Guam Power Authority

Smart Grid Project

Scope of Work

The Guam Power Authority's (GPA's) Smart Grid Project involved a territory-wide deployment of advanced metering infrastructure (AMI) and integration of the AMI with an outage management system (OMS). GPA also implemented substation automation equipment including voltage regulators, fault indicators, smart relays, and transformer monitors. An energy management system was deployed to leverage the new automation assets. Customers now have the ability to install devices that assist in managing electricity use and costs, including in-home displays and home area networks.

Objectives

The new AMI and substation automation improve reliability and stability of GPA's electric system, reduce operating costs, and accommodate future deployment of distributed generation. Integration of AMI and OMS enables faster outage identification and restoration, real-time calculation of outage indices, and more efficient dispatch of field resources. Improved reliability and automated meter reading leads to fewer trucks rolls and, in turn, a smaller carbon footprint. A web portal and the ability to utilize customer devices give GPA's consumer base tools to better manage energy use and costs, empowering informed decisions and enhancing the customer experience.

Deployed Smart Grid Technologies

- **Communications infrastructure:** Meter communications and backhaul networks enable two-way communication between the head-end system, smart meters, and substation automation assets.
- **Advanced metering infrastructure:** The project involved territory-wide deployment of more than 50,000 smart meters to both commercial and residential customers. The meters provide customers with home area network connectivity, allowing customers to install additional energy management tools such as energy management systems. The smart meters also reduce meter operations costs and electricity theft.

At-A-Glance

Recipient: Guam Power Authority

Territory: Guam

NERC Region: N/A

Total Project Cost: $33,213,756

Total Federal Share: $16,603,507

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment

- 50,233 Smart Meters
- AMI Communications Systems
  - Meter Communications Network (4.9 GHz wireless mesh)
  - Backhaul Communications (fiber and RF)
- Outage Management System
- Customer Information System
- Energy Management System
- Customer Web Portal
- Substation Automation Equipment for 7 out of 29 Substations
  - Substation Automation Communications Network (fiber)
  - Voltage Regulators
  - Digital Relays
  - Transformer Monitors

Key Benefits

- Reduced Meter Reading Costs
- Reduced Operating and Maintenance Costs
- Improved Electric Service Reliability and Power Quality
- Reduced Costs from Equipment Failures, Distribution Line Losses, and Theft
- Reduced Truck Fleet Fuel Usage
- Reduced Greenhouse Gas and Criteria Pollutant Emissions

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- **Outage management system:** GPA integrated the AMI system with an OMS, which includes a fully detailed circuit model integrated with a meter data management system and customer information system. GPA also integrated AMI data with their enterprise planning system and supervisory control and data acquisition (SCADA) system.
- **Advanced electricity service options:** A web portal enables customers to view their electricity usage and costs so that they can better manage their consumption and bills. Customers can also use their own in-home devices to access consumption data.
- **Energy management system:** GPA deployed this equipment to better utilize the automation assets and improve distribution system reliability and operational efficiency.
- **Substation automation systems:** GPA installed smart relays and equipment health sensors (transformer monitors), enabling advanced transmission and distribution activities and information exchange through data acquisition from the power grid. GPA also upgraded system protection practices and substation metering to better account for system losses and to enable remote reading of revenue meters with power quality functions.

Benefits Realized

- **Reduced meter reading costs:** GPA is now able to remotely and reliably read over 50,000 meters using the AMI system. From project initiation to August 31, 2014, the average savings due to reduced meter reading costs were resulting in $433,417 per year.
- **Reduced operating and maintenance costs**: GPA's AMI system has allowed GPA to save approximately $120,990 per year in meter operations costs from project initiation to August 31, 2014. The AMI system helped Guam significantly reduce the need for manual meter operations, mainly through automated meter reading and automated service switching.
- **Reduced truck fleet fuel usage and greenhouse gas emissions:** As meter reading, troubleshooting, service connects, and service disconnects can be done remotely, Guam has a reduced need to roll trucks, resulting in reduced fuel usage and associated emissions.
- **Improved electric service reliability and customer service:** Operations personnel can remotely ping meters during outages to confirm service restoration rather than deploy field crews or call customers for verification. This not only saves the utility time and money but allows for more efficient service restoration.

Lessons Learned

- GPA assembled a dedicated implementation team. Additionally, GPA contracted for program management office services to work alongside the core project team. Assembling a team focused exclusively on professionally managing the project proved crucial given the scale of the deployment and the size of the utility.
- In order to overcome initial challenges posed by organizational silos, the GPA project team pushed for increased commitment, alignment, and partnership from multiple divisions and project players across the GPA organization, including operations, customer services, communications, engineering, IT organizations, program management office, and the general manager for consolidated utility services.
- The GPA general manager created a project issue resolution team to resolve implementation issues quickly to protect the project schedule. This committee enabled a significant increase in project momentum.
- Executive leadership engagement and buy-in is critical to the success or failure of projects involving enterprise-wide changes in processes and technology.

Future Plans

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- GPA plans to implement additional grid analytics applications.
- GPA will launch extensive demand-side management programs. On the list for consideration are time-of-use pricing and direct load control including interruptible load. These rate programs may be supplemented by customer systems such as home area networks, and customer energy management systems.
- GPA is investigating the use of renewable energy sources and currently focusing on possible incorporation of solar energy.
- GPA is expanding their fiber and wireless networks to cover the southern portion of the island and handle communications for water and wastewater.
- GPA will bid a mobile workforce management system.
- GPA will replace their existing SCADA system.
- GPA is preparing to issue a request for bids to implement an energy storage system.
- GPA is in the process of making pre-paid metering available to customers, which can be integrated with the web portal.

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