Tampa Electric

The Art of the Possible

PROJECT OVERVIEW

Tampa Electric Company (TEC) is making a transformational investment in new customer experience and operational programs with supporting projects that include AMI, data analytics, advanced distribution management, work management, distributed intelligence, asset management, Volt/VAR optimization, smart streetlights and smart cities applications. In order to achieve this transformation, derive value and deliver actionable insights, they were in search of an industry leader with a track record of reliable performance, a flexible, multi-purpose network platform, future-proof solutions and ultimately, a true partnership.

TEC selected Itron due to our shared vision for distributed intelligence; an industry-leading, open platform; and our established relationship. By delivering end-to-end solutions based on a multi-application network, TEC is building on their investment in AMI, realizing financial benefits, expanding value to community stakeholders and achieving their vision through the "art of the possible."

> "We selected Itron due to our long-standing partnership, their transformative and open network, powerful meters, extensive smart cities ecosystem, innovative partner program and trusted managed services."
>
> ***David Lukcic, Senior Director, Operations Technology & Strategy, Tampa Electric Company***

SMART UTILITIES

Multi-Application Network

TEC's long-term vision to deliver transformational value through new operational programs and new customer experience solutions is built on Itron's industry-leading industrial IoT (IIoT) network. Through a multi-year deployment, TEC will leverage its network to support advanced metering infrastructure (AMI) for electricity, smart streetlights and ultimately other advanced applications such as grid management, distribution automation, solar generation and EV integration that require the ability to access granular data and dynamic power flows. As part of its long-term grid modernization efforts, TEC is also upgrading its 800,000+ electricity meters to advanced smart meters with distributed intelligence capability—a state-of-the-art feature that will enable them to monitor and manage devices at the edge of the grid, enabling greater control and insights.

CUSTOMER

Tampa Electric Company

BUSINESS DRIVERS

- Gain better optics and visibility into system operations and status
- Upgrade aging AMR infrastructure and replace with AMI
- Enable smart grid applications that extend beyond AMI
- Address operational challenges and costs of aging outdoor lighting infrastructure
- Enhance customer support and expand service offerings

RESULTS

- $2.5M annual reduction in O&M for street lighting (20% from networked lighting controllers)
- Centralized data collection, management and treatment processes (including migration from Itron MV-90 xi to Itron Service Mode)
- Distributed intelligence detected 100% of events with zero false positives
- $2.7M annual increase in annual base revenue from street lighting (~17% from controllers)
- 72% improvement in restoration response from street lighting (10% from networked lighting controllers)
- Improved customer experience through proactive outage notifications, remote connect/disconnect, etc.
- 5K truck rolls avoided due to automated controls
- 55% improvement to system reliability
- 121M kWh reduced annually

ABOUT TAMPA ELECTRIC COMPANY

Part of **EMERA CONSORTIUM**

2,000 SQUARE-MILE
service area in West Central Florida

5,000 MW
of generating capacity

655 MW
AC solar generation

800K+ METERS
residential, commercial and industrial

260K STREETLIGHTS
will be installed by the end of the project (2024)

450 NETWORK ROUTERS
with >99% coverage

CURRENTLY BILL THROUGH
FieldNet (AMR), MV-90 xi and SAP

GOALS

- Establish a technology foundation capable of supporting multiple utility and city services while expanding network investment value
- Harness the power of real-time data to gain actionable insights and achieve value-based outcomes
- Enhance network visibility and health by pushing intelligence and decision-making to the grid edge
- Achieve a futuristic vision by enabling an ecosystem of interoperable solutions from best-of-breed applications

SOLUTION

- Advanced Metering Infrastructure: Residential, C&I smart electricity meters, AMI Headend System, Network Headend System, Web Portal, Asset Management, Grid Management
- Smart Cities: Smart Streetlights, Traffic Monitoring, Smart Parking, Gunshot Detection
- Software & Services: Data Management, Forecasting, Distributed Energy Management, Managed Services

