

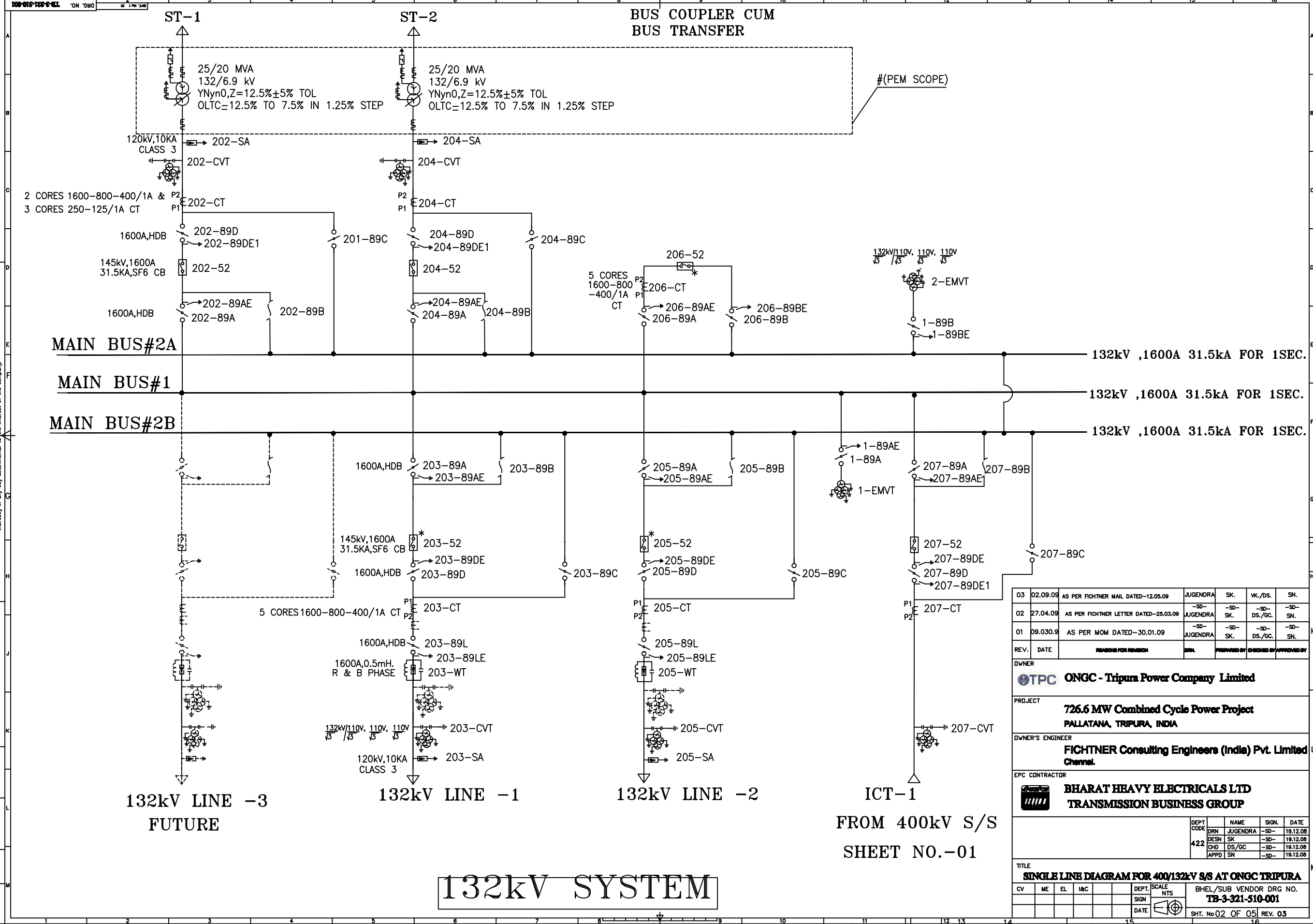


03	02.09.09	AS PER FICHTNER MAIL DATED-12.05.09	10/09/09	SK.	W./DS.	SK.
02	27.04.09	AS PER FICHTNER LETTER DATED-25.03.09	10/09/09	SK.	DS./OC.	SK.
01	09.03.09	AS PER MOM DATED-30.01.09	10/09/09	SK.	DS./OC.	SK.
REV.	DATE	REASON FOR REVISION	DATE	PREPARED BY	CHECKED BY	APPROVED BY
DWRN						
ONGC - Tripura Power Company Limited						
PROJECT						
726.6 MW Combined Cycle Power Project						
PALATKA, TRIPURA, INDIA						
DWRN'S ENGINEER						
FICHTNER Consulting Engineers (India) Pvt. Limited						
Chennai.						
EPC CONTRACTOR						
						
