

A large circular graphic composed of numerous small icons representing various industries and technologies, including energy, agriculture, healthcare, and manufacturing.

TRANSFORMING DATA INTO ACTION

**Ankit Takle
Adityan Sainath**

Tata Power

TATA POWER



India's largest integrated private power utility.



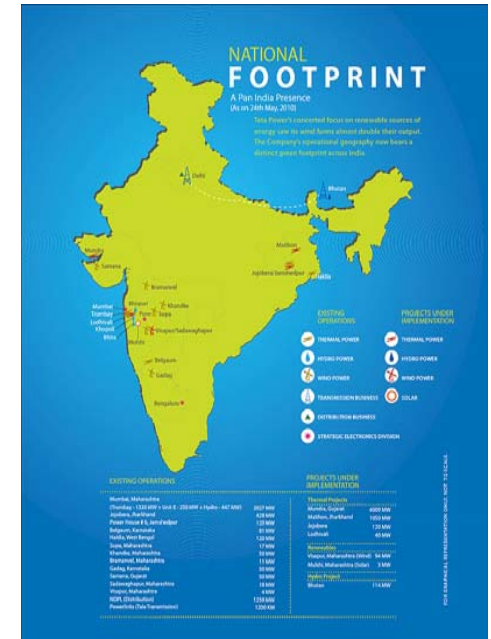
8521 MW Installed capacity (Thermal, Hydro, DG, Solar and Wind)



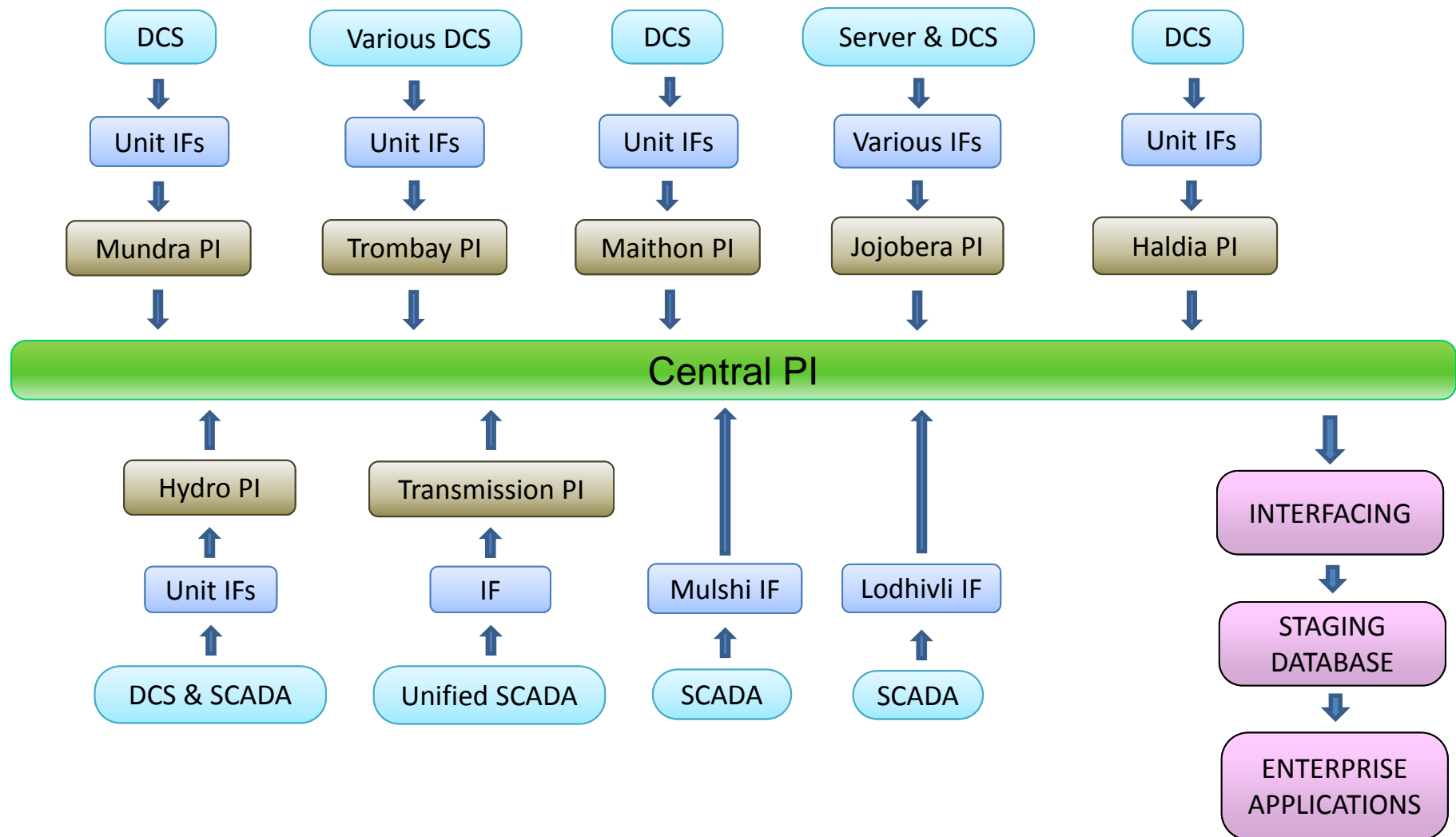
Presence in entire value chain like Generation, Transmission, Distribution, Fuel sourcing, Logistics and Power trading.



