भारत इलेक्ट्रॉनिक्स
BHARAT ELECTRONICS
QUALITY. TECHNOLOGY. INNOVATION.

INTEGRATED CONTROL, MONITORING AND OPERATION OF POWER DISTRIBUTION TO ENHANCE PRODUCTIVITY

By, ShashiKumar B K, BEL-Bangalore

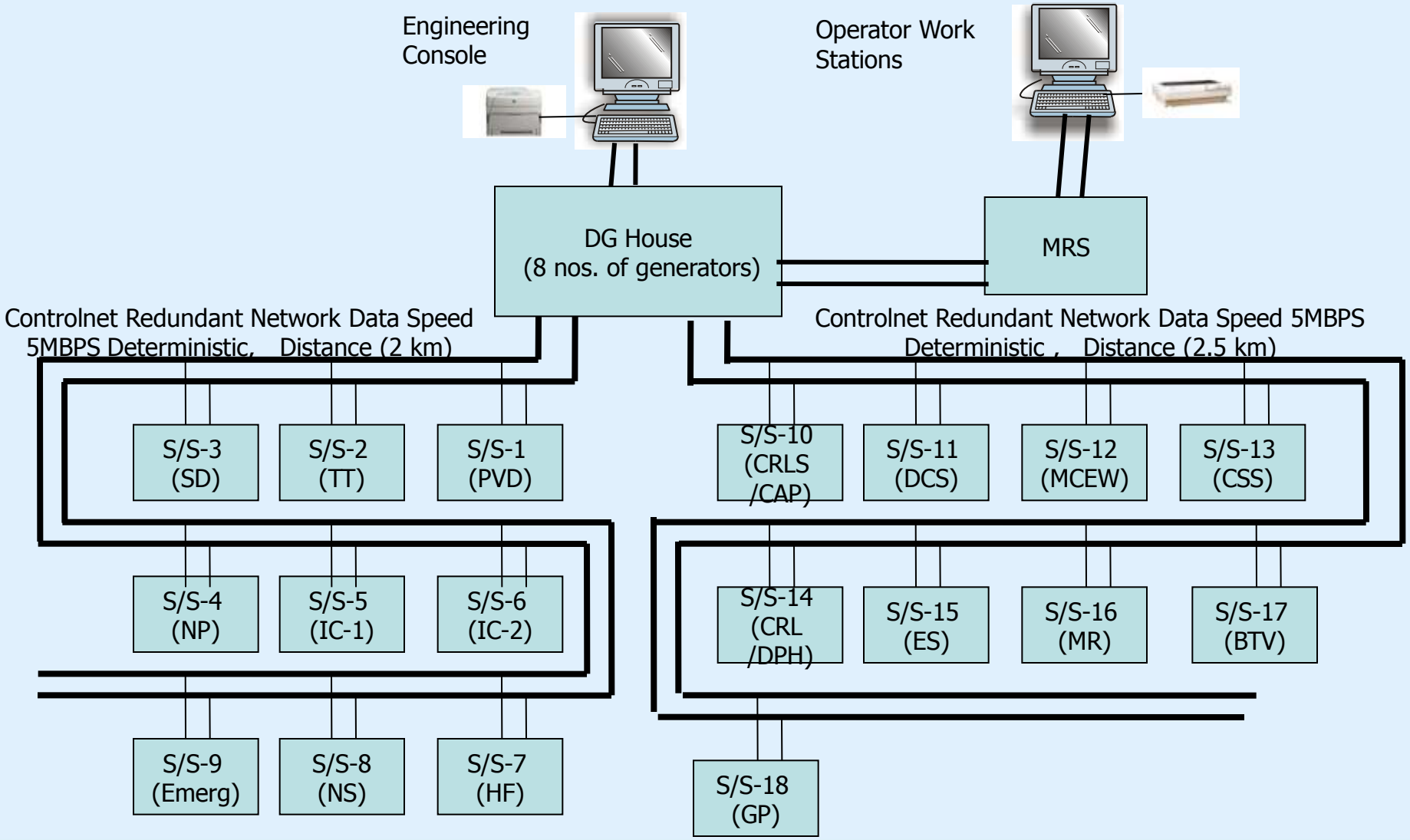
25th August 2012 at Chennai

Real-time SCADA System

Supervisory Control And Data Acquisition enables us

- Remotely monitoring of power distribution system and in house generation
- Facilitates supervisory control & operation of devices
- Provides decision support tools to improve the system performance
- Load management through LMS
- Energy consumption reporting through Energy Management system
- Sequence of Event recording to enhance the reliability

System Architecture OverView



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SYSTEM CONFIGURATION

Tuesday, May 15, 2007
2:06:53 PM

RSView32 Operator Workstation
Inkjet Colour Printer
RSView32 Operator Workstation
Dotmatrix Printer
Operating Workstation
Dotmatrix Printer
Redundant Processor Chassis
Redundant Processor Chassis
NODE # 19
NODE # 21
NODE # 23
Battery Status
NODE # 20
NODE # 22
NODE # 24
CONTROLNET REDUNDANT
Controlnet A
Controlnet B
NODE # 01
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0 1 2 3 4 5 6
ACNR ID 2 ID 2 ID 2 ID 2 ID 2 MCM MCM
NODE # 02
ACNR IB 32 IB 32 IB 32 IB 32 IB 32 IE 8 IE 8 IE 8
NODE # 03
ACNR IE 8 IE 8 IE 8 IE 8 IE 8 IE 8 IE 8 IE 8
NODE # 04
ACNR IT 8 IT 8 IT 8 IT 8 IT 8 IT 8 IT 8 IT 8
NODE # 05
ACNR IT 8 IT 8 IT 8 IT 8 IT 8 IT 8 IT 8
NODE # 06
ACNR IB 32 IB 32 IB 32 IB 32 IB 32 IB 32 OB 32 OB 32
NODE # 07
ACNR IR 8 IR 8 IR 8 IR 8 IR 8 IR 8
NODE # 08
Main Menu
NEXT
Alarm Banner:
Clear
Clear All

start | RSView32 Runtime 32K | TagServer | Report & BackUp | USB (E:) | Microsoft PowerPoint... | 2:06 PM

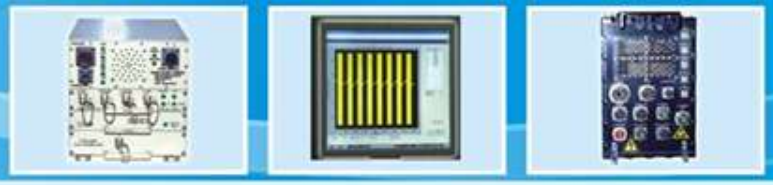


SCADA system@BEL is integrated for

- Monitoring and control of Switchgears
- Intelligent auto operation of equipments
- Alarming and protection of the equipments
- Demand side management
- Auto prioritization of loads.
- Auto Starting & Synchronization of captive generation
- Load sharing & Load shedding
- Condition based auto operation
- Auto synchronization
- Remote monitoring and auto operation of substations
- Energy management and Generation of reports.
- Data storage, Trend study and analysis
- Fundamental change in work culture.

LOAD MANAGEMENT SYSTEM

IN HOUSE GENERATION
AND
SYNCHRONISATION



LOAD MANAGEMENT SYSTEM

- Auto starting based on priority
- Auto Synchronization
- Auto loading of diesel generators
- Auto-off loading
- Auto Load sharing of diesel generators
- Auto Load shedding
- Auto shutdown of generators

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LOAD MANAGEMENT SYSTEM

MAIN MENU

PLANT OVERVIEW DPH	PLANT OVERVIEW MRS	ANALOG INPUT INSTANT REPORT
SYNCHRONIZATION	F1 & F2 SUB STATION-1	THERMOCOUPLE INPUT INSTANT REPORT
LOAD SHARING	F1 & F2 SUB STATION-2	RTD INPUT INSTANT REPORT
LOAD SHEDDING	F1 & F2 SUB STATION-3	ENERGY REPORTS
COOLING WATER SYSTEM	F3 & F4 SUB STATION-1	TRENDS
COMPRESSOR	F3 & F4 SUB STATION-2	TRENDS S/S
GMR RELAY DATA	F5 & F6 SUB STATION	ALARM SUMMARY
LOAD SHEDDING SUBSTATION	S/S BREAKERS TRIP/NON-TRIP	SYSTEM CONFIGURATION

LOGOUT

Tag not found: VRS_B1 Clear Clear All

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LOAD MANAGEMENT SYSTEM- Plant Overview

GRID FREQ. 49.31 Hz
GENERATION FREQ. 0.00 Hz

KPTCL GRID
65157 V
[66KV, MRS BUS]

