Silver Spring® NETWORKS

WHITEPAPER

How Utilities Can Capitalize on the Consumerization of Demand Response

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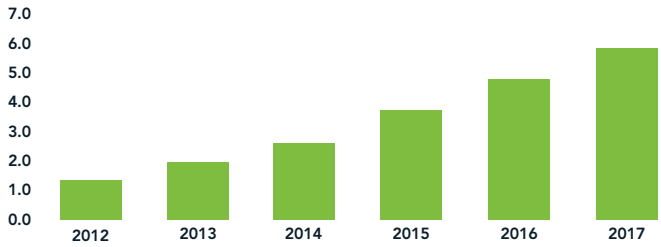
The consumer electronics and energy markets have reached a significant inflection point as a result of new devices and smart grid networks. Programmable communicating thermostats (PCTs) and other "smart home" technologies are becoming readily available from retailers such as Best Buy and Lowe's. Consumers can install PCTs and control them remotely using a smart phone, tablet or computer.

Thanks to increasing media attention and the work of climate activists, consumers are more aware of the impact of their energy usage on the environment. Many are looking to use energy more efficiently in order to reduce that impact as well as to save money. Shipments of PCTs that consumers can control via smartphone and tablet are projected to quadruple by 2017, driven by high demand in North America, according to IMS Research. The firm estimates that 1.9 million such thermostats will ship in 2013, a 46 percent jump over 2012, as shown in figure 1.

This is good news for utilities. Rising demand for PCTs makes it clear that there's growing consumer acceptance of energy management. Customer-owned PCTs also represent a potential new demand response (DR) resource that utilities can call upon to curtail peak demand. Utilities that get out in front of this trend have the opportunity to bring customer-owned PCTs into their portfolio of DR programs and increase the value of their relationship with customers.

Figure 1

IHS IMS Figure: Worldwide Shipment Forcast for Remote Access and Control Thermostats (Millions of Units)



Market forecast for programmable communicating thermostats

In today's "there's an app for that" culture, utilities that don't respond to this trend risk losing control —and customer relationships--to third parties ranging from security companies, telecoms, and PCT vendors acting as DR aggregators. Leveraging the right smart grid solution is key to aligning with consumer enthusiasm, offering additional value to customers, and meeting utility goals for better management of energy generation and peak demand.

Silver Spring Networks can help you take advantage of the new generation of PCTs and tap the growing market for demand response. Our smart grid solution ensures you can meet your DR goals with predictable, reliable load shed and consistent customer engagement across your entire portfolio of DR programs, including both consumer- and utility-owned devices.

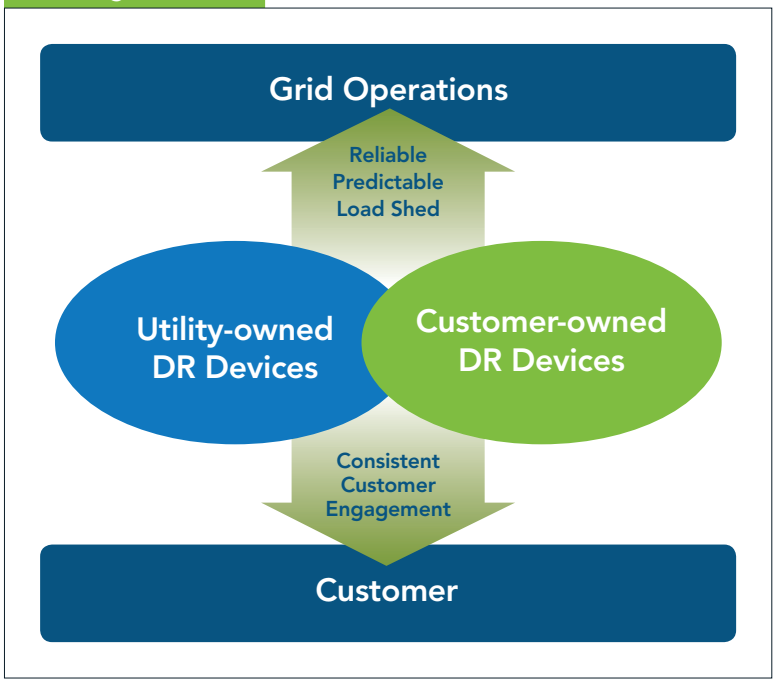
Understand the role of consumer-owned devices in DR

Utilities have traditionally operated residential DR programs by deploying their own devices to remotely turn off customer air conditioners and other appliances. With growing consumer demand for PCTs sold at retail stores, utilities have the opportunity to expand DR to a greater number of residential customers. Participation rates associated with these devices are forecast to increase substantially in the next five years. A key benefit is that utilities don't have to pay to install and service customer-owned devices; customers have self-interest

in properly maintaining the operation of gear they own. Customer ownership reduces the utility share of DR program costs, which can substantially improve overall program cost effectiveness.

