



SEED (System Energy Efficiency Display) - Energy Efficiency Monitor for a coal fired power station

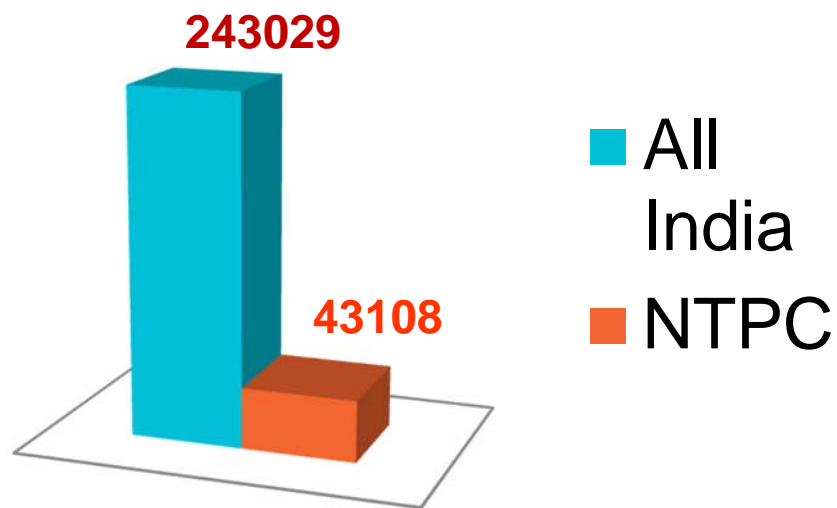
Presented by **Diwakar Kaushik, AGM(ERP), NTPC Ltd., NOIDA**
Raj Pal Singh, AGM(ERP), NTPC Ltd., NOIDA
Dated: 09.10.2014, Mumbai

AGENDA

- About NTPC
- PI System implementation in NTPC
- Business Challenge
- Solution - SEED (System Energy Efficiency Display)
- OSIsoft Products employed
- SEED – Results / Benefits
- Future Roadmap
- Conclusion

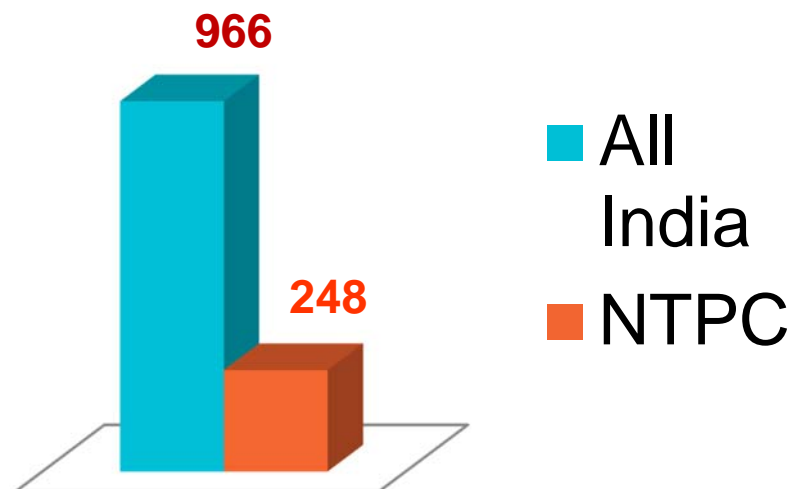
NTPC Power Share

Installed Capacity – MW
(as on 31.03.14)



17.7%

Generation - BU
(Year 2013-14)



25.7%

NTPC Contributes More Than One-fourth of India's Total Power Generation with Less Than One-fifth Capacity

About NTPC

Set up in 1975 with 100% Government Ownership

Awarded “MahaRatna” Status in May 2010

Target of 1,28,000 MW capacity by 2032

No.1 Independent Power Producer globally in 2013 in top 250 Global Energy Companies' list by Platts

