

Vermont Transco, LLC

eEnergy Vermont

Scope of Work

The Vermont Transco eEnergy Project is a collaboration of 11 publicly owned and investor-owned utilities in Vermont, as well as the statewide energy efficiency utility, Efficiency Vermont. The project deployed advanced metering infrastructure (AMI), including 305,464 smart meters across the state, and provides two-way communication between customers and the utilities. The project also installed automated voltage regulators and supervisory control and data acquisition (SCADA) equipment at selected substations. The scope of work included assessment of time-of-use and peak-time rebate programs through statistically rigorous consumer behavior studies that involved consumer web portals and in-home displays. Although all project equipment has been deployed, data gathering and analysis from the studies is ongoing.

Objectives

The project aimed to increase energy efficiency and thereby reduce energy consumption and environmental impacts. The AMI deployment gives customers the tools necessary to better manage their electricity usage and help reduce peak loads on the system. Distribution automation equipment enables more efficient management of the distribution system and reduces operations and maintenance costs.

Deployed Smart Grid Technologies

- **Smart meters:** The project deployed 305,464 smart meters covering nearly 90% of all Vermont customers. The meters allow the utilities to view near-real-time usage and power quality information, and customers can also access consumption information through in-home displays or the new web portal.
- **Meter data management systems:** Three MDMSs were installed to process consumption and event data that are relayed back from the AMI meters. Those data are validated in the MDMS prior to customer bill generation. Meter data management functions were hosted offsite for some of the smaller participants.

At-A-Glance

Recipient: Vermont Transco

State: Vermont

NERC Region: Northeast Power Coordinating Council

Total Project Cost: \$137,767,170

Total Federal Share: \$68,883,585

Key Partners: Burlington Electric Department, Central Vermont Public Service, Green Mountain Power Corp., Group of Municipal Electric Utilities, Stowe Electric Department, Vermont Electric Cooperative, Vermont Energy Investment Corporation, Vermont Transco LLC, Washington Electric Cooperative

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment

- 305,464 Smart Meters
- AMI Communications Systems
 - Meter Communications Network (RF Mesh, Power line carrier (PLC))
 - Backhaul Communications (RF LAN)
- Meter Data Management Systems
- Customer Web Portal
- 1,091 In-Home Displays
- Distribution Automation Equipment for 62 out of 447 Circuits
 - Distribution Management System
 - Distribution Automation Communications Network
 - SCADA Communications Network
 - Outage Management System
 - Automated Distribution Circuit Switches
 - Automated Voltage Regulators
 - Equipment Condition Monitors

Time-Based Rate Programs for 500+ Customers

- Time of Use
- Peak-Time Rebate

Key Benefits

- Reduced Meter Reading Costs
- Improved Operations
- Improved Customer Service

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- **Communications infrastructure:** A large portion of the meters utilize radio frequency (RF) mesh technology for the meter communications network. Power line carrier (PLC) was utilized by the state's two cooperative electric utilities. A ZigBee-enabled RF local access network (LAN) system uses gatekeepers on a private wireless network for AMI data backhaul.
- **Distribution automation systems:** Distribution line circuit breakers, fault indicators, circuit metering, smart relays, automated switches, feeder monitors, and voltage regulators were installed on 62 circuits. This upgrade increases operational efficiency of the Vermont distribution system while lowering operations and maintenance costs. SCADA remote terminal units were installed at several substations to expand the SCADA network, and a new outage management system reduces restoration times by making it easier to identify and pinpoint power outages.
- **Advanced electricity service options:** The project provided over 1,000 in-home displays. In addition, a new web portal provides customers with interval consumption data, rate comparison tools, and features of social networking, facilitating a two-way information exchange that helps customers better manage their energy usage.
- **Time-based rate programs:** Time-of-use (TOU) rates were already available to most Vermont consumers, but the new AMI system enabled development of a peak-time rebate tariff and more granular TOU measurements. Peak-time rebates provide additional financial incentives for consumers to shift usage from on-peak to off-peak periods. In addition to empowering customers, time-based rate programs help the local utility reduce the amount of electric capacity required, thus allowing investment in distribution capacity expansion to be deferred.

Consumer Behavior Study

Vermont Transco is performing a statistically rigorous assessment of the relative merits of several time-based rate program options and information treatments on a subset of residential customers in Vermont. This is a randomized study involving both treatment groups and control groups. The options include (1) opt-in variable-peak pricing, (2) opt-out flat pricing with peak-time rebates for critical events, and (3) opt-in flat pricing with critical peak price events. Information treatments include a web portal, in-home displays, and appliance controls. The study explores how consumers respond to these pricing options and information treatments, with the final goal of estimating the impacts on total electricity use and hourly load profiles using information collected through advanced meters. This study also compares transition effects for two groups of customers: those who transition from flat pricing to critical peak pricing, and those who transition from peak-time rebates to critical peak pricing.

Benefits Realized

- **Reduced meter reading costs:** Labor and equipment costs were reduced as a result of remote reading of meters, and theft and tamper detection allows for quick identification of issues at the service point.
- **Improved operations:** Automated systems provide real-time actionable data for operation of the grid. Rich data sets allow for data-driven decisions and improve system planning efficiency due to the availability of actual load data.
- **Improved customer service:** Access to detailed customer usage and meter event data allows utilities to resolve issues and concerns quickly.

Lessons Learned

When deploying AMI in a mountainous environment, a robust communications infrastructure is critical. Ensuring that complementary communications platforms are available greatly increases the odds of project success.

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For projects that involve collaboration between multiple entities, schedules must allow enough time to ensure consensus as the group makes decisions.

Future Plans

Vermont is now planning on leveraging its Smart Grid assets to help in developing innovative ways to integrate renewable and distributed generation into the grid.

Contact Information

Allen Stamp
Project Manager
Vermont Transco
astamp@velco.com