

01	25.02.19	REVISED AS PER DCPL/MAHAGENCO COMMENTS	MC	KK	MS
REV.	DATE	DESCRIPTION			

PROJECT

1 X 660 MW BHUSAWAL T.P.S. UNIT-6 TPP

OWNER



MAHARASHTRA STATE POWER GENERATION
CO. LTD.

PMC CONSULTANT



DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
VASHI, NAVI MUMBAI



BHARAT HEAVY ELECTRICALS LTD
UNIT : PROJECT ENGINEERING MANAGEMENT, NOIDA

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DEPT
CODE

NAME

SIGN.

DATE

DRN

MC

—sd—

31.05.18

DESN

MC

—sd—

31.05.18

CHD

KK

—sd—

06.06.18

APPD

MS

—sd—

07.06.18

TITLE

SLD OF STATION TRANSFORMER METERING AND PROTECTION

					ELEC	DEPT.	SCALE NTS	BHEL DRG NO.	
						SIGN		PE-DG-415-510-E041	
						DATE		TOTAL SHEETS = 05	REV. 01

PE-DG-415-510-E041

LEGEND

CT	CURRENT TRANSFORMER
HV	HIGH VOLTAGE
LA	LIGHTNING ARRESTER
MF	MULTIFUNCTION METER
OLTC	ON LOAD TAP CHANGER
R	RESISTOR
RCT	RESISTANCE OF SECONDARY WINDING OF MAIN CT
ST	STATION TRANSFORMER
STRP	STATION TRANSFORMER RELAY PANEL
VK	KNEE POINT VOLTAGE
VT	VOLTAGE TRANSFORMER

1

WTI	WINDING TEMPERATURE INDICATOR
63	BUCHHOLZ RELAY
FPR	FIRE PROTECTION RELAY
LOL	LOW OIL LEVEL INDICATOR
OTI	OIL TEMPERATURE INDICATOR
OSR	OLTC OIL SURGE RELAY
PRV	PRESSURE RELIEF VALVE
SPR	SUDDEN PRESSURE RELAY

REFERENCE DRAWINGS

1. ELECTRICAL SINGLE LINE DIAGRAM FOR AUXILIARY POWER DISTRIBUTION.
BHEL DRAWING NO. PE-DG-415-565-E001.
2. SINGLE LINE DIAGRAM OF 11KV STATION SWITCHBOARD METERING AND PROTECTION.
3. SINGLE LINE DIAGRAM: GENERATOR, GT, UT, ST METERING & PROTECTION
(CUSTOMER'S TENDER DRAWING NO. PE-189-EL-503, ISSUE P1)

NOTES

1. EXACT MAKE, TYPE & COMBINATION OF PROTECTION FUNCTIONS IN NUMERICAL RELAYS WILL BE AS FINALISED BY BHEL-BHOPAL.
2. SOFT DATA FROM NUMERICAL RELAYS WILL BE SENT TO DDCMIS THROUGH IEC-61850 COMMUNICATION PROTOCOL.
3. TIME SYNCHRONISATION OF NUMERICAL RELAYS SHALL BE DONE WITH DDCMIS OVER IEC-61850 PROTOCOL.
4. METERING AT 11KV STATION SWITCHGEAR IS COVERED IN SEPARATE DRAWING.
5. METERING AT ST 400KV BREAKER CONTROL PANEL & PROTECTION AT 400KV ST BAY PROTECTION RELAY PANELS ARE IN MAHAGENCO (CUSTOMER) SCOPE.
6. THERE ARE TOTAL 2 STRP PANELS, ONE EACH FOR STATION TRANSFORMER.

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
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BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE **SINGLE LINE DIAGRAM OF STATION
TRANSFORMER METERING AND PROTECTION**

