	**58.75 MW(EXP)**	**0.83 MVAR**
Unit-2 (at GT primary)	**56.7 MW(EXP)**	**1.79 MVAR**
….		

Weather conditions - Normal / Stormy / Rainy / Lightning strikes going on - Normal

(6) Location and nature of Fault

Line	Fault Locator	Fault Current
CHZ-RANGPO	**DP 21L(44.86 KM)**	**IA- 270.2 A, IB- 307.6 A, IC- 618.7 A**

(7) Sequence of Trippings

Time (hh mm ss)	Event
09:55:55.156	**CHZ-RANGPO Line CB Open**
09:55:57.192	**CHZ-Unit-1 CB Open**

(8) Protection out of service (if any)

Line / Transformer / Generator / Reactor	Protection out of service	Reasons
	NA	**NA**

(9) Relay / DR / EL NOT time-synchronized with GPS prior to the tripping

Relay & DR - NOT time-synchronized with GPS EL - Time-synchronized with GPS

(10) Relay Indication for Faulted Line / Bus

(A)			
Sl. No.	Name of Bay / Line	Local End Relay type And Indications	Remote End Relay type And Indications
1	CHZ-RANGPO	P442 / DISTANCE PROTECTION (Z3)	DISTANCE PROTECTION (Z3)(44.86 km)

(11) Relay Indication for Generating Units / Transformers / Reactors / FSC etc.

Unit / ATR	Relay Indication
Unit #1	
Unit #2	
…….	
ATR #1	
ATR #2	
……	

(12) PLCC counter readings

	Local End								Remote End	
	Before				After				Before	After
	CH-A TX/RX	CH-B TX/RX	CH-C TX/RX	CH-D TX/RX (SPS SIGNAL)	CH-A TX/RX	CH-B TX/RX	CH-C TX/RX	CH-D TX/RX (SPS SIGNAL)	CH-I	CH-II
CHZ-GTK	92/58	00/00	12/01	00/01	92/58	00/00	12/01	00/01	NA	NA
CHZ-RANGPO	05/86	00/00	01/35	00/60	05/86	00/00	01/35	00/60	NA	NA

(13) Analysis and Conclusion (With explanation and inference drawn from DR, EL and PLCC readings)

CHZ-Rangpo Line breaker tripped at Chuzachen ends.

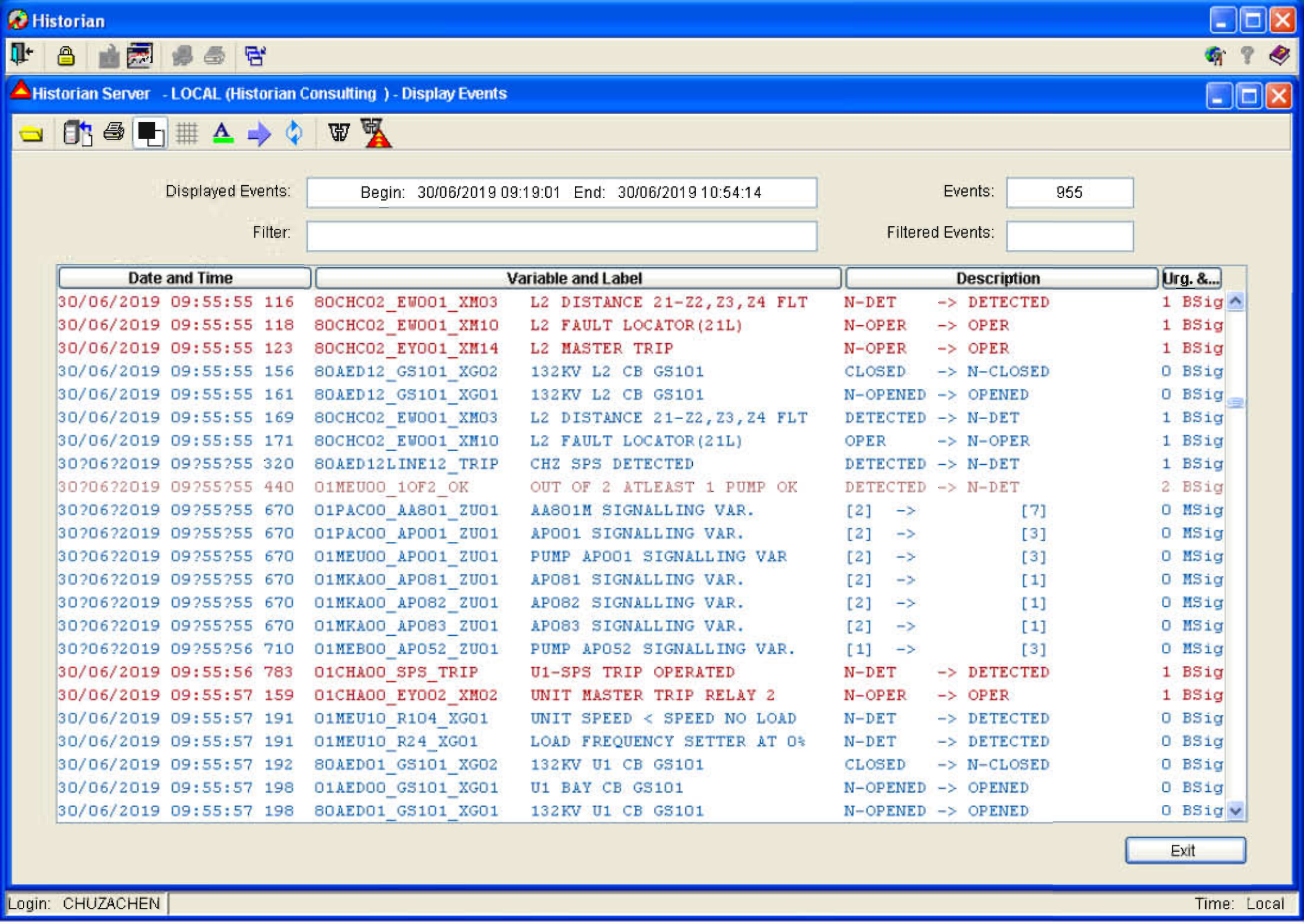
(14) Restoration Details

Sl. No.	Line / ATR / Unit	Outage	Restoration	Duration
1	Chuzachen-RANGPO Feeder	30-Jun-19 09:55:55.156	30-Jun-19 10:16:42.291	00:20:47.135
2	Unit-1	30-Jun-19 09:55:57.192	30-Jun-19 10:17:11.504	00:21:14.312

(15) Remedial Measures taken / Lesson Learnt

Enclosure:-

Historian Event report / Trends / DR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Historian Server - LOCAL (Historian Consulting) - Display Events
Displayed Events: Begin: 30/06/2019 09:19:01 End: 30/06/2019 10:54:14
Events: 955
Filter:
Filtered Events:
Date and Time | Variable and Label | Description | Urg. &...
30/06/2019 09:55:55 116 8OCHCO2_EWOO1_XMO3 L2 DISTANCE 21-Z2,Z3,Z4 FLT N-DET -> DETECTED 1 BSig
30/06/2019 09:55:55 118 8OCHCO2_EWOO1_XM10 L2 FAULT LOCATOR(21L) N-OPER -> OPER 1 BSig
30/06/2019 09:55:55 123 8OCHCO2_EYOO1_XM14 L2 MASTER TRIP N-OPER -> OPER 1 BSig
30/06/2019 09:55:55 156 8OAED12_GS1O1_XGO2 132KV L2 CB GS1O1 CLOSED -> N-CLOSED 0 BSig
30/06/2019 09:55:55 161 8OAED12_GS1O1_XGO1 132KV L2 CB GS1O1 N-OPENED -> OPENED 0 BSig
30/06/2019 09:55:55 169 8OCHCO2_EWOO1_XMO3 L2 DISTANCE 21-Z2,Z3,Z4 FLT DETECTED -> N-DET 1 BSig
30/06/2019 09:55:55 171 8OCHCO2_EWOO1_XM10 L2 FAULT LOCATOR(21L) OPER -> N-OPER 1 BSig
30?06?2019 09?55?55 320 8OAED12LINE12_TRIP CHZ SPS DETECTED DETECTED -> N-DET 1 BSig
30?06?2019 09?55?55 440 O1MEUOO_1OF2_OK OUT OF 2 ATLEAST 1 PUMP OK DETECTED -> N-DET 2 BSig
30?06?2019 09?55?55 670 O1PACOO_AA8O1_ZUO1 AA8O1M SIGNALLING VAR. [2] -> [7] 0 MSig
30?06?2019 09?55?55 670 O1PACOO_APOO1_ZUO1 APOO1 SIGNALLING VAR. [2] -> [3] 0 MSig
30?06?2019 09?55?55 670 O1MEUOO_APOO1_ZUO1 PUMP APOO1 SIGNALLING VAR [2] -> [3] 0 MSig
30?06?2019 09?55?55 670 O1MKAOO_APO81_ZUO1 APO81 SIGNALLING VAR. [2] -> [1] 0 MSig
30?06?2019 09?55?55 670 O1MKAOO_APO82_ZUO1 APO82 SIGNALLING VAR. [2] -> [1] 0 MSig
30?06?2019 09?55?55 670 O1MKAOO_APO83_ZUO1 APO83 SIGNALLING VAR. [2] -> [1] 0 MSig
30?06?2019 09?55?56 710 O1MEBOO_APO52_ZUO1 PUMP APO52 SIGNALLING VAR. [1] -> [3] 0 MSig
30/06/2019 09:55:56 783 O1CHAOO_SPS_TRIP U1-SPS TRIP OPERATED N-DET -> DETECTED 1 BSig
30/06/2019 09:55:57 159 O1CHAOO_EYOO2_XMO2 UNIT MASTER TRIP RELAY 2 N-OPER -> OPER 1 BSig
30/06/2019 09:55:57 191 O1MEU1O_R1O4_XGO1 UNIT SPEED < SPEED NO LOAD N-DET -> DETECTED 0 BSig
30/06/2019 09:55:57 191 O1MEU1O_R24_XGO1 LOAD FREQUENCY SETTER AT 0% N-DET -> DETECTED 0 BSig
30/06/2019 09:55:57 192 8OAEDO1_GS1O1_XGO2 132KV U1 CB GS1O1 CLOSED -> N-CLOSED 0 BSig
30/06/2019 09:55:57 198 O1AEDOO_GS1O1_XGO1 U1 BAY CB GS1O1 N-OPENED -> OPENED 0 BSig
30/06/2019 09:55:57 198 8OAEDO1_GS1O1_XGO1 132KV U1 CB GS1O1 N-OPENED -> OPENED 0 BSig
Exit
Login: CHUZACHEN
Time: Local

