EASTERN REGIONAL POWER COMMITTEE

Minutes of Special Protection Coordination for "To review the data submitted by BSPTCL & JUSNL and also to discuss the road map for the site visit" held at ERPC on 29-03-2016

List of participants enclosed at **Annexure-I**.

Member Secretary, ERPC welcomed all the participants to the meeting and informed that as per the decision of 32nd TCC and 41st PCC meetings the protection team has to review the protection system in respect of Chandil, Ramchandrapur, Adityapur & adjoining substations in Jharkhand and New Purnea, Madhepura, Biharshariff & adjoining substations in Bihar.

It was informed that JUSNL and BSPTCL had submitted all the requisite data as desired by the Protection Team. The observations as submitted by Protection team in its preliminary study were discussed in detail. The remedial action taken by JUSNL and BSPTCL was reviewed by the protection team which is as given below:

.A. JUSNL System (Chandil, Ramchandrapur, Adityapur & adjoining substations)

1) 220kV / 132kV Chandil s/stn

i. Study of CT details reveal that there are many bays of 220kV & 132 kV bay where the CTs are more than 25 years old.
ii. Tan delta & characteristics of the CTs are required to be re-checked.
BREAKERS HAVE ALREADY BEEN CHANGED
iii. 220kV & 132 kV BUS PT is also more than 25 years old and the accuracy class of 132kV PT is 5 while one of the 220kV PT is 1/5.
iv. DP setting not as per ERPC philosophy.
v. Differential relay not numerical.
vi. Earth resistance high: 2Ω
vii. DC positive earthed.

Deliberation in the meeting

JUSNL clarified that—

- *There are many C.Ts which are more than 25 years old and Tan delta characteristics is also not satisfactory as such these C.T's will be replaced after its procurement.*
- *However tan delta test & characteristics of the other C.Ts will be carried out by outsourcing.*
- *One set of 220 kV P.T (accuracy class-0.2) has already been replaced and other sets of 220 kV P.T will be replaced after procurement. One set 132 kV P.T will be also replaced after procurement.*

- *At present only ICT-IV is having REF protection and rest old ICT- I, II & III are not incorporated with REF protection.*
- *DGA test for ICTs had been carried out 4-5 years back and Transformer oil was also replaced once.*
- *Work for relay coordination as per the revised philosophy of ERPC has been awarded to AREVA and it will be carried out soon.*
- *Supply of Second DC supply source is awaited.*

During discussion it was emerged that the in JUSNL system CTs are on bus side instead which should be on line side as per regular practice.

JUSNL informed that in their sub-stations are following these design since inception and this is beibg taken care by transferring the protection from line CB to the Bus-coupler CB. But their transformers need not to be transferred as they have adequate number of ICTs.

The Protection team advised JUSNL---

- ✓ *Carry out Tan-delta measurement of all CTs and replace the CTs which are violating Tan-delta characteristics.*
- ✓ *Identify and connect the proper protection core of PT for protection purpose.*
- ✓ *All old PTs may be replaced with proper ratings, core and class of PTs.*
- ✓ *JUSNL should incorporate REF protection for other ICTs (ICT- I, II & III) and if required external neutral CTs may be mounted for the purpose.*
- ✓ *To carry out DGA analysis of ICTs once in every 2 years.*
- ✓ *Take suitable measure for detection and rectification of the DC earth fault.*
- ✓ *While commissioning of second set of Battery Bank, proper measures to be taken for proper connection & segregation of DC#1 & DC#2 for redundancy & segregation as per the standard practices followed.*

2) Ramchandrapur S/stn: (clear SLD is required)

i. The CT rating of 132kV side of 150 MVA transformer is set at 600/ 1 which seems on the lower side. It requires further analysis and review
ii. There are only one (1) trip coil in the breakers as seen from the results in 220kV breakers.
iii. Provision of two separate DC as Main DC#1 and Main DC#2 for individual bays are to be studied for redundancy.
iv. Breaker trip time of ICT 220kV Breaker: Y pole- 589 ms, B Pole-589 ms which is very high.
v. Here also the bay CTs which are more than 25 years requires the characteristics of the CT to be analysed.
vi. DP setting not as per ERPC philosophy.
vii. Differential relay not numerical.
viii. Earth resistance high: 2Ω
ix. DC positive earthed.

