



BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

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TITLE CT & VT SIZING CALCULATION FOR 66KV GIS				SIGN	-Sd-	-Sd-	-Sd-
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				GROUP	TBEM	W.O. No	87010
CUSTOMER	HPCL						
CONSULTANT	EIL						
PROJECTS	66KV GIS OF CCPP FOR VRMP, Vishakhapattanam						

CONTENTS

Section	Description	No. of Sheets
1.	SUMMARY OF CORE DETAILS OF CURRENT TRANSFORMER SUMMARY OF WINDING DETAILS OF VOLTAGE TRANSFORMER	03
2	CURRENT TRANSFORMER –SELECTION CRITERIA VOLTAGE TRANSFORMER –SELECTION CRITERIA ANNEXURE – REFERENCE DOCUMENTS	11 8

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Name of Reviewer: SAI ACHUTUNI (A738)

Transmittal No.



Bharat Heavy Electricals Limited

Project : CPP of VRMP .

Customer : HPCL

Consultant : EIL

Document Title: **CT & VT sizing calculation**

Doc No. **TB-402-510-024, Rev No. 00**

Please note the following proposed parameters for Indoor GIS CT & VT are subject to confirmation from the customer approved GIS suppliers.

Summary of Core details of 66kV Current Transformer:

Applicable for-

- I) Incomer from Generator Transformer: GTG#7 TR Bay (Applicable bay # 04)
- II) Incomer from Generator Transformer : STG#01 TR Bay (Applicable bay # 12)

CT1 Core No.	Current Ratio	Accuracy Class	Min. Burden	Min kPV (V)	Max Im at kPV	Purpose
1.	1200-600-300 / 1	PS	-	1200-600-400	30mA-60mA-120mA	Transf. Overall Diff. Protn. 87O
2.	1200-600-300 / 1	PS	-	1200-600-400	30mA-60mA-120mA	Transf. Diff. Protn. 87GT
3.	1200-600-300 / 1	PS	-	1200-600-400	30mA-60mA-120mA	Transf. REF Protn. 64R
4.	1200-600-300 / 1	5P10	15VA	-	-	Overcurrent Protn & Metering
5.	2500/ 1	PS	-	2500	30mA	Busbar Diff. Protn.

III) Incomer from Transformer : 220/66kV Transformer TR9301 , TR9302 & Future grid transformer (Applicable bay # 09, 18, 22)

CT1 Core No.	Current Ratio	Accuracy Class	Min. Burden	Min kPV (V)	Max Im at kPV	Purpose
1.	1200-600-300 / 1	PS	-	1200-600-400	30mA-60mA-120mA	Transf. Diff. Protn. 87T (Upstream CRP scope)
2.	1200-600-300 / 1	PS	-	1200-600-400	30mA-60mA-120mA	Transf. REF Protn.
3.	1200-600-300 / 1	PS	-	1200-600-400	30mA-60mA-120mA	Spare
4.	1200-600-300 / 1	5P10	15VA	-	-	Overcurrent Protn & Metering
5.	2500/ 1	PS	-	2500	30mA	Busbar Diff. Protn.

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IV) Bus Coupler#1, Bus Section #1, Bus Section#2, Bus Coupler#2 (Applicable bay # 01, 14, 15, 27)

CT1 Core No.	Current Ratio	Accuracy Class	Min. Burden	Min kPV (V)	Max Im at kPV	Purpose
1	2500 / 1	5P10	15VA	-	-	Over current Protection
2	2500 / 1	PS	-	2500	30mA	Busbar Differential protection

CT2 Core No.	Current Ratio	Accuracy Class	Min. Burden	Min kPV (V)	Max Im at kPV	Purpose
1	2500 / 1	PS	-	2500	30mA	Spare

V) Outgoing Transformer Feeders :

a) 66/11.5kV Transformer TR9403 , TR9404, TR9401, TR9402, Spare Feeder (Applicable bay # 10, 19, 02, 16, 03)

b) Outgoing Transformer Feeders : a)TR-8301 SS-83 (CDU/VDU) b)TR-8302 SS-83 (CDU/VDU) c) TR01 SS-90(HCU) d)TR02 SS-90(HCU)

e) Spare Feeder (Applicable bay # 05, 17, 13,23 & 24)

c) Outgoing Transformer Feeders : a)TR-8201 SS-82 (HCU) b)TR-8202 SS-82 (HCU) c)TR-8601 in SS-86(CT) d)TR-8602 in SS-86(CT)

e) TR-8401 SS-84 (RUF) f) TR-8402 SS-84(RUF) (Applicable bay numbers : 08, 20 , 11, 06, 25 & 21)

g) Outgoing Feeders : To Large Motors in SS-84 (RUF) Applicable bay numbers : 07, 26

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CT1 Core No.	Current Ratio	Accuracy Class	Min. Burden	Min kPV (V)	Max Im at kPV	Purpose
1	600-300 / 1	PS	-	600-400	30mA-60mA	Diff. Protn. 87T /87F
2	600-300 / 1	5P10	15VA	-	-	Overcurrent Protn & Metering
3	2500 / 1	PS	-	2500	30mA	Busbar Diff. Protn.



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Summary of Winding details of 66kV Potential Transformer :

- I) Potential Transformer for Bus 1 , Bus 2 , Bus 1A, Bus 2A, GTG#7 TR Bay, STG#01 TR Bay, 220/66kV Transformer TR9301 , TR9302 & Future grid transformer (Applicable for bays 04, 09, 12 , 18 , 22)

Winding No.	Voltage Ratio	Accuracy Class	Min. Burden	Purpose
1	66kV/ $\sqrt{3}$ / 110V/ $\sqrt{3}$	3P	50 VA	Protn.
2	66kV/ $\sqrt{3}$ / 110V/ $\sqrt{3}$	1	100 VA	Metering & Dir O/C



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CT Selection Criteria

System Data

a)	System Voltage	=	66 kV	
b)	Bus Rating	=	2500 A	
c)	Fault Level	=	40 kA	for 1 Sec

I. Incomer from Generator Transformer : GTG#7 TR Bay Applicable bay numbers : 04

MVA of Transformer	=	100 MVA	
Percentage Impedance	=	12.5 % ±	10 %
Load Current	=	874.80 A	
Fault Current (Primary)	=	7775.99 A	

A) Core - 1 / 2 :

Core-1 Purpose	=	Transf. Overall Diff. Protn. 87OA (mounted in GRP)
Core-2 Purpose	=	Transformer Diff. Protn. 87GT
i. Current Ratio	=	1200 /1A (1200 -600-300/1A)
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. a) Knee Point Voltage for 87 protn.	≥	0.14(If*X/R)*(Rct + RL) (typical)
Fault Current (secondary) If	=	6.48 A
X/R for 100MVA trafo (Approx)	≤	40
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min) for 87 Protn.	=	36 *(Rct + 1)
Selected KpV	=	50 Rct +200 V
Minimum KpV at each tap	=	1200V- 600V-400V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	-

B) Core- 3

Purpose	=	Transf. REF Protn. 64R
i. Current Ratio	=	1200 /1A (1200 -600-300/1A)
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. b) Knee Point Voltage for 64R protn.	≥	4*If*(Rct + 2RL)
Fault Current (secondary) If	=	6.48 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min) for 64R	=	26 *(Rct + 2)
Selected KpV	=	50 Rct +200 V
Minimum KpV at each tap	=	1200V- 600V-400V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	-



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C) Core - 4 :

Purpose	=	Overcurrent Protection (Metering is in-built function of numerical relay)
i. Current Ratio	=	1200 /1A (1200 -600-300/1A)
ii. Protection Class	=	5P10
iii. Rct (secondary) at 75°C	=	- Ohms
iv. Knee Point Voltage	≥	- V
v. Magnetising current at KpV	<	- mA
vi. Burden	=	Sum Burden of Transducer , Numerical relay
Current transducer (Phase)	≤	3 VA
Numerical Relay	≤	1 VA
Lead burden	≤	1 VA
Total burden	≤	5 VA
Selected burden	=	15 VA

D) Core - 5 :

Core 5 Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	2*If*(Rct + RL)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41 Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA

II. Incomer from Generator Transformer : STG#01 TR Bay
Applicable bay numbers : 12

MVA of Transformer	=	20 MVA
Percentage Impedance	=	12.5 % ± 10 %
Load Current	=	174.96 A
Fault Current (Primary)	=	1555.20 A



