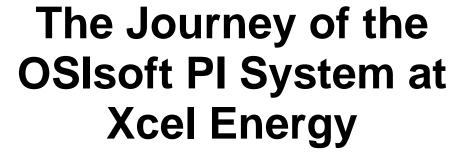
OSIsoft。 USERS CONFERENCE 2016

April 4-8, 2016 | San Francisco

TRANSFORM YOUR WORLD









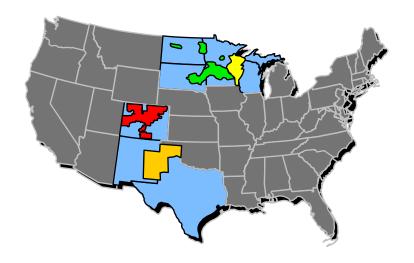
Presented by

Rich Greenslit - Sr. Director, Application Delivery Kasen Huwa - Sr. Manager, Application Delivery

Xcel Energy: Who we are

- Eight states served
- Approximately 3.5 million electric and 2.0 million natural gas customers
- Revenue of \$11.7 billion (YE 2014)
- No. 1 wind energy provider
- No. 5 in utility solar capacity
- Top 5 in energy efficiency programs
- Industry-leading in voluntary emission reductions through new technologies





Xcel Energy: Who we are



- Over 12,000 Employees
- Assets: \$28 billion (property, plant, & equipment)
- Own and operate:
 - 17,000 MW of Generation
 - 20,000 miles of Transmission lines
 - 1,200 Substations
- \$14.5 billion Capital Expenditure Plan (2015-2019)
- The multiple mergers led Xcel energy to have disparate process in each of the jurisdictions

Xcel Energy (2000)

Southwestern Public Service Amarillo, TX (1904) Public Service Company of Colorado Denver, CO (1923) Northern States Power Minneapolis, MN (1909)

Transformation through Innovation



- The utility industry has seen more change in last 10 years than in the previous 100 years
- There are many business drivers that are causing us to innovate:
 - Renewable energy
 - Energy efficiency
 - Distributed generation
 - Energy storage
 - Electric vehicles
 - Grid Modernization
- Xcel Energy Four Pillar Plan
 - Improve Operating Companies Performance
 - Transition a Workforce Ready for Competition
 - Compete for Customers
 - Grow the Business



Xcel Energy and OSIsoft



- Business Systems CIO strategic priorities
 - Think more strategically
 - Maximize partner value
 - Increase our throughput
- Xcel Energy's partnership with OSIsoft helps achieve this criteria
- OSIsoft PI System real-time operational information infrastructure helps with bridging the gap between assets and people while providing visibility across service territories



Productivity Through Technology (PTT) Initiative





RESPONSIBLE BY NATURE®

- Productivity Through Technology (PTT) is a commitment to innovation to drive consistent processes
- We are implementing technologies that can streamline, simplify, and improve work processes throughout all of our Operating Companies.
- We are employee driven. This initiative is about people, process and technology.
- We are implementing enterprise systems which leads to consistent process and data usage across three Operating Companies.
- The Enterprise Agreement (EA) with OSIsoft is a cornerstone of PTT.





Xcel Energy and OSIsoft Success is based on...

- The strength of our partnership with OSIsoft
- Business customers who are committed to the journey
- Business leadership sees the benefits that PI System can drive for enterprise consistency in data, reporting and process
- Strong centralized PI System delivery team with an enterprise focus
- Delivery team who educates/evangelizes the benefits of the PI System on a regular basis.





The journey is loaded and ready to go







The Journey Begins



- 1990's: Four individual plants have separate PI System installations
- 2003: First centralized installation in Colorado Transmission Operations, followed by Installations in Minnesota and Texas
 - Generation and market pricing data used by Commercial Operations
 - System expanded for new SPP market and MISO market changes
- 2008: Wind Forecasting efforts begins
- 2011: Enterprise Agreement (EA) Signed Covering PSCo, SPS and NSP Transmission Operations and Commercial Operations as well as Wind Data Integration
- 2013: Pilot added to cover 6 coal fired generation facilities for diagnostic purposes
- 2015: EA expanded to cover 7 more Combined Cycle (Gas) and 1 coal fired generation facilities along with a centralized Diagnostic Center