Deliberation in the meeting

*JUSNL submitted the SLD of Ramchandrapur GSS which is enclosed at **Annexure-A1** and updated the following:*

- *220 kV Breaker of Ramchandrapur G/S/S will be checked for operation timing of trip coil-1 trip coil-2 by suitable agency.*
- *Purchase order for second set of sub-station batteries set with charger has already been placed and it will be commissioned after delivery.*
- *Breaker trip time of ICT 220 kV breaker will be rechecked and corrective measures to be taken if required.*
- *There are some C.Ts which are 25 years old their tan delta characteristics and other specifications like knee voltage and ratio errors will be checked very soon with the help of suitable agency.*
- *There are two trip-coil in the breakers but during testing the agency missed to test the second coil as they could not trace the contact of second coil. The same will be traced and tested.*

The Protection team advised JUSNL---

- ✓ *Carry out Tan-delta measurement of all CTs and replace the CTs which are violating Tan-delta characteristics.*
- ✓ *Identify and connect the proper protection core of PT for protection purpose.*
- ✓ *All old PTs may be replaced with proper ratings, core and class.*
- ✓ *Old EM relays are to be replaced with Numerical relay for ICT-I&II.*
- ✓ *Circuit Breakers are to be tested with both the trip-coils and results to be submitted.*
- ✓ *Circuit Breaker of ICT-I may be checked as the CB trip time is very high (589 ms).*
- ✓ *Take suitable measure for detection and rectification of the DC earth fault.*
- ✓ *While commissioning of second set of Battery Bank, proper measures to be taken for proper connection & segregation of DC#1 & DC#2 for redundancy & segregation as per the standard practices followed.*

During discussion it was informed that usually JUSNL is keeping two ICTs in service as per their load requirement and one ICT in standby mode under charged condition.

It was advised to JUSNL that all the three ICTs may be kept in service during peak hours for meeting the n-1 criterion and during off-peak hours they may keep any of the two ICTs in service.

3) Adityapur 132 kV

i. Breaker time test result not provided.
ii. DP with O/c & E/F P441. Separate back up protection suggested.
iii. DP setting not as per ERPC philosophy.
iv. Differential relay not numerical.

v. Tripping time very high for 220kV CB for ICT-1 (569ms)
vi. DC positive is earthed.
vii. 220kV CB only one tripping coil.

Deliberation in the meeting

- *JUSNL submitted the Breaker time test result during the meeting which isgiven at **Annexure-A2**.*
- *There are two trip-coil in the breakers but during testing the agency missed to test the second coil as they could not trace the contact of second coil. The same will be traced and tested.*

The Protection team advised JUSNL---

- ✓ *Circuit Breakers are to be tested with both the trip-coils and results to be submitted.*
- ✓ *The breaker timings of ASEA make breakers need to be checked and if possible may be reduced.*
- ✓ *Take suitable measure for detection and rectification of the DC earth fault.*

4) COMMON ISSUES [KNEE PT VOLTAGE and RCT not provided)

i. Earth resistance values provided have been found to be 2 ohm.
--Improvement of these values and the values more than 1 have to be reduced to less than 1 ohm.
ii. DC system of all the three sub-stations are to be reviewed
DC Voltage between +ve and –ve = 230 V.
But +ve to earth = 191 V at 220kV Chandil
227 V at 220kV Ramchandrapur
210 V at Adityapur
–ve to earth = 20 V at Chandil
7 V at Ranchi
34 V at Adityapur

From the results it signifies that –ve is more or less earthed.
DC earthing is the root of many mal-operation and mal-tripping which has to be addressed.
iii. Auto reclosure and carrier is not active. This has to be brought to service.

