S. No	DESCRIPTION	Qty of RTU	MODBUS RS485	MODBUS TCP/IP	IEC 61850	DI	DO	AI	BI	BO	Remark
1	132kV Switch Yard + MCR - SCADA **(Type-A)**	1	15	16	7	37	6	8	106	38	110kV Line CRP - 1No, PTR HV CRP - 1No, PTR LV CRP - 1No. 33kV Twin Feeder CRP - 1No. PSS Eqp - 1Set.
2	MCR Cum ICR **(Type-B)**	2	16	14	188	24	16	12	0	0	Land Parcel-1 & 2
3	ICR - SCADA **(Type-C)**	3	6	6	60	4	12	0	0	0	ICR - 3Nos.
	TOTAL	6	37	36	255	65	34	20	106	38	

| | 132kV Switch Yard - SCADA | 1 | | | | | | | | | 110kV Line CRP - 1No, PTR HV CRP - 1No, PTR LV CRP - 1No. 33kV Twin Feeder CRP - 1No. |

PROJECT	: 33/110kV, 1X50MVA PSS, KUMBAKARANATHAM, TN.
DEVELOPER / CLIEN	: FOURTH PARTNER ENERGY PRIVATE LIMITED
SUBJECT	: SCADA IO List - PSS - *Type-A*
REVISION	: R0
DATE	: 19.02.2025

S No	Device Description	Qty	Signal Description	Protocol Type	Sub Type	MODBUS RS485	MODBUS TCP/IP	IEC 61850	DI	DO	AI	BI	BO	Remarks
B			**SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)**											
			110kV Control Room (CR) (FPEL)											
1	110kV CR / Engineering Work Station (EWS)	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							Redundant
2	110kV CR / Operator Work Station (OWS)	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							Redundant
3	110kV CR / GPS	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							
4	110kV CR / CCTV Rack	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							
5	110kV CR / Printer	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							
6	110kV CR / Firewall	2	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		2							Redundant
7	110kV CR / SLDC	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							
8	110kV CR / WMS	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							
9	110kV CR / PMU (Phasor Measurement Unit)	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1							Future Purpose
10	PQM	3	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		3							110kV Line Feeder-1 33kV Feeder-2
11	SAS / LILO	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		0							
			110kV LINE BAY / CRP											
12	110kV CRP Line / ANNUNCIATOR	1	*LINE DIFFERNTIAL OPTD.*	Modbus RTU	RS485	1								
			SOTF. OPTD.											
			PBS (POWER SWING BLOCKING) OPTD.											
			COMMUNICATION FAIL											
			AUTO RECLOSE OPTD.											
			AUTO RECLOSE LOCAK OUT											
			MANI PROTECTION RELAY FAIL											
			OVER CURRENT / EARTH FAULT OPTD.											
			LINE PT FUSE FAIL											
			BUS PT FUSE FAIL											
			BACKUP PROTECTION OPTD.											
			SF6 GAS PRESSURE LOW ALARM											
			SF6 GAS PRESSURE LOW LOCKOUT											
			CB T/C-1 FAULTY											
			CB T/C-2 FAULTY											
			GP A (86A) & GP B(86B) MASTER TRIP RELAY OPTD.											
			LINE DIFFERNTIAL FAULTY											
			BCPU RELAY FAULTY											
			LBB PROTECTION OPTD.											
			LBB TRIP RELAY OPTD.											
			AC POWER SUPPLY FAIL											
			DC SOURCE-1 & 2 FAIL											
			UNDER / OVER VOLTAGE ALARM											
			SPARE											
13	110kV CRP Line / TVM / ABT	1	kW Energy / Peak	Modbus RTU	RS485	1								
			kVA Energy / Peak											
			kVAr Energy / Peak											
			kWh Energy											
			kVAh Energy											
			kVArh Energy											
			kWh Energy / Daily											
			kVAh Energy / Daily											
			kVArh Energy / Daily											
			R PHASE VOLTAGE											
			Y PHASE VOLTAGE											
			B PHASE VOLTAGE											
			R PHASE CURRENT											
			Y PHASE CURRENT											
			B PHASE CURRENT											
			RY PHASE VOLTAGE											
			YB PHASE VOLTAGE											
			BR PHASE VOLTAGE											
			FREQUENCY											
			POWER FACTOR											
			ACTIVE POWER IMPORT											
			ACTIVE POWER EXPORT											
			REACTIVE POWER IMPORT											
			REACTIVE POWER EXPORT											
			TOTAL APPARENT POWER											
			CUMULATIVE ENERGY - FORWARD KVAH											
			CUMULATIVE ENERGY - FORWARD KWH											
			CUMULATIVE ENERGY - REVERSE KVAH											
			CUMULATIVE ENERGY - REVERSE KWH											
1			RY-PHASE VOLTAGE											SOFT SIGNALS
			YB-PHASE VOLTAGE											
			BR-PHASE VOLTAGE											
			R,Y,B-PHASE CURRENT											
			ACTIVE POWER											
			REACTIVE POWER											
			POWER FACTOR											
			FREQUENCY											
			R- PHASE FAULT											
			Y- PHASE FAULT											
			B- PHASE FAULT											
			R-PHASE ANGLE											
			Y-PHASE ANGLE											
			B-PHASE ANGLE											
			CB OPEN											FROM RELAY
			Trip Relay-1 OPTD (86A)											
			Trip Relay-2 OPTD (86B)											
			CB MANUAL CLOSE											
			A/R INITIATION (Auto Recloser)											
			Trip Relay-1 FAIL (86A)											
			Trip Relay-2 FAIL (86B)											
			CB MANUAL TRIP											
			A/R BLOCK											
			SYN. PREMISSION OK											
			21LM-2 RELAY FAIL											
			BPCU FAIL											
			ARSS IN MAINS-1 (AUTO RECLOSE SELECTOR SWITCH)											
			ARSS OFF											
			LBB TRIP RELAY OPTD. (86LBB)											
			LBB TRIP RELAY FAIL											