TOTAL GRID KVA 7096 kVA

SF6-3 3806 kW 4049 KVA
BANK-3
B3 3738 kW 11125 / 419 V -0.95 PF 49.46 Hz HT/LT

SF6-1 2954 kW 3098 KVA
BANK-1
B1 2805 kW 11141 / 420 V -0.97 PF 49.28 Hz HT/LT

SF6-2 0 kW 0 KVA
BANK-2
B2 0 kW 10851 / 409 V 0.00 PF 49.45 Hz HT/LT

SYSTEM STATUS

SECTION-5 BC-1 SECTION-4 BC-2 SECTION-3 BC-3 SECTION-2 BC-4 SECTION-1 [11KV MRS BUS]

E2 E3 MB E1

TOTAL GENERATION kW 0 kW
TOTAL GENERATION kVA 0 kVA
TOTAL LOAD kW 6685 kW
TOTAL LOAD kVA 7096 kVA
ENERGY METER 49210 kwh

SYSTEM STATUS

E3 MB E2 E1

11044 V
49.37 Hz
49.44 Hz
[11KV DPH BUS]

SECTION-1 BC-2 SECTION-2 BC-1 SECTION-3

FO TANK-1 7116.5 L
FO TANK-2 7712.1 L
200KL TANK 46.3 KL
TOTAL FUEL 61.2 KL

	MMB-1 200 A	MMB-3 200 A	MB 200 A	MMB-2 200 A	PB-4 100 A	PB-3 100 A	PB-2 100 A	PB-1 100 A
kVA	0	0	0	0	0	0	0	0
kW	0	0	0	0	0	0	0	0
PF	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	0.07

Main Menu

10:52:59 A GP POWER MONITOR FAULT

Silence Cntrl F1

Plant Oww DPH | Synchronization | Load Sharing | Load Shedding | Compressor & Chiller | Cooling Water System | Auto- Start | Plant Overview MRS | Print Cntrl F4

Tag not found: VRS_B1

Clear | Clear All

PR CHANGE OG

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LOAD MANAGEMENT SYSTEM- Auto - Startup/Loading

TOTAL GENERATION	0	kW	TOTAL LOAD ALLOWED	0	kW
TOTAL LOAD	6906	kW	GRID FAIL LOAD	0	kW

0

AUTO OPERATION TERMINATE

	F1	F2	F3	F4	F5	F6	EF1	EF2	MRS 11KV	CRL 11KV
PRIORITY	8	7	6	5	9	10	1	2	3	4
STATUS										
KW	1053	1473	870	762	1131	774	111	228	291	213
MAX KW	450	250	300	350	300	300	140	240	280	50

	MMB1	MMB2	MMB3	MB	PB1	PB2	PB3	PB4
PRIORITY	1	2	3	7	4	5	6	0
DG STATUS								
BREAKER STS								
OPER FAIL								
	0 kW	0 kW	0 kW	0 kW	0 kW	0 kW	0 kW	0 kW
	0.00 PF	0.00 PF	0.00 PF	0.00 PF	0.01 PF	0.00 PF	-0.01 PF	0.00 PF

Main Menu

10:52:59 A GP POWER MONITOR FAULT

Silence Cntrl F1

Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1

Clear | Clear All

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LOAD MANAGEMENT SYSTEM- Load Sharing

MMB#1
Priority- 1
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 50
kVAR Setpoint: 75
Capacity kW: 2000
Capacity kVAR: 1650
PF: 0.00
Voltage (v): 0.0
G

MMB#2
Priority- 2
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 50
kVAR Setpoint: 75
Capacity kW: 1400
Capacity kVAR: 1350
PF: 0.00
Voltage (v): 0.0
G

MMB#3
Priority- 3
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 50
kVAR Setpoint: 75
Capacity kW: 1400
Capacity kVAR: 1350
PF: 0.00
Voltage (v): 0.0
G

MB
Priority- 7
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 50
kVAR Setpoint: 75
Capacity kW: 1200
Capacity kVAR: 900
PF: 0.00
Voltage (v): 0.0
G

PB#1
Priority- 4
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 25
kVAR Setpoint: 75
Capacity kW: 650
Capacity kVAR: 487
PF: 0.07
Voltage (v): 11134.5
G

PB#2
Priority- 5
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 25
kVAR Setpoint: 75
Capacity kW: 650
Capacity kVAR: 487
PF: 0.00
Voltage (v): 0.0
G

PB#3
Priority- 6
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 25
kVAR Setpoint: 75
Capacity kW: 650
Capacity kVAR: 487
PF: -0.0
Voltage (v): 11128.7
G

PB#4
Priority- 0
Mode of Operation
Load Sharing LOCAL REMOTE
Off AUTO MANUAL
kW: 0.0
kVAR: 0.0
kW Setpoint: 500
kVAR Setpoint: 75
Capacity kW: 650
Capacity kVAR: 487
PF: 0.00
Voltage (v): 0.0
G

Freq. Setpoint (Hz): 50.00

Volt. Setpoint (v): 11000

Main Menu

10:52:59 A GP POWER MONITOR FAULT

Silence Cntrl F1

Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1

Clear | Clear All

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LOAD MANAGEMENT SYSTEM- Synchronization

CASE SELECTION

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

MODE

Live Bus

Vol. Error	0.00 %
Freq. Error	0.00 Hz
Phase Error	0 deg

Synchronisation Off

MMB-1	0.00 Kw	PB-1	0.00 Kw
MMB-2	0.00 Kw	PB-2	0.00 Kw
MMB-3	0.00 Kw	PB-3	0.00 Kw
MB	0.00 Kw	PB-4	0.00 Kw

Reference Bus Parameters	
Line Voltage R - Y	0 V
Line Voltage Y - B	0 V
Line Voltage B - R	0 V
Average Line Voltage	0 V
Phase Voltage R	0 V
Phase Voltage Y	0 V
Phase Voltage B	0 V
Average Phase Voltage	0 V
Frequency	0.00 Hz
Phase Rotation	RBY

Synchronising Bus Parameters	
Line Voltage R - Y	0 V
Line Voltage Y - B	0 V
Line Voltage B - R	0 V
Average Line Voltage	0 V
Phase Voltage R	0 V
Phase Voltage Y	0 V
Phase Voltage B	0 V
Average Phase Voltage	0 V
Frequency	0.00 Hz
Phase Rotation	RBY

Main Menu | 10:52:59 A GP POWER MONITOR FAULT | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1 | Clear | Clear All

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LOAD MANAGEMENT SYSTEM- Load Shedding Report

DT. 09 / 01 / 2006 REASON: GRID-2 TRIPPED

TIME 18 : 52 : 56

PRT	FEEDER DESCRIPTION	STATUS	LOAD (KW)	LS Command
01	OUTGOING F6 FEEDER	OFF	0	NO
02	OUTGOING F5 FEEDER	OFF	0	NO
03	OUTGOING F1 FEEDER	OFF	0	NO
04	OUTGOING F2 FEEDER	OFF	0	NO
05	OUTGOING F3 FEEDER	OFF	0	NO
06	OUTGOING F4 FEEDER	OFF	0	NO
07	OUTGOING CRL FEEDER	OFF	0	NO
08	OUTGOING MRS FEEDER	OFF	0	NO
09	OUTGOING EF2 FEEDER	OFF	0	NO
10	OUTGOING EF1 FEEDER	OFF	0	NO

	KW
MMB-1	0
MMB-2	0
MMB-3	0
MB	0
PB-1	0
PB-2	0
PB-3	0
PB-4	0
GRID-1	1106
GRID-2	0
GRID-3	2325

LOAD TO BE SHED (KW)	LOAD SHED (KW)
0	0

Main Menu | 10:52:59 A GP POWER MONITOR FAULT | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1 Clear Clear All