Historian

Historian Server - LOCAL (Historian Consulting) - Display Samples

Selected Bases: Begin: 30/06/2019 09:41:56 End: 30/06/2019 10:11:

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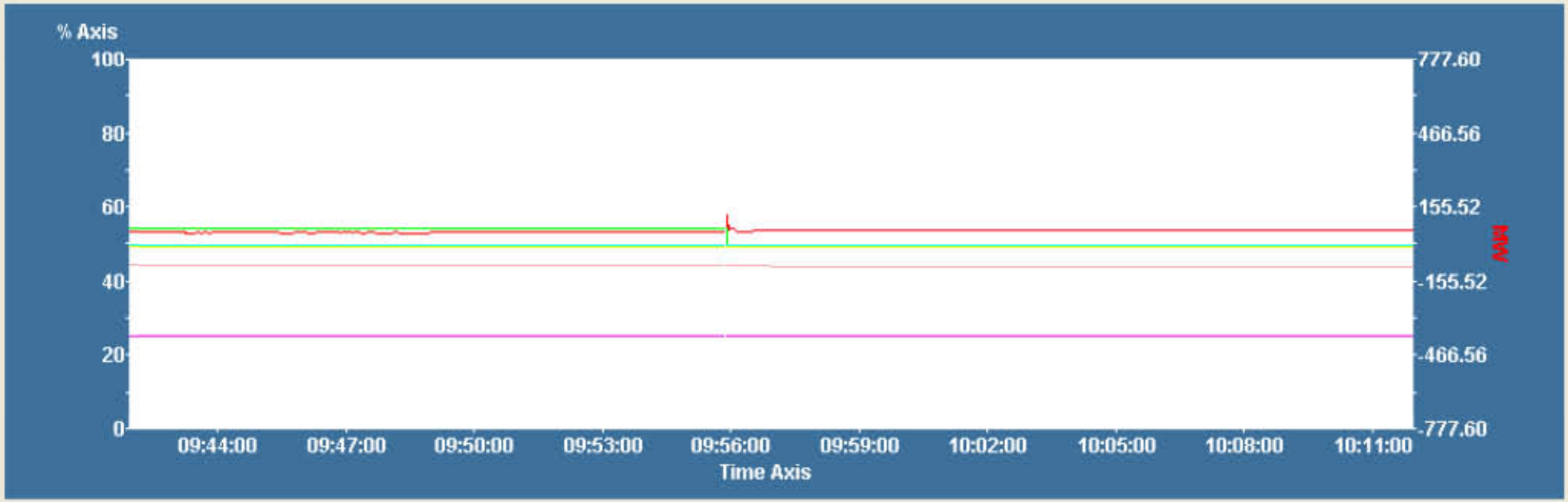

Picked Time: 30/06/2019 09:55:52

100 %

Name	Label	Value	Unit	State	Min.
80CHC01_CE001_XJ07	132KV L1 POWER	49.27	MW	MONI	-777.6
80CHC01_CE001_XJ08L	132KV L1 REACTIVE POWER	-8.15	Mvar	MONI	-777.0
80CHC02_CE001_XJ07	132KV L2 POWER	63.63	MW	MONI	-777.6
80CHC02_CE001_XJ08L	132KV L2 REACTIVE POWER	-3.85	Mvar	MONI	-777.0
80CHB01_CE002_XJ03	132KV BB2 FREQUENCY	50.06	Hz	MONI	45.0
80CHB01_CE002_XJ02	132KV BB2 VOLT PH Y-N	132.36	KV	MONI	0.0

Select Pointer:

Right Button

Zoom

Move

Exit

Login: CHUZACHEN

Time: Local

Historian

Historian Server - LOCAL (Historian Consulting) - Display Samples

Selected Bases: Begin: 30/06/2019 09:41:56 End: 30/06/2019 10:11:

Displayed Samples: Begin: 30/06/2019 09:41:56 End: 30/06/2019 10:11:

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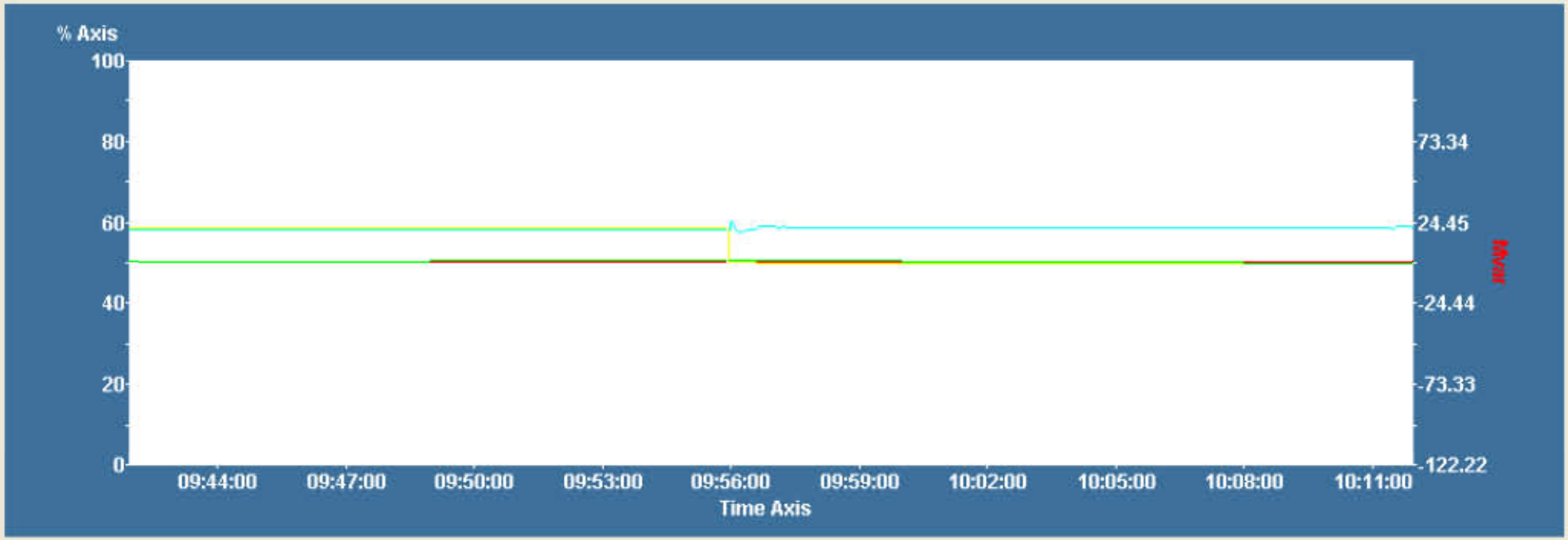


Picked Time: 30/06/2019 09:55:54

100 %

	Name	Label	Value	Unit	State	Min.
◉ ☑	01BAA20CE332_XJ60	GENERATOR REACTIVE POWER	0.83	Mvar	MONI	-122.2
○ ☑	01CHA00_CE004_XJ07	UNIT-1 ACTIVE POWER	58.75	MW	MONI	-345.6
○ ☑	02BAA20CE332_XJ60	GENERATOR REACTIVE POWER	1.79	Mvar	MONI	-122.2
○ ☑	02CHA00_CE004_XJ07	UNIT-2 ACTIVE POWER	56.70	MW	MONI	-345.6
○ ☐						

