

CECPL Management Solar Solutions



SCADA Solutions



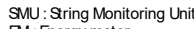


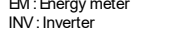
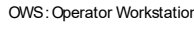
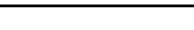


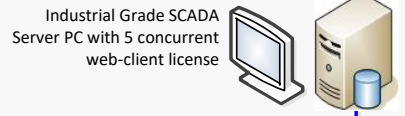
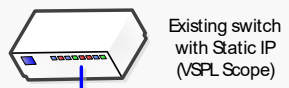
electrifying change



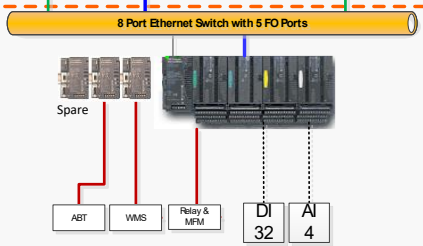
TYPICAL SCADA SOLUTION ARCHITECTURE

Legend

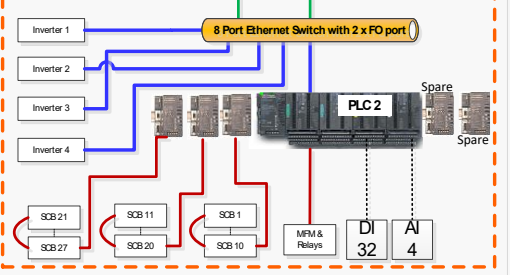
 FO Cable	 CAT 6 Cable	 SMU : String Monitoring Unit
 Serial Cable	 HardWired Cable	 EM : Energy meter
		 INV : Inverter
		 OWS : Operator Workstation



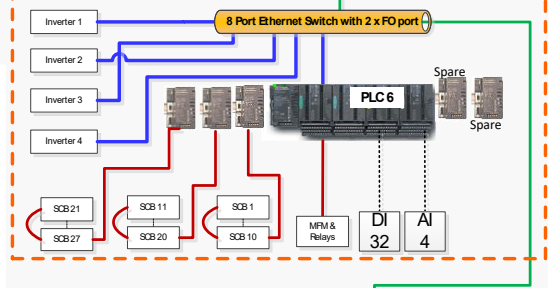
MAIN CONTROL ROOM



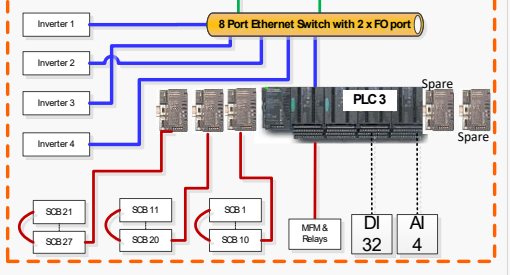
Inverter Room 01



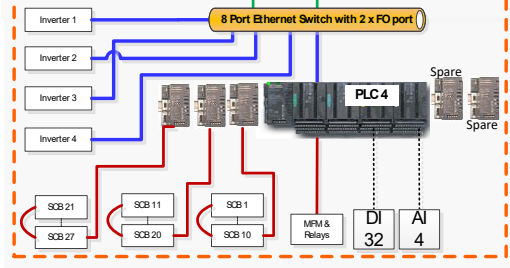
Inverter Room 05



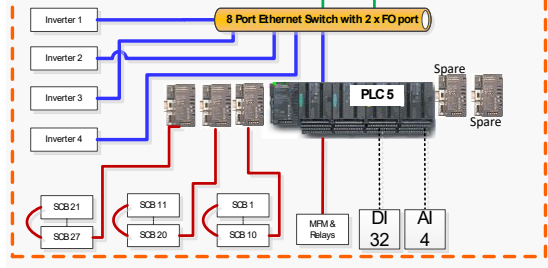
Inverter Room 02




Inverter Room 03



Inverter Room 04



TODAY'S/ONLINE ENERGY



59.60
MWh

ENERGY




Y' Day	Week	Monthly	Yearly
51.00	102.00	489.00	1072.80
MWh	MWh	MWh	MWh

Irradiance WMS

5.00 W/M²

Inst Sol Enrgy 65384.55 kWh/M2

33.00 °C

2.00 m/s 27.00 °C

PLANT DATA

	PR	POA	PLF
Online	91.15	0.0	74.50
Y' day	89.00	0.0	21.25

Navigation: Home, Overview, BLOCK1, BLOCK2, BLOCK3, BLOCK-4, MCR, SLD, SMB, WMS, ALARMS, TRENDS, DIAG, REPORT

17/12/2014 5:43 PM

Online Generation 59.60MWH Online PR 91.15% Solar radiation 5.00 W/m²

Plant Active Power 30.16 kW

Lifetime Export 0.00 MWh

CO2 39932.00 Ton

Diesel Energy Generated 5900.40 KL

Yesterday's		Today's/Online		
Block	kWh	kW	kWh	PR
Block - 1	12610.00	7.61	13020.00	93.00
Block - 2	12610.00	6.43	13040.00	93.14
Block - 3	10850.00	5.80	11090.00	85.31
Block - 4	10590.00	8.82	11220.00	89.76

String Status

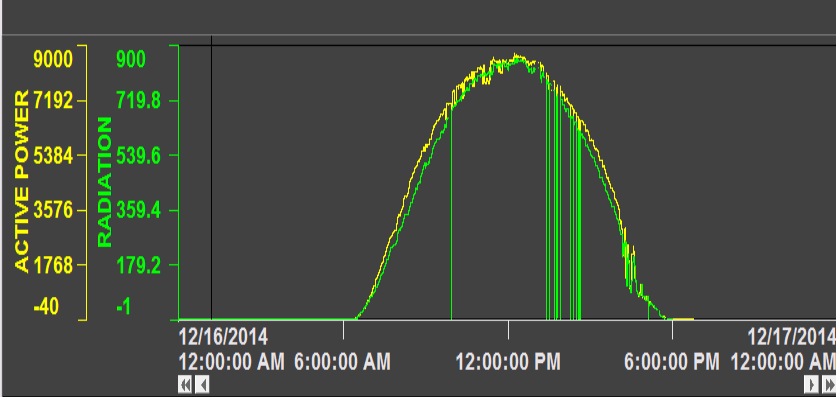
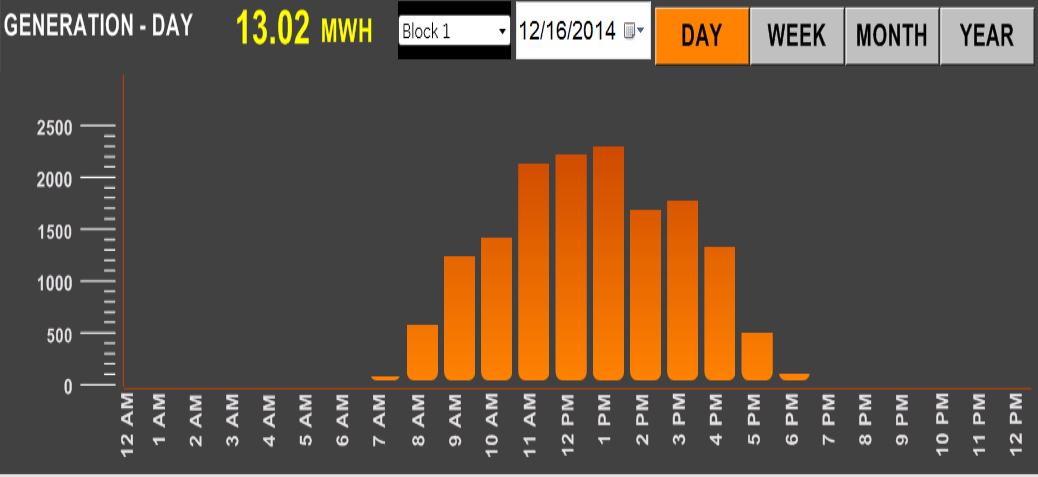
Block ID	Functional	Total
Block - 1	45	460
Block - 2	7	464
Block - 3	140	466
Block - 4	105	345