While industry trends are encouraging the use of customer-owned devices to save energy, it will take years for these devices to reach critical mass. Even with high participation rates, utilities may find it more difficult to shed load predictably and manage demand reduction targets.

Figure 2



A mix of both customer and utility devices balances the needs of customers and grid operators

In contrast, the predictability, reliability and timeliness of load shed have been high for utility-owned devices even though participation rates have traditionally been low. There will continue to be a large segment of customers who prefer a utility-owned and installed device, including those who are not technically savvy enough to install and maintain the device and low-income customers who cannot afford a $200 to $300 thermostat.

Consequently, utilities should plan to support both consumer-owned and utility-owned devices within a portfolio of DR programs.

Combining these approaches as shown in figure 2, while accounting for strengths and weaknesses, will give utilities the greatest flexibility to manage energy resources. A combined approach also ensures high overall engagement and the greatest value to customers.

Take full advantage of the smart grid

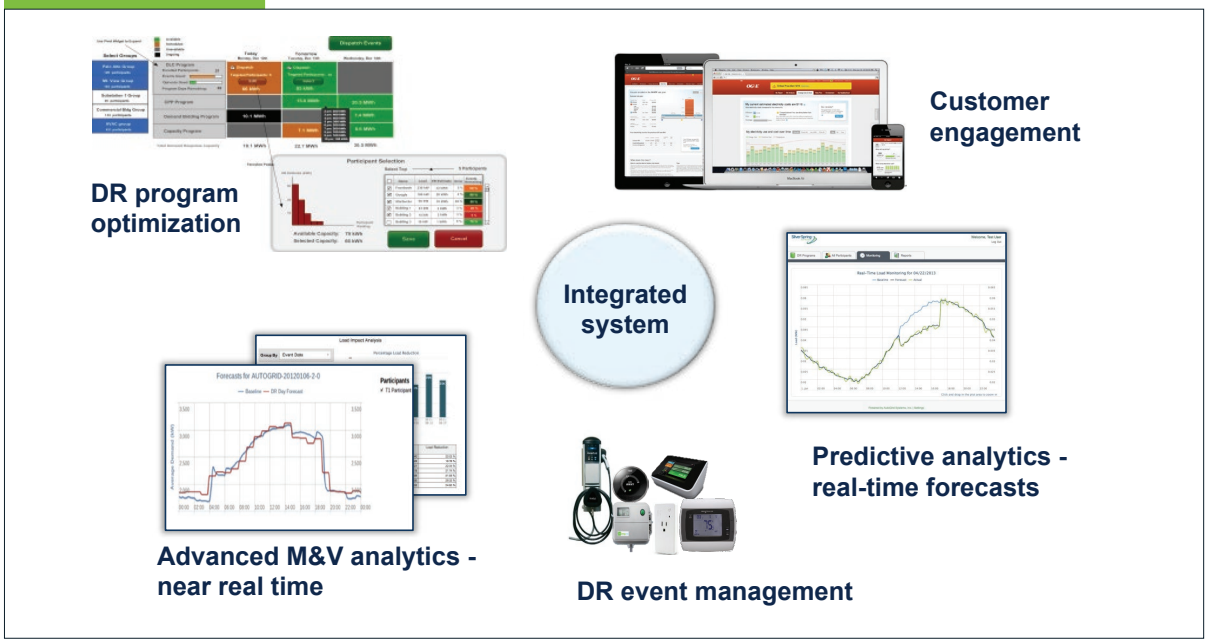
Regardless of who owns the device, utilities need DR programs that are tailored to customer needs, whether price-based or through direct load control (DLC), and a way to consistently manage customer relationships across devices and programs, including an effective method of engaging customers. They also need an automated, accurate method of forecasting, dispatching and verifying DR events.

A smart grid network helps address these challenges by providing two-way communications to smart meters and other in-home devices, which is key to effectively managing consumer-owned thermostats and unlocking additional value for utility-owned DR devices. A smart grid network should provide continuous two-way communication and ubiquitous connectivity to all customer devices, enabling operators to dispatch DR commands, measure load reductions, and support new customer-friendly capabilities such as allowing DR participants to opt-out of events directly on the PCT.

A smart grid solution must include a full-featured Demand Response Management Systems (DRMS) that lets operators manage a portfolio of disparate programs, including both utility- and customer-owned devices; reduce cost and complexity; and increase program effectiveness. The right DRMS solution, illustrated in figure 3, enables utilities to meet their DR goals, including:

- Predictability of load shed by providing precise forecasts of future grid load and load shed potential based on planned DR events;
- Broad customer participation by delivering effective program engagement through multiple channels of communications with rich, contextual energy usage and pricing information;
- Unified management multiple DR programs and the ability to optimize this portfolio by automatically recommending the best mix of programs and technologies to achieve the target load shed at any given time; and
- Highly accurate, consistent and fast measurement and verification (M&V) based on near real-time monitoring and reporting of baseline, forecast, and actual load reduction achieved.