Select Pointer:

Right Button

◉ Zoom

○ Move

Exit

Login: CHUZACHEN

Time: Local

Events Report
Substation: 132KV Switchyard_CHZ
File: 2019-07-02 10.29.09.evt
Model Number: P442311B3M0350J

Printed on: 02/07/2019 10:35:21

- 5 Trip I2>: OFF
- 6 Trip IN>1: OFF
- 7 Trip IN>2: OFF
- 8 Trip IN>3: OFF
- 9 Trip IN>4: OFF
- 10 Trip Aided DEF: OFF
- 11 Trip V<1: OFF
- 12 Trip V<2: OFF
- 13 Trip V>1: OFF
- 14 Trip V>2: OFF
- 15 Trip Broken Line: OFF
- 16 Trip Z1: OFF
- 17 Trip Z2: OFF
- 18 Trip Z3: ON
- 19 Trip Zp: OFF
- 20 Trip Z4: OFF
- 21 Trip Z2 Aided: OFF
- 22 Trip LOL: OFF
- 23 Trip SOTF TOR: OFF
- 24 Trip Weak Infeed: OFF
- 25 Trip CB Fail 1: OFF
- 26 Trip CB Fail 2: OFF
- 27 Trip ZSeq. Pow.: OFF
- 28 Trip PAP: OFF
- 29 Trip Thermal: OFF
- 30 Unused: OFF
- 31 Trip User: OFF

Time Stamp Sunday 30 June 2019: 09:54:05.516

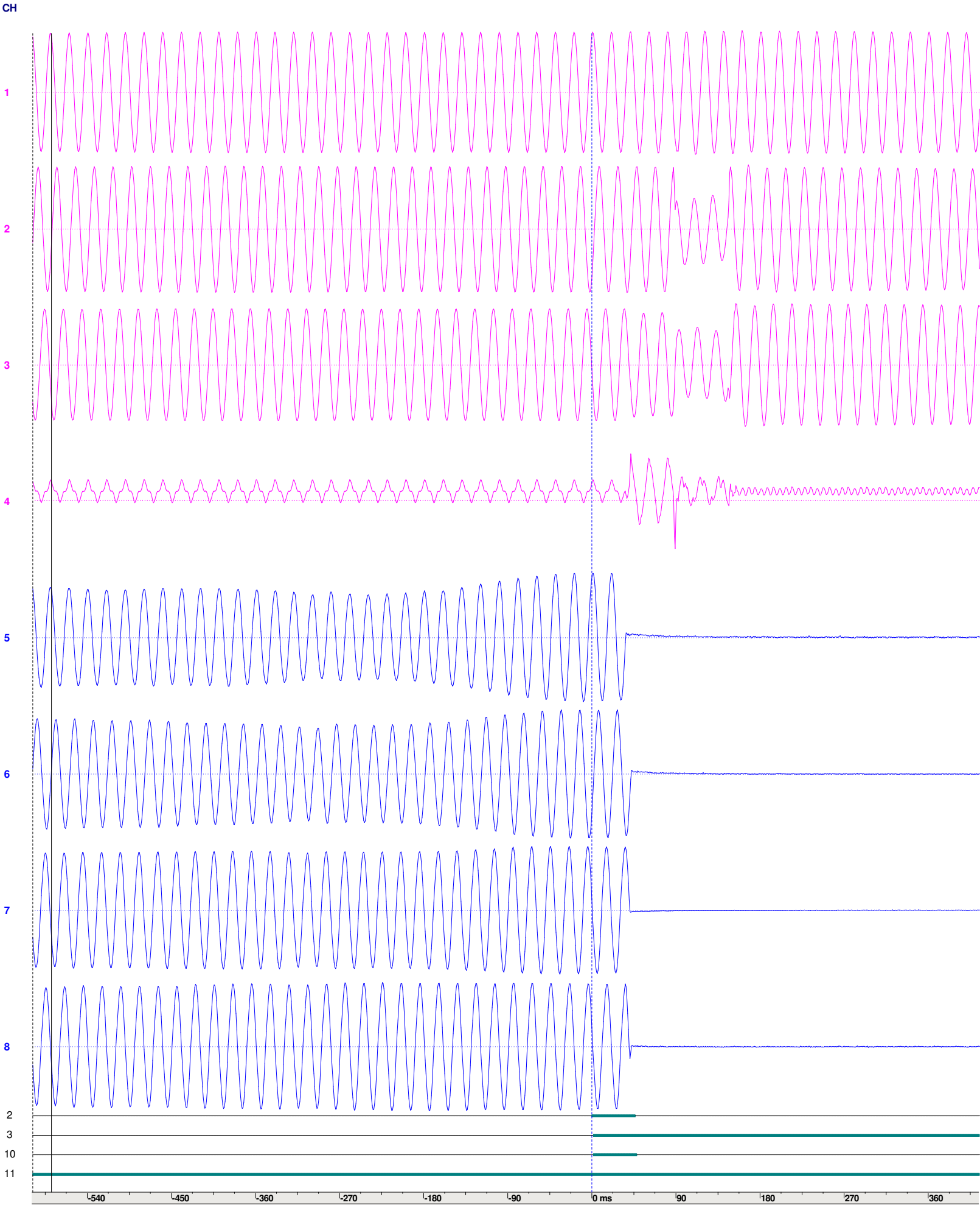
Fault Alarms: 0000000000

- 0 VT Fail Alarm: OFF
- 1 CT Fail Alarm: OFF
- 2 CB Status Alarm: OFF
- 3 AR Lockout Shot>: OFF
- 4 V<1 Alarm: OFF
- 5 V<2 Alarm: OFF
- 6 V>1 Alarm: OFF
- 7 V>2 Alarm: OFF
- 8 COS Alarm: OFF
- 9 CVT Alarm: OFF

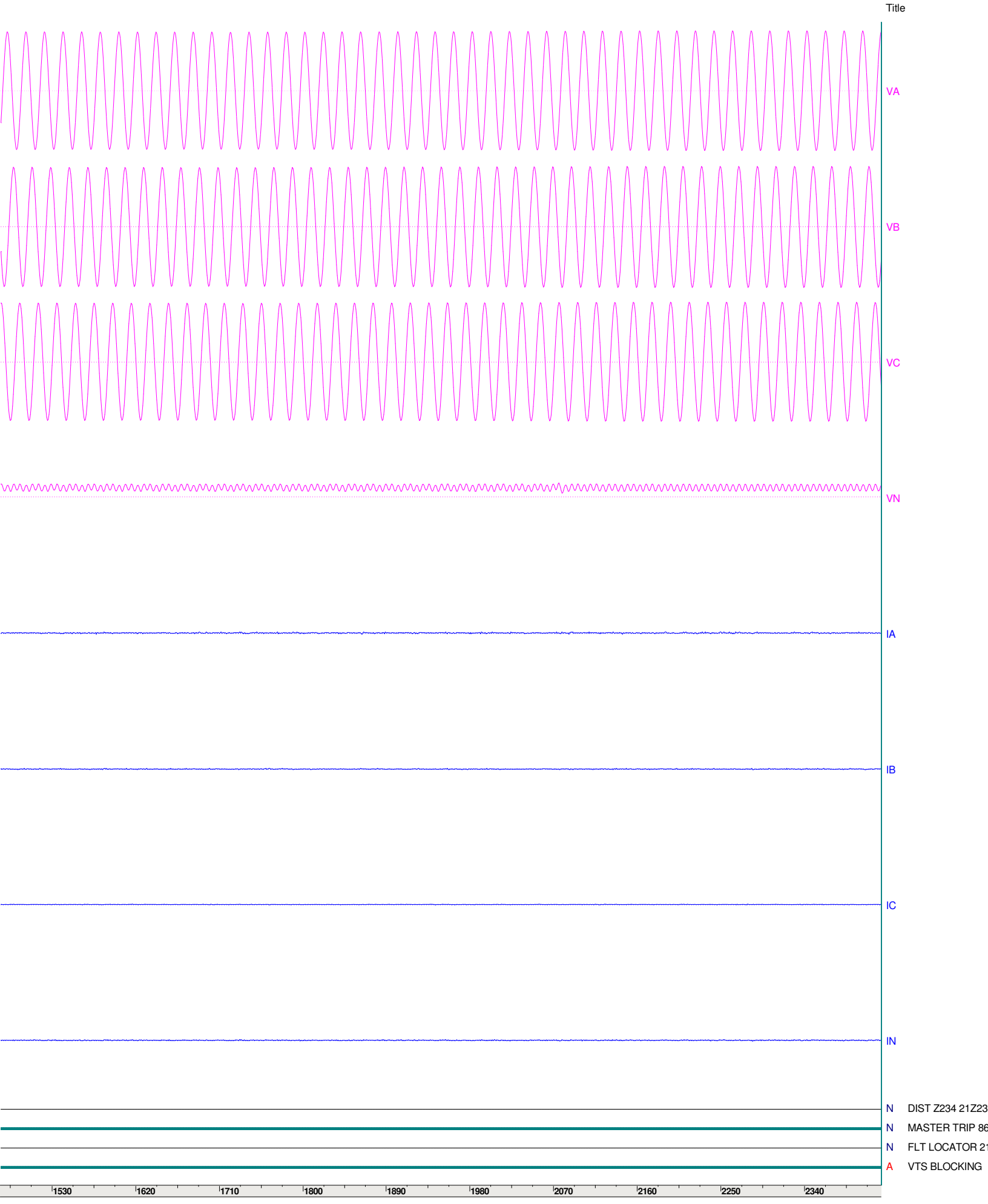
System Frequency: 49.98 Hz
Fault Duration: 1.062 s
Relay Trip Time: 80.03ms
Fault Locatio XY: 44.86km
IA: 270.2 A
IB: 307.6 A
IC: 618.7 A
VAN: 75.33kV
VBN: 78.28kV
VCN: 72.81kV
Fault Resista XY 95.43: Ohm
Fault in Zone Zone: 3