Expanding its horizon beyond India in countries like Australia, Bhutan, Singapore, Indonesia, Nepal, Africa, Netherlands & the Middle East.



PI SYSTEM AT TATA POWER



TRANSFORMING DATA INTO ACTION

SOLUTIONS FOR
TRANSMISSION

INTEGRATION
WITH SAP

IN-HOUSE BUSINESS
SOLUTIONS

WAY AHEAD

Transmission
Grid Availability

OSI SCADA
Availability

Smart Soot
Blowing
Solution

Solar plant
performance
analysis

CMDC

Mobile
App

SOLUTIONS FOR TRANSMISSION

Transmission Grid Availability

- Mumbai Transmission grid includes 71 transmission lines and 71 Transformers.
- Status of each equipment of Switchyard of all Generation and Transmission stations made available on PI System.
- Some of the required parameters for this analysis are Station Transformer breaker status, LT breaker status, Line breaker status etc.
- The number of outages are calculated according the data available from the respective PI tags.

Transmission Grid Availability

- Sequential calculations developed in PI System for calculating outage details of lines and Transformers.
- PI Performance equations developed according to the standard Grid calculations and formulae.
- Availability of each line and each Transformer was calculated to provide Grid Availability of entire Transmission grid.

SCADA Availability

- Requirement of monitoring SCADA availability at unified as well as station level by Transmission O&M.
- This required calculation of Gateway & RTU availability at instantaneous and daily level.
- Uptime for each station and Total SCADA availability were calculated.
- AF Structure for the system created

SOLUTIONS FOR TRANSMISSION



\\PI-BACKUP\transpi - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element New Attribute

Elements

- TRANS
 - UNIFIED SCADA AVAILABILITY
 - AMBERNATH
 - 110 KV AREVA GATEWAY
 - 22KV AREVA GATEWAY
 - BACKBAY
 - 110 KV ABB GATEWAY
 - 220/33 KV HARISS GATEWAY
 - BORIVALI
 - 110/22 KV HARISS GATEWAY
 - 220 KV HARISS GATEWAY
 - 33 KV ABB GATEWAY
 - CARNAC
 - GIS ABB GATEWAY
 - OLD ABB GATEWAY
 - CHEMBUR
 - 110 KV AREVA GATEWAY
 - 22 KV AREVA GATEWAY
 - DHARAVI
 - 110/22 KV ABB GATEWAY
 - 220/33 KV ABB GATEWAY
 - 33 KV SIEMENS GATEWAY
 - GRANT ROAD
 - 110 KV ABB GATEWAY
 - KOLSHET
 - 110 KV AREVA GATEWAY
 - MAHALAKSHMI
 - 110 KV AREVA GATEWAY
 - 22 KV AREVA GATEWAY
 - MALAD
 - 110 KV ABB GATEWAY
 - PAREL
 - 110 KV ABB GATEWAY
 - BKC
 - ABB GATEWAY