Overview of PI Deployments at Xcel Energy

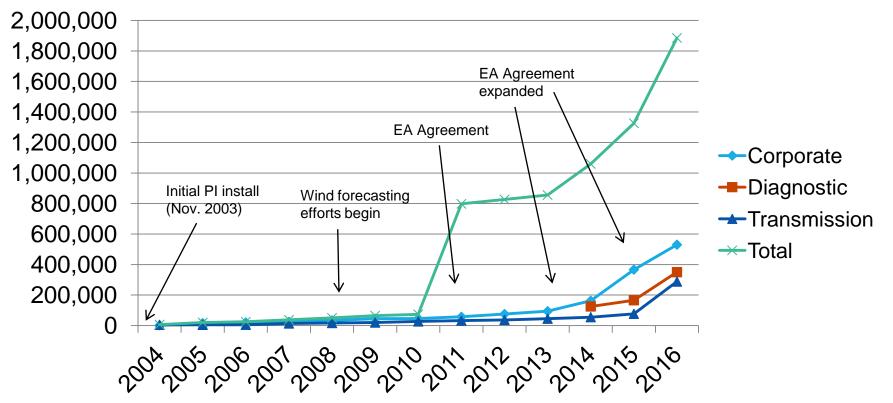


PI System deployments at Xcel Energy include:

- EMS
 - Electric Transmission Operations
 - All Operating Companies
 - With limited Gas, Distribution and Substation Data
- Corporate
 - Commercial Operations
 - Wind and load forecasts, ISO data, internal applications
 - Xcel System Summary Dashboard
- Generation (~13,300 MW of ~17,000 MW)
 - Two Nuclear plants, seven coal and seven gas generation facilities
 - Centralized Diagnostic Center
 - eLog all 76 owned generation facilities

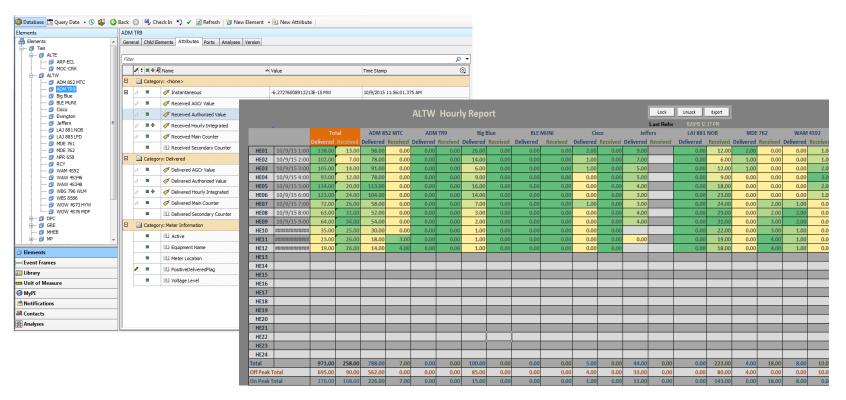
Xcel Energy PI System Point Counts





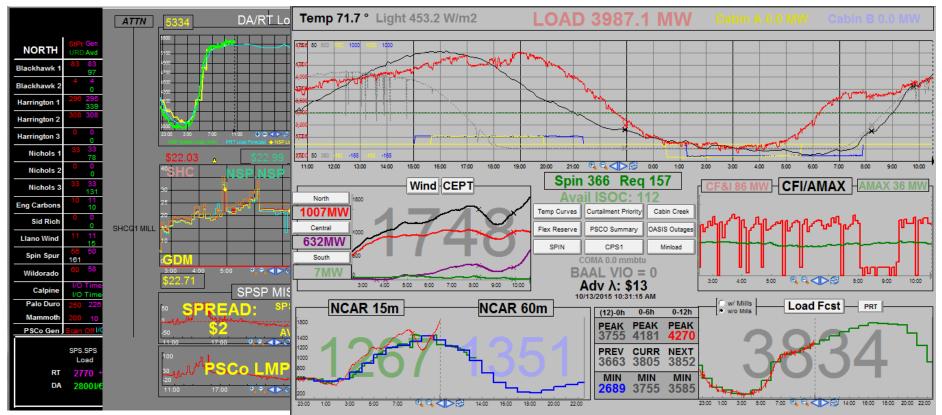
Transmission – PI AF, Counterparty Connections **Zeel** Energy®