Sunday 30 June 2019 09:54:06.756 : TOR Enable ON

Description: CHZ RANGPO



CHUZACHEN HEP DT: 30/06/2019 09:54:05.923016 Dt: 578796 microsec - 28.94 Cyc 1199.0408 AS: ++

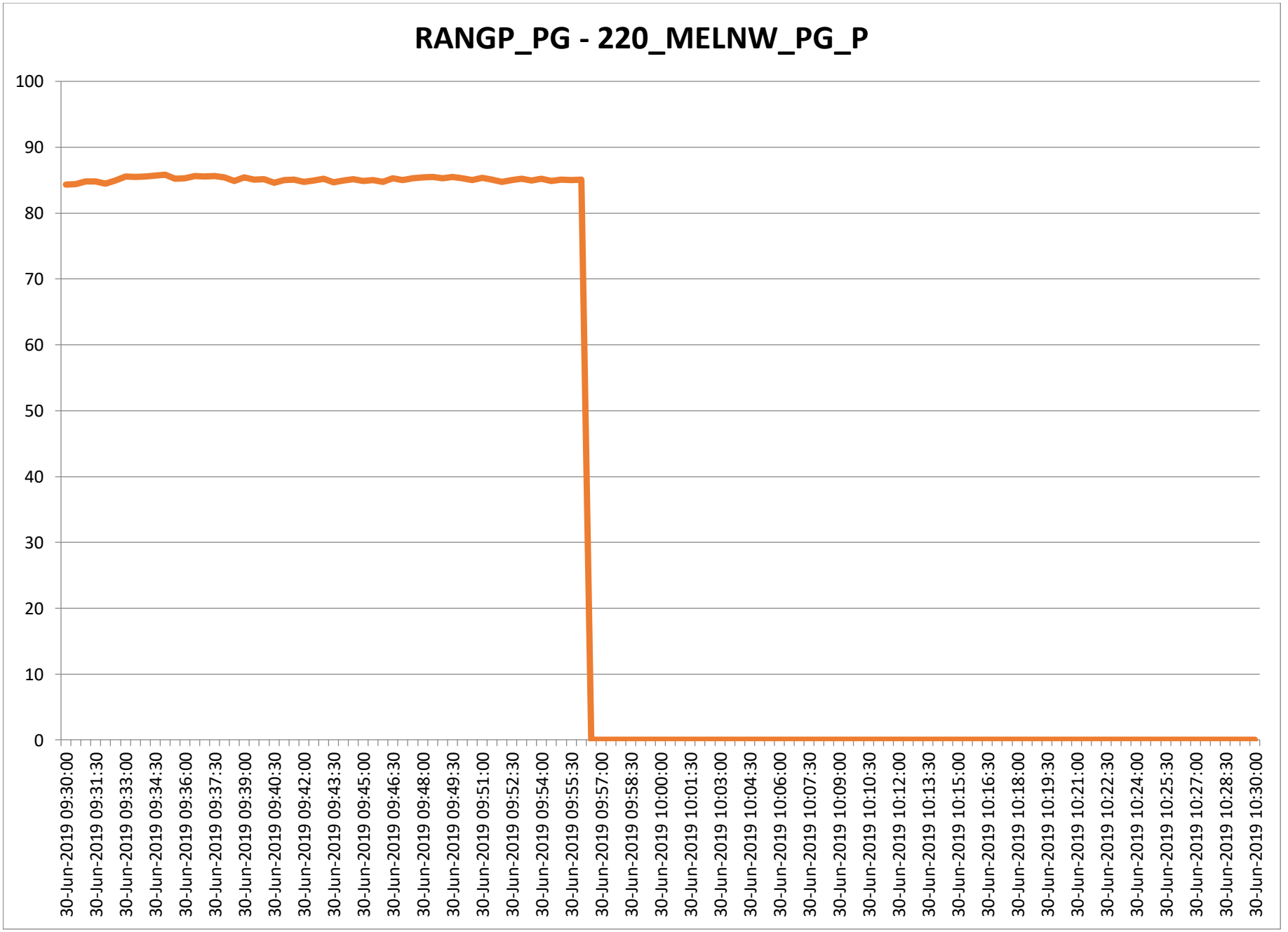

Title
VA
VB
VC
VN
IA
IB
IC
IN
N DIST Z234 21Z23
N MASTER TRIP 86
N FLT LOCATOR 21
A VTS BLOCKING
1530
1620
1710
1800
1890
1980
2070
2160
2250
2340

```
* File Information::
* ------------------
            Station: CHUZACHEN HEP
             Device: 1
          File Name: C:\DOCUMENTS AND SETTINGS\DELL\MY DOCUMENTS\S1 STUDIO\CHZ\132KV SWITCHYARD_CHZ\132KV\LINE-2 (CHZ-RGP W.E.F
          File Size: 492865 Bytes
      Prefault Time: 30/06/2019 09:54:05.903000
         Fault Time: 30/06/2019 09:54:06.502000
          Save Time: 07/02/2019 10:40:20
       Process Time: 07/02/2019 10:41:37
 Start Date && Time: 30/06/2019 09:54:05.903000
   End Date && Time: 30/06/2019 09:54:08.925086
      File Duration: 3  Sec(s) - 22 Mils(s) - 86 Mics(s)
 Sampling Frequency: 1199.040767, 834.000  Microsecond Rate
     Line Frequency: 50.000000

* Maximum/Minimum Analog Summary:
* -------------------------------
>  Max-Inst     Min-Inst      Max-RMS     Min-RMS    One-Bit   Inst-Diff    RMS-Diff   pUnits    Description
 112716.960  -112863.400   101210.961   61367.316    10.4600     146.440   39843.645    V        1-VA
 117141.540  -115091.380    81405.352   17285.141    10.4600    2050.160   64120.211    V        2-VB
 111503.600  -112560.060    91144.289   43603.883    10.4600    1056.460   47540.406    V        3-VC
  33995.000   -52415.060    23082.982    2155.575    10.4600   18420.060   20927.408    V        4-VN
    273.504     -277.648      207.200       1.126     2.0720       4.144     206.074    A        5-IA
    358.456     -358.456      250.654       1.040     2.0720       0.000     249.615    A        6-IB
    975.912     -982.128      744.852       1.279     2.0720       6.216     743.572    A        7-IC
    640.248     -642.320      477.367       1.787     2.0720       2.072     475.580    A        8-IN

* Events/Sensors Activity Summary:
* ---------------------------------
>Fst  Lst  Fst-Change       Lst-Change      Changes    Description
  N    N    09:54:06.501812  09:54:06.548516  002        2-DIST Z234 21Z234
  N    N    09:54:06.503480  xx:xx:xx.xxxxxx  001        3-MASTER TRIP 86L
  N    N    09:54:06.503480  09:54:06.550184  002       10-FLT LOCATOR 21L
  A    A    xx:xx:xx.xxxxxx  xx:xx:xx.xxxxxx  000       11-VTS BLOCKING
```

Annexure-III: 220 kV Rangpo-New Melli flow



POWERGRID CORPORATION OF INDIA LTD
2000 MW HVDC Station Talcher
Odisha Projects

BRIEF REPORT ON TRIPPING OF POLE-1 & POLE 2 OF TALCHER-KOLAR HVDC LINK ON 05.06.2019 DUE TO PREVAILING HEAVY WIND CONDITIONS.

Date: 06.06.2019

HVDC Station, Talcher

BRIEF REPORT ON TRIPPING OF POLE-1 & POLE-2 OF TALCHER-KOLAR HVDC LINK ON 05.06.2019.