UNIFIED SCADA AVAILABILITY

General Child Elements Attributes Ports Version

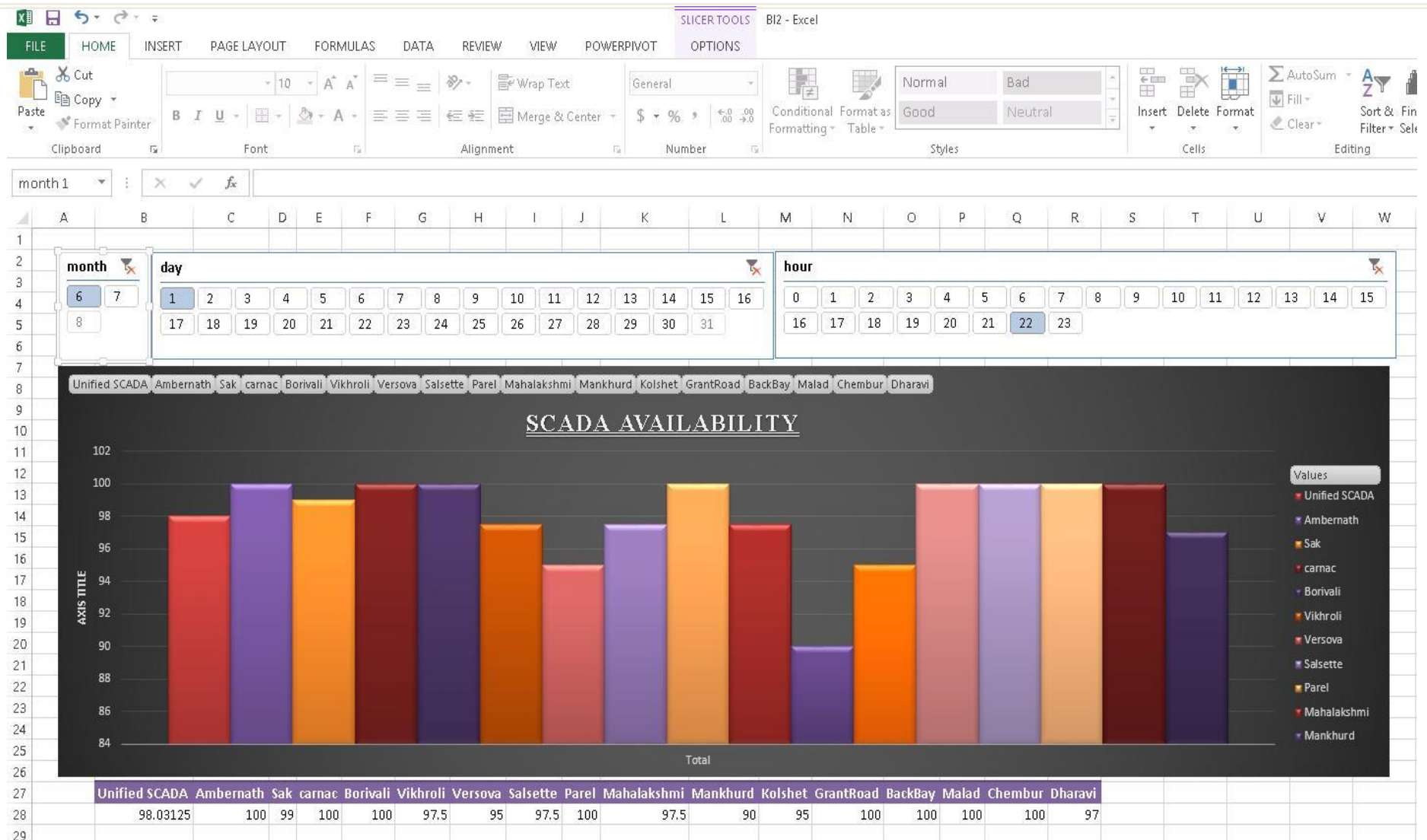
Filter

Name	Value
Category: Current Value	
SCADA AVAILABLE	1
Category: Daily Values	
UNIFIED SCADA AVAILABILITY DAILY	98.82952 %
Category: Hourly Value	
UNIFIED SCADA AVAILABILITY HOURLY	94.04591 %
Category: Monthly Values	
UNIFIED SCADA AVAILABILITY MONTHLY	99.83939 %