No.	Equipment	Qty	Signal	Type	Protocol								Remarks
14	**110kV CRP Line / Relay** i. Numerical Multifunction Relay - **1 No.** ii. Differential protection -**1 No.** iii. Numerical Bay Control & Protection Unit **(BCPU) - 1 No.**	3	CB CLOSE	IEC	IEC 61850			3					**FROM BPCU**
			CB OPEN										
			ISO -ON Status **(101-89L - Position)**										
			ISO -OFF Status **(101-89L - Position)**										
			ISO -E/S ON Status **(101-89L-E - Position)**										
			ISO -E/S OFF Status **(101-89L-E - Position)**										
			*ISO -Interlock **(101-89L - Interlock)***										
			*ISO -E/S Interlock **(101-89L-E - Interlock)***										
			ISO Remote Open **(101-89L - Position)**										
			ISO Remote Close **(101-89L - Position)**										
			ISO -ON Status **(101-89A - Position)**										
			ISO -OFF Status **(101-89A - Position)**										
			ISO -E/S ON Status **(101-89A-E - Position)**										
			ISO -E/S OFF Status **(101-89A-E - Position)**										
			*ISO -Interlock **(101-89A - Interlock)***										
			*ISO -E/S Interlock **(101-89A-E - Interlock)***										
			ISO Remote Open **(101-89A - Position)**										
			ISO Remote Close **(101-89A - Position)**										
			ISO -ON Status **(101-89B - Position)**										
			ISO -OFF Status **(101-89B - Position)**										
			*ISO -Interlock **(101-89B - Interlock)***										
			ISO Remote Open **(101-89B - Position)**										
			ISO Remote Close **(101-89B - Position)**										
			ISO -ON Status **(BUS CVT-89A - Position)**										
			ISO -OFF Status **(BUS CVT-89A - Position)**										
			ISO -E/S ON Status **(BUS CVT-89A -E - Position)**										
			ISO -E/S OFF Status **(BUS CVT-89A -E - Position)**										
			*ISO -Interlock **(BUS CVT-89A - Interlock)***										
			*ISO -E/S Interlock **(BUS CVT-89A -E - Interlock)***										
			ISO Remote Open **(BUS CVT-89A - Position)**										
			ISO Remote Close **(BUS CVT-89A - Position)**										
			CB TC-1 FAIL										
			CB TC-2 FAIL										
			LOOS OF SF6 ALARM										
			SF6 LOW LOCKOUT										
			CB SPRING CHARGED										
			AUTO RECLOSER I/L-1										
			AUTO RECLOSER I/L-2										
			CB DC SUPPLY-1 FAIL										
			CB DC SUPPLY-2 FAIL										
			CB SPRING STATUS										
			86BB TRIP RELAY OPTD										
			DC SUPPLY-1 FAIL										
			DC SUPPLY-2 FAIL										
			AC SUPPLY FAIL										
			SPARE (NOT TO LIMITED)										
15	110kV CRP Line / PQM	1	kW Energy / Peak	Modbus RTU	TCP/IP			1					
			kVA Energy / Peak										
			kVAr Energy / Peak										
			kWh Energy										
			kVAh Energy										
			kVArh Energy										
			kWh Energy / Daily										
			kVAh Energy / Daily										
			kVArh Energy / Daily										
			R PHASE VOLTAGE										
			Y PHASE VOLTAGE										
			B PHASE VOLTAGE										
			R PHASE CURRENT										
			Y PHASE CURRENT										
			B PHASE CURRENT										
			RY PHASE VOLTAGE										
			YB PHASE VOLTAGE										
			BR PHASE VOLTAGE										
			FREQUENCY										
			POWER FACTOR										
			ACTIVE POWER IMPORT										
			ACTIVE POWER EXPORT										
			REACTIVE POWER IMPORT										
			REACTIVE POWER EXPORT										
			TOTAL APPARENT POWER										
			CUMULATIVE ENERGY - FORWARD KVAH										
			CUMULATIVE ENERGY - FORWARD KWH										
			CUMULATIVE ENERGY - REVERSE KVAH										
			CUMULATIVE ENERGY - REVERSE KWH										
16	110kV CRP Line / ISOLATOR-89L **(With 1-Earth Switch)**	1	ISO -ON Status **(101-89L - Position)**	BI	Hard wire						1		**Directly Communicated to BCPU**
			ISO -OFF Status **(101-89L - Position)**	BI	Hard wire						1		
			ISO -E/S ON Status **(101-89L-E - Position)**	BI	Hard wire						1		
			ISO -E/S OFF Status **(101-89L-E - Position)**	BI	Hard wire						1		
			*ISO - **(101-89L - Interlock)***	-	Hard wire						-		
			*ISO -E/S Interlock **(101-89L-E - Interlock)***	-	Hard wire						-		
		1	ISO Remote Open **(101-89L - Position)**	BO	Hard wire							1	
			ISO Remote Close **(101-89L - Position)**	BO	Hard wire							1	
17	110kV CRP Line / ISOLATOR-89A **(With 1-Earth Switch)**	1	ISO -ON Status **(101-89A - Position)**	BI	Hard wire						1		**Directly Communicated to BCPU**
			ISO -OFF Status **(101-89A - Position)**	BI	Hard wire						1		
			ISO -E/S ON Status **(101-89A-E - Position)**	BI	Hard wire						1		
			ISO -E/S OFF Status **(101-89A-E - Position)**	BI	Hard wire						1		
			*ISO -Interlock **(101-89A - Interlock)***	-	Hard wire						-		
			*ISO -E/S Interlock **(101-89A-E - Interlock)***	-	Hard wire						-		
		1	ISO Remote Open **(101-89A - Position)**	BO	Hard wire							1	
			ISO Remote Close **(101-89A - Position)**	BO	Hard wire							1	
18	110kV CRP Line / ISOLATOR-89B **(Without Earth Switch)**	1	ISO -ON Status **(101-89B - Position)**	BI	Hard wire						1		**Directly Communicated to BCPU**
			ISO -OFF Status **(101-89B - Position)**	BI	Hard wire						1		
			*ISO -Interlock **(101-89B - Interlock)***	-	Hard wire						-		
		1	ISO Remote Open **(101-89B - Position)**	BO	Hard wire							1	
			ISO Remote Close **(101-89B - Position)**	BO	Hard wire							1	

No	Description	Qty	Signal	Type	Comm	Protocol							BI	BO	Remarks
19	110kV CRP Line / ISOLATOR-89A CVT **(With 1-Earth Switch)**	1	ISO -ON Status **(BUS CVT-89A - Position)**	BI	Hard wire								1		**Directly Communicated to BCPU**
			ISO -OFF Status **(BUS CVT-89A - Position)**	BI	Hard wire								1		
			ISO -E/S ON Status **(BUS CVT-89A -E - Position)**	BI	Hard wire								1		
			ISO -E/S OFF Status **(BUS CVT-89A -E - Position)**	BI	Hard wire								1		
			ISO -Interlock **(BUS CVT-89A - Interlock)**	-	Hard wire								-		
			ISO -E/S Interlock **(BUS CVT-89A -E - Interlock)**	-	Hard wire								-		
		1	ISO Remote Open **(BUS CVT-89A - Position)**	BO	Hard wire									1	
			ISO Remote Close **(BUS CVT-89A - Position)**	BO	Hard wire									1	
20	110kV CRP Line / CB	1	CB ON Status **(52 - Position - ON)**	BI	Hard wire								1		**Directly Communicated to BCPU**
			CB OFF Status **(52 - Position - OFF)**	BI	Hard wire								1		
			CB in Service **(52 - Position - Service)**	BI	Hard wire								1		
			CB in Test **(52 - Position - Test)**	BI	Hard wire								1		
			CB Master Trip-A **(86A - Operated)**	BI	Hard wire								1		
			CB Master Trip-B **(86B - Operated)**	BI	Hard wire								1		
			CB Trip Circuit - A **(TC1 - Operated)**	BI	Hard wire								1		
			CB Trip Circuit - B **(TC2 - Operated)**	BI	Hard wire								1		
			CB Trip Circuit Healthy-A **(TC1 - Supervision)**	BI	Hard wire								1		
			CB Trip Circuit Healthy-B **(TC2 - Supervision)**	BI	Hard wire								1		
			CB Spring Charged	BI	Hard wire								1		
			CB Spring Status	BI	Hard wire								1		
			General Lockout / Emergency Stop	BI	Hard wire								1		
			Loss of SF6	BI	Hard wire								1		
			SF6 Pressure Lockout	BI	Hard wire								1		
			CB in Local	BI	Hard wire								1		
			CB in Remote	BI	Hard wire								1		
			DC SUPPLY-1 FAIL	BI	Hard wire								1		
			DC SUPPLY-2 FAIL	BI	Hard wire								1		
			AC SUPPLY FAIL	BI	Hard wire								1		
		1	CB Remote Open **(52 - Remote Trip)**	BO	Hard wire									1	
			CB Remote Close **(52 - Remote Close)**	BO	Hard wire									1	