Today's Data

Aux Consumption	76.5
Grid Availability	✓
Grid Downtime	0 : 0
Operation Hours	8 : 30
Today Max Power	2921.48 kW
Today Max Irradiance	244.00 W/M ²
Plant Start Time	06:14:37
Plant Stop Time	19:14:37

Device Statuses

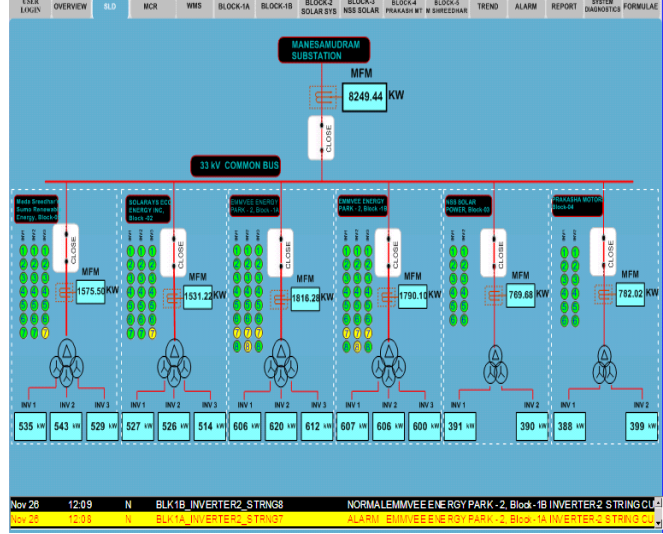
Device	Functional	Total
SMBs	297	1735
Inverters	19	15



Description	Current Value	Slider Value	Slider Value Time
WEATHER STATION HORIZONTAL GLOBAL RADIATION	5	0	7:58:35,094252 PM
BUS PT TRANSFORMER PROTECTION RELAY ACTIVE POWER	30.16	-19.68	1:13:00,599297 AM

Dec 17 17:39	N	B1 ISO1.VCB ON	ALARM	B1 ISO1.VCB ON
Dec 17 17:39	N	B1 ISO2.VCB ON	ALARM	B1 ISO2.VCB ON
Dec 17 17:10	N	B1 DIAG,PLC	ALARM	PLC Loss of Module

Solar Irradiance 33751.62	Module Temp 36.00	Yearly Energy 866.40	Monthly Energy 114.60	Yesterday's PR 96.05 %	Online PR 97.48 %	Today's Plant Start Time 06:28:22
Heat Solar Energy 28987.13	Ambient Temp 25.00	Yearly Energy 866.40	Monthly Energy 32.90	Yesterday's PR 23.88	Today's Plant Stop Time 17:42:51	



Nov 26 12:09	N	BLK1B_INVERTER2_STR1V68	NORMALEMMVEE ENERGY PARK - 2, Block -1B INVERTER 2 STRING CU
Nov 25 12:33	N	BLK1B_INVERTER2_STR1V67	ALARM EMMVEE ENERGY PARK - 2, Block -1B INVERTER 2 STRING CU

Solar Irradiance 836.00	Module Temp 36.00	Yearly Energy 809.10	Monthly Energy 114.60	Yesterday's PR 97.10 %	Online PR 96.94 %	Today's Plant Start Time 06:33:47
Heat Solar Energy 28987.13	Ambient Temp 25.00	Yearly Energy 809.10	Monthly Energy 28.10	Yesterday's PR 23.63	Today's Plant Stop Time 17:41:05	

WEATHER MONITORING STATION

Effective Radiation CO₂: 672.95 Tonnes
 Global Energy Generated: 93.44 Kilts
 No. of Time Planted: 672.95

Wind Direction: 106.00 Deg
 Ambient temperature: 25.00 °C
 Solar Radiation: 836.00 W/M²

WEATHER STATION

Relative Humidity	50.00 %
Relative air Pressure	944.00 hPa
Wind direction	106.00 Deg
Solar Radiation	836.00 W/M ²
Ambient Temperature	25.00 °C
Air Temperature (MAX)	26.00 °C
Wind Speed (ACT)	2.00 m/s
Wind Speed (MAX)	5.00 m/s
Absolute Humidity	13.00 mg/m ³
Solar air Pressure	944.00 hPa
Module Temperature	36.00 °C

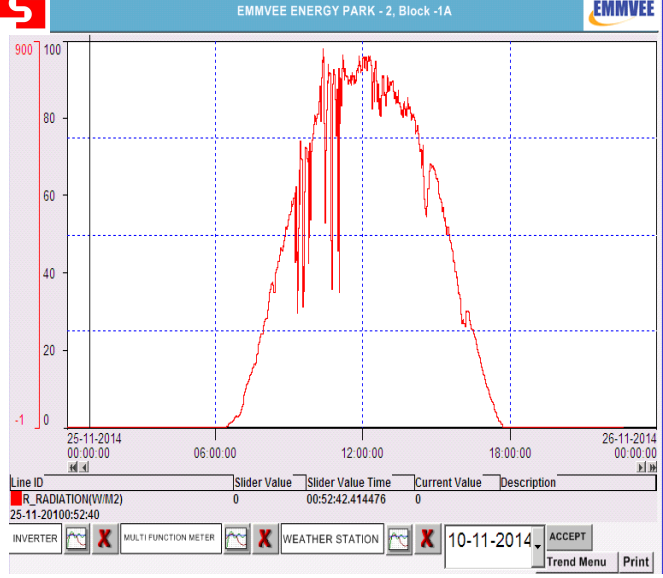
25-11-14 11:14	Y	BLK2_INVERTER1_STR1V67	ALARM SOLARAYS B2 ENERGY MGR B4-MSS-B5-MSS-B5 STR1V67
25-11-14 11:13	Y	BLK1A_INVERTER1_STR1V67	ALARM EMMVEE ENERGY PARK - 2, Block -1A INVERTER 1 STRING CU

OVERALL_REPORT_25_11_2014_20_07_31 [Read-Only] - Microsoft Excel

OVERALL SUMMARY REPORT

EMMVEE ENERGY PARK - 2, Block -1A

DATE	BLOCK 1A INVERTER 1 AC ENERGY OUTPUT (kWh) Actual	BLOCK 1A INVERTER 2 AC ENERGY OUTPUT (kWh) Actual	BLOCK 1A INVERTER 3 AC ENERGY OUTPUT (kWh) Actual	BLOCK 1A INVERTER 4 AC ENERGY OUTPUT (kWh) Actual	BLOCK 1A INVERTER 5 AC ENERGY OUTPUT (kWh) Actual	Total Generation by all the Inverters (kWh) Actual	Total Generation by all the Inverters (kWh) PV syst	AC Energy Out put at Meter (kWh)	PERFORM ANCE RATIO (PR) Actual	PERFORM ANCE RATIO (PR) PV syst	
20/11/2014	4180.00	916.78	4250.00	916.78	4230.00	916.78	12660.00	2750.33	12560.00	96.71	79.35
21/11/2014	4370.00	328.94	4460.00	4330.00	328.94	328.94	13260.00	986.83	13130.00	96.87	77.14
22/11/2014	3550.00	1414.40	3620.00	1414.40	3590.00	1414.40	10760.00	4243.19	10670.00	95.92	79.61
23/11/2014	4210.00	1576.57	4320.00	1576.57	4240.00	1576.57	12770.00	4729.72	12640.00	96.96	79.02
24/11/2014	4140.00	4003.10	4220.00	4003.10	4130.00	4003.10	12490.00	12009.30	12380.00	97.93	77.73
25/11/2014	4170.00	4542.23	4260.00	4542.23	4160.00	4542.23	12590.00	13626.70	12470.00	96.56	76.11