Figure 3



New generation demand response system elements

Utilities with legacy one-way DR systems should begin upgrading to two-way smart grid technology to reduce DR program cost and drive greater benefits from their programs. By taking advantage of smart grid capabilities, utilities can boost the effectiveness of current DR programs and be well positioned to bring the increasing number of consumer-owned devices under their DR umbrella.

Reaching customer-owned DR devices

Many of the new off-the-shelf PCTs communicate primarily over the customer's home broadband connection. Often the thermostat vendor or home automation provider offers a cloud-based service or application for controlling the thermostat and other home automation devices. Consumers use their smartphone or table to interact with a web-based service or application in order to remotely control their thermostat, lighting and other smart home systems.

A standards-based approach connects customer-owned home area network (HAN) devices through a smart meter and an interface such as the ZigBee Smart Energy Profile specification. Using smart meters as the gateway into the home makes it easy for utilities to address consumer demand for PCTs while ensuring they can communicate directly with such devices over the smart grid network to deliver commands, pricing information, etc. In addition to gaining direct, ubiquitous access to consumer-owned devices for DR control, this smart grid approach ensures that utilities maintain a strong relationship with their customers, mitigating the risk of disintermediation from their customers by a third party.

Alternatively, utilities may partner with PCT vendors and integrate with vendor-specific devices and software in order to dispatch commands to the thermostats. However, this one-off systems integration approach can entail considerable time and expense depending on the number of PCT/home automation vendors supported and the complexity of the integration. Emerging standards such as OpenADR seek to address the back office integration challenge but the residential broadband/WiFi communications to the device can still be unpredictable, making it difficult for utilities to accurately predict and shed load.

Consider new pricing incentives for consumer-owned devices

Motivating customers to participate in DR using their own devices may call for different incentives. Utilities can consider providing rebates or other incentives for customers who agree to purchase approved PCTs and participate in a DR program. For example, after identifying specific thermostat manufacturers and where customers can purchase those devices, a utility can inform customers and offer them a rebate when they sign up for a DR program.

In addition, these customers can be rewarded based on their actual load reductions. Rather than offer an annual rebate or payment for participating in a fixed number of DR events, utilities may want to push dynamic pricing information to customer-owned PCTs, energy displays, smartphones or other devices and let the device/customer respond—and be compensated--on a per-event basis for the number of kilowatts saved.

Smart meters can provide the consumption data that operators need to track energy usage and responses to DR events, and to better align customer incentives and payments with load reductions. A utility may want to seek approval for new rates, such as a dynamic rate structure, designed specifically to appeal to DR customers who participate using their own PCT or other devices.

Smart meters are key to getting these pilots going, setting up new rate structures, and ensuring that utilities capitalize on the consumer DR trend rather than simply react as the market unfolds.

How Silver Spring can help

In steadily increasing numbers, utility customers are choosing to better control their energy consumption using off-the-shelf technology. The best way for utilities to capitalize on this market trend is to embrace it. Use customer-owned devices to do what they're best at, which is deliver high participation rates. Continue to invest in DR programs based on utility-owned devices. The Silver Spring Networks' comprehensive DR solution combines the key elements necessary to capitalize on these market dynamics.

- A unified platform built on open standards, leveraging a single network to support multiple smart grid applications
- Continuous two-way communications from in-home devices to the head end ensuring connectivity even in areas not reachable by paging, cellular and broadcast
- Support for ZigBee communications from Silver Spring-equipped smart meters to devices such as thermostats for automated response to events
- On-demand forecasting and real-time measurement and verification (M&V)
- Load shed optimization that maximizes resources for load reduction and unifies diverse DR programs
- Consistent customer engagement across multiple channels

Numerous utilities have already implemented successful DR programs using Silver Spring's smart grid solution. These include a wide variety of price-based and direct load control programs.

Expand the reach of DR

Utilities can take advantage of the growing interest in energy management by getting out in front of the customer-owned device trend. The key is to support customer-owned devices on your terms, and to incorporate these devices into a broader DR portfolio that also includes utility-owned devices.

Leveraging a smart grid for DR enables utilities to manage peak capacity and avoid the need to build new generating facilities while improving customer satisfaction through proactive engagement. You maintain a solid relationship with customers and they benefit from the ability to actively manage their energy use for greater savings.

Silver Spring Networks can help you grow a robust DR portfolio that delivers reliable, predictable load shed and consistent customer engagement. Our proven DR solution ensures you can optimize load shed across multiple programs encompassing both utility-owned and customer-owned devices. By providing effective customer engagement, forecasting and M&V over a secure, high-performance network, Silver Spring can help you build value with DR.