110kV PTR BAY

No	Description	Qty	Signal	Type	Comm	Protocol									Remarks
12	110kV CRP PTR/ ANNUNCIATOR	1	DIFF. PROTECTION OPTD. (87T)												
			51G HV OPTD.												
			BACKUP PROTECTION OPTD.												
			BUCH. TRIP												
			OTI TRIP												
			WTI TRIP (HV+LV)												
			PRV / OLTC PRV TRIP												
			OSR TRIP												
			AIRCELL PUNCHER TRIP												
			BUCH. ALARM												
			OLTC ALARM												
			OLTC/MAIN MOG ALARM												
			WTI ALARM (HV+LV)												
			SF6 LOW/SF6 LOCKUOT												
			LBB PROTECTION OPTD.												
			V/F ALARM/TRIP												
			64R HV OPTD.												
			CB TC-1/2 FAIL												
			SPARE (DC SOURCE-1 FAIL (80DC1))												
			SPARE (DC SOURCE-1 FAIL (80DC2))												
			PROTECTION RELAY FAIL												
			CB AC SUPPLY FAIL												
			51G LV OPTD.												
			64R LV OPTD.												
13	33kV MV Panel / ANNUNCIATOR **(12W)** AUX. TRANSFORMER	1	Buch. Relay - Trip		Modbus RTU	RS485	1								
			Buch. Relay - Alarm												
			OTI - Trip Status												
			OTI - High Alarm Status												
			HV WDG. TRIP												
			HV WDG. ALARM												
			LV WDG. TRIP												
			LV WDG. ALARM												
			PRV - Trip Signal												
			MOG ALARM												
			FUSE FAILURE TRIP												
			SPARE												
13	110kV CRP PTR/ TVM	1	kW Energy / Peak												
			kVA Energy / Peak												
			kVAr Energy / Peak												
			kWh Energy												
			kVAh Energy												
			kVArh Energy												
			kWh Energy / Daily												
			kVAh Energy / Daily												
			kVArh Energy / Daily												
			R PHASE VOLTAGE												
			Y PHASE VOLTAGE												
			B PHASE VOLTAGE												
			R PHASE CURRENT												
			Y PHASE CURRENT												
			B PHASE CURRENT												
			RY PHASE VOLTAGE												
			YB PHASE VOLTAGE												
			BR PHASE VOLTAGE												
			FREQUENCY												
			POWER FACTOR												
			ACTIVE POWER IMPORT												
			ACTIVE POWER EXPORT												
			REACTIVE POWER IMPORT												
			REACTIVE POWER EXPORT												
			TOTAL APPARENT POWER												
			CUMULATIVE ENERGY - FORWARD KVAH												
			CUMULATIVE ENERGY - FORWARD KWH												
			CUMULATIVE ENERGY - REVERSE KVAH												
			CUMULATIVE ENERGY - REVERSE KWH												
14	110kV CRP PTR Numerical Multifunction Relay **(PTR DIFF. PROTECTION) (87T) - 1 No**	1	HV CB OPEN	IEC	IEC 61850	1									
			BUCHHOLZ TRIP												
			OTI TRIP												
			WTI TRIP												
			PRV-1/PRV-2 TRIP												
			OSR TRIP												
			AIRCELL PUNCHER TRIP												
			HV CB CLOSE CMD												
			LBB RELLAY OPTD.												
			BB/LBB OPTD												
			87T, 24, 64R LV PROTN. OPTD.												
			87T, 24, PROTN. OPTD.												
			DIFF. PROTECTION OPTD.												
			DIFF. PROTECTION OPTD.												
			87T, 24, 64R LV PROTN. OPTD.												
			DIFF. PROTECTION OPTD.												
			64R LV OPTD.												
			V/F ALARM/TRIP												
			PROTN. RELAY FAIL												

#	Description	Qty	Signal										
15	110kV CRP PTR Numerical Multifunction Relay **(PTR DIRECTIONAL PROTECTION) (67/67N) - 1 No**	1	BCU DC FAIL BCU FAULTY 51G HV OPTD. 86-1 OPTD. 86-2 OPTD. BB/LBB OPTD. LBB INITIATION 51G LV OPTD. CB CLOSE 64R HV OPTD. DIFF. RELAY OPTD. B/U PROTECTION OPTD. B/U PROTECTION RELAY FAULTY LBB RETRIP LBB RELAY OPTD. LBB OPTD.	IEC	IEC 61850		**1**					
16	110kV CRP PTR Numerical Multifunction Relay (PTR GROUND TIME OVERCURRENT **PROTECTION) (51G HV) - 1 No**	1	51G HV OPTD. 51G HV RELAY FAULTY										
17	110kV CRP PTR Numerical Multifunction Relay **(PTR RESTRICTED EARTH FAULT PROTECTION) (64R HV) - 1 No**	1	64R HV OPTD. 64R HV RELAY FAULTY										
18	110kV CRP PTR Numerical Multifunction Relay **(PTR GROUND TIME OVERCURRENT PROTECTION) (51G LV) - 1 No**	1	51G LV OPTD. 51G LV RELAY FAULTY										
19	110kV CRP PTR Numerical Bay Control & Protection Unit **(BCU) - 1 No**	1	CB CLOSE CB OPEN SUB-CIRCUIT DC SUPPLY FAIL LBB OPTD. MAIN MOG ALARM OLTC MOG ALARM OTI ALARM LOSS OF SF6 SF6 LOW LOCKOUT CB AC SUPPLY FAIL CB SPRING CHARGE 86-1 OPTD. 86-2 OPTD. 48V DC SUPPLY FAIL 51G HV OPTD. 64R HV OPTD. DIFF. RELAY FAULTY B/U RELAY FAULTY 51G HV RELAY FAULTY 51G LV OPTD. 51G LV RELAY FAULTY WTI ALARM (HV+LV) DC SUPPLY -1 FAIL DC SUPPLY -2 FAIL AC SUPPLY FAIL CB TC-1 FAULTY CB TC-2 FAULTY 89A ISO. I/L OK 89AE ISO. I/L OK DC FAIL ACCEPT 86-1 RESET 86-2 RESET CB CLOSE I/L OK CB CLOSE CMD CB TC TRIP CMD ANN. ACCEPT ANN. RESET ANN. TEST ISO -ON Status **(102-89A - Position)** ISO -OFF Status **(102-89A - Position)** ISO -E/S ON Status **(102-89A-E - Position)** ISO -E/S OFF Status **(102-89A-E - Position)** *ISO -Interlock* **(102-89A - Interlock)** *ISO -E/S Interlock* **(102-89A-E - Interlock)** ISO Remote Open **(102-89A - Position)** ISO Remote Close **(102-89A - Position)** ISO -ON Status **(102-89B - Position)** ISO -OFF Status **(102-89B - Position)** ISO -E/S ON Status **(102-89B-E - Position)** ISO -E/S OFF Status **(102-89B-E - Position)** *ISO -Interlock* **(102-89B - Interlock)** *ISO -E/S Interlock* **(102-89B-E - Interlock)** ISO Remote Open **(102-89B - Position)** ISO Remote Close **(102-89B - Position)** ISO -ON Status **(301-89A - Position)** ISO -OFF Status **(301-89A - Position)** *ISO -Interlock* **(301-89A - Interlock)** ISO Remote Open **(301-89A - Position)** ISO Remote Close **(301-89A - Position)** ISO -ON Status **(301-89B - Position)** ISO -OFF Status **(301-89B - Position)** *ISO -Interlock* **(301-89B - Interlock)** ISO Remote Open **(301-89B - Position)** ISO Remote Close **(301-89B - Position)**	IEC	IEC 61850		**1**					

