Rhode Island Power Sector Transformation

Advanced Grid Capabilities

August 20th, 2017

Goal	Capability	Description
Security and Resiliency	Automated islanding and reconnection (microgrid) control	Automated islanding and reconnection is achieved by automated separation and subsequent reconnection (autonomous synchronization) of an indepen interconnected electric grid. A microgrid is an integrated energy system consisting of interconnected loads and distributed energy resources which, as an island. (NY)
	Fault Location, Isolation, Service Restoration (FLISR)	FDIR is a collective term for the process of identifying the location of a fault condition on the system through the use of current and voltage monitoring d fault (e.g., opening two switches on either side of the fault); and, restoring service to the customers in the unaffected areas (i.e., not in the isolated sectic programmed restoration scenarios that rapidly respond to equipment load ratings and real-time system load measurements. Such advanced applications Although FDIR is sometimes referred to as a "self-healing grid," it is important to note that the fault is not corrected until Distribution Company workers into service. (MA)
	Automated Feeder Reconfiguation	Automated feeder reconfiguration refers to the constant monitoring of the status of the distribution system (e.g. voltage and load conditions) and the ab to avoid an overload situation. Some FDIR systems also support automated feeder reconfiguration capability that enables restoration of service to the gr monitoring. (MA)
	Remote Monitoring & Diagnostics (equipment and system conditions)	Remote monitoring and diagnostics for system conditions consists of data collected via SCADA systems, to include voltage, loading, current, power factor feed planning models, support advanced load forecasting and enable analytics that can improve and optimize system planning and operations. Remote n more frequent data on the status of system equipment (e.g., oil samples from substation transformers). A Distribution Company may use these data to ic day-to-day asset utilization and support condition-based maintenance programs. (MA)
	Adaptive protection	Adaptive protection uses adjustable protective relay settings (e.g., current, voltage, feeders, and equipment) in real time based on signals from local sens feeder transfers and two-way power flow issues associated with high DER penetration. (NY)
	Outage and restoration notification	Provides power status information down to the customer service point. Upon loss of power or restoration of power, status sensors will send a notificatio deliver the message to a reliability operator or system. Sensors should be capable of measuring load side power status and sending a notification messag
	Dynamic event notification	Automatic notification by the DSPP to market participants of events including, but not limited to: price changes, incentives, penalities, or special circumst events or conditions that may effect electrical network performance or availability such as equipment failure, weather or other hazards; achieving or exc Such notification would be intended to provide market participants the ability to respond to important situations or conditions in a timely manner.(NY)
Facilitate Consumer Choice	Time Varying / Dynamic Pricing	Time varying rates (TVR) changes the price customers pay based on time of day such that the rate is higher during periods of peak demand. At the most e wholesale market prices. In more traditional pricing structures, customers pay a different rate for a given number of hours every weekday, coincident wi rates is a critical peak price or peak-time rebate that is typically implemented for a limited number of critical peak events when the system is constrained a higher price during critical peak periods, whereas a peak-time rebate provides customers with a credit or rebate for reducing usage during the same cri
	Home Area Network Communications Capability	A home area network (HAN) is a network of energy management devices, digital consumer electronics, signal-controlled or enabled appliances, and appl the electric meter13. A HAN provides customers with access to usage data in more frequent time increments than once-monthly billing information. Reta through a HAN. For example, a customer may program controls in the home to increase the set-point on the air conditioner in response to a critical peak HAN to the customer's meter, the meter must have a HAN communication module installed and activated or be otherwise able to communicate with the energy management purposes without requiring a connection to the meter. (MA)
	Energy Usage Visibility	Allow customers to view, and to assign others to view, their energy usage data
	Demand Side Management Options	Support systems and software to manage a range of customer-side energy resources