Only PSU among the top 35 companies, ranked 6th in the prestigious study of The Economic Times and Great Place to Work Institute" for 2013

About NTPC

2675 MW of new
commercial
capacity addition

Coal Stations
generated 221
BU's, up 3.94%
over last year

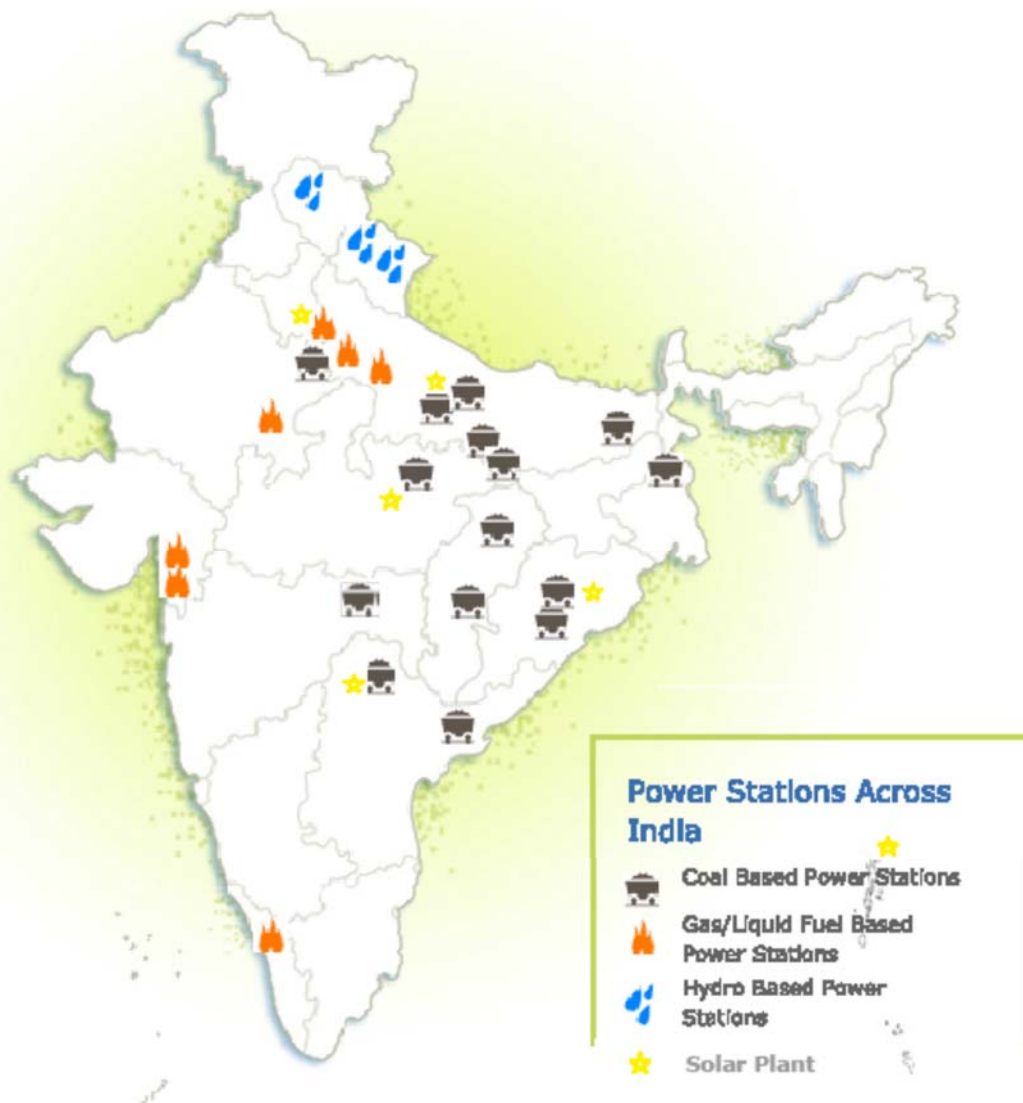
Performance
2013-14

Coal Stations
PLF of 81.50%
(All India
65.5%)

4 stations
achieved
more than
90% PLF.