Category: Uptime Daily	
AMBERNATH DAILY	83130 s
BACKBAY DAILY	85569.06 s
DHARAVI DAILY	85932.98 s
VERSOVA DAILY	86400 s
Category: Uptime Hourly	
AMBERNATH HOURLY	3600 s
BACKBAY HOURLY	3556.098 s
DHARAVI HOURLY	3600 s
VERSOVA HOURLY	3600 s

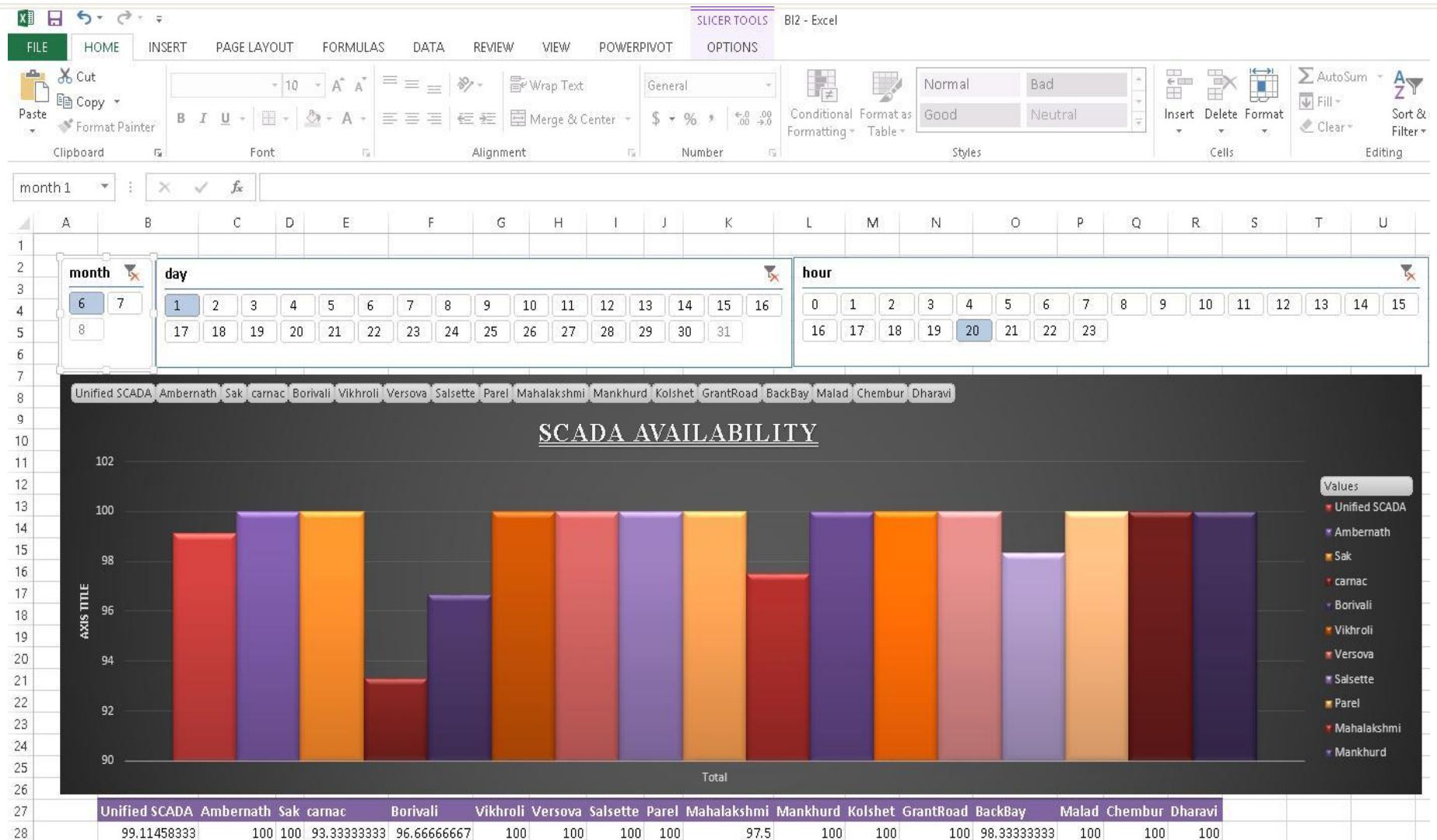
UNIFIED SCADA AVAILABILITY Modified:27-06-2013 14:15:28. Version: 01-01-1970 00:00:00, Revision 27