Sr No	Equipment	Qty	Signal	Type	Protocol					Remarks
20	110kV RTCC PTR/ RTCC TMR Relay	1	4-20mA Signal of OTI	IEC	IEC 61850		1			**Directly Communicated to TMR Relay**
			4-20mA Signal of WTI (HV)				1			
			4-20mA Signal of WTI (LV)				1			
			4-20mA Signal of TRIP				1			
			TC in Progress					1		
			OLTC Control Supply Fail					1		
			OLTC Motor Trip					1		
			OLTC Fail					1		
			Cooler in Remote Auto			1		1		
			Cooler in Remote Manual					1		
			Cooler in Local Auto					1		
			Cooler in Local Manual					1		
			OLTC in Local Mode					1		
			OLTC in Remote Mode					1		
			Tap Raise						1	
			Tap Lower						1	
			Out of Step						1	
			Fan Control						1	
21	110kV RTCC PTR/ RTCC Annuncitor	1	Running Fan Fail (Group - 1)	Modbus RTU	RS485	1				
			Running Fan Fail (Group - 2)							
			Standby Fan Fail (Group - 1)							
			Standby Fan Fail (Group - 2)							
			Cooler Supply Fail (Main)							
			Cooler Supply Fail (Satndby)							
			Cooler Control Supply Fail							
			Supply Change-Over							
			Transfer to Fail							
			OLTC Moto Trip							
			OLTC Moto Stuck Up							
			OLTC Out of Step							
22	110kV CRP PTR / ISOLATOR **(102-89A + 1ES)**	1	ISO -ON Status **(102-89A - Position)**	IEC	IEC 61850			1		**Directly Communicated to BCPU**
			ISO -OFF Status **(102-89A - Position)**					1		
			ISO -E/S ON Status **(102-89A-E - Position)**					1		
			ISO -E/S OFF Status **(102-89A-E - Position)**					1		
			*ISO -Interlock **(102-89A - Interlock)***					-		
			*ISO -E/S Interlock **(102-89A-E - Interlock)***					-		
		1	ISO Remote Open **(102-89A - Position)**						1	
			ISO Remote Close **(102-89A - Position)**						1	
23	110kV CRP PTR / ISOLATOR **(102-89B + 1ES)**	1	ISO -ON Status **(102-89B - Position)**	IEC	IEC 61850			1		**Directly Communicated to BCPU**
			ISO -OFF Status **(102-89B - Position)**					1		
			ISO -E/S ON Status **(102-89B-E - Position)**					1		
			ISO -E/S OFF Status **(102-89B-E - Position)**					1		
			*ISO -Interlock **(102-89B - Interlock)***					-		
			*ISO -E/S Interlock **(102-89B-E - Interlock)***					-		
		1	ISO Remote Open **(102-89B - Position)**						1	
			ISO Remote Close **(102-89B - Position)**						1	
24	110kV CRP PTR / ISOLATOR **(301-89A)**	1	ISO -ON Status **(301-89A - Position)**	IEC	IEC 61850			1		**Directly Communicated to BCPU**
			ISO -OFF Status **(301-89A - Position)**					1		
			*ISO -Interlock **(301-89A - Interlock)***					-		
		1	ISO Remote Open **(301-89A - Position)**						1	
			ISO Remote Close **(301-89A - Position)**						1	
25	110kV CRP PTR / ISOLATOR **(301-89B)**	1	ISO -ON Status **(301-89B - Position)**	IEC	IEC 61850			1		**Directly Communicated to BCPU**
			ISO -OFF Status **(301-89B - Position)**					1		
			*ISO -Interlock **(301-89B - Interlock)***					-		
		1	ISO Remote Open **(301-89B - Position)**						1	
			ISO Remote Close **(301-89B - Position)**						1	
26	110kV CRP PTR / CB **(PTR - HV & PTR - LV)**	2	CB CLOSE Status **(52 - Position - ON)**	IEC	IEC 61850			2		**Directly Communicated to BCPU**
			CB OPEN Status **(52 - Position - OFF)**					2		
			CB Master Trip-A **(86A - Operated)**					2		
			CB Master Trip-B **(86B - Operated)**					2		
			CB Master Trip-Transformer Differential **(87T - Operated)**					2		
			CB Trip Circuit Healthy-A **(TC1 - Supervision)**					2		
			CB Trip Circuit Healthy-B **(TC2 - Supervision)**					2		
			CB Spring Charged					2		
			Loss of SF6					2		
			SF6 Pressure Lockout					2		
			CB AC Supply Fail					2		
			AC Supply Fail					2		
			DC SUPPLY-1 FAIL					2		
			DC SUPPLY-2 FAIL					2		
			SUB-CIRCUIT DC SUPPLY FAIL					2		
			CB in Local					2		
			CB in Remote					2		
		2	CB Remote Open **(52 - Remote Trip)**						2	
			CB Remote Close **(52 - Remote Close)**						2	
27	110kV CRP PTR / MB	1	Oil Temperature	4-20mA	AI		1			
			Winding temperature - HV	4-20mA	AI		1			
			Winding temperature - LV	4-20mA	AI		1			
			Tap Position Indication	4-20mA	AI		1			
28	110kV PTR / RTCC	1	OIL TEMPERATURE ALARM	DI	Hard wire			1		
			OIL TEMPERATURE TRIP	DI	Hard wire			1		
			WINDING TEMPERATURE ALARM-HV	DI	Hard wire			1		
			WINDING TEMPERATURE TRIP-HV	DI	Hard wire			1		
			MAIN TANK MOG ALARM	DI	Hard wire			1		
			MAIN TANK PRV TRIP (PRV-1)	DI	Hard wire			1		
			OLTC PRV TRIP (PRV-2)	DI	Hard wire			1		
			BUCHHOLZ ALARM	DI	Hard wire			1		
			BUCHHOLZ TRIP	DI	Hard wire			1		
			WINDING TEMPERATURE ALARM-LV	DI	Hard wire			1		
			WINDING TEMPERATURE TRIP-LV	DI	Hard wire			1		
			OCSR TRIP	DI	Hard wire			1		
			OLTC OIL LEVEL LOW ALARM	DI	Hard wire			1		
			AIRCELL FAIL ALARM	DI	Hard wire			1		
			OLTC MOG ALARM	DI	Hard wire			1		
29	110kV PTR / NIFPS	1	System Out of Service	Modbus RTU	TCP/IP	1				
			PNRV/TCIV Closed							
			Fire detector Trip							
			Cylinder pressure Low							
			Visual / Audio Alarm							
			Visual / Audio alarm for DC supply Fail							
			NIFPS system Fail							
30	FLOAT CUM BOOST CHARGER (FCBC) (BATTERY CHARGER) (110V DC / 300Ah/40A)	1	AC FAIL	Modbus RTU	RS485	1				
			AC OV/UV							
			CHARGER FAIL							
			DC VOLTAGE LOW							
			DC VOLTAGE HIGH							
			O/P MCB TRIP							
			DC OVERLOAD							
			BATTERY ON FLOAT MODE							
			BATTERY ON BOOST MODE							