TEC's advanced network is an intelligently connected platform that delivers fast, reliable, flexible and secure connectivity that is helping them unlock the full potential of IIoT. Intelligent connectivity ensures that the network delivers the best operational performance for every application by utilizing the communications transport method (such as RF mesh or cellular) that best fits each use case. TEC's primary smart grid objectives include:

- **Drive increased operational savings** – Manage many grid operations remotely and in real time while reducing truck rolls for meter reading and service connect/disconnect.
- **Enhance customer service and choice** – Provide easy-to-understand information about electricity use along with tools to help manage consumption and bills.
- **Improve outage detection and restoration** – Ability to proactively detect, diagnose and repair electric grid problems to minimize and reduce outage frequency and duration.

TEC's innovative vision and interest in implementing a modern, multi-application network solution that is capable of supporting many applications in smart energy and smart cities was a key factor in the utility's decision to expand its partnership with Itron. After extensive industry research, TEC was confident that the quality of network service, effective use of open protocols, broad ecosystem and ability of the network platform to support multiple initiatives that Itron offered would ensure success as they continued on their utility modernization journey.

"It was Itron's IIoT network performance and capabilities that ultimately swayed us. For TEC, this was a strategic investment in a platform that could support our vision beyond AMI."

David Lukcic, Senior Director, Operations Technology & Strategy, Tampa Electric Company

Intelligence that Empowers

Distributed intelligence (DI) is the process of distributing analysis, decision-making and action to the edge of the grid by moving the solution closer to the problem. This helps evolve distribution grid operations and enhance the customer experience. Distributed intelligence is important because it provides power and control to edge devices, resolves issues quicker, manages transactions and power flows in real-time, predicts and manages energy needs across the entire network, delivers consumer-based insights to improve safety and address usage, and empowers an open and vibrant ecosystem of solution providers.

TEC chose Itron's distributed intelligence applications due to the long-standing relationship between the companies, the open network, smart meters with significant memory offered at a competitive price point, a growing developer ecosystem and Itron's vision for application development.

Exploring & Validating the Value of Distributed Intelligence

TEC decided to test the performance of back-office analytics versus DI to determine which option delivers maximum value while considering costs, finds conditions and opportunities in the field more effectively, uncovers feasibility of deploying apps, and provides a basis for other utilities to cite success and justify projects. This testing helped to justify an investment in newer technology with a greater upside potential. TEC predicted that by moving analytics to the meter with access to one-second data and peer-to-peer communications, they would realize:

- *Greater accuracy* in finding conditions, resulting in higher yield and less wasted resources,
- *Faster decisions* based on more valuable information (assuming the value of data degrades with latency) and
- *Increased benefits* from AMI investment.

The apps tested in the lab, over the course of one month, included: Meter Bypass Theft Detection, Residential Neutral Fault Detection and High Impedance Detection.

As detailed in Figure 1, the Meter Bypass Theft Detection DI app identified all 10 use cases. While the back-office analytics also identified all 10 use cases, they produced seven false positives.

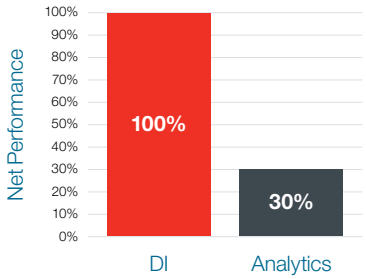
The Residential Neutral Fault Detection DI app identified all six use cases, while the back-office cloud analytics identified zero use cases since attributes required to identify broken neutrals are not present in the data available in the back office. The High Impedance Detection DI app identified five use cases, while cloud analytics identified zero use cases since attributes required to identify broken neutrals are not present in the data available in the back office.

In conclusion, TEC's predictions were correct in that DI's access to real-time data provided actionable information, the ability to tackle problems from an entirely different perspective and discovered events that are otherwise undetectable by back-office analytics. In addition, safety and customer impact issues would have gone undetected and there would have been costs associated with investigating false positives.