Commercial Operations - Dispatch Displays





The Journey Continues: Wind Forecasting

- Started in 2008 and continues with ongoing improvements
- Partnered with NCAR and NREL
- Now hosted by GWC
- Benefits
 - Reduced error by 38%
 - Savings/efficiencies of \$46M over six years
 - More efficient and maintenance minded operation of Fossil Fuel Plants
 - Allow coal plant to be shut down for a weekend
 - Colorado Territory %50 wind for 24 hour period



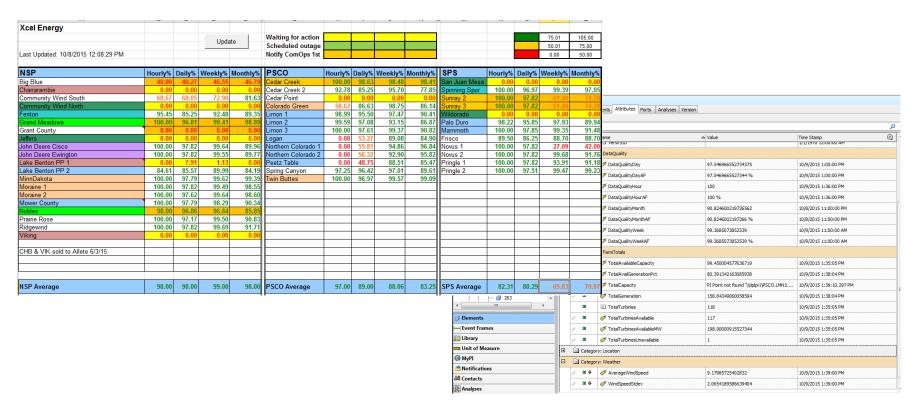
Wind Forecasting





Commercial OperationsWind Generation data quality – AF Analysis

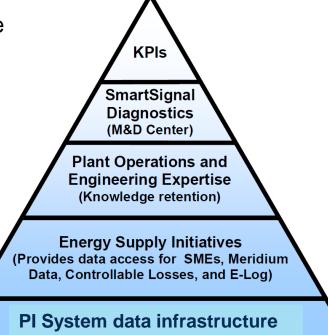




The Journey Expands: Monitoring and Diagnostic Center

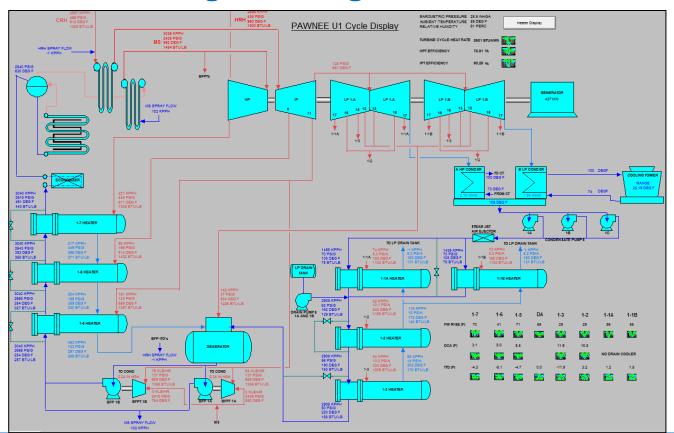
Xcel Energy® RESPONSIBLE BY NATURE®

- PI System provides primary data to M&D center and is the foundation for many applications including Predictive Analytics, Process Screens, Controllable Parameters and On-line Heat Rate Monitoring.
- PI System is installed at seven major coal plants and seven major combined cycle plants
- Allows centralized SMEs secure access to plant data for assistance in troubleshooting and analysis
- PI System will be an enabler for the following:
 - ✓ Smart Signal
- ✓ Vibration Analysis
- ✓ Executive Operating ✓ Meridium Report - "150z"
 - ✓ eLog
- ✓ Near Real time **Dispatch Curves**
- Emissions Tracking



Monitoring and Diagnostic Center





Stream real time data and calculations into cycle monitoring sheets and provide embedded trend charts

