VISION STRATEGY REALITY

Minding the store

+ SCE DIGITALLY INTEGRATES RENEWABLES

By William Opalka

IN HIS DAYS AS A CONTROL ROOM OPERATOR MORE THAN A DECADE AGO, JOHN Pespisa remembers working intermittent renewable energy resources like wind into the system. The footprint may have been small, but the resource had to be dispatched. "Sometimes at 3 a.m., you'd wonder where the wind went," he said.

No longer. With more advanced forecasting tools and improved monitoring of generation sites and communication with grid operators, controllers are better able to anticipate the fluctuations of what were once a few MWs of generation. Now, with renewables measured in the hundreds of MWs, better tools are available. And even more important than that, ambitious goals to incorporate renewable energy into California's resource mix have put added pressure on utilities to get it right. Instead of a goal to get wind, solar and geothermal power into the system, it's a mandate. Accurate forecasts and dispatch are imperative.

ONGOING TIMING

These articles explore various grid timing issues. William Opalka and Dennis Keim explore the timing and dipatch of renewables on the grid. Kate Rowland explores timing in terms of transmission versus customers—where should utilities focus first?

Nowhere is this more acute than in California, and specifically, at Southern California Edison (SCE), where Pespisa is manager of real-time operations. He spent 13 of his 23 years at the utility in control rooms. That was before the creation of the California Independent System Operator (CAISO), so he's seen the evolution.

California has the most aggressive renewable energy portfolio standard in the country—by far. An executive order signed by Governor Arnold Schwarzenegger in September requires 33 percent of the state's energy to come from renewable resources by 2020. In the meantime, the state's investor-owned utilities are mandated to procure 20 percent of their electricity from renewable resources by 2012. Utilities are scrambling to acquire generation assets, either from their own plants or through power purchasing agreements, and are sometimes looking beyond the state's borders to find it.

SCE is well on its way, and closer than many, with 16 percent of its electricity from renewables. Its footprint is from Orange and San Bernardino counties in the south, stretching to Arizona in the east and moving north along the Nevada border. With nearly 2,800 MW of wind, solar and geothermal and other generation assets, SCE controls the largest portfolio of renewable generation resources in the United States. And this November, it started to roll out a Web portal for its generation portfolio for enhanced communication of availability and dispatch.

The company is a large user of renewable energy, with 12.6 billion kWh of renewable energy sold last year. In terms of the installed capacity, SCE has 1,137 MW of wind generation, 906 MW of geothermal and 356 MW of solar. It also acquires energy from hydropower and biomass generation. Geothermal is more of a baseload asset, depending on the production of the wells and any maintenance issues that could be faced, as is the case in any other power plant. In fact, it produces about 62 percent of SCE's total renewable generation.

SCE says it will meet its 20 percent goal. The company will even be importing 2 billion kWh of wind energy from Puget Sound Energy in Washington state over the next two years. And likewise, it's got more experience in integrating renewable energy into its system.

It is using digital technologies on its own and in conjunction with the vendors it employs for its site monitoring.

For assets like those inside and outside of California to be fully integrated into the system, site monitoring is crucial. That's where the meteorological towers come into play. "We're moving into an area where we think the technical advances of forecasting and managing that data are improving," Pespisa said. "We are able to share data that is more accurate in generating forecasts for forward markets." Along with its two forecasting vendors, this reporting system allows it to build a data bank for both wind and solar as their percentages grow.

But the forecasting vendors are moving closer to refining the hourly forecasts so that there is more confidence built into the models that influence generation dispatch and utility bids that set power prices.

A second area is sharing the available information from the generation site. "Wind or solar is only as good as the capacity to determine the availability of each site," Pespisa said. For that, the utility uses a direct supervisory control and data acquisition (SCADA) system with each plant connected to the control area and the integration more automated through a series of nodes. That creates both operational challenges and cost issues.

