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NRG Energy Using PI WebParts to Improve Overall Performance

Presented by **Mike Kanhai & Van Nguyen**

Agenda

- About NRG Energy
- PI System at NRG Energy
- Challenges at NRG Energy
- Solution
- Benefits
- Future Plans

About NRG Energy, Inc



- Power Generation/Retail
 - *Reliant Energy and Green Mountain Energy*
- North America
 - *Texas, Northeast, South Central, and Western*
- International
 - *Australia and Europe*

NRG Energy

- Fortune 300 wholesale power generation company with HQ in Princeton, NJ & 5th largest in the Energy Industry.
- Owns and operates one of the industry's most diverse generation portfolios (includes coal, natural gas, oil, nuclear, wind and solar power) that provides ~25,000 Megawatts of electric generating capacity.
- In 2009, NRG purchased Reliant Energy, the second largest retail energy business in Texas, serving nearly 1.6 million business, industrial & residential customers.
- In 2010, NRG purchased Green Mountain Energy Company

Business Challenges

- real-time data to dispatchers, schedulers, traders
- Increasing the visibility of the performance of assets
 - *Centralized performance reporting*
- Improving overall plant and fleet performance
 - *Managing fuel costs*
 - *Reducing outages*
 - *Maintenance of an aging fleet*
- Anticipating market conditions to improve cross-group coordination
- Utilization of technical resources
 - *West Coast, Texas, South Central, Northeast*
- Improving overall maintenance process
 - *Calendar-based vs. Conditioned-based*
- Accessing data from various platforms
- Keeping cost down

Background

- Some plants were acquired with PI System already in place; PI System was later implemented at selected sites within NRG fleet.
- Each plant PI System setup differently
 - *No two plants setup the same*
- PI usage throughout the fleet varied
 - *High, Medium, and Low*
- No clear objective for PI System
- No centralized support for PI System
 - *Every man/woman for themselves*
- Different historian platforms
 - *PI System, Honeywell PHD, Siemens T3000*

Challenge/Problem Detail

- Pulling together data from various locations for reporting
 - *No common tag naming convention*
- PI System not being properly maintained
 - *Hardware*
 - *Behind software version*
- Historians on different platforms
 - *PI System and Honeywell*

Solution

- The plants would use the PI System to identify operational changes and benefit opportunities as well as to analyze plant conditions and failures. The PI System assists in understanding operational capabilities through:
 - *Systems efficiency monitoring*
 - *Equipment condition monitoring*
 - *Economic performance and unit optimization capabilities*
 - *Current trending and historical data analysis capabilities*

OSIsoft Products and Services Employed

- PI Server
- PI ProcessBook
- PI DataLink
- PI WebParts
- PI System Management Tools (PI SMT)
- PI Collective Manager
- PI ActiveView
- PI Module Database
- PI to PI Interface
- PI Tag Configurator
- PI SDK

PI System Architecture

- 18 Plants currently running a PI System
- PI to PI interfaces from Plants to HQ/Regional office
- Central PI System located in Texas and Corporate offices (NJ)
- PI System in Texas/LaGEN Energy Management System (EMS)
- PI WebParts provides fleet-wide dashboards/reports
- PHD to PI Interface connecting Texas PHD Systems to Centralized PI System