BACKGROUND:

Pole-1 of Talcher-Kolar HVDC Transmission system was Switched Off by ESOF due to heavy sparking being observed due to online opening of isolator on dtd 05.06.2019 at 18:53 Hrs on to facilitate quenching of heavy spark. Before tripping, the power flow through the link was 1774 MW and after tripping of Pole-1, Pole-2 came to MR Mode with Power flow through the Link of 1000MW with loss of power of 774MW.
Pole-2 of Talcher-Kolar HVDC Transmission System was blocked due to loss of incoming voltage due to tripping of all the 4 Feeders of NTPC-HVDC I,II,III & IV on dtd. 05.06.2019 at 19:01Hrs at NTPC end.

PRECONDITIONS:

Date of event: 05.06.2019
Time of event: 18:53 hrs Pole-1 & 19:01 Hrs Pole-2.
Pre-Fault Power: 1774 MW at Talcher.

Description of event:

- On dated 05.06.2019 at 18:53 Hrs, Pole-1 was Switched off to facilitate quenching of heavy spark observed due to online opening of main bay isolator pertaining to Converter Transformer due to heavy wind & thunderstorm.
- Again Pole-2 was blocked at 19:01 Hrs on dtd. 05.06.2019 due to loss of AC Voltages in response to tripping of all HVDC-NTPC Feeders (I,II,III & IV) & consequential damage of 10C03A-Q1 Isolator due to heavy wind & thunderstorm.
- The SER shows the followings:
  1) 18:53:23:370 Emergency Switch Off Pole 1.
  2) 18:53:23:422 Pole 1 Summary Trip.
  3) 18:53:23:459 Inter Trip Pole-1 Blocked.
  4) 19:01:45:035 NTPC-HVDC Feeder 3 Circuit Breaker Open.
  5) 19:01:45:454 NTPC-HVDC Feeder 4 Circuit Breaker Open.
  6) 19:01:45:535 NTPC-HVDC Feeder 2 Circuit Breaker Open.
  7) 19:01:45:538 NTPC-HVDC Feeder 1 Circuit Breaker Open.
  8) 19:01:46:175 Pole 2 Summary Trip.
  9) 19:01:46:175 Emergency Switch Off by Pole Control.
  10)19:01:46:185 Inter Trip Pole-2 Blocked

- As heavy wind & thunderstorm was lashing outside Switchyard & consequent to heavy spark being observed in Pole 1 main bay isolator due to online opening of the said isolator. Upon Inspection it was found that the male & female finger contact of the isolator was burnt due to repeated sparking.
- Upon inspection in Pole 2 side Switchyard, it was observed that 10C03A-Q1 Isolator R-Phase Collapsed with consequential damage to associated equipment along with tripping of all 4 NTPC-HVDC Feeders from NTPC end.

Action taken:

- Pole-2 was made ready for charging after isolation of damaged isolator of 10C03A-Q1 & Charging of NTPC-HVDC Feeders I, II & III. NTPC-HVDC Feeder-IV & Sectionalizer breaker connecting Bus 1 & 3 was isolated for revival of 10C03A-Q1 Isolator. Sectionalizer Breaker connecting Bus 2 & 4 was under shutdown for retrofitting work as per approval of SRLDC Code#17 w.e.f 01.06.2019.

- Pole—1 was made ready for charging after replacement of burnt male & female finger contacts of the main bay isolator.

- Pole-2 was Blocked at 21:53Hrs on dtd. 05.06.2019 through NTPC-HVDC Feeder 3 only while Pole-1 was blocked at 00:10 Hrs on dtd. 06.06.2019 through NTPC-HVDC Feeders I & II.

Conclusion:

Pole 2 was deblocked at 22:08Hrs on dtd. 05.06.2019 while Pole 1 was deblocked at 00:37Hrs on dtd.06.06.2019.

Submitted please.

(R.R Dungdung)
Sr. DGM Kaniha

POWER GRID CORPORATION OF INDIA, LTD
2000-MW KANIHA HVDC TERMINAL STATION

DETAILED TRIPPING REPORT OF HVDC POLE-1 & POLE-2 ON 05.06.2019

INTRODUCTION:

In continuation to the earlier report of tripping on Pole-1 & Pole-2 on 05.06.2019 at 18:53Hrs & 19:01Hr, respectively, it is further elaborated as under,

A) Pole-1 Trip:

Pre-conditions:
Power flow: 900-MW
Protection in service: ALL
Bays in service: ALL except 10C04-Q02 for CB retrofitting works as approved in 157th OCC of ERPC
Environment conditions: Heavy wind, rain and lightening.

Events during conditions:

- Heavy wind, rain and thunderstorm started at Kaniha around 18:45Hrs. At around 18:50Hrs, intermittent sparking was observed in 10C05A-Q9 convertor isolator contacts. Due to heavy wind pressure, the isolator arms of B-phase were found making and breaking. Intermittent heavy sparks were observed.
- To avoid further damage to the isolator and other connected equipments, Pole-1 was switched OFF on emergency. Pole-2 came to MR mode with power flow of 1000-MW.

B) Pole-2 Trip:

Pre-conditions:
Power flow: 1000-MW in MR mode. Pole-1 switched OFF.
Protection in service: ALL
Bays in service: ALL except 10C05A & 10C05B (Main and Tie Bay of Pole-1) and 10C04-Q02
Environment conditions: Heavy wind, rain and lightening.

Events during conditions:

- Pole-2 tripped at 19:01Hrs on loss of incoming Voltage from NTPC, due to tripping of all the 4-Nos of NTPC-HVDC Feeders (I, II, III & IV) at NTPC end. With this the DC power came to zero.

Observations:

- After the thunderstorm subsided at around 19:20Hrs, the switchyard at POWERGRID end was inspected. It was found that R-phase of 10C03A-Q1 bus isolator had failed. Few photographs attached.
- No trace of any sparking/pitting in the isolator contacts was observed. The isolator status in the station HMI was in closed conditions. No abnormality/spark in the above isolator could be reported by any of the security personnel in the main gate, which was around 50-meters near to the 10C03 Bay.
- There in no change of state of the isolator in the station SER. The associated breaker 10C03A-Q0 breaker was also in closed position.
- It is to mention that the Main and redundant bus-bar protection hasn't picked up at HVDC end, indicating no generation of fault current at HVDC end.

- NTPC was asked to provide the details of tripping of all the 04-feeders. They reported activation of OPEN jumper protection at 19:01Hrs and tripping of Unit No. 04.
- SER records noted,
  1) 19:01:45:035 NTPC-HVDC Feeder 3 Circuit Breaker Open.
  2) 19:01:45:275 100-HZ protection stage-1 alarm
  3) 19:01:45:454 NTPC-HVDC Feeder 4 Circuit Breaker Open.
  4) 19:01:45:535 NTPC-HVDC Feeder 2 Circuit Breaker Open.
  5) 19:01:45:538 NTPC-HVDC Feeder 1 Circuit Breaker Open.
  6) 19:01:46:175 Pole 2 Summary Trip.
  7) 19:01:46:175 Emergency Switch Off by Pole Control.
  8) 19:01:46:185 Inter Trip Pole-2 Blocked

Action taken:

- 10C03A bay was isolated by opening of CB and the isolators.
- Subsequently, NTPC feeder-01, 02 & 03 were charged between 21:39Hrs to 21:41Hrs and the Pole-2 was taken into service at 22:08Hrs.
- Further, the burnt contacts of 10C05A-Q9 (Pole-1 convertor isolator) were replaced, isolators aligned, CRM measurements carried out and Pole-1 was taken into service at 00:37Hrs on 06.06.2019
- On 06.06.2019, the damaged isolator of 10C03A-Q1 was replaced from spare and the bay was normalized at 21:43Hrs. Subsequently, feeder-4 was charged from NTPC at 22:08Hrs.