65 MW solar
capacity
addition

NTPC – PAN INDIA PRESENCE



Type of Plant	Count
Coal based	16 (33015 MW)
Gas / Liquid Fuel based	07 (4017 MW)
Renewables	07 (95 MW)
JV's (Coal & Gas)	08 (6001 MW)

PI System Implementation

PI System implemented in NTPC at

- 17 Coal stations (latest Barh)
- 7 Gas stations
- Corporate office

Note: PI Server-2012 installed at last two stations of Mouda & Barh.

Business Challenge

- Auxiliaries Energy Consumption

Amount of energy consumed by auxiliary equipments in a power station

Increased auxiliaries energy consumption reduces the Energy sent out to the consumers & hence the accrued revenues.

Auxiliaries Energy Consumption requires close monitoring



PresenterMedia

Business Challenge

Auxiliary Energy Consumption Monitoring Requirements

- Monitoring electrical power vis-a-vis its process contribution
- Intra-unit & inter-unit, system wise comparison
- Trending over a period
- Early Identification of less efficient equipments for remedial action.



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Problem Background

- OLEMS (On Line Energy Management System) had been in use for monitoring power plant auxiliaries energy consumption using energy meters measuring KW, Current, Voltage and p.f.
- Meters connected to OLEMS server for display and archiving

However ..

- OLEMS provides only KW data (no process data)
- Data is available only at 2 or 3 places in the station

Challenges Envisaged

- Integration of OLEMS data with Process data already available at PI server
- Identification of systems for energy monitor based on availability of KW and process data
- Deciding indices to monitor auxiliary energy consumption & its configuration in the PI System
- Providing the required information to the users in desired formats

SEED – Steps Followed

- Ensured OLEMS System OPC Compliance & connected to PI server
- Systems identified for covering under SEED such as Draft system, Milling System, Condensate, ESP etc.
- SEC & ECI chosen indices to monitor energy efficiency
- PI Tags required for SEED created in the station PI Server using PI Performance Equations

The Solution

System Energy Efficiency Display (SEED)

**An Energy Consumption Monitoring system
for power plant auxiliaries using PI server**

Integration of Data available on PI server

1. Process Parameter from DAS/DDCMIS
2. Electrical data from OPC compliant OLEMS



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SEED – Indices Used

Specific Energy Consumption (SEC) Kw/Ton

Energy Consumption, Kwh
Flow , TPH

Energy Consumption Index (ECI) Kw/MW

Energy Consumption, Kwh
Generation in MWh

SEED OUTPUT

- SEED Process Book Displays with values & trends for auxiliary energy efficiency analysis.
- SEED Process Book Displays availability at Station / RHQ / OS LAN
- Regular Review of SEED Indices at Stations for identifying actionable points.