Deliberation in the meeting

JUSNL informed that following actions are being taken to resolve the above common issues:

- *D.C system of all three sub-stations will be reviewed and necessary rectification work will be carried out.*
- *Auto reclose of 220 kV Chandil-Ramchandrapur, 220 Kv Chandil-PGCIL had been make active and it is in service.*
- *Auto reclose of 220 kV Chandil-STPS has done at Chandil end PLCC panel has also checked and terminated.*

- *Auto reclose of 220 kV Ramchandrapur-JODA has done at Ramchandrapur end and PLCC panel has also checked and terminated at RCP end. Both will be enabled in service after installation of CVT and PLCC panel at remote end i.e. STPS end and JODA end. Hence they requested to take up the issue with consultation of ULDC, JUSNL and with the coordinator STPS and JODA for restoring the PLCC scheme of both transmission lines.*

The Protection team advised JUSNL---

- ✓ *Take suitable measure for detection and rectification of the DC earth fault.*
- ✓ *To carry out relay coordination as per the revised protection philosophy of ERPC.*
- ✓ *To complete the DPR for PSDF funding towards improvement/development of JUSNL protection system at the earliest.*
- ✓ *As agreed in the 41st PCC & 119th OCC meetings, JUSNL to share their standby PLCC panels (BPL make) with WBPDCL (for remote end of 220 kV Chandil -Santaldih) and OPTCL (for remote end of 220 kV Ramchandrapur -Joda) to complete the PLCC schemes of both the lines.*

.B. BSPTCL System (New Purnea, Madhepura, Biharshariff & adjoining substations)

1) 220kV Begusarai sub-station

i. Equipment rated for 220 V DC but control DC voltage is 266 V DC which may cause damage to Power Supply units of Protection relays etc
ii. The earth resistance of start point Neutral's of transformers are on higher side i.e. 2.2, 1.4 etc should be reduced below 1 ohm.
iii. Breaker time test of all breakers were not submitted. Again only the trip time of one coil was submitted. Is the 2nd coil there or not used.
iv. DP setting not as per ERPC philosophy.
v. Earth resistance high for TRFR

Deliberation in the meeting

BSPTCL informed that following actions are being taken to resolve the above common issues:

- *DP Setting adjusted as per ERPC Philosophy as follow:*

	Nomenclature	Relay setting			
		Zone 1	Zone 2	Zone 3	Zone 4
Main 1(MICOM P442)	220 kv Begusarai-BTPS CKT-2(15 KM)	forward,1.95 ohm , T-0.00 sec,Kz1= 0.780/_2.2 deg. ,T-0.00 sec	forward,2.92 ohm ,T-0.35 sec,Kz2= 0.780/_2.2 deg. ,T-0.35 sec	Forward,12.19 ohm ,T 3 Delay-1 sec,Kz3= 0.780/_2.2 deg. , T 3 Delay-1 sec	Reverse, 0.49 ohm,T4 delay-0.5 sec,Kz4= 0.780/_2.2 deg. ,T-0.5 sec

Main 2(ABB,REL 670)	220 kv Begusarai-BTPS CKT-2(15 KM)	forward X1Z1'-4.79 ohm,R1Z1'-0.89 ohm, X0Z1'-16.07 ohm, R0Z1'-2.64 ohm ,T-0.00 sec	Forward,X1Z2'-7.03 ohm,R1Z2'-1.39 ohm ,X0Z2'-24.10 ohm,R0Z2'-3.96 ohm,T-0.35 sec	Forward,X1Z3'-29.90 ohm, R1Z3'-5.81 ohm, X0Z3'-100.44ohm, R0Z3'-16.49 ohm, T 3 Delay-1 sec	Reverse,X1Z4'-1.19ohm ,R1Z4'-0.22ohm ,X0Z4'-4.01ohm, R0Z4'-0.66ohm,T-0.5 sec

- *Remedial action for lowering the Earth resistance for Transformer is under progress.*
- *Both tripping coils are in service.*
- *DC voltage adjusted to 240V dc for Charger No.1 and 250V dc for ChargerNo.2*

The Protection team advised BSPTCL---

- ✓ *By adjusting the DC voltage knob from charging panel the charging/cell value of individual cells may get affected. So, it was advised that number of the cells per Battery bank may be reduced (i.e. 3-4 cells may be kept out of connection) so as to maintain 240 V DC in consultation with the Battery manufacturer/OEM.*
- ✓ *Consult with Battery manufacturer for choosing the best optimum charging option in the Battery charger panel as BSPTCL is opting "Float-cum-Boost" charging option which is not as per standard practices.*
- ✓ *PLCC scheme with auto reclosure facility to be commissioned for 220 kV feeders.*
- ✓ *Check weather both the DC sets are in use as DC#1 & DC#2 and proper connection & segregation of DC#1 & DC#2 for redundancy & segregation as per the standard practices. The DC sets should not be kept in standby mode.*

