Moving on Up(stream) with Automated Demand Response Technologies

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ABSTRACT

While the upstream incentive program model is not new, it has never before been applied to automated demand response technologies. Southern California Edison is piloting a program during 2013-2014 that targets incentives to distributors and manufacturers to integrate automated demand responsive controls with their sale of high efficiency heating, ventilation, and air conditioning equipment to commercial end use customers. This paper describes the pilot scope, and provides an update on progress, challenges, lessons learned, and next steps. Results, including kW of load shed made available, are pending following conclusion of the pilot at the end of 2014.

The pilot fulfills several objectives for SCE, including integrated demand side management (IDSM), increased program efficiency, and expanding renewable energy integration in California. The California Public Utilities Commission has directed all investor-owned utilities to implement IDSM in alignment with the state's Long Term Energy Efficiency Strategic Plan. Upstream incentive programs accelerate market adoption compared to downstream programs by supplying at high volume high efficiency equipment, shifting the rebate application burden away from end users, and partnering with equipment manufacturers and distributors to leverage market-based strategies to motivate energy efficient product purchasing behavior.

The adoption of the open-source communication standard for automated demand response (OpenADR) in California is allowing manufacturers to integrate ADR-enabled controls into lighting, HVAC, motors and other building energy equipment. The utility has a role to play in facilitating growth of this nascent and fragmented market. Expanding adoption of ADR-enabled controls also advances the vision of intelligent efficiency, where smart, automated systems optimize energy use by more precisely operating equipment based on need, market and environmental conditions, and pre-programmed human preferences.

Introduction

Upstream programs offer incentives to 'upstream' market actors such as manufacturers and their distributors to stock, and 'upsell' or promote the most efficient products to their customers, which are typically installation contractors but also larger retail end-use customers.[2]

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[2] The term "upstream" program broadly refers to any point along a market supply chain other than the final consumer, to facilitate widespread deployment of a targeted technology. Technically, the market supply chain consists of both "midstream" and "upstream" links. The upstream link generally consists of the technology manufacturers, and the midstream link consists of the distribution and resale of the device or technology. The

Upstream incentive programs address specific barriers to efficiency more effectively than traditional downstream programs. First and foremost is the tremendous leverage from influencing the decisions and behavior of a limited number of market actors who have the potential to affect an entire market. In southern California, less than half dozen distributors are responsible for more than 80 percent of total heating, ventilation, and air conditioning (HVAC) equipment sales. Secondly, by encouraging the stocking of high efficiency equipment by distributors (or retailers), upstream programs affect purchasing decisions at exactly the time when end customers are replacing equipment. Thirdly, upstream incentives are cost effective in the sense that lowering the purchase cost at the distributor level can greatly reduce final purchase cost downstream from retail markups. Distributors and retailers generally welcome upstream incentives as it offers them an opportunity to sell more premium equipment at competitive prices. When cost reductions are applied upstream, the markup is also lower as a percentage applied to the base cost. Thus, the savings multiply when the equipment passes through additional intermediary dealers and contractors by the time the end use customer pays for the equipment downstream.

Thus, upstream incentives are a win-win for sellers, buyers, and utilities. This aspect allows utilities and other organizations to influence market transformation by specifying desired characteristics and features of the next generation of "premium" equipment. For example, Southern California Edison (SCE) and Pacific Gas and Electric (PG&E) are incenting variable refrigerant flow (VRF) equipment to accelerate their adoption in California. Successful upstream programs such as those in California and Nevada have achieved 900 percent greater (gross) savings than traditional downstream programs (Nevada Energy 2012, SCE 2012).

While upstream incentive programs are not new, we are not aware of previous applications to automated demand response (ADR). ADR refers to the use of technology to automate the execution of a sequence of steps at facilities to curtail electrical load after receiving a communications signal. The value of ADR over manual demand response (DR) continues to increase in California as utilities complete their deployment of advanced metering and dynamic pricing tariffs throughout their service territories, and actively pursue the state's mandated renewable portfolio standards. ADR is considered an emerging resource for firming wind and solar generation on California's electricity grid, as it can dynamically reduce (and sometimes increase) consumption to better match the variable wind and solar supply. ADR also can provide more reliable and consistent load shed compared to manual demand response.

