

Improving Reliability and Efficiency

ComEd Improves Reliability and Efficiency with a Single Network for Multiple Smart Grid Services



BACKGROUND

Commonwealth Edison (ComEd), a unit of Chicago-based Exelon Corporation, provides electrical service to more than 4 million customers in Chicago and northern Illinois, operating as the state's largest electrical utility. Set in motion by an Energy Infrastructure Modernization Act (EIMA) by the State Legislature of Illinois, ComEd is undergoing a 10-year, \$2.6 billion Infrastructure Investment Plan, investing \$1.3 billion to strengthen its electric system and another \$1.3 billion to add new smart grid technology.

THE CHALLENGE

With the passage of EIMA, ComEd was required to improve its overall system reliability. In order to reach the goals outlined in the law, ComEd decided to leverage a common network for multiple applications, including advanced metering infrastructure (AMI), distribution automation (DA) and smart city programs. With a modernized communications infrastructure, the utility would be able to increase grid reliability by identifying problems faster, optimizing business processes, automating problem resolution and reducing truck rolls.

Adopting a smart grid strategy based on a single, unified network, ComEd identified the following benefits for its customers and the State of Illinois:

- » Minimize impact of power outages by reducing outage frequency by 20% and duration by 15%
- » Improve customer satisfaction by empowering customers with more information about their energy usage and providing better service
- » A positive impact on the state economy by creating more jobs as a result of smart grid investments

In addition, ComEd anticipated streamlining internal processes and increasing overall efficiencies with an integrated, standards-based platform. ComEd projected lower long-term operational costs through a gradual reduction in meter reading and field services operations. By creating a highly secure smart grid foundation, ComEd's AMI system would also support future applications, such as advanced rate designs and distribution operations asset optimization. In all, ComEd expects \$2 billion in savings over 20-years from an upgraded, stronger electric system, fewer power interruptions and greater operational efficiencies.

CUSTOMER

Commonwealth Edison (ComEd)

OUTCOMES

- » **\$1.4 billion** in societal savings from avoided outages¹
- » **Most improved large utility** in the United States over the last five years by JD Power
- » **\$100M** in operational cost reductions returned to customers each year
- » **7.1M** customer interruptions avoided (since 2012)
- » **48%** reduction in outage duration
- » **65%** expected cost reduction for streetlight OPEX

TECHNOLOGY

- » **>4 million** smart meters installed by end of 2018
- » **>6,300** critical DA devices connected
- » **750** smart streetlights (pilot)
- » **Operations Optimizer** analytics modules for AMI Operations, Grid Operations and Revenue Assurance

¹ <https://www.comed.com/SiteCollectionDocuments/AboutUs/ComEdProgressReport2017.pdf>



THE PILOT

Over a three-year period, ComEd conducted due diligence to research and select a smart grid technology provider. Following an extensive evaluation process, ComEd selected two-way communications from Itron, integrated into GE and Landis+Gyr meters. The AMI pilot, including 131,000 meters, leveraged Itron's multi-application platform, an integrated set of solutions for networking, control and application enablement, as well as solution-specific AMI hardware, software and services widely implemented and commercially proven at scale.

As a result of the pilot's success, ComEd chose Itron's end-to-end IPv6 network platform for deployment to all 4 million Illinois customers. Relying on Itron's secure and standards-based foundation for delivering smart grid services, ComEd could unlock customer benefits more rapidly, as well as easily integrate future technologies and applications. Increased business efficiencies expected from the project included a targeted reduction of \$30 million in uncollectible expense, a 90% reduction in consumption of inactive meters and a 50% reduction in unaccounted energy use.

"The smart grid program is delivering on its promise to generate efficiencies and we are pleased to pass-along those savings to our customers by decreasing their electric delivery costs. The investments in the smart grid program are producing a stronger, more reliable system with fewer outages. Those results mean less operational costs and greater savings for our customers."

– Anne Pramaggiore, President and CEO, ComEd

**TOP
10%**



In the utility industry for service reliability

**CUSTOMER
ENGAGEMENT
PROGRAM OF
THE YEAR**



For smart meter outage reporting by DistribuTECH 2017

\$ > 2 BILLION IN SAVINGS

Expected over 20-years from an upgraded, stronger electric system, fewer power interruptions and greater operational efficiencies

ADVANCED METERING (AMI) SOLUTION

ComEd's integrated AMI solution provides two-way communications between customers and ComEd, enabling applications such as automated billing, remote disconnect and connect service operations, a customer web portal with real-time consumption information, AMI-based outage management, meter hazard discovery, revenue assurance and dynamic pricing.