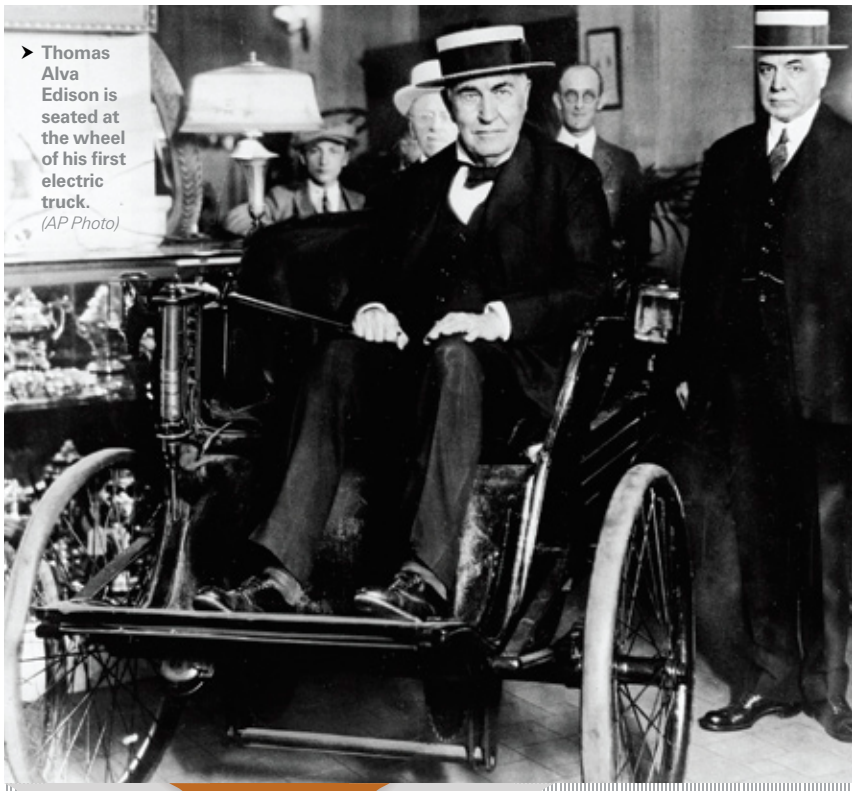
For example, a single power plant, or perhaps a large solar array, might have its own SCADA system reporting its generating capacity and output to the independent system operator (ISO). But if there are perhaps hundreds of rooftop sites in a relatively small area all reporting similar data to the same central monitoring site, there are potentially thousands of pieces of data being generated. As commercial and industrial locations become part of the rooftop solar programs, there are also potentially thousands of sites instead of a few data collection sites. In solar integration, SCE announced this summer that its rooftop program for commercial sites will generate 500 MW. It is developing a pilot program to relay transmission data from each site to the ISO.

The potential is not only duplication of the information generated, but also the real possibility of creating unnecessary costs. CAISO is developing a model to provide for both information and cost sharing. State regulators are developing plans to address the cost-sharing issue.

Another effort this November was the unveiling of a Web portal, part of the program to deploy digital technology through telemetry to monitor plant availability and production and even assist in outage management. The rollout is taking place over three months to all cell plant operations—the largest or most impactful assets first and then cascading down through the smaller and less important ones later—until all generation over 10 asset classes is connected to the ISO. Real-time availability is thus communicated.

A telemetry regime is also being rolled out with SCE and the ISO implementing technical requirements and standards for generating units and load participants. This effort is to establish and maintain a data processing gateway between the plants and CAISO's energy management system. This telemetry offers a gateway into the network of generation plants and transmission and distribution networks. "This is better at data collection and it's timelier in its reporting," Pespisa said. For dispatching generation assets, especially renewables, it is important to understand not just what a site is producing at a given moment, but that the amount produced by a renewable resource at a given moment matches the capacity expected.

William Opalka is editor-in-chief of RenewablesBiz Daily.



➤ Thomas Alva Edison is seated at the wheel of his first electric truck. *(AP Photo)*

VISION STRATEGY REALITY

Back to the future

+ RENEWABLES ARE REALLY NOTHING NEW

By Dennis Keim

FOUR RELAYS. THOSE WERE THE KEY COMPONENTS THAT ALLOWED A Delco-Light plant to automatically maintain a battery set to provide basic electrical service to more than 100,000 farms in 1920. Add a wind electric plant and save on fuel and wear and tear while maintaining reliable power. In the early 1910s, Thomas Edison investigated the use of windmills to charge his improved storage batteries for applications such as the then still popular electric car market.