Start

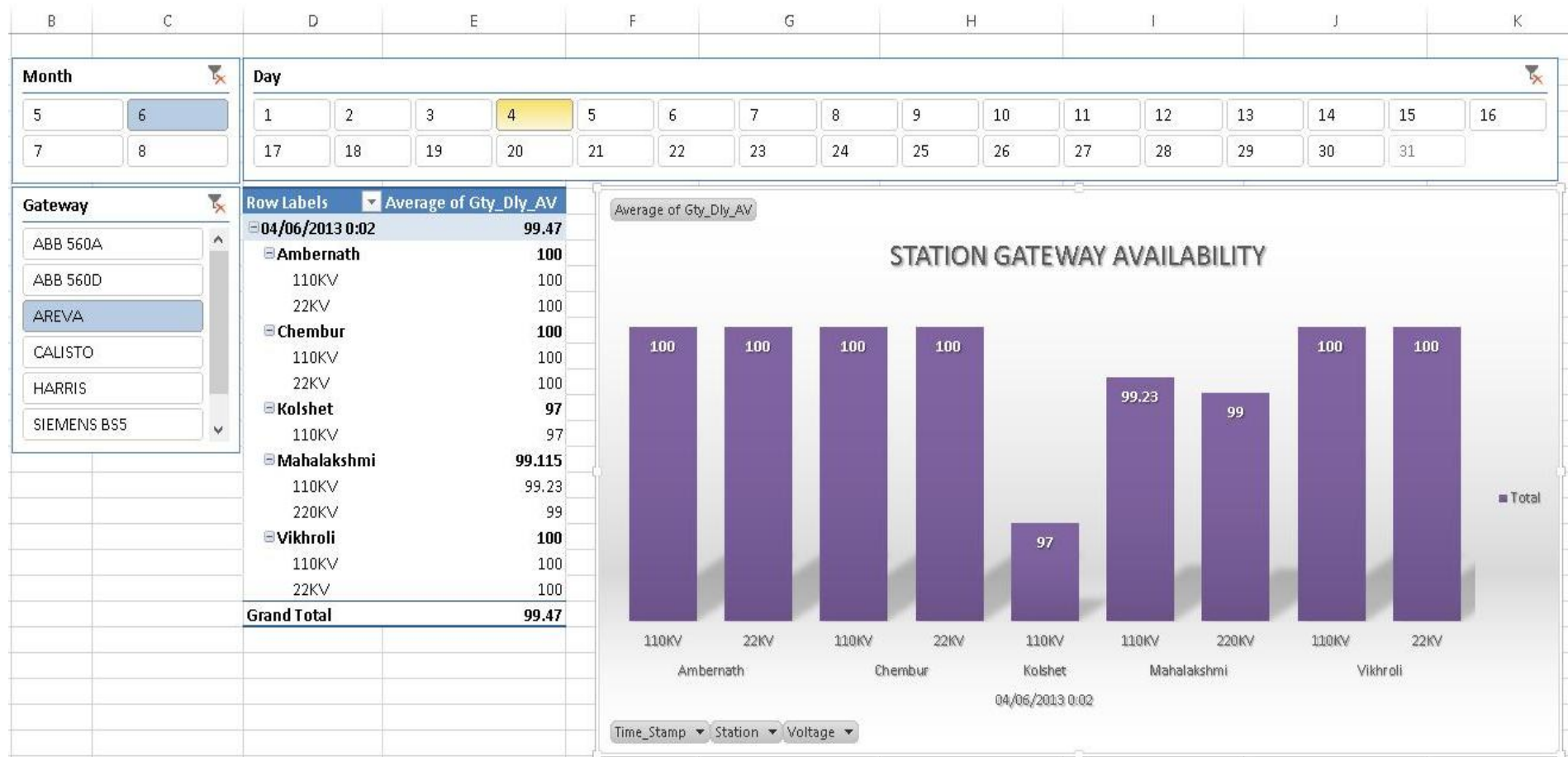
BI DASHBOARD



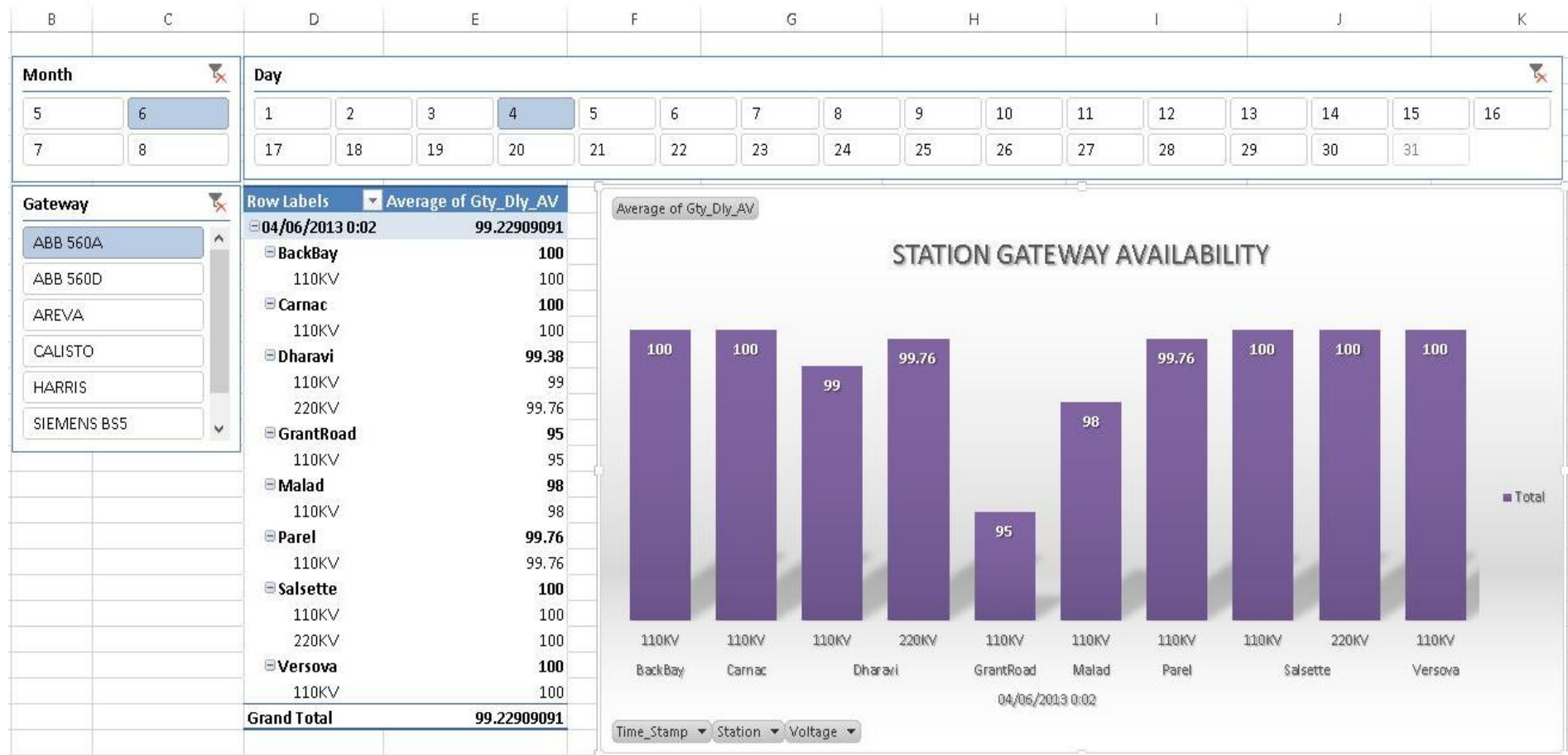
BI DASHBOARD



BI DASHBOARD



BI DASHBOARD





INTEGRATION WITH SAP

INTEGRATION WITH SAP



SAP-COE plans to automate performance monitoring drill down using SAP-BI report tools.



Trombay Unit 5 heat rate was decided upon as a pilot project.