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A) Core - 1 / 2 :

Core-1	Purpose	=	Transf. Overall Diff. Protn. 87OA (mounted in GRP)
Core-2	Purpose	=	Transformer Diff. Protn. 87GT
i. Current Ratio		=	300 /1A (1200-600- 300 /1A)
ii. Protection Class		=	PS
iii. Rct (secondary) at 75°C		=	CT manufacturer specific
iv. a) Knee Point Voltage for 87 protn.		≥	0.14(If*X/R)*(Rct + RL) (typical)
Fault Current (secondary) If		=	5.18 A
X/R for 20MVA trafo (Approx)		≤	30
RL		=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)			
KpV (min) for 87		=	22 *(Rct + 1)
Selected KpV		=	50 Rct +200 V
Minimum KpV at each tap		=	1200V- 600V-400V
v. Magnetising current at KpV		<	120 mA Typical for Diff. Relay
vi. Burden		=	-

B) Core - 3 :

Core-3	Purpose	=	Transf. REF Protn. 64R
i. Current Ratio		=	300 /1A (1200-600- 300 /1A)
ii. Protection Class		=	PS
iii. Rct (secondary) at 75°C		=	CT manufacturer specific
iv. a) Knee Point Voltage for 64R protn.		≥	4*If*(Rct + 2RL) (typical)
Fault Current (secondary) If		=	5.18 A
RL		=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)			
KpV (min) for 64R (REF)		=	21 *(Rct + 2)
Selected KpV		=	50 Rct +200 V
Minimum KpV at each tap		=	1200V- 600V-400V
v. Magnetising current at KpV		<	120 mA Typical for Diff. Relay
vi. Burden		=	-



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C) Core - 4 :

Purpose	=	Overcurrent Protection (Metering is in-built function of numerical relay)
i. Current Ratio	=	300 /1A (1200-600- 300 /1A)
ii. Protection Class	=	5P10
iii. Rct (secondary) at 75°C	=	- Ohms
iv. Knee Point Voltage	≥	- V
v. Magnetising current at KpV	<	- mA
vi. Burden	=	Sum Burden of Transducer , Numerical relay
Current transducer (Phase)	≤	3 VA
Numerical Relay	≤	1 VA
Lead burden	≤	1 VA
Total burden	≤	5 VA
Selected burden	=	15 VA

D) Core - 5 :

Core 5 Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	$2 \cdot I_f \cdot (R_{ct} + R_L)$ (typical)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV min	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA

**III. Incomer from Transformer : 220/66kV Transformer TR9301 , TR9302 & Future grid transformer
 Applicable bay numbers : 09 , 18 , 22**

MVA of Transformer	=	100 MVA
Percentage Impedance	=	12.5 % ± 10 %
Load Current	=	874.80 A
Fault Current (Primary)	=	7775.99 A

I. Core - 1 :

Core-1 Purpose	=	Transf. Diff. Protn. 87T (220kV CRP supplier scope)
i. Current Ratio	=	1200 /1A (1200 -600-300/1A)
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage for 87 protn.	≥	$0.14(I_f \cdot X/R) \cdot (R_{ct} + R_L)$ (typical)
Fault Current (secondary) If	=	6.48 A
X/R for 100MVA trafo (Approx)	≤	40
RL	=	2 Ohms
(considering 300m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
Selected KpV	=	50 Rct +200 V
Minimum KpV at each tap	=	1200V- 600V-400V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
	=	-



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Core - 2 / Core 3 :

Purpose	=	Transformer REF Protn. 64R (BHEL Scope)
i. Current Ratio	=	1200 /1A (1200 -600-300/1A)
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage for 64R protn.	≥	4*If*(Rct + 2RL) (typical)
Fault Current (secondary) If	=	6.48 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	26 *(Rct + 2)
Selected KpV	=	50 Rct +200 V
Minimum KpV at each tap	=	1200V- 600V-400V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	-

Core - 4 :

Purpose	=	Overcurrent Protection (Metering is in-built function of numerical relay)
i. Current Ratio	=	1200 /1A (1200 -600-300/1A)
ii. Protection Class	=	5P10
iii. Rct (secondary) at 75°C	=	- Ohms
iv. Knee Point Voltage	≥	- V
v. Magnetising current at KpV	<	- mA
vi. Burden	=	Sum Burden of Transducer , Numerical relay
Current transducer (Phase)	≤	3 VA
Numerical Relay	≤	1 VA
Lead burden	≤	1 VA
Total burden	≤	5 VA
Selected burden	=	15 VA

Core - 5 :

Core 5 Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	2*If*(Rct + RL) (typical)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV min	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA



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IV. Bus Coupler 1, 2 & Bus Section 1, 2 Bays
Applicable Bays : 01, 14, 15, 27

CT1 Core - 1 :

Purpose	=	Overcurrent Protection (Metering is in-built function of numerical relay)
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	5P10
iii. Rct (secondary) at 75°C	=	- Ohms
iv. Knee Point Voltage	≥	- V
v. Magnetising current at KpV	<	- mA
vi. Burden	=	Sum Burden of Transducer , Numerical relay
Current transducer (Phase)	≤	3 VA
Numerical Relay	≤	1 VA
Lead burden	≤	1 VA
Total burden	≤	5 VA
Selected burden	=	15 VA

CT1 Core - 2 & CT2 Core-1

Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	2If*(Rct + RL) (typical)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV min	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA

V. Outgoing Transformer Feeders : 66/11.5kV kV Transformer TR9403 , TR9404, TR9401 , TR9402, Spare Feeder
Applicable bay numbers : 10, 19, 02, 16, 03.

MVA of Transformer	=	60 MVA
Percentage Impedance	=	12.5 % ± 10 %
Load Current	=	524.88 A
Fault Current (Primary)	=	4665.59 A

I. Core - 1 :

Purpose	=	Transf. Diff. Protn. 87T (BHEL Scope)
i. Current Ratio	=	600 /1A (600 -300/1A)
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage for 87 protn.	≥	0.14(If*X/R)*(Rct + RL) (typical)
Fault Current (secondary) If	=	7.78 A
X/R for 60MVA trafo(Approx)	≤	35
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	38 *(Rct + 1)
Selected KpV	=	50 Rct +200 V
Minimum KpV at each tap	=	600V-400V
v. Magnetising current at KpV	<	60 mA Typical for Diff. Relay
	=	-

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Core - 2 :

Purpose	=	Overcurrent Protection (Metering is in-built function of numerical relay)
i. Current Ratio	=	600 /1A (600 -300/1A)
ii. Protection Class	=	5P10
iii. Rct (secondary) at 75°C	=	- Ohms
iv. Knee Point Voltage	≥	- V
v. Magnetising current at KpV/2	<	- mA
vi. Burden	=	Sum Burden of Transducer , Numerical relay
Current transducer (Phase)	≤	3 VA
Numerical Relay	≤	1 VA
Lead burden	≤	1 VA
Total burden	≤	5 VA
Selected burden	=	15 VA

Core - 3 :

Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	2*If*(Rct + RL) (typical)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV min	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA

VI. Outgoing Transformer Feeders : a)TR-8301 SS-83 (CDU/VDU) b)TR-8302 SS-83 (CDU/VDU) c)TR01 SS-90(HCU) d)TR02 SS-90(HCU) e)Spare Applicable bay numbers : 05 , 17 , 13, 23 & 24

MVA of Transformer	=	31 MVA (Tentative load)
Percentage Impedance	=	12.5 % ± 10 %
Load Current	=	271.19 A
Fault Current (Primary)	=	2410.56 A

I. Core - 1 :

Core-1 Purpose	=	Feeder Diff. Protn. 87F (BHEL Scope)
i. Current Ratio	=	300 /1A 600- 300 /1A)
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage for Feeder Diff	≥	65* In*(Rct + 2RL)
Fault Current (secondary) If	=	8.04 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	65 *(Rct + 2)
Selected KpV	=	70Rct +150 V
Minimum KpV at each tap	=	600V-400V
v. Magnetising current at KpV	<	60 mA Typical for Diff. Relay
vi. Burden	=	-



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Signature with Date **25-APR-2018**
 Name of Reviewer **SAI ACHUTUNI (A738)**
 Transmittal No. _____

Core - 2 :

Purpose	=	Overcurrent Protection (Metering is in-built function of numerical relay)
i. Current Ratio	=	300 /1A (600- 300 /1A)
ii. Protection Class	=	5P10
iii. Rct (secondary) at 75°C	=	- Ohms
iv. Knee Point Voltage	≥	- V
v. Magnetising current at KpV	<	- mA
vi. Burden	=	Sum Burden of Transducer , Numerical relay
Current transducer (Phase)	≤	3 VA
Numerical Relay	≤	1 VA
Lead burden	≤	1 VA
Total burden	≤	5 VA
Selected burden	=	15 VA

Core - 3 :

Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	2*If*(Rct + RL) (typical)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA



DOCUMENT REVIEW DETAILS

- ☐ 1 No Comments.
- ☒ 2 Proceed with manufacture / fabrication as per the commented document. Revised document required.
- ☐ 3 Document does not conform to basic requirements as marked. Resubmit for review.
- ☐ R Retained for Records. ☐ V Void.