Background and California Regulatory Context

In its 2013 and 2014 EE program portfolio, SCE expanded its efforts to advance the integration of DSM program implementation in accordance with the California Public Utility Commission's (CPUC) Long Term Strategic Plan. The expanded programs included a number of IDSM pilots and programs that would develop integrated frameworks for coordinating the DR programs with the larger components of the EE portfolio. The CPUC directed the IOUs to include demand response, distributed generation, and Advanced Metering Initiative portions of

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downstream link refers to the end user or final consumer who installs and operates the technology. The distinctions between the typical upstream, midstream market players are often blurred, as some large manufacturers also distribute and install their products for end users. For simplicity, this report will use the term "upstream" program to refer loosely to all links of the supply chain before the end user.

their Integrated Demand Side Management-related costs in their EE applications. This included the DR IDSM pilots and programs approved in 2012. The CPUC also directed SCE to continue and expand integration efforts in the following areas:

- Increase coordination across different proceedings with the IDSM Task Force as the lead;
- Request IDSM funding from the other proceedings to support IDSM efforts;
- Increase involvement of Stakeholders and experts in the efforts of the IDSM Task Force;
- Provide information on IDSM projects and pilot programs;
- Continued integrated Audit tool development;
    - Increase integrated marketing efforts and improve reporting and communication with the Energy Division; and
    - Improve databases for tracking integrated projects.

A specific effort is the development of an upstream incentive pilot during 2013-2014 that integrates ADR controls with the sale of high efficiency heating, ventilation, and air conditioning equipment (HVAC). The "Upstream ADR with HVAC" pilot is part of SCE's current upstream HVAC efficiency program for commercial customers. The pilot is an integrated demand side management (IDSM) program, since it simultaneously incents energy efficiency and ADR to promote market adoption of HVAC equipment with ADR controls equipment. Key activities of the pilot program relate to testing and studying the integration of ADR technologies with the existing upstream program model and include:

1. Working with HVAC distributors and manufacturers to increase the ***availability*** of ADR-capable, high efficiency HVAC equipment,
2. Working with HVAC with contractors and distributors to ***stock and upsell*** ADR-enabled controls with high efficiency HVAC equipment,
3. Testing a number of options to leverage distributors and contractors to ***enroll*** end-use customers in a DR program.

This paper provides an update on each of the above activities including research findings, pilot status, and next steps.

Approach to Pilot Design

The upstream HVAC program at SCE provides incentives to HVAC distributors to stock and upsell high efficiency equipment. Engagement with market actors across the supply chain was necessary due to the separation of HVAC equipment sales from the majority of HVAC control sales and DR service providers. Engaging with market actors helps ground the design in the existing market realities and aligns it with the near term and medium term HVAC market trends related to DR.

The research involved a series of interviews with HVAC market actors to gauge their level of interest in the Pilot concept, solicit input on Pilot design ideas, assess product features, capabilities and costs, and clarify our understanding of the sales process related to HVAC controls. The team leaned on its extensive network of relationships formed from implementing HVAC programs in California.

Three rounds of interviews were conducted. The objective of each successive phase was to narrow the list of potential market actors, while refining the pilot design through market engagement. The first round of interviews involved all market actors selling equipment and services for HVAC and DR. In the second round, we engaged with those market actors who could provide ADR-enabled equipment, demonstrated experience with DR programs, and expressed willingness to participate in the Pilot. A third round of interviews was conducted to address any remaining issues or barriers to participation in the pilot for market actors.

Technology Availability

The current HVAC industry is fragmented with respect to ADR-capable[3] product availability (Figure 1). Today an end user interested in enabling their HVAC system for ADR needs to separately purchase HVAC controls and HVAC equipment, and contract with a DR service provider to identify appropriate DR strategies and program the controls to execute those strategies. While the major controls manufacturers such as Johnson Controls and Honeywell have ADR-capable controls products, they are promoted to large commercial and institutional customers. In California, 80%-90% of cooling systems sold are unitary air conditioners 20 tons and smaller, as tracked by the commercial upstream HVAC programs. For these small capacity air conditioning units especially, HVAC manufacturers offer limited control options, and primarily focus on operational efficiency.

