University of Iowa
Leveraging data to meet evolving sustainability goals

The University of Iowa is one of the nation's top public research universities with over 30,000 students, cutting-edge research facilities, a 705-bed hospital complex, and an ongoing commitment to sustainability. The University originally implemented the OSIsoft PI System™ in 2004 to help manage its on campus power plant. When an aggressive 10-year sustainability program was announced in 2010, the University decided to leverage its existing PI System infrastructure to help it reach its new sustainability goals.

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– George Paterson, Senior Utilities Systems Specialist, University of Iowa

Situation

The University of Iowa is a leading educational institution with a longstanding commitment to sustainability. All new construction must be certified to a minimum silver LEED standard and use at least 20% less energy than ASHRAE 90.1. The University takes the approach that to manage energy it must be measured.

The University meters all of the steam, electricity, and chilled water consumption at all 90-plus buildings on its distribution system in real-time. Additionally, new buildings are being submetered per LEED measurement and verification standards with dozens of measurements per building. All of this data is captured in the PI System.

In 2010, the University announced "2020 Vision", an aggressive, broad spectrum, sustainability initiative that includes:

- "net-negative" growth which requires that less energy be used in 2020 than was used in 2010.
- 40% renewable energy consumption by 2020.

While these goals were already aggressive, the University is undergoing its largest construction cycle in history, partly due to the 500-year flood in 2008. The flood caused the closure of 20 buildings and affected more than 2.5 million square feet of space. "We lost our primary power plant and most of our arts campus. We had $25 million dollars of damage just in the plant and several hundred millions of dollars in damage around campus," says George Paterson, Senior Utilities Systems Specialist for University of Iowa.

In addition, the University is in the midst of several other large construction projects. A 256,000 square-foot biomedical center opened in summer 2014, a new children's hospital will be completed in 2016 with a combined 553,630 square feet of new construction being added to the campus. "It's probably the biggest single period of growth in our campus history," says Paterson. "We've tried to estimate what all that means to us as an institution. If we don't do anything, our energy needs will be growing by about 10%."

Faced with aggressive conservation goals and booming growth, the University scrutinized the data. "We're trying to use our data to make better decisions about how we both deliver and consume energy and therefore use less."

Solution

While the PI System was originally installed to collect campus-wide instrumentation data, aid in running the University's power plant, and assist with internal energy billing, as the University's sustainability and conservation efforts have evolved, so has the PI System. Most recently, the University added Asset Framework (AF) and has piloted PI Integrator for Esri® ArcGIS® with its PI System. With AF, the University is now able to perform automatic building roll-up calculations for energy usage, contextualize its information, and present campus wide power generation and energy usage data in a more intuitive manner. While PI Integrator for Esri ArcGIS is allowing the University to deliver real-time PI System data to its existing Esri maps, thereby increasing campus wide visibility into energy use.

Benefits

The expanded PI System, is assisting with both day to day operation and the 2020 Vision. The PI System helps the University optimize its energy delivery by combining real-time energy pricing data with the University's energy load demands and equipment operating characteristics and ability. The University then uses this information to decide which fuels and which generation methods to use based on cost and need. "There are times when it's cheaper to run a steam chiller and times when it's cheaper to run an electric chiller and we need to optimize around that," says Paterson.

To meet the Vision 2020 goals for increased power from renewable energy sources, the University has installed two solar arrays on campus. Energy data from the University's solar panels is sent to the PI System alongside data from the cogeneration plant where it's used for load planning.

To reach the 40% renewable energy goal by 2020 the University is undertaking several innovative bio-mass projects. The University currently burns oat hulls, a by-product of the cereal production which the University receives from Quaker® Oats in Cedar Rapids, Iowa and wood chips in its solid fuel boilers. The University has contracts to buy miscanthus grass, a high-yield crop that is grown by local farmers on land that can't support food production, as fuel for the University's cogeneration plants. The first crop will be harvested in 2015.

The University's oat hull silo can only hold about four hours of fuel so reliable fuel delivery is critical. To assist with this, the University is using a homebuilt dashboard that leverages PI System data and Java to provide real-time silo level information to Quaker. Quaker in turn provides just in time oat hull delivery to the University based on real-time fuel use.

The University's Energy Engineers are using PI System data to identify buildings in need of energy retrofits such as new HVAC systems. "We benchmark those buildings before we do the retrofit and we can actually quantify the savings of the retrofit with the PI System," says Junk. The PI System also helps the University fine-tune fault detection and identify high usage areas. "With the PI System-Esri integration we can see hot spots on a map and give more data to management," says Alexander Junk., Senior Utilities Systems Specialist for University of Iowa.

The University is also working to increase campus wide visibility into energy usage. "We have buildings that cost a couple dollars an hour to operate, and we have buildings that cost $400-$500 and hour. That's surprising to a lot of people when they see it," says Paterson. "It's very useful in creating awareness and helping drive behavioral change." To help increase visibility, the University has made a series of energy usage dashboards and Esri maps that display real-time power usage information available to both internal decision makers and the general public. Now people throughout the University are gaining new context and understanding around the Universities energy successes and challenges. "With the PI System we're able to make data accessible and understandable throughout the organization," says Junk.

Business Challenge

- **Energy consumption must be at 2010 levels by 2020 despite unprecedented growth.**
- **Renewable energy usage will increase to 40% by 2020.**
- **Wanted to increase campus wide visibility into current energy usage.**
- **Need to optimize power production to both meet sustainability goals and optimize costs.**

Solution

- **The existing PI System implementation was expanded.**
- **AF is making information more intuitive to campus-wide users and providing new roll-up functionality.**
- **PI Integrator for Esri ArcGIS is bringing PI System data to Esri maps and increasing visibility into campus wide energy use.**

Customer Results

- **Areas in need of energy retrofits (and the benefits of those retrofits) are easily identifiable.**
- **Delivery of renewable fuel sources is dynamically scheduled based on actual production.**
- **Energy consumption information is visible to both decision makers and the public and is easy to understand.**