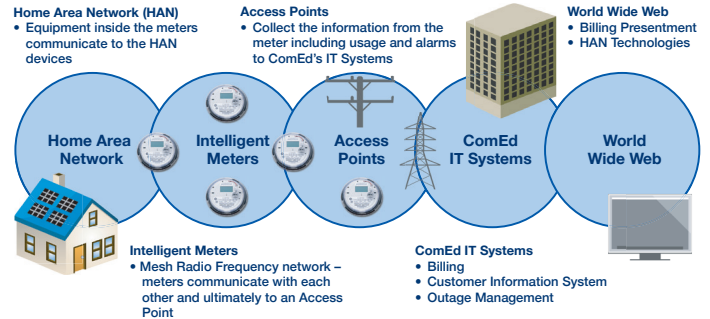


Figure 1: ComEd Advanced Metering Infrastructure (AMI) Solution

Itron's mesh radio frequency network ensures reliable communications for ComEd's full-scale deployment. As illustrated in Figure 1, the network consists of smart meters at customer homes and businesses and network infrastructure including access points and relays. The intelligent devices collect information and communicate with ComEd's IT systems for billing, customer information and outage management.

By the end of 2018, ComEd will have installed all 4 million smart meters. Due to meter acceleration, all ComEd customers are expected to have smart meters by the end of 2018—three years ahead of the original commitment, resulting in increased customer savings of approximately \$170 million..

ComEd's investment in AMI hardware is already enabling a variety of advanced applications that deliver value to the utility and the customer. ComEd implemented Itron's analytics solutions—including the Operations Optimizer application—to enhance grid resiliency and increase operational efficiency. The application allows operators to leverage vast amounts of data from multiple internal and third party sources for a unified enterprise analytics solution covering numerous use cases.

Itron's analytics solution enables operators to improve hazard detection and revenue assurance through actionable insights and workflow automation capabilities. This has significant implications for operators, who can now leverage data and proven pattern recognition techniques for proactive rather than reactive problem resolution. They can use analytics as virtual "eyes-in-the-field" to identify and track cases of meter tamper, meter malfunction and theft. The results have been immediate. With an average accuracy of over 95%, the software has dramatically improved ComEd's ability to remotely detect incidents of theft and meter malfunction.

ComEd's investment in AMI infrastructure has already delivered significant and measurable value. With the flexible and adaptive capabilities of the Itrons' Operations Optimizer application, operators are equipped with powerful tools and insights they need to continue to unlock future gains for ratepayers.

DISTRIBUTION AUTOMATION (DA) SOLUTION

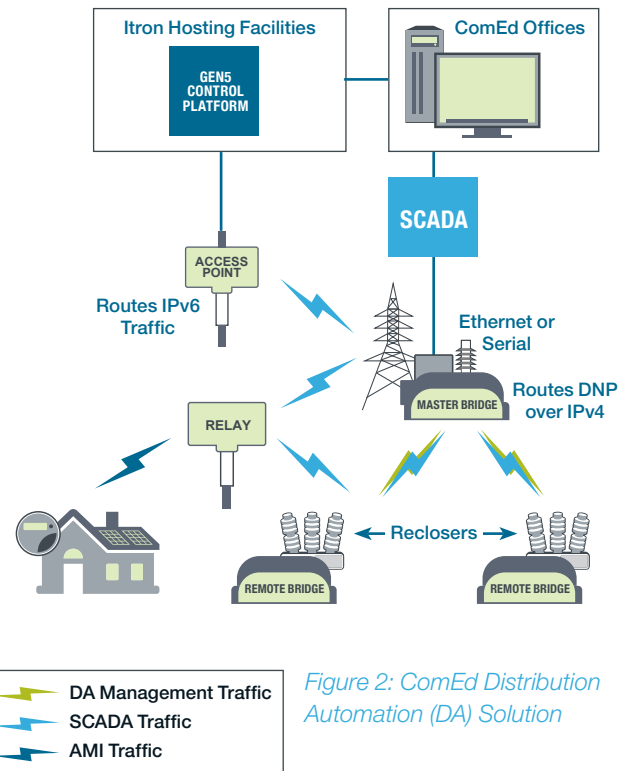
ComEd is implementing a five-year DA plan to improve outage management through better targeting of restoration crews to fault locations, enhanced asset tracking and faster power restoration through the automatic detection of faults and rerouting of power around the faults.

ComEd leveraged its Itron's infrastructure to deliver two-way communications for 6,300 DA devices, including the migration of more than 3,000 DA devices from a legacy Utilinet 900 MHz system onto an Itron mesh network. The Itron network transports SCADA communications to control and monitor reclosers and other grid management hardware in the field and delivers the DA network traffic to the Itron control platform, hosted by Itron. As of January, 2018, ComEd's smart grid network supports more than 6,300 smart switches.

ComEd has enabled additional gains by combining its investment in DA hardware with the Itron Operations Optimizer application. ComEd leveraged the software's advanced analytics capabilities to improve outage management capabilities while reducing costs related to on-site investigation.

