Leveraging the PI System in a Dynamic Operating Environment

Presented by

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Plant Optimization Manager

National Grid

National Grid is an International Energy Company operating in the U.K. and the U.S.

In the U.K., National Grid:

- Owns and operates high voltage electric transmission networks
- Owns and operates the high pressure gas transmission system
- Distributes gas to 11 million customers

In the U.S., National Grid:

- Distributes electricity to nearly 5 million customers in Massachusetts, New Hampshire, New York and Rhode Island
- Owns and operates approximately 4,200 MW of generating capacity
- Distributes natural gas to 3.4 million gas customers in Massachusetts, New Hampshire, New York and Rhode Island
- Service contract with LIPA to maintain and operate electric transmission and distribution system on Long Island

Who am I?

John L. Ragone
Power Plant Operations
National Grid

35 years power plant experience

Controls Manager Northport Power Station

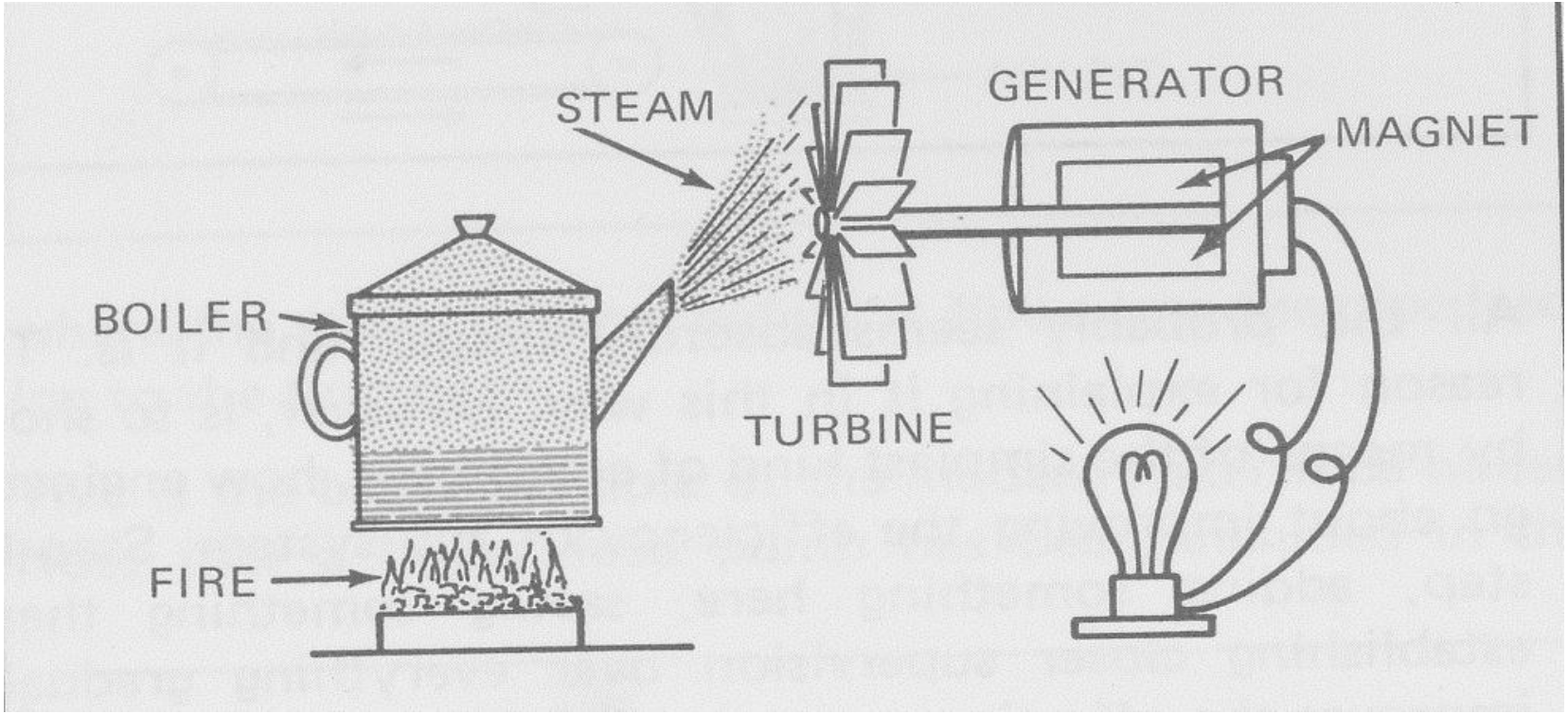
Operations and Controls Manager Port Jefferson Power Station

Plant Optimization Manager

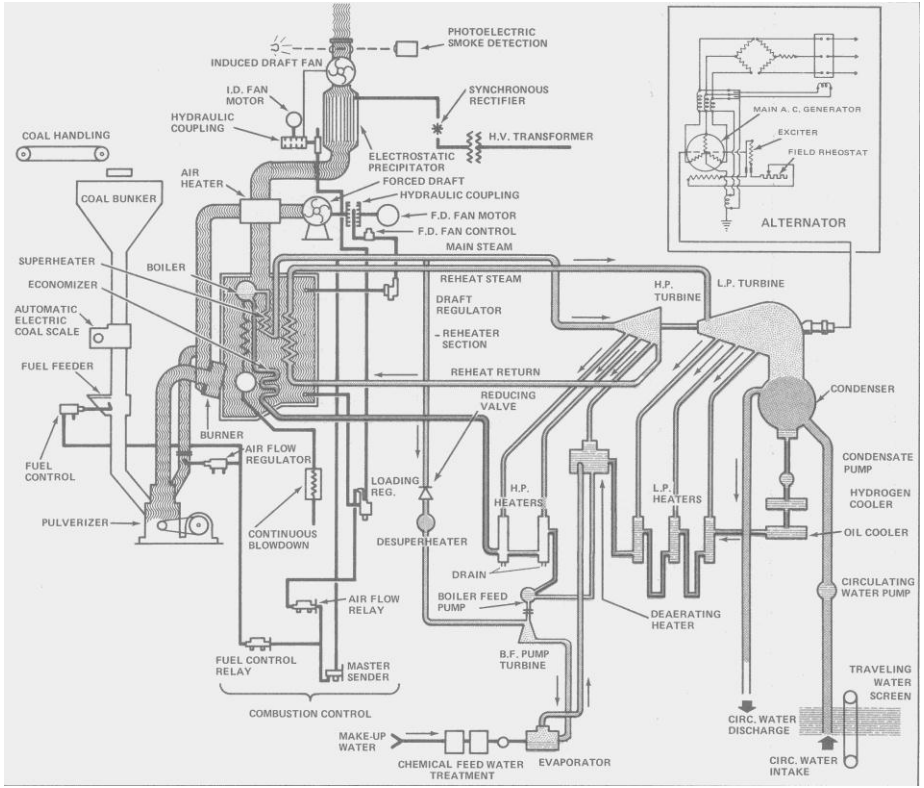
NERC CIP Compliance Manager

Where are we?