Results

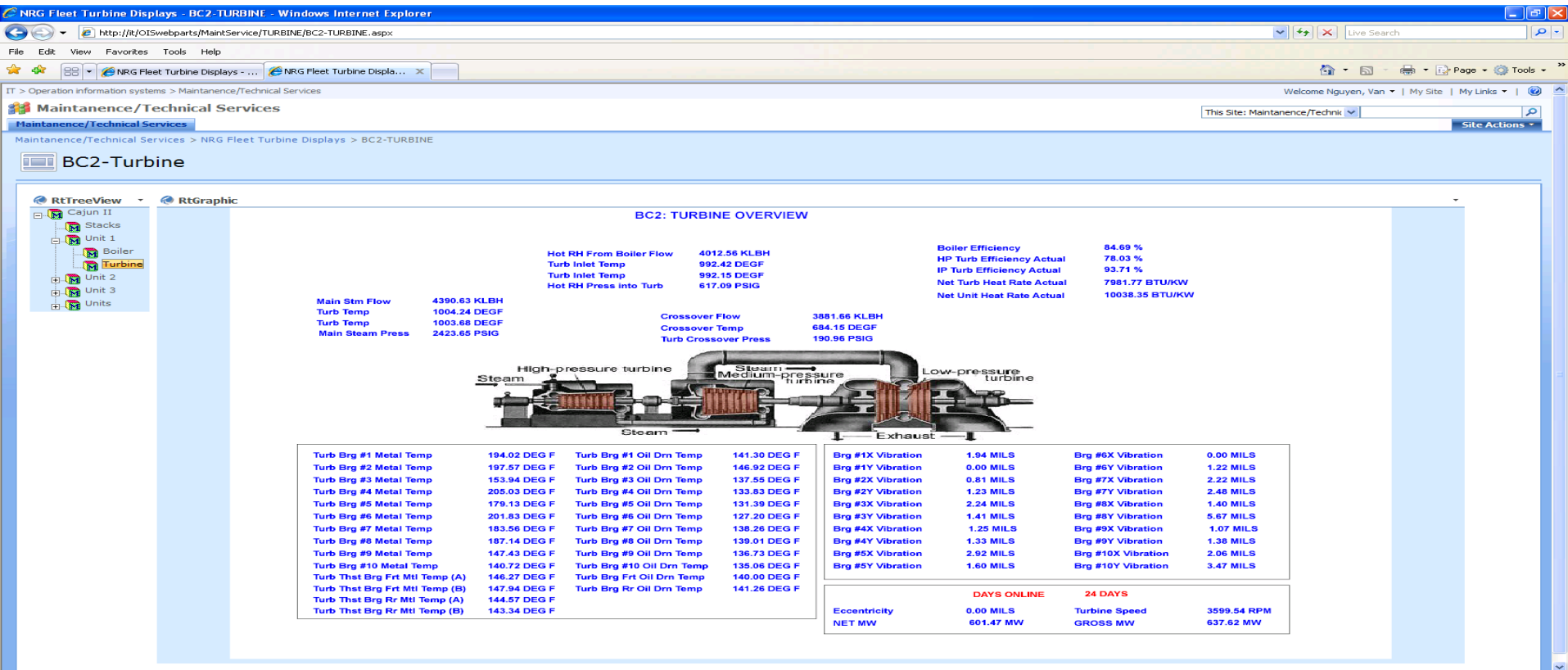
- Ability to view Process Information
 - ***Corporate monitoring of assets across the Enterprise; we monitor the operations of each equipment***
 - *Turbines*
 - *Boilers*
 - *Feedwater Heater*
- Ability to view Market Data
 - ***Fuel Costs***
 - ***Market Value***
 - ***Unit Capacity/Derate framework***
 - ***Automatically Generate Status Reports***
 - ***Outages and Derate process***

Results

- Ability to display **“Islands of Information”** Together such as Process, Fuel, Price, CEMS, Equipment, Vibration Monitoring, etc.
 - ***Correlate Emissions and Price Data with Actual Operating Conditions***
 - ***NOx Emissions***
 - ***Texas Nodal Market***
- One version of the truth that everyone follows with centralized reporting
 - ***Steam Purity***
 - ***Controllable Loss***
 - ***Settlement Audits***
 - ***Generation Dispatch***
 - ***Fuel costs***
 - ***Heat Rate***

PI System Displays

Results - Turbine



Results - Boiler

NRG Fleet Boiler Displays - BC2 - BOILER PERFORMANCE - Windows Internet Explorer

http://it/OISwebparts/MaintService/BOILER/BC2-%20-%20BOILER%20PERFORMANCE.aspx

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NRG Fleet Boiler Displays - BC2 - BOILER PERFORMAN...

IT > Operation information systems > Maintenance/Technical Services

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Maintenance/Technical Services

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Maintenance/Technical Services > NRG Fleet Boiler Displays > BC2 - BOILER PERFORMANCE