2) Biharshariff : Fault level about 19.53 KA

i. DC voltage = 245 V DC
+ve to earth =239.1 V
–ve to earth=6.7 V
–ve is grounded
ii. Breakers having only one trip coil
iii. In 132 kV Sekharpura Line 1 Z2 TIME =0.01 sec and TZ_3 = 0.03 sec
Same for Nalanda line for Hatidah line Z_3=.03 sec – **needs to be checked**
iv. The open time of 220 kV Begusarai Biharshariff line 2 is also too high i.e. 118,109 110 msecs
v. Bus bar protection detail not available.
vi. Relay testing record not available.
vii. Open time for Begusarai-2 is high (110 ms)
viii. DC 2sets, one set stand by.
ix. DP relay setting not as per ERPC philosophy.
x. Zone 2 & 3 Time for 132kV Sekhpura-1 Line very low.
xi. Zone 3 Time for 132kV Hatidah Line very low.

xii. Detail setting to be reviewed in respect of resistive reach and additional functions in respect of 220kV lines.
xiii. Separate REF relay for Auto Transformer for redundancy.

Deliberation in the meeting

BSPTCL informed that:

- *The provision of the Bus bar protection has been proposed in the repair & up-gradation of the Biharsharif GSS under the PSDF works.*
- *While checking the DC fault at Biharsharif GSS, DC Positive was found earthed from the following two DC feeder panels:*
  a) 20 MVA Transformer Panel feeder
  b) Old relay room DC supply feeder.
- *The TNC Division Biharsharif is on work to further identify the source of earthing.*
- *Details of Ckt. Breaker closing and triping coils at 220/132/33KV GSS Biharsharif was submitted which is given at* ***Annexure-B1.***
- *The settings of 132 kV Biharsharif - Seikhpura line has been revised as follow:-*
  a) tms of Z2 changed from .01 sec to 350 msec .
  b) tms changed from .03 sec to 1000 msec.
  c) The tms setting of Z3 was changed from .03 sec to 350 msec in 132 kv Hatidah ckt
- *The tms setting of Z3 was changed from .03 sec to 350 msec in 132 kv Hatidah ckt.*
- *The relay details of 220 & 132 kV feeders along with protection available are given at* ***Annexure-B2****.*
- *The Ckt. Brk. timer test of 220 kV Begusarai ckt no. 02 of M/s Siemens make is as follow:*

	R phase	Y Phase	B Phase
Close time(msec)	64	63	64
Open time(msec)	114	115	115
Close-open(msec)	68	68	67

- *For rectification of open time of the breaker, M/S Siemens has been requested to send service engineer.*
- *For ICTs which have no separate REF relay, the inbuilt feature of REF protection n numerical differential relays are in enabled conditions.*

The Protection team advised BSPTCL---

- ✓ *To check the provision of separate REF relay in the scheme of Transformer protection. A provision for separate REF relay may be made for redundancy of Transformer protection if inbuilt feature of numerical relay is being used.*
- ✓ *PLCC scheme with auto reclosure facility to be commissioned for all important 220 kV feeders.*
- ✓ *Check weather both the DC sets are in use as DC#1 & DC#2 and proper connection & segregation of DC#1 & DC#2 for redundancy & segregation as per the standard practices. The DC sets should not be kept in standby mode.*

3) Forbesgunj

i. Closing time of 132kV Katiya line-1 was very high i.e. 447 ms.
ii. Other datas apparently 100ms to be in order
iii. DP relay setting not as per ERPC philosophy.
Zone timing very low.
iv. Closing time very high for 132kV Katiya line CB.