Signature with Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No. _____

VII. Outgoing Transformer Feeders : a)TR-8201 SS-82 (HCU) b)TR-8202 SS-82 (HCU) c)TR-8601 in SS-86(CT) d)TR-8602 in SS-86(CT) e)TR-8401 SS-84 (RUF) f)TR-8402 SS-84 (RUF) g) Spare & Future feeders

Applicable bay numbers : 08, 20, 11, 06, 25 & 21

MVA of Transformer	=	50 MVA	(Tentative load)
Percentage Impedance	=	12.5 % ±	10
Load Current	=	437.40 A	
Fault Current (Primary)	=	3887.99 A	

I. Core - 1 :

Core-1	Purpose	=	Feeder Diff. Protn. 87F	(BHEL Scope)
--------	---------	---	-------------------------	--------------

i. Current Ratio	=	600 /1A	(600-300/1A)
ii. Protection Class	=	PS	
iii. Rct (secondary) at 75°C	=	CT manufacturer specific	
iv. Knee Point Voltage for 87F protn.	≥	65* In*(Rct + 2RL)	(typical)
Fault Current (secondary) If	=	6.48 A	
Rated secondary current In	=	1 A	
RL	=	1 Ohms	
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)			
KpV (min)	=	65 *(Rct + 2)	
Selected KpV	=	70 Rct +150 V	
Minimum KpV at each tap	=	600V-400V	
v. Magnetising current at KpV	<	30 mA	Typical for Diff. Relay
vi. Burden	=	-	

Core - 2 :

Purpose	=	Overcurrent Protection	(Metering is in-built function of numerical relay)
---------	---	------------------------	---

i. Current Ratio	=	600 /1A	(600-300/1A)
ii. Protection Class	=	5P10	
iii. Rct (secondary) at 75°C	=	- Ohms	
iv. Knee Point Voltage	≥	- V	
v. Magnetising current at KpV	<	- mA	
vi. Burden	=	Sum Burden of Transducer , Numerical relay	
Current transducer (Phase)	≤	3 VA	
Numerical Relay	≤	1 VA	
Lead burden	≤	1 VA	
Total burden	≤	5 VA	
Selected burden	=	15 VA	

Core - 3 :

Purpose	=	Busbar Differential Protection	
---------	---	--------------------------------	--

i. Current Ratio	=	2500 /1A	
ii. Protection Class	=	PS	
iii. Rct (secondary) at 75°C	=	CT manufacturer specific	
iv. Knee Point Voltage	≥	2*If*(Rct + RL)	(typical)
Fault Current (Secondary)	=	40000 A	(Bus Fault Level)
RL	=	16 A	
	=	1 Ohms	
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)			
	=	32 (Rct + 1)	
Selected KpV min	=	50Rct +200 V	
Minimum KpV at each tap	=	2500V	



DOCUMENT REVIEW DETAILS

☐ No Comments.

☒ Proceed with manufacture / fabrication as per the commented document. Revised document required.

☐ Document does not conform to basic requirements as marked. Resubmit for review.

☐ Retained for Records.

Signature with Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No. _____

v. Magnetising current at KpV	<	30 mA	Typical for Diff. Relay
vi. Burden	=	-	VA

VIII. Outgoing Feeders : To Large Motors in SS-84 (RUF)
Applicable bay numbers : 07, 26

MVA of Transformer feeding Motor load	=	50 MVA	(Tentative load)
Percentage Impedance	=	12.5 % ±	10
Load Current	=	437.40 A	
Fault Current (Primary)	=	3887.99 A	
I. Core-1 Purpose	=	Feeder Diff. Protn. 87F	(BHEL Scope)
i. Current Ratio	=	600 /1A	(600-300/1A)
ii. Protection Class	=	PS	
iii. Rct (secondary) at 75°C	=	CT manufacturer specific	
iv. Knee Point Voltage for 87F protn.	≥	65* In*(Rct + 2RL)	(typical)
Fault Current (secondary) If	=	6.48 A	
RL	=	1 Ohms	
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)			
KpV (min)	=	65 *(Rct + 2)	
Selected KpV	=	70 Rct +150 V	
Minimum KpV at each tap	=	600V-400V	
v. Magnetising current at KpV	<	30 mA	Typical for Diff. Relay
vi. Burden	=	-	

Core - 2 :

Purpose	=	Overcurrent Protection	(Metering is in-built function of numerical relay)
i. Current Ratio	=	600 /1A	(600-300/1A)
ii. Protection Class	=	5P10	
iii. Rct (secondary) at 75°C	=	- Ohms	
iv. Knee Point Voltage	≥	- V	
v. Magnetising current at KpV	<	- mA	
vi. Burden	=	Sum Burden of Transducer , Numerical relay	
Current transducer (Phase)	≤	3 VA	
Numerical Relay	≤	1 VA	
Lead burden	≤	1 VA	
Total burden	≤	5 VA	
Selected burden	=	15 VA	



DOCUMENT REVIEW DETAILS

- ☐ 1 No Comments.
- ☒ 2 Proceed with manufacture / fabrication as per the commented document. Revised document required.
- ☐ 3 Document does not conform to basic requirements as marked. Resubmit for review.
- ☐ R Retained for Records. ☐ V Void.

Signature with Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No. _____

Core - 3 :

Purpose	=	Busbar Differential Protection
i. Current Ratio	=	2500 /1A
ii. Protection Class	=	PS
iii. Rct (secondary) at 75°C	=	CT manufacturer specific
iv. Knee Point Voltage	≥	2*I _f *(Rct + RL) (typical)
Fault Current (Primary)	=	40000 A (Bus Fault Level)
Fault Current (Secondary)	=	16 A
RL	=	1 Ohms
(considering 100m from CT to Relay & Considering 7.41Ohms /km of the Control Cable resistance)		
KpV (min)	=	32 (Rct + 1)
Selected KpV	=	50Rct +200 V
Minimum KpV at each tap	=	2500V
v. Magnetising current at KpV	<	30 mA Typical for Diff. Relay
vi. Burden	=	- VA

VT Selection Criteria

I Applicable for a) Bus 1 , Bus 2 , Bus 1A, Bus 2A PT b) PT for bays 04, 09, 12 , 18 , 22

SECONDARY - 1

Purpose	=	Protection
i. Voltage Ratio	=	66kV/√3 / 110V/√3
ii. Accuracy Class	=	3P
iii. Burden	=	
Main Protection relay burden	≤	2 VA
Lead burden	≤	2 VA
Total burden	≤	4 VA
Selected burden	=	50 VA

SECONDARY -2

Purpose	=	Metering
i. Voltage Ratio	=	66kV/√3 / 110V/√3
ii. Accuracy Class	=	1
iii. Burden	=	

BCU/Numerical relay burden	≤	2 VA	
Synchronizing Burden	≤	20 VA	(Only during synch)
Lead burden	≤	2 VA	
Total burden	≤	24 VA	
Selected burden	=	100 VA	



DOCUMENT REVIEW DETAILS

- ☐ 1 No Comments.
- ☒ 2 Proceed with manufacture / fabrication as per the commented document. Revised document required.
- ☐ 3 Document does not conform to basic requirements as marked. Resubmit for review.
- ☐ R Retained for Records. ☐ V Void.