While not all use cases may be a fit for DI, when they are applicable, the value far exceeds back-office results. Distributed intelligence has delivered visibility to TEC that wasn't able to be previously measured and quantified. TEC is in the process of deploying these DI applications and are realizing exciting results. This phased approach will result in over 200,000 meters providing **intelligence that empowers.**

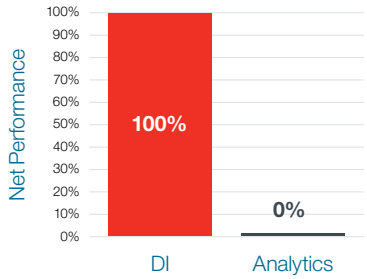
For more information about their DI field results, please read the white paper, *"Positive Proof for Distributed Intelligence at the Edge."*

Meter Bypass Theft Detection



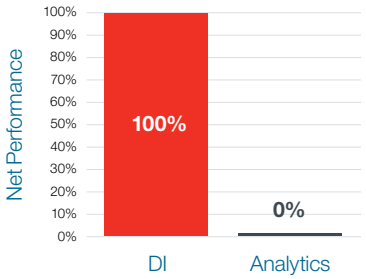
Events Created	10
DI Detected	10
DI False Positives	0
Analytics Detected	10
Analytics False Positives	7

High Impedance Detection



Events Created	5
DI Detected	5
DI False Positives	0
Analytics Detected	0
Analytics False Positives	0

Residential Neutral Fault Detection



Events Created	6
DI Detected	6
DI False Positives	0
Analytics Detected	0
Analytics False Positives	0

Net Performance = (Number Successfully Detected – Number False Positives) / (Number of Events) x 100%

Figure 1: TEC's Performance Evaluation of Distributed Intelligence to Back-office Analytics

Data Management for the Active Grid

Providing secure, accurate and reliable data to upstream systems facilitates efficiency, yet relying on multiple systems and databases maintained in isolation can create challenges. To make business operations function seamlessly, utilities rely on a data management system to create a system of record where consistent, secure and auditable processes are enforced.

After initially selecting a competing MDM solution, TEC chose Itron to evolve their data management vision and strategy, and was willing to partner with Itron to invest in the solution. With over 100 customers spanning six continents and more than 50 million meters in production, Itron Enterprise Edition™ is a highly scalable enterprise application that centralizes the collection, processing, storage and complex analysis of meter and other utility-related data. TEC selected IEE MDM to assist in consolidating the collection of data validation and estimation rules from multiple sources, across both residential and C&I customers, thereby leading to an increase in operational efficiency. In addition, it was crucial for TEC's MDM solution to support their current and future requirements, including integration and scalability requirements—as Florida is considered a "high load-growth state" with recent increased population growth.

As TEC was an existing AMR customer, Itron was able to successfully navigate the transition of migrating systems and keep billing online (all without the MDM in place) by delivering MDM data over four years in an AMR format to allow the deployment and back-office projects to run in parallel. More than 50% of TEC's meter population was deployed before the production MDM system went live. This was accomplished by making the AMI data look like AMR data to their existing systems.

Currently, TEC is actively leveraging the Interval Billing module to support their distributed energy management (DEM) project as well as migrating all meters from MV-90 to IEE Service Mode (a primary driver for TEC was the integration between Itron products and IEE Service Mode). By replacing their data collection solution and shifting to a hosted model, they gain the most value from their DEM and load control settlement solutions. This initiative is foundational to common data collection, storage and analytics for critical decision making.

IEE MDM also includes the SAP ISAIM adapter, Itron's meter data unification and synchronization solution that manages and utilizes robust meter data and is fully integrated with SAP for Utilities software. The ability to leverage a seamless productized integration was extremely cost-effective, decreased deployment time, minimized customization and provided maximum value—all of which played a key role in their decision.