Deliberation in the meeting

BSPTCL informed that following actions are being taken to resolve the above issues:

- *Software not available for DP relay setting, the relay company is being consulted for remedial action.*
- *For decreasing the high closing time 132 KV Kataiya line CB (CGL make), breaker company is being consulted for remedial action.*

4) Madhepura 220 kV /132kV: AR & CO available

i. Trip coil only with one coil given the other coil is there or not available
ii. Open time of 220 kV Ckt 1 and Ckt 2 is very high i.e. about 90ms to be checked.
iii. DP setting not as per ERPC philosophy.
iv. DC voltage appears to be high: (120+136=256V dc)
v. Open time high for 220kV incomer-1 & 2 Line CB.(>86mSec.)
vi. Zone2,Zone-3 timing of Madhepura-PG 220kv Line 1 & 2 is Zero

Deliberation in the meeting

BSPTCL informed that following:

- *Due to typing mistake closing time got interchanged with opening time and the corrected data is as follows:*

CIRCUIT BREAKER TIMER TEST REPORT OF 220 KV INCOMER CIRCUITS

220 KV CKT – 1(incomer-1 Line)

PHASE OF BKR POLE	OPEN	CLOSE	CLOSE - OPEN
R - PHASE	67 MS	90 MS	54 MS
Y - PHASE	63 MS	86 MS	61 MS
B - PHASE	63 MS	86 MS	62 MS

220 KV CKT - 2(incomer-2 Line)

PHASE OF BKR POLE	OPEN	CLOSE	CLOSE - OPEN
R - PHASE	64 MS	94 MS	62 MS
Y - PHASE	66 MS	93 MS	59 MS
B - PHASE	66 MS	92 MS	59 S

- *Zone-2, Zone-3 timing of Madhepura-PG 220kV Line 1 & 2 was zero. Now it was corrected as per ERPC philosophy.*
- *Both tripping coils are in service.*
- *DC voltage adjusted to 240V dc with the help of DC volt adjustment knob.*

The Protection team advised BSPTCL---

- ✓ *By adjusting the DC voltage knob from charging panel the charging/cell value of individual cells may get affected. So, it was advised that number of the cells per Battery bank may be reduced (i.e. 3-4 cells may be kept out of connection) so as to maintain 240 V DC in consultation with the Battery manufacturer/OEM.*
- ✓ *Consult with Battery manufacturer for choosing the best optimum charging option in the Battery charger panel as BSPTCL is opting "Float-cum-Boost" charging option which is not as per standard practices.*
- ✓ *PLCC scheme with auto reclosure facility to be commissioned for 220 kV feeders.*

5) **Kishenganj**- No other details

6) **132/33kV Purnea**

i. DC positive is earthed.

Deliberation in the meeting

BSPTCL informed that detection and remedial action for earthing of DC positive is under progress.

The protection team advised JUSNL and BSPTCL to initiate the implementation of above recommendations however, the final report with recommendations will be given after the complete study and site visit of the listed sub-stations. It was also decided that the team will start the site visit from the month of April, 2016. The site visit plan will be formulated in consultation with the team members and will be intimated to JUSNL and BSPTCL in due course.

Meeting ended with vote of thanks to the chair.

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Annexure-I

Participants in the Special Meeting to review the data submitted by BSPTCL & JUSNL and also to discuss the road map for the site visit

Venue: ERPC Conference Hall, Kolkata Time: 11:00 hrs Date: 29.03.2016 (Tuesday)

