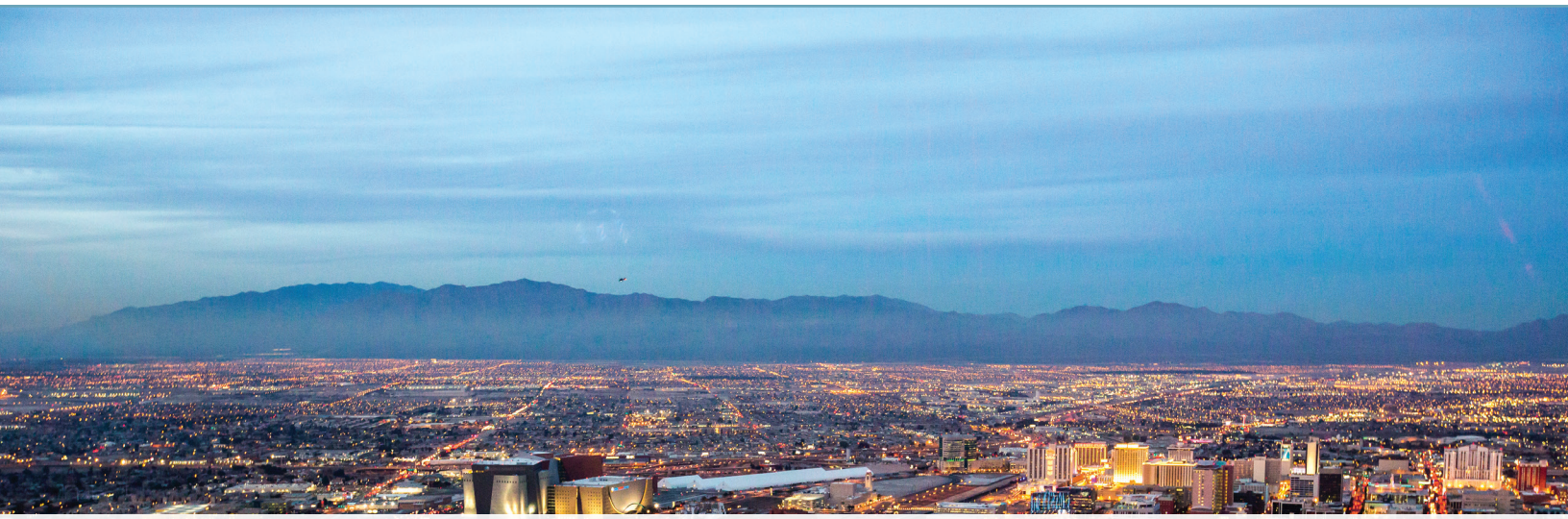

Case Study: Grid Monitoring

Grid Distribution Monitoring

NV Energy, U.S.

Headquartered in Las Vegas, Nevada, NV Energy provides electricity to nearly 90% of the Nevada population. That means serving 1.2 million residential, business and industrial customers and providing much-needed electricity to an impressive tourist population of more than 40 million annually.

When electric distribution engineers discuss network operations, they typically talk about the challenges to retrofit and upgrade substations and distribution feeders across their network.

"Like many other utility companies, we maintain and operate a combination of modern and older electric grid infrastructure. Substations and distribution power lines are two of the most valuable assets that support our customers. Receiving electrical flow data is crucial in order for us to provide the most reliable service possible."

RON KIRKER
Senior Engineer for Distribution Planning at NV Energy

BUSINESS CHALLENGE

Although comparative analyses put NV Energy's reliability records in the top quartile nationally, the company continuously strives to provide more reliable services to its customers. Typically, that involves gaining better situational awareness of grid conditions using methodologies such as telemetry and other more traditional types of monitoring solutions. The trouble is that existing technologies used for monitoring distribution networks can take months or longer to implement. They are often costly and demand significant coordination with several divisions within the company. According to Kirker, telemetering equipment, for example, involves:

- Extensive planning and involvement of multiple departments to coordinate the substation pre-design work for metering and communications systems.
- Planned outages during the installation phase. The installation needs to be carefully managed with customers, particularly for those located in remote areas where alternative power lines to provide backup may not be available.
- Time. Such installations often involve a full schedule of work for numerous line crews adding to the cost of equipment purchase.

A traditional approach to enhancing situational awareness often can involve the use of paper chart recorders or analog meters and the requirement for personnel to drive to each substation and read the data manually, record it on spreadsheets and then share it with team members. This labor-intensive process easily can take several weeks to complete, and the process has the potential for errors.