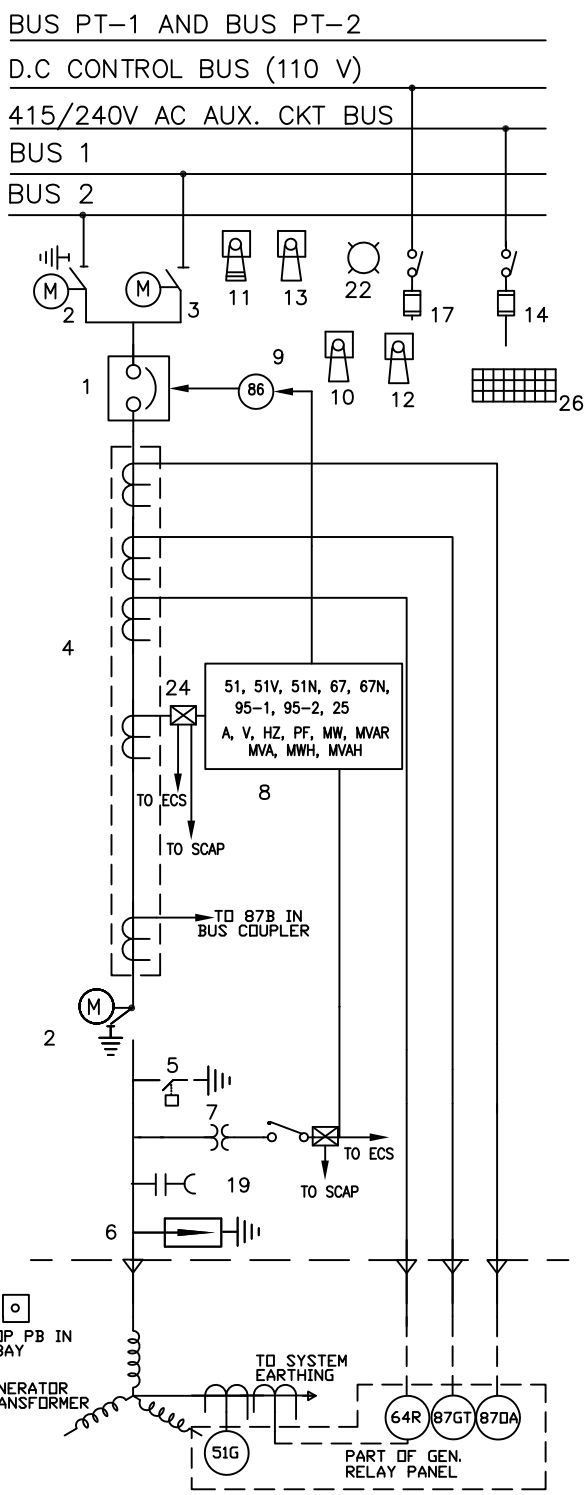
Signature with Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No. _____

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PROJECT: VRMP	REV	DATE	PURPOSE	BY	CHKD	APPRV
CLIENT: M/s HPCL	A	19.05.17	ISSUED WITH TENDER	NNB	AS	PG



EQUIPMENT DATA

ITEM NO	NEMA NO.	QTY	DESCRIPTION
1	52	1	SF6 CIRCUIT BREAKER
2	---	2	3 POSN. DISCONNECTOR EARTHING SWITCH- ON/ISOLATED/EARTHED
3	---	1	2 POSN. DISCONNECTOR SWITCH- ON/ISOLATED
4	---	3	CORE-1 FOR 870A CLASS PS
			CORE-2 FOR 87GT CLASS PS
			CORE-3 FOR 64R CLASS PS
			CORE-4 CLASS-5P10
			CORE-5 FOR 87B CLASS PS
5	---	1	HIGH SPEED MAKE PROOF EARTHING SWITCH
6	---	1	SURGE ARRESTOR
7	---	1	PT EHV/3/110/3, CL 1 WITH 4 POLE MCB
8	67	1	DIRECTIONAL IDMTL O/C RELAY
	51N		IDMTL E/F RELAY (10-40%)
	25		SYNCHRONISING CHECK RELAY
	95-1, 95-2		TRIP CIRCUIT SUPERVISION RELAY
	67N		DIRECTIONAL IDMTL E/F RELAY
	51V		VOLTAGE RESTRAINED OVERCURRENT RELAY
	51		IDMTL O/C RELAY (50-200%)
			METERING AS INDICATED
9	86	1	TRIPPING RELAY
10	---	1	UPSTREAM BREAKER TRIP SWITCH(2 POSITION)(STAYPUT & LOCKABLE)
11	---	4	CONTROL SWITCH FOR DISCONNECTORS & EARTH SWITCHES
12	---	1	LOCAL/OFF/REMOTE SELECTOR SWITCH
13	52C/S	1	BREAKER CONTROL SWITCH (TNC) CLOSE-NEUTRAL-TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
14	---	2	MV POWER SUPPLY SWITCH FUSE FOR LCC & CRP
15	---	2	CUBICLE LAMP WITH MCB, DOOR SWITCH FOR LCC & CRP
16	---	2	3 PIN SOCKET WITH TOGGLE SWITCH FOR LCC & CRP
17	---	2	D.P. SWITCH 10 A WITH FUSE FOR D.C. CONTROL SUPPLY FOR LCC & CRP
18	---	1	SOCKET AT PANEL BACK FOR CABLE TESTING,CURRENT & VOLTAGE INJECTION
19	---	1	CAPACITIVE VOLTAGE DETECTOR
20	AS REQD.		SF6 GAS MONITORING, ALARMS AND INDICATIONS
21	AS REQD.		CLUSTER LED TYPE INDICATION LAMP
22	AS REQD.		AUXILIARY RELAY
24	AS REQD.		TRANSDUCERS, AS REQUIRED FOR SCAP & ECS INTERFACE
25	---	2	PANEL SPACE HEATER WITH THERMOSTAT FOR LCC & CRP
26	AS REQD.		WINDOW ALARM ANNUNCIATIONS
27	AS REQD.		STARTERS FOR MOTORS OF CB, DISCONNECTOR & EARTH SWITCH
28	AS REQD.		INTERCONNECTING ARMoured CABLE BETWEEN GIS, LCC & CRP

- NOTES:
1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
 2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN JOB SPECIFICATION SHALL BE IN VENDOR'S DATA SHEET.
 3. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A PART OF NUMERICAL RELAY.
 4. VA BURDEN OF CT & PT SHALL BE DECIDED BY THE SWITCHER VENDOR CONSIDERING VA BURDEN REQUIREMENTS FOR OWNER'S EQUIPMENTS AS WELL.
 5. TYPE OF RELAYS SHALL BE NUMERICAL RELAYS OR BAY CONTROL UNIT AS SPECIFIED IN DATA SHEET.

6. MIMIC DIAGRAM FOR OPERATION AND STATUS INDICATION OF CIRCUIT BREAKER AND ASSOCIATED DISCONNECTORS & EARTH SWITCH SHALL BE PROVIDED ON LCC & CRP. THIS SHALL BE IN ADDITION TO MIMIC PROVIDED IN RELAY/BCU.
7. THE COMPONENTS & EQUIPMENTS TO BE LOCATED ON GIS, LCC & CRP RESPECTIVELY SHALL BE AS SPECIFIED IN THE STANDARD SPECIFICATION.

R1 PART OF NUMERICAL RELAY-1

DOCUMENT REVIEW DETAILS

1	Design	Checked
2	Drawings	Checked
3	Comments	Checked
4	Approved	Checked
5	Retained for Records	Checked

Signature With Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmitted To **ENGINEERS INDIA LIMITED**

NEW DELHI

EHV GIS DATA SHEET	DATA SHEET	REV
	B016-606-16-50-DS-1029	A
HARDWARE DATASHEET FOR INCOMER FROM GENERATOR TRANSFORMER	Sht.1 OF 6	

