CUSTOMER CASE STUDY

Energy Queensland uses data to monitor capacity in real time

Energy Queensland - www.energyq.com.au
Industry - Transmission and distribution
Partners - Dimension Software | Esri

Goal

- Use dynamic ratings based on real-time data to take full advantage of unused network capacity.

Challenge

- Changing market competition and the need to provide two-way power flow in a system designed for one-way power flow.

Solution

- The PI System™

Result

- Demonstrated potential asset utilization improvements of more than 20%.

Energy Queensland has delivered electrical power to the northeastern Australian territory of Queensland for more than a century. During this time, the company rose to every challenge of the harsh rural terrain that is two and a half times the size of Texas. But recent advances in renewable energy are testing Energy Queensland's capacity. Large solar farms have emerged in the company's territory as solar power becomes cheaper and more feasible. These farms seek to feed electricity back into a grid designed for the one-way flow of power. At the same time, grid-independent home solar is becoming cost-competitive with electrical rates, putting downward pressure on the utility's operating costs. This new energy market demands a new approach to managing power. Making the most efficient use of the grid's full capacity requires intelligent and dynamic data analysis. Energy Queensland chose the PI System to bring together real-time data on grid infrastructure, weather, and geographic features and to enable engineers to manage power flow more economically.

Under pressure

Queensland's fluctuating weather conditions affect how much power a section of its electrical grid can carry. "The network is extremely affected by the environment it's in," said Tim Lewsey, senior engineer at Energy Queensland.

As current flows through a conductor, it generates heat, which causes the conductor to expand. Power lines sag as they heat up; if stretched too far, they can come into contact with buildings or become deformed. Cooler weather and wind help offset this expansion, while hot weather accelerates it. This acceleration makes it even more for difficult for Queensland because power demand spikes on hot summer days due to increased use of air conditioning.

To keep power lines from overheating, Energy Queensland uses ratings for different sections of the grid as an upper limit on how much power each section can carry. That approach works, but in an ever-changing environment, a static rating means that there is unused potential capacity for power flow. As the network is taxed more heavily by two-way power flow, it becomes more critical to tap into that unused capacity.

Using Asset Framework (AF), a contextualization layer of the PI Server, Energy Queensland built a virtual model of its assets in the field. AF allowed engineers to combine technical information about each feeder line in the network with an array of real-time weather, geographic, and environmental data, creating a dynamic rating for each piece of the network. PI Integrator for Esri ArcGIS ensured that GIS data was integrated seamlessly with other asset data and could be used to create real-time maps of dynamic ratings.

During times of high environmental stress on the system, the dynamic, real-time rating of a line is close to the old static rating. But depending on weather conditions, it can be as much as 40% higher. The difference between the two ratings is a business opportunity Energy Queensland can capitalize on.

Turning data into information

Before signing an Enterprise Agreement (EA), Energy Queensland's main access to data on assets in the field was through SCADA systems. The company was generating plenty of data, but engineers struggled to turn it into actionable insights. "Data does not equal information," Lewsey said. "We wanted the platform to be able to produce information."

Today, Energy Queensland engineers use PI Vision to develop intuitive, easy-to-use custom dashboards and monitoring displays tailored to the specific needs of different system users. The rural nature of Energy Queensland's territory means that one of the company's biggest challenges is keeping an eye on its extremely remote assets in real time.

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> Senior Engineer, Energy Queensland

Integration of the PI System with Esri ArcGIS reveals the dynamic load on a segment of power line in real time. Segments that are more parallel to the direction of the wind retain more heat and have less excess power-carrying capacity than more perpendicular segments.

With so much territory to cover, Energy Queensland must be able to rely on the accuracy of its data. To test the accuracy of the company's new dynamic rating system, Energy Queensland's engineers installed sensors in several sections of the network and compared the actual temperature of the lines under different conditions to the ratings generated by the new data-driven model. What the engineers found gave them confidence in their new system.

"We don't need to deploy temperature sensors to every section on the network if we're getting results like this," Lewsey said. The system has already been deployed to 30 feeder lines and demonstrated potential asset utilization improvements of more than 20%.

For more information about Energy Queensland and the PI System, watch the full presentation here.