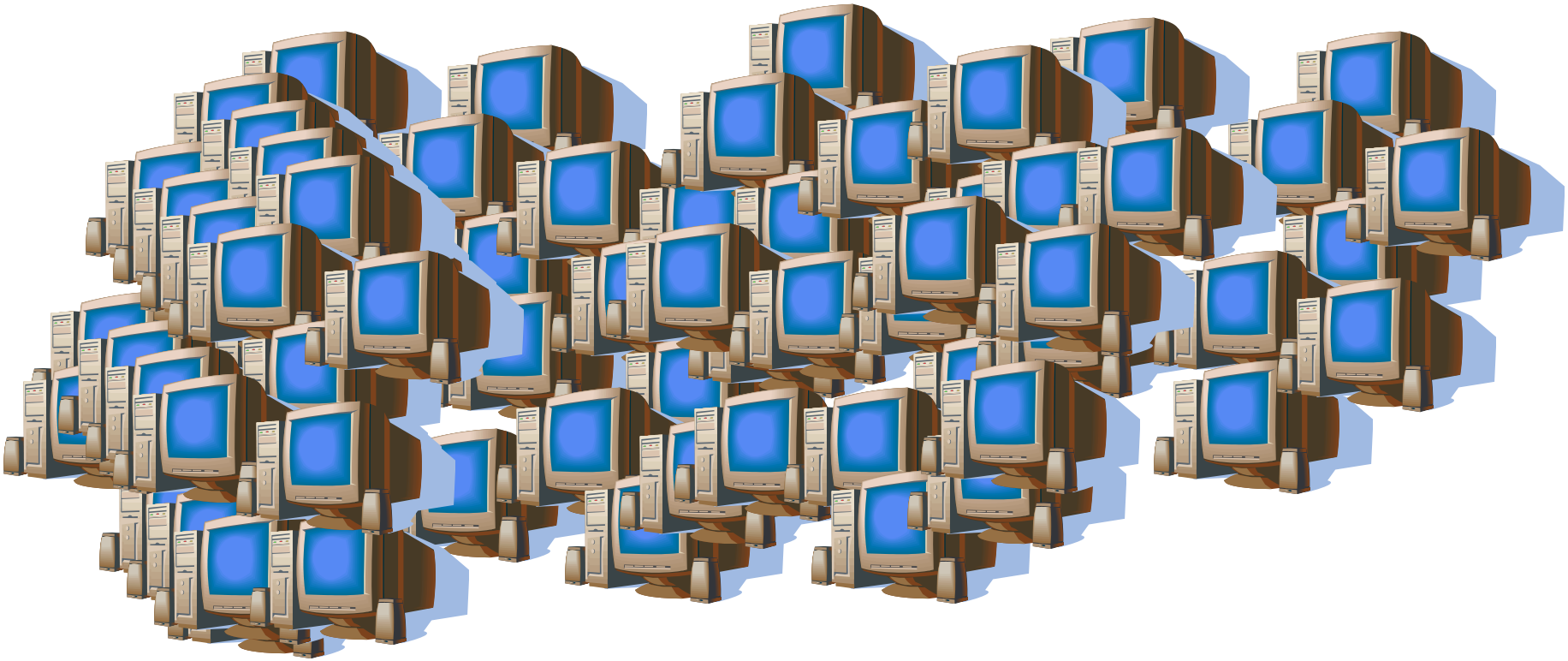
Life used to be so simple……



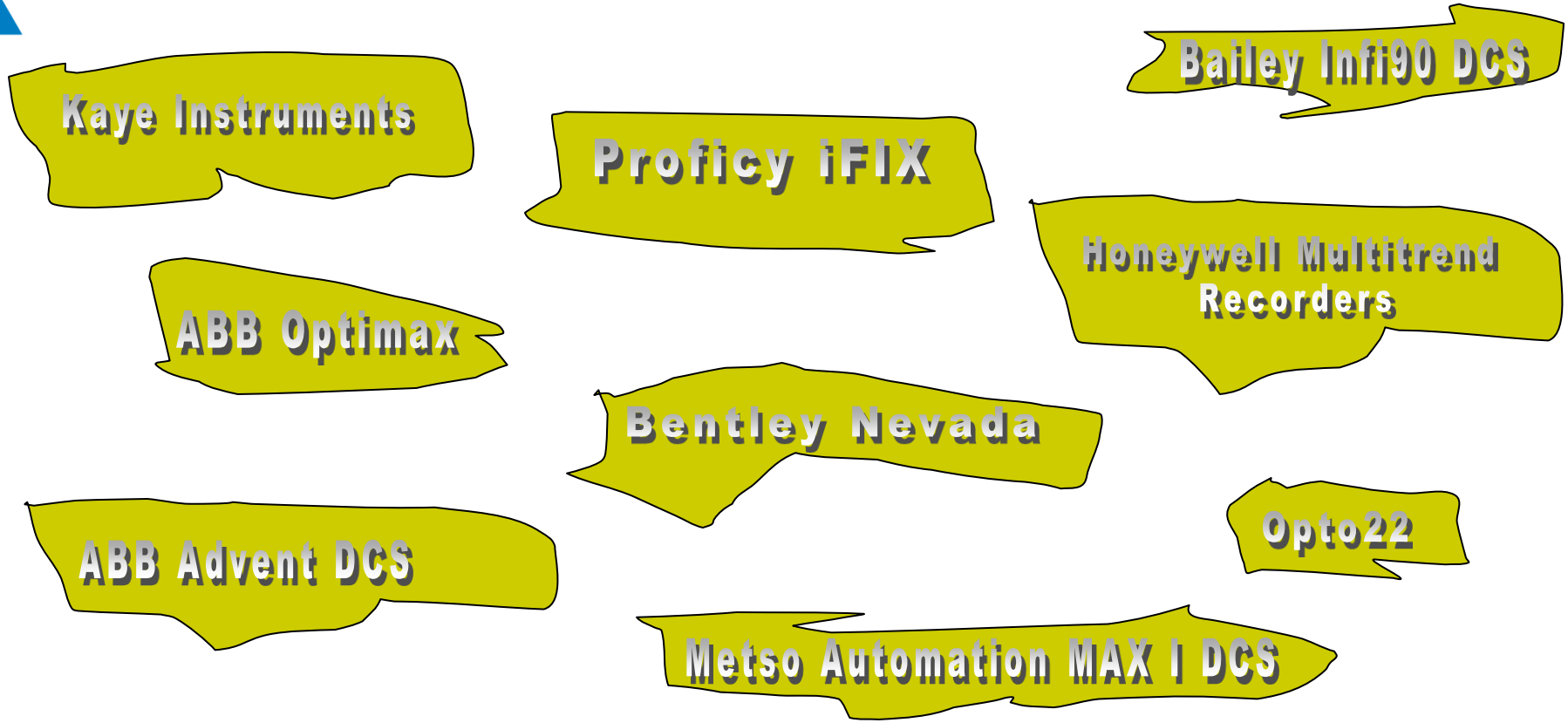
Then Control Systems got more complicated…..



All of a sudden Computers were everywhere…..



and we had all these Islands of Information….



The Operators were not happy…….

- “I’ve been running this plant for 20 years without a computer and I don’t need one now!”
- “It’s big brother looking over my shoulder!”
- “I don’t want any more data!”
- “I’m not computer literate!”
- “I don’t need any more work!”

Our Managers were not happy……

- “Web enabled devices are a luxury, we’re trying to run a business here.”
- “I don’t need anyone from headquarters second guessing our decisions without all the details!”
- “I don’t want any more data!”
- “I’m not a computer analyst!”
- “I don’t need any more work!”

Challenges included……

- Distributed asset base
  - 20+ generating units covering Long Island/NYC
- Information required by various business areas
  - Executives, engineering, operations, environmental
- Limited resources
  - Capital and human resources (aging workforce)
- Vast amounts of data
  - Not presented in a relevant, actionable format
- Cross business collaboration opportunities
  - Need to extend “team” boundaries

So what did we do?

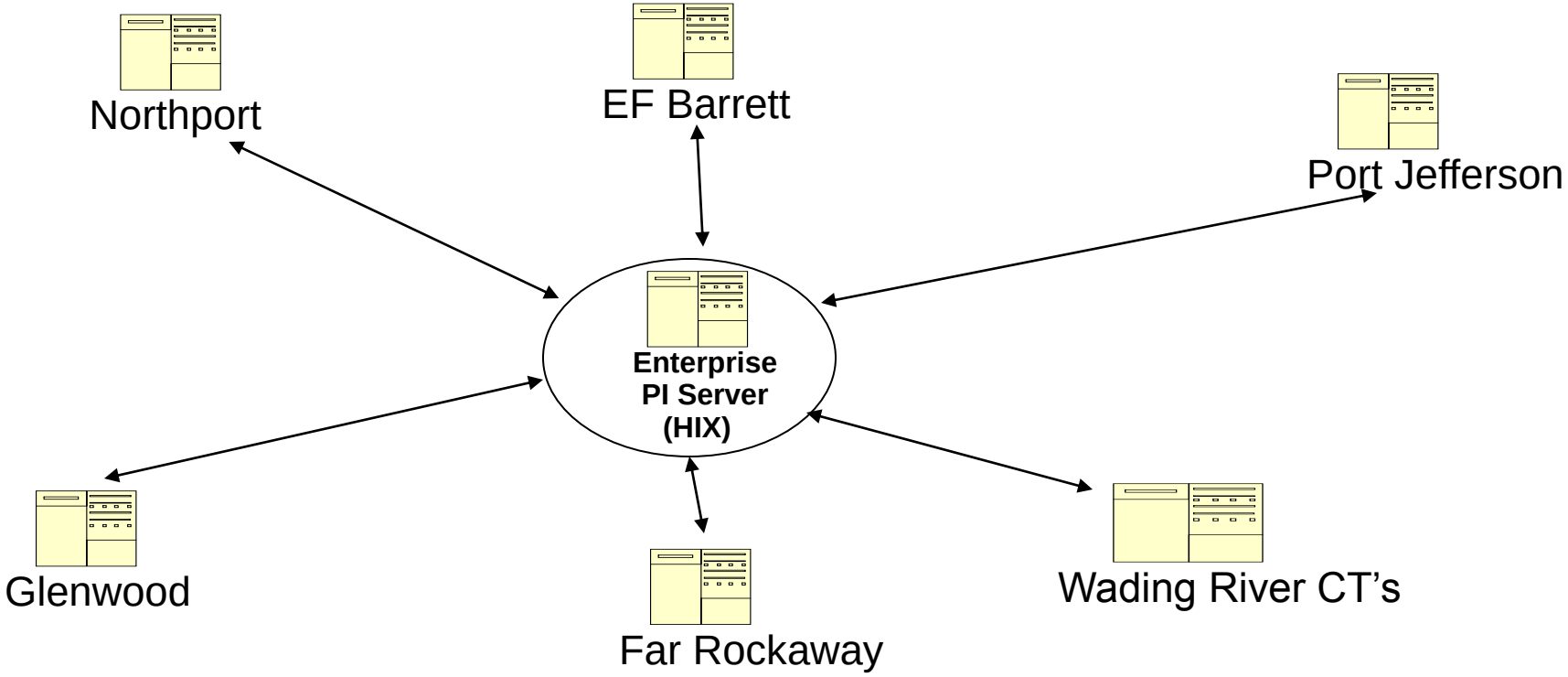
We focused on Operator hot buttons

- Initially targeted local plant missionaries and opinion leaders
- Solicited user input
- Provided fewer screens with “key information” using large visible numbers, buttons and graphics in our screen designs
- Provided “role specific training”
- Minimized audible alarms. Used new systems to automate manual tasks