Sl No	Name	Designation/ Organization	Contact Number	Email	Signature
1	A K Bandyopadhyaya	M S, ERPC	9433068533	mserpc-power@nic.in	
2	U.K. Verma	GM, ERLDC	08902496290	vejwalkumar.verma@gmail.com	
3	S. BANERJEE	DGM, ERLDC	9433041823	surojitb@gmail.com	
4	Saurav K Sahay	Sr Engg, ERLDC	9432013173	Sahay.saurav@gmail.com	
5	Anuj Kukreti	Junior Engineer, JUSNL	9931104538	anujsdec@gmail.com.	
6	AJIT KUMAR	ESE TC JAMSHEDPUR	9431707314	tcjsr_jusnl@rediffmail.com.	
7	L.K. JHA	EEE/G.O.D CHANDIL	9431707318	[illegible]@1958@gmail.com	
8	S. Roy	C.E.@ SLDC WBSETCL	9434910030	srabya_60@yahoo.com	
9	L. Nayak	GM (O&M), OPTCL	9438907801	ele.lanayak@optcl.co.in	
10	Vidya Sagar Singh	ESE/TC/ JUSNL Ranchi.	9934169984	sagarjseb@gmail.com	
11	S. B. Prasad	ESE/CRITL BSPTCL, Patna	7763817721	esecritl@gmail.com	
12	Jitesh kumar	EEE/CRITL BSPTCL, Patna	7763817793 9471155136	jiteshkuu@gmail.com	
13	V. Kalyanaraman	SE, ERPC	8902495969	akvaraman@rediffmail.com	
14	RAJDEEP BHATTACHARJEE	RE, BSPHCL	9830380689	rekolbsphcl@gmail.com	29/3/16
15	A. De.	AEE, ERPC	9681932906	alikpantha@gmail.com	
16	J. DUTTA	SE. OPTCL	9431515712	jdutta.dvc@gmail.com	
17	D. K. Bauri	EE, ERPC	9883617236	ee.op.erpc@gov.in	
18					
19					
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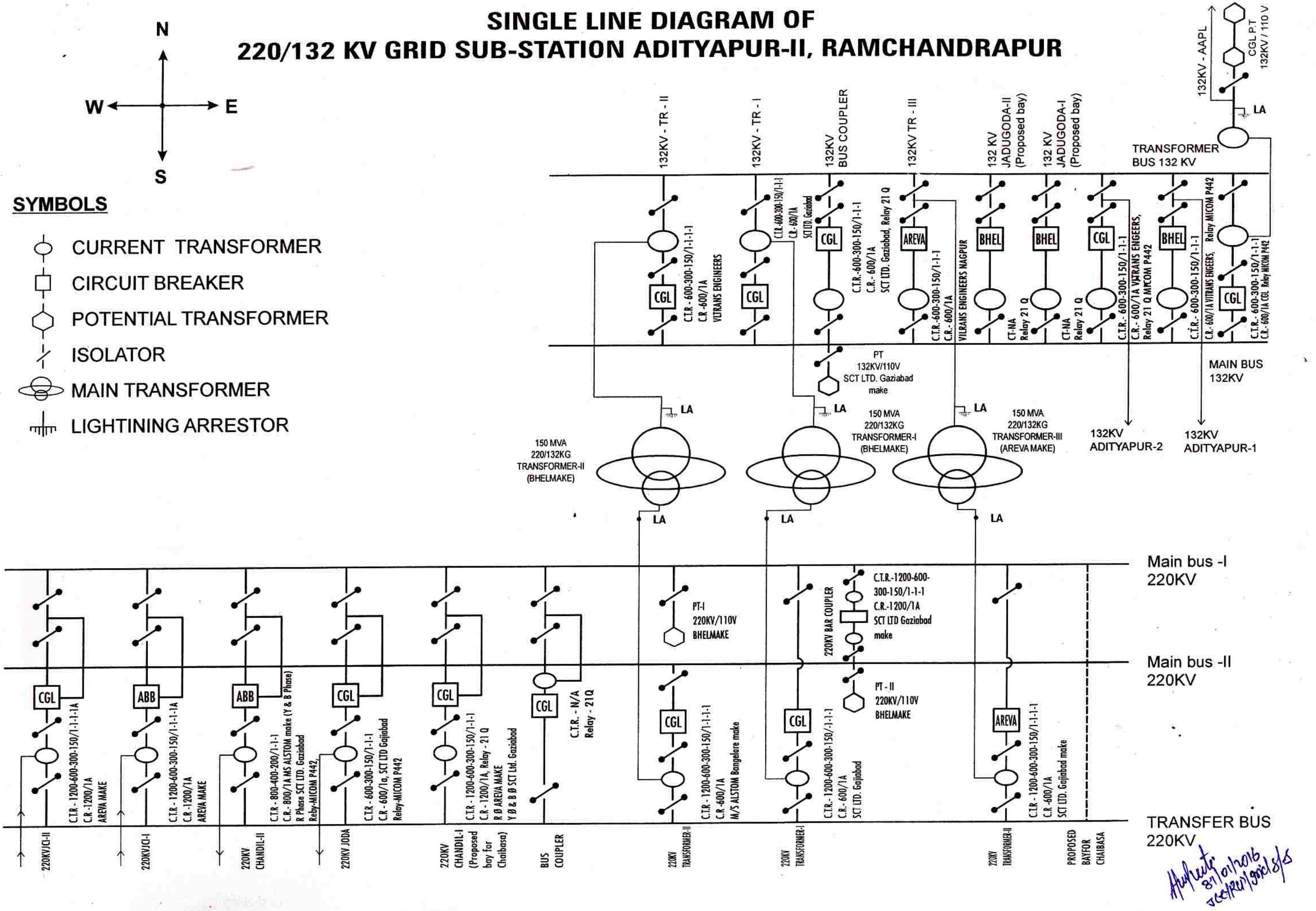
Annexure- A1