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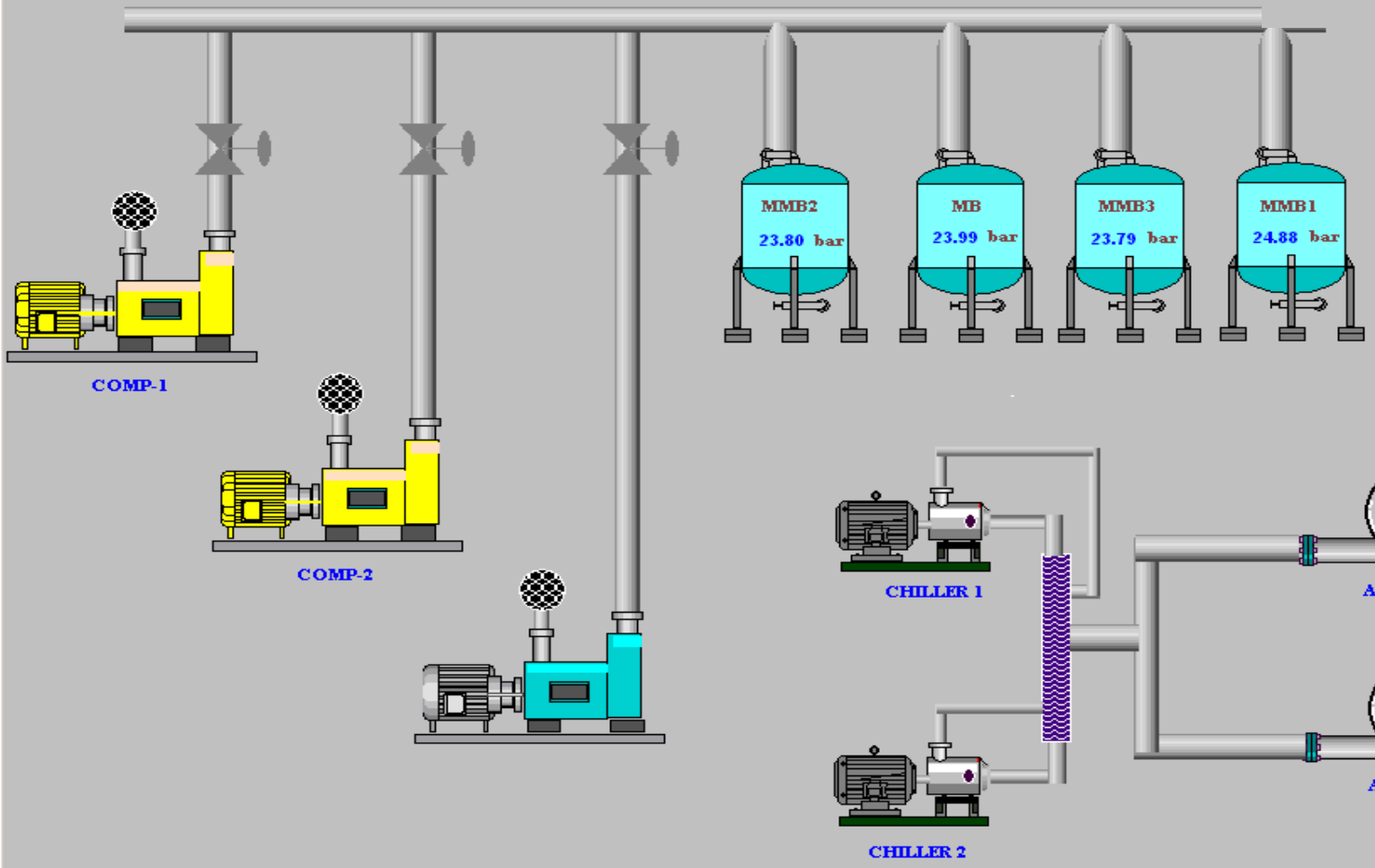
LOAD MANAGEMENT SYSTEM- Compressor & Chiller



Main Menu | 10:52:59 A GP POWER MONITOR FAULT | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1 | Clear | Clear All



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LOAD MANAGEMENT SYSTEM- CW SYSTEM

PB DG SET EM. SUMP
FROM MMB DG
FROM PB DG
CT FAN 5
CT FAN 4
CT FAN 3
CT FAN 2
PETBOW
1A CT FAN 1B
MMBL & MB
COOLING TOWER WATER SUMP
CW PUMP 3
CW PUMP 4
TO PB DG
TO PB DG
CW NEW PUMP
CW PUMP 2
TO MMB DG

Main Menu | 10:52:59 A GP POWER MONITOR FAULT | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1 | Clear | Clear All



LOAD MANAGEMENT SYSTEM- RTD Input Instant Report

Main Menu | Print Cntrl F4

Monday, January 23, 2006 11:51:37 AM

MMB1 CHARGE AIR TEMP.	29.3	DEG. C.
MMB2 CHARGE AIR TEMP.	36.8	DEG. C.
MMB3 CHARGE AIR TEMP.	36.3	DEG. C.
MB BEARING TEMP.	22.7	DEG. C.
MB BEARING LUB OIL TEMP.	23.9	DEG. C.
MB LUB OIL TEMP.	22.4	DEG. C.
MB CLR LO O/L TEMP.	22.5	DEG. C.
MB JCKT WATER I/L TEMP.	22.6	DEG. C.
MB JCKT WATER O/L TEMP.	22.6	DEG. C.
MB EXHAUST TEMP. -A1	26.0	DEG. C.
MB EXHAUST TEMP. -A2	23.6	DEG. C.
MB EXHAUST TEMP. -A3	25.0	DEG. C.
MB EXHAUST TEMP. -A4	25.9	DEG. C.
MB EXHUAST TEMP. -A5	25.4	DEG. C.
MB EXHAUST TEMP. -A6	24.9	DEG. C.
MB EXHAUST TEMP. -B1	23.5	DEG. C.
MB EXHAUST TEMP. -B2	25.3	DEG. C.
MB EXHAUST TEMP. -B3	25.7	DEG. C.
MB EXHAUST TEMP. -B4	26.2	DEG. C.
MB EXHAUST TEMP. -B5	27.6	DEG. C.
MB EXHAUST TEMP. -B6	26.2	DEG. C.
MB EXHUAST TEMP. -AT	24.5	DEG. C.
MB RW I/L TEMP.	22.3	DEG. C.
MB RW O/L TEMP.	22.4	DEG. C.
MB HEAT EXCH O/L TEMP.	22.5	DEG. C.
MB CHARGE AIR TEMP.	23.0	DEG. C.

PB1 COOLANT TEMP.	22.2	DEG. C.
PB1 EXHAUST TEMP. -1	24.1	DEG. C.
PB1 EXHAUST TEMP. -2	24.1	DEG. C.
PB1 LUBE OIL TEMP.	22.0	DEG. C.
PB1 RW I/L TEMP.	22.5	DEG. C.
PB1 RW O/L TEMP.	870.0	DEG. C.
PB2 COOLANT TEMP.	22.0	DEG. C.
PB2 EXHAUST TEMP. -1	23.8	DEG. C.
PB2 EXHAUST TEMP. -2	24.2	DEG. C.
PB2 LUBE OIL TEMP.	21.6	DEG. C.
PB2 RW I/L TEMP.	21.7	DEG. C.
PB3 COOLANT TEMP.	21.7	DEG. C.
PB3 EXHAUST TEMP. -1	24.2	DEG. C.
PB3 EXHAUST TEMP. -2	24.0	DEG. C.
PB3 LUBE OIL TEMP.	21.7	DEG. C.
PB3 RW I/L TEMP.	21.7	DEG. C.
PB4 COOLANT TEMP.	53.9	DEG. C.
PB4 EXHAUST TEMP. -1	23.8	DEG. C.
PB4 EXHAUST TEMP. -2	24.3	DEG. C.
PB4 LUBE OIL TEMP.	20.8	DEG. C.
PB4 RW I/L TEMP.	22.5	DEG. C.
50KL SUMP RW TEMP.	870.0	DEG. C.

Tag not found: VRS_B1 | Clear | Clear All

LOAD MANAGEMENT SYSTEM- Thermo-Couple Input Instant Report

Monday, January 23, 2006 11:50:33 AM

MMB-1

EXHAUST TEMP. -A1	39.5	DEG. C.
EXHAUST TEMP. -A2	41.0	DEG. C.
EXHAUST TEMP. -A3	41.8	DEG. C.
EXHAUST TEMP. -A4	42.7	DEG. C.
EXHAUST TEMP. -A5	42.8	DEG. C.
EXHAUST TEMP. -A6	38.0	DEG. C.
EXHAUST TEMP. -A7	41.9	DEG. C.
EXHAUST TEMP. -A8	41.6	DEG. C.
EXHAUST TEMP. -B1	40.4	DEG. C.
EXHAUST TEMP. -B2	40.3	DEG. C.
EXHAUST TEMP. -B3	40.7	DEG. C.
EXHAUST TEMP. -B4	41.2	DEG. C.
EXHAUST TEMP. -B5	41.4	DEG. C.
EXHAUST TEMP. -B6	41.0	DEG. C.
EXHAUST TEMP. -B7	40.4	DEG. C.
EXHAUST TEMP. -B8	39.7	DEG. C.
EXHAUST TEMP. -AT	31.8	DEG. C.