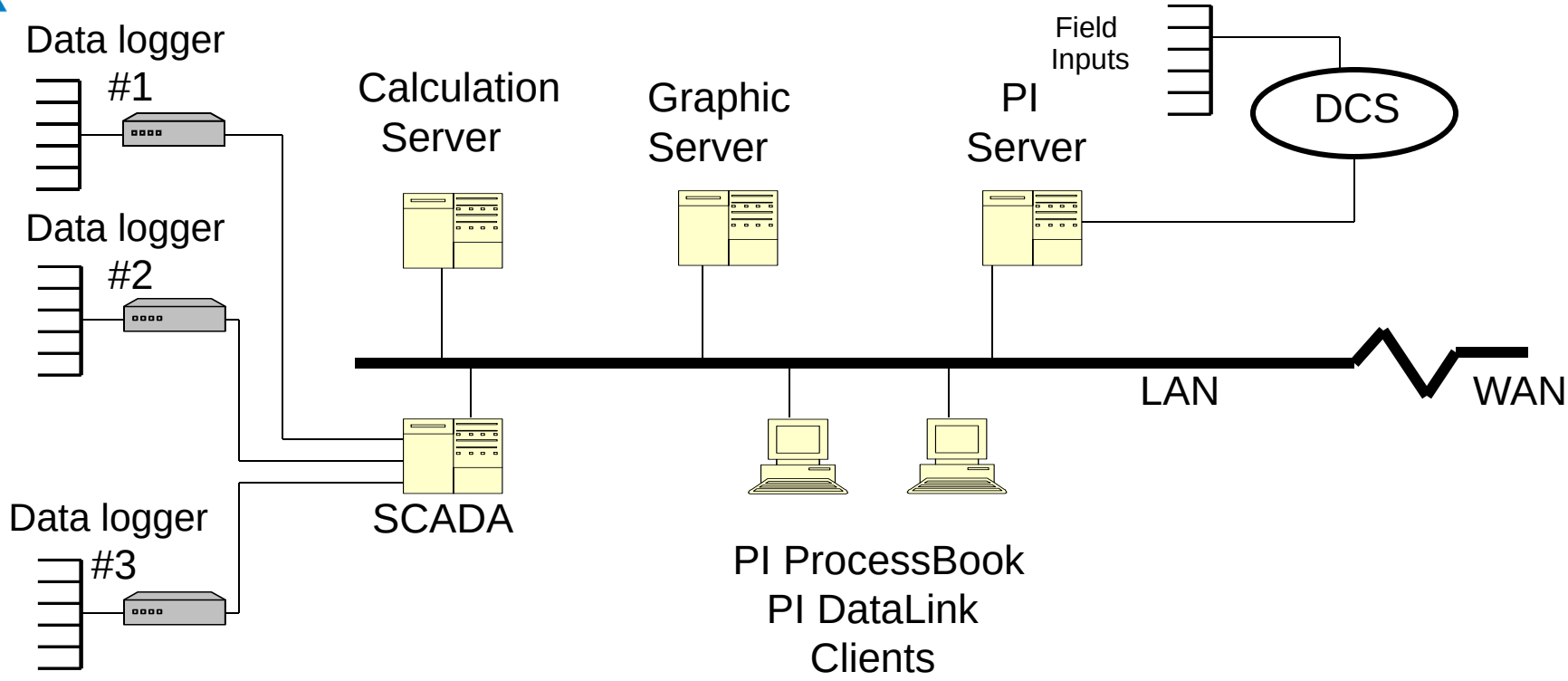
Next we went after the Manager's hot buttons

- Presented solutions that would reduce risks
- Solicited manager input to design screens
- Set up different levels of implementation for our products
- Provided "manager specific training"
- Reduced routine workload
- Initially targeted local plant missionaries and opinion leaders

PI Server Infrastructure



Typical Generation Architecture



PI System Infrastructure

- 12 Years
- 7 Servers
- 40,000 points
- 150 users
- Architecture

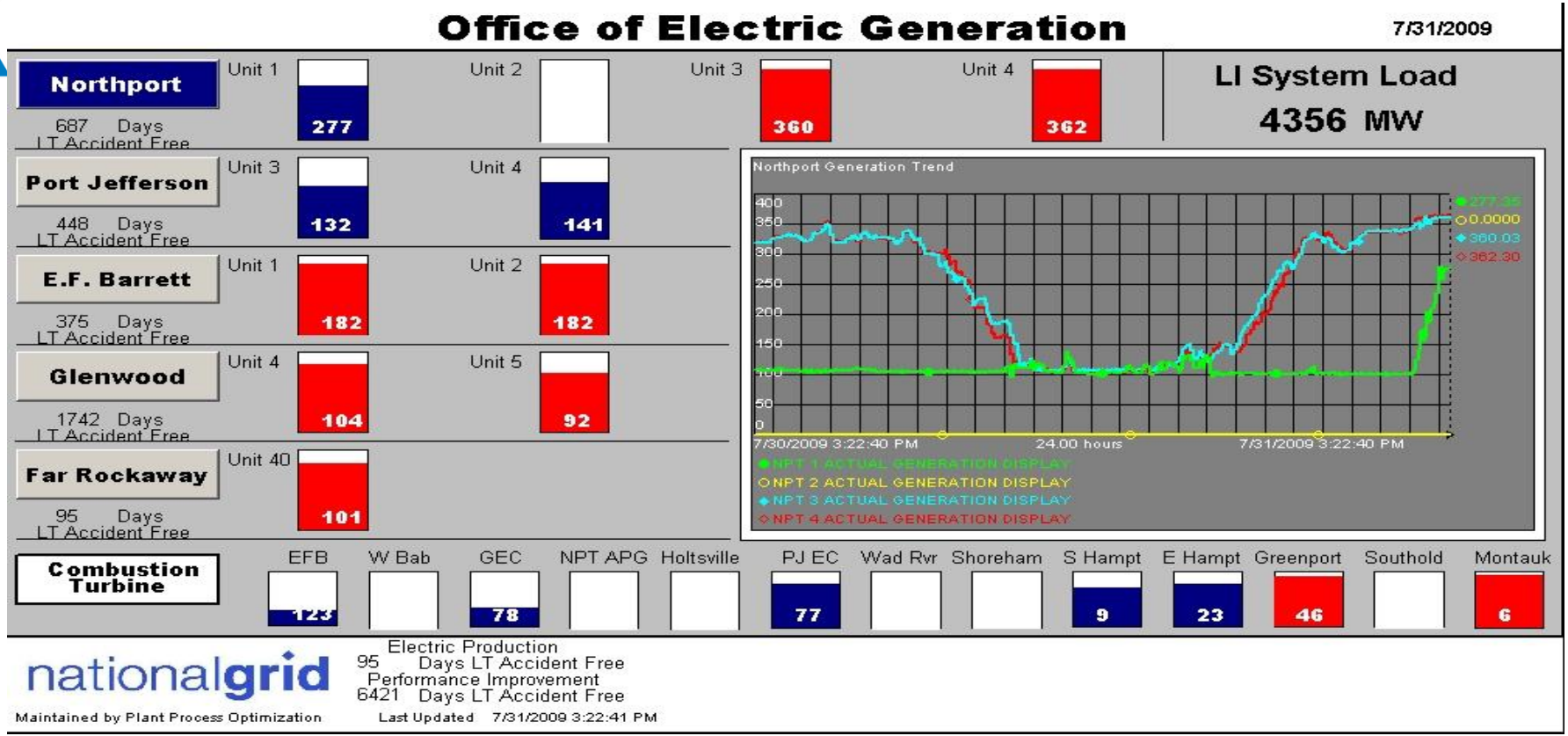
Where do we use the PI System?