BHARAT HEAVY ELECTRICALS LTD						
TRANSMISSION BUSINESS GROUP						
			DEPT	NAME	SIGN.	DATE
			CODE	DRN	10/09/09	19.12.08
			DESIN	SK	10/09/09	19.12.08
			422	CHD	DS./OC	19.12.08
			APPD	SN	10/09/09	19.12.08
TITLE						
SINGLE LINE DIAGRAM FOR 400/132kV S/S AT ONGC TRIPURA						
CV	WE	EL	I&C	DEPT. SCALE	BHEL/SUB VENDOR TRIPURA	
				SIGN	TB-3-321-510-001	
				DATE	SHT. No 01 OF 05	
					REV. 03	

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INVENTORY NO. _____
DATE AND DATE _____
COMP. FILE NAME _____

FIRST ANGLE PROJECTION



03	02.09.09	AS PER FICHTNER MAIL DATED-12.05.09	JUGENDRA	SK.	VK./DS.	SN.
02	27.04.09	AS PER FICHTNER LETTER DATED-25.03.09	JUGENDRA	-SD-	-SD- DS./GC.	-SD- SN.
01	09.03.09	AS PER MOM DATED-30.01.09	JUGENDRA	-SD-	-SD- DS./GC.	-SD- SN.
REV.	DATE	REASON FOR REVISION	DRN	PREPARED BY	CHECKED BY	APPROVED BY
OWNER						
TPC ONGC - Tripura Power Company Limited						
PROJECT						
726.6 MW Combined Cycle Power Project PALLATANA, TRIPURA, INDIA						
OWNER'S ENGINEER						
FICHTNER Consulting Engineers (India) Pvt. Limited Chennai.						
EPC CONTRACTOR						
BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP						
TITLE						
SINGLE LINE DIAGRAM FOR 400/132kV S/S AT ONGC TRIPURA						
CV	ME	EL	I&C	DEPT.	SCALE	BHEL/SUB VENDOR DRG NO.
				SIGN	NTS	TB-3-321-510-001
				DATE		SHT. No 02 OF 05 REV. 03

BILL OF QUANTITY (MAIN EQUIPMENT)

S.L.	ITEM DESCRIPTION	KV	QTY.	SYMBOL
1	125 MVA, 3–PH, AUTO TRANSFORMER	400/132/33	1	
2	63MVAR, 3–PH, SHUNT LINE REACTOR ALONG WITH NGR	400	02	
3	80 MVAR, 3–PH, SHUNT BUS REACTOR	400	01	
4	2000A,3–PH ,40KA FOR 1 SEC, SPRING OPERATED SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITH CLOSING RESISTOR.	400	6	
5	2000A,3–PH ,40KA FOR 1 SEC, SPRING OPERATED SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITHOUT CLOSING RESISTOR.	400	9	
6	2000A,3–PH ,HDB ISOLATOR(ELECTRICALLY GANGED MOTOR OPERATED) WITH 1E/S (MANUALLY OPERATED).	400	31	
7	2000A,3–PH ,HDB ISOLATOR(ELECTRICALLY GANGED MOTOR OPERATED) WITH 2E/S (MANUALLY OPERATED).	400	09	
8	2000 A, 5 CORE CURRENT TRANSFORMER,1 PHASE WITH 120% EXTENDED CURRENT RATING.	400	27	
9	2000 A, 6 CORE CURRENT TRANSFORMER,1 PHASE WITH 120% EXTENDED CURRENT RATING.	400	12	
10	4400 pF CVT 1PH.	400	36	
11	SURGE ARRESTER, 1–PH. 20KA CLASS–4	360	30	
12	SURGE ARRESTER, 1–PH. 10KA CLASS–3 FOR REACTOR	120	03	
13	WAVE TRAP (2000A, 0.5mH), 1–PH	400	4	
14	1600A,3–PH ,31.5KA FOR 1 SEC, SPRING OPERATED SF6,CB. SUITABLE FOR 1ø & 3ø OPERATION	132	3	
14A	1600A,3–PH ,31.5KA FOR 1 SEC, SPRING OPERATED SF6,CB. SUITABLE FOR 3ø OPERATION	132	3	
15	1600A,3–PH ,HDB ISOLATOR(MECHANICALLY GANGED MOTOR OPERATED) WITH 1E/S (MANUALLY OPERATED).	132	15	
15A	1600A,3–PH ,HDB ISOLATOR(MECHANICALLY GANGED MOTOR OPERATED) WITH 2E/S (MANUALLY OPERATED).	132	1	
16	1600A,3–PH ,HDB ISOLATOR(MECHANICALLY GANGED MOTOR OPERATED) WITHOUT E/S	132	5	
17	1600A,3–PH ,HDB TANDEM ISOLATOR (MECHANICALLY GANGED MOTOR OPERATED) WITHOUT E/S	132	5	
18	1600A, 5 CORE CURRENT TRANSFORMER,1 PHASE WITH 120% EXTENDED CURRENT RATING.	132	18	
19	4400 pF CVT 1–PH.	132	15	
20	SURGE ARRESTER, 1–PH. 10KA CLASS–3	120	15	
21	EMWT 1–PH.	132	6	
22	WAVE TRAP (1600A, 0.5mH), 1–PH	132	4	

