



## SUMMARY

Xcel Energy®

### INDUSTRY

Power Generation, Utilities,  
Renewables, Natural Gas

### BUSINESS VALUE

- Process Optimization
- Energy Optimization
- Maintenance Cost Reductions
- Energy Production Forecasting
- Weather Prediction Modeling

### PI SYSTEM™ COMPONENTS

- PI Server™
  - Asset Framework (AF)
  - Notifications
  - PI WebParts™
- Enterprise Agreement (EA)

Xcel Energy uses the PI System to improve wind forecasting and save \$46 million in operation costs

Xcel Energy provides power for 3 million electric customers and 1.9 million natural gas customers across eight states. According to the American Wind Energy Association (AWEA), it has been America's leading provider of wind-generated power for the past 11 years, and the company holds a world record for electricity generated from wind power. At OSIsoft's 2015 Regional Seminar in Denver, Kasen Huwa, Senior Business Manager at Xcel Energy, explained how his company's Enterprise Agreement with OSIsoft has ensured "all of our data is secure," enabled "a point count increase," and empowered a data initiative to reduce error in wind forecasting and increase savings.

### UNPREDICTABLE WIND POWER AND HIGH MAINTENANCE COSTS

Xcel Energy began a centralized installation of OSIsoft's PI System in their Colorado Transmission Operations in 2003, "quickly followed by... our Minnesota and Texas regions," Huwa said. "We then added in our generation and market pricing data for commercial operations... [we] started wind forecasting in 2008, [and] in 2011... signed an Enterprise Agreement [with OSIsoft] covering our Transmission Operations and Commercial Operations and Wind Data Integration."

The impetus for the wind forecasting initiative was "issues with our wind," Huwa explained. "Up here in Colorado, northeast section, there is around 900 or 1,000MW all coming down one line. When you have a lot of wind event coming up and you start producing wind that is great. Once wind hits a certain speed, if you don't know the turbine's clutch, then they stop producing power. You go from having 900 megawatts of power to 0 in about a 30-minute time span. For these guys in generation to make up for that wind power, you have to turn up your coal plants or your gas plants... It's a maintenance nightmare. You try to ramp them up real fast and that is not the way that they are meant to operate. In order to counteract that, either you carry a lot of spinning reserves or you have a lot of power plants running at a base load. That costs a lot of money."

### IMPROVING WIND FORECASTING WITH THE PI SYSTEM

To improve wind forecasting, Xcel Energy "went to the experts, the National Center for Atmospheric Research (NCAR) and National Renewable Energy Laboratory (NREL)." Then, they "grabbed a lot of data from these wind farms, anywhere from 4 to 9 points per turbine" for "just over 1200 turbines" in northeast Colorado. Following the release of the PI Server 2015, Xcel Energy in partnership with NCAR and NREL improved displays for the PI Server data. "It's all web-based," Huwa said, "a lot sleeker, a lot cleaner [with] a lot more options."

The current wind forecasting data model "runs every 15 minutes," and users can "go up to 72 hours before to show real-time data and then 168 hours after."

You can go pretty far out there to see your forecast.” The model display also provides 15-minute forecasts “for the next three hours” that tell users “what is our potential power” and “what is our available power.” After three hours, it switches to an hourly forecast with “potential power, available power, and our real-time metered lines and metered points.”

**ENSURING DATA QUALITY THROUGH ASSET FRAMEWORK**

Asset Framework (AF) has been critical to capturing quality wind forecasting data. “If we don’t have good data in, you don’t get good forecast out,” Huwa said. “We actually built Notifications so [if] we hit a certain limit, say, 30% data error, we will get a notification to our team and be able to... figure out the issue and get it quickly resolved. That way our forecast on the back end is also good... Without the use of AF and Notifications, it would be almost impossible to chase down those data quality errors. You would find them a month later, which doesn’t really do you any good.”

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– Kasen Huwa,  
*Senior Business Manager,  
Xcel Energy*

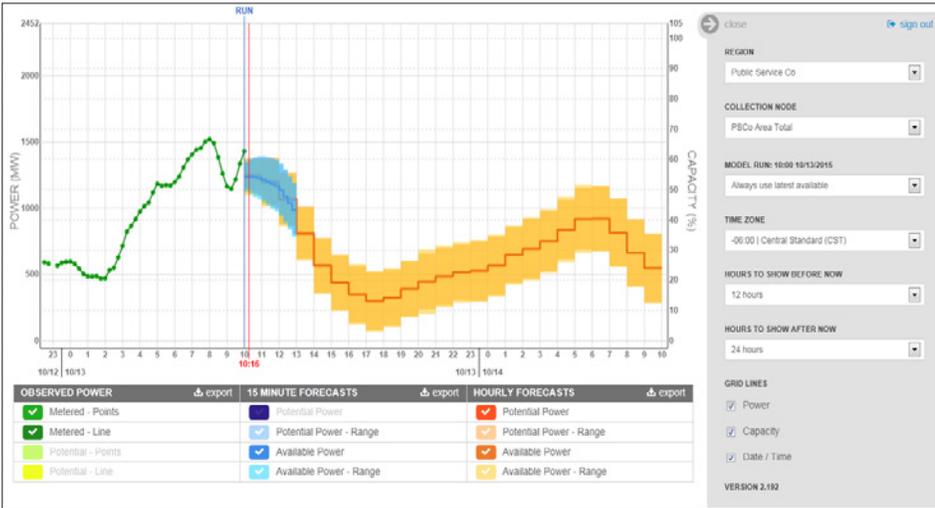


Figure 1. An Xcel Energy wind forecasting display

The full-time meteorologists at Xcel Energy were initially skeptical of data modeling to forecast wind. However, the forecasting was so reliable that Huwa said, “after about a month or two of using the system, they stopped doing their own forecasts... It was neat to see our IT System be automated enough that meteorologists who were very skeptical of our systems wanted to use them.”

From the wind forecasting data initiative alone, Xcel Energy has reduced its mean average error “by 38%” and realized “a lot of cost savings” as “plants are now running better.” Xcel Energy was able to “turn a coal plant off for a whole weekend because we knew that wind was going to be there,” Huwa said, adding, “It makes it much easier on your maintenance cycles... You can now tell [your plants] hours ahead of time rather than last minute.” “We cut down a lot of [curtailment payments].” Overall, the wind forecasting has led to “Savings/ Efficiencies [that] are roughly estimated over the last six years at \$46 million.”

Huwa concluded with his own forecast of Xcel Energy’s future data initiatives. “We have gas distribution that we want to look into, gas transmission, emission monitoring... electric distribution, adding substations, distributed generation, smart meters coming up, and anything else the business can dream of.”

Huwa, Kasen, *The Journey of the OSIsoft PI System at Xcel Energy*, OSIsoft.com, Oct. 2015, Web. 08 Jan. 2016 [http://www.osisoft.com/resources/presentations/presentation\\_abstracts/2015\\_-\\_Regional\\_Seminar\\_-\\_Denver/RS15CO040\\_The\\_Journey\\_of\\_the\\_OSIsoft\\_PI\\_System\\_at\\_Xcel\\_Energy.aspx?terms=Xcel%2bEnergy](http://www.osisoft.com/resources/presentations/presentation_abstracts/2015_-_Regional_Seminar_-_Denver/RS15CO040_The_Journey_of_the_OSIsoft_PI_System_at_Xcel_Energy.aspx?terms=Xcel%2bEnergy)