MMB-2

EXHAUST TEMP. -A1	40.5	DEG. C.
EXHAUST TEMP. -A2	42.2	DEG. C.
EXHAUST TEMP. -A3	42.6	DEG. C.
EXHAUST TEMP. -A4	42.6	DEG. C.
EXHAUST TEMP. -A5	41.9	DEG. C.
EXHAUST TEMP. -A6	43.7	DEG. C.
EXHAUST TEMP. -B1	42.3	DEG. C.
EXHAUST TEMP. -B2	42.8	DEG. C.
EXHAUST TEMP. -B3	43.5	DEG. C.
EXHAUST TEMP. -B4	43.1	DEG. C.
EXHAUST TEMP. -B5	43.5	DEG. C.
EXHAUST TEMP. -B6	44.6	DEG. C.
EXHAUST TEMP. -AT	29.4	DEG. C.

MMB-3

EXHAUST TEMP. -A1	9.0	DEG. C.
EXHAUST TEMP. -A2	41.8	DEG. C.
EXHAUST TEMP. -A3	41.0	DEG. C.
EXHAUST TEMP. -A4	41.0	DEG. C.
EXHAUST TEMP. -A5	40.7	DEG. C.
EXHAUST TEMP. -A6	39.8	DEG. C.
EXHAUST TEMP. -B1	38.7	DEG. C.
EXHAUST TEMP. -B2	40.4	DEG. C.
EXHAUST TEMP. -B3	41.2	DEG. C.
EXHAUST TEMP. -B4	42.2	DEG. C.
EXHAUST TEMP. -B5	41.9	DEG. C.
EXHAUST TEMP. -B6	41.5	DEG. C.
EXHAUST TEMP. -AT	29.0	DEG. C.

Tag not found: VRS_B1

Clear | Clear All

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LOAD MANAGEMENT SYSTEM- Analog Input Instant Report

Main Menu | Print Cntrl F4

Monday, January 23, 2006 11:43:38 AM

MMB1 FO PR. BEFORE FILTER	1.12	bar
MMB1 FO PR. AFTER FILTER	0.36	bar
MMB1 LO PR. BEFORE FILTER	0.06	bar
MMB1 LO PR. AFTER FILTER	0.00	bar
MMB1 JACKET WATER PR.	0.00	bar
MMB1 CHARGE AIR PR.	0.00	bar
MMB1 RW INLET PR.	0.00	bar
MMB1 RW OUTLET PR.	0.11	bar
MMB1 AIR BOTTLE PR.	24.89	bar
MMB2 FO PR. BEFORE FILTER	1.81	bar
MMB2 FO PR. AFTER FILTER	4.25	bar
MMB2 LO PR. BEFORE FILTER	0.02	bar
MMB2 LO PR. AFTER FILTER	0.02	bar
MMB2 JACKET WATER PR.	0.26	bar
MMB2 CHARGE AIR PR.	0.00	bar
MMB2 RW INLET PR.	0.24	bar
MMB2 RW OUTLET PR.	0.11	bar
MMB2 AIR BOTTLE PR.	23.80	bar
MMB3 FO PR. BEFORE FILTER	0.00	bar
MMB3 FO PR. AFTER FILTER	0.00	bar
MMB3 LO PR. BEFORE FILTER	0.06	bar
MMB3 LO PR. AFTER FILTER	0.04	bar
MMB3 JACKET WATER PR.	0.00	bar
MMB3 CHARGE AIR PR.	0.01	bar
MMB3 RW INLET PR.	0.23	bar
MMB3 RW OUTLET PR.	0.10	bar
MMB3 AIR BOTTLE PR.	23.80	bar

MB BEARING OIL INLET PR.	0.01	bar
MB LUB OIL PR.	0.06	bar
MB JACKET WATER PR.	0.31	bar
MB COOLER PR.	0.13	bar
MB BOOST AIR PR.	0.01	bar
MB RAW WATER INLET PR.	0.21	bar
MB RAW WATER OUTLET PR.	0.15	bar
MB AIR BOTTLE PR.	23.99	bar
PB1 RW INLET PR.	0.17	bar
PB1 RW OUTLET PR.	0.17	bar
PB1 LO PR.	0.00	bar
PB1 COOLANT PR.	0.04	bar
PB2 RW INLET PR.	0.17	bar
PB2 RW OUTLET PR.	0.18	bar
PB2 LO PR.	0.03	bar
PB2 COOLANT PR.	0.05	bar
PB3 RW INLET PR.	0.20	bar
PB3 RW OUTLET PR.	0.18	bar
PB3 LO PR.	0.00	bar
PB3 COOLANT PR.	0.06	bar
PB4 RW INLET PR.	0.00	bar
PB4 RW OUTLET PR.	0.00	bar
PB4 LO PR.	0.00	bar
PB4 COOLANT PR.	0.00	bar

SEC CW SUMP LEVEL	0.0	%
FO SYSTEM TANK 1 LEVEL	7147.9	L
FO SYSTEM TANK 2 LEVEL	7740.3	L
FO 200KL TANK 1 LEVEL	46.3	KL
TOTAL FUEL QUANTITY	61.2	KL
24 V DC BATT. CHARGER 1	0.0	V
24 V DC BATT. CHARGER 2	0.0	V
OLTC 1 TAP POSITION	0.0	
OLTC 2 TAP POSITION	0.0	
OLTC 3 TAP POSITION	0.0	

Tag not found: VRS_B1 | Clear | Clear All

REDUCTION IN MAN POWER REQUIREMENT

SUPERVISORY CONTROL AND REMOTE OPERATION
OF
Central Main Receiving Station and SUBSTATIONS at different locations in the factory

- Centralized monitoring of all the 18 substations spread across the factory leads to reduction in man power requirement for deploying skilled labour at all substations

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LOAD MANAGEMENT SYSTEM-Plant Overview MRS

GRID FREQ. 49.31 Hz
GENERATION FREQ. 0.00 Hz

KPTCL GRID
65053 V
[66KV, MRS BUS]

TOTAL GRID KW 6872 kW
TOTAL GRID KVA 7175 kVA

SF6-3 — BANK-3 — B3
3831 kW
4105. kVA
HT/LT
11111 / 418 V
49.50 Hz
3769 kW
-0.95 PF

DG — E2
DG — E3

3040 kW
3167. kVA
11126 / 419 V
49.40 Hz
2911 kW
-0.97 PF

SF6-1 — BANK-1 — B1
DG — MB
DG — E1

0 kW
0 KVA
HT/LT
10840 / 408 V
49.46 Hz
0 kW
0.00 PF

SF6-2 — BANK-2 — B2

11KV, 800A, MRS BUS

SECTION-5 — BC1 400A — SECTION-4 — BC2 400A — SECTION-3 — BC3 400A — SECTION-2 — BC4 400A — SECTION-1

F5 400A
EF1 400A
F6 400A
F3 400A
F4 400A
AUX CRL 400A
F1 400A
EF2 400A
MRS 400A
F2 400A

TOTAL GENERATION kW 0 kW
TOTAL GENERATION kVA 0 kVA
TOTAL LOAD kW 6814 kW
TOTAL LOAD kVA 7175 kVA
ENERGY METER 49751 kwh

	OUTGOING FEEDER F5	OUTGOING FEEDER EF1	OUTGOING FEEDER F6	OUTGOING FEEDER F3	OUTGOING FEEDER F4	OUTGOING FEEDER AUX CRL	OUTGOING FEEDER F1	OUTGOING FEEDER EF2	OUTGOING FEEDER MRS	OUTGOING FEEDER F2
kW	1149	114	774	840	705	213	1065	231	280	1443
PF	-0.95	-0.95	-0.98	-0.97	-0.89	0.86	-0.97	0.99	0.92	0.97
kWh	7695	1291	5416	6117	7941	1211	8030	2106	2325	7614

Main Menu | 10:52:59 A GP POWER MONITOR FAULT | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw DPH | Synchronization | Load Sharing | Load Shedding | F1 & F2 Substation-1 | F1 & F2 Substation-2 | F1 & F2 Substation-3 | F3 & F4 Substation-1 | F3 & F4 Substation-2 | F5 & F6 Substation | Auto- Start