SINGLE LINE DIAGRAM OF
220/132 KV GRID SUB-STATION ADITYAPUR-II, RAMCHANDRAPUR



Annexure- A2

Test Report
132/33 Kv Grid Sub-Station, Adityapur-I

1. Breaker Specification:

Date 19.12.2015

Name of feeder - 132 Kv Chandil Bay
Make - ASEA
Type - MOCB
Sl. No. - 20165180
Year - 1966

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	200	201	200
Tripping Coil 1	58	62	63
C/o Coil 1	62	63	63

2. Breaker Specification:

Date 19.12.2015

Name of feeder - Transformer No. 01
Make - ASEA
Type - MOCB
Sl. No. - 2165195
Year - 1966

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	214	214	214
Tripping Coil 1	62	63	65
C/o Coil 1	72	72	72

3. Breaker Specification:

Date 19.12.2015

Name of feeder - 132 Kv RCP Bay - I
Make - CGL
Type - 120-SFM-32A
Sl. No. - 12720C
Year - 1999

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	89	89	89
Tripping Coil 1	25	25	25
C/o Coil 1	0	0	0
Tripping Coil 2	25	25	25
C/o Coil 2	0	0	0

Annexure-B1

Details of Ckt. Brk. closing and triping coilsat 220/132/33KV GSS Biharsharif

Sl no	Name of Bay	CB details	No. of Tripping coil	No. of Closing coil	Healthiness
1	150 MVA TR 2	Make-AREVA YEAR-2009 SL no -151464	2 Set	1 set	OK
2	220KV MAIN BUS COUPLER	Make-AREVA YEAR-2009 SL no -151489	2 Set	1 set	OK
3	150 MVA TR 1(220KV Side)	Make-AREVA YEAR-2009 SL no -05623	2 Set	1 set	OK
4	TBC	Make-AREVA YEAR-2009 SL no -152463	2 Set	1 set	OK
5	220 KV BEGUSARAI 2	Make – Siemens Year-2007 Sl no 2007-ind-12-4367	2 Set	1 set	OK
6	220 KV BEGUSARAI 1	Make – Siemens Year-2005 Sl no 2007-ind-08-2076	2 Set	1 set	OK
7	220 KV FATWA 2	Make-AREVA YEAR-2009 SL no -151462	2 Set	1 set	OK
8	220 KV FATWA 1	Make-AREVA YEAR-2009 SL no -151457	2 Set	1 set	OK
9	220 KV BODHGAYA 2	Make-AREVA YEAR-2009 SL no -151458	2 Set	1 set	OK
10	220 KV BODHGAYA 1	Make-AREVA YEAR-2009 SL no -151456	2 Set	1 set	OK

11	150 MVA TR 3	Make – Siemens Year-2007 Sl no 2007-ind-12-4366	2 Set	1 set	OK
12	ICT 3	Make –ABB Year-2002 Sl no 21000139	2 Set	1 set	OK
13	220 KVTTPS	Make-AREVA YEAR-2009 SL no -151455	2 Set	1 set	OK
14	ICT 1	Make-AREVA YEAR-2009 SL no -151461	2 Set	1 set	OK
15	ICT 2	Make-AREVA YEAR-2009 SL no -151454	2 Set	1 set	OK
16	132kv Nawada	Make-Areva YEAR-2008 SL no-210075	2 Set	1 set	OK
17	132kv Sheikhpura	Make-Areva YEAR-2008 SL no-210077	2 Set	1 set	OK
18	20 MVA Tr(132KV Side)	Make-Areva YEAR-2008 SL no-210373	2 Set	1 set	OK
19	132 KV HATHIDAH 2	Make-Areva YEAR-2000 SL no-210381	2 Set	1 set	OK
20	132 KV HATHIDAH 1	Make-Areva YEAR-2009 SL no-210385	2 Set	1 set	OK
21	132KV BARIPAHARI 2	Make-Areva YEAR-2009 SL no-210375	2 Set	1 set	OK
22	132KV BARIPAHARI 1	Make-Areva YEAR-2009 SL no-210380	2 Set	1 set	OK
23	150 MVA TR 2 (132KV Side)	Make-Areva YEAR-2009 SL no-210386	2 Set	1 set	OK
24	132KV TBC	Make-Areva YEAR-2009 SL no-210371	2 Set	1 set	OK
25	150 MVA TR 1 (132KV Side)	Make-Areva YEAR-2009 SL no-210376	2 Set	1 set	OK