Collaborating to Extend Value

Through a collaborative partnership, Itron and TEC conducted working sessions together to determine their needs and, as a result, built over 20 new functional requirements into the new release of IEE MDM. In addition, TEC is now involved in the requirements and pre-release process moving forward. This significant investment on both sides not only helps facilitate the advancement of IEE, but also builds upon, and extends, a solid relationship with TEC.

By extending data for growth and enabling a data-quality foundation, TEC continues to focus on "data governance" and utilize MDM as a system of record to contain all validated data. IEE MDM provides mission-critical data to deliver business outcomes—allowing TEC to gain operational efficiency while revolutionizing and accelerating the timeline to realize business value.

Enhancing AMI Operational Efficiencies

TEC is utilizing AMI Operations to extend their investment in AMI by ensuring day-to-day operations are seamless, productive and efficient. AMI Operations maximizes field efficiency by providing the ability to first interrogate endpoint issues in the back office thereby reducing field service work and creating logical work queues to make the most efficient use of field crew and equipment. AMI Operations ensures read rate SLAs are met, provides the tools to predict read rates through a 21-day bill cycle and proactively identifies issues that will cause a drop in meter-reading performance so that these issues can be remediated before their scheduled read date. AMI Operations also provides a number of tools to automate repetitive tasks, allowing the AMI Operations team members to focus only on outlier issues and on developing new automations as trends emerge.

Distributed Energy Management

TEC has worked with Itron since 2005 creating a time-of-use and critical peak pricing (CPP) program that has resulted in their current Energy Planner Program. There are roughly 5,000 residential homes enrolled in this program which reduces generation needs, utilizes existing capacity, and enhances customer satisfaction and value. Participants engage with a portal to program their HVAC systems, water heaters and pool pumps; monitor their appliance runtime; and reprogram their appliances to operate when it is most cost-effective. Participants are offered lower rates for electricity most of the day, major holidays and throughout the entire weekend, allowing them to take advantage of lower rates 87% of the time and enjoy an average annual savings of 6% (1,156 kWh) on their electric bills.

Energy Planner 2.0 will further utilize:

- Mesh and cellular networks for communication,
- IntelliSOURCE® for DRMS AMI to collect usage and CPP event performance,
- IEE MDM to calculate interval billing for participants during pricing events and
- Itron Global Managed Services to host and support applications.

Itron is delivering a total solution to modernize a long-standing and successful Demand-Side Management program.

Forecasting

Itron's forecasting team has been working with TEC for well over the last decade developing forecast models, assisting with regulatory filings and presenting to management on sales and energy trends. Itron has helped implement the Itron Load Research System (LRS) to support billing analysis, cost of service and forecasting work, and most recently assisted with developing a modeling framework for incorporating the impact of new technologies, including behind-the-meter solar and electric

vehicles, into their load forecasts. TEC's forecasting group have been long-time users of Itron's MetrixND®, MetrixLT™ and Load Research forecasting solutions to produce their financial and long-term resource plan forecasts.

SMART CITIES

Connecting Communities through Smart Streetlights and Beyond

Building off the experience of their grid modernization program, TEC looked to leverage their experience, technology infrastructure and partnership with Itron to identify new areas for driving efficiencies and creating long-term value. Outdoor lighting provided an ideal starting point since it is an essential community service for public safety.

Similar to legacy metering systems, aging street lighting infrastructure presented a variety of operational challenges. TEC's lighting service covered more than 220,000 streetlights, 95% of which were legacy high-intensity discharge (HID) luminaires, when the modernization journey began in 2018. This legacy system was highly inefficient and failure prone, with failure rates reaching nearly 25%. Given the lack of visibility to these legacy systems, the burden often fell on customers to file complaints to report outages. Additionally, HID luminaires degrade over time, which can dramatically reduce luminescence and impact safety on the roadways. Lastly, severe storms have the potential to cause frequent, widespread outages that require costly and time-consuming deployment of restoration crews.