Tag not found: VRS_B1 | Clear | Clear All

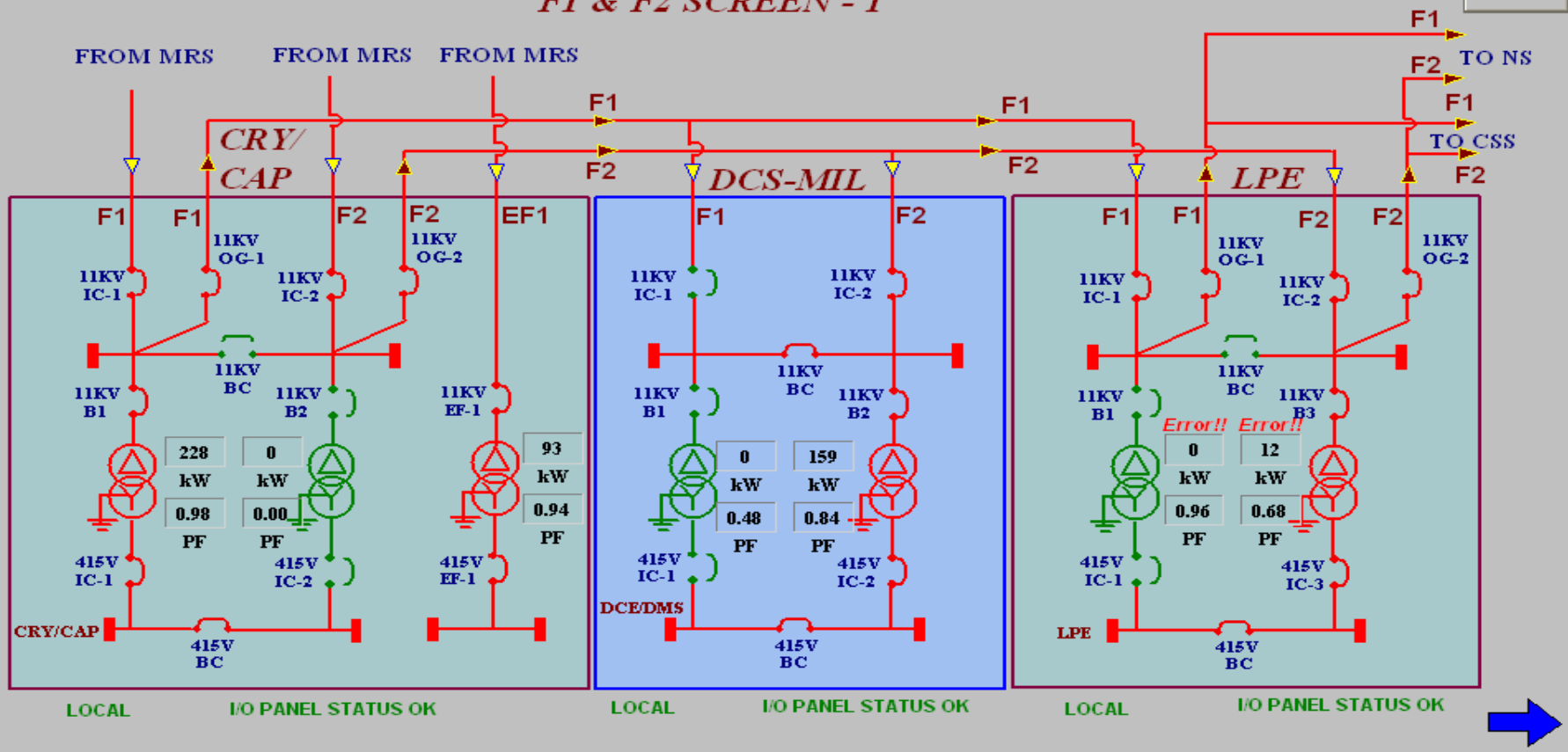
TOTAL LOAD
6817 kW

BHARAT ELECTRONICS LIMITED

LOAD MANAGEMENT SYSTEM- SUB-STATIONS

F1 & F2 SCREEN - 1

EXIT



F1 & F2 SCREEN - 1 | F1 & F2 SCREEN - 2 | F1 & F2 SCREEN - 3 | F3 & F4 SCREEN - 1 | F3 & F4 SCREEN - 2 | F5 & F6

Main Menu | 10:52:59 A GP POWER MONITOR FAULT | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1 | Clear | Clear All

TOTAL LOAD
6834 kW

BHARAT ELECTRONICS LIMITED

LOAD MANAGEMENT SYSTEM- SUB-STATIONS

F1 & F2 SCREEN - 2

EXIT

FROM LPE FROM LPE

TO RASSY

TO HF

F1 F2

CSS

F1 F2

11KV IC-1 11KV IC-2

11KV BC

11KV B1 11KV B2

341 kW 0.99 PF

335 kW 0.90 PF

415V IC-1 415V IC-2

CSS

415V BC

LOCAL I/O PANEL STATUS OK

NS

F1 F1 F2 F2

11KV OG-1 11KV OG-2

11KV IC-1 11KV IC-2

11KV BC

11KV B1 11KV B2

251 kW 0.97 PF

0 kW 0.00 PF

415V IC-1 415V IC-2

RSM

415V BC

LOCAL I/O PANEL STATUS OK

T&BS

F1 F1 F2 F2

11KV OG-1 11KV OG-2

11KV IC-1 11KV IC-2

11KV BC

11KV B1 11KV B2

204 kW 0.96 PF

0 kW 0.00 PF

415V IC-1 415V IC-2

BTV

415V BC

LOCAL I/O PANEL STATUS OK

F1 & F2 SCREEN - 1 | F1 & F2 SCREEN - 2 | F1 & F2 SCREEN - 3 | F3 & F4 SCREEN - 1 | F3 & F4 SCREEN - 2 | F5 & F6

Main Menu

10:52:59 A GP POWER MONITOR FAULT

Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1 Clear Clear All



PR CHANGE OG

BHARAT ELECTRONICS LIMITED

LOAD MANAGEMENT SYSTEM- Auto - Startup/Loading

TOTAL GENERATION	0	kW	TOTAL LOAD ALLOWED	0	kW
TOTAL LOAD	6906	kW	GRID FAIL LOAD	0	kW

0

AUTO OPERATION TERMINATE

	F1	F2	F3	F4	F5	F6	EF1	EF2	MRS 11KV	CRL 11KV
PRIORITY	8	7	6	5	9	10	1	2	3	4
STATUS										
KW	1053	1473	870	762	1131	774	111	228	291	213
MAX KW	450	250	300	350	300	300	140	240	280	50

	MMB1	MMB2	MMB3	MB	PB1	PB2	PB3	PB4
PRIORITY	1	2	3	7	4	5	6	0
DG STATUS								
BREAKER STS								
OPER FAIL								
	0 kW	0 kW	0 kW	0 kW	0 kW	0 kW	0 kW	0 kW
	0.00 PF	0.00 PF	0.00 PF	0.00 PF	0.01 PF	0.00 PF	-0.01 PF	0.00 PF