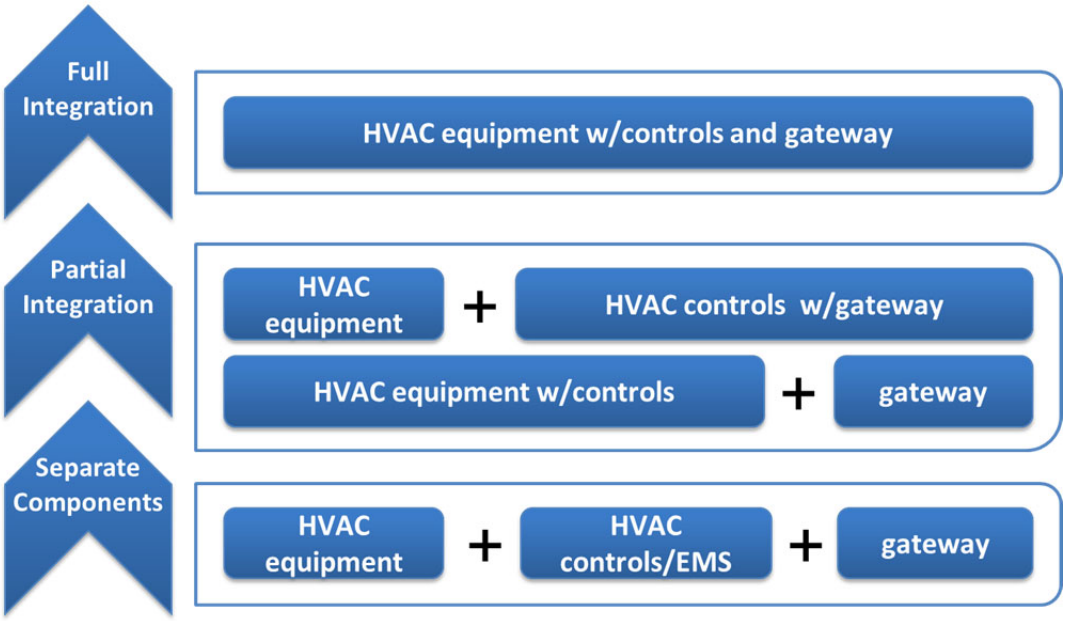

Figure 1. Technology Availability Options of ADR-Capable Controls with HVAC Equipment. *Source*: Energy Solutions 2013.

[3] For this paper, a device is considered to be "ADR-capable" if it is a) capable of receiving a DR event signal via a continuous broadband connection such as Internet or cellular, and b) capable of executing one or more DR load shed strategies after receiving a DR event signal. A device is "ADR-enabled" if a) One or more DR strategies has been selected (or programmed) to be executed after receiving a DR event signal, b) The signal relay or gateway is connected to a demand response signal server, and c) has been tested to successfully receive a DR event signal from the utility's demand response signal server.

A few HVAC manufacturers are beginning to offer partially integrated ADR-capable equipment. Examples include HVAC controls equipment that is already capable of receiving a DR event signal, or HVAC equipment with factory mounted controls that can be applied for DR. Partially integrated equipment lowers the adoption barrier for ADR for end use customers. When controls and other technologies can provide multiple benefit streams, such as energy savings and intelligent demand management, the easier it is for customers to justify the investment.

A long term vision of the pilot is to accelerate the evolution of HVAC equipment to fully integrated, ADR-capable products. This consists of programmable controls that are factory mounted with each HVAC unit, and capable of receiving a DR event signal. Currently no fully integrated, ADR-capable HVAC products are available, but we believe this is likely to change in the next 2-5 years. There is keen interest among selected HVAC manufacturers in designing smart, variable capacity AC equipment with the ability to limit or reduce demand based on local user command or a remote signal. HVAC manufacturers are motivated to expand market share by offering customers more models that distinguish them from the competition, as well as more premium models that can be sold at higher margins.

Unitary ACs make up a majority of all HVAC installations and are controlled with thermostats, onboard controllers, or energy management systems (EMS). ADR-enablement is achieved by installing the controls, programming in the load shed strategies, plus a hardware or software communications gateway, to allow the EMS to receive DR event signals. Thermostats are the most basic type of controllers that executes heating or cooling based on the indoor temperature setpoint. Onboard controllers can execute more sophisticated operations, such as controlling fan speeds and cooling stages. Facilities with energy management systems (EMS) already have a connection between the EMS and the unit controllers. Load shed strategies can be programmed into the EMS without paying for additional unit controllers.

Partially integrated ADR-capable products are available today with some commercial unitary ac controls. Thermostats including Ecobee and Pelican Wireless Systems are available with wireless communications interfaces. Examples of onboard controller products with built-in communications interfaces include the Swarm Energy Management system by REGEN Energy and the CATALYST solution by Transformative Wave Technologies. In early 2013, Carrier completed a strategic agreement to offer REGEN Energy's Swarm Energy Management system to customers through Carrier's distribution network (REGEN Energy 2013).

Variable refrigerant flow equipment is another example of partially integrated ADR-capable technology. The systems are currently sold exclusively with the manufacturers' factory-built controls, which have demand limiting capabilities such as setting a maximum kW operating point and compressor lockout. VRF manufacturers Fujitsu and Mitsubishi both offer DR signal communication devices. These products are marketed to medium to large commercial facilities generally, rather than exclusively for the company's own VRF equipment.