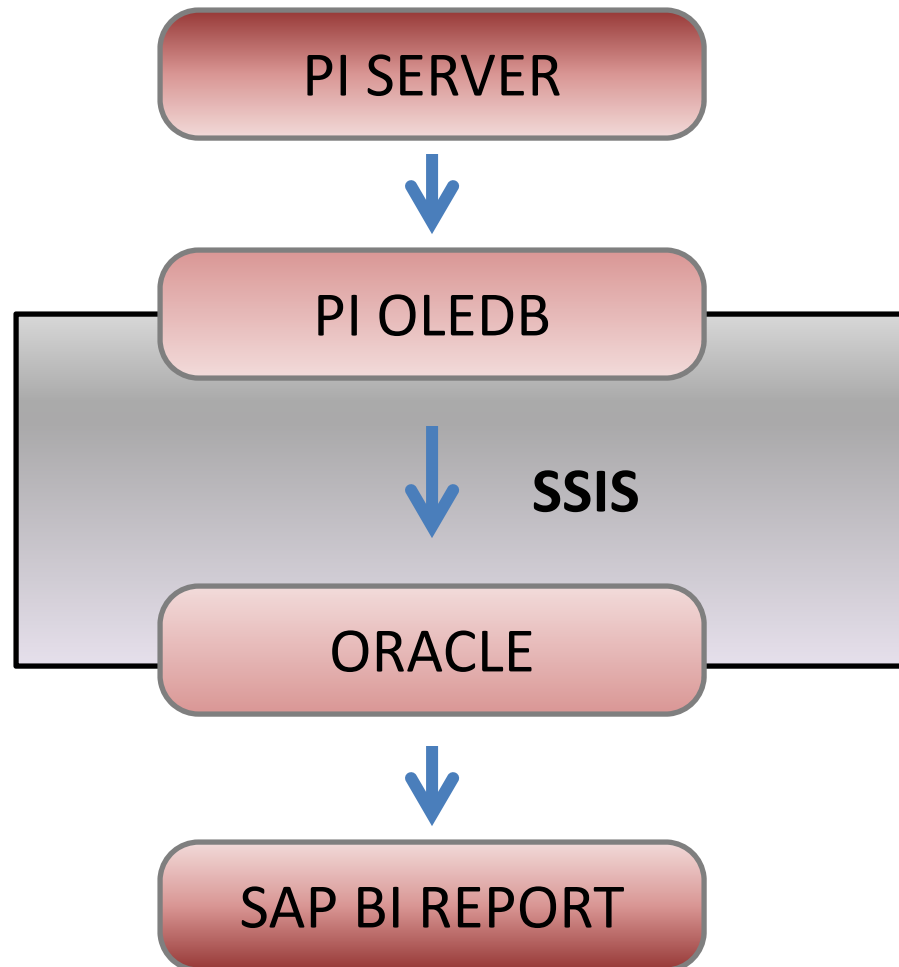


PI system is used for performing automated calculations and data transfer.

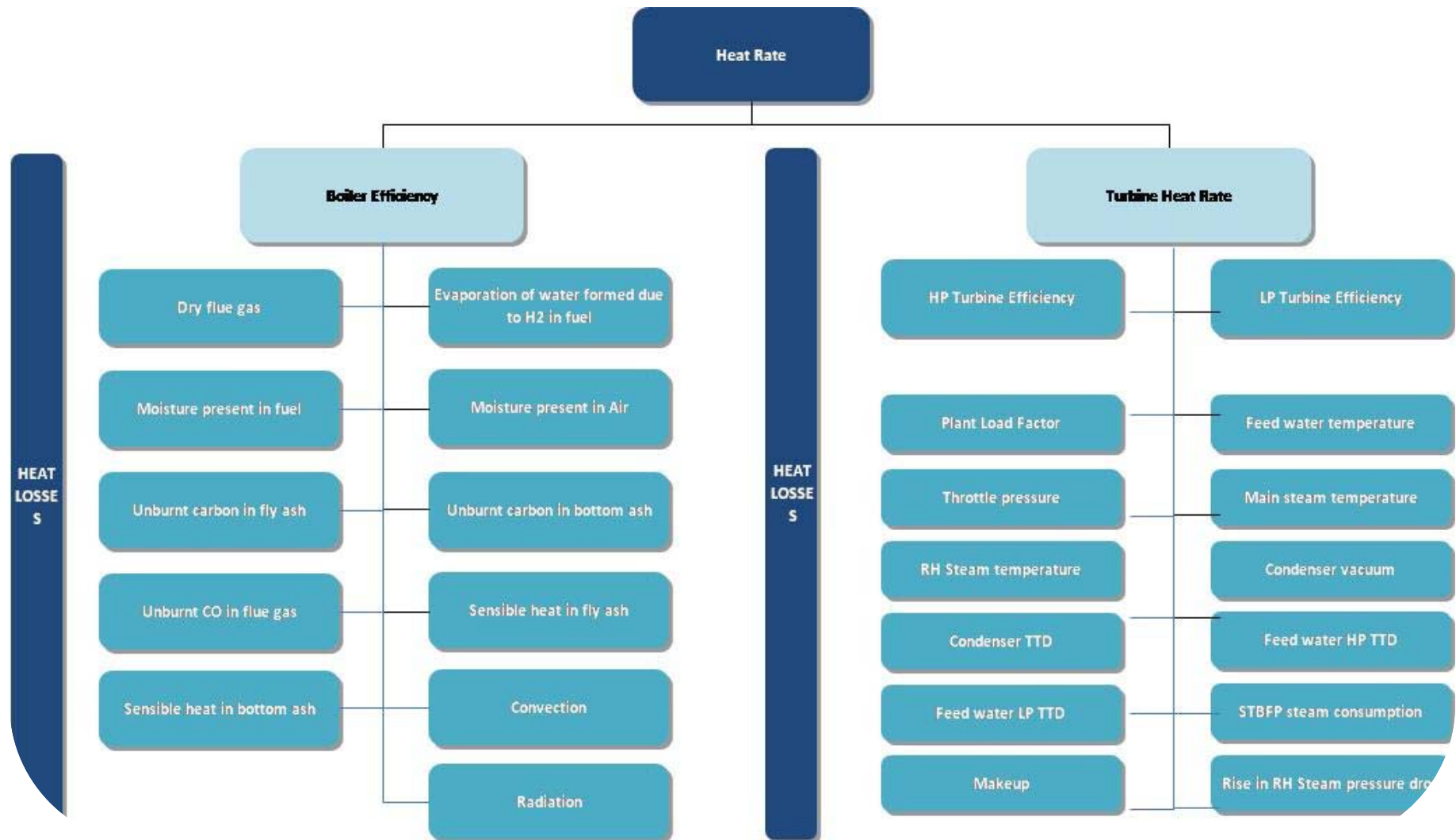


Since Steam Tables cannot be deployed in SAP, it was decided to use the steam tables function of PI system for thermodynamic calculations.