Main Menu

10:52:59 A GP POWER MONITOR FAULT

Silence Cntrl F1

Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Tag not found: VRS_B1

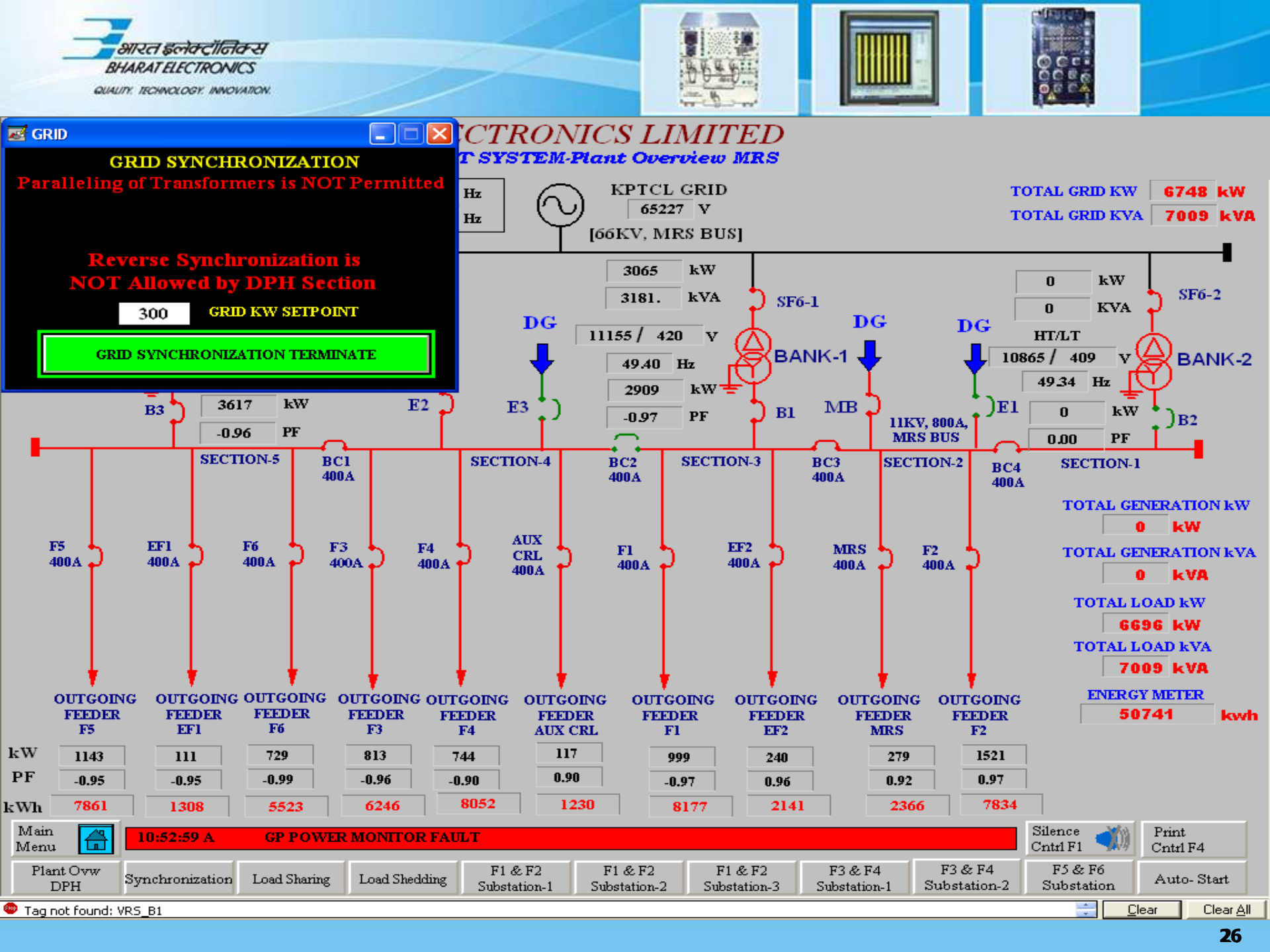
Clear | Clear All

SAFETY AND STABILITY IN OPERATION

INTERLOCKS AND SEQUENCIAL LOGIC

SOFTWARE INTERLOCKS

MRS BC-2
MRS BUSCOUPLER-2
CLOSE
OPEN
BREAKER IN OPEN POSITION
BREAKER TRIP CIRCUIT HEALTHY
BREAKER SPRING CHARGED
BREAKER SEL. SWITCH IN REMOTE POS.
RESET
ELECTRONICS LIMITED
ALARM
CLOSING OF THIS BUS COUPLER IS NOT ALLOWED
PARALLALING OF TRANSFORMERS IS NOT ALLOWED THROUGH SCADA*
KW 6686 kW
KVA 6969 kVA
3028 kW
3154. kVA
11163 / 420 V
49.38 Hz
2876 kW
-0.97 PF
SF6-1
BANK-1
DG
DG
DG
DG
E2
E3
B1
MB
E1
B2
0 kW
0 KVA
HT/LT
10872 / 409 V
49.38 Hz
0 kW
0.00 PF
SF6-2
BANK-2
11KV, 800A, MRS BUS
SECTION-4
SECTION-3
SECTION-2
SECTION-1
BC2 400A
BC3 400A
BC4 400A
F5 400A
EF1 400A
F6 400A
F3 400A
F4 400A
AUX CRL 400A
F1 400A
EF2 400A
MRS 400A
F2 400A
TOTAL GENERATION kW
0 kW
TOTAL GENERATION kVA
0 kVA
TOTAL LOAD kW
6640 kW
TOTAL LOAD kVA
6969 kVA
ENERGY METER
50677 kwh
OUTGOING FEEDER F5
OUTGOING FEEDER EF1
OUTGOING FEEDER F6
OUTGOING FEEDER F3
OUTGOING FEEDER F4
OUTGOING FEEDER AUX CRL
OUTGOING FEEDER F1
OUTGOING FEEDER EF2
OUTGOING FEEDER MRS
OUTGOING FEEDER F2
kW 1146 111 708 810 750 117 999 240 283 1476
PF -0.95 -0.95 -0.97 -0.97 -0.91 0.91 -0.98 0.95 0.92 0.97
kWh 7850 1306 5516 6237 8045 1229 8168 2138 2363 7820
Main Menu
10:52:59 A GP POWER MONITOR FAULT
Silence Cntrl F1
Print Cntrl F4
Plant Ovw DPH
Synchronization
Load Sharing
Load Shedding
F1 & F2 Substation-1
F1 & F2 Substation-2
F1 & F2 Substation-3
F3 & F4 Substation-1
F3 & F4 Substation-2
F5 & F6 Substation
Auto- Start
Tag not found: VRS_B1
Clear
Clear All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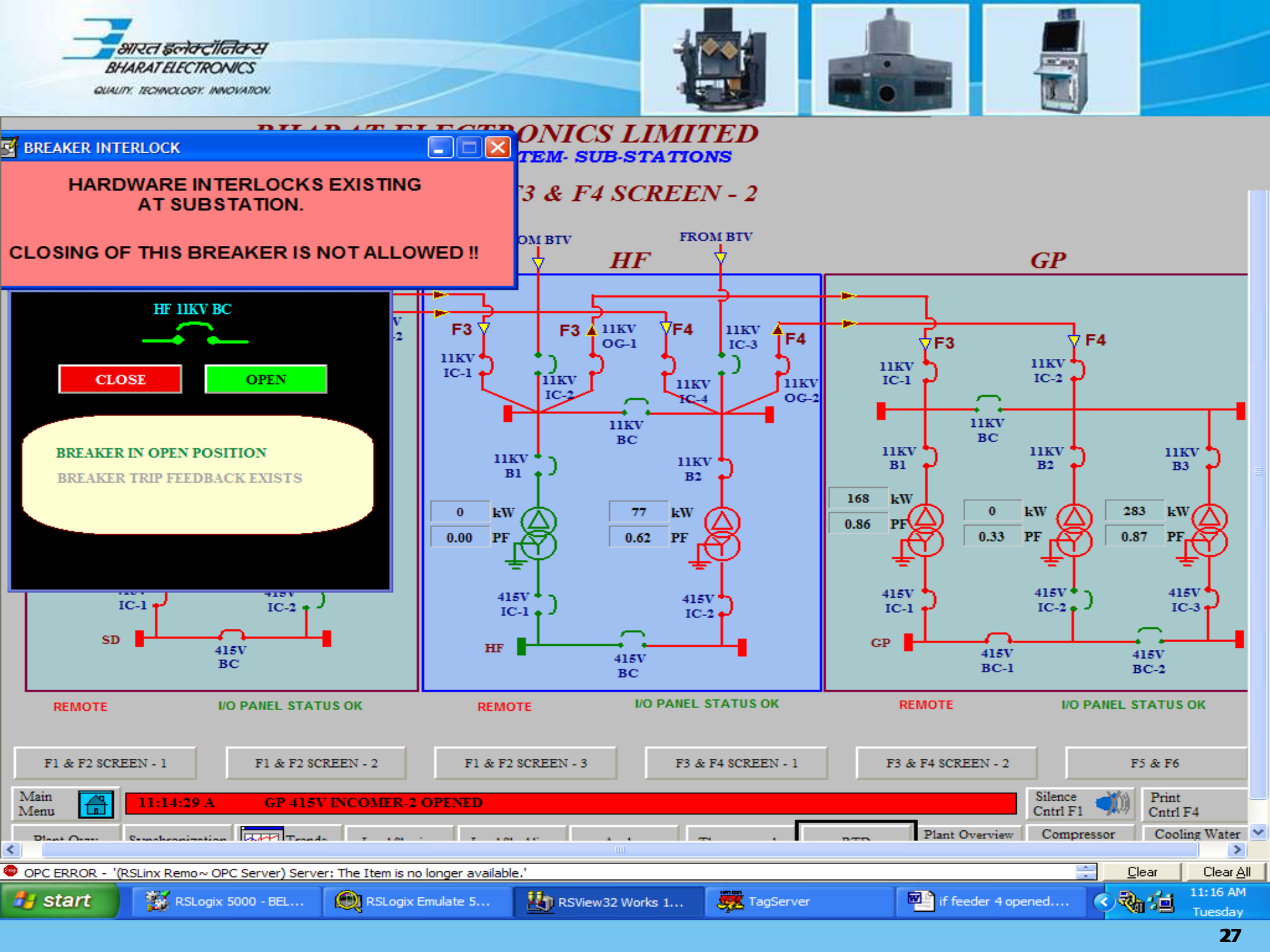
BHARAT ELECTRONICS
QUALITY. TECHNOLOGY. INNOVATION.
GRID
GRID SYNCHRONIZATION
Paralleling of Transformers is NOT Permitted
Reverse Synchronization is
NOT Allowed by DPH Section
300
GRID KW SETPOINT
GRID SYNCHRONIZATION TERMINATE
CTRONICS LIMITED
T SYSTEM-Plant Overview MRS
Hz
Hz
KPTCL GRID
65227 V
[66KV, MRS BUS]
TOTAL GRID KW 6748 kW
TOTAL GRID KVA 7009 kVA
3065 kW
3181. kVA
SF6-1
DG
11155 / 420 V
49.40 Hz
2909 kW
-0.97 PF
BANK-1
DG
DG
0 kW
0 KVA
SF6-2
HT/LT
10865 / 409 V
49.34 Hz
0 kW
0.00 PF
BANK-2
B3
3617 kW
-0.96 PF
E2
E3
B1
MB
E1
B2
11KV, 800A,
MRS BUS
SECTION-5
BC1
400A
SECTION-4
BC2
400A
SECTION-3
BC3
400A
SECTION-2
BC4
400A
SECTION-1
TOTAL GENERATION kW
0 kW
TOTAL GENERATION kVA
0 kVA
TOTAL LOAD kW
6696 kW
TOTAL LOAD kVA
7009 kVA
ENERGY METER
50741 kwh
F5 400A
EF1 400A
F6 400A
F3 400A
F4 400A
AUX CRL 400A
F1 400A
EF2 400A
MRS 400A
F2 400A
OUTGOING FEEDER F5
OUTGOING FEEDER EF1
OUTGOING FEEDER F6
OUTGOING FEEDER F3
OUTGOING FEEDER F4
OUTGOING FEEDER AUX CRL
OUTGOING FEEDER F1
OUTGOING FEEDER EF2
OUTGOING FEEDER MRS
OUTGOING FEEDER F2
kW 1143 111 729 813 744 117 999 240 279 1521
PF -0.95 -0.95 -0.99 -0.96 -0.90 0.90 -0.97 0.96 0.92 0.97
kWh 7861 1308 5523 6246 8052 1230 8177 2141 2366 7834
Main Menu
10:52:59 A GP POWER MONITOR FAULT
Silence Cntrl F1
Print Cntrl F4
Plant Ovw DPH
Synchronization
Load Sharing
Load Shedding
F1 & F2 Substation-1
F1 & F2 Substation-2
F1 & F2 Substation-3
F3 & F4 Substation-1
F3 & F4 Substation-2
F5 & F6 Substation
Auto- Start
Tag not found: VRS_B1
Clear
Clear All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BHARAT ELECTRONICS
QUALITY. TECHNOLOGY. INNOVATION.
BREAKER INTERLOCK
HARDWARE INTERLOCKS EXISTING AT SUBSTATION.
CLOSING OF THIS BREAKER IS NOT ALLOWED !!
HF 11KV BC
CLOSE
OPEN
BREAKER IN OPEN POSITION
BREAKER TRIP FEEDBACK EXISTS
TEM- SUB-STATIONS
3 & F4 SCREEN - 2
HF
GP
FROM BTV
F3
F4
11KV IC-1
11KV IC-2
11KV IC-3
11KV IC-4
11KV OG-1
11KV OG-2
11KV BC
11KV B1
11KV B2
11KV B3
0 kW
0.00 PF
77 kW
0.62 PF
168 kW
0.86 PF
0 kW
0.33 PF
283 kW
0.87 PF
415V IC-1
415V IC-2
415V IC-3
SD
HF
GP
415V BC
415V BC-1
415V BC-2
REMOTE
I/O PANEL STATUS OK
F1 & F2 SCREEN - 1
F1 & F2 SCREEN - 2
F1 & F2 SCREEN - 3
F3 & F4 SCREEN - 1
F3 & F4 SCREEN - 2
F5 & F6
Main Menu
11:14:29 A GP 415V INCOMER-2 OPENED
Silence Cntrl F1
Print Cntrl F4
Plant Overview
Compressor
Cooling Water
OPC ERROR - '(RSLinx Remo~ OPC Server) Server: The Item is no longer available.'
Clear
Clear All
start
RSLogix 5000 - BEL...
RSLogix Emulate 5...
RSView32 Works 1...
TagServer
if feeder 4 opened....
11:16 AM
Tuesday