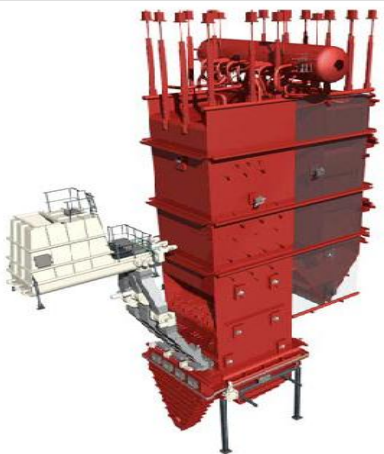
BC2-Boiler Performance

RtTreeView

- Cajun II
 - Stacks
 - Unit 1
 - Boiler
 - Turbine
 - Unit 2
 - Unit 3
 - Units

RtGraphic

BC2: Boiler Performance

<p>MAIN STEAM</p> <p>4297.1 KLBH</p> <p>1010.7 DEGF</p> <p>1009.9 DEGF</p> <p>2429.6 PSIG</p> <p>HOT REHEAT</p> <p>3909.1 KLBH</p> <p>1013.6 DEGF</p> <p>1012.6 DEGF</p> <p>606.88 PSIG</p> <p>COLD REHEAT</p> <p>3909.1 KLBH</p> <p>679.49 DEGF</p> <p>645.21 PSIG</p> <p>TO ECONOMIZER</p> <p>3767.5 KLBH</p> <p>497.06 DEGF</p> <p>2731.7 PSIG</p>		<p>Net Generation 890.92 MW</p> <p>HEAT LOSSES (%)</p> <table> <tr> <td>CARBON IN ASH</td> <td>9.95035E-05</td> <td>H2 & H2O IN FUEL</td> <td>4.1551</td> </tr> <tr> <td>DRY GAS</td> <td>4.7519</td> <td>MOISTURE IN FUEL</td> <td>4.4656</td> </tr> <tr> <td>FLUE GAS CO2 (DRY)</td> <td>15.9</td> <td>COMBUST IN REFUSE</td> <td>0.19901</td> </tr> <tr> <td>FLUE GAS CO2 (WET)</td> <td>12.567</td> <td>UNBURNED CARBON</td> <td>46</td> </tr> <tr> <td>FLUE GAS O2 (DRY)</td> <td>3.4554</td> <td>LOESSES EFF OF UNIT</td> <td>85.758</td> </tr> <tr> <td>FLUE GAS O2 (WET)</td> <td>2.9761</td> <td>TOTAL LOSSES</td> <td>14.242</td> </tr> </table> <p>BOILER EFFICIENCY</p> <table> <tr> <td>EXCESS AIR</td> <td>19.014 %</td> </tr> <tr> <td>DRY GAS</td> <td>7.4203 lb/lb</td> </tr> <tr> <td>BOILER EFF.</td> <td>84.559 %</td> </tr> </table>	CARBON IN ASH	9.95035E-05	H2 & H2O IN FUEL	4.1551	DRY GAS	4.7519	MOISTURE IN FUEL	4.4656	FLUE GAS CO2 (DRY)	15.9	COMBUST IN REFUSE	0.19901	FLUE GAS CO2 (WET)	12.567	UNBURNED CARBON	46	FLUE GAS O2 (DRY)	3.4554	LOESSES EFF OF UNIT	85.758	FLUE GAS O2 (WET)	2.9761	TOTAL LOSSES	14.242	EXCESS AIR	19.014 %	DRY GAS	7.4203 lb/lb	BOILER EFF.	84.559 %
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Results – Texas Nodal Market

Nodal Market - Windows Internet Explorer

http://it/OISwebparts/Texas/Nodal%20Market/Nodal%20Market.aspx

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Nodal Market - Nodal Market

Texas > Nodal Market > Nodal Market

Nodal Market

RtGraphic

Nodal Market

	LAMBDA	5 MIN BP	5 MIN LMP
STP-1			
STP-2			

	LAMBDA	5 MIN BP	5 MIN LMP
LEG-1			
LEG-2			

	LAMBDA	5 MIN BP	5 MIN LMP
WAP-1	0.00	0.00	
WAP-2	0.00	0.00	
WAP-3	0.00	0.00	
WAP-4	0.00	0.00	
WAP-5	0.00	0.00	
WAP-6			
WAP-7			
WAP-8			
WAPGT-1	0.00	0.00	

	LAMBDA	5 MIN BP	5 MIN LMP
GBY-5	0.00	0.00	0.00
GBYGT73	0.00	0.00	
GBYGT74	0.00	0.00	
GBYGT81	0.00	0.00	
GBYGT82	0.00	0.00	
GBYGT83	0.00	0.00	
GBYGT84	0.00	0.00	