33kV BAY / PSS															
31	33kV Twin Line CRP / ANNUNCIATOR **(Line-1 & 2 - 2 Nos.)**	2	OVER CURRENT (OC) OPTD.	Modbus RTU	RS485	2									
			EARTH FAULT (EF) OPTD.												
			UNDER VOLTAGE ALARM												
			OVER VOLTAGE ALARM												
			BUS PT FUSE FAIL												
			GP A (86A) MASTER TRIP RELAY OPTD.												
			GP B(86B) MASTER TRIP RELAY OPTD.												
			CB T/C-1 FAULTY												
			CB T/C-2 FAULTY												
			AC POWER SUPPLY FAIL												
			DC SOURCE-1 & 2 FAIL												
			SPARE												
32	33kV Twin Line CRP / TVM **(Line-1 & 2 - 2 Nos.)**	2	kW Energy / Peak	Modbus RTU	RS485	2									
			kVA Energy / Peak												
			kVAr Energy / Peak												
			kWh Energy												
			kVAh Energy												
			kVArh Energy												
			kWh Energy / Daily												
			kVAh Energy / Daily												
			kVArh Energy / Daily												
			R PHASE VOLTAGE												
			Y PHASE VOLTAGE												
			B PHASE VOLTAGE												
			R PHASE CURRENT												
			Y PHASE CURRENT												
			B PHASE CURRENT												
			RY PHASE VOLTAGE												
			YB PHASE VOLTAGE												
			BR PHASE VOLTAGE												
			FREQUENCY												
			POWER FACTOR												
			ACTIVE POWER IMPORT												
			ACTIVE POWER EXPORT												
			REACTIVE POWER IMPORT												
			REACTIVE POWER EXPORT												
			TOTAL APPARENT POWER												
			CUMULATIVE ENERGY - FORWARD KVAH												
			CUMULATIVE ENERGY - FORWARD KWH												
			CUMULATIVE ENERGY - REVERSE KVAH												
			CUMULATIVE ENERGY - REVERSE KWH												
33	33kV Twin Line CRP Numerical Multifunction Relay **(BPCU)** **(Line-1 & 2 - 2 Nos.)**	2	MASTER TRIP RELAY OPERATED	IEC	IEC 61850	2									
			INSTANTANEOUS O/C & E/F PROTECTION (50/50N)												
			INVERSE TIME O/C & E/F PROTECTION (51/51N)												
			UNDER VOLTAGE PROTECTION (27)												
			OVER VOLTAGE PROTECTION (59)												
			DIRECTIONAL OVERCURRENT (67)												
			NEUTRAL DIRECTIONAL OVERCURRENT (67N)												
			CIRCUIT BREAKER IN ON STATUS												
			CIRCUIT BREAKER IN OFF STATUS												
			CIRCUIT BREAKER IN TRIP STATUS												
			TCS SUPERVISION-1 (95)												
			TCS SUPERVISION-2 (95)												
			TCS HEALTHY												
34	33kV Twin Line CRP **(Line-1 & 2 - 2 Nos.)**	2	VCB in Local	DI	Hard wire				2						
			VCB in Remote	DI	Hard wire				2						
			VCB ON Status	DI	Hard wire				2						
			VCB OFF Status	DI	Hard wire				2						
			VCB Spring Charged	DI	Hard wire				2						
			VCB Master Trip Operated	DI	Hard wire				2						
			Input DC Supply Fail	DI	Hard wire				2						
			Input AC Supply Fail	DI	Hard wire				2						
			TCS Healthy-1	DI	Hard wire				2						
			TCS Healthy-2	DI	Hard wire				2						
		2	Remote Open	DO	Hard wire					2					
			Remote Close	DO	Hard wire					2					
35	33kV Twin Feeder CRP / ISOLATOR **(302-89L + 1ES)**	1	ISO -ON Status **(302-89L - Position)**	IEC	IEC 61850								1		**Directly Communicated to BCPU**
			ISO -OFF Status **(302-89L - Position)**										1		
			ISO -E/S ON Status **(302-89L-E - Position)**										1		
			ISO -E/S OFF Status **(302-89L-E - Position)**										1		
			ISO -Interlock (302-89L - Interlock)										-		
			ISO -E/S Interlock (302-89L-E - Interlock)										-		
		1	ISO Remote Open **(302-89L - Position)**											1	
			ISO Remote Close **(302-89L - Position)**											1	
36	33kV Twin Feeder CRP / ISOLATOR **(303-89L + 1ES)**	1	ISO -ON Status **(303-89L - Position)**	IEC	IEC 61850								1		**Directly Communicated to BCPU**
			ISO -OFF Status **(303-89L - Position)**										1		
			ISO -E/S ON Status **(303-89L-E - Position)**										1		
			ISO -E/S OFF Status **(303-89L-E - Position)**										1		
			ISO -Interlock (303-89L - Interlock)										-		
			ISO -E/S Interlock (303-89L-E - Interlock)										-		
		1	ISO Remote Open **(303-89L - Position)**											1	
			ISO Remote Close **(303-89L - Position)**											1	
37	33kV Twin Feeder CRP / ISOLATOR **(302-89A)**	1	ISO -ON Status **(302-89A - Position)**	IEC	IEC 61850								1		**Directly Communicated to BCPU**
			ISO -OFF Status **(302-89A - Position)**										1		
			ISO -Interlock (302-89A - Interlock)										-		
		1	ISO Remote Open **(302-89A - Position)**											1	
			ISO Remote Close **(302-89A - Position)**											1	
38	33kV Twin Feeder CRP / ISOLATOR **(303-89A)**	1	ISO -ON Status **(302-89A - Position)**	IEC	IEC 61850								1		**Directly Communicated to BCPU**
			ISO -OFF Status **(302-89A - Position)**										1		
			ISO -Interlock (302-89A - Interlock)										-		
		1	ISO Remote Open **(303-89A - Position)**											1	
			ISO Remote Close **(303-89A - Position)**											1	
39	33kV Twin Feeder CRP / ISOLATOR **(BUS PT-89A)**	1	ISO -ON Status **(BUS PT-89A - Position)**	IEC	IEC 61850								1		**Directly Communicated to BCPU**
			ISO -OFF Status **(BUS PT-89A - Position)**										1		
			ISO -Interlock (BUS PT-89A - Interlock)										-		
		1	ISO Remote Open **(BUS PT-89A - Position)**											1	
			ISO Remote Close **(BUS PT-89A - Position)**											1	
40	33kV Twin Feeder CRP / ISOLATOR **(AUX TF-89A)**	1	ISO -ON Status **(AUX TF-89A - Position)**	IEC	IEC 61850								1		**Directly Communicated to BCPU**
			ISO -OFF Status **AUX TF-89A - Position)**										1		
			ISO -Interlock (AUX TF-89A - Interlock)										-		
		1	ISO Remote Open **(AUX TF-89A - Position)**											1	
			ISO Remote Close **(AUX TF-89A - Position)**											1	

			MCR/ PSS										

#	Device	Qty	Parameter	Protocol	Interface								
41	ACDB-MFM	1	kW Energy / Peak	Modbus RTU	RS485	1							
			kVA Energy / Peak										
			kVAr Energy / Peak										
			kWh Energy										
			kVAh Energy										
			kVArh Energy										
			kWh Energy / Daily										
			kVAh Energy / Daily										
			kVArh Energy / Daily										
			R PHASE VOLTAGE										
			Y PHASE VOLTAGE										
			B PHASE VOLTAGE										
			R PHASE CURRENT										
			Y PHASE CURRENT										
			B PHASE CURRENT										
			RY PHASE VOLTAGE										
			YB PHASE VOLTAGE										
			BR PHASE VOLTAGE										
			FREQUENCY										
			POWER FACTOR										
			ACTIVE POWER IMPORT										
			ACTIVE POWER EXPORT										
			REACTIVE POWER IMPORT										
			REACTIVE POWER EXPORT										
			TOTAL APPARENT POWER										
			CUMULATIVE ENERGY - FORWARD KVAH										
			CUMULATIVE ENERGY - FORWARD KWH										
			CUMULATIVE ENERGY - REVERSE KVAH										
			CUMULATIVE ENERGY - REVERSE KWH										
42	10kVA UPS	1	BATTERY VOLTAGE	Modbus RTU	RS485	1							
			BATTERY CURRENT										
			OUTPUT VOLTAGE										
			UPS LOAD										
			UPS TEMPERATURE										
			UPS BACKUP TIME										
			FREQUENCY										
			BATTERY LOW STATUS										
			MAINS FAIL STATUS										
			OVERLOAD STATUS										
			BYPASS MODE STATUS										
			BATTERY MODE STATUS										
43	FLOAT CUM BOOST CHARGER (FCBC) (BATTERY CHARGER) **(110V/50A, 300Ah)**	1	AC FAIL	Modbus RTU	RS485	1							
			AC OV/UV										
			CHARGER FAIL										
			DC VOLTAGE LOW										
			DC VOLTAGE HIGH										
			O/P MCB TRIP										
			DC OVERLOAD										
			BATTERY ON FLOAT MODE										
			BATTERY ON BOOST MODE										
44	FACP	1	All Modbus Registers available on mapping sheet	Modbus RTU	RS485	1							
45	Weather Monitoring Station (WMS)	1	SOLAR INSOLATION HORIZONTAL (GHI)	Modbus RTU	TCP/IP			1					
			SOLAR INSOLATION TILTED (GII)										
			RAIN FALL										
			WIND SPEED (ANEMOMETER)										
			WIND DIRECTION										
			AMBIENT TEMPERATURE										
			MODULE TEMPERATURE										
			AIR PRESSURE										
			HUMIDITY										
			SOILING STATUIN										
46	ACDB / MCCB	1	ON Status	DI	Hard wire				1				
			OFF Status	DI	Hard wire				1				
		1	Remote Open	DO	Hard wire					1			
			Remote Close	DO	Hard wire					1			
			Total IO List			15	16	7	37	6	8	106	38	

