

PowerSession:

Success with Line Sensing – Overhead & Underground

Q&A Recap



In a recent Energy Central PowerSession Success with Line Sensing: Overhead and Underground our panelist explored the latest advancements in “line sensing” technology and examined the lessons learned on the latest Overhead projects and new Underground pilots. If you missed the webinar, you can watch it [here](#).

This document highlights questions from session participants and responses from our panel.

Would fiber optics in the conductor/power line provide better information about temperature and strain? Have you considered line sensing with information coming from within the line? Are there any considerations toward using fiber optics within the conductor to measure temperature, strain, etc.?

Answer from Ron Critelli, FPL - The use of fiber for temperature and strain would be another tool in the tools box, one must consider how to handle this operational (i.e. what is the process to restore when the conductor fails?) We have looked technology for sensing, one of the main considerations is you need to have an operational plan for failures and restoration. We have but could not overcome operational issues for restoration for conductor failure which would increase the O&M cost to the restoration of both fiber and conductor.

Answer from Arvind Simhadri, PG&E - PG&E has been presented products of this nature but has not yet evaluated this technology.

The Access data on the entire, or near the entire grid, could provide a risk to grid security. How are the Cyber Protection systems currently in place to protect the critical data?

Answer from Arvind Simhadri, PG&E - Cybersecurity of grid data is a serious concern for PG&E. Therefore, the communications/network architecture uses the most advanced forms of encryption and standards, and is thoroughly assessed and tested for cybersecurity issues before operational deployment.

It seems like concentration is on sensors/detectors with the locations of the highest risk areas. Any progress in mitigation efforts to pre-empt service outages with hardening / new wire technologies and other pole hardware attachments versus costly undergrounding in some instances?

Answer from Arvind Simhadri PG&E - In 2021, PG&E deployed 147 miles of overhead hardened miles (w/ covered conductors). More details about historical progress and planned miles can be found in PG&E's 2022 Wildfire Mitigation Plan.

Answer from Ron Critelli, FPL - FPL has deployed sensors on overhead and underground with great results across the system. As far as pre-emptive outage we have had good progress in a number of area of predictive. We have had much success in overhead hardening, as far as out laterals we have selected to underground them as the most effective way to hardened. Everyone's option will be different than FPL as our philosophy is to design to the environment.

How are you making the information collected from the sensors available to dispatchers/operations employees to respond and take action?

Answer from Arvind Simhadri PG&E - Sensor data is being aggregated in several ways. In addition, event data is integrated into DMS/Dispatch platform.

Answer from Ron Critelli, FPL - We have selected information go to the "control" center which they can act on, but trending information goes to our "smart grid control center".

Can you speak to any challenges you're facing or have faced concerning data transmission and reliability?

Answer from Arvind Simhadri PG&E - connecting sensors in remote areas is challenging due to coverage and bandwidth limitations.

Answer from Ron Critelli, FPL - balancing bandwidth and cost

Can anyone speak to analytic tools or methods to determine when sensor data is missing, or when measured values are likely incorrect (outside of the possible range of values)? With so many sensors, it will be necessary to quickly detect when any of them are failing/going offline.

Answer from Arvind Simhadri PG&E - Identifying incorrect data is always challenging. We continue to evaluate new tools and methodologies to validate and reject erroneous data.

Answer from Ron Critelli, FPL - we monitor the availability of all smart grid devices on the system inside substations and our lines. Offline devices are address quickly as availability is key for success.

Which group in your organization manages the sensor data and performs the analytics

Answer from Arvind Simhadri PG&E - PG&E is collecting data from several sensors. The sensor data is collected and stored in various systems (i.e., AMI database, distribution management system, GIS, and other 3rd party systems) and managed by various teams. However, we have started to develop a centralized cloud platform to bring all this data together and create more user centric ontologies to improve data analytics capabilities and data visualization abilities for multiple stakeholders.

Answer from Ron Critelli, FPL - The reliability team is accountable for the data and analytics

Q&A Specific for PG&E

All answers from Arvind Simhadri

Please ask Arvind about the rf sensors he showed us.. how is the data collected? (i.e., who's digital infrastructure is it? PG&E's? or some cellular operator?). And are the sensors being deployed in distribution grids too? Or is it only on feeders & bulk transmission for now?

Answer: Data from RF sensors is collected through PG&E's Private IP cellular network. The sensors are currently being deployed on the distribution feeders.