Analysis:

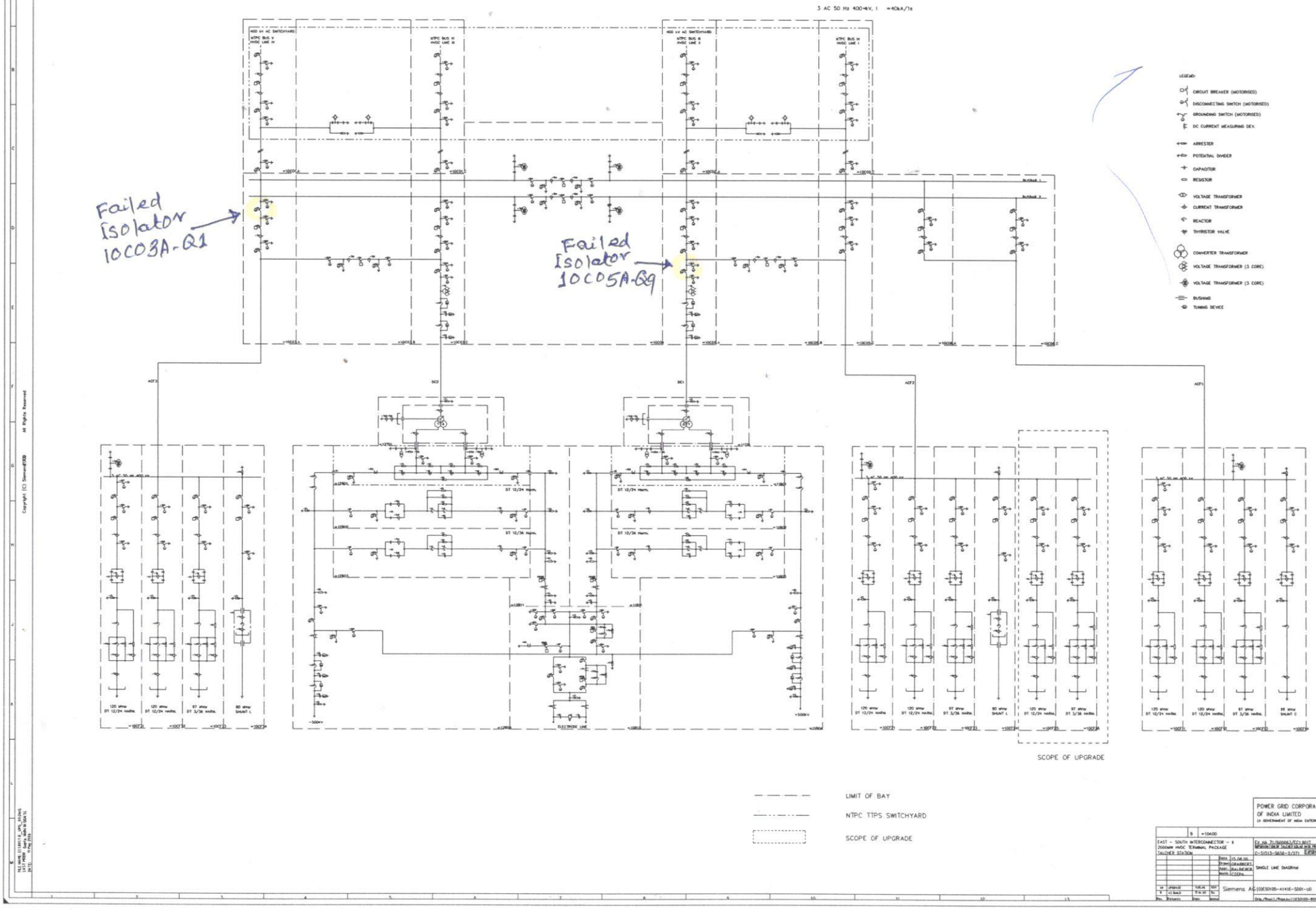
- From the SER records of both the HVDC and NTPC end, the Pole-2 has tripped on loss of incoming voltage from NTPC.
- The absence of any sparking in the failed isolator 10C03A-Q1 indicates that the failure has occurred after current has become zero subsequent to the tripping of all 04-Nos NTPC feeders.
- The activation of 100Hz protection stage-1 further indicates voltage unbalance in the 400kV side next to the HVDC station. This substantiates the fault in NTPC end.
- On the basis of information from NTPC, it is also learnt that 02-Nos of BPI pertaining to 28th Bay at NTPC end had failed with earth fault causing operation of TEED-1 & TEED-2 protection and thereby tripping of Generator Unit-04 (Copy of NTPC SLD attached)
- It is presumed that fault has occurred initially in NTPC end, which subsequently tripped all the 04-Nos feeders and Unit-04. Further detailed analysis of the disturbance can be done from the PMU plots available with RLDC

Submitted, please

Encl:

1) SLD of HVDC indicating the failed isolator
2) SLD of NTPC stage-2, indicating the location of failed BPI
3) Photographs of 10C05A-Q9 isolator
4) Photographs of 10C03A-Q1 failed isolator

Rabi Roshan
Sr. DGM, HVDC


3 AC 50 Hz 400 kV, 1 =40kA/1s
Failed Isolator 10C03A-Q1
Failed Isolator 10C05A-Q9
LEGEND:
CIRCUIT BREAKER (MOTORISED)
DISCONNECTING SWITCH (MOTORISED)
GROUNDING SWITCH (MOTORISED)
DC CURRENT MEASURING DEV.
ARRESTER
POTENTIAL DIVIDER
CAPACITOR
RESISTOR
VOLTAGE TRANSFORMER
CURRENT TRANSFORMER
REACTOR
THYRISTOR VALVE
CONVERTER TRANSFORMER
VOLTAGE TRANSFORMER (3 CORE)
VOLTAGE TRANSFORMER (3 CORE)
BUSHING
TUNING DEVICE
SCOPE OF UPGRADE
LIMIT OF BAY
NTPC TTPS SWITCHYARD
SCOPE OF UPGRADE
POWER GRID CORPORATION OF INDIA LIMITED
EAST - SOUTH INTERCONNECTOR - II
2000MW HVDC TERMINAL PACKAGE
TALCHER STATION
SINGLE LINE DIAGRAM
Siemens AG

Annexure-B8

List of Intra Regional line tripping in the month of June 2019 where violation of protection standard has been observed