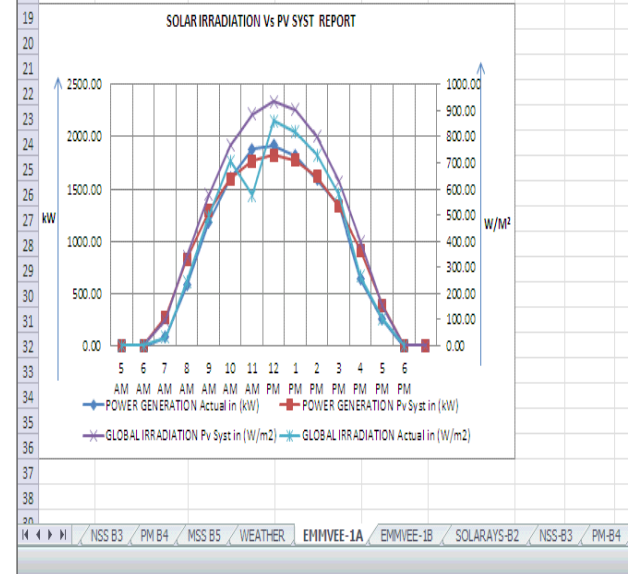
OVERALL_REPORT_25_11_2014_20_07_31 [Read-Only] - Microsoft Excel

BEECHGANIPALLI OVERALL REPORT

EMMVEE BEECHAGANAPALLE SOLAR PARK

Capacity 10 MW

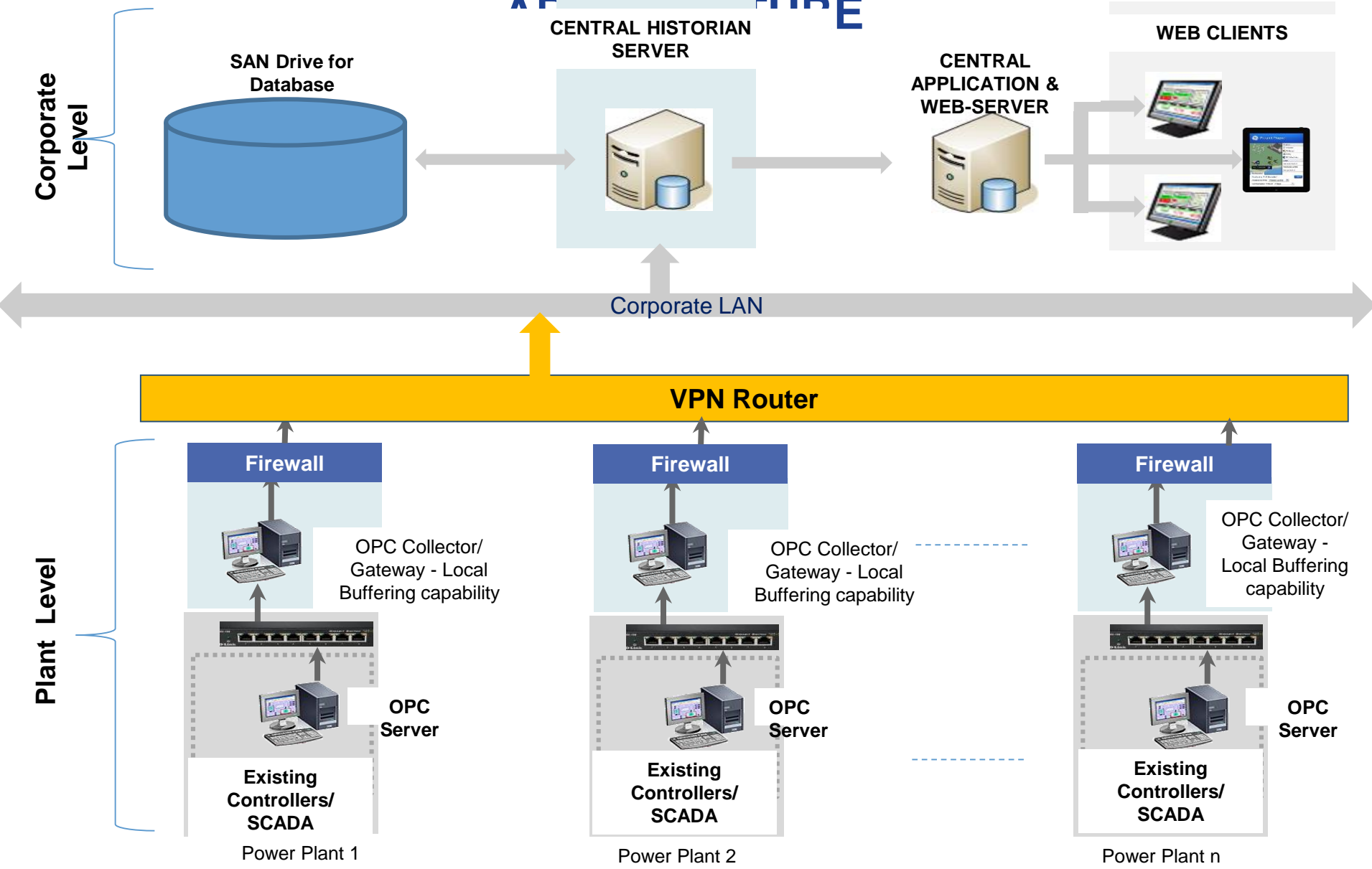
OVERALL SUMMARY | BSMVEE1A SUMMARY | BSMVEE1B SUMMARY
 SOLARAYS B2 SUMMARY | NSS B3 SUMMARY | P-INVERTER1A SUMMARY
 M-SHREEDHAR B5 SUMMARY | WEATHER SUMMARY
 BSMVEE1A DAILY REPORT | BSMVEE1B DAILY REPORT | SOLARAYS B2 DAILY REPORT
 NSS B3 DAILY REPORT | P-INVERTER1A DAILY REPORT | M-SHREEDHAR B5 DAILY REPORT



Centralized Performance Monitoring Station for Renewable Power Plants

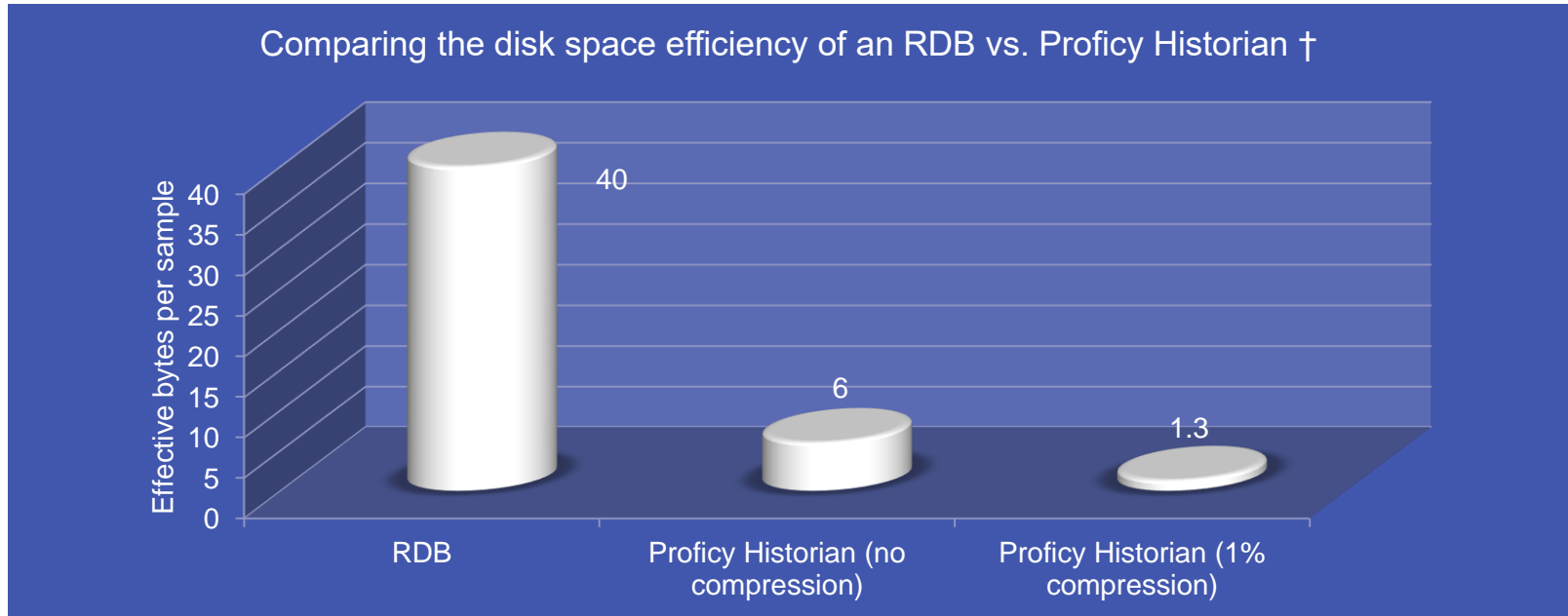
CENTRAL MONITORING STATION - SOLUTION

ARCHITECTURE



The Value Time Series Database

- Hardware agnostic – can layer on anybody's OPC compliant SCADA
- Online Monitoring of Defined KPIs
- Access from anywhere & everywhere....mobility on Android or iOS
- Creates treasure of past & current performance at 1/40th of the disk space as required by a relational database like SQL or Oracle
- Web based reports & dashboards, customizable on the fly.... Ad hoc reporting & trend analyses
- Makes the past data available at finger tips
- Creates a benchmark from the past performance
- Lesser Disk space & Fast retrieval