S No	Device Description	Qty	Signal Description	Protocol Type	Sub Type	MODBUS RS485	MODBUS TCP/IP	DI	DO	AI	Remarks
					MCR & ICR-1 x 1 RTU - *Type-B*						
1	MCR + ICR-1 / Engineering Work Station (EWS)	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1				
2	MCR + ICR-1 / CCTV Rack	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1				
3	MCR + ICR-1 / Printer	1	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		1				
4	SACU for String inverter communication	2	All Modbus Registers available on mapping sheet	Modbus RTU	TCP/IP		2				String inverters will be connected to Sungrow EMU 200A via PLCC comnication and string Inverter mapping details will be available in SCADA from Sungrow EMU
5	PV Module Temperature	1	All Modbus Registers available on mapping sheet	Modbus RTU	RS485	1					
6	33kV MV Panel / ANNUNCIATOR (14W) Out Going Feeders (O/G) - 1 Nos	1	O/C & E/F RELAY OPERATED MASTER TRIP RELAY OPERATED TCS UNHEALTHY-1 TCS UNHEALTHY-2 U/V & O/V TRIP SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE							
7	33kV MV Panel / ANNUNCIATOR (24W) Solar Feeder ICR-1 (I/C-1) (IDT-1) - 1Nos	1	O/C & E/F PROTECTION OPERATED MASTER TRIP OPERATED TCS UNHEALTHY-1 TCS UNHEALTHY-2 BUCH. TRIP BUCH. ALARM OTI TRIP OTI ALARM HV WTI TRIP HV WTI ALARM LV-1 WTI TRIP LV-1 WTI ALARM LV-2 WTI TRIP LV-2 WTI ALARM LV-3 WTI TRIP LV-3 WTI ALARM LV-4 WTI TRIP LV-4 WTI ALARM PRV-1 TRIP PRV-2 TRIP MOG ALARM AIR CELL RUPTURE RELAY ALARM AUX. AC UPS SUPPLY FAIL AUX. AC RAW SUPPLY FAIL	Modbus RTU	RS485	1					
8	33kV MV Panel / ANNUNCIATOR (12W) Solar Feeder ICR-2&3 2No.	2	O/C & E/F RELAY OPERATED MASTER TRIP RELAY OPERATED TCS UNHEALTHY SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE SPARE							
9	33kV MV Panel / ANNUNCIATOR (12W) AUX. TRANSFORMER	1	Buch. Relay - Trip Buch. Relay - Alarm OTI - Trip Status OTI - High Alarm Status HV WDG. TRIP HV WDG. ALARM LV WDG. TRIP LV WDG. ALARM PRV - Trip Signal MOG ALARM FUSE FAILURE TRIP SPARE							
10	33kV MV Panel / TVM Out Going Feeders (O/G) - 1No, Solar Feeders - MCR Cum ICR-1- 1Nos. & Solar Feeders - ICR-2&3 2Nos.	3	kW Energy / Peak kVA Energy / Peak kVAr Energy / Peak kWh Energy kVAh Energy kVArh Energy kWh Energy / Daily kVAh Energy / Daily kVArh Energy / Daily R PHASE VOLTAGE Y PHASE VOLTAGE B PHASE VOLTAGE R PHASE CURRENT Y PHASE CURRENT B PHASE CURRENT RY PHASE VOLTAGE YB PHASE VOLTAGE BR PHASE VOLTAGE FREQUENCY POWER FACTOR ACTIVE POWER IMPORT ACTIVE POWER EXPORT REACTIVE POWER IMPORT REACTIVE POWER EXPORT TOTAL APPARENT POWER CUMULATIVE ENERGY - FORWARD KVAH CUMULATIVE ENERGY - FORWARD KWH CUMULATIVE ENERGY - REVERSE KVAH CUMULATIVE ENERGY - REVERSE KWH	Modbus RTU	RS485	1					

Sr	Description	Qty	Signal	Type	Comm	Media	Soft	DI	DO	AI	Remarks
11	33kV MV Panel Numerical Multifunction Relay Solar Feeders - I/C - 1&2 2Nos	2	MASTER TRIP RELAY OPERATED								
			INSTANTANEOUS O/C & E/F PROTECTION (50/50N)								
			INVERSE TIME O/C & E/F PROTECTION (51/51N)								
			CIRCUIT BREAKER IN ON STATUS								
			CIRCUIT BREAKER IN SERVICE POSITION								
			CIRCUIT BREAKER IN TEST POSITION								
			TCS SUPERVISION								
			TCS HEALTHY								
12	33kV MV Panel Numerical Multifunction Relay **(IDT-1 DIFF. PROTECTION) (87T)** - 1 No Solar Feeders - I/C - 1 (ICR-1)		BUCHHOLZ TRIP		Modbus RTU	RS485	1				
			OTI TRIP								
			WTI TRIP								
			PRV-1/PRV-2 TRIP								
			OSR TRIP								
			AIRCELL PUNCHER TRIP								
			DIFF. PROTECTION OPTD.								
			V/F ALARM/TRIP								
			PROTN. RELAY FAIL								
13	33kV MV Panel Numerical Multifunction Relay Out Going Feeders (O/G) - 1 Nos	1	MASTER TRIP RELAY OPERATED								
			INSTANTANEOUS O/C & E/F PROTECTION (50/50N)								
			INVERSE TIME O/C & E/F PROTECTION (51/51N)								
			OVER VOLTAGE PROTECTION (59)								
			UNDER VOLTAGE PROTECTION (27)								
			CIRCUIT BREAKER IN ON STATUS								
			CIRCUIT BREAKER IN SERVICE POSITION								
			CIRCUIT BREAKER IN TEST POSITION								
			TCS SUPERVISION-1 (95)								
			TCS SUPERVISION-2 (95)								
			TCS HEALTHY								
14	ICR-1 IDT / NIFPS	1	System Out of Service		Modbus RTU	TCP/IP	1				
			PNRV/TCIV Closed								
			Fire detector Trip								
			Cylinder pressure Low								
			Visual / Audio Alarm								
			Visual / Audio alarm for DC supply Fail								
			NIFPS system Fail								
14	33kV MV Panel Solar Feeders (I/C) - 1 Nos (ICR-1 IDT)	1	VCB in Local	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Remote	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Test	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Service	DI	Hard wire			1			PF Contact in VCB Board
			VCB ON Status	DI	Hard wire			1			PF Contact in VCB Board
			VCB OFF Status	DI	Hard wire			1			PF Contact in VCB Board
			VCB Spring Charged	DI	Hard wire			1			PF Contact in VCB Board
			VCB Master Trip Operated	DI	Hard wire			1			PF Contact in VCB Board
			Input DC Supply Fail	DI	Hard wire			1			PF Contact in VCB Board
			Input AC Supply Fail	DI	Hard wire			1			PF Contact in VCB Board
			TCS-1 Healthy	DI	Hard wire			1			PF Contact in VCB Board
			TCS-2 Healthy	DI	Hard wire			1			PF Contact in VCB Board
			Buch. Relay - Trip	DI	Hard wire			1			PF Contact in VCB Board
			Buch. Relay - Alarm	DI	Hard wire			1			PF Contact in VCB Board
			OTI - Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			OTI - High Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - HV Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - HV Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-1 Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-1 Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-2 Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-2 Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-3 Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-3 Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-4 Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV-4 Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			PRV-1 - Trip Signal	DI	Hard wire			1			PF Contact in VCB Board
			PRV-2 - Trip Signal	DI	Hard wire			1			PF Contact in VCB Board
			MOG - Alarm	DI	Hard wire			1			PF Contact in VCB Board
			Air Cell Rupture Relay Alarm	DI	Hard wire			1			PF Contact in VCB Board
			Remote Open	DO	Hard wire				1		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
			Remote Close	DO	Hard wire				1		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
15	MCR Cum ICR-1 IDT OTI / WTI	1	Oil Temperature	4-20mA	AI					1	
			Winding Temperature - LV-1	4-20mA	AI					1	
			Winding Temperature - LV-2	4-20mA	AI					1	
			Winding Temperature - LV-3	4-20mA	AI					1	
			Winding Temperature - LV-4	4-20mA	AI					1	
			Winding Temperature - HV	4-20mA	AI					1	
16	33kV MV Panel Solar Feeders (I/C) - 2 Nos (ICR-2 & 3)	2	VCB in Local	DI	Hard wire			2			PF Contact in VCB Board
			VCB in Remote	DI	Hard wire			2			PF Contact in VCB Board
			VCB in Test	DI	Hard wire			2			PF Contact in VCB Board
			VCB in Service	DI	Hard wire			2			PF Contact in VCB Board
			VCB ON Status	DI	Hard wire			2			PF Contact in VCB Board
			VCB OFF Status	DI	Hard wire			2			PF Contact in VCB Board
			VCB Spring Charged	DI	Hard wire			2			PF Contact in VCB Board
			VCB Master Trip Operated	DI	Hard wire			2			PF Contact in VCB Board
			Input DC Supply Fail	DI	Hard wire			2			PF Contact in VCB Board
			Input AC Supply Fail	DI	Hard wire			2			PF Contact in VCB Board
			TCS Healthy	DI	Hard wire			2			PF Contact in VCB Board
		2	Remote Open	DO	Hard wire				2		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
			Remote Close	DO	Hard wire				2		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
17	33kV MV Panel Aux. T/F Feeder	1	VCB in Local	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Remote	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Test	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Service	DI	Hard wire			1			PF Contact in VCB Board
			VCB ON Status	DI	Hard wire			1			PF Contact in VCB Board
			VCB OFF Status	DI	Hard wire			1			PF Contact in VCB Board
			VCB Spring Charged	DI	Hard wire			1			PF Contact in VCB Board
			VCB Master Trip Operated	DI	Hard wire			1			PF Contact in VCB Board
			Input DC Supply Fail	DI	Hard wire			1			PF Contact in VCB Board
			Input AC Supply Fail	DI	Hard wire			1			PF Contact in VCB Board
			TCS Healthy	DI	Hard wire			1			PF Contact in VCB Board
			Buch. Relay - Trip	DI	Hard wire			1			PF Contact in VCB Board
			Buch. Relay - Alarm	DI	Hard wire			1			PF Contact in VCB Board
			OTI - Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			OTI - High Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - HV Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - HV Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV Trip Status	DI	Hard wire			1			PF Contact in VCB Board
			WTI - LV Alarm Status	DI	Hard wire			1			PF Contact in VCB Board
			PRV - Trip Signal	DI	Hard wire			1			PF Contact in VCB Board
			MOG - Alarm	DI	Hard wire			1			PF Contact in VCB Board
		1	Remote Open	DO	Hard wire				1		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
			Remote Close	DO	Hard wire				1		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
		1	Oil Temperature	4-20mA	AI					1	
			Winding temperature - HV	4-20mA	AI					1	