Layering on smart street lighting and advanced smart city applications was a perfect fit given TEC's long-term vision to leverage Itron's multi-purpose IIoT platform to enable new operational programs and advanced services. The initial focus was a wholesale conversion of legacy fixtures, which would

address some of their most pressing concerns of wasted energy, system reliability, escalating costs, spare part obsolescence and decreased luminescence. TEC's long-term strategy aimed to extend these benefits by offering innovative services for communities within their service territory.

In total, TEC's network will connect about 260,000 streetlights using Itron's industry-leading smart street lighting solution. Extending their network to connect critical smart city assets, TEC could provide system-wide visibility and real-time asset management to enhance their lighting services with greater efficiency and quality of service. While the traditional response to outage mitigation involved costly and time-intensive field surveys to identify device failures, modern LED lighting connected with smart controls promised to reduce field mobilization for outage restoration (utilizing real-time communications to detect failures), diagnose the source of failure and send a targeted response.

> TEC has already achieved significant benefits from its smart street lighting initiative, with operational savings of more than $2.5M per year and accelerated restoration response by more than 72%.

Having demonstrated initial benefits of their smart community program, TEC is looking ahead to continue to leverage its multi-application platform to deploy additional smart city applications that will deliver economic benefit, improve quality of life and expand environmental stewardship. Itron's open ecosystem of technology partners features solutions covering all critical domains of smart city applications, offering a variety of growth opportunities for TEC to unlock additional benefits for the community through advanced applications like smart parking and gunshot detection. To that end, TEC has embraced a collaborative approach, including a strategic partnership with the University of Central Florida to create a program to pilot, evaluate and scale emerging smart city solutions. The program centralizes the process for demonstrating, evaluating and publishing the outcomes from smart city solutions, thereby streamlining the go-to-market process for innovative new services. Further, the flexibility of the network canopy will enable TEC to extend benefits of IIoT-enabled services like traffic monitoring and water management to neighboring communities, such as the City of Tampa and other smaller municipalities within TEC's service territory.

GLOBAL MANAGED AND DELIVERY SERVICES

From a technical solutions perspective, Itron Global Managed Services (GMS) provides a Software as a Service offering for a number of Itron products (IEE MDM, AMI Headend and Streetlight.Vision) that will support over 800K endpoints and approximately 210k streetlight endpoints once completed. In addition, a Disaster Recovery service is being provided to TEC that will deliver geographic resiliency to core TEC systems with a contractually required Recover Point Objective (RPO) and Recovery Time Objective (RTO).

A recent migration to an improved Tier 4 hosting datacenter (Switch Las Vegas), utilizing analytics within Microsoft Azure, and scaling up the system to mirror deployment was conducted jointly by the GMS and Delivery teams, in close collaboration with TEC. These efforts align with long-term technical strategies to provide TEC with improved features, security, system resiliency and endpoint scalability. Simultaneously, TEC was able to undertake more initiatives and mitigate risks since their IT staff was able to shift to an advisor role, audit best practices and focus on more critical functions while the Itron team specialized in the development and support of technology. This enabled TEC to move more swiftly with the pace of business, take on more projects, leverage compliance skills within the organization and get fixed costs with defined service level agreements. As TEC's project has grown, Itron technology and managed services are able to keep pace to scale as they scale—with less effort and cost.

Ultimately, TEC took the impossible and made it possible. Other than their CIS, TEC changed and migrated most systems and processes concurrently while deploying AMI. This was achieved because they established a foundation of technology and services upon which to create, build and extend value.

CONCLUSION

Improvements in outage detection and restoration, increasing operational savings and the ability to both enhance customer service and provide customers with more choice are all possible with technology that is available today. Through its investment in technology and vision for the future, TEC has positioned itself to not only better manage its resources today but also address the challenges and open the door to countless possibilities for new outcomes tomorrow with a smarter, active grid.

Itron and TEC are excited to deliver on the promise of transformational value and explore the "art of the possible" through partnership, technology and innovation.

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