OVERVIEW DASHBOARD

http://3.234.214.220:82/ProficyPortal/default.htm - Windows Internet Explorer

http://3.234.214.220:82/ProficyPortal/default.htm

SupportCentral

Favorites Web Slice Gallery

http://3.234.214.220:82/ProficyPortal/default.htm

File Help

SOLAR PLANT MONITORING - DASHBOARDS

Report Name

- HOME PAGE
- ENERGY METER
- INVERTER
- PG TEST
- WEATHER STATION

No of Locations	:	6
Total MW Generation	:	95.8 MW

Local intranet | Protected Mode: Off

Done

2:38 PM 4/3/2014



CENTRAL MONITORING SYSTEM



Home



22MW Plant Overview



Inverter Summary



Inverter SMB Monitoring



Weather Monitoring System

22MWp SOLAR POWER PLANT

Online Generation

14.49 MW



TVM Online Generation



14,318.90 kW

Today Plant Start Time

06:29:01

Plant Running Time

8 h 17 m 35 s

Last Plant StopTime

18:54:10

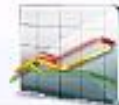
Yesterday Generation

27.76 MWh



Today TVM Generation

83,728.52 kWh



Current Performance Ratio

94.73 %

CO2 Footprint Saved

12,816.06 Tonnes

Yesterday PR

90.88 %

Yesterday PLF

5.41 %



18.6MW

0.0 MW



Weather Monitoring System

GHI

760.91

W/m²

AMB TEMP

36.21

°C

INCLINED

804.35

W/m²

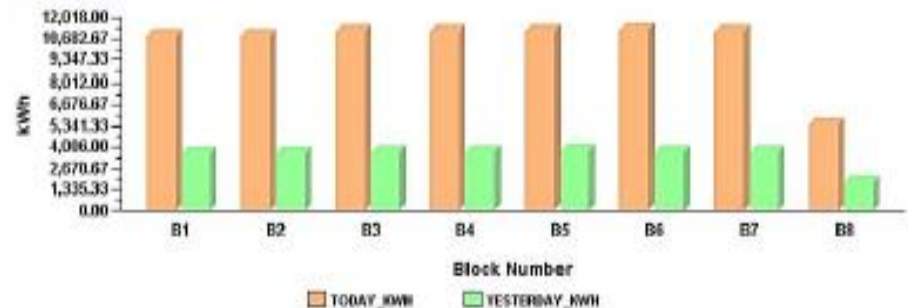
MODULE TEMP

56.34

°C



Block Wise kWh





CENTRALIZED MONITORING SYSTEM



Home



22MW Plant Overview



Inverter Summary

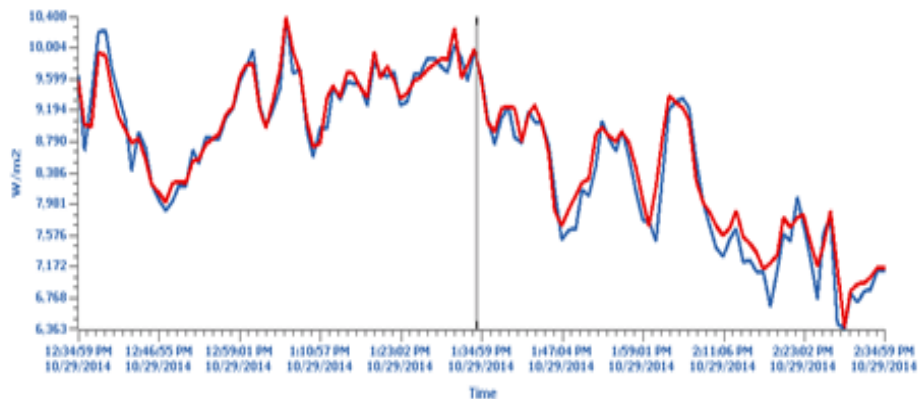


Inverter SMB Monitoring




Weather Monitoring System

PLANT PERFORMANCE



Pen Name	Description	Value
22MW.Overview.TVM_ONLINE_GENERATION	22MW.Overview.TVM_ONLINE_GENERATION	9,871
22MW.Overview.TVM_TREND	22MW.Overview.TVM_TREND	548

Generation

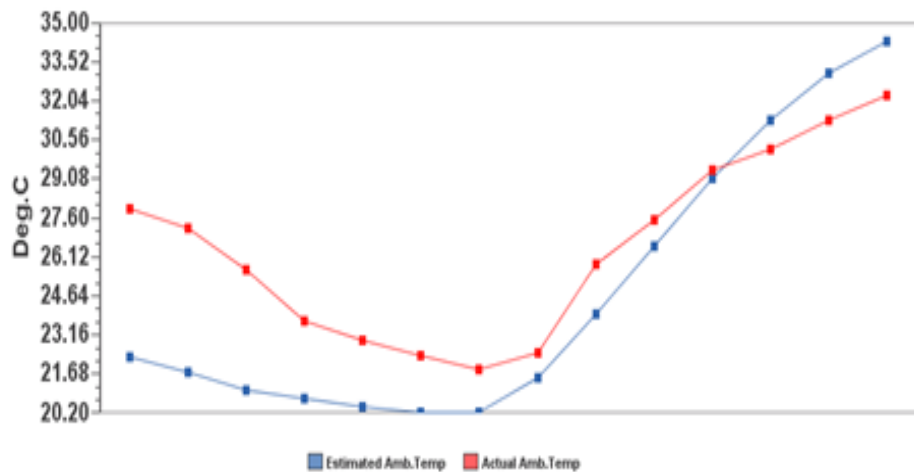
Estimated 
106.75 MWh

Actual 
55.26 MWh

Revenue


6.89 lacs.


3.56 lacs.




PR


73.79%


83.41%

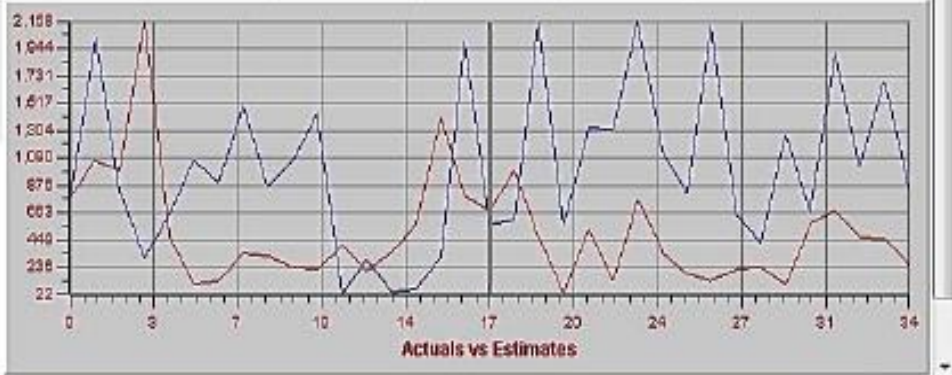
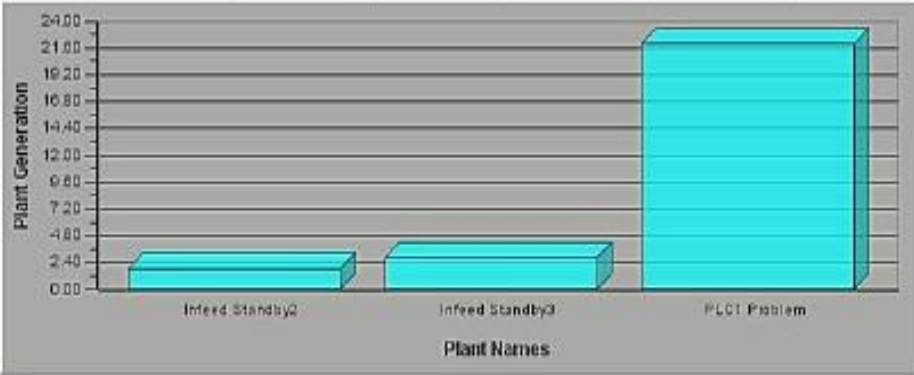
PLF