Question for BGE/PGE or FPL: other than Sentient Energy, which other manufacturers do you use for your sensors?

Answer: Yes. PG&E uses other manufacturers that include Aclara, Itron, Power Solutions and others.

Which group in your organization manages the sensor data and performs the analytics?

Answer: PG&E is collecting data from several sensors. The sensor data is collected and stored in various systems (i.e., AMI database, distribution management system, GIS, and other 3rd party systems). However, we have started to develop a centralized cloud platform to bring all this data together and create more use centric ontologies to improve data analytics capabilities and data visualization abilities.

Arvind, has PF&W considered local wind and solar monitoring as useful planning data for future DER planning?

Answer: Yes, we leverage local wind and solar growth information into consideration for forecasting areas of DER growth, and associated capacity needs.

Q&A Specific for FPL

All answers from Ron Critelli

To the extent needed, is FPL using an unlicensed or licensed spectrum for AMI and overhead/underground sensors?

Answer: We use the most secure and cost-effective options available to us.

How does FPL use drones to assist monitoring and restoration?

Answer: We have a newly created department in Power Delivery that the engineering, reliability or operations teams calls for request to fly. They are integrated into those processes for all teams.

What is a "first quarter-point"?

Answer: We divide the feeder into 4 sections so the first 25% of it

Which predictive analytics are you still needing to develop?

Answer: We continue to work on proactive detection of the device and location on the distribution feeders (underground and overhead)

Question for BGE/PGE or FPL: other than Sentient Energy, which other manufacturers do you use for your sensors?

Answer: Ubicquia,

Q&A Specific for Sentient Energy

All answers from Sentient Energy Team

Who owns the data, Sentient Energy or the Utility?

Answer: The utility owns the end data. In some cases, a utility will choose to share data with Sentient Energy for use in partnering to develop predictive analytics.

What's the method of communication with the sensors?

Answer: Utilities can choose between AMI/DA Mesh, or a secure version of cellular public 4G/LTE. Note that data from the sensors is encrypted at the payload level as well as an additional layer of encryption from the cellular carriers, so the data is virtually impossible to read. We continue to work with our customers as new communications methods become popular (such as fiber, private LTE or 5G).

What is the reliability and expected life of these overhead sensors?

Answer: Sentient Energy's line sensors have an expected life of 10 years

What does CMI stand for?

Answer: Customer Minutes Interrupted

How much data granularity is required for key use cases to benefit from various sensors, to allow the analytics to deliver value?

Answer: For faults and disturbances the sensors capture data at 130 or 256 samples/cycle, depending on the sensor. We believe that this is the resolution necessary to analyze faults effectively and characterize waveform perturbations for advanced analytics (e.g., vegetation contact on a line). System load data is typically measured every 5 minutes and reported every 4 hours to the Ample Analytics Platform. Customers can configure these settings.

Q&A Specific for Sentient Energy

All answers from Sentient Energy Team

Do the same solutions for Overhead also applies to your Underground system?

Answer: We offer two overhead line sensors (MM3, ZM1) and two underground line sensors (UM3+, UM1). Although the hardware is different, all four sensors capture similar data – load current, faults with magnitudes and waveforms, and disturbances. All four sensors integrate with Sentient Energy's Ample software.

Can the line sensor data be integrated into our SCADA and ADMS systems for visibility and control? Or is this contained on a separate software tool and network?

Answer: Sensor data can be integrated into SCADA and ADMS systems using our DNP concentrator software. Sentient Energy's line sensors support dual master, which means the devices can talk to both SCADA and our Ample Analytics Platform for reporting, visualization, and engineering analysis. Additionally, the Ample platform offers REST APIs for integration into data lakes, OMS, PI, or other external customer systems.

Are there currently any plans on using some of the data provided by the sensors to help determine injection capacity on the distribution grid for renewables such as wind and solar?

Answer: Yes. With the deployment of sensors, load current measurements are available and changes caused by renewables and EVs can be detected. This creates a more accurate understanding of loading on feeders and laterals with DERs and EVs.

Are any utilities using voltage sag/fault data from line sensors to locate faults/ improve performance?

Answer: Yes. All our customers use fault data to better locate faults and reduce outage durations, improving SAIDI and CMI. Some customers integrate fault data from our sensors into an ADMS for improved distance-to-fault calculations. Additionally, continuous load monitoring can help with system planning while tracking and analyzing the sequence of events for momentary events can help with reliability planning.