SEED SCREENSHOTS

System Energy Efficiency Display

Prev Day Report

Station: XXX

21-08-2014 11:44:00

Stage: x

Unit Load , MW

U#4
470

U#5
444

U#6
478

U#7
494

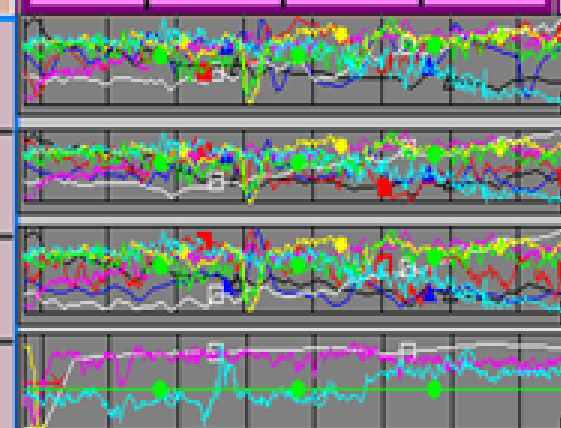


Main Plant

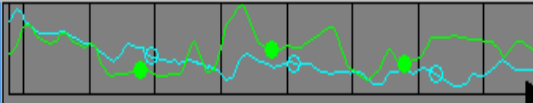
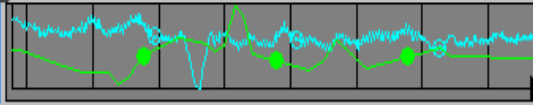
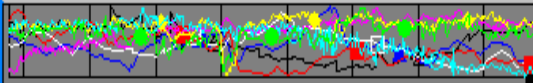
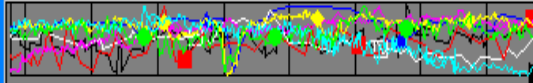
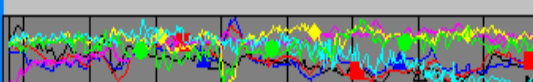
Energy Consumption Index

	FW	Air	Coal
U#4	1289	1774	377
U#5	1186	1815	379
U#6	1382	1726	379
U#7	1570	1749	399

System	Unit	U#4	U#5	U#6	U#7
Days Since O/H	Nos.	403	67	638	709
Post O/H Draft ECI	Kw/MW	18.1	17.5	17.4	14.7
Draft	Kw/MW	* 21.1	* 20.4	* 20.6	* 14.8
Milling	Kw/MW	* 5.2	* 5.4	* 5.3	* 6.2
CW Pumps	Kw/MW	10.4	11.0	10.2	9.5
Cooling Tower	Kw/MW	4.1	3.9	3.5	2.1



* The data displayed in the screenshot is typical, only for demonstration purpose.

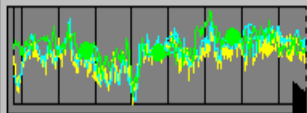
Off Site		Energy Consumption Index				
System		Stage-II	Stage-III			
Ash Handling	Kw/MW	1.2	1.3			
Compressed Air	Kw/MW	0.8	0.8			
Specific Energy Consumption						
System	Unit	U#4	U#5	U#6	U#7	
Milling	Kw/Ton	6.4	6.4	6.7	7.7	
PA & SA	Kw/Ton	2.2	1.9	2.2	2.2	
Condensate	Kw/Ton	1.4	Calc Failed	1.4	1.1	

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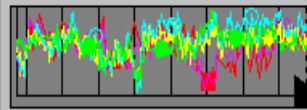
Unit 04 Draft System