20.72%


10.45%



Title		Performance Measurement			From Design	From Site	% Variation Estimated vs Actuals	Guarantees				STATISTICS
Sr.No.	Project	Date	Actual Radiation (kWh/m ²)	Actual Temperature (kWh/m ²)	Generation in Kwh			Description	As per contract	At actuals	% Variation	
					Estimated	Actual						
1.	22 MW ABG	10/24/2014	6.84	33.47	120147	117350	-2.38	NMGG (kWh)	18736181	20948677	11.81	
								PR (%)	75.00	75.00		
2.	7.5 MW RSSB	10/24/2014	6.32	44.09	25036	24300	-3.03	NMGG (kWh)	4328788	3845057	-11.17	
								PR (%)	00.00	00.00		
3.	20 MW	10/24/2014	6.83	53.58	103057	102312	-0.73	NMGG (kWh)	15667623	17479084	11.56	
								PR (%)	73.5	74.90		
4.	xxxx MW							NMGG (kWh)				
								PR (%)				



GENERATION REPORT

http://3.234.214.220:82/ProficyPortal/default.htm - Windows Internet Explorer

http://3.234.214.220:82/ProficyPortal/default.htm

SupportCentral

Web Slice Gallery

http://3.234.214.220:82/ProficyPortal/default.htm

File Help



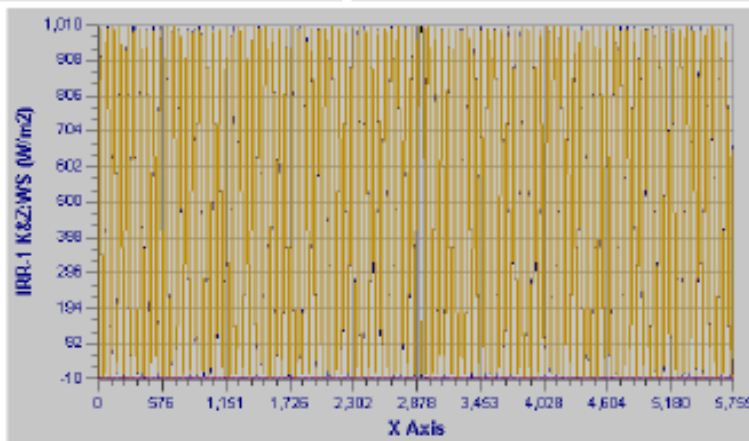


GENERATION REPORT



Report Name: HOME PAGE | Date: | | 

DATE TIME	IRR-1 K&Z WS (W/m2)	FDR-1 FREQ (Hz)	FDR-1 VOLT (v)	FDR-2 FREQ (Hz)	FDR-2 VOLT (v)
1 Apr 3 2014	0.00	0.00	0.00	0.00	0.00
2 Apr 3 2014	434.85	438.09	438.42	450.55	447.00
3 Apr 3 2014	497.78	492.99	508.94	508.11	493.33
4 Apr 3 2014	498.67	504.32	505.93	500.31	491.42
5 Apr 3 2014	503.42	500.38	506.29	507.48	503.59
6 Apr 3 2014	504.26	505.65	505.85	504.50	496.09
7 Apr 3 2014	493.94	490.97	507.91	499.12	498.93
8 Apr 3 2014	502.64	497.23	499.65	501.05	495.67
9 Apr 3 2014	494.23	497.17	491.77	502.36	496.43
10 Apr 3 2014	494.15	507.61	495.09	507.08	495.33
11 Apr 3 2014	492.48	497.65	507.54	492.53	503.21
12 Apr 3 2014	506.98	504.11	508.80	497.43	502.45
13 Apr 3 2014	495.41	503.77	503.19	505.13	488.51
14 Apr 3 2014	507.85	493.45	490.39	502.05	501.46
15 Apr 3 2014	494.38	502.28	490.08	499.22	501.37
16 Apr 3 2014	500.44	494.87	494.28	495.36	503.70
17 Apr 3 2014	496.11	499.82	502.61	501.51	480.83
18 Apr 3 2014	499.15	506.81	499.45	508.71	495.90
19 Apr 3 2014	499.64	500.14	504.46	495.68	493.81
20 Apr 3 2014	503.02	496.59	509.64	501.13	497.19
21 Apr 3 2014	491.68	497.62	502.35	496.12	508.76
22 Apr 3 2014	503.40	507.70	499.23	491.68	506.34
23 Apr 3 2014	495.93	503.62	495.32	494.21	507.62
24 Apr 3 2014	507.03	494.52	507.26	507.07	502.66
25 Apr 3 2014	506.78	504.86	502.41	496.66	496.92



Pen Name	Description	Value
IRR-1 K&Z WS (W/m2)	null	6
IRR-2 K&Z WS (W/m2)	null	2
INVT LOAD (kW)	null	10