LINE NAME	TRIP DATE	TRIP TIME	RESTORATION TIME	RESTORATION DATE	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	DR From End	DR To End	Remarks
Miscellaneous: High Fault clearence time (or) Tripping on DT (or) No Fault observed in PMU											
400KV JAMSHEDPUR-ANDAL-II	04-06-2019	18:59	04-06-2019	19:22	No Tripping	DT RECEIVED	DT RECEIPT AT ANDAL	--	NO	NO	No Fault observed in PMU
400KV JAMSHEDPUR-ANDAL-II	05-06-2019	5:04	05-06-2019	5:45	No Tripping	DT RECEIVED	DT RECEIPT AT ANDAL	--	NO	NO	No Fault observed in PMU
400KV MENDHASAL-PANDIABILI-I	05-06-2019	21:05	05-06-2019	21:13	Tripped from Mendhasal end	No Tripping	Tripped from Mendhasal end	--	NO	NO	
220KV DARBHANGA (DMTCL)-DARBHANGA-I	07-06-2019	13:25	07-06-2019	14:00	DT RECEIVED		DT RECEIVED AT DMTCL	--	NO	NO	No Fault observed in PMU
400KV JHARSUGUDA-OPGC-DC	07-06-2019	15:42			R-N FAULT, F/C=2.5KA, 55.3 KM		R-N Fault	1000 msec	NO	NO	
765KV JHARSUGUDA-Raipur PS (Durg)-1	07-06-2019	15:42			R-N FAULT, F/C=2.5KA, 55.3 KM		R-N Fault	1000 msec	NO	NO	
400KV JAMSHEDPUR-ANDAL-II	10-06-2019	11:55	10-06-2019	12:16		DT Received	DT Received at Andal	--	NO	NO	No Fault observed in PMU
400KV DURGAPUR-SAGARDIGHI-I	13-06-2019	16:11	13-06-2019	16:40	DT Received		DT receivd at dgp	--	NO	NO	
400KV KOLAGHAT-KHARAGPUR-II	14-06-2019	19:24	14-06-2019	19:34	Received carrier trip	No fault at KGP end.	Carrier Received at Kolaghat	--	NO	NO	
220KV BEGUSARAI-NEW PURNEA-II	21-06-2019	17:35	21-06-2019	17:54	Master trip	No Tripping	Master trip at Begusarai end	--	NO	NO	No Fault observed in PMU
400KV BIHARSARIFF(PG)-PUSAULI-II	21-06-2019	23:03	22-06-2019	0:39	O/V at B'Srf	DT received	O/V at B'Srf	--	YES	YES	No O/V signal in DR channel
400KV KODERMA-BIHARSARIFF(PG)-I	27-06-2019	7:35	27-06-2019	9:19		DT RECEIVED	DT RECEIVED AT BIHARSHARIFF	--	YES	NO	
220KV BEGUSARAI-NEW PURNEA-II	30-06-2019	13:00	30-06-2019	13:19	Tripped only at Begusarai	No Tripping	Tripped only at Begusarai	--	NO	NO	
Autoreclose related issues											
220KV MADHEPURA-NEW PURNEA-I	02-06-2019	3:47	02-06-2019	4:08	B-N : IB : 1.05 kA , 89.2 km	B-N , 1.8 km, Ib = 15.2 kA	B-N Fault	< 100 msec	YES	YES	
400KV KhSTPP-LAKHISARAI-I	02-06-2019	4:27	02-06-2019	05:26		Z-2, B-N, 2.1 KA, 138.4 KM	B-N Fault	< 100 msec	YES	YES	
220KV DALKHOLA-PURNEA-II	02-06-2019	4:28			A/R SUCCESSFUL, B-N, 10.86 KM, 6.213 KA		B-N Fault	< 100 msec	YES	NO	
400KV MALDA(PG)-NEW PURNEA-I	02-06-2019	5:40			A/R SUCCESSFUL, Z-I, Y-N, 4.136 KA, 61.58 KM		Y-N Fault		NO	NO	
400KV DURGAPUR-SAGARDIGHI-I	05-06-2019	9:37	05-06-2019	10:06	Z1, Y-N, 16.54 kA, 29.9km		Y-N Fault	< 100 msec	YES	NO	
400KV MEERAMUNDALI-JSPL-I	05-06-2019	19:28	06-06-2019	6:35	R-N17.5 KA,3.5 KM Z1		R-N Fault		YES	NO	
220KV BUDHIPADAR-KORBA-II	07-06-2019	16:43	07-06-2019	17:44	B-N FAULT		B-N Fault	< 100 msec	YES	NO	
220KV BUDHIPADAR-RAIGARH-SC	07-06-2019	16:43	07-06-2019	17:57	B-N FAULT		B-N Fault	< 100 msec	NO	NO	
220KV NEW PURNEA-MADHEPURA-II	11-06-2019	0:30	11-06-2019	0:47	R_N, 3 kA, 45.8 KM	R_N, 49.1 KM, 2.01 kA	R-N Fault		YES	YES	
400KV BINAGURI-ALIPURDUAR-II	11-06-2019	3:20	11-06-2019	3:46	R-N , 102.9 KM, F/C=3.47KA		R-N Fault	< 100 msec	NO	NO	
220KV TTPS-TSTPP-SC	12-06-2019	13:31	12-06-2019	19:01		Z-1, R-Ph, 19.8Km	R-N Fault		NO	NO	
400KV RENGALI-KEONJHOR-SC	12-06-2019	15:56	12-06-2019	16:25	R-N ,98.96 KM ,3.703 KA	A/R SUCCESFUL	R-N Fault	< 100 msec	NO	NO	
220KV MAITHON-DHANBAD-II	12-06-2019	19:14	12-06-2019	20:34	Y-N, 21.2 km, 7.07 ka	Y ph Z1, dist 24.49 km, cur 5.362 KA AR operated	Y-N Fault		NO	NO	
220KV CHANDIL-RANCHI-sc	12-06-2019	19:16				A/R Successful, Z-2 ,IR=339.1 A,IY=122.2 A,IB=1.78 4 KA	B-N Fault	< 100 msec	NO	YES	
400KV MAITHON-MEJIA-III	12-06-2019	20:05	12-06-2019	21:26	A/R SUYCCESSFUL, B-N 8.004 KA 30.9 KM	TRIPPED FROM MEJIA	B-N Fault	< 100 msec	YES	YES	
400KV ARAMBAGH-BAKRESWAR-SC	12-06-2019	20:46	13-06-2019	15:34	Cph-N, Z1, 104km, 3.89kA	Cph-N, Z1, 32.7km, 5.39kA	B-N Fault	< 100 msec	YES	YES	
400KV JAMSHEDPUR-ANDAL-I	12-06-2019	21:10	12-06-2019	21:46	A/R Successful, YN, 68.1 KM, 4.06 KA	Z1, BN, 98.04 KM, 3.792 KA	Y-N Fault	< 100 msec	YES	NO	
400KV BOLANGIR-ANGUL-SC	13-06-2019	1:54	13-06-2019	14:11	1.87 KA FD 102 KM B-N	B-N FC 4.3 KA LOC 96 KM	B-N Fault	< 100 msec	NO	NO	
220KV JAMSHEDPUR-JINDAL-SC	15-06-2019	13:45	15-06-2019	14:12	Z-1, B-N,F.D= 37.631 Km		B-N Fault		NO	NO	
220KV JODA-RAMCHANDRAPUR-SC	15-06-2019	14:49	15-06-2019	15:31	F.L-L2-n F.D-119.91Km IL2-1.229Ka	B PH, IB= 2.843 KA, Z-1, DISTANCE=55.60 KM,)	B-N Fault	< 100 msec	YES	NO	
400KV TSTPP-RENGALI-I	15-06-2019	20:28	15-06-2019	23:11	R-N,13 KA,14.49 KM		R-N Fault	< 100 msec	NO	NO	
220KV BUDHIPADAR-KORBA-II	16-06-2019	18:37	16-06-2019	21:06	R-N Dist 100 meter FC 24.51 KA		R-N Fault	< 100 msec	YES	NO	
220KV MADHEPURA-NEW PURNEA-I	17-06-2019	11:35	17-06-2019	12:16	B-N,1.8 KA,60KM		B-N Fault		NO	NO	
220KV BARIPADA-BALASORE-II	19-06-2019	17:42	19-06-2019	19:09	b-n , f/d-27km , f/c-4ka		B-N Fault		NO	NO	
220KV BUDHIPADAR-KORBA-II	19-06-2019	23:10	19-06-2019	23:53	R_N, 83.5 KM, 1.74 kA	R_N, 72.54 KM, 2.41 kA	R-N Fault		YES	NO	
220KV CHANDIL-RANCHI-sc	20-06-2019	14:55	20-06-2019	16:00	Z-1, R-Ph, 7.041KM, 7.02KA		R-N Fault	350 msec	NO	YES	
220KV STPS(WBSEB)-CHANDIL-SC	20-06-2019	14:55	20-06-2019	15:23		z-2,120.2 km,ir=1.074 kA R-N	R-N Fault	350 msec	NO	NO	

LINE NAME	TRIP DATE	TRIP TIME	RESTORATION TIME	RESTORATION DATE	Relay Indication LOCAL END	Relay Indication REMOTE END	Reason	Fault Clearance time in msec	DR From End	DR To End	Remarks
400KV KHARAGPUR-CHAIBASA-I	20-06-2019	19:03	20-06-2019	19:07	A/R succesful R-N Z1,18.42 KM		R-N Fault	< 100 msec	YES	YES	
400KV MENDHASAL-PANDIABILI-I	20-06-2019	21:59	20-06-2019	23:30		RN, 4.5 KA, 15.8 KM	R-N Fault	< 100 msec	NO	NO	
400KV DARBHANGA (DMTCL)-KISHANGANJ(PG)-II	22-06-2019	17:07	22-06-2019	17:36	Y-N FAULT,F/C=8.7KA, 12.8 KM		Y-N Fault	< 100 msec	YES	YES	
220KV BEGUSARAI-NEW PURNEA-II	24-06-2019	12:13				B-N, 129.8Km, 1.37KA	B-N Fault		NO	NO	
400KV DARBHANGA (DMTCL)-MUZAFFARPUR-I	25-06-2019	10:59	25-06-2019	11:33	Z1, 53.76Km, 2.54KA, B-N	B-N, 6.1KA, 31.47KM	B-N Fault	< 100 msec	YES	YES	
220KV MADHEPURA-NEW PURNEA-I	25-06-2019	11:25	25-06-2019	12:11		B-N FAULT,Z-1,97.4 KM, 2KA	B-N Fault		NO	NO	
400KV DARBHANGA (DMTCL)-MUZAFFARPUR-II	25-06-2019	11:33	25-06-2019	17:32	B-N FAULT		B-N Fault		NO	NO	
220KV BEGUSARAI-NEW PURNEA-I	26-06-2019	13:13	27-06-2019	19:53		Y-N, 1.4KA, 131kM	Y-N Fault		NO	NO	
220KV DALKHOLA-MALDA(PG)-II	26-06-2019	14:21	26-06-2019	14:45	R-N, 0.5kA, 94 km		R-N Fault		NO	NO	
765KV ANGUL-JHARSUGUDA-III	28-06-2019	0:34	28-06-2019	12:57	B-N, 4.379KA, 157KM		B-N Fault	< 100 msec	NO	NO	
400KV MAITHON-GAYA-I	28-06-2019	22:34	28-06-2019	23:04	Y-N,FD 254.5KM,FC1.94 KA	Y-N,63.09KM,4.64KA	Y-N Fault	< 100 msec	NO	YES	
400KV RANCHI-RAGHUNATHPUR-III	29-06-2019	0:39	29-06-2019	2:01	A/R SUCESSFUL ,B-N,152.8 KM,3.6 KA		B-N Fault	< 100 msec	YES	NO	
400KV MAITHON-RAGHUNATHPUR-SC	29-06-2019	1:41	29-06-2019	1:58	A/R SUCCESSFUL ,R-N,8.6KA,FD 36 KM		R-N Fault	< 100 msec	NO	YES	
220KV BEGUSARAI-NEW PURNEA-II	29-06-2019	12:11	29-06-2019	17:37		B-N, 1.38kA, 128.4 km	B-N Fault		NO	NO	
220KV DEHRI -GAYA-II	29-06-2019	16:10	29-06-2019	16:25	Zone-1, B-N	A/R SUCCESSFUL, B-N, 48.6KM, 2.5KA	B-N Fault		YES	YES	
220KV MUZAFFARPUR(PG)-MUZAFFARPUR(BSEB)-	30-06-2019	5:16	30-06-2019	5:49	RN, 23.45 KM,6.66 KA		R-N Fault	< 100 msec	YES	NO	
220KV MUZAFFARPUR(PG)-DHALKEBAR-II	30-06-2019	10:42	30-06-2019	11:34	RN, Z1, 13.9KM , 9.765KA		R-N Fault	< 100 msec	YES	NO	
220KV DEHRI -GAYA-II	30-06-2019	12:49	30-06-2019	12:58	R-N, Z1, 53km	A/R SUCCESSFUL,R-N.,33.656 KM,4.657 KA	R-N Fault	< 100 msec	YES	YES	
220KV TSTPP-MEERAMUNDALI-II	30-06-2019	14:56	30-06-2019	19:34	Z1, R-N, 4.758KA, 27.59Km	Z1, R-N, 10.8Km, 11.8KA	R-N Fault		NO	YES	