With the dawning of today's smart grid and its focus on automatic interactive control and integrating distributed generation, including renewable energy systems, we are seeing a gradual return to these largely forgotten localized autonomous systems. This time they are being developed with the added reliability, support and market benefit of a smart utility grid.

Ideally, the use of smart grid technologies allows the small business owner or homeowner, in coordination with their utility, to optimize their renewable energy investment. The goal is to provide any excess power to the grid at peak pricing periods and to directly utilize the energy produced during lower-cost nonpeak periods.

A key feature of great importance to small renewable installations, and supported by smart metering, is time-of-use (TOU) metering. Use of TOU rates by solar power consumers have significantly improved the economics of photovoltaic systems in locations where the solar peak production closely matches the utility's daily peak demand. Wind is often a nonpeak source of energy, and the adoption of TOU metering encourages the consumer to schedule loads when the wind is blowing rather than feeding excess power to the grid.

In the future, a local storage system may be used to absorb off-peak renewable power. Not unlike what Edison once envisioned, that storage role may be taken by charging electric vehicles, plug-in hybrids and vehicle-to-grid (V2G) plug-in hybrids. V2G systems are being designed to allow for two-way power and information flow from the vehicle to the grid. Smart grid technologies will be critical to a successful implementation of electric vehicles, of any type, on a large scale.

With V2G technology linked to renewable charging systems, autonomous and automatic micro-islands of power supply, not unlike the Delco-Light and wind-electric systems of bygone years, become a possibility. Should the utility supply ever fail, the home or business would be able, in theory, to use the generator and battery of the hybrid along with any available renewables to provide power for emergency needs.

On the utility scale, Denmark has been in the forefront of wind energy technology and its implementation for many years. In 2007, wind energy provided almost 20 percent of Denmark's domestic electrical energy supply. Unfortunately, during low demand and high wind supply periods, they often have to export their extra wind energy.

To better utilize this resource, Denmark has started the EDISON project. EDISON stands for Electric vehicles in a Distributed and Integrated market using Sustainable energy and Open Networks. This research consortium includes IBM and Siemens along with other notable international and Danish organizations.

The idea behind EDISON is to take Denmark's excess wind energy and charge electric vehicles. They will do this by implementing smart grid technologies to balance the wind supply, transmission capability and vehicle charging demands and also to handle the billing. Thus, rather than exporting excess wind energy, they will be able to capture it for local high-value and low-carbon transportation. This will also allow for future expansion of their already formidable wind power base.

It's clear that the combination of renewable energy and smart grid technologies has a very promising future. The development of an increasingly dynamic IT-based supply and demand management system will continue to enhance the utility of renewable energy, not only for the utility, but also for the consumer-producer.

Dennis Keim is a freelance writer based in Nebraska.

VISION STRATEGY REALITY

Tangled network

+ TRANSMISSION OR METER INVESTMENTS?

By Kate Rowland

IT'S AS OLD A DEBATE AS THE CHICKEN AND THE EGG, AND AS COMPLICATED as the Gordian knot. Should utilities tackle transmission or customers first when making investments in a smarter grid?

On the one hand, it's imperative—and mandated in several states in their renewable energy portfolios—to ensure new renewable generation can be added to the grid and transported to urban centers, often long distances away, where it can be used.

On the other hand, the federal money, and the more visible push, is on the other end of the equation: smart meters and demand response scenarios involving the end-use customer are getting a lot of play these days. If utilities can get their customers to use less, then not as much new generation will be immediately necessary. And, while that may decrease revenues to the utility, it may still be in a better financial position by not having to build new generation.

It's a tangled knot, indeed.

And then there's the question of available federal stimulus funding. The matching grant money is focused mainly on smart meter projects, though there has been $750 million in federal loan guarantees for transmission made available through the stimulus legislation.