1:40:38 PM 4/3/2014 | 1 Hour Ago

2:40:38 PM 4/3/2014 | Current

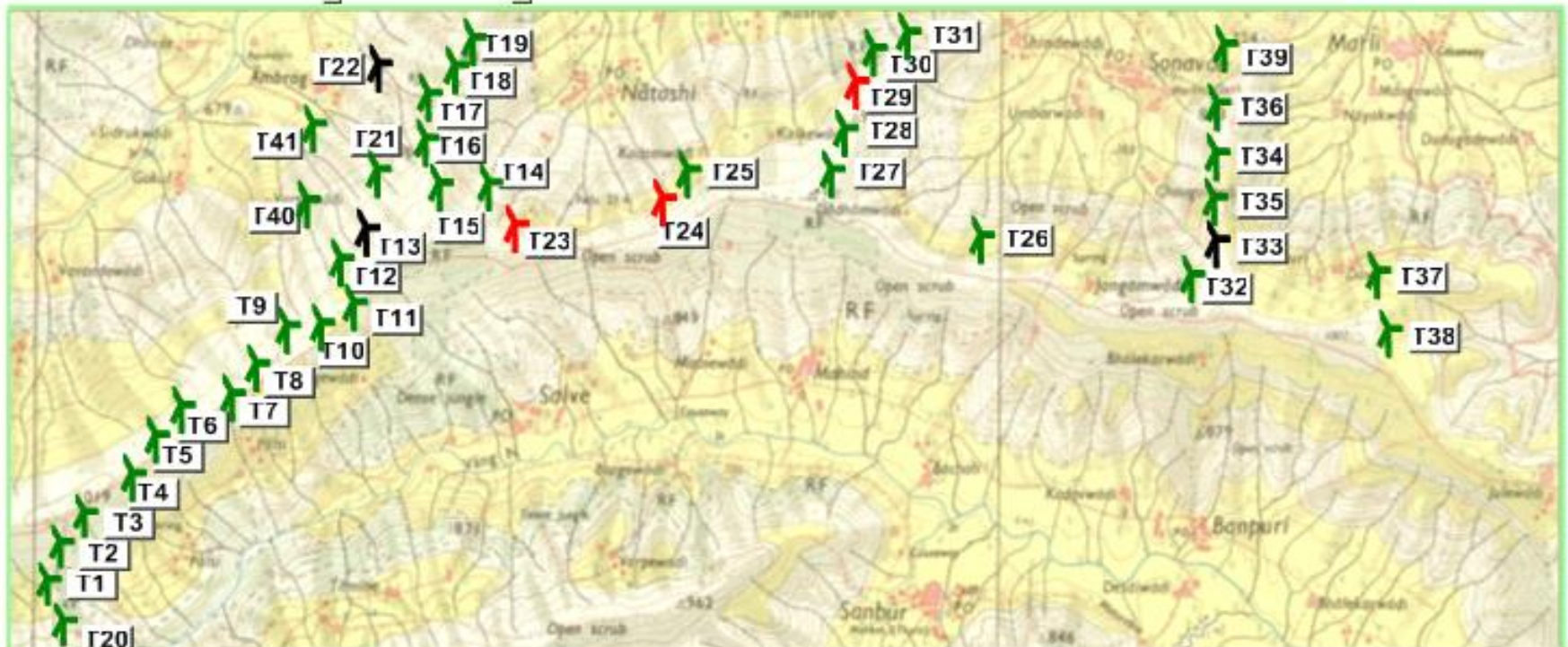
Done

Local intranet | Protected Mode: Off

90%

2:41 PM 4/3/2014

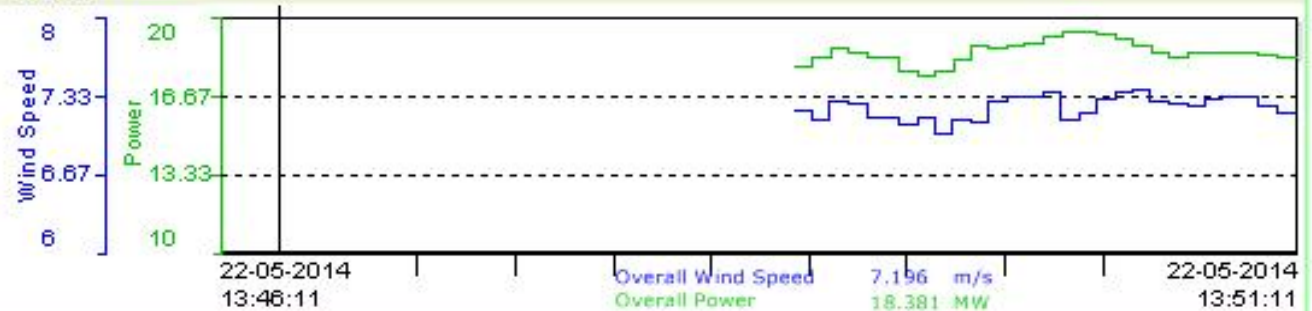
Home Wind Screen



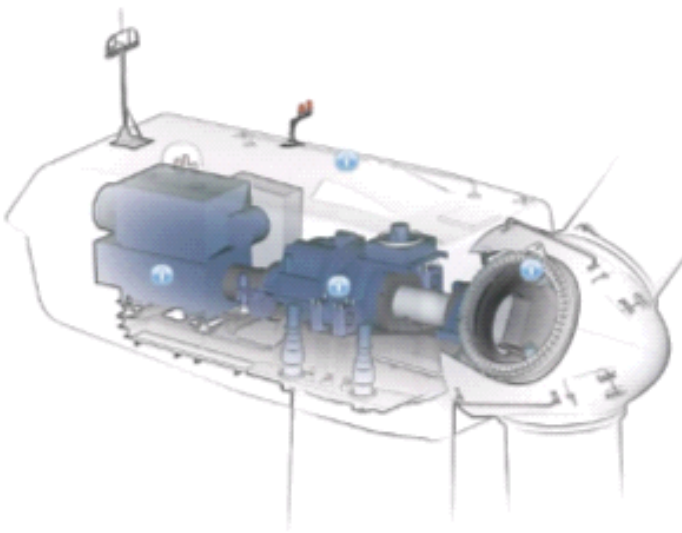















Key Performance Indicators

Power	18.4 MW
Wind Speed	7.2 m/s
Capacity Factor (MTD)	13.5 %
Availability (MTD)	84.7 %

Trend

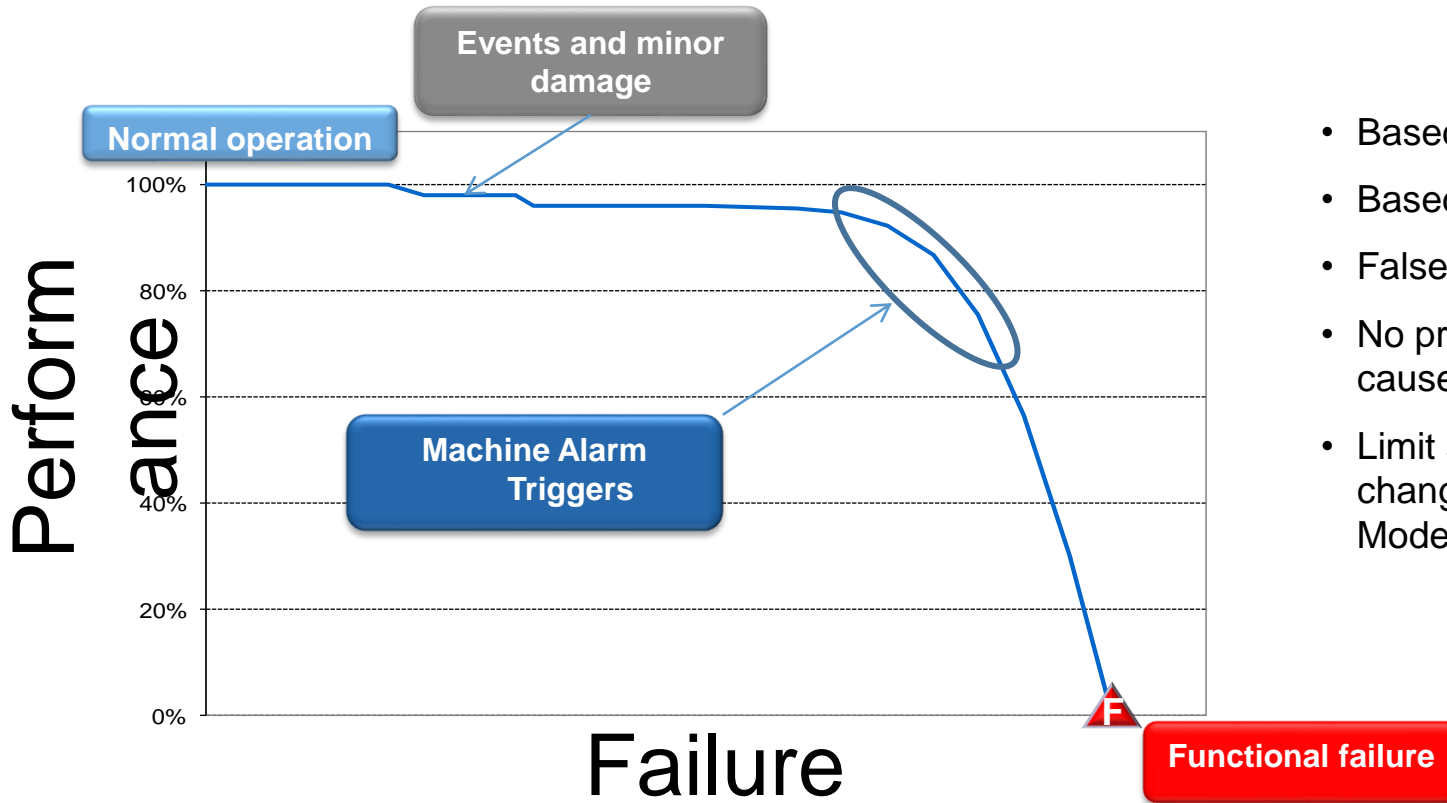
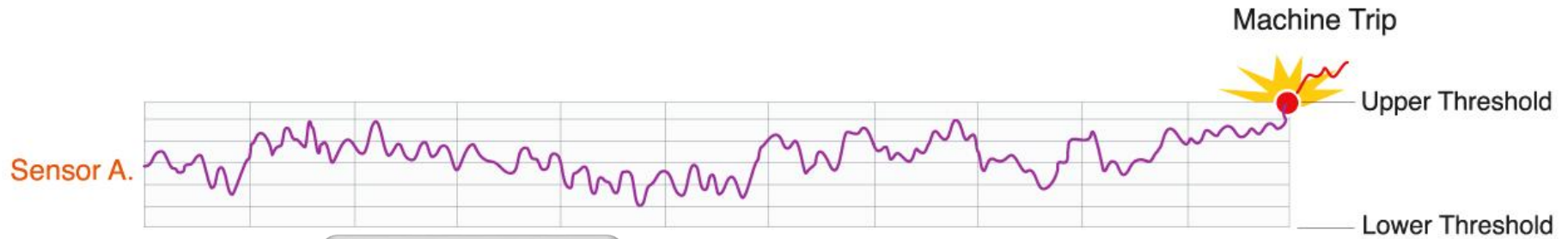