1 X 660 MW BHUSAWAL TPP
MAHARASHTRA STATE POWER
GENERATION CO. LTD.

DRAWING NO. **PE-DG-415-510-E041**
SHEET 2 OF 5 REV. 01

PE-DG-415-510-E041

CT DETAILS

C.T. NO.	CORE NO.	RATIO	BURDEN	ACCURACY CLASS	ALF/ISF	Vk $\gg$	Ie $\leq$	PURPOSE	LOCATION
CT-1A	1	$\triangle 1$ 3500/1A	—	PS	—	40Rct + 100 V	30mA AT Vk/2	DIFFERENTIAL PROTECTION (WINDING 1)	11kV STATION SWITCHGEAR OBA/OBC
	2	$\triangle 1$ 3500/1A	—	PS	—	20Rct + 75 V	30mA AT Vk/2	LV REF PROTECTION (WINDING 1)	
CT-1B	1	$\triangle 1$ 3500/1A	—	PS	—	40Rct + 100 V	30mA AT Vk/2	DIFFERENTIAL PROTECTION (WINDING 2)	11kV STATION SWITCHGEAR OBB/OBD
	2	$\triangle 1$ 3500/1A	—	PS	—	20Rct + 75 V	30mA AT Vk/2	LV REF PROTECTION (WINDING 2)	
CT-2A	1	300/1A	10VA	5P	20	—	—	LV SEF PROTECTION (WINDING 1)	ST LV1 NEUTRAL BUSHING
	2	$\triangle 1$ 3500/1A	—	PS	—	20Rct + 75 V	30mA AT Vk/2	LV REF PROTECTION (WINDING 1)	
CT-2B	1	300/1A	10VA	5P	20	—	—	LV SEF PROTECTION (WINDING 2)	ST LV2 NEUTRAL BUSHING
	2	$\triangle 1$ 3500/1A	—	PS	—	20Rct + 75 V	30mA AT Vk/2	LV REF PROTECTION (WINDING 2)	
CT-3	1	250/1A	10VA	5P	20	—	—	HV SEF PROTECTION	ST HV NEUTRAL BUSHING
	2	250/1A	—	PS	—	20Rct + 50 V	30mA AT Vk/2	HV REF PROTECTION	
CT-4	1	250/1A	—	PS	—	20Rct + 50 V	30mA AT Vk/2	HV REF PROTECTION	ST HV LINE BUSHING
* SWYD-CT	CORE 5	—	—	—	—	—	—		400kV SWITCHYARD (BY CUSTOMER-MAHAGENCO)
	CORE 4	—	—	—	—	—	—		
	CORE 3	*/1A	*	*	*	—	—	MFM	
	CORE 2	*/1A	—	PS	—	*	*	OVER CURRENT PROTECTION	
	CORE 1	*/1A	—	PS	—	*	*	DIFFERENTIAL PROTECTION	

* : CT DETAILS TO BE FURNISHED BY MAHAGENCO.

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
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BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE SINGLE LINE DIAGRAM OF STATION
TRANSFORMER METERING AND PROTECTION

1 X 660 MW BHUSAWAL TPP
MAHARASHTRA STATE POWER
GENERATION CO. LTD.

DRAWING NO.
PE-DG-415-510-E041
SHEET 3 OF 5
REV. 01

PE-DG-415-510-E041

RELAY DETAILS FOR EACH STRP PANEL

DEVICE NO.	DESCRIPTION	RATED CURRENT	RATED VOLTAGE	AUXILIARY VOLTAGE	MAKE	QTY.	LOCATION
STR1	ST LV1 RESTRICTED EARTH FAULT PROTECTION (64RST-LV1)	1A	—	220V DC	MAKE AGREED BY BHEL BHOPAL	1	STRP
STR2	ST LV2 RESTRICTED EARTH FAULT PROTECTION (64RST-LV2)	1A	—	220V DC	MAKE AGREED BY BHEL BHOPAL	1	STRP
STR3	ST HV IDMT BACKUP OVERCURRENT PROTECTION (51STH) ST HV INSTANTANEOUS HIGH SET OVER CURRENT PROTECTION (50STH) ST HV RESTRICTED EARTH FAULT PROTECTION (64RST-HV)	1A	—	220V DC	MAKE AGREED BY BHEL BHOPAL	1	STRP
STR4	ST DIFFERENTIAL PROTECTION (87ST) ST OVER FLUXING PROTECTION (99ST) ST HV BACKUP EARTH FAULT PROTECTION (51NST-HV) ST LV1 BACKUP EARTH FAULT PROTECTION (51NST-LV1) ST LV2 BACKUP EARTH FAULT PROTECTION (51NST-LV2)	1A	—	220V DC	MAKE AGREED BY BHEL BHOPAL	1	STRP
50Z1 50Z2	LOCAL BREAKER BACKUP PROTECTION	1A	—	220V DC	MAKE AGREED BY BHEL BHOPAL	1	STRP