BILL OF QUANTITY FOR 400/132kv SYSTEM

- NOTES : –
- 01) EQUIPMENT FAULT LEVEL–40KA FOR 1 SEC FOR 400KV AND 31.5KA FOR 1 SEC FOR 132KV.
- 02) WAVE TRAPS WOULD BE IN TWO PHASES ONLY.
- 03) #(PEM SCOPE)– RATING OF GTG, STG, ST & BUSHING DETAILS SHALL BE AS PER APPROVED PEM DRG.
- REFERENCE : –
- 1 DRG. NO:– 10–6725–E–202–400 AND 132kv KEY SINGLE LINE DIAGRAM

LEGEND : –

PRESENT _____

FUTURE -----

03	02.09.09	AS PER FIGHTNER MAIL DATED–12.05.09	JUGENDRA	SK.	WK./DS.	SN.
02	27.04.09	AS PER FIGHTNER LETTER DATED–25.03.09	JUGENDRA	–SD– SK.	–SD– DS./GC.	–SD– SN.
01	09.03.09	AS PER MOM DATED–30.01.09	JUGENDRA	–SD– SK.	–SD– DS./GC.	–SD– SN.
REV	DATE	REVISION FOR REVISION	DATE	APPROVED BY (SIGNED AND STAMPED BY)	APPROVED BY (SIGNED AND STAMPED BY)	APPROVED BY (SIGNED AND STAMPED BY)
OWNER						
TPC ONGC - Tripura Power Company Limited						
PROJECT						
726.6 MW Combined Cycle Power Project						
PALATAWA, TRIPURA, INDIA						
OWNER'S ENGINEER						
FIGHTNER Consulting Engineers (India) Pvt. Limited						
Channel.						
EPC CONTRACTOR						
BHARAT HEAVY ELECTRICALS LTD						
TRANSMISSION BUSINESS GROUP						
TITLE						
SINGLE LINE DIAGRAM FOR 400/132kv S/S AT ONGC TRIPURA						
CV			ME	EL	L&C	
DEPT			SCALE	N.T.S		
SIGN			DATE		BH&E/SUB VENDOR DRG NO.	
DATE			SHT. NO		3 OF 03 REV. 03	

Summary of Core Details of CTs and CVTs

132kV BAY Line, ICT & Bus Coupler CTs

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie at Highest Tap	Max Ret	Acc Class	Purpose
5	1600-800-400/1	-	1600-800-400V	30mA at KPV/2	<8 Ohms at 1600/1 Tap	PS	PROTECTION
4	1600-800-400/1	-	1600-800-400V	30mA at KPV/2	<8 Ohms at 1600/1 Tap	PS	PROTECTION
3	1600-800-400/1	25VA	-	-	-	0.2	METERING
2	1600-800-400/1	30VA	-	-	-	5P20	PROTECTION
1	1600-800-400/1	-	1600-800-400V	30mA at KPV/2	<8 Ohms at 1600/1 Tap	PS	PROTECTION