Turbine Status		Turbine Details -Greenko15		Online 																														
 Greenko01	▲	Power	118 kW																															
 Greenko02		Reactive Power	1 kVAr																															
 Greenko03		Ambient Temperature	28 °C																															
 Greenko04		Wind Speed	5.54 m/s																															
 Greenko05		Generator speed	1071 rpm																															
 Greenko06		Rotor speed	10.0 rpm																															
 Greenko07		Temp Nacelle	33 °C																															
 Greenko08		Availability (MTD)	53 %																															
 Greenko09		Reliability (MTD)	100 %																															
 Greenko10		Cap. Factor	5 %																															
 Greenko11		Production (MTD)	38034 kWh																															
 Greenko12																																		
 Greenko13																																		
 Greenko14		▼																																
Key Performance Indicators		Alarms																																
Power	17.9 MW	<table border="1"> <thead> <tr> <th>Date</th> <th>Time</th> <th>Resource ID</th> <th>Message</th> <th>State</th> <th>Ack</th> </tr> </thead> <tbody> <tr> <td>May ...</td> <td>14:29</td> <td></td> <td>Load operation</td> <td>ALARM</td> <td>N</td> </tr> <tr> <td>May ...</td> <td>14:29</td> <td></td> <td>System OK</td> <td>ALARM</td> <td>N</td> </tr> <tr> <td>May ...</td> <td>14:29</td> <td></td> <td>No Errors</td> <td>ALARM</td> <td>N</td> </tr> <tr> <td>May ...</td> <td>17:58</td> <td></td> <td>Low wind speed cut ...</td> <td>NORM. ..</td> <td>N</td> </tr> </tbody> </table>	Date	Time	Resource ID	Message	State	Ack	May ...	14:29		Load operation	ALARM	N	May ...	14:29		System OK	ALARM	N	May ...	14:29		No Errors	ALARM	N	May ...	17:58		Low wind speed cut ...	NORM. ..	N		
Date	Time	Resource ID	Message	State	Ack																													
May ...	14:29		Load operation	ALARM	N																													
May ...	14:29		System OK	ALARM	N																													
May ...	14:29		No Errors	ALARM	N																													
May ...	17:58		Low wind speed cut ...	NORM. ..	N																													
Wind Speed	7.3 m/s	<div style="text-align: right;"> <input type="button" value="Ack"/> <input type="button" value="Reset"/> <input type="button" value="Delete"/> </div>																																
Capacity Factor (MTD)	13.5 %	<div style="text-align: right;"> <input type="button" value="Toggle"/> <input type="button" value="Setup"/> <input type="button" value="Refresh"/> <input type="button" value="Help"/> <input type="button" value="View Stack"/> <input type="button" value="Comments"/> </div>																																
Availability (MTD)	84.7 %	<div style="text-align: right;"> 273 May 22 13:43 </div>																																

Predictive Diagnostics

Conventional Monitoring ...

Uses Hard Thresholds... damage already done alerting

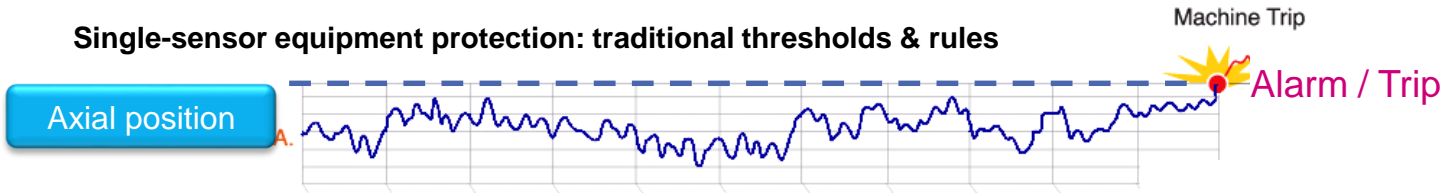


- Based on MFGR Specs
- Based on Plant Experience
- False Alarms
- No prediction or apparent cause diagnostic
- Limit sets need to be changed to encompass all Modes of Operation

SmartSignal Difference: Equipment condition in context

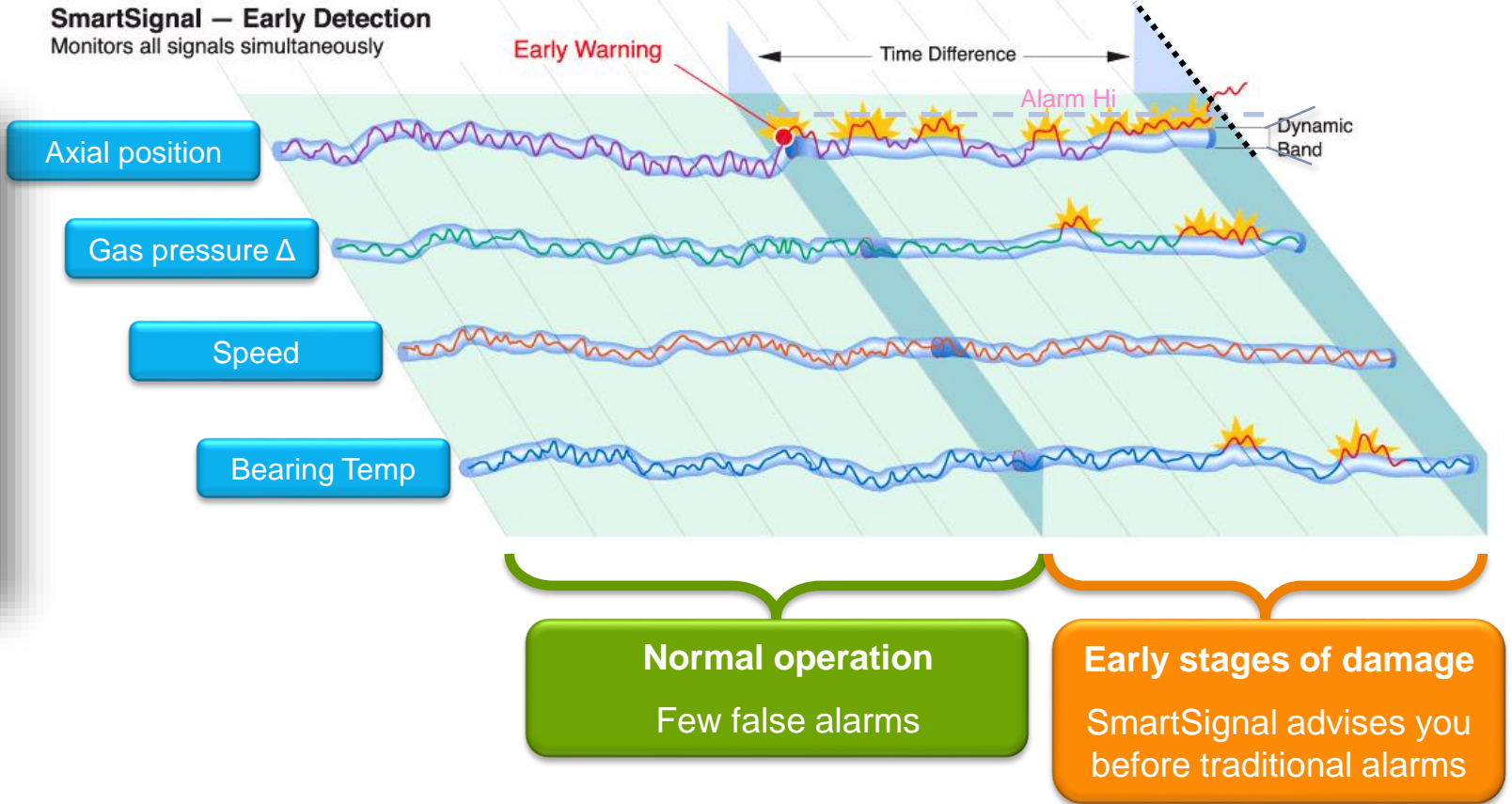
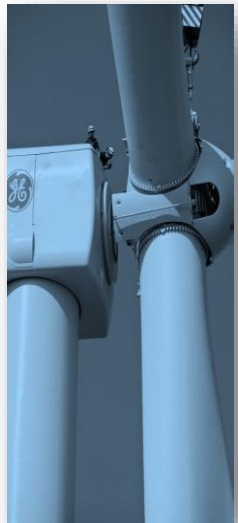
Multiple sensors, thresholds based on residual values