ENERGY MANAGEMENT SYSTEM

TRENDS AND DATABASE

Trends To Monitor Online and Control

- Study of load patterns
- Load balancing /sharing
- Maintain good voltage / frequency profile
- Power factor management
- Maximum demand analysis and control
- Optimize and monitor to achieve cost reduction and equipment safety
- Better information for engineering and planning

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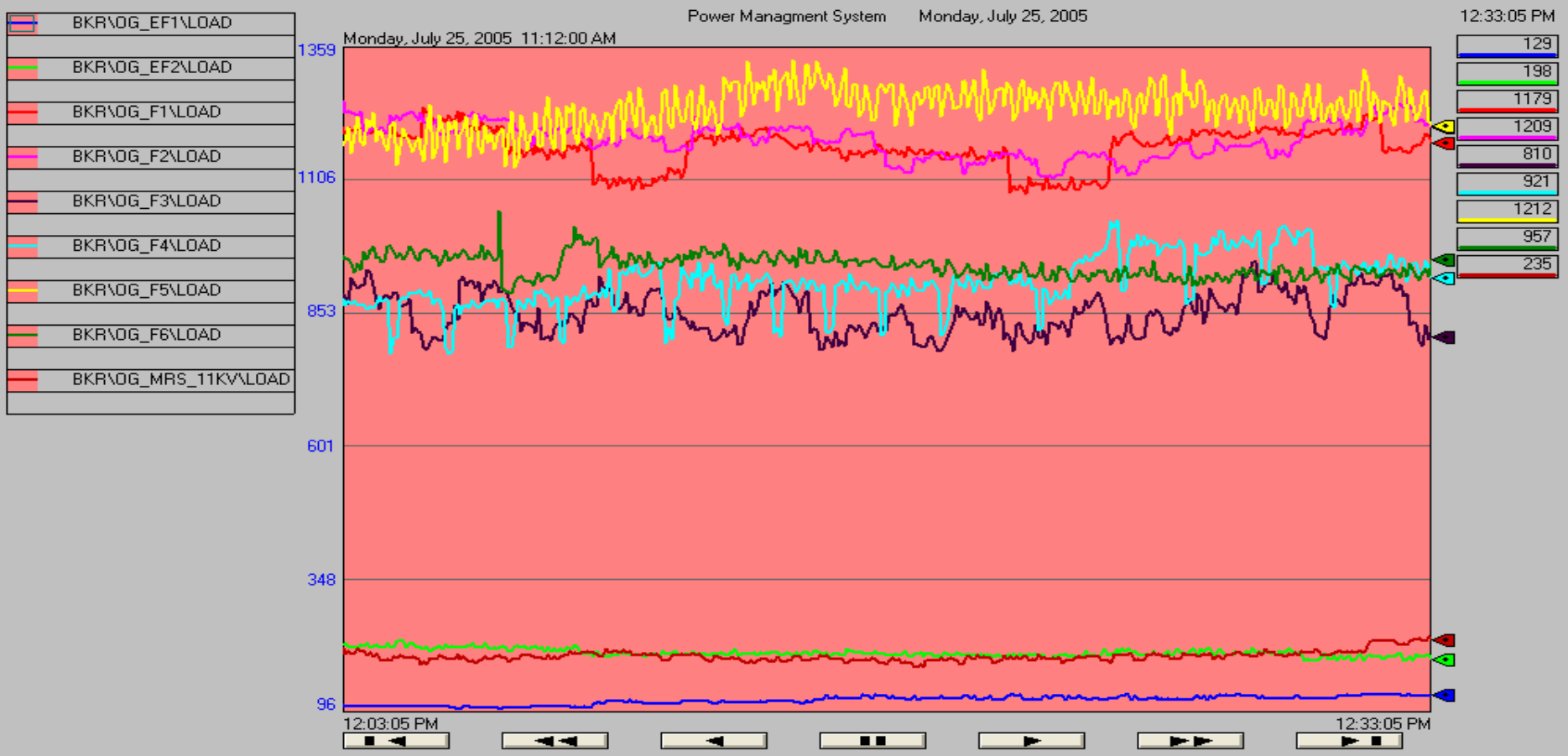
Trend



Main Menu | Silence Cntrl F1 | Print Cntrl F4

Plant Ovw | Synchronization | Trends | Load Sharing | Load Shedding | Analog | Thermocouple | RTD | Plant Overview MRS | Compressor & Chiller | Cooling Water System

Clear | Clear All

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LOAD MANAGEMENT SYSTEM - Power monitor

OG F5

	VOLTAGE	
R - N	6256.0	VOLT
Y - N	6375.9	VOLT
B - N	6276.0	VOLT
AVERAGE	6302.7	VOLT
R - Y	10842.3	VOLT
Y - B	11050.2	VOLT
B - R	10877.0	VOLT
AVERAGE	10923.1	VOLT

	CURRENT		ACTIVE POWER		REACTIVE POWER		APARENT POWER	
R - N	60.6	AMP	366.0	KW	132.8	KVAR	379.1	KVA
Y - N	67.2	AMP	411.0	KW	83.5	KVAR	428.5	KVA
B - N	63.9	AMP	393.0	KW	129.2	KVAR	401.0	KVA
TOTAL			1170.0	KW	351.2	KVAR	1208.6	KVA

POWER FACTOR
-0.957

Plant Overview MRS | Plant Overview DPH

Tag not found: CRY_EF1 | Clear | Clear All

Reporting and Data Base

- Online metering of energy consumption
- Online hourly logging
- Daily/monthly/yearly energy consumption reports
- Load survey and energy accounting
- Identification of high consumption area for optimization of energy consumption.