Integrate Renewables	Remote Distributed Generation Disconnect	Remote disconnect is technology that enables a Distribution Company to use automation to remotely disconnect a distributed generation facility from th customers. (MA)
	Energy storage	Storage of electricity for later use. An electricity storage device can convert electricity into another form of energy in its charging state, and then produce storage device can be stationary or mobile depending on its application. Most electricity storage devices include an inverter or converter so as to work w
	DER power control	Adjustment of status and power output or consumption for electricity producing/storing distributed energy resources. The purpose is to control the real be achieved by delivering an instruction to the DER power inverter/converter, charge controller or similar control system. (NY)
	DER power factor control	Adjustment of status and power output or consumption for electricity producing/storing distributed energy resources. The purpose is to control the real be achieved by delivering an instruction to the DER power inverter/converter, charge controller or similar control system. (NY)
	DER optimization	Determine the values for the controllable factors of one or more DERs to maximize, minimize or balance system performance on either side of the DSPP s to, energy efficiency, reliability, supplying peak demand, or providing ancillary services such as frequency regulation or reserves. (NY)
	Algorithms and analytics for Customer/DER/Microgrid control and optimization	Software that can utilize operational and non-operational data from network sensors, equipment health sensors, weather instruments, and other operat identify abnormal conditions and determine optimum set points or topologies for network elements. (NY)
Control Energy Costs	Integrated and Automated Volt/VAR Control, Conservation Voltage Reduction	Volt/VAR management is the term for technology that measures voltage and power factor on the distribution system and corrects imbalances to minimiz Next generation systems may include centralized processing with the ability to perform feeder-specific, substation-specific and area/region optimization. photovoltaic (PV) cells and other resources through the use of controllable inverters for VAR support. Conservation voltage reduction refers to the active reduce energy consumptions and peak demand. Next generation systems may include centralized processing with the ability to perform feeder-specific, s
	Utility/3rd party Load Control	A load control demand response program is one where a signal is sent to a customer device (e.g., programmable controllable thermostats, water heaters instructing that device to reduce electricity consumption. A two-way signal allows the sender of the signal to confirm whether the device has responded program may be implemented by a Distribution Company or third party. (MA)
	Remote Monitoring & Diagnostics (system conditions)	
	Load leveling and shifting	Load leveling and shifting alters the pattern of demand to more closely match output from non-dispatchable, intermittent distributed resources such as s and localized disturbances typically associated with high levels of intermittent distributed generation. Advanced applications may enable Distribution Co operations. Such applications may include: on-site battery storage for active energy support; and voltage "ride through" capabilities that enable distribut (MA)
	Advanced Load Forecasting	Advanced load forecasting is the process of making more accurate and discrete predictions about future system loads based on customer usage data. Im generation. Such forecasting may also include distributed generation and other resources, including demand response and electric vehicles. (MA)
	Real-time load monitoring	Provides real-time measurement of energy consumption at the customer premise or device level. This could be accomplished using voltage and current s sensor. The sensors would be connected to a communications network capable of delivering load measurements to a central monitoring system in interv
	Real-time network monitoring	Provides real-time measurement of voltage and current within the transmission and distribution network, including primary distribution feeders, laterals resolution view of voltage and load profiles throughout the network suitable for use in operations and real-time optimization algorithms. Sensors could b reclosers, voltage regulators, capacitor banks, transformers, or other dedicated sensor hardware. The sensors would be connected to a communications monitoring system in intervals of one hour or less (more frequently). (NY)
	Real-time load transfer	Real-time load transfer is achieved through real-time feeder reconfiguration and optimization to relieve load on equipment, improve asset utilization, im performance. (NY)
	Algorithms and analytics for Grid control and optimization	Software that can utilize operational and non-operational data from network sensors, equipment health sensors, weather instruments, and other operat identify abnormal conditions and determine optimum set points or topologies for network elements. (NY)
	Power flow control	Flow control requires techniques that are applied at transmission and distribution levels to influence the path that power (real & reactive) travels. This us angle regulating transformers (PARs), series capacitors, and very low impedance superconductors. (NY)
	Dynamic capability rating	Dynamic capability rating can be achieved through real -time determination of an element's (e.g., line, transformer, DER, etc.) ability to carry load based

Workforce Management	Mobile Workforce Management Systems	The capability to communicate the status of assigned work projects between workers and a dispatch office and to automatically receive updates and cha
	Mobile GIS Platforms	The capability to allow employees to locate themselves and distribution assets through a mobile application.
Market Functionalities	Market-based demand response	Demand response that can be targeted at certain market participants to optimize system performance. Response incentives and penalties would be calcu demand, congestion, energy efficiency or other factors. (NY)
	Dynamic electricity production forecasting	Calculation and forecasting of electricity production from DER based on geography, forecasted fuel supply, solar insolation, wind speed, electrical networ quality of electricity. Production forecasts would change with changes in input data. The purpose of the forecasts would be to provide supply informatior prices in the DSPP market. (NY)
	Dynamic electricity consumption forecasting	Calculation and forecasting of electricity consumption based on ambient temperature, weather, day of week, time of day, electrical network conditions, electricity. Consumption forecasts would change with changes in input data. The purpose of the forecasts would be to provide demand information to DS and ancillary services prices in the DSPP market. (NY)
	Historical DER performance monitoring	Monitoring and archiving of DER performance data including electricity production and services, availability/uptime, pricing, and other factors that woulc production forecasting. This information would help DSPP grid operations, supply planning and market operations. (NY)
	Historical load monitoring	Monitoring and archiving of customer electricity consumption would aid in the development of detailed dynamic load models and load forecasting. This i market operations. (NY)
	M&V for producers and consumers (premise/appliance/resource)	Measurment and verification of electricity production and consumption by market participants. This could be done at the DSPP point of service, or at ind accurate billing and payment for market participants, and to help ensure a robust and trustworthy market. (NY)
	Participant registration and relationship management	Qualification (e.g. credit and performance checking) of new participants. Management of participant interactions such as service compl satsifaction levels. Management of promotions, marketing, customized services and solutions, relationship building. (NY)
	Confirmation and settlement	Includes receiving confirmation of market participant commitments, e.g. advanced comfirmation from DER that energy will be supplied comparison of actual energy production or consumption according to commitment in terms of quantity, quality, timing etc., tracking an escalations. Netting functions may be incorporated to offset outstanding invoice or receivable balances. (NY)
	Billing, receiving and cash management	Generation of invoices and statements. Cash management functions and banking or financial intermediary interfaces resulting in the re payables due to providers. Credit/collections processes occurring from delinquencies. (NY)
	Free-market trading	Capability for participants to make offers or bids, likely through a cooperative or other intermediary, enhancing a competitive energy m
	Algorithms and analytics for Market Information and Operations	Software that can utilize market data from producers and consumers to analyze market performance, identify abnormal conditions and determine key su to continually improve market performance and the value of products and services being transacted. (NY)