PI System is the Core of our:

- Performance Analysis Engine
- E-notification System
- Distributed Control System (DCS) Historical Database
- Independent System Operator (ISO) Interface to Control Rooms
- Performance Analysis Historical Database
- Monthly Heatrate Packages

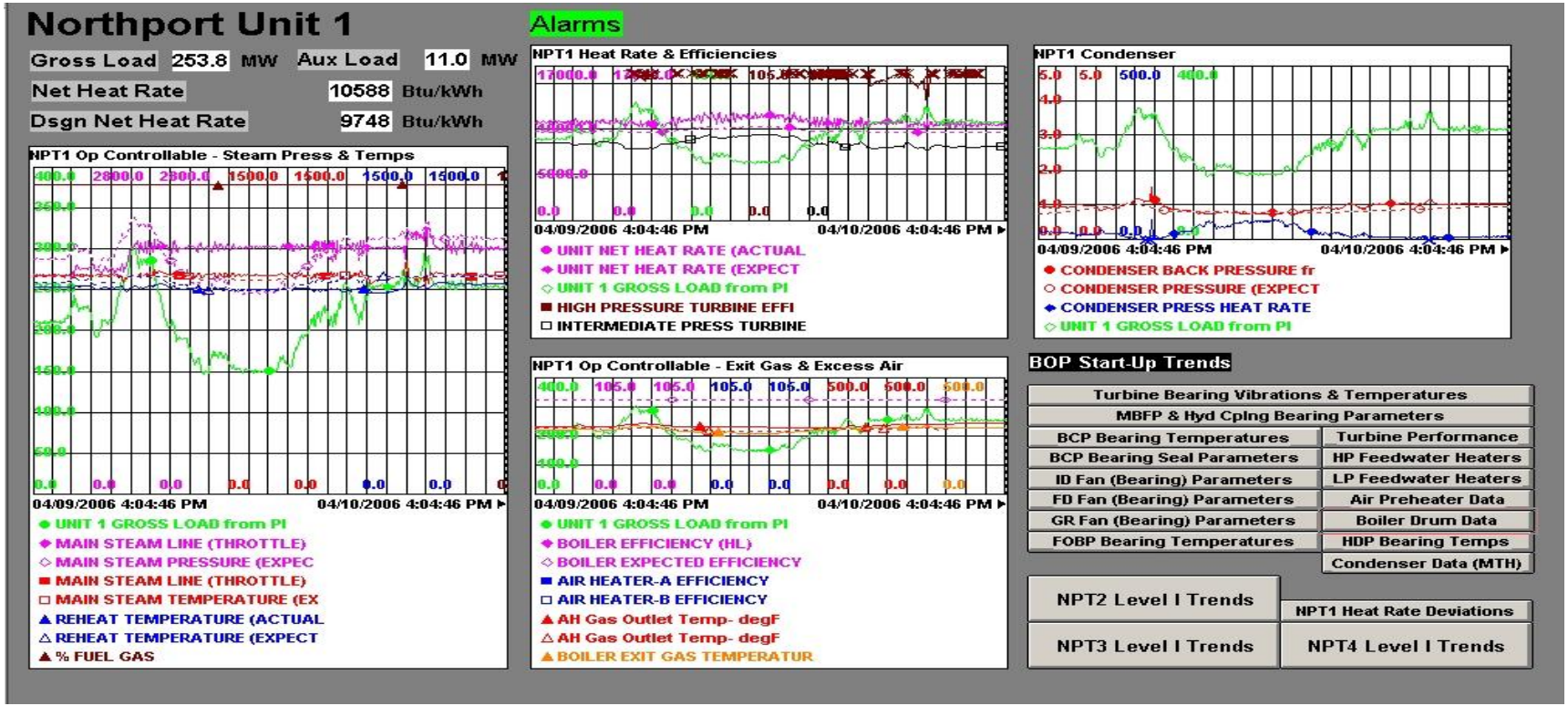
So how about a few examples of what this PI System stuff looks like?

Performance Assessment Center

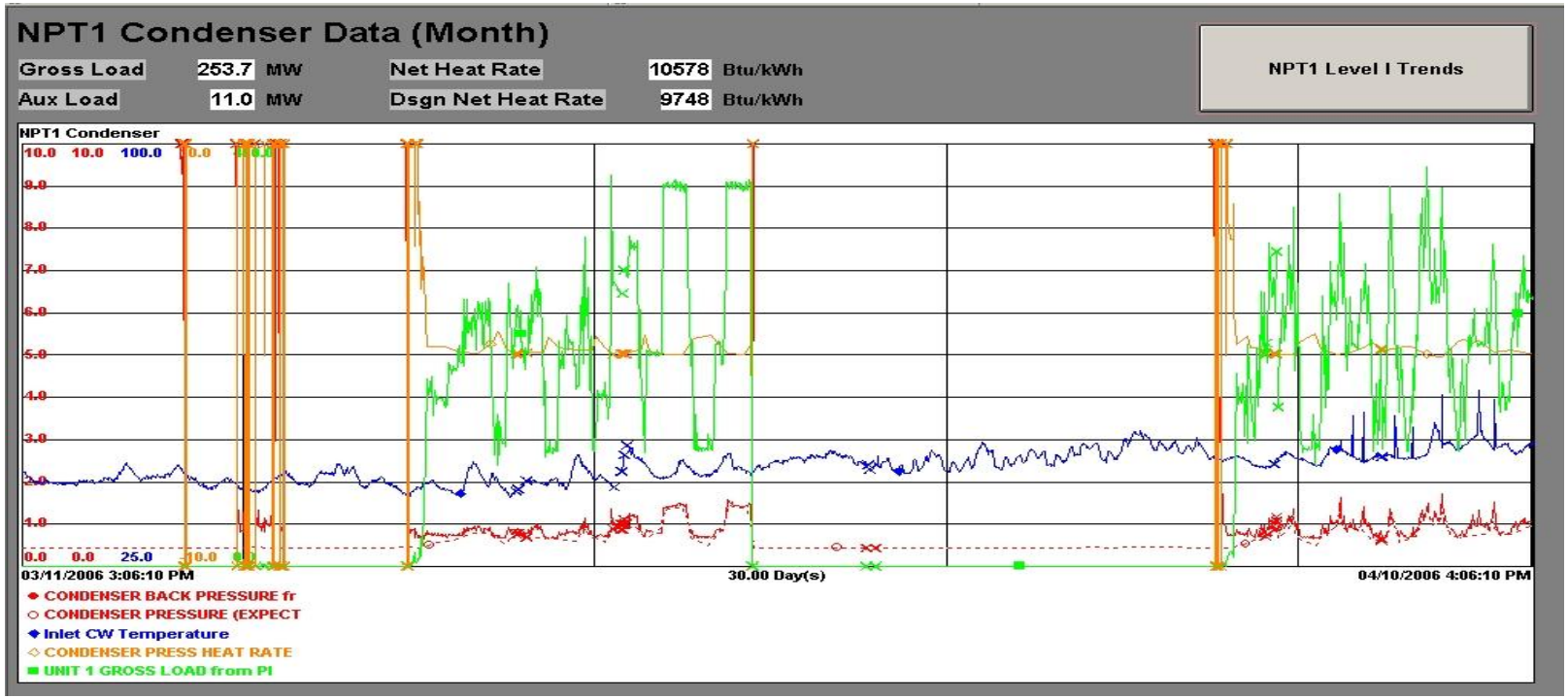


For this screen, RED is good!