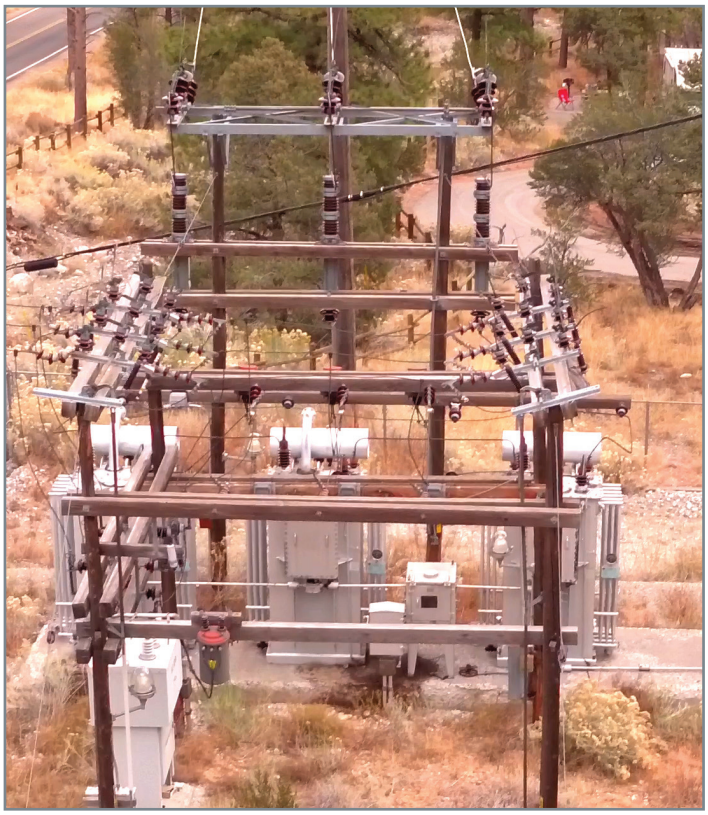

Fig. 1 - NV Energy Remote Substation

Dissatisfied with costly and burdensome methodologies of traditional approaches, NV Energy was on the lookout for a monitoring solution to retrofit substations and distribution feeders across its network. That solution needed to meet several criteria. It had to be cost competitive, capable of being installed and activated quickly – without disrupting grid operations – and must demonstrate clear benefits for NV Energy's customers. Health and safety was also high on the utility's agenda. With utility line work rated consistently as one of the top 10 most dangerous occupations, the solution also had to be safe for their linemen.

SOLUTION OVERVIEW

The company decided to take a fresh approach towards obtaining accurate, real-time operating data. With such valuable information in hand, NVE would be better equipped to balance load, resolve power quality issues, restore power more quickly during an outage, and anticipate customers' needs.

"Energy companies should always be on the lookout for technological solutions that are better than business-as-usual."

RON KIRKER
Senior Engineer for Distribution Planning at NV Energy

One such opportunity included using the Aclara distribution monitoring platform. The resource comprised software-defined, inductively-powered (battery-free) medium-voltage sensors and software with predictive analytics.

This plug-and-play, turn-key platform is simple to set up, easy to integrate across network infrastructures, very scalable and upgradeable over-the-air. Here is how it works:

STEP 1 – Sensor installation – With a clamp-on design, the sensors are easily installed onto overhead lines using a hot-stick or glove. The sensors provide accurate readings and work effectively down to three amps. A single lineman is capable of installing a sensor safely in just a few minutes.

STEP 2 – Turn on your communications – With Wi-Fi or cellular options, various sensor models can be adapted to support any utility's unique communications requirements.

STEP 3 – Install special software with predictive analytics – This process allows network operators to aggregate sensor data with a single connection that can be aligned with a variety of available utility operating systems. This allows the system to classify network events and monitor grid conditions.

STEP 4 – Set up configurable alarms – The software can be configured to send notifications via text message or email for crews to decide whether to investigate power quality issues, potential equipment failures, network overloads, momentaries, or even line disturbance conditions to improve service reliability. With the sensor-management software's integrated DNP concentrator, alarms and interval data can easily be mapped to multiple DNP masters.