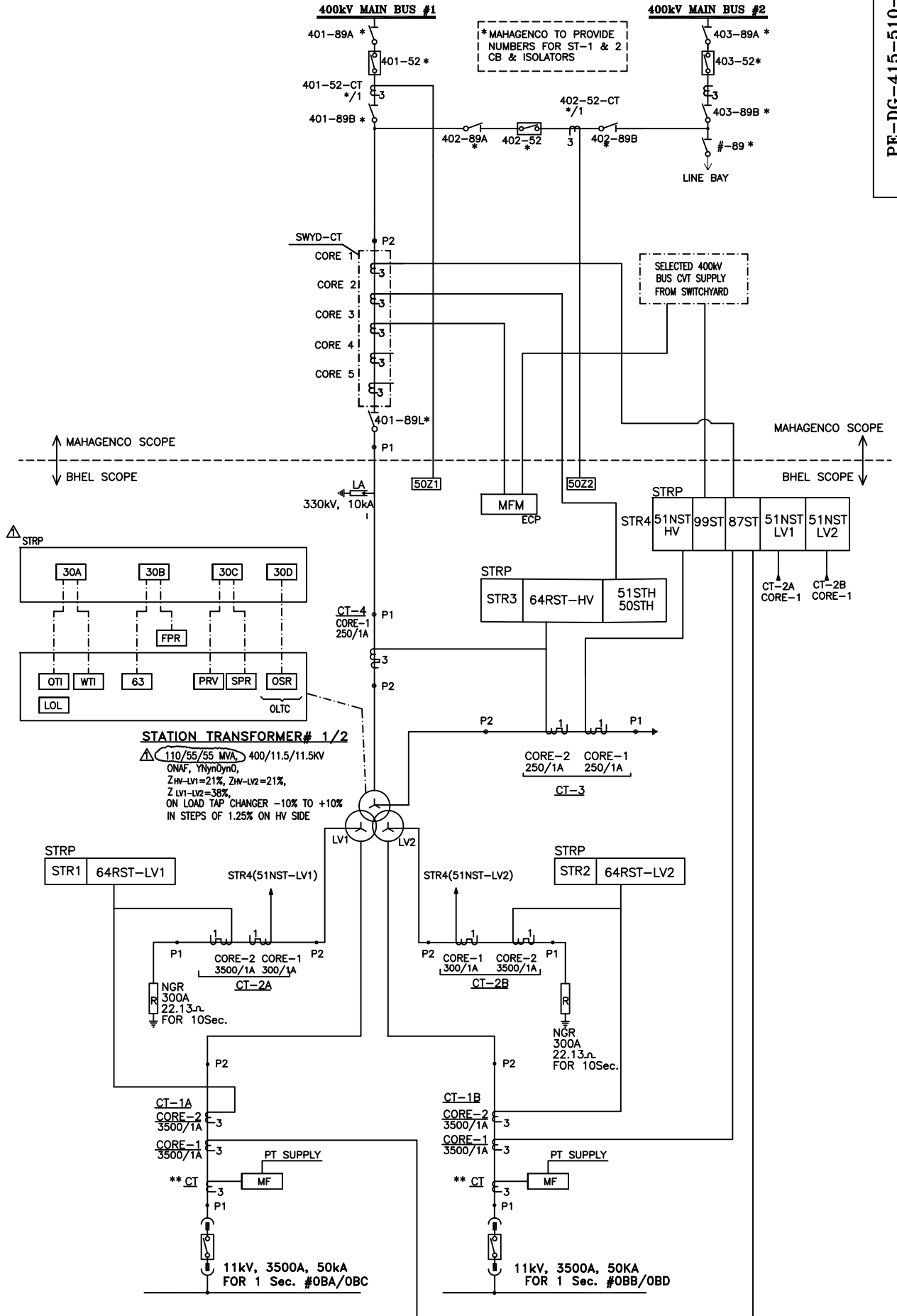
NOTE: STRP PANEL (TOTAL 2 NOS.) IS LOCATED IN EER ROOM (EL 17M— TG HALL)

1 AUXILIARY RELAY DETAILS

DEVICE NO.	DESCRIPTION	RATED CURRENT	RATED VOLTAGE	AUXILIARY VOLTAGE	TYPE	MAKE	QTY.	LOCATION
30A	AUXILIARY RELAY FOR ST HV/LV1/LV2 WINDING TEMPERATURE—TRIP (WTI) AUXILIARY RELAY FOR OIL TEMPERATURE—TRIP (OTI)	—	—	220V DC	VAA21	AREVA/EQUIVALENT	1	STRP
30B	AUXILIARY RELAY FOR ST BUCHHOLZ RELAY—TRIP (63) AUXILIARY RELAY FOR FIRE PROTECTION—TRIP (FPR)	—	—	220V DC	VAA21	AREVA/EQUIVALENT	1	STRP
30C	AUXILIARY RELAY FOR ST SUDDEN PRESSURE—TRIP (SPR) AUXILIARY RELAY FOR PRESSURE RELIEF VALVE—TRIP (PRV)	—	—	220V DC	VAA21	AREVA/EQUIVALENT	1	STRP
30D	AUXILIARY RELAY FOR OLTC OIL SURGE RELAY (OSR)	—	—	220V DC	VAA21	AREVA/EQUIVALENT	1	STRP

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	 BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	1 X 660 MW BHUSAWAL TPP MAHARASHTRA STATE POWER GENERATION CO. LTD.			
										TITLE SINGLE LINE DIAGRAM OF STATION TRANSFORMER METERING AND PROTECTION									
																DRAWING NO. PE-DG-415-510-E041			
																SHEET 4 OF 5		REV. 01	

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD



**: FOR CT/PT DETAILS REFER BHEL DRG. NO. PE-DG-415-505-E001

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT
NODA

**SINGLE LINE DIAGRAM OF STATION
TRANSFORMER METERING AND PROTECTION**

**1 X 660 MW BHUSAWAL TPP
MAHARASHTRA STATE POWER
GENERATION CO. LTD.**

DRAWING NO. **PE-DG-415-510-E041**
SHEET OF 5 REV. 01