REV	DATE	PURPOSE	BY	CHKD	APPRV
A	19.04.17	ISSUED WITH TENDER	NNB	AS	PG

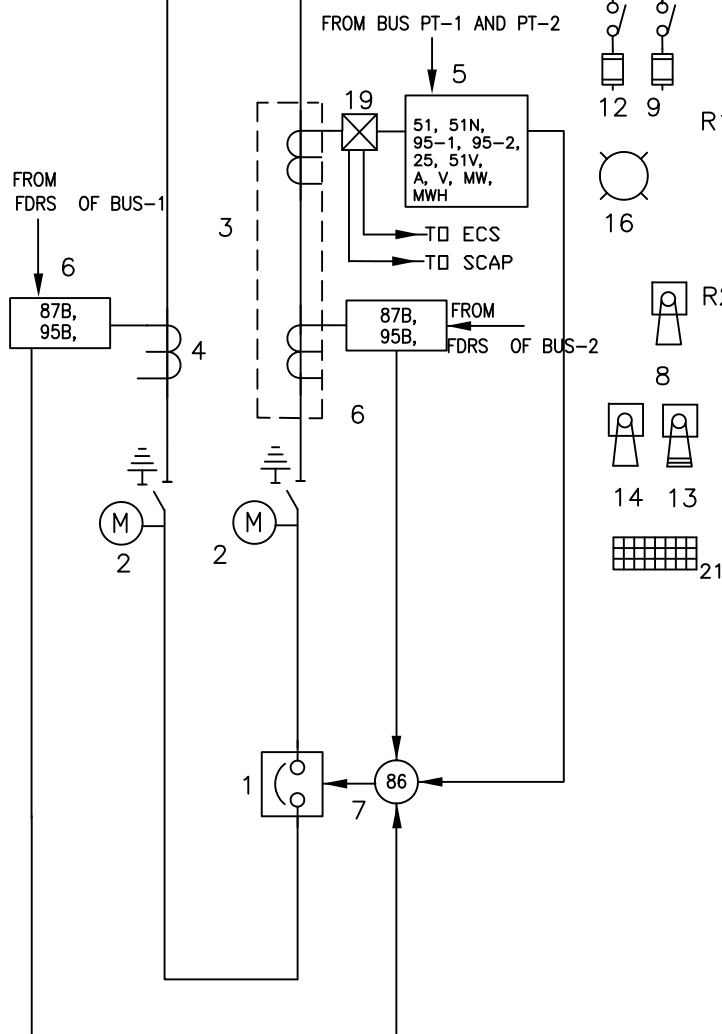
BUS PT-1 AND BUS PT-2

D.C. CONTROL BUS

415/240V AC AUX. CKT BUS

BUS 1

BUS 2



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY	DESCRIPTION
1	52	1	SF6 CIRCUIT BREAKER
2	--	2	3 POSN. DISCONNECTOR EARTHING SWITCH -ON/ ISOLATED/ EARTHED
3	--	3	CORE-1 CLASS-5P10
0		0	CORE-2 FOR 87B CLASS PS
4	--	3	CT FOR 87B CLASS PS
	25	1	SYNCHRONISING CHECK RELAY
5	51		IDMTL O/C RELAY (50-200%)
	51N		IDMTL E/F RELAY (10-40%)
	95-1, 95-2		TRIP CIRCUIT SUPERSUPERVISION RELAY
	51V		VOLTAGE RESTRAINED OVERCURRENT RELAY
			METERING AS INDICATED
6	95B	2	CT SUPERVISION RELAY
	87B		BUS DIFFERENTIAL RELAY
7	86	1	TRIPPING RELAY
8	52 C/S	1	BREAKER CONTROL SWITCH (TNC) CLOSE-NEUTRAL-TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
9	--	2	MV POWER SUPPLY SWITCH FUSE FOR LCC & CRP
10	--	2	CUBICLE LAMP WITH MCB, DOOR SWITCH FOR LCC & CRP
11	--	2	3 PIN SOCKET WITH TOGGLE SWITCH FOR LCC & CRP
12	--	2	D.P. SWITCH 10 A WITH FUSE FOR D.C. CONTROL SUPPLY FOR LCC & CRP
13	--	2	CONTROL SWITCH FOR DISCONNECTORS AND EARTH SWITCHES
14	--	1	LOCAL/ OFF/ REMOTE SELECTOR SWITCH
15	--	AS REQD.	SF6 GAS MONITORING, ALARMS AND INDICATIONS
16	--	AS REQD.	CLUSTER LED TYPE INDICATION LAMP
17	--	AS REQD.	AUXILIARY RELAY
19	--	AS REQD.	TRANSDUCERS, AS REQUIRED FOR SCAP & ECS INTERFACE
20	--	2	PANEL SPACE HEATER WITH THERMOSTAT FOR LCC & CRP
21	--	AS REQD.	WINDOW ALARM ANNUNCIATIONS
22	--	AS REQD.	STARTERS FOR MOTORS OF CB, DISCONNECTOR & EARTH SWITCH
23	--	AS REQD.	INTERCONNECTING ARMoured CABLE BETWEEN GIS, LCC & CRP

R1 ☐ PART OF NUMERICAL RELAY-1

R2 ☐ PART OF NUMERICAL RELAY-2

FOR BUS SECTIONALIZER:
READ BUS 1 = BUS 1A AND
BUS 2 = BUS 1B

NOTES:

1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN JOB SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
3. ~~ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A PART OF~~

NUMERICAL RELAY

4. VA BURDEN OF CT & PT SHALL BE DECIDED BY THE SWITCHBOARD VENDOR CONSIDERING VA BURDEN REQUIREMENTS FOR OWNER'S EQUIPMENTS AS WELL.
5. TYPE OF RELAYS SHALL BE NUMERICAL RELAYS OR BAY CONTROL UNIT AS SPECIFIED IN DATASHEET.
6. MIMIC DIAGRAM FOR OPERATION AND STATUS INDICATION OF CIRCUIT BREAKER AND ASSOCIATED SWITCH SHALL BE PROVIDED ON LCC & CRP. THIS SHALL BE IN ADDITION TO MIMIC PROVIDED IN RELAY/BCU.
7. RESULTANT COMPONENTS & EQUIPMENTS TO BE LOCATED ON GIS, LCC & CRP RESPECTIVELY SHALL BE AS SPECIFIED IN THE STANDARD SPECIFICATION.

~~25-APR-2018~~

SAI ACHUTUNI (A738)

ENGINEERS INDIA LIMITED
NEW DELHI

EHV GIS DATA SHEET

HARDWARE DATASHEET FOR BUS COUPLER/ BUS SECTIONALIZER

DATA SHEET

REV

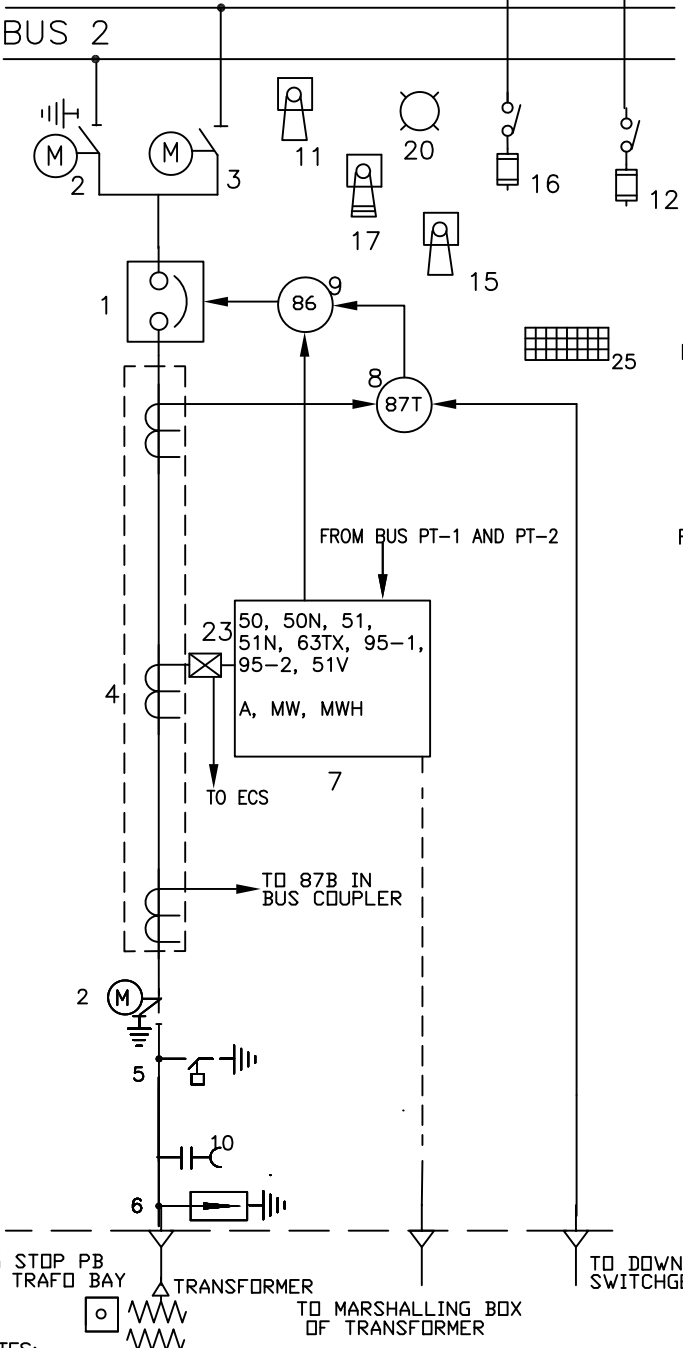
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Sht.3 OF 6