INTEGRATION WITH SAP



INTEGRATION WITH SAP



INTEGRATION WITH SAP



TATA POWER
Lighting up Lives!

GENERATION



August 2013						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Heat Rate



2580.54 kcal/kwh

Hide Heat Rate Bifurcation

Boiler Efficiency



83.63 %

View Boiler Efficiency

Turbine Heat Rate



2226.23 kcal/kwh

Losses in Turbine Heat Rate

HP Turbine Efficiency	85.5 %
IP Turbine Efficiency	88.79 %
Plant load factor	84.43 kcal/kwh
Feed water temperature	0 kcal/kwh
Throttle pressure	0 kcal/kwh
Main steam temperature	10.22 kcal/kwh
RH Steam temperature	0 kcal/kwh
Condensor vacuum	0 kcal/kwh
HP Feed water TTD	0 kcal/kwh
LP Feed water TTD	0 kcal/kwh
Makeup	2.09 kcal/kwh
Rise in RH Steam pressure drop	0 kcal/kwh
Loss due to RH spray	10.57 kcal/kwh

INTEGRATION WITH SAP



TATA POWER
 Lighting up Lives!

GENERATION

August 2013
◀ ▶

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Heat Rate

2580.54 kcal/kwh

Hide Heat Rate Bifurcation

Boiler Efficiency

83.63 %

Turbine Heat Rate

2226.23 kcal/kwh

View Turbine Heat Rate

Losses in Boiler Efficiency

Dry flue gas	5.96 %
Evaporation of wtr formed due to H2 in fuel	4.45 %
Moisture present in fuel	4.87 %
Moisture present in Air	0.31 %
Unburnt carbon in fly ash	0.62 %
Unburnt carbon in bottom ash	0.15 %
Unburnt carbon in flue gas	0 %
Sensible heat in fly ash	0 %
Sensible heat in bottom ash	0 %
Convection	0 %
Radiation	0 %



IN-HOUSE BUSINESS SOLUTIONS

Overview

- Applications developed by combining the features of PI functionality, MS Excel/Processbook and VBA.
- Historical data obtained from PI system is processed using VBA.
- Advice given to users using this empirical data.
- Application also consists of a User-friendly front end.

Smart Soot Blowing Solution

- Traditional Soot Blowing operations to clean ash deposited on Boiler tubes cannot have an overall impact on Boiler efficiency.
- Application is developed that analyzes effect of individual soot blowers in various conditions.
- Application developed for Trombay Thermal power plant.

Smart Soot Blowing Solution

The salient features of the application:

- Dynamically updating historical data
- Coal Mill combination using PI-ACE
- Pattern recognition
- Frequency/Impact/Elevation based guidance of soot blower operation
- Control flow feature of VBA

Smart Soot Blowing Solution

- Group of most effective soot blowers is suggested to Operators for prioritizing operation of soot blowers.
- Maximum impact on Boiler Efficiency, its effect is evident in improvement in SH temp, DM Water consumption and Heat Rate.

IN-HOUSE BUSINESS SOLUTIONS



Smart Soot Blowing Solution

	SH N Temp		SH S Temp		SH Spray		Coal Mill Combination				RH N Temp		RH S Temp		RH Spray												
	543.2		541.9		19.77						BCDFGH				540.8								539.2		16.63		
													MW														
													498.079														
													Click to Execute														