Customer information management

- Information to customers is managed through e-mails regarding monthly energy consumption and preventive maintenance schedules

Integration to SAP/MRP system

- The reports generation tool is integrated to our SAP system enabling online data access to the customers

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LOAD MANAGEMENT SYSTEM

MAIN MENU

BEL Reports

BEL Reports

Rockwell Automation

Select Report Type

- ○ Rec. Station Log Sheet
- ○ Load in KW
- ○ Energy Consumption
- ○ Peak Load Report
- ◉ Energy Mgmt. Report
- ○ DG LogSheet Report

Select Category

- ◉ Daily Report
- ○ Monthly Report
- ○ Yearly Report

Available Dates

15-May-2007
14-May-2007
13-May-2007
12-May-2007
11-May-2007
10-May-2007
09-May-2007
08-May-2007
07-May-2007
06-May-2007
05-May-2007
04-May-2007

For Date: 15-May-2007

Show | Close

PLANT O… DE…
SYNCHRO…
LOAD SH…
LOAD SH…
COOLIN… SYST…
COMPR…
GMR P… DA…
LOAD SH… SUBST…
TIME SYNCH…

…LOG INPUT …ANT REPORT
…OCOUPLE INPUT …ANT REPORT
…TD INPUT …ANT REPORT
…GY REPORTS
…TRENDS
…RENDS S/S
…M SUMMARY
…CONFIGURATION
…LOGOUT

Clear | Clear All

start | RSView32 Runtime 32K | TagServer | Report & BackUp | USB (E:) | Microsoft PowerPoint… | 2:05 PM

Microsoft Excel - 22-Jan-06.XLS

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10 B I U

100%

U13

	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1														
2														
3														
4														
5														
6														
7			LOAD CONSUMPTION SUBSTATION											
8			Name Of S/S	BANK-1	BANK-2	BANK-3	BANK-4	TOTAL						
9														
10			CRY/CAP	3174	0			3174						
11			DCE/DMS	0	778			778						
12			LPE	0	0			0						
13			CSS	1516	1143			2659						
14			NS (RSM)	1007	0			1007						
15			T&BS (BTV)	3101	0			3101						
16			MIL-RADAR (R-ASSY)	0	1841			1841						
17			VRS	2691	0			2691						
18			PVD	0	3989			3989						
19			MW	552	0			552						
20			TT	229	0	0		229						
21			SD	1589	10			1599						
22			HF	0	616			616						
23			GP	2789	0	5052		7841						
24			NP (TV)	1460	1721			3181						
25			IC-1 & IC-2	244	1073	0	1380	2697						
26			EF-1	1918				1918						
27			EF-2	3037				3037						
28							TOTAL	40910						
29														
30														
31														
32														
33														

REPORT

Draw AutoShapes

Ready NUM

SEQUENCE OF EVENT RECORDING

Microsoft Excel - 20060122AL.DBF

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10 B I U

100%

A1 Date

				O
4	1/22/2006	1:30:33	MMB-2 LO Priming Pump ON	COS_ON
5	1/22/2006	1:37:02	MB LUBE OIL PRIMING PUMP ON	COS_ON
6	1/22/2006	2:19:31	CRY 11KV INCOMER-1 OPENED	COS_OFF
7	1/22/2006	2:19:31	CRY 11KV INCOMER-2 OPENED	COS_OFF
8	1/22/2006	2:19:40	CRY 11KV INCOMER-1 CLOSED	COS_ON
9	1/22/2006	2:19:40	CRY 11KV INCOMER-2 CLOSED	COS_ON
10	1/22/2006	2:22:03	PVD 415V BC OPENED	COS_OFF
11	1/22/2006	2:22:03	PVD 415V INCOMER-2 OPENED	COS_OFF
12	1/22/2006	2:22:10	PVD 415V BC CLOSED	COS_ON
13	1/22/2006	2:22:10	PVD 415V INCOMER-2 CLOSED	COS_ON
14	1/22/2006	4:44:26	MB LUBE OIL PRIMING PUMP ON	COS_ON
15	1/22/2006	5:14:24	MMB-3 LO Priming Pump ON	COS_ON
16	1/22/2006	5:22:35	MMB-1 LO Priming Pump ON	COS_ON
17	1/22/2006	5:44:26	GP ACNR FAULT	ON
18	1/22/2006	5:44:26	LPE POWER MONITOR FAULT	ON
19	1/22/2006	6:20:01	SD BANK-2 OPENED	COS_OFF
20	1/22/2006	6:24:23	GP ACNR FAULT	ON
21	1/22/2006	6:24:23	LPE POWER MONITOR FAULT	ON
22	1/22/2006	6:40:34	MMB-2 LO Priming Pump ON	COS_ON
23	1/22/2006	7:06:48	MMB-3 LO Priming Pump ON	COS_ON
24	1/22/2006	7:06:51	MMB-2 LO Priming Pump ON	COS_ON
25	1/22/2006	7:07:04	MMB-1 LO Priming Pump ON	COS_ON
26	1/22/2006	7:07:52	MMB-3 Engine Control Lever in Stop Position	COS_ON
27	1/22/2006	7:07:53	MMB3 DG I/C BREAKER FAULTED	COS_ON
28	1/22/2006	7:07:53	MMB3 DG I/C TRIP FEEDBACK	COS_ON
29	1/22/2006	7:07:59	MMB2 DG I/C BREAKER FAULTED	COS_ON
30	1/22/2006	7:07:59	MMB2 DG I/C TRIP FEEDBACK	COS_ON
31	1/22/2006	7:08:00	MMB-2 Engine Control Lever in Stop Position	COS_ON
32	1/22/2006	7:08:00	MMB-2 Engine Shutdown	COS_ON
33	1/22/2006	7:08:04	MMB-3 Engine Control Lever in Work Position	COS_ON
34	1/22/2006	7:08:15	MMB-1 Engine Control Lever in Stop Position	COS_ON
35	1/22/2006	7:08:24	MMB-1 Engine Control Lever in Work Position	COS_ON
36	1/22/2006	7:08:35	MMB-2 Engine Control Lever in Work Position	COS_ON

20060122AL

Draw AutoShapes

Ready NUM

BENEFITS

- Enables online measurement of electrical and DG parameters , resulting in optimization of process control on the basis of dynamic, accurate system / plant overview.
- Advanced monitoring, control and operation thro' automatic data recording and logging.
- Load sharing, Load shedding and Demand management
- Energy accounting and feed back to individual user
- Loss measurement at interfaces
- Suitably customized to meet the individual departmental needs and aligned to the business objectives by reducing cost of operation, improving efficiency.

Case study on Military Radar SBU

- One of the major productive SBUs

Turnover of BEL, Bangalore Complex for the year 2011-12 →**Rs. 3704 crores**

Turnover of MR SBU → **Rs. 765 crores**

Power supply for all the critical manufacturing process/acceptance tests of MR SBU is controlled and monitored from central station, situated about a KM from the load centre. The processes includes environmental tests and endurance tests which run for 3-5 days continuously, needs high attention towards the facility management to avoid failure during the process. Continuous power supply is an essence during the period/inspection by Defence inspection team. Hence Radar substation is always kept at highest priority for loading on DG sets in case of power failure. Also continuous monitoring of load patterns are done through trends.

If any fault / failures occurs disturbing the process, the fault records are displayed in the system through pop up messages at Central station enabling for rectification with minimum down time thereby avoiding impact on production processes.

Financial LOSS estimated due to delay in resumption/ failure due to poor monitoring at MR SBU is around Rs. 8.7 lakhs per hour in the single division alone.



COST REDUCTION

- Significant energy savings is achieved through continuous energy monitoring which has lead financial savings for the company.
- Energy savings achieved during the financial year 2011-12 is 15.25 lakh units.

THANK YOU