Operations Optimizer uses analytics to improve asset tracking of critical hardware across the DA network. Whereas legacy systems required trained field technicians to identify cases of meter-to-transformer mismatch, Operations Optimizer empowers ComEd to remotely discover and proactively solve problems, also improving ComEd's asset tracking capabilities. Operators have discovered that approximately 5% of meters have incorrect transformer listings. The analytics have also improved workflows, resulting in an 87% success rate in remote identification of meter-to-transformer mismatch without costly truck-rolls.

The implications for distribution automation are significant. Operators are gaining improvements in outage management, distribution transformer load management and transformer/feeder-level analysis. The Itron solution also supports the high bandwidth and low latency requirements of the most demanding DA applications, giving ComEd the ability to add other use cases in the future.



SMART CITY SOLUTION

In 2015, ComEd began extending the use of its mesh network to support a smart streetlight pilot for 750 of the 176,000 ComEd-owned fixtures in the Chicagoland area. The program equips energy-efficient LED lighting fixtures with Itron's wireless monitoring and controls, leveraging the same smart grid network infrastructure used to support AMI and DA. The pilot is testing advanced functionality including remote control and scheduling the lights, outage and maintenance alerts, and public safety support. ComEd is providing the two pilot villages, Lombard and Bensenville, with access to central management software that allows them to monitor the status of streetlights for outages or proactive maintenance and allows them to adjust dimming levels in real time from a mobile device. ComEd expects this project to reduce costs for operations, maintenance and energy by up to 65%, improve mesh resilience, provide an 'anchor' for other smart city applications as well as improve customer satisfaction"

BENEFITS FROM SMART GRID DEPLOYMENT

Since Itron's network platform supports multiple smart grid and smart city applications, it enables ComEd to run integrated AMI, DA, customer programs, smart city, and asset management use cases on a single, unified network while supporting the unique requirements of each application. The addition of new nodes, such as streetlights, serves to strengthen the overall network to benefit existing and future applications.

By building upon a common network, ComEd is also maximizing the impact of its investments in analytics solutions. ComEd's modernized IT infrastructure integrates multiple data streams from internal and third party sources, enabling seamless data transactions for enhanced visibility and control across multiple business units. Operators can now leverage proven algorithms and robust role-based workflow management tools to generate actionable, predictive insights for enhanced operations and program management.

ComEd's smart grid investments are improving the strength and reliability of the electric system and providing benefits across multiple areas:

Fewer and shorter outages generated societal savings of more than \$1.4 billion

From 2012 through 2017, ComEd avoided more than 7.6 million customer interruptions with smart switches that automatically route power around potential problem areas.

Improved reliability, now in the top 10%

ComEd's reliability performance is now in the top 10% of comparable U.S. utilities.

Reduced the number of outages by 44%

Despite more intense weather events, storm restoration performance has significantly improved. Storm hardening work and storm restoration improvements have reduced average outage duration by 48% with 80% fewer customers experiencing lengthy outages.

Saved customers \$2.3 billion

Smart meter-enabled energy efficiency programs are helping to stabilize rate increases while providing customers with opportunities to reduce consumption. Residential rates are 17% lower the average of the 10 largest American cities. Innovative pricing programs and peak-pricing alerts have helped customers save more than 21.5 million megawatt hours of energy.

Enhances discovery of meter tamper and theft

With Itron's Operations Optimizer analytics solution, ComEd has significantly improved the efficiency of its revenue assurance operations. Using AMI data and proven algorithms, investigators have been able to increase the accuracy of remote theft detection to more than 95%.

Improves asset tracking for critical DA hardware

Operators have also improved their ability to proactively discover meter-to-transformer mismatches remotely. The algorithm is highly accurate, achieving a 98% success rate in identifying and correcting mismatched assets. In total, the software estimates that 5% of meters are associated with mismatched transformers.

Reduces the cost of street lighting by 65%

ComEd expects the ability to monitor and control fixtures will reduce costs to manage its street lights by up to 65%, due to increased efficiencies in operations, maintenance and energy use.

Supports economic growth

In addition to benefits to ComEd customers, ComEd's smart grid program is also delivering benefits to the state of Illinois through job creation. ComEd work related to the smart grid program has resulted in more than 11,200 full-time equivalent jobs in Illinois as of the end of 2017.



A FLEXIBLE FOUNDATION FOR THE FUTURE

Itron's multi-application platform serves as a foundation to add future smart grid and smart city applications. In addition to its street lighting initiative, ComEd is exploring new analytics, grid efficiency and restoration acceleration applications. With a standards-based smart infrastructure, ComEd can easily integrate new smart services and solutions, driving additional benefits for its customers in the future.



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