132kV BAY ST CTs

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie at Highest Tap	Max Ret	Acc Class	Purpose
5	1600-800-400/1	-	1600-800-400V	30mA at KPV/2	<8 Ohms at 1600/1 Tap	PS	PROTECTION
4	1600-800-400/1	-	1600-800-400V	30mA at KPV/2	<8 Ohms at 1600/1 Tap	PS	PROTECTION
3	250-125/1	25VA	-	-	-	0.2	METERING
2	250-125/1	30VA	-	-	-	5P20	PROTECTION
1	250-125/1	-	400V at 125/1 Tap	30mA at KPV/4 at 125/1 Tap	<1.25 Ohms at 125/1 Tap	PS	PROTECTION

400kV BAY CTs (5 Core)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
5	2000-1000/1	-	2000-1000V	30mA at 2000V 60mA at 1000V	10 Ohms 5 Ohms	PS	PROTECTION
4	2000-1000/1	-	2000-1000V	30mA at 2000V 60mA at 1000V	10 Ohms 5 Ohms	PS	PROTECTION
3	2000-1000-500/1	25VA, ISF<5	-	-	-	0.2	METERING
2	2000-1000-500/1	-	4000-2000-1000V	30mA at 4000V 60mA at 2000V 120mA at 1000V	10 Ohms 5 Ohms 2.5 Ohms	PS	PROTECTION
1	2000-1000-500/1	-	4000-2000-1000V	30mA at 4000V 60mA at 2000V 120mA at 1000V	10 Ohms 5 Ohms 2.5 Ohms	PS	PROTECTION

400kV TIE CTs (6 Core)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	2000-1000-500/1	-	4000-2000-1000V	30mA at 4000V 60mA at 2000V 120mA at 1000V	10 Ohms 5 Ohms 2.5 Ohms	PS	PROTECTION
2	2000-1000-500/1	-	4000-2000-1000V	30mA at 4000V 60mA at 2000V 120mA at 1000V	10 Ohms 5 Ohms 2.5 Ohms	PS	PROTECTION
3	2000-1000-500/1	25VA, ISF<5	-	-	-	0.2	METERING
4	2000-1000-500/1	25VA, ISF<5	-	-	-	0.2	METERING
5	2000-1000-500/1	-	2000-1000-500V	30mA at 4000V 60mA at 2000V 120mA at 1000V	10 Ohms 5 Ohms 2.5 Ohms	PS	PROTECTION
6	2000-1000-500/1	-	2000-1000-500V	30mA at 4000V 60mA at 2000V 120mA at 1000V	10 Ohms 5 Ohms 2.5 Ohms	PS	PROTECTION

132kV CVT

Ratio	$\frac{132KV}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$
Sec-I	Class - 3P, 100VA
Sec-II	Class - 3P, 100VA
Sec-III	Class -0.2, 75VA Capacitance - 4400pF

132kV EMT

Ratio	$\frac{132KV}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{\sqrt{3}} / \frac{110V}{\sqrt{3}}$
Sec-I	Class - 3P, 100VA
Sec-II	Class - 3P, 100VA
Sec-III	Class -0.2, 75VA

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01	09.03.09	AS PER MOM DATED-30.01.09	JUGENDRA	-SD-	DS./GC.	-SD-
REV	DATE	REVISION FOR REVISION	DATE	APPROVED BY (SIGNED BY PROJECTED BY)		
DWNER						
TPC ONGC - Thipura Power Company Limited						
PROJECT 726.6 MW Combined Cycle Power Project						
DWNER'S ENGINEER PALATAWA, TRIPURA, INDIA						
FICHTNER Consulting Engineers (India) Pvt. Limited						
Channel.						
EPC CONTRACTOR						
BHARAT HEAVY ELECTRICALS LTD						
TRANSMISSION BUSINESS GROUP						
DEPT CODE			DEPT NAME			
JUGENDRA			JUGENDRA			
DSN SK			DSN SK			
422			422			
CHD DS/GC			CHD DS/GC			
APPD SN			APPD SN			
18.12.08			18.12.08			
TITLE SINGLE LINE DIAGRAM FOR 400/132KV S/S AT ONGC TRIPURA						
CV	ME	EL	ISC	DEPT SCALE	BHCL/SUB VENDOR DRG NO.	
				NIS	TB-3-321-510-001	
				SIGN	SHT. No.04 OF 05 REV. 03	
				DATE		

