REDUCE YOUR WIND INTEGRATION COSTS

Atmospheric Observation Networks for Electric Utilities

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Southern California Edison (SCE) recently awarded Vaisala a five-year contract extension to provide a turnkey atmospheric observation network (AON) for wind observations, including sensors, telemetry, preventative maintenance, depot repairs, and operational data acquisition and management services.

Vaisala was approached by SCE in 2004 to develop a solution to meet the needs of their expanding wind power purchase program. The state of California has the most aggressive renewable portfolio standards in the United States, directing local electric utilities to deliver 20% of their power from renewable energy sources by 2010. As wind energy becomes a larger share of SCE's electricity generation portfolio, it requires a better understanding of the dynamic changes in wind speed and direction that directly impact power generation. The AON provides high quality wind data for the San Gorgonio and Tehachapi Pass areas in inland California where SCE purchases 500 MW and 700 MW of wind energy capacity respectively. The data are used to improve the accuracy of short- and medium-term power output forecasts. Vaisala enables successful delivery of this information through its Observation Services Americas center in Tucson, Arizona where the AON performance is monitored remotely and the data are quality controlled and delivered to the end users.

In order to meet the demands of managing the variable power production of wind energy, SCE partners with AWS Truewind, a global leader in wind energy forecast modeling. State-of-the-art wind energy forecast models utilize wind speed and direction information from multiple locations and height levels to improve the initial observed conditions in the model. The model then steps forward in time to produce hourly wind forecasts out to 48 hours. The models have demonstrated a considerable improvement over the climatological models previously used by SCE. The generation scheduling group utilizes the forecast data to formulate the wind energy generation for day-ahead commitments 24 hours in advance.

A Vaisala AON system in San Gorgonio Pass near Palm Springs, California. Wind speed, wind direction, and temperature are measured at 10 m and 30 m above ground level to improve Southern California Edison's wind power forecasts provided by AWS Truewind. The Shell WindEnergy Whitewater Hill Wind Park's GE 1.5 MW turbines are visible in the background.

The Vaisala AON is also valuable for SCE's real-time operations center. Short-term statistical models recently developed by AWS Truewind assist electricity traders and generation planners in one-hour-ahead schedule adjustments within their generation management system. The real-time weather information from the Vaisala AON is used by the model's empirical equations to align the forecast fields with actual observations near SCE's operational wind farms. It is estimated that large electric utilities like SCE can save up to $250,000 USD annually for every one percent improvement in their wind speed forecast error, so reliable Vaisala AON measurements and services are improving generation management and profitability.

To reliably achieve the model and generation forecast improvements, 12 weather stations were installed and are operated by Vaisala in order to create a suitable observation grid to capture wind patterns. In the Tehachapi Pass area, seven stations are needed to monitor the wind flows in the complex terrain. For future power purchase agreements, SCE is requiring wind farm developers to install one weather station for every 25 MW of installed capacity to meet the future demands of high resolution models that can substantially improve their financial performance and reduce energy costs for end consumers.

The AON sites have been equipped with Vaisala Ultrasonic Wind Sensors, with measurements at 10 and 30 meters. Temperature is also measured at both height levels to understand the atmospheric stability, while barometric pressure is measured at ground level at some sites to understand the density of the air – an important parameter for wind power generation forecasts.

Vaisala works with an electric utility or wind farm operator to find the best location to site the AON equipment. Southern California Edison uses a number of existing transmission structures to support anemometers and communications equipment to reduce their costs (Left). Vaisala remote monitoring notifies personnel when sensors are not meeting performance standards. SCE field crews partner with Vaisala Services to provide their tower climbing expertise during maintenance visits.

SCE acquired a complete, integrated automated AON system including the weather sensing stations, installation, operations, communications, maintenance, and data management package from Vaisala. Vaisala is responsible for the entire scope of work including hardware, software, satellite communications, engineering, field engineering, site implementation, startup commissioning, data acquisition, data storage, data access, and training on turnkey basics.

Controlled access to the data is provided via a secured internet connection. SCE is gaining the benefit of the latest meteorological sensing platforms coupled with state-of-the-art communications and systems monitoring. The Vaisala Observation Services facilities in Tucson and Birmingham, UK provide 24/7 monitoring and support for a complete data services solution.

FOR MORE INFORMATION CONTACT

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