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PROJECT: VRMP	REV	DATE	PURPOSE	BY	CHKD	APPRV
CLIENT: M/s HPCL	A	19.05.17	ISSUED WITH TENDER	NNB	AS	PG

BUS PT-1 AND BUS PT-2
D.C CONTROL BUS
415/240V AC AUX. CKT BUS
BUS 1
BUS 2



EQUIPMENT DATA			
ITEM NO.	NEMA NO.	QTY	DESCRIPTION
1	52	1	SP6 CIRCUIT BREAKER
2	--	2	3 POSN. DISCONNECTOR EARTHING SWITCH - ON/ISOLATED/EARTHED
3	--	1	2 POSN. DISCONNECTOR SWITCH - ON/ISOLATED
4	--	3	CORE-1 C.T. FOR 87T CLASS PS
			CORE-2 C.T CLASS-5P10
0			CORE-3 C.T. FOR 87B CLASS PS
5	--	1	HIGH SPEED MAKE PROOF EARTHING SWITCH
6	--	1	SURGE ARRESTOR
7	51N	1	IDMTL E/F RELAY (10-40%)
	50		INSTANTANEOUS O/C RELAY
	50N		INSTANTANEOUS E/F RELAY
	51		IDMTL O/C RELAY (50-200%)
	51V		VOLTAGE RESTRAINED RELAY
	95-1, 95-2		TRIP CIRCUIT SUPERSUPERVISION RELAY
	63TX		AUXILIARY TRANSFORMER PROTECTION RELAY
			METERING AS INDICATED
8	87T	1	TRANSFORMER DIFFERENTIAL RELAY
9	86	1	TRIPPING RELAY
10	--	1	CAPACITIVE VOLTAGE DETECTOR
11	52 C/S	1	BREAKER CONTROL SWITCH (TNC) CLOSE-NEUTRAL-TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
12	--	2	MV POWER SUPPLY SWITCH FUSE FOR LCC & CRP
13	--	2	CUBICLE LAMP WITH MCB, DOOR SWITCH FOR LCC & CRP
14	--	2	3 PIN SOCKET WITH TOGGLE SWITCH FOR LCC & CRP
15	--	1	LOCAL /OFF/REMOTE SELECTOR SWITCH
16	--	2	D.P. SWITCH 10 A WITH FUSE FOR D.C. CONTROL SUPPLY FOR LCC & CRP
17	--	4	CONTROL SWITCH FOR DISCONNECTORS AND EARTH SWITCHES
18	--	1	SOCKET AT PANEL BACK FOR CABLE TESTING,CURRENT & VOLTAGE INJECTION
19	--	AS REQD.	SP6 GAS MONITORING, ALARMS AND INDICATIONS
20	--	AS REQD.	CLUSTER LED TYPE INDICATION LAMP
21	--	AS REQD.	AUXILIARY RELAY
23	--	AS REQD.	TRANSDUCERS, AS REQUIRED FOR ECS INTERFACE
24	--	2	PANEL SPACE HEATER WITH THERMOSTAT FOR LCC & CRP
25	--	AS REQD.	WINDOW ALARM ANNUNCIATIONS
26	--	AS REQD.	STARTERS FOR MOTORS OF CB, DISCONNECTOR & EARTH SWITCH
27	--	AS REQD.	INTERCONNECTING ARMoured CABLE BETWEEN GIS, LCC & CRP

- NOTES:
1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
 2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN JOB SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
 3. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A
 4. VA BURDEN OF CT & PT SHALL BE DECIDED BY THE SWITCHGEAR VENDOR CONSIDERING VA BURDEN REQUIREMENTS FOR OWNER'S EQUIPMENTS AS WELL.
 5. TYPE OF RELAYS SHALL BE NUMERICAL RELAYS OR BAY CONTROL UNIT AS SPECIFIED IN DATA
 6. MANUFACTURE / fabrication as per the commented documents. Revised documents required.
 7. ADDITION TO EMIC PROVIDED IN RELAY/BCU.
 8. THE COMPONENTS & EQUIPMENTS TO BE LOCATED ON GIS, LCC & CRP RESPECTIVELY SHALL BE AS SPECIFIED IN THE STANDARD SPECIFICATION.

R1 ☐ PART OF NUMERICAL RELAY-1
R2 ☐ PART OF NUMERICAL RELAY-2

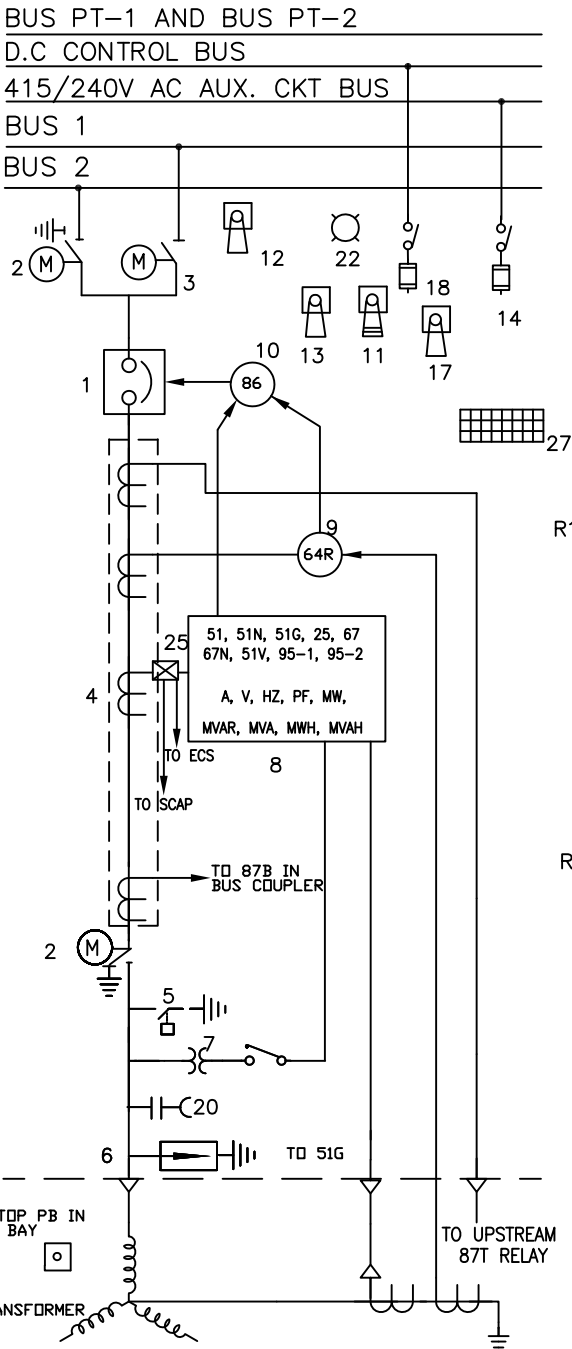
Signature With Date **25-APR-2018**
Name of Reviewer **SAI ACHUTUNI (A738)**
Transmitted To **ENGINEERS INDIA LIMITED**
NEW DELHI

EHV GIS DATASHEET
HARDWARE DATASHEET FOR OUTGOING
TRANSFORMER FEEDER

DATA SHEET	REV
B016-606-16-50-DS-1029	A
Sht.4 OF 6	

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PROJECT: VRMP	REV	DATE	PURPOSE	BY	CHKD	APPRV
CLIENT: M/s HPCL	A	19.05.17	ISSUED WITH TENDER	NNB	AS	PG