Minimal additional equipment would be needed for ADR-enablement of chiller systems. The majority of the costs are in the configuration, connection, and installation of a (hardware or software) gateway into the EMS. New EMS systems are easier to enable for ADR compared to existing EMS systems. Effort is also needed to integrate the balance of system components, so that they work in coordination with the chiller when executing demand response strategies. In order for a chiller HVAC system to shed load, all of the components of the HVAC system must work in a coordinated fashion. For example, if a chiller were to raise the chilled water temperature for a demand response event, the fans may try to increase airflow, in order to supply the same amount of cooling to a space. Thus, the load reduction from the warmer chilled water is

counterbalanced by an increased fan power. The optimal controls strategy thus needs to take into account the chiller operation plus all of the "balance of system" components operations to ensure a real kW load reduction for demand response.

Stocking and Upselling

With separate or partial technology integration, controls equipment is considered an "add-on", incurring additional costs on competitive bids. The pilot addresses this near term challenge by providing an upfront incentive for installed HVAC equipment plus controls that are programmed to execute customer specified DR strategies, and capable of receiving event signals from SCE. This pilot is implemented through the existing upstream HVAC efficiency program, and the incentive is layered on top of the efficiency incentive from stocking and upselling high efficiency HVAC equipment. Pilot participants consist of upstream HVAC market actors, made up of manufacturers, distributors, and installation contractors who supply HVAC equipment and services to end use customers.[4] This section enumerates on these key market actors and discusses opportunities for pilot intervention to increase sales and installation of ADR-enabled controls.

An HVAC manufacturer's primary business objective is to sell HVAC equipment. They are willing to promote controls to the extent that it helps them increase HVAC equipment sales volume or to market them as a premium product line and make a larger profit margin. Large manufacturers have technical staff that are knowledgeable about controls and can provide an overall solution framework for their customers. However, the extent of controls-based solutions they recommend is often limited to a few controls packages that meet general HVAC needs. Detailed controls design, load shed strategy identification and programming, and system integration to final end use consumers are usually implemented by contractors and controls engineers. A number of HVAC manufacturers are looking at the production of smart AC equipment and highlighting ADR capabilities as a key strategy for future sales and market share growth.

Orders for equipment are negotiated with the national sales team and delivered through the distributors. HVAC distributors stock equipment to sell to local contractors and occasionally to customers directly. An HVAC distributor's primary business motivation is to provide technology solutions. In order to achieve this goal, distributors stock, promote, and sell HVAC equipment, HVAC controls, and any other related technology they think their customers need or want. This makes distributors a key market actor for upstream incentives. Indeed, they are the primary participants of the upstream HVAC program in California promoting high efficiency equipment. With limited exceptions, HVAC distributors are not familiar with DR and do not have experience selling DR benefits and functionality to customers. Education of distributors is needed in addition to incentives to facilitate sale of ADR-capable products with HVAC equipment and to advocate for partial and full technology integration over the long term.

HVAC contractors have direct relationships with end use customers and therefore can have a large influence on customer purchasing decisions. Contractors are able to engineer solutions for most straightforward projects, but often need to pull in a professional mechanical or controls engineers to provide solutions for large or complex HVAC projects. HVAC equipment contractors turn to a commercial HVAC distributor to supply them with equipment. Contractors also purchase thermostats in bulk. A contractor's customer base and market reach is not as wide

[4] To a lesser extent, architects, designers, engineers and consultants also influence customer equipment purchasing decisions.

as a distributor's. Like distributors, contractors have limited experience selling ADR to end use customers. Leading contractors and distributors see ADR less as a distraction from their primary business, and more as an opportunity to expand and customize relationships with customers. ADR is another value stream for customers who enroll in utility DR programs that further differentiates them from competitors, particularly for more sophisticated customers.

Controls manufacturers make a wide variety of controls and employ a variety of strategies and business models to increase sales of their products. They are motivated to continually improve upon existing products and innovations to meet new customer demands and needs. They sell controls products to distributors or directly to HVAC equipment manufacturers to incorporate into their own brands. However, to date these products focus primarily on equipment diagnostics and efficiency, rather than flexible load management functionalities that are better suited for demand response. Most controls manufacturers have experience promoting and selling ADR, some extensively. However, they have less influence on HVAC purchasing decisions compared to distributors.

DR signal relay or gateway device manufacturers are a relatively new breed of controls manufacturer specific to the ADR market niche. Its use distinguishes manual demand response from ADR. This group includes established controls companies such as Honeywell and Johnson Controls, but also includes startups such as IPKeys and Gridlink.

Controls contractors are in charge of purchasing and programming the controls equipment, and therefore are in a prime position to