Monitoring and Diagnostic Center



Streams real time data and calculations for plant controllable monitoring sheets

Controlla	able	Generation Net Generation	266.89 MW 242.09 MW				
Throttle Conditions	Trend	Units	Actual	Target	Deviation	Heat Rate Change*	Heat Rate Change*
Throttle Pressure	Intern	PSIG	2342	2400	-57.58	12.22 BTU/kWh	
Throttle Temperature		DEGF	998	1000	-2.07	4.05 BTU/kWh	
Reheat Temperature	11.31	DEGF	940	1000	-59.56	57.51 BTU/kWh	
Cycle Conditions							
Condenser Pressure	Con	INHG	4.56	1.50	3.06	620.76BTU/kWh	
Final Feedwater Temp	U	DEGF	456.4	447.2	9.14	-25.82 BTU/kWh	
Boller Conditions							
SH Spray Flows		KPPH	107.0	0.00	5.98 %*	12.27 BTU/kWh	
RH Spray Flow		KPPH	10.2	0.00	0.62 %*	10.16 BTU/kWh	
Exhaust Gas Temp		DEGF	290.6	246.4	44.22	Unavailable	
Excess O2		%	3.26 %	3.54 %	-0.21	Unavailable	
Miscellaneous							
Aux Steam Flow		KPPH	0	0.00	0.00	Unavailable	
Aux Power	Log	MVV	24.8	24.3	0.5	21.95 BTU/kWh	
Net Unit Heat Rate		BTU/kWh	11040	10346	694.5		
* Spray deviation is a percentage of MS and HRH flow * Note a decrease in Heat Rate is an improvement							

Executive Summary Dashboard

Xcel Energy®

- Commercial Operations & Generation
 - PSCo, SPS, NSP, all systems
- Energy Supply
 - Controllable Parameters, Steam Cycles
- Transmission
 - PSCo, SPS, NSP
- Executive Summary
 - All Operating Companies in one view

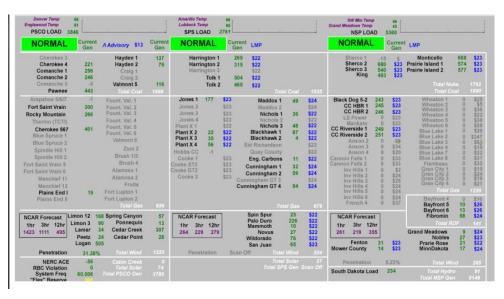




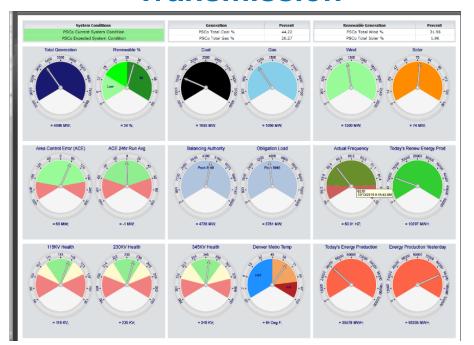
Generation & Commercial Operations



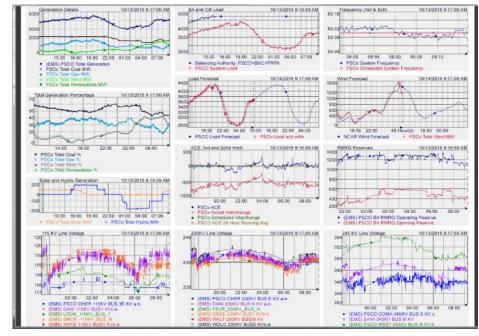




Transmission



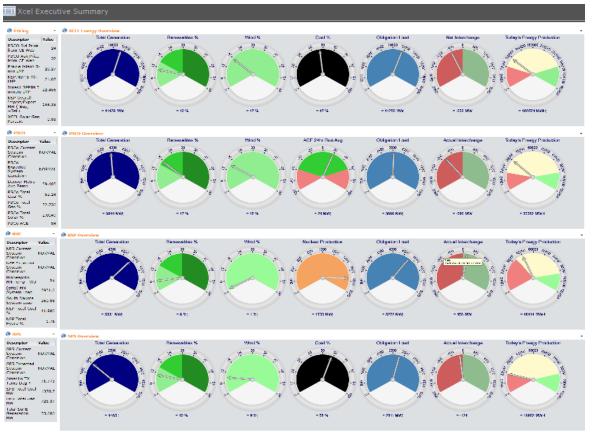






Executive Summary





The Journey Ahead of Us



- Substations and Dissolve Gas Analysis
- SAP
- Gas Distribution
- Gas Transmission
- Emissions
- Electric Distribution
- Distributed Generation
- Smart Meters
- Anything the Business can dream of







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BUSINESS SYSTEMS

TECHNOLOGY • SOLUTIONS • SUPPORT

Think more strategically.

Maximize partner value.

Increase our throughput.

감사합니다

Danke 谢谢

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

Remember: "Don't Stop Believing"

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