ANNEXURE-C6

Sl No.	Name of the incidence	PCC Recommendation	Latest status
80th PCC Meeting			
1.	Disturbance at 400 kV OPGC S/s on 22.05.2019 at 19:57 Hrs.	PCC advised OPGC to submit the relevant DR, ELs to analyze the event.	
2.	Disturbance at 400 kV Vedanta S/s on 16.05.2019 at 19:10 Hrs.	PCC opined that instantaneous time setting is not desirable for backup protection, if primary distance protection is available for a transmission line and advised to review the settings.	
3.	Disturbance at 400 kV Darabhanga S/s on 29.05.2019 at 21: 44 Hrs.	After detailed deliberation, PCC advised KPTL to submit all the DR & ELs to further analyze the operation of busbar protection at Darbhanga end. PCC also opined that the shunt reactors shall be tripped whenever the corresponding line trips so that the overcompensation of the line can be reduced thus the ferroresonance effect can be avoided.	
4.	Repeated Tripping of 132 kV KhSTPP-Lalmatia S/C	PCC advised JUSNL to check the sag of the line at relevant location during the daytime.	
5.	Spurious Tripping of 400 kV Rangpo-Kishanganj circuit from Kishanganj end on 26.04.2019 and 15.05.2019	PCC advised Powergrid to check the reason for tripping of 315 MVA ICT during the disturbance on 15.05.2019.	
6.	Protection Coordination issue in 400 kV Kishanganj-Darbhanga D/C line along with Line Reactor at Darbhanga end	PCC advised KPTL to analyze and find out the reason for tripping of 400 kV Kishanganj-Darbhanga D/C line in zone-3 protection for a fault in same line and simultaneous tripping of Line reactor at Darbhanga end. PCC also advised KPTL to submit the relevant relay settings to ERLDC/ERPC.	
79th PCC Meeting			

7.	Disturbance at Sikkim Hydro Complex on 12.04.19 at 23:55 hrs.	PCC advised Powergrid to configure the DR settings properly at Kishanganj end as per the DR standard finalized in PCC meeting. PCC also advised to send all the relay settings at Kishanganj end to ERPC for updating of the settings in PDMS database. PCC observed the CT rating at Kishanganj for 400 kV Kishanganj-Rangpo line is quite low for a quad moose circuit and advised Powergrid to install a CT of higher rating. In 80th PCC Powergrid was advised to submit a report on actions taken on 79th PCC observations.	
8.	Total Power Failure at 220 kV Tenughat S/s on 17.04.19 at 10:16 Hrs.	PCC advised BSPTCL to coordinate with Powergrid audit team & review their settings at Biharsharif S/s. PCC observed that zone settings at TVNL need to be reviewed and advised TVNL to submit the line & relay details to ERPC at the earliest. ERPC and PRDC will study the settings.	TVNL vide mail dated 12.06.19 submitted the relay settings to ERPC & PRDC.
9.	Total Power failure at TLDP-III S/s on 27.10.18 at 10:24 hrs.	PCC advised NHPC to change the DEF settings from DMT to IDMT keeping the settings at 40A and advised to increase the time delay of DEF settings in order to have a proper protection coordination between Line and GTs.	NHPC vide mail informed that they have changed the DEF settings to 40 A with NI curve and TMS of 0.4.
76th PCC Meeting			
10.	Disturbance at 220 kV Katapalli S/s on 07.01.2019 at 15:40 hrs.	PCC advised OPTCL to send the details of Hindalco islanding scheme to analyze the reasons behind failure of the islanding scheme during this disturbance	OPTCL informed that they have received the scheme from Hindalco.

11.	Disturbance at 400kV Gaya(PG), 220kV Gaya and Bodhgaya on 05-01-19 at 11:20 hrs	PCC advised BSPTCL to review the Khijasarai end relay settings to avoid unwanted tripping at Khijasarai end and submit the relay settings to ERPC for inclusion in PDMS.	BSPTCL informed that they will send the relay settings at the earliest.
12.	Mutual effect 400kV Andal-Jamshedpur-II on 400 kV Adhunik-Jamshedpur D/C	PCC advised Adhunik and POWERGRID to analyze the event in detail to find the root cause in consultation with the ERPC and ERLDC. PCC also advised Adhunik to submit the details of PSS tuning to ERLDC/ERPC.	
72nd PCC Meeting			
13.	HVDC TFR triggering standardization and reporting requirements.	PCC advised POWERGRID to submit TFR triggering criteria and TFR signal list for all HVDC station of Eastern region to ERLDC	It was informed that required information was received from Talcher HVDC station.
71st PCC Meeting			
14.	Disturbance at 220/132 kV Motipur(BSPTCL) S/s on 15.08.18 at 13:00 hrs.	PCC advised BSPTCL to check the disturbance recorders of all the lines in 220 kV Motipur S/s and communicate the findings to ERPC/ERLDC at the earliest.	BSPTCL informed that OEM is yet to visit the station.
15.	Disturbance at 400 kV Farakka S/s on 19.08.18 at 15:26 hrs.	PCC advised to check the reason for not sending carrier from Farakka to Kahalgaon and non-operation of Autorecloser.	NTPC informed that the carrier healthiness will be checked at next available shutdown.
68th PCC Meeting			
16.	Issues related with Generation Backing down during Talcher-Kolar SPS operation on 16th May 2018.	PCC advised Powergrid to explore for inclusion of pole block with ground return mode signal in the SPS logic. PCC advised NTPC also to explore for inclusion of pole block with ground return mode signal in the SPS logic.	PCC advised Powergrid and NTPC to coordinate and implement pole block with ground return mode signal in SPS. Powergrid informed that confirmation from NTPC is awaited whether they are receiving the pole block signal or not.

Annexure-C6.1

एनएचपीसी लिमिटेड
(भारत सरकार का उद्यम)
NHPC Limited
(A Govt. of India Enterprise)
CIN : L40101HR1975GOI032564

एक कदम स्वच्छता की ओर

O&M DIVISION
NHPC OFFICE COMPLEX
SECTOR-33, FARIDABAD
HARYANA- 121003
Ph. 91-129-2250846
FAX:91-129-2272413/1419

NH/O&M/2432. **10/07/2019**

Member Secretary
Eastern Regional Power Committee
14, Golf Club Road, Tollygunj
Kolkata-700032

Sub: Revised relay setting for TLDP-III, TLDP-IV and NJP sub-station.

Sir,

This has reference to the item no. C.2 of the minutes of 79th PCC meeting of the ERPC regarding total power failure at TLDP-III Power Station due to prolonged high resistive fault in TLDP-III to NJP Line.

In this context, keeping in view the standard protection co-ordination philosophy for GSU transformer neutral over current relay and earth fault over current relay (DEF) of Line, following setting is being proposed. It is considered that at least one unit each of TLDP-III and TLDP-IV will be in operation at a time and TLDP-III to TLDP-IV line will be available. Keeping in view of above, co-ordination of DEF of line (80 A) has been done with two units (40*2=80 A).

1. For individual Units at TLDP-III and TLDP-IV: Pickup current 40 A (primary), Curve: Normal Inverse, TMS: 0.4.
2. For Line at TLDP-III, TLDP-IV end: Pickup current 80 A (primary), Curve: Normal Inverse, TMS: 0.18.
3. DEF relay setting at sl.no.2 should also be implemented at NJP end of the above lines.
4. In case of tripping of line on DEF, a DT shall be send to remote end to isolate faulty line from both ends.
5. Stage-II earth fault over current setting: Pickup current 1480A , Time Delay: 100ms (DT).

The above setting is being implemented at TLDP-III and TLDP-IV Power Station. Accordingly WBSETCL may also be requested to implement the same at their end.

Thanking You.

Yours faithfully,

10/7/19

(V. K. Sinha)
General Manager (O&M)