

Using Smart Grid Technologies to Combat Energy Theft



By Lee Purvis, Senior Project Manager, JTS Utility Consulting.

Utilities around the world lose billions of dollars to energy theft every year. In developing nations it is estimated that as much as half of all electricity used is stolen. Here in North America, the numbers are lower but the loss in revenue is still significant. In 2011, BC Hydro estimated it was losing nearly \$100 million annually to electricity theft -- enough to power 77,000 homes.

The results of this theft:

- Higher electricity rates for paying consumers
- Increased risk of fire or electrocution due to improperly installed bypasses
- Reduced grid reliability

To combat energy theft, utilities around the world are using Smart Grid technologies, such as smart meters and distribution system meters, to identify and prevent energy theft.

How Does Energy Theft Occur?

Energy theft can be difficult to identify and pinpoint. Like any other criminal activity, methods shift constantly as utilities develop countermeasures. Unfortunately, anyone wishing to hack their meter can find instructions on the internet. In fact, a quick search of YouTube turns up a number of tutorials on meter hacking. Most kinds of energy theft are variations on the following:

Bypassing the meter: Involves hooking directly into the power line ahead of the meter, or short-circuiting the input/output terminal to prevent energy from registering.

Slowing down the meter: Physical objects or magnets are sometimes used to slow down a meter, while more advanced methods involve installing a foreign circuit that can be controlled remotely to avoid easy detection.

Inverting the meter: Some users pull a meter out of its socket and re-install it upside down to run backwards for a few days, then turn it right side up before a meter reading.

How Can Smart Grid Technologies Stop Energy Theft?

By pairing smart meters with distribution meters, utilities can collect data from many locations and balance the energy being distributed with what is being consumed. Here's how that system works:

A **smart meter** is more than just a device that measures customer usage for billing purposes. Smart meters are designed to alert utilities of tampering, power outages, and other unusual activity. All of the data they collect is transmitted to backend systems for analysis.

Unlike smart meters that collect data from individual customers, **distribution system meters** are devices located at key points throughout the grid. They allow utilities to understand how much energy is being consumed at a given point on the network in real-time.

By comparing the energy consumed to that distributed from the substations, it's possible to identify where energy is being lost and whether that loss is of a technical or suspicious origin.

With intelligent tools like these at their disposal, utilities can begin to realize considerable benefits including:

Energy recoupment: By identifying and mitigating energy theft, the overall footprint of the utility can be reduced. This results in reduced need for generation and transmission, resulting in lower rates.

Improved reliability: Energy theft is most commonly accomplished via some kind of diversion which can result in fires or power surges.

Operational efficiency: When the utility has a good understanding of energy being delivered and consumed on its network, it can optimize the network.

Takeaway: Utilities No Longer Have to Live with Energy Theft

In the coming decades, smart grids will prove to be a powerful tool for utilities. Grid operators no longer have to simply accept that a certain amount of energy theft will occur. Smart grid technologies now provide an effective means to all but eliminate non-technical losses, ensure services/products delivered are billed (assuring revenue), improved customer safety and service, and grid stability.

ABOUT THE AUTHOR

Lee blends technology depth and business acumen to tackle large and complex projects, including several recent Smart Grid and AMI projects as a senior JTS consultant. When he isn't helping to realize the huge potential of Smart Grid technologies, Lee enjoys a busy family life with his five children, and is an avid rock and ice climber.

ABOUT JTS CONSULTING

JTS prides itself on making the complex simple. As a niche firm focused exclusively on the utility industry, our team has the practical operational knowledge, innovative thinking and sound business sense to help utilities safely, reliably and efficiently modernize their grid and transform their business for future generations.