Single-sensor equipment protection: traditional thresholds & rules



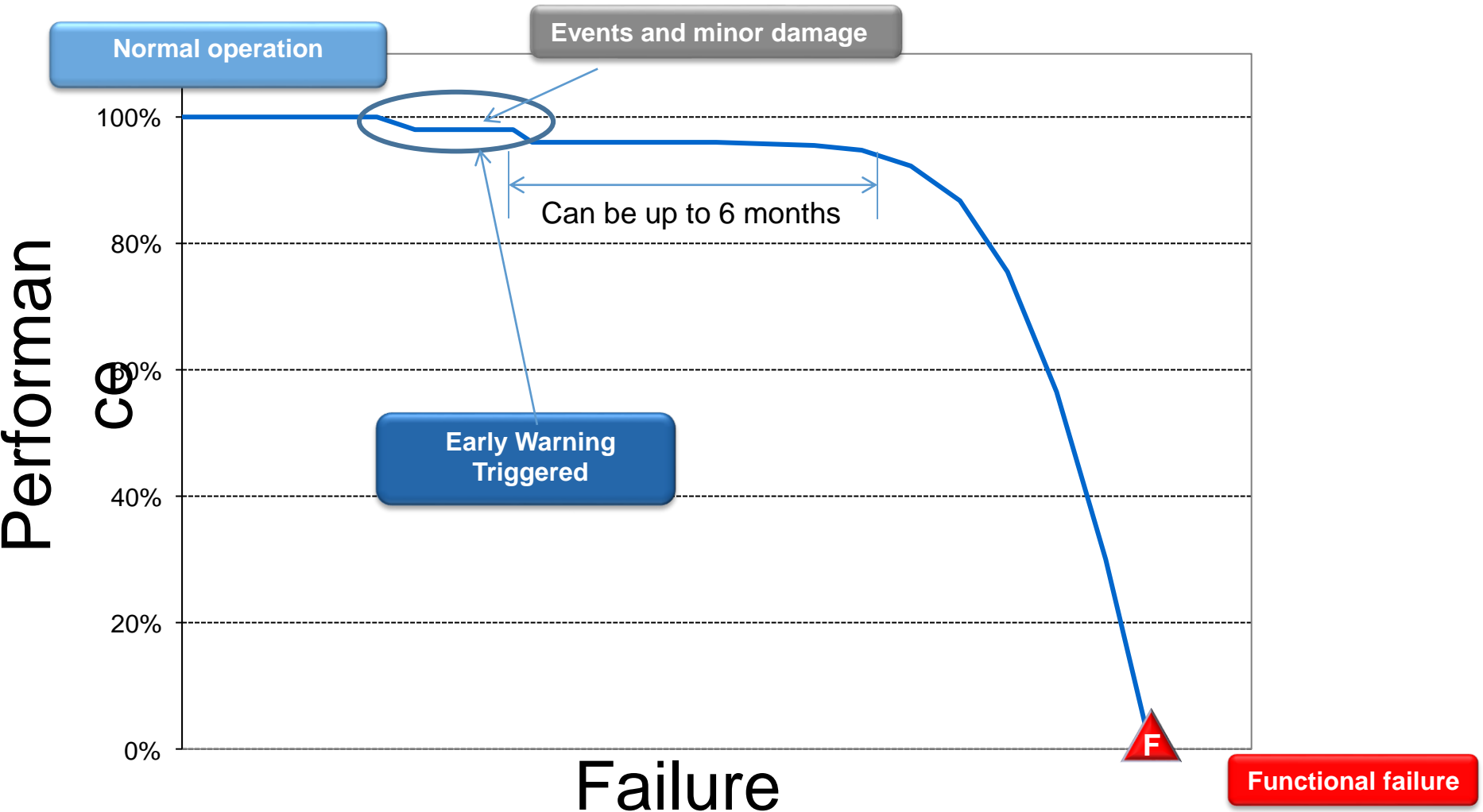
SmartSignal – Early Detection

Monitors all signals simultaneously



Delivers time for decision making

Have the foresight to see issues developing 'early'



Some Other SCADA Screens References

10MWP MAHESWARI MINING AND ENERGY PVT LTD (PEERAMPALLY) dd/mm/yy hh/min/sec

Plant Info Dashboard PVB-1 PVB-2 PVB-3 PVB-4 WMS OUTGOING INCOMER

INCOMERS

INCOMER_1		INCOMER_1		INCOMER_1		INC	
Active Power (kw)	STATIC TEXT	Active Power (kw)	STATIC TEXT	Active Power (kw)	STATIC TEXT	Active Power (kw)	STATIC TEXT
Reactive power(kw)	STATIC TEXT	Reactive power(kw)	STATIC TEXT	Reactive power(kw)	STATIC TEXT	Reactive power(kw)	STATIC TEXT
Apparent Power	STATIC TEXT	Apparent Power	STATIC TEXT	Apparent Power	STATIC TEXT	Apparent Power	STATIC TEXT
Frequency(Hz)	STATIC TEXT	Frequency(Hz)	STATIC TEXT	Frequency(Hz)	STATIC TEXT	Frequency(Hz)	STATIC TEXT
Phase Current (A)		Phase Current (A)		Phase Current (A)		Phase Current (A)	
STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT
Output Voltage (A)		Output Voltage (A)		Output Voltage (A)		Output Voltage (A)	
STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT	STATIC TEXT

10MWP MAHESWARI MINING AND ENERGY PVT LTD (PEERAMPALLY) dd/mm/yy hh/min/sec

Plant Info Dashboard PVB-1 PVB-2 PVB-3 PVB-4 WMS OUTGOING INCOMER SMB

Weather Station

Rain(mm) STATIC TEXT

Weather Station		
Global Horizontal Irradiation(GHI)	STATIC TEXT	w/m2
Global Inclination Irradiation(GII)	STATIC TEXT	w/m2
Module Temperature 1	STATIC TEXT	deg c
Module Temperature 2	STATIC TEXT	deg c
Wind Direction	STATIC TEXT	deg
Wind speed	STATIC TEXT	mis
Air Temperature	STATIC TEXT	deg c
Rain	STATIC TEXT	mm
Humidity	STATIC TEXT	%

GHI VS GII

Wind Speed(m/s) STATIC TEXT Wind Direction (°) STATIC TEXT

10MWP MAHESWARI MINING AND ENERGY PVT LTD (PEERAMPALLY)

Plant Info Dashboard PVB-1 PVB-2 PVB-3 PVB-4 WMS OUTGOING INCOMER SMB

3 MW PV BOX

3 MW PV BOX

3 MW PV BOX

1 MW PV BOX

ACDB

T/F

T/F

T/F

T/F

ICOG zone -1

ICOG zone -2

ICOG zone -3

I/C 1 Pannel

I/C 2 Pannel

I/C 3 Pannel

I/C 4 Pannel

O/G 1 Pannel

Transmission through Switchyard

Main Control Room

O/G 2 Pannel