EQUIPMENT DATA

ITEM NO	NEMA NO.	QTY	DESCRIPTION
1	52	1	SF6 CIRCUIT BREAKER
2	--	2	3 POSN. DISCONNECTOR EARTHING SWITCH- ON/ISOLATED/EARTHED
3	--	1	2 POSN. DISCONNECTOR SWITCH- ON/ISOLATED
4	--	3	CORE-1 FOR 87T CLASS PS
			CORE-2 FOR 64R CLASS PS
			CORE-3 CLASS-5P10
			CORE-4 FOR 87B CLASS PS
5	--	1	HIGH SPEED MAKE PROOF EARTHING SWITCH
6	--	1	SURGE ARRESTOR
7	--	1	PT EHV/√3/110/√3, CL 1 WITH 4 POLE MCB
8	67	1	DIRECTIONAL IDMTL O/C RELAY
	51N		IDMTL E/F RELAY (10-40%)
	51G		IDMTL E/F RELAY (BACK UP)(20-40%)
	25		SYNCHRONISING CHECK RELAY
	95-1, 95-2		TRIP CIRCUIT SUPERVISION RELAY
	67N		DIRECTIONAL IDMTL E/F RELAY
	51V		VOLTAGE RESTRAINED OVERCURRENT RELAY
	51		IDMTL O/C RELAY (50-200%)
			METERING AS INDICATED
9	64R	1	RESTRICTED E/F RELAY
10	86	1	TRIPPING RELAY
11	--	4	CONTROL SWITCHES FOR DISCONNECTORS & EARTH SWITCHES
12	52C/S	1	BREAKER CONTROL SWITCH (TNC) CLOSE-NEUTRAL-TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
13	--	1	UPSTREAM BREAKER TRIP SWITCH(2 POSITION)(STAYPUT & LOCKABLE)
14	--	2	MV POWER SUPPLY SWITCH FUSE FOR LCC & CRP
15	--	2	CUBICLE LAMP WITH MCB, DOOR SWITCH FOR LCC & CRP
16	--	2	3 PIN SOCKET WITH TOGGLE SWITCH FOR LCC & CRP
17	--	1	LOCAL/OFF/REMOTE SELECTOR SWITCH
18	--	2	D.P. SWITCH 10 A WITH FUSE FOR D.C. CONTROL SUPPLY FOR LCC & CRP
19	--	1	SOCKET AT PANEL BACK FOR CABLE TESTING,CURRENT & VOLTAGE INJECTION
20	--	1	CAPACITIVE VOLTAGE DETECTOR
21	--	AS REQD.	SF6 GAS MONITORING, ALARMS AND INDICATIONS
22	--	AS REQD.	CLUSTER LED TYPE INDICATION LAMP
23	--	AS REQD.	AUXILIARY RELAY
25	--	AS REQD.	TRANSDUCERS, AS REQUIRED FOR SCAP & ECS INTERFACE
26	--	2	PANEL SPACE HEATER WITH THERMOSTAT FOR LCC & CRP
27	--	AS REQD.	WINDOW ALARM ANNUNCIATIONS
28	--	AS REQD.	STARTERS FOR MOTORS OF CB, DISCONNECTOR & EARTH SWITCH
29	--	AS REQD.	INTERCONNECTING ARMoured CABLE BETWEEN GIS, LCC & CRP

- NOTES:
1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
 2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN JOB SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
 3. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A PART OF NUMERICAL RELAY.
 4. VA BURDEN OF CT & PT SHALL BE DECIDED BY THE SWITCHGEAR VENDOR CONSIDERING VA BURDEN REQUIREMENTS FOR OWNER'S EQUIPMENTS AS WELL.
 5. TYPE OF RELAYS SHALL BE NUMERICAL RELAYS OR BAY CONTROL UNIT AS SPECIFIED IN DATA SHEET.
- DOCUMENT REVIEW DETAILS
- | | | | |
|---|-----------|-------------|---------------------|
| 1 | Design | 25-APR-2016 | SAI ACHUTUNI (A738) |
| 2 | Reviewed | | |
| 3 | Approved | | |
| 4 | Checked | | |
| 5 | Confirmed | | |
| 6 | Finalized | | |
- Signature With Date: 25-APR-2016
- Name of Reviewer: SAI ACHUTUNI (A738)
- Transmitted To: ENGINEERS INDIA LIMITED, NEW DELHI

EHV GIS DATA SHEET

DATA SHEET	REV
B016-000-16-50-DS-1029	A
Sht.5 OF 6	

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PROJECT: VRMP	REV	DATE	PURPOSE	BY	CHKD	APPRV
CLIENT: M/s HPCL	A	19.05.17	ISSUED WITH TENDER	NNB	AS	PG

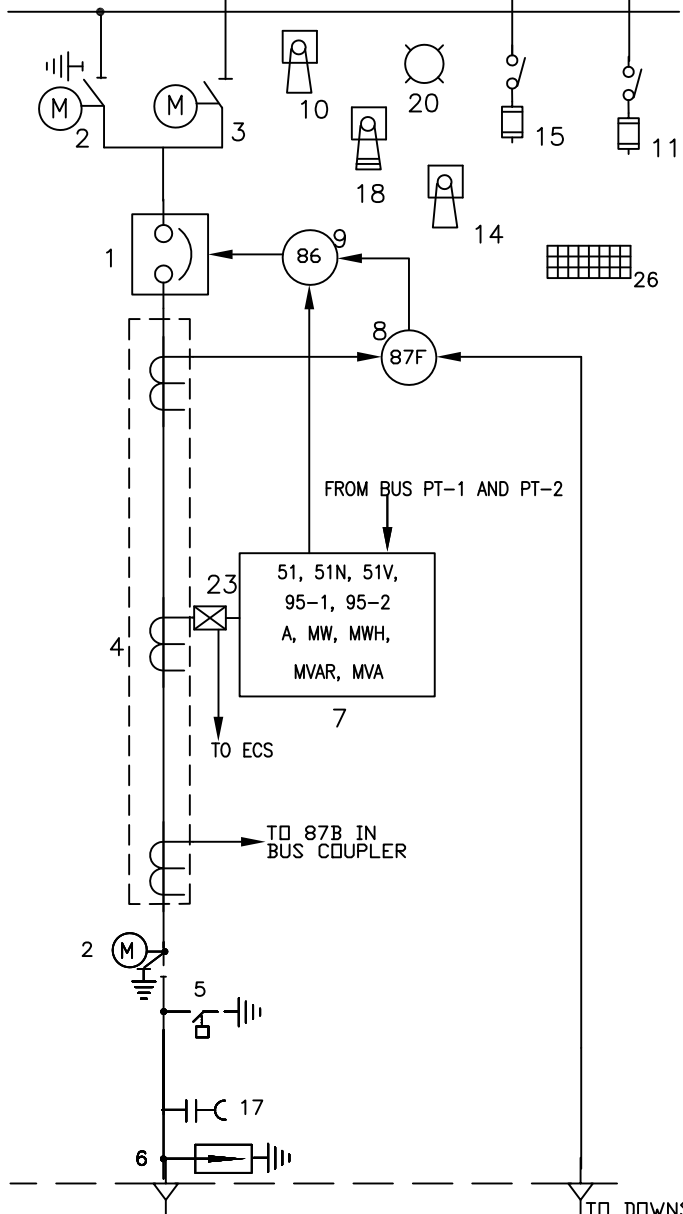
BUS PT-1 AND BUS PT-2

D.C CONTROL BUS

415/240V AC AUX. CKT BUS

BUS 1

BUS 2



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY	DESCRIPTION
1	52	1	SF6 CIRCUIT BREAKER
2	--	2	3 POSN. DISCONNECTOR EARTHING SWITCH- ON/ISOLATED/EARTHED
3	--	1	2 POSN. DISCONNECTOR SWITCH- ON/ISOLATED
4	--	3	CORE-1 C.T. FOR 87F CLASS PS
			CORE-2 C.T CLASS-5P10
0			CORE-3 C.T. FOR 87B CLASS PS
5		1	HIGH SPEED MAKE PROOF EARTHING SWITCH
6		1	SURGE ARRESTOR
7	51	1	IDMTL O/C RELAY (50-200%)
	51N		IDMTL E/F RELAY (10-40%)
	51V		VOLTAGE RESTRAINED OVERCURRENT RELAY
	95-1, 95-2		TRIP CIRCUIT SUPERSUPERVISION RELAY
			METERING AS INDICATED
8	87	AS REQD	FEEDER DIFFERENTIAL RELAY SUITABLE FOR FO CABLE (REFER NOTE-4)
9	86	1	TRIPPING RELAY
10	52 C/S	1	BREAKER CONTROL SWITCH (TNC) CLOSE-NEUTRAL-TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
11	--	2	MV POWER SUPPLY SWITCH FUSE FOR LCC & CRP
12	--	2	CUBICLE LAMP WITH MCB, DOOR SWITCH FOR LCC & CRP
13	--	2	3 PIN SOCKET WITH TOGGLE SWITCH FOR LCC & CRP
14	--	1	LOCAL /OFF/REMOTE SELECTOR SWITCH
15	--	2	D.P. SWITCH 10 A WITH FUSE FOR D.C. CONTROL SUPPLY FOR LCC & CRP
16	--	1	SOCKET AT PANEL BACK FOR CABLE TESTING,CURRENT & VOLTAGE INJECTION
17	--	1	CAPACITIVE VOLTAGE DETECTOR
18	--	4	CONTROL SWITCH FOR DISCONNECTORS AND EARTH SWITCHES
19	--	AS REQD.	SF6 GAS MONITORING, ALARMS AND INDICATIONS
20	--	AS REQD.	CLUSTER LED TYPE INDICATION LAMP
21	--	AS REQD.	AUXILIARY RELAY
23	--	AS REQD.	TRANSDUCERS, AS REQUIRED FOR ECS INTERFACE
24	--	AS REQD.	LIU FOR TERMINATION OF FO CABLE
25	--	2	PANEL SPACE HEATER WITH THERMOSTAT FOR LCC & CRP
26	--	AS REQD.	WINDOW ALARM ANNUNCIATIONS
27	--	AS REQD.	STARTERS FOR MOTORS OF CB, DISCONNECTOR & EARTH SWITCH
28	--	AS REQD.	INTERCONNECTING ARMOURED CABLE BETWEEN GIS, LCC & CRP