Sl. No.	Description	Qty	Signal	Type	Medium	C1	C2	C3	C4	C5	Remarks
18	33kV MV Panel Out Going (O/G) - 1 Nos	1	VCB in Local	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Remote	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Test	DI	Hard wire			1			PF Contact in VCB Board
			VCB in Service	DI	Hard wire			1			PF Contact in VCB Board
			VCB ON Status	DI	Hard wire			1			PF Contact in VCB Board
			VCB OFF Status	DI	Hard wire			1			PF Contact in VCB Board
			VCB Spring Charged	DI	Hard wire			1			PF Contact in VCB Board
			VCB Master Trip Operated	DI	Hard wire			1			PF Contact in VCB Board
			Input DC Supply Fail	DI	Hard wire			1			PF Contact in VCB Board
			Input AC Supply Fail	DI	Hard wire			1			PF Contact in VCB Board
			TCS-1 Healthy	DI	Hard wire			1			PF Contact in VCB Board
			TCS-2 Healthy	DI	Hard wire			1			PF Contact in VCB Board
			U/V & O/V Trip	DI	Hard wire			1			PF Contact in VCB Board
		1	Remote Open	DO	Hard wire				1		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
			Remote Close	DO	Hard wire				1		230V AC shall be generated from VCB Board closing circuit & DO shall be potential free within the SCADA
19	33kV OH LINE I/C ISOLATOR (With 1-Earth Switch)	1	ISO -CLOSE Status	DI	Hard wire			1			
			ISO -OPEN Status	DI	Hard wire			1			
			ISO -E/S CLOSE Status	DI	Hard wire			1			
			ISO -E/S OPEN Status	DI	Hard wire			1			
20	33kV MV Panel Trivector Meter (TVM) - 8 Nos. Incommer (I/C) (ICR-1 to 3) - 3 Nos. Outgoing (O/G) - 1 Nos.	4	kW Energy / Peak	Modbus RTU	RS485	1					
			kVA Energy / Peak								
			kVAr Energy / Peak								
			kWh Energy								
			kVAh Energy								
			kVArh Energy								
			kWh Energy / Daily								
			kVAh Energy / Daily								
			kVArh Energy / Daily								
			R PHASE VOLTAGE								
			Y PHASE VOLTAGE								
			B PHASE VOLTAGE								
			R PHASE CURRENT								
			Y PHASE CURRENT								
			B PHASE CURRENT								
			RY PHASE VOLTAGE								
			YB PHASE VOLTAGE								
			BR PHASE VOLTAGE								
			FREQUENCY								
			POWER FACTOR								
			ACTIVE POWER IMPORT								
			ACTIVE POWER EXPORT								
			REACTIVE POWER IMPORT								
			REACTIVE POWER EXPORT								
			TOTAL APPARENT POWER								
			CUMULATIVE ENERGY - FORWARD KVAH								
			CUMULATIVE ENERGY - FORWARD KWH								
			CUMULATIVE ENERGY - REVERSE KVAH								
			CUMULATIVE ENERGY - REVERSE KWH								
20	MFM - Aux. ACDB - 1Nos.	1	kW Energy / Peak	Modbus RTU	RS485	1					
			kVA Energy / Peak								
			kVAr Energy / Peak								
			kWh Energy								
			kVAh Energy								
			kVArh Energy								
			kWh Energy / Daily								
			kVAh Energy / Daily								
			kVArh Energy / Daily								
			R PHASE VOLTAGE								
			Y PHASE VOLTAGE								
			B PHASE VOLTAGE								
			R PHASE CURRENT								
			Y PHASE CURRENT								
			B PHASE CURRENT								
			RY PHASE VOLTAGE								
			YB PHASE VOLTAGE								
			BR PHASE VOLTAGE								
			FREQUENCY								
			POWER FACTOR								
			ACTIVE POWER IMPORT								
			ACTIVE POWER EXPORT								
			REACTIVE POWER IMPORT								
			REACTIVE POWER EXPORT								
			TOTAL APPARENT POWER								
			CUMULATIVE ENERGY - FORWARD KVAH								
			CUMULATIVE ENERGY - FORWARD KWH								
			CUMULATIVE ENERGY - REVERSE KVAH								
			CUMULATIVE ENERGY - REVERSE KWH								
21	Aux. ACDB / MCCB	1	ON Status	DI	Hard wire			1			PF Contact in Aux. ACDB
			OFF Status	DI	Hard wire			1			PF Contact in Aux. ACDB
		1	Remote Open	DO	Hard wire				1		PF Contact in Aux. ACDB
			Remote Close	DO	Hard wire				1		PF Contact in Aux. ACDB
22	10kVA UPS	1	BATTERY VOLTAGE	Modbus RTU	RS485	1					
			BATTERY CURRENT								
			OUTPUT VOLTAGE								
			UPS LOAD								
			UPS TEMPERATURE								
			UPS BACKUP TIME								
			FREQUENCY								
			BATTERY LOW STATUS								
			MAINS FAIL STATUS								
			OVERLOAD STATUS								
			BYPASS MODE STATUS								
			BATTERY MODE STATUS								
23	FACP	1	All Modbus Registers available on mapping sheet	Modbus RTU	RS485	1					
		1	ON Indication	DI	Hard wire			1			
			OFF Indication	DI	Hard wire			1			
24	Weather Monitoring Station (WMS)	1	SOLAR INSOLATION HORIZONTAL (GHI)	Modbus RTU	TCP/IP		1				
			SOLAR INSOLATION TILTED (GII)								
			RAIN FALL								
			WIND SPEED (ANEMOMETER)								
			WIND DIRECTION								
			AMBIENT TEMPERATURE								
			MODULE TEMPERATURE								
			AIR PRESSURE								
			HUMIDITY								
			SOILING STATUIN								
					Sub-Total IO List	8	7	94	12	8	
					SPARE	2		10	4	8	
					TOTAL	10	7	104	16	16	