CT/CVT/EMVT CORE DETAILS (SHEET-1)

Summary of Core Details of CTs and CVTs

400kV CVT

Ratio	$\frac{400KV}{\sqrt{3}} \bigg/ \frac{110V}{\sqrt{3}} \bigg/ \frac{110V}{\sqrt{3}} \bigg/ \frac{110V}{\sqrt{3}}$
Sec-I	Class - 3P, 100VA
Sec-II	Class - 3P, 100VA
Sec-III	Class -0.2, 75VA
Capacitance - 4400pF	

400/132/33kV 125MVA ICT

400/132/33kV ICT BUSHING CT (HV Side)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	1000/1	-	500V	30mA at KPV/2	10 Ohms	PS	REF
2	1000-500/1	20VA	-	-	-	5P20	BACKUP PROTECTION

400/132/33kV ICT BUSHING CT (LV Side)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	1000/1	-	500V	30mA at KPV/2	10 Ohms	PS	REF

400/132/33kV ICT BUSHING CT (Neutral Side)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	1000/1	-	500V	30mA at KPV/2	10 Ohms	PS	REF
2	1000-500/1	20VA	-	-	-	5P20	Neutral E/F

63MVAR Line Reactor

400kV Line Reactor (Line Side)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	100/1	-	100V	30mA at KPV/2	0.5 Ohms	PS	Reactor Differential
2	100/1	-	100V	30mA at KPV/2	0.5 Ohms	PS	REF
3	100/1	20VA	-	--	-	5P20	Reactor B/U
4	100/1	20VA	-	-	-	0.5	Metering

400kV Line Reactor (Neutral Side) 63MVAR

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	100/1	-	100V	30mA at KPV/2	0.5 Ohms	PS	Reactor Differential
2	2000-1000-500/1	-	1000-500-250V	30mA at KPV/2 at Highest Tap	10 Ohms 5 Ohms 2.5 Ohms	PS	Line Distance Protection
3	2000-1000-500/1	-	1000-500-250V	30mA at KPV/2 at Highest Tap	10 Ohms 5 Ohms 2.5 Ohms	PS	Line Distance Protection

Line Reactor NGR (Line Side)63 MVAR

1	100/1	-	100V	30mA at KPV/2	0.5 Ohms	PS	REF
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Line Reactor NGR (Neutral Side)63 MVAR

1	100/1	-	100V	30mA at KPV/2	0.5 Ohms	PS	REF
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80MVAR BUS REACTOR 400KV BUS REACTOR (LINE side)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	200/1		200V	30mA at KPV/2	1 Ohms	PS	REF
2	200/1	20VA	-	-	-	5P20	Reactor B/U

Bus Reactor (Neutral Side)

Core No.	RATIO	Output Burden at lowest Tap (VA)	Min KPV (V)	Max Ie	Max Ret	Acc Class	Purpose
1	200/1	-	200V	30mA at KPV/2	1 Ohms	PS	REF
2	2000-1000-500/1	-	1000-500-250V	30mA at KPV/2 at Highest Tap	10 Ohms 5 Ohms 2.5 Ohms	PS	Reactor Differential

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DWR									
ONGC - Thipura Power Company Limited									
PROJECT									
726.6 MW Combined Cycle Power Project									
PALATANA, TRIPURA, INDIA									
DWR'S ENGINEER									
FIGHTNER Consulting Engineers (India) Pvt. Limited									
Channel									
EPC CONTRACTOR									
BHARAT HEAVY ELECTRICALS LTD									
TRANSMISSION BUSINESS GROUP									
TITLE									
SINGLE LINE DIAGRAM FOR 400/132KV S/S AT ONGC TRIPURA									
CV	ME	EL	L&C	DEPT	SCALE	NIS			
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				DATE					
			BHCL/SUB VENDOR DRG NO.						
			TB-3-321-510-001						
			SHT. No05 OF 05 REV. 03						
			DEPT	NAME	SIGN.	DATE			
			CODE	JUGENDRA	-SD-	19.12.09			
			DESIGN	SK	-SD-	19.12.09			
			CHKD	DS/GC	-SD-	19.12.09			
			APPRO	SN	-SD-	19.12.09			