26	132 KV L28	Make-Areva YEAR-2009 SL no-210382	2 Set	1 set	OK
27	132 KV L29	Make-Areva YEAR-2009 SL no-210377	2 Set	1 set	OK
28	132 KV EKENGARSARAI	Make- SIEMENS LTD YEAR-2007 SL no-2007-IND-11-4263	2 Set	1 set	OK
29	150MVA TR 3 (132KV SIDE)	Make- SIEMENS LTD YEAR-2007 SL no-2007-IND-11-4277	2 Set	1 set	OK

Annexure-B2

The relay details of 220 & 132 kV feeders along with protection available

Serial No.	Details of Relay	Details of Protection	Detail of line	Date of Commissioning
01.	P442	Zone Protection , Power swing ,overcurrent	220kv Biharsharif bodhgaya ckt 02	10/11/2014
02.	P442	Zone Protection, overcurrent Protection	220 kv Biharsharif Bodhgaya ckt 01	17/11/2014
03.	P442,P127	Zone Protection O/C+E/F Protection	132kv Biharsharif Nalanda	15/12/2014
04	P442,P127	Zone Protection O/C+E/F Protection	132kv Biharsharif Hatidah ckt 02	15/12/2014
05	P442,P127	Zone Protection O/C+E/F Protection	132kv Biharsharif Hatidah ckt 01	15/12/2014
06	P442,P127	Zone Protection O/C+E/F Protection	132kv Biharsharif Nalanda Barhi ckt	15/06/2014
07	P442,P127	Zone Protection O/C+E/FProtection	132kv Biharsharif Rajgir Barhi ckt	14/06/2014
08	P442,P127	Zone Protection O/C+E/F Protection	220kv Biharsharif Fatuha ckt 01	02/12/2014
09	P442,P127	Zone Protection O/C+E/F Protection	220kv Biharsharif Fatuha ckt 02	11/12/2014
10	P442,P127	Zone Protection O/C+E/F Protection	220kv Biharsharif TTPS	17/12/2014

4. Breaker Specification:

Date 19.12.2015

Name of feeder	-	132 Kv RCP Bay – 1I
Make	-	CGL
Type	-	120-SFM-32A
Sl. No.	-	12713C
Year	-	1999

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	87	86	87
Tripping Coil 1	23	23	23
C/o Coil 1	0	0	0
Tripping Coil 2	23	23	23
C/o Coil 2	0	0	0

5. Breaker Specification:

Date 19.12.2015

Name of feeder	-	Transformer No. - 4
Make	-	CGL
Type	-	120-SFM-32B
Sl. No.	-	22173C
Year	-	2006

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	84	83	83
Tripping Coil 1	25	25	26
C/o Coil 1	36	37	37
Tripping Coil 2	25	25	26
C/o Coil 2	35	37	37

6. Breaker Specification:

Date 20.12.2015

Name of feeder	-	132 Kv Bus-Coupler
Make	-	ASEA
Type	-	BLF 122F
Sl. No.	-	2165196
Year	-	1966

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	206	206	209
Tripping Coil 1	64	63	64
C/o Coil 1	73	70	72

7. **Breaker Specification:**

Date 20.12.2015

Name of feeder	-	132 Kv RKSN
Make	-	AREVA
Type	-	GL312
Sl. No.	-	101739
Year	-	2007

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	71	71	73
Tripping Coil 1	35	34	35
C/o Coil 1	62	60	59

8. Breaker Specification:

Date 20.12.2015

Name of feeder	-	Transformer No. - 2
Make	-	ASEA
Type	-	BLF122F
Sl. No.	-	2165182
Year	-	1966

Operating time in Mille Second:

	R Ph	**Y Ph**	**B Ph**
Closing	200	200	200
Tripping Coil 1	55	54	54
C/o Coil 1	73	71	71