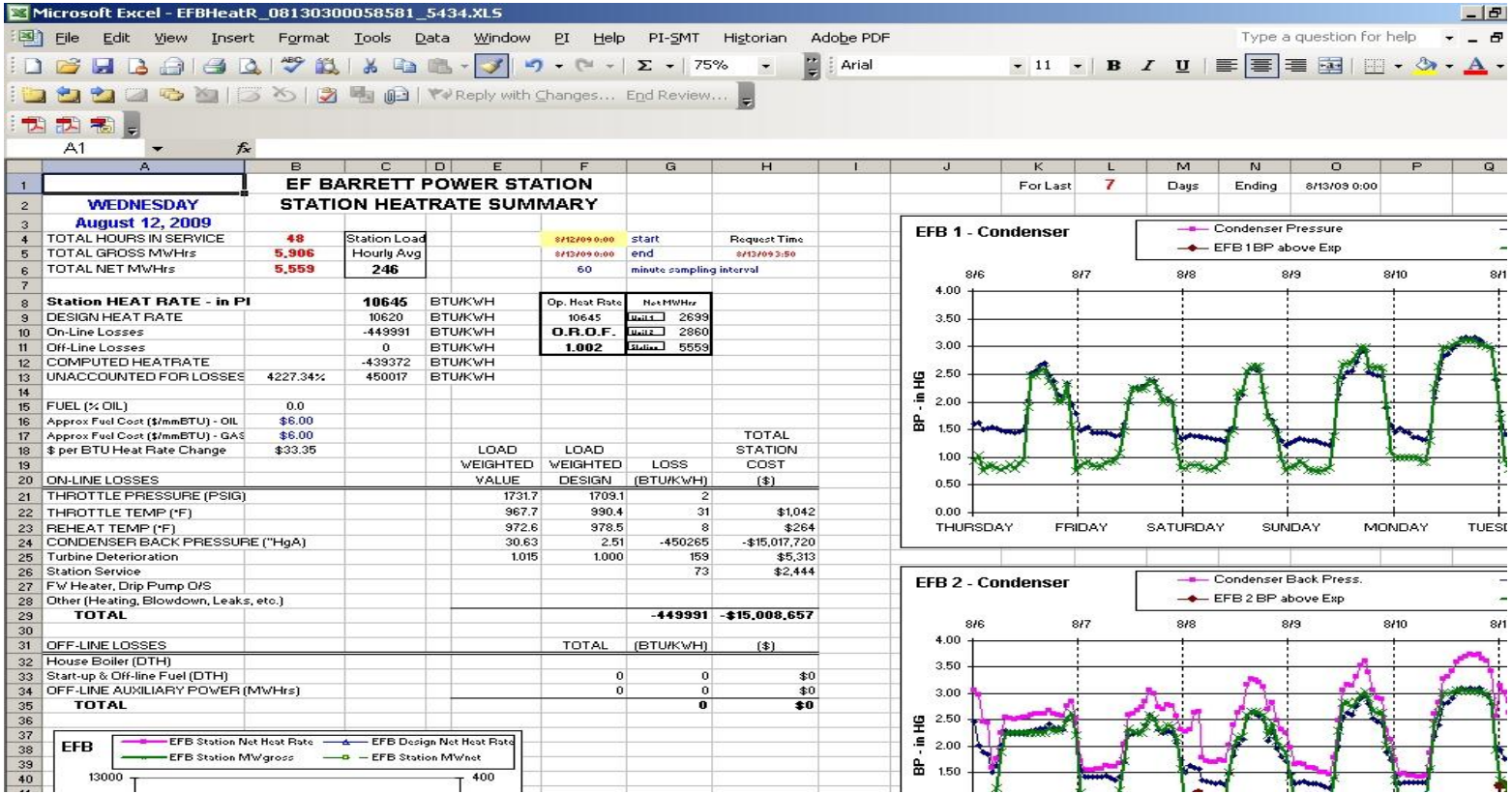
Unit Performance Overview - NPT



Condenser Performance - NPT

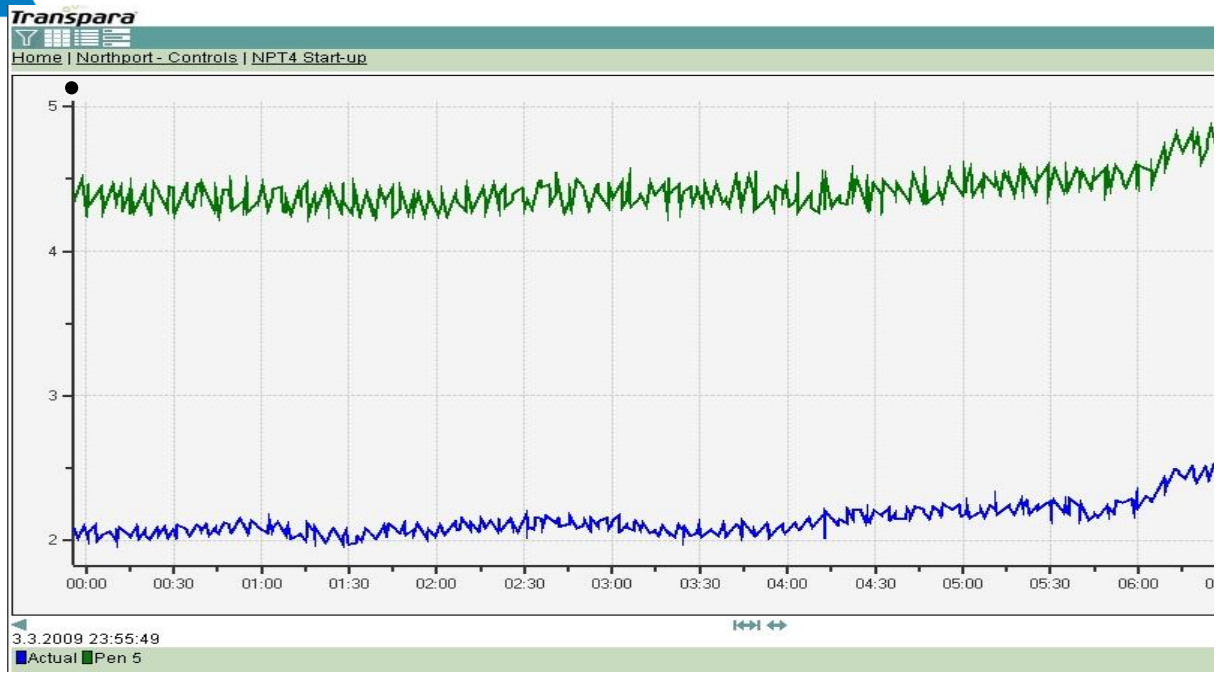


PI DataLink for Excel

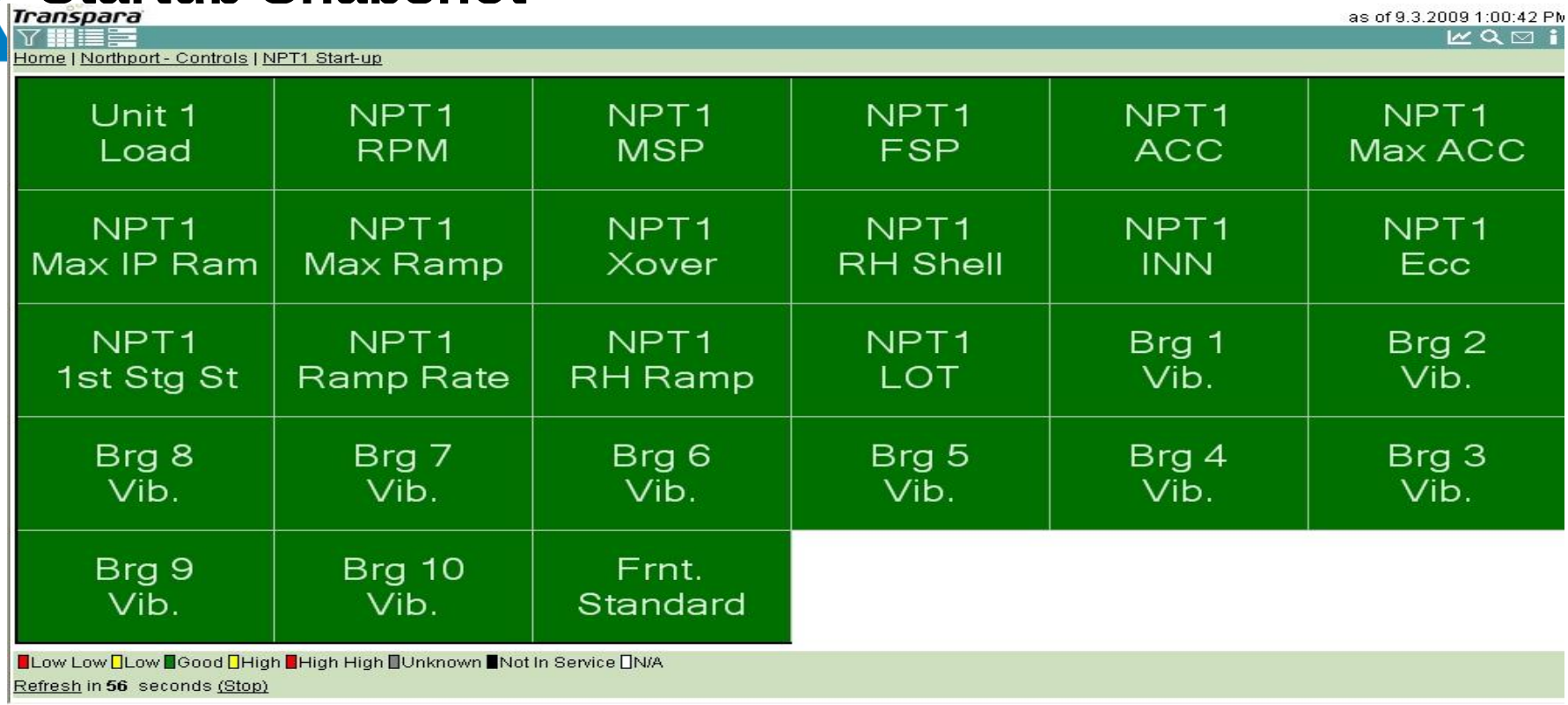


Northport Unit 4 Startup

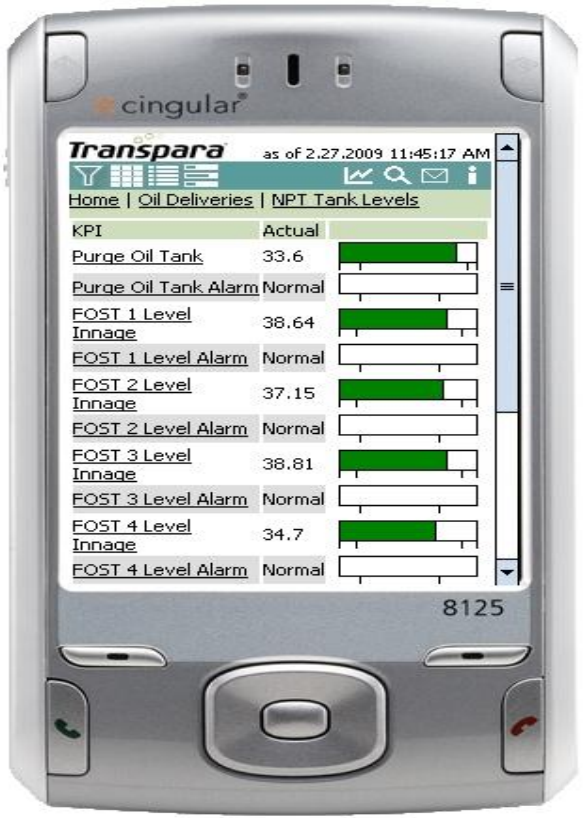
Unit Start-up Trends



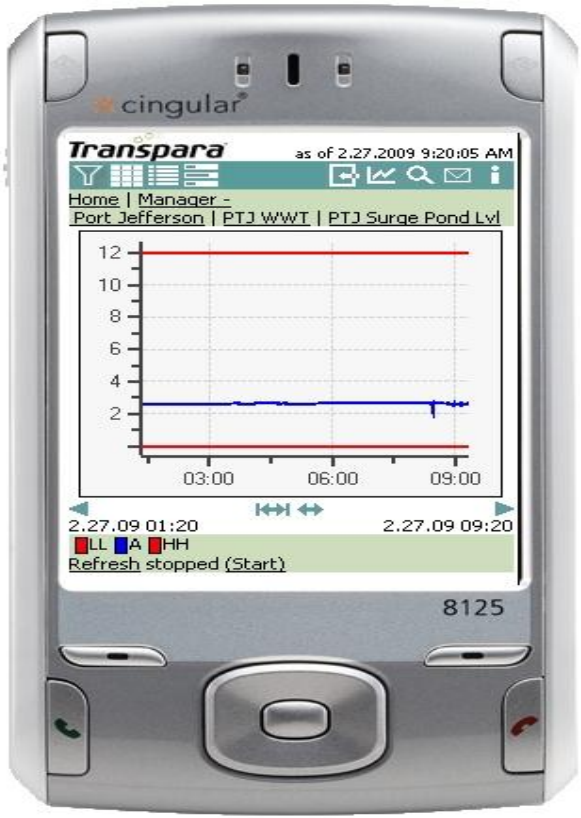
Startup Snapshot



Northport Off-Shore Platform Fuel Deliveries



Port Jefferson Wastewater Treatment



Unit Desired Generation information

We focused on a “Role Based Implementation”

Top Menu of All Views

Summary View – Desktop & PDA

Transpara

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Views
Executive - Overview
Executive - Northport
Executive - Ravenswood
Manager - Northport
Northport - Controls
SmartSignal
Manager - EF Barrett
Executive - EF Barrett
Port Jefferson - Controls
Technician Toolbox - Northport
Manager - Port Jefferson
Northport - Mechanic Toolbox
Oil Deliveries
Northport - Maintenance
Manager - Combustion Turbines
KETS
Plant Process Optimization

Role 1 – Executives and Managers

High-level overview of system status

Transpara Visual KPI - Windows Internet Explorer

https://realtime.keyspanenergy.com/visualkpi/map.aspx?view=0fe7d13b-d4d5-4f69-9d23-4be6bcfd51e5&sc=All&filter=

File Edit View Favorites Tools Help

Transpara Visual KPI

Home | Executive - Northport

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NPT1 Load	NPT2 Load	NPT3 Load	NPT4 Load	NPT1 Gen	NPT1 6 sec	NPT1 5 min	NPT1 % Oil
NPT2 % Gas	NPT2 % Oil	NPT2 5 min	NPT2 6 sec	NPT2 Gen	NPT1 NOx	NPT1 Opacity	NPT1 % Gas
NPT2 Opacity	NPT2 NOx	NPT3 Gen	NPT3 6 sec	NPT3 5 min	NPT3 % Oil	NPT3 % Gas	NPT3 Opacity
NPT4 NOx	NPT4 Opacity	NPT4 % Gas	NPT4 % Oil	NPT4 5 min	NPT4 6 sec	NPT4 Load	NPT3 NOx