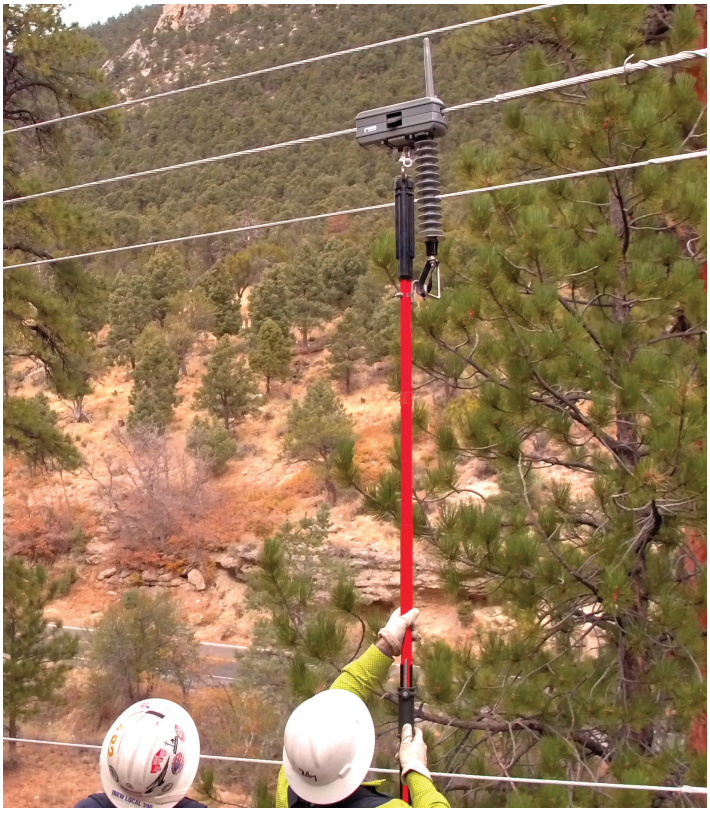

Fig. 2 - Hot-stick installation of Power Sensor

Fig. 3 - Aclara's Smart Grid Sensor installation near Las Vegas, Nevada

"This type of technology provides immediate, real-time data capable of alerting network operators to potential problems on the network. It enables utilities, such as NV Energy, to stay one step ahead by being able to predict outages and locate major faults before they even occur."

RON KIRKER
Senior Engineer for Distribution Planning at NV Energy

BUSINESS JUSTIFICATION

From the start of the project, data collected by Aclara's platform helped NV Energy improve its service reliability. Here is just one example.NV Energy decided to deploy a combination of medium-voltage sensors and power sensors in the Lovelock, Nevada area, where Kirker and his team had poor network visibility of grid conditions due to the remote location. Within days, the sensor information revealed a weakness in the area's network infrastructure. Kirker and the NV Energy team were able to address the problem immediately. Had NV Energy waited for the scheduled upgrade (in two years' time) customers likely would have experienced unreliable service and the company's reliability indices would have suffered.

"We were able to address overloads and poor primary voltage conditions much more quickly with the sensor's data. As a result, we were able to improve customer reliability."

RON KIRKER
Senior Engineer for Distribution Planning at NV Energy

As a result of this successful business case, which demonstrated true customer-related benefits, NV Energy plans to further expand the deployment of smart grid sensors throughout its distribution network, reaching an estimated 300 locations over the next two years.

The Aclara grid monitoring solution proved to be an excellent choice for NV Energy for several reasons:

1. **Ease of integration –** The Aclara sensor technology easily integrates with different platforms used by the company, allowing the sensor technology to be used for multiple applications.
2. **Instant data –** Once clamped on, the sensors immediately begin sending data for SMS to classify power disturbance events in a visual format so crews can respond quickly to situations such as load planning, outages and faults.

3. **Greater safety –** Even with the best training and work practices in place, working with energized power lines can be hazardous. The more time and installation steps involved, site visits required, and activity needed to rectify network problems, the higher the risk is for linemen and field personnel. Due to its design and ease of installation, linemen can deploy the MV sensors on live overhead lines and remain safe.

4. **Immediate financial benefits –** As explained by Kirker, the deployment of smart grid sensors over traditional monitoring solutions have proved advantageous for NV Energy: Kirker calculated that the cost of implementing monitoring solutions using more conventional equipment is approximately 10 times more expensive than deploying smart grid sensors.

"One example of the differences is that about eight different departments are required to design, construct and implement existing systems, but the number required for such smart grid sensors is just three. That results in a significant reduction in project time and resources."

RON KIRKER
Senior Engineer for Distribution Planning at NV Energy

5. **Shared company data –** Load and substation monitoring were the first two applications NV Energy's Distribution Planning department wanted to focus on; however, today, the data is being shared with other departments. Staff working in Operations Research and Analysis, Field Trouble Shooters, Protection Engineering and Distribution Outage Management also benefit from timely and accurate energy data. It gives them a better understanding of grid events, allowing teams to make informed decisions regarding the most appropriate actions. These actions help ensure the lights stay on, with reliability of customers' electricity supply maximized.

Fig. 4 - Software Integration with Smart Grid Sensors

This new distribution grid monitoring platform has enhanced NV Energy's ability to monitor its distribution network, substations and other assets and enable NV Energy to react quickly to adverse conditions that would have gone undetected without this new technology.