NOTES:

1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN JOB SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
3. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE OF APPROVED MAKES. METERING SHALL BE A PART OF NUMERICAL RELAY.
4. SCOPE OF SUPPLY OF 87F RELAYS FOR THIS FEEDER AND DOWNSTREAM FEEDER SHALL BE AS SPECIFIED IN JOB SPECIFICATION/DATASHEET.
5. BURDEN REQUIREMENTS FOR OWNER'S EQUIPMENTS AS WELL.
6. TYPE OF RELAYS SHALL BE NUMERICAL RELAY OR BAY CONTROL UNIT AS SPECIFIED IN DATASHEET.
7. MIMIC DIAGRAM FOR OPERATION AND STATUS INDICATION OF CIRCUIT BREAKER AND ASSOCIATED DISCONNECTOR, EARTHING SWITCH AND EARTH SWITCH SHALL BE PROVIDED ON LCC & CRP. THIS SHALL BE IN ADDITION TO MIMIC PROVIDED IN RELAY/BCU.
8. DISCONNECTOR AND EARTHING SWITCH TO BE LOCATED ON GIS, LCC & CRP RESPECTIVELY SHALL BE AS SPECIFIED IN THE STANDARD SPECIFICATION.

R1 ☐ PART OF NUMERICAL RELAY-1
R2 ☐ PART OF NUMERICAL RELAY-2

DOCUMENT REVIEW DETAILS

1	Desig.	Not Comments
2	Checked with Designation	Not Comments
3	Reviewed with Designation	Not Comments
4	Approved with Designation	Not Comments
5	Retained for Records.	Not Comments

Signature With Date **25-APR-2018**
Name of Reviewer **SAI ACHUTUNI (A738)**
Transmitted To **ENGINEERS INDIA LIMITED**
NEW DELHI

EHV GIS DATASHEET
HARDWARE DATASHEET FOR
OUTGOING PLANT FEEDER

DATA SHEET	REV
B016-606-16-50-DS-1029	A
Sht.6 OF 6	

Date: 19.03.18

66kV GIS Outgoing feeders			
Sr No	Feeder description	Tentative rating of down stream load	Tentative Normal load
1	To SS-82 66kV FDR-1 (FCHCU)	50MVA	16.5 MW
2	To SS-82 66kV FDR-2 (FCHCU)	50MVA	16.5 MW
3	To SS-83 66kV FDR-1 (SS-83 CDU-IV)	31MVA	8MW
4	To SS-83 66kV FDR-2 (SS-83 CDU-IV)	31MVA	8MW
5	To SS-84 66kV FDR-1 (SS-84 RUF)	50MVA	15MW
6	To SS-84 66kV FDR-2 (SS-84 RUF)	50MVA	15MW
7	To SS-84 66kV FDR-3 (SS-84 RUF)	50MVA	15MW
8	To SS-84 66kV FDR-4 (SS-84 RUF)	50MVA	15MW
9	To SS-86 66kV FDR-1 (SS-86 CT)	50MVA	16.5 MW
10	To SS-86 66kV FDR-2 (SS-86 CT)	50MVA	16.5 MW
11	To SS-90 66kV FDR-1 (SS-90 HGU)	31MVA	8MW
12	To SS-90 66kV FDR-2 (SS-90 HGU)	31MVA	8MW
13	SPARE		
14	SPARE		



DOCUMENT REVIEW DETAILS

- ☐ 1 No Comments.
☒ 2 Proceed with manufacture / fabrication as per the commented document. Revised document required.
☐ 3 Document does not conform to basic requirements as marked. Resubmit for review.
☐ R Retained for Records. ☐ V Void.

Signature with Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No. _____

Refer attached comment sheets



DOCUMENT REVIEW DETAILS

- ☐ 1 No Comments.
- ☒ 2 Proceed with manufacture / fabrication as per the commented document. Revised document required.
- ☐ 3 Document does not conform to basic requirements as marked. Resubmit for review.
- ☐ R Retained for Records. ☐ V Void.

Signature with Date **25-APR-2018**

Name of Reviewer **SAI ACHUTUNI (A738)**

Transmittal No. _____

COMMENT SHEET

DOC. NO.	B016		--
	JOB NO.	TR. NO.	S.NO

PROJECT: VRMP PROJECT, VIZAG
NAME OF PACKAGE: CPP package

CLIENT: M/s HPCL-Vizag
CONTRACTOR: M/s BHEL

SL. NO.	COMMENT/ OBSERVATION	RESOLUTION / ACTION
1	DRAWING / DOCUMENT TITLE : CT & VT Sizing calculations for 66kV GIS DOCUMENT NUMBER: TB-402-510-024 R 00 CATEGORY/CODE: 2	
1.1	Furnish the reason for providing multi ratio CT in generator incomers where as only one CT ratio is used (i.e., 1200A for GTG incomer and 300A for STG incomer).	
1.2	Provide Class 5P20 CTs instead of Class 5P10.	
1.3	CT knee point voltage calculation for differential and REF protection shall be updated based on formula of final selected relay model. Alternatively, worst case formula of all possible relay models shall be selected.	
1.4	It is observed that I _{mag} at knee point voltage in some cases has been indicated as 60mA and 120mA. Please note that I _{mag} shall be 30mA.	
1.5	Metering core CT (Class 0.2) shall be provided for Current input to ECS & SCAP. In case transducer is used in series with overcurrent protection relay, the same shall be clearly shown in SLD for all incomers, bussectionalizer, bus couplers and outgoing feeders.	
1.6	Sizing calculation for metrosil and stabilizing resistor shall be included.	
1.7	CT2 core in buscouplers and bus sectionalizers is indicated as spare. The same shall be indicated as busbar differential protection.	
1.8	Please note that the downstream Owner's loads are plant feeders for various substations. Accordingly 40kA through fault current shall be considered for differential protection knee point voltage. However CT ratio shall be selected as per the loading of each feeder forwarded earlier.	
1.9	Future bays shall be renamed as HGU (SS-90) as commented on overall key SLD.	
1.10	Large motors in SS-84 (RUF) shall be renamed as SS-84 feeder- 3 & Feeder-4. Downstream load shall be considered as 50MVA for CT sizing. 40kA through fault current shall be considered for differential protection Knee point voltage calculation.	

NOTE: CONTRACTOR IS OBLIGED TO FURNISH THIS SHEET (DULY FILLED UP WITH RESOLUTION TO ALL EIL COMMENTS) ALONGWITH REVISED DRAWINGS

DOCUMENT REVIEW DETAILS	
☐	No Comments.
☒	Proceed with manufacture / fabrication as per the commented document. Revised document required.
☐	Document does not conform to basic requirements as marked. Resubmit for review.
☐	Retained for Records.
☐	Void.

Comments By: SAI CHITUNI (SIGN/ DATE): 25/04/18
 Signature with Date: 25 APR 2018
 Name of Reviewer: SAI CHITUNI
 Department: Electrical
 Transmittal No. _____

ENGINEERS INDIA LIMITED, NEW DELHI

Name: SAI