Unit 4 Load	Brg 1 Vib.	Brg 2 Vib.	Brg 3 Vib.	Brg 4 Vib.	Brg 5 Vib.	Brg 6 Vib.	Brg 7 Vib.
NPT2 Load	NPT1 NOx	NPT1 Opacity	NPT1 Load	Frnt. Standard	Brg 10 Vib.	Brg 9 Vib.	Brg 8 Vib.
NPT2 Opacity	NPT2 NOx	NPT3 Load	NPT3 Opacity	NPT3 NOx	NPT4 Load	NPT4 Opacity	NPT4 NOx

Refresh stopped (Start)

Role 1 – Executives and Managers

Drill-down for system status Scorecard

Transpara Visual KPI - Windows Internet Explorer

https://realtime.keyspanenergy.com/visualkpi/scorecard.aspx?view=0fe7d13b-d4d5-4f69-9d23-4be6bcfd51e5

File Edit View Favorites Tools Help

Transpara Visual KPI

Home | Executive - Northport

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Scorecard	KPI		Actual	Target
Northport - Load	NPT 1		302.3	
Northport - Load	NPT 2		107.7	
Northport - Load	NPT 3		107.7	
Northport - Load	NPT 4		313	
NPT 1 UDG	NPT 1 Load		302.3	
NPT 1 UDG	NPT 1 Desired 6 sec		303	
NPT 1 UDG	NPT 1 Desired 5 min		304	
NPT 1 UDG	NPT 1 Oil % Burn		-.07	
NPT 1 UDG	NPT 1 Gas % Burn		100.1	
NPT 1 UDG	NPT 1 Opacity		.665	
NPT 1 UDG	NPT 1 NOx		.117	
NPT 2 UDG	NPT 2 Load		107.7	
NPT 2 UDG	NPT 2 Desired 6 sec		115.7	
NPT 2 UDG	NPT 2 Desired 5 min		120	
NPT 2 UDG	NPT 2 Oil % Burn		78.93	
NPT 2 UDG	NPT 2 Gas % Burn		21.07	
NPT 2 UDG	NPT 2 Opacity		1.65	
NPT 2 UDG	NPT 2 NOx		.143	
NPT 3 UDG	NPT 3 Load		107.7	
NPT 3 UDG	NPT 3 Desired 6 sec		115.4	

Role 1 – Executives and Managers

Detail = Total MW for all sites

Role 2 - Plant Managers

Focus on his Units only

Home | Manager - Northport | CEM
9/10/2006 5:20:47 PM
View KPI Map

KPI		Actual
Unit 1 Opacity		2.45
Unit 1 NOx		.15
Unit 2 Opacity		2.05
Unit 2 NOx		.12
Unit 3 Opacity		6.07
Unit 3 NOx		0
Unit 4 Opacity		4.82
Unit 4 NOx		.08

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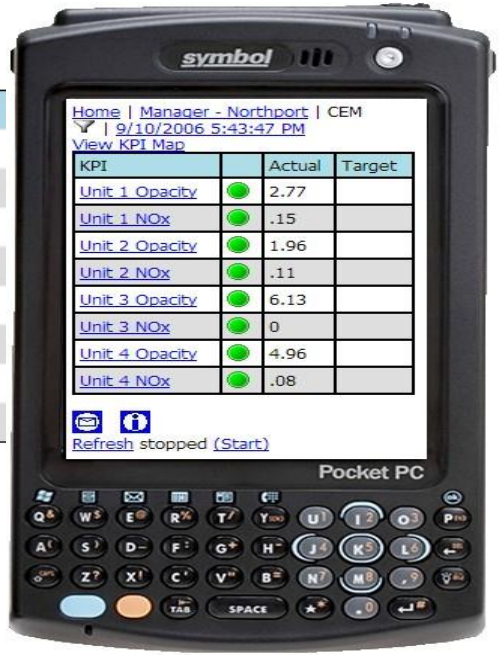