Unit Load **469 MW**
 Total Draft **9955 KW**
 Draft ECI **21.2 KW/MW**

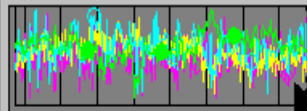
FD Fans



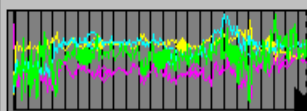
ID Fans



PA Fans



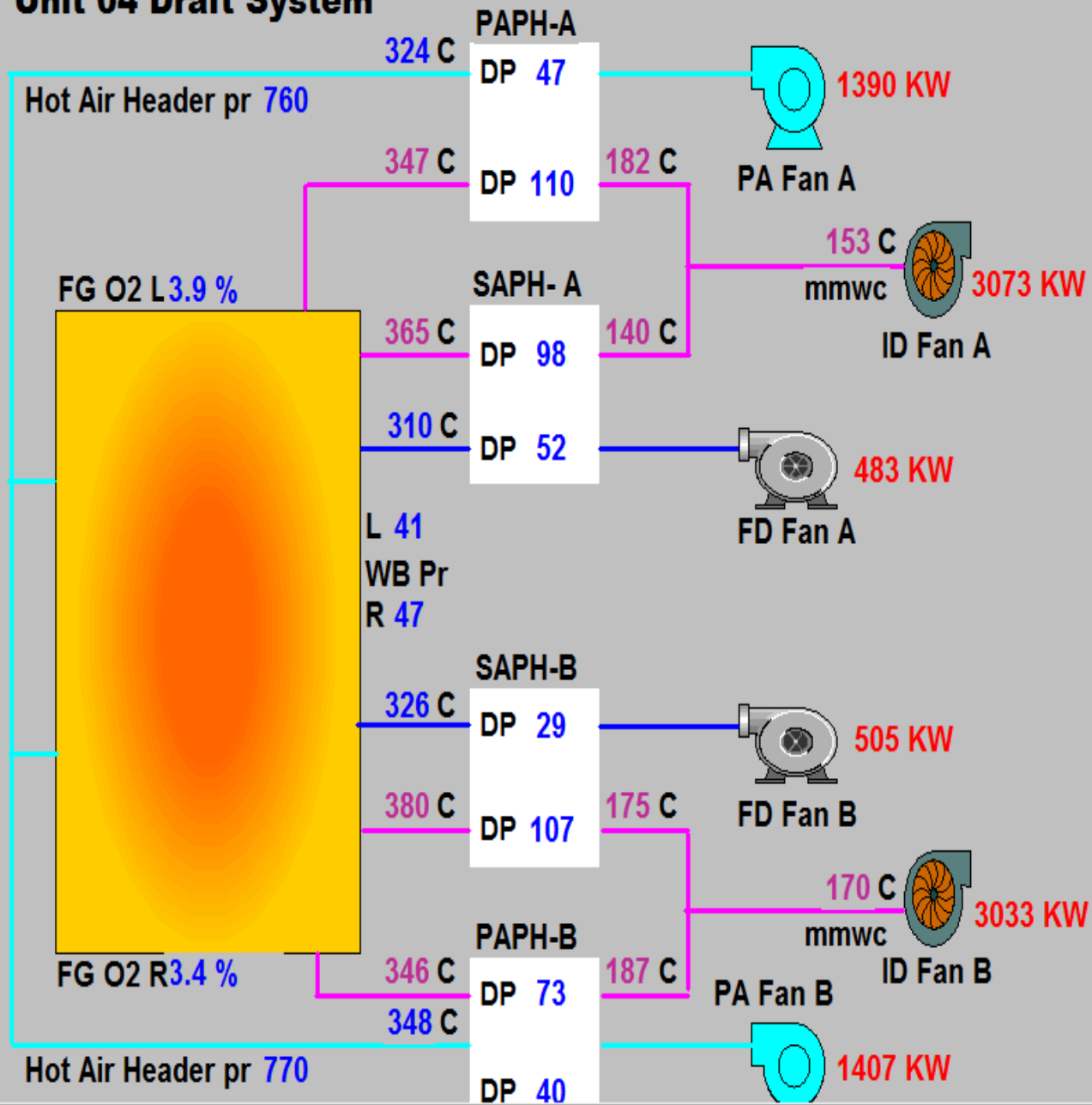
Coal Air Ratios



ID Fans **6136 KW**
 FD Fans **1014 KW**
 PA Fans **2807 KW**
 Total Air **1758 t/h**
 Total PA **668 tph**
 Total SA **1093 t/h**
 Total Coal **378 t/h**
 Total Air / Coal **4.6**
 PA to Coal **1.8**
 SA to PA **1.6**

OVERVIEW

MILLING 04

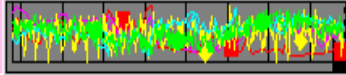
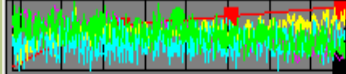
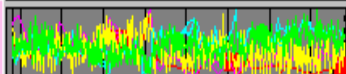
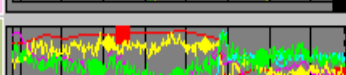
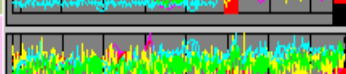
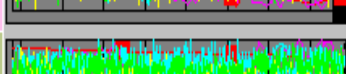
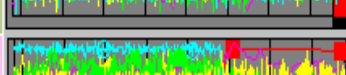
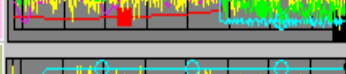