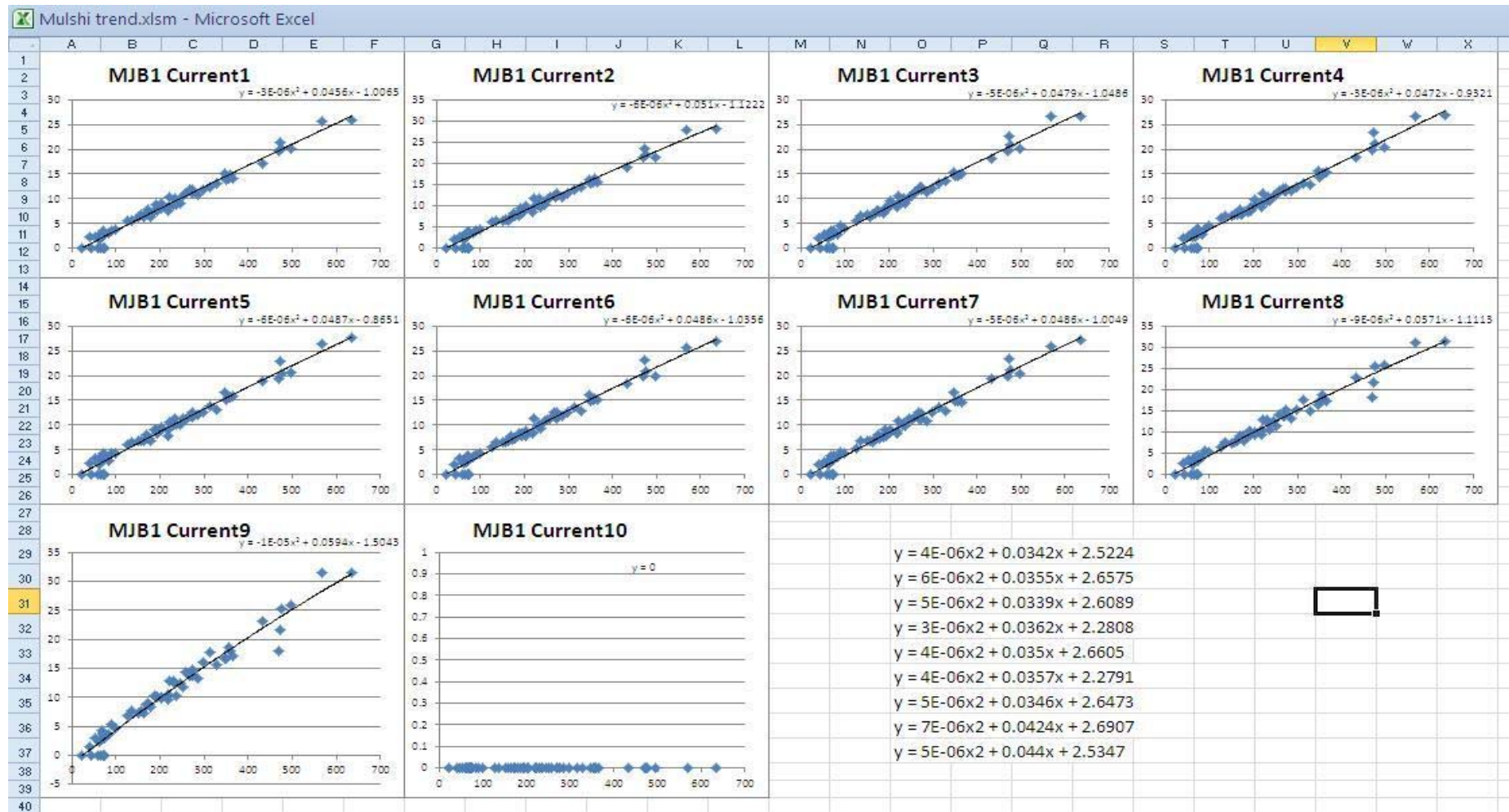
Solar plant performance analysis

- Application is developed which provides direct relationship between solar irradiation and current in the form $y = f(x)$.
- Alarming condition is provided if any deviation from normal condition is observed.
- Helps in predictive analysis of future deviations for solar power plant
- Application developed for Mulshi Solar power plant.

IN-HOUSE BUSINESS SOLUTIONS



Solar plant performance analysis



IN-HOUSE BUSINESS SOLUTIONS



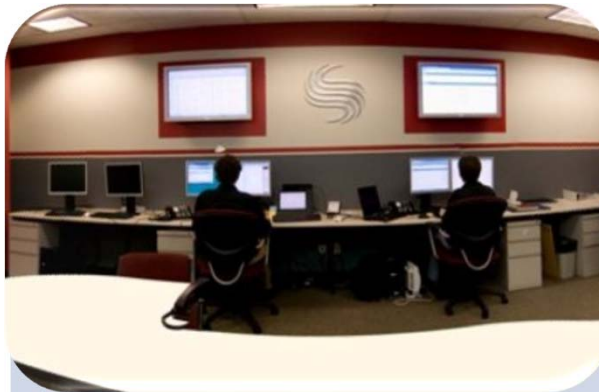
Solar plant performance analysis

	P22														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	
2															
3	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	
4															
5	P29	P30	P31	P32	P33	P34	P35	P36	P37	P38	P39	P40	P41	P42	
6															
7	P43	P44	P45	P46	P47	P48	P49	P50	P51	P52	P53	P54	P55	P56	
8															
9	P57	P58	P59	P60	P61	P62	P63	P64	P65	P66	P67	P68	P69	P70	
10															
11	P71	P72	P73	P74	P75	P76	P77	P78	P79	P80	P81	P82	P83	P84	
12															
13	P85	P86	P87	P88	P89	P90	P91	P92	P93	P94	P95	P96	P97	P98	
14															
15	P99	P100	P101	P102	P103	P104	P105	P106	P107	P108	P109	P110	P111	P112	
16															
17	P113	P114	P115	P116	P117	P118	P119	P120	P121	P122	P123	P124	P125	P126	
18															
19	P127	P128	P129	P130	P131	P132	P133	P134	P135	P136	P137	P138	P139	P140	
20															
21															



WAY AHEAD

Centralized Monitoring and Diagnostic Centre



Data from
decentralized
plants to
Centralized
location

Facilitates
Centralized
diagnostics
and analytics

Expert advice
from centralized
location to
decentralized
locations

PI System Mobile App

- Application being developed on new generation smart phones to view live real time and cumulative dashboard of Tata Power generation.
- Convenient, easy to use application which is very similar to OPMS web based dashboard.
- Application supports all Blackberry, Android and iPhone.
- Convenient, easy to use opening/closing, zooming, navigation, login facilities as well as simultaneous use on multiple phones provided.

QUESTIONS