Role 2 - Plant Managers

Detail = single unit performance

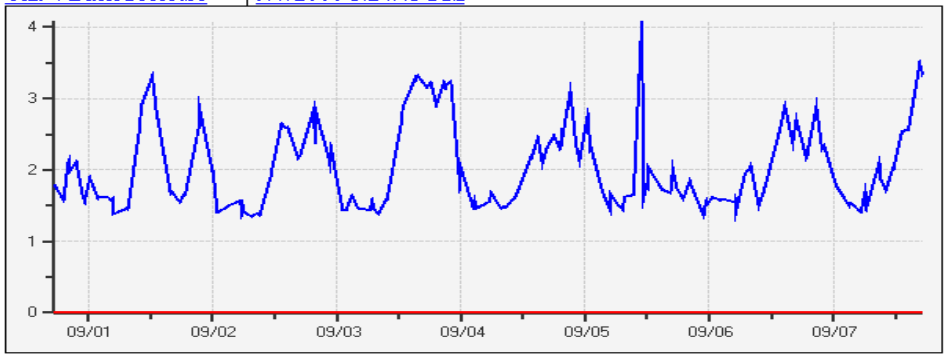
View KPI Map

Scorecards
CEM
Condenser
Load
Main Steam

View KPI Map

KPI		Actual	Target
Unit 1 Back Pressure		3.02	
Unit 2 Back Pressure		2.98	
Unit 3 Back Pressure			
Unit 4 Back Pressure			

Unit 4 Back Pressure | 9/7/2006 5:24:45 PM



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8/31/2006

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9/7/2006

Defined Range | Custom Range

Role 3 - Technician

Asset- and task- centric focus

Home | Technician Toolbox - Northport
9/11/2006 11:21:26 PM
View KPI Map

Scorecards
Continuous Emissions Monitoring (CEM)
Modified Turbine Test (MTT)
Station Thermal Output
Tank Farm - Wireless Troubleshooting
Weather Station

Refresh stopped (Start)

Home | Technician Toolbox - Northport | Continuous Emissions Monitoring (CEM)
| 9/11/2006 11:23:08 PM
View KPI Map

KPI		Actual
Unit 1 Load		130.86
Unit 1 Opacity		2.83
Unit 1 NOx		.1
Unit 2 Load		113.48
Unit 2 Opacity		1.62
Unit 2 NOx		.12
Unit 3 Load		0
Unit 3 Opacity		5.9
Unit 3 NOx		0
Unit 4 Load		101.35
Unit 4 Opacity		5.22
Unit 4 NOx		.08
Ambient Temperature		62.16

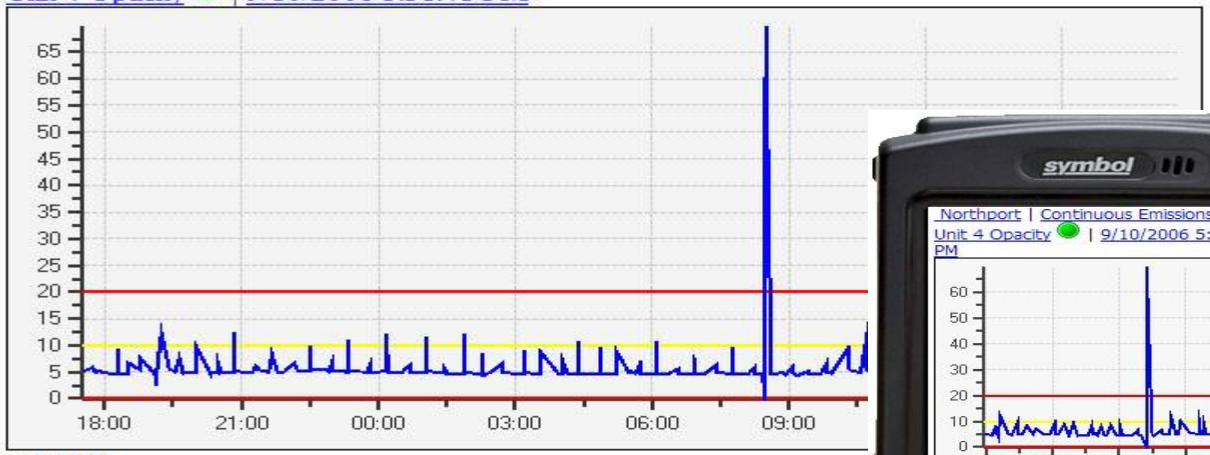
Refresh stopped (Start)

Role 3 - Technician

Detail = remote CEM subsystem tuning

Home | Technician Toolbox - Northport | Continuous Emissions Monitoring (CEM) | Trend

Unit 4 Opacity | 9/10/2006 5:31:41 PM



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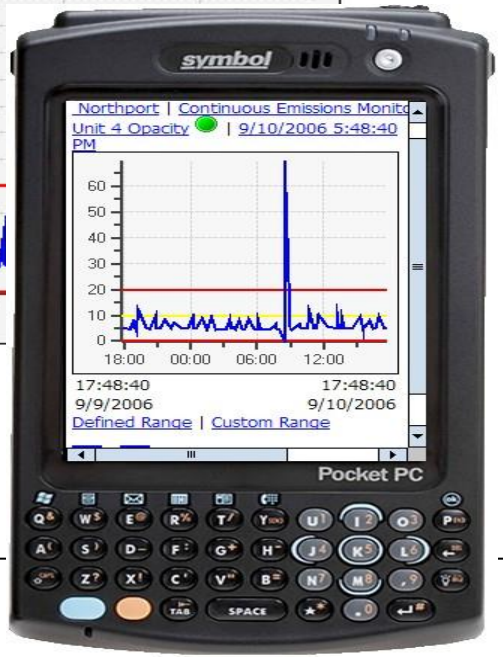
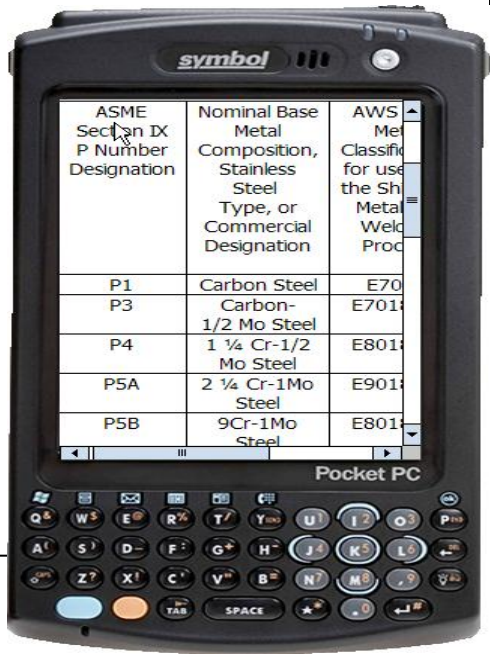
9/9/2006

Defined Range | Custom Range

Refresh stopped (Start)





Role 4 – Regulatory Manager

Detail = Waste Water Treatment Plant Status

Home | Manager - EF Barrett | EFB WWT

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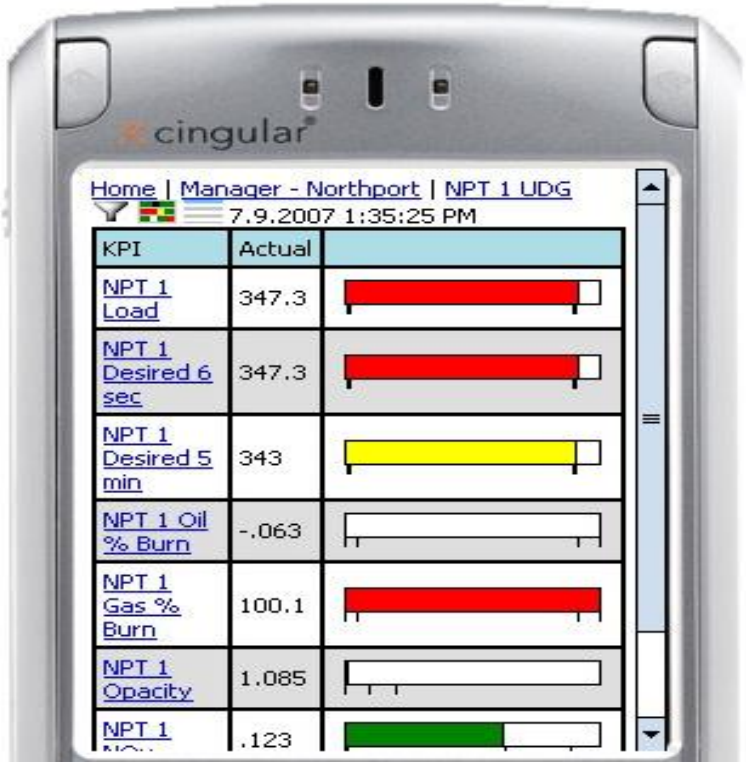
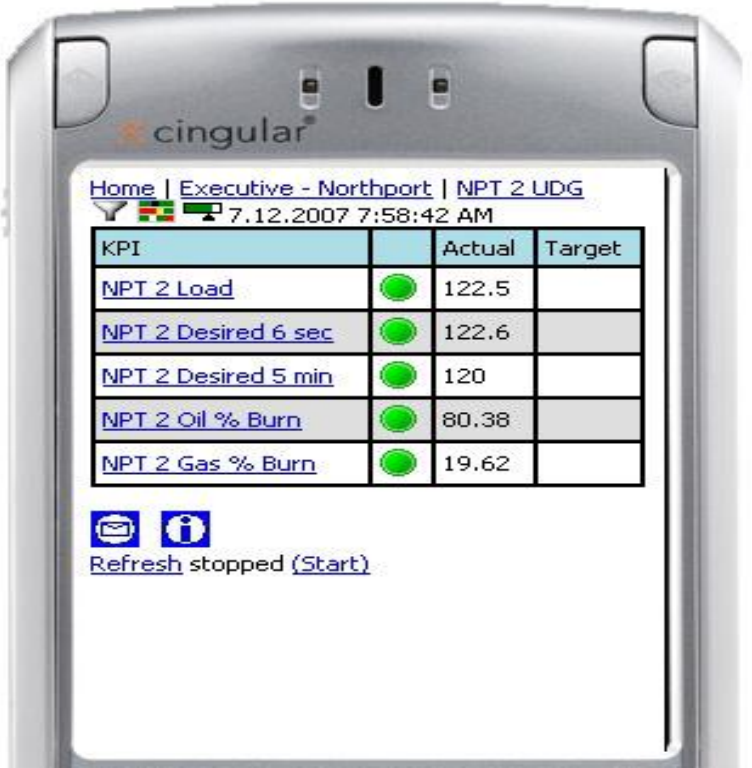
KPI		Actual
EFB Effluent Discharge	↓	.18
EFB Acid Tank Level	●	11.43
EFB Clairifer pH	●	9.015
EFB Clarifier Turbidity	●	67.3
EFB Demin Conductivity	●	258.5
EFB Holding Pond Level	●	4.325
EFB Neutralization Tank Level	●	6.823
EFB Reactor Tank pH	●	10.54
EFB Surge Pond Level	●	4.057