	LAMBDA	5 MIN BP	5 MIN LMP
SRB-1	0.00	0.00	0.00
SRB-2	0.00	0.00	0.00
SRB-3	0.00	0.00	
SRB-4	0.00	0.00	
SRBGT-2	0.00	0.00	

	LAMBDA	5 MIN BP	5 MIN LMP
ELBCREEK			
LANGFORD			

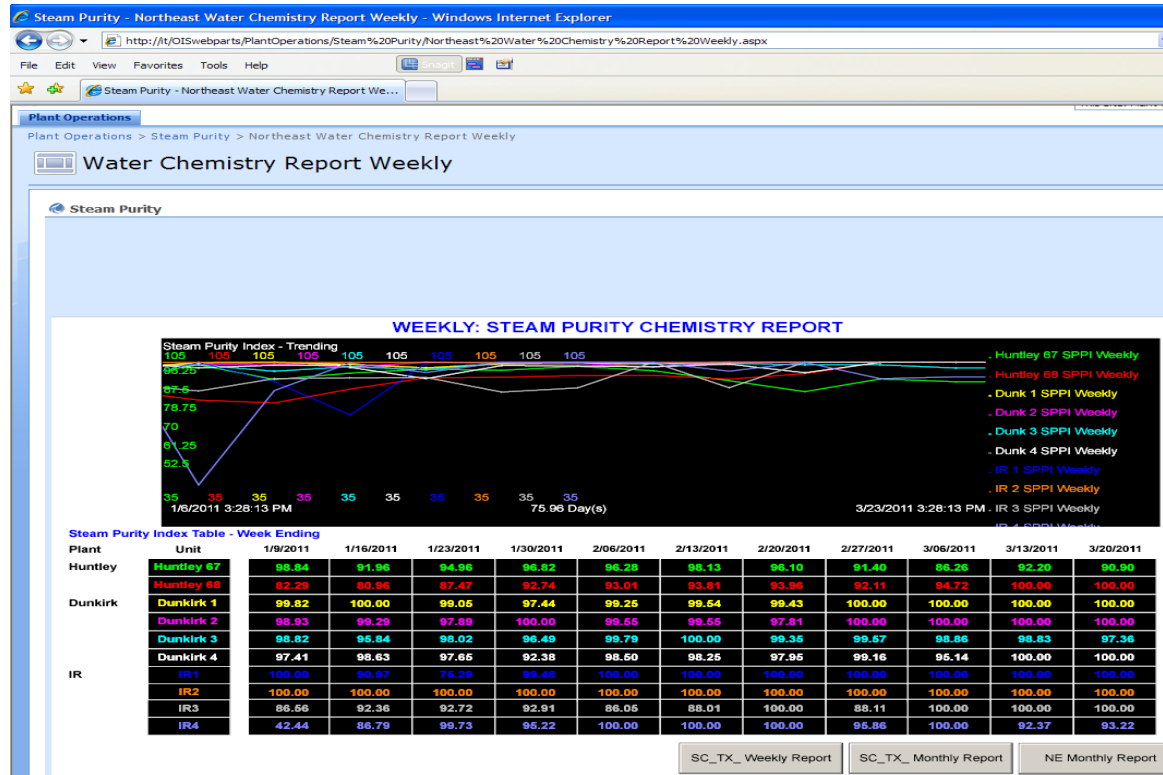
	LAMBDA	5 MIN BP	5 MIN LMP
THW-2	0.00		
THWGT-1	0.00	0.00	
THWGT31			
THWGT32			
THWGT33			
THWGT34			
THWGT41			
THWGT42			
THWGT43	0.00		
THWGT44	0.00		
THWGT51	0.00	0.00	
THWGT52			
THWGT53	0.00	0.00	
THWGT54	0.00	0.00	
THWGT55	0.00	0.00	
THWGT56	0.00	0.00	

	LAMBDA	5 MIN BP	5 MIN LMP
PMBCT-1	0.00	0.00	
PMBCT-2	0.00	0.00	
PMBCT-3	0.00	0.00	
PMBCT-4	0.00	0.00	
PMBCT-5	0.00	0.00	

	LAMBDA	5 MIN BP	5 MIN LMP
CBY-1	0.00	0.00	
CBY-2	0.00	0.00	

	LAMBDA	5 MIN BP	5 MIN LMP
VISGT-1	0.00	0.00	
VISGT-2	0.00	0.00	
STRYK-1	0.00	0.00	
TRINID-6	0.00	0.00	

Results – Steam Purity



Benefits

- PI System applies a standard methods, processes, tools and architectures
 - *resulting in predictable, reliable and on-time delivery of Data.*
- Development of additional diagnostic tools from one common platform throughout the fleet
- Moving from post-event analysis to proactive analysis/monitoring
- Implementation of PHD to PI Interface allowed us to keep existing historian in place while still having the ability to have the data in a common platform for reporting
- Provides a common language and one framework
 - *promoting consistency across NRG Fleet and reducing cultural differences.*
- Ensures a standard approach is used across the entire engagement
 - *achieving greater efficiencies in activities from program and project management to development and operations.*

Future Plans and Next Steps

- PI System can optimize the plant from Historical Analysis and Performance Indicators in Order to Reduce Heat Rate & Other Marginal Operating Costs
 - *Operator Box*
- Ability to view Business Intelligence
 - *Corporate Monitoring for executive reporting*
 - *fleet optimization*
 - *reliability*
 - *operational performance*
- Develop Pro-Active Alarming & E-Mailing On Limit Violations
- Continue to develop **“Islands of Information”**
- Fleet-wide Fuel tracking/costs

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Questions

- Mike Kanhai
 - Michael.Kanhai@nrgenergy.com
- Van Nguyen
 - Van.Nguyen@nrgenergy.com



Thank you

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