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Unit 04 Milling System

Unit Load **469 MW**

Milling ECI **5.2 KW/MW**

Mill	Power KW	Coal Flow TPH	SEC Kw/T	PA I/L Temp Deg C	O/L Temp Deg C	Air Flow TPH	AFR	
A	343	55	6.4	188	61	97	1.8	
B	343	57	6.5	200	72	91	1.6	
C	330	52	6.3	182	71	89	1.7	
D	329	56	6.2	266	80	83	1.5	
E	358	55	6.5	206	74	98	1.8	
F	358	56	6.4	180	69	97	1.8	
G	322	49	6.6	166	60	87	1.8	
H	0	-1		35	35	12	0.0	
UNIT		377 t/h	6.4 KW/T			672 tph	1.8	




PAPH-A Air O/L temp **324 degC**

PAPH-B Air O/L temp **348 degC**

OVERVIEW

DRAFT 04

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	A	B	C	D	E
1	SEED Parameters - Previous Day Average Report				
2	Current Date/time		20-02-2014 16:05		
3	From Date/time		19-02-2014 00:00		
4	To Date/time		20-02-2014 00:00		
5	Station: XXX				
6	Tag Description		Unit # 4	Unit # 5	Unit # 6
7	Days since last O/H	Nos.	212	600	176
8	Post O/H Draft ECI	KW/MW	19.2	19.3	19.1
9	Unit Load	MW	503.2	501.7	510.7
10	Draft ECI	KW/MW	17.3	21.5	21.0
11	Milling ECI	KW/MW	5.8	6.2	5.3
12	Condensate ECI	KW/MW	3.5	3.5	3.4
13	Comp. Air St-II	KW/MW	1.2		
14					
15	 ling System SEC	KW/T	7.5	8.6	7.2
16	Draft (Air) SEC	KW/T	2.1	2.5	2.5
 Chart2 / Chart1 / Pre Day data / input tags / Sheet3 / 					

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OS/Soft Products Used

- PI Server
- PI Performance Equations
- PI Process Book
- PI Data Link
- PI System Management Tools (PI SMT)
- PI Tag Configurator

SEED Results / Benefits

- Improved operator awareness of critical plant auxiliaries energy efficiency
- Allows operators to make system wise intra-unit & inter-unit energy efficiency comparisons
- Helps operator to decide most efficient combination of auxiliaries in the system
- Integration of process data with OLEMS data for MIS & other applications

SEED Future Roadmap

- Incorporating more systems for SEED analysis.
- Improving availability & reliability of SEED information
- Creation of Region / Company level SEED displays for reviews at HQ
- Completing SEED roll out at all NTPC stations