Role 5 – Watch Supervisor

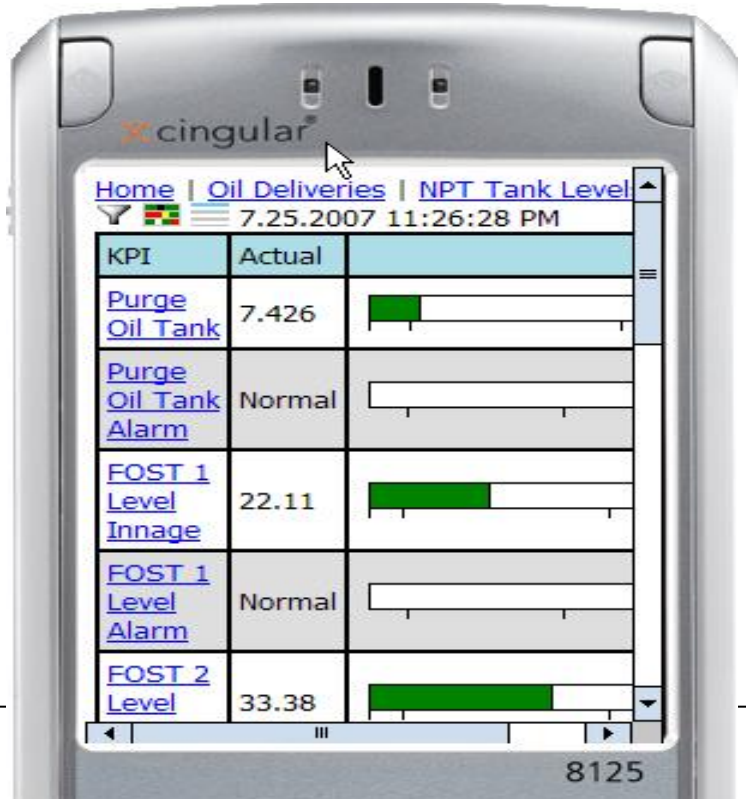
Detail = Unit base points





Role 6 - Mechanic

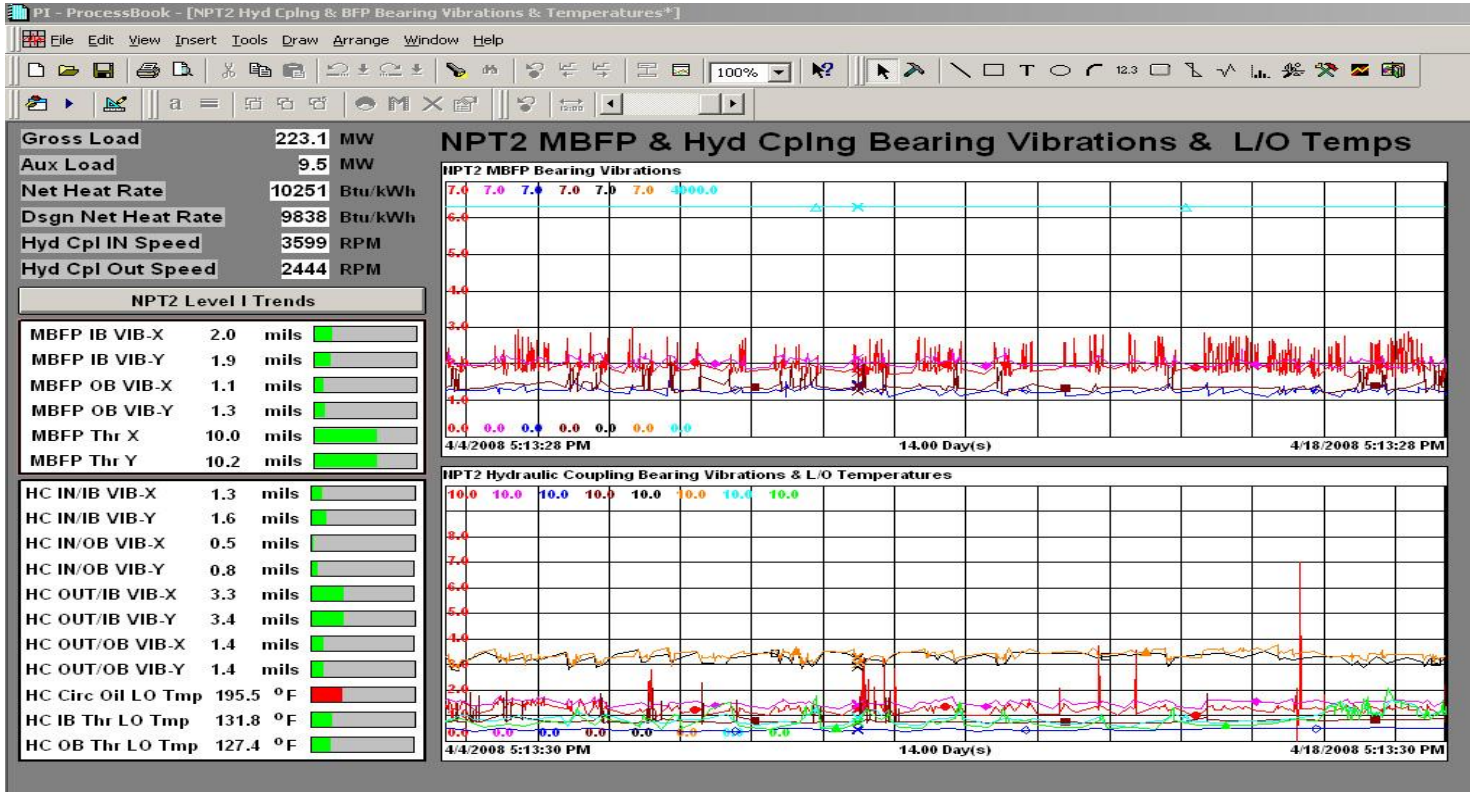
Detail = Offshore fuel loading platform



Role 7 – Test Engineer

Detail = Modified Turbine Test KPIs

Role 8 – Performance Engineer



Initial Savings

- 2% reduction in Technician overtime = $16,000/yr
- 2% Tech/Operator productivity gain = $12,000/yr
- Environmental incursion = $5,000-$100,000/incident
- Cell Phone deployment over notebooks with air cards for 18 users = $52,000 capital savings
- Training savings for 18 users = $14,000
- Leveraging existing PI System investment saved start-up costs = $80,000
- Competitive edge could be worth = $100,000
- Return on Investment Less than 6 Months

Benefits include ……

- Rapid deployment
- Technology acceptance
- Team collaboration
- Off-site connectivity
- KPIs directly aligned with “role” needs
- Corporate visibility and transparency

Future plans and next steps…

Building **NERC CIP** PI System Infrastructure

Building a **NERC CIP** PI System Database

Building **NERC CIP** Information Interface for Plant Optimization and Generation CNI

Building a Mission Critical PI System Infrastructure

Building a Mission Critical PI System Database

Building Mission Critical Information Interface for Plant Optimization and Generation CNI

Questions

- Contact information

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Thank you