PROJECT	: 50 MWac Solar Project, KUMBAKARANATHAM, TN.
DEVELOPER / CLIEN	: FOURTH PARTNER ENERGY PRIVATE LIMITED
SUBJECT	: SCADA IO List - *Type-C*
REVISION & DATE	: R0 & 03.04.2025

S No	Device Description	Qty	Signal Description	Protocol Type	Sub Type	MODBUS RS485	MODBUS TCP/IP	DI	DO	AI	Remarks
					ICR x 1 RTU - *Type-C*						
1	String Inverter PLCC Communication	2	All Modbus Registers available on mapping sheet	MODBUS RTU	TCP/IP		2				String inverters will be connected to Sungrow EMU 200A via PLCC commnication and string Inverter mapping details will be available in SCADA from Sungrow EMU 200A.
2	PV Module Temperature	1	All Modbus Registers available on mapping sheet	Modbus RTU	RS485	1					
3	VCB (ICOG) / Annunciator	1	O/C & E/F PROTECTION OPERATED	Modbus RTU	RS485	1					
			MASTER TRIP OPERATED								
			TCS UNHEALTHY-1								
			TCS UNHEALTHY-2								
			BUCH. TRIP								
			BUCH. ALARM								
			OTI TRIP								
			OTI ALARM								
			HV WTI TRIP								
			HV WTI ALARM								
			LV-1 WTI TRIP								
			LV-1 WTI ALARM								
			LV-2 WTI TRIP								
			LV-2 WTI ALARM								
			LV-3 WTI TRIP								
			LV-3 WTI ALARM								
			LV-4 WTI TRIP								
			LV-4 WTI ALARM								
			PRV-1 TRIP								
			PRV-2 TRIP								
			MOG ALARM								
			AIR CELL RUPTURE RELAY ALARM								
			AUX. AC UPS SUPPLY FAIL								
			AUX. AC RAW SUPPLY FAIL								
4	VCB (ICOG) / Numerical Multifunction Relay	1	MASTER TRIP RELAY OPERATED								
			INSTANTANEOUS O/C & E/F PROTECTION (50/50N)								
			INVERSE TIME O/C & E/F PROTECTION (51/51N)								
			CIRCUIT BREAKER IN ON STATUS								
			CIRCUIT BREAKER IN SERVICE POSITION								
			CIRCUIT BREAKER IN TEST POSITION								
5	VCB (ICOG) Numerical Multifunction Relay *(IDT DIFF. PROTECTION) (87T)*	1	BUCHHOLZ TRIP								
			OTI TRIP								
			WTI TRIP								
			PRV-1/PRV-2 TRIP								
			OSR TRIP								
			AIRCELL PUNCHER TRIP								
			DIFF. PROTECTION OPTD.								
			V/F ALARM/TRIP								
			PROTN. RELAY FAIL								
6	VCB (ICOG)	1	VCB in Local	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB in Remote	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB in Test	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB in Service	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB ON Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB OFF Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB Spring Charged	DI	Hard wire			1			PF Contact in VCB (ICOG)
			VCB Master Trip Operated	DI	Hard wire			1			PF Contact in VCB (ICOG)
			Input DC Supply Fail	DI	Hard wire			1			PF Contact in VCB (ICOG)
			Input AC Supply Fail	DI	Hard wire			1			PF Contact in VCB (ICOG)
			TCS-1 Healthy	DI	Hard wire			1			PF Contact in VCB (ICOG)
			TCS-2 Healthy	DI	Hard wire			1			PF Contact in VCB (ICOG)
			Buch. Relay - Trip	DI	Hard wire			1			PF Contact in VCB (ICOG)
			Buch. Relay - Alarm	DI	Hard wire			1			PF Contact in VCB (ICOG)
			OTI - Trip Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			OTI - High Alarm Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - HV Trip Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - HV Alarm Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-1 Trip Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-1 Alarm Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-2 Trip Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-2 Alarm Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-3 Trip Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-3 Alarm Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-4 Trip Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			WTI - LV-4 Alarm Status	DI	Hard wire			1			PF Contact in VCB (ICOG)
			PRV-1 - Trip Signal	DI	Hard wire			1			PF Contact in VCB (ICOG)
			PRV-2 - Trip Signal	DI	Hard wire			1			PF Contact in VCB (ICOG)
			MOG - Alarm	DI	Hard wire			1			PF Contact in VCB (ICOG)
			Air Cell Rupture Relay Alarm	DI	Hard wire			1			PF Contact in VCB (ICOG)
			Remote Open	DO	Hard wire				1		230V AC shall be generated from VCB (ICOG) closing circuit & DO shall be potential free within the SCADA Panel
			Remote Close	DO	Hard wire				1		230V AC shall be generated from VCB (ICOG) closing circuit & DO shall be potential free within the SCADA Panel
7	IDT - OTI / WTI	1	Oil Temperature	4-20mA	AI					1	
			Winding Temperature - LV-1	4-20mA	AI					1	
			Winding Temperature - LV-2	4-20mA	AI					1	
			Winding Temperature - LV-3	4-20mA	AI					1	
			Winding Temperature - LV-4	4-20mA	AI					1	
			Winding Temperature - HV	4-20mA	AI					1	
8	ICR IDT / NIFPS	1	System Out of Service	Modbus RTU	TCP/IP		1				
			PNRV/TCIV Closed								
			Fire detector Trip								
			Cylinder pressure Low								
			Visual / Audio Alarm								
			Visual / Audio alarm for DC supply Fail								
			NIFPS system Fail								

#	Equipment	Qty	Parameter	Protocol	Interface	AI	DI	AO/RS485	DO	...	...	Remarks
9	Auxilairy Power - LT Panel MFM	1	kW Energy / Peak	Modbus RTU	RS485	1						
			kVA Energy / Peak									
			kVAr Energy / Peak									
			kWh Energy									
			kVAh Energy									
			kVArh Energy									
			kWh Energy / Daily									
			kVAh Energy / Daily									
			kVArh Energy / Daily									
			R PHASE VOLTAGE									
			Y PHASE VOLTAGE									
			B PHASE VOLTAGE									
			R PHASE CURRENT									
			Y PHASE CURRENT									
			B PHASE CURRENT									
			RY PHASE VOLTAGE									
			YB PHASE VOLTAGE									
			BR PHASE VOLTAGE									
			FREQUENCY									
			POWER FACTOR									
			ACTIVE POWER IMPORT									
			ACTIVE POWER EXPORT									
			REACTIVE POWER IMPORT									
			REACTIVE POWER EXPORT									
			TOTAL APPARENT POWER									
			CUMULATIVE ENERGY - FORWARD KVAH									
			CUMULATIVE ENERGY - FORWARD KWH									
			CUMULATIVE ENERGY - REVERSE KVAH									
			CUMULATIVE ENERGY - REVERSE KWH									
10	3kVA UPS	1	BATTERY VOLTAGE									
			BATTERY CURRENT									
			OUTPUT VOLTAGE									
			UPS LOAD									
			UPS TEMPERATURE									
			UPS BACKUP TIME									
			FREQUENCY									
			BATTERY LOW STATUS									
			MAINS FAIL STATUS									
			OVERLOAD STATUS									
			BYPASS MODE STATUS									
			BATTERY MODE STATUS									
			Total IO List			3	3	30	2	6		
			SPARE			3		10	6	2		
			TOTAL			6	3	40	8	8		