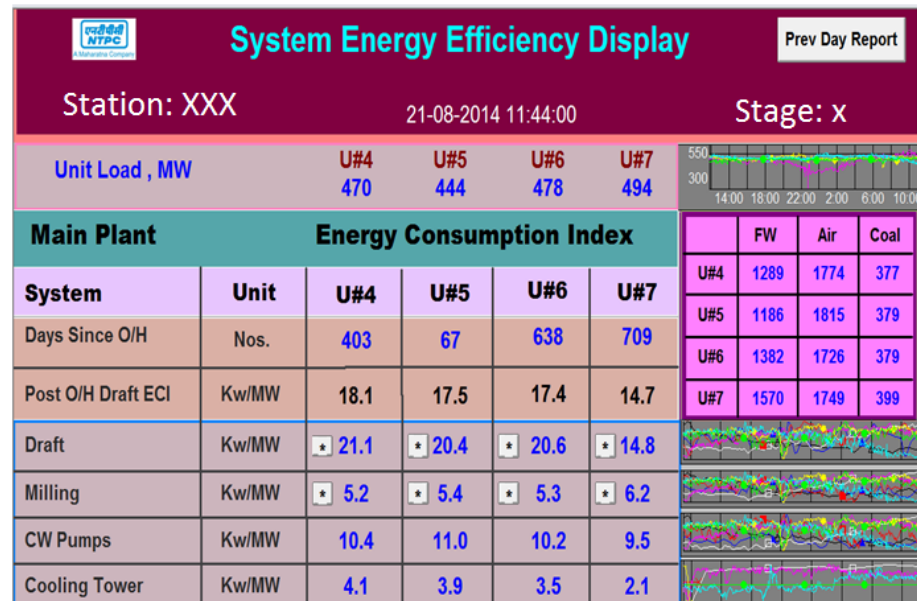
Conclusion

- Real time process monitoring & decision making is the need of the hour in view of the stricter commercial regulations
- Information availability to the operators to facilitate quick operational decisions promoting energy efficiency
- Increasing comfort level of operators in using PI System based applications & hence the demand for newer applications

Summary

SEED – System Energy Efficiency Display

- Higher auxiliaries energy consumption directly impacts the power plant revenues, hence real time relevant input to the operators facilitates quick decisions promoting energy efficiency



Business Challenge

Real time Monitoring of auxiliaries energy consumption vis-a-vis its contribution to the process

Solution

An Energy Consumption Monitoring system for power plant auxiliaries using PI server integrating Data available on PI server

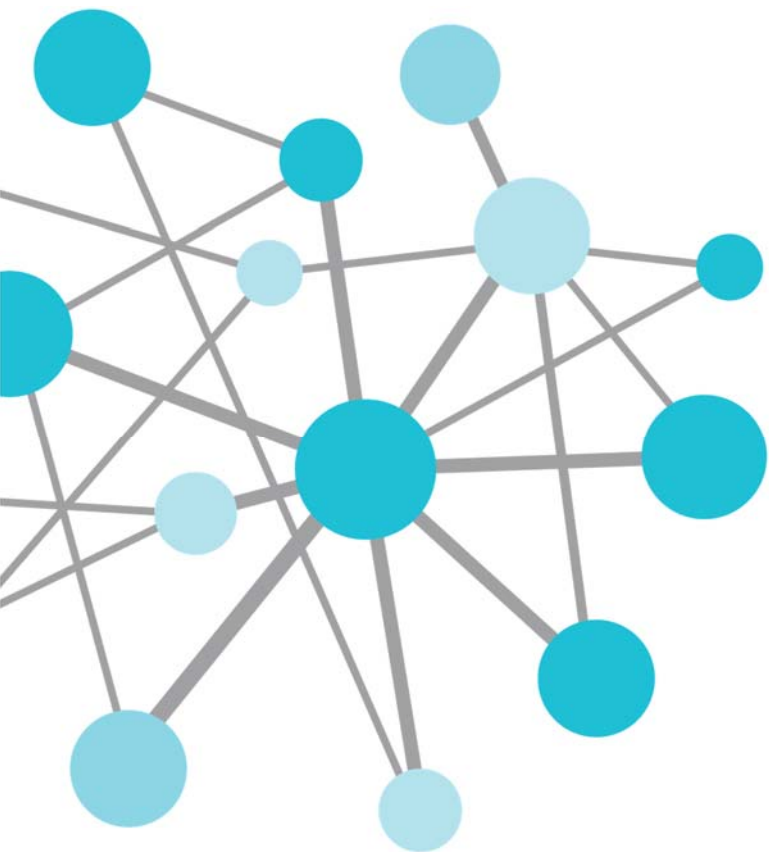
Results and Benefits

Helps operator to correctly identify auxiliaries consuming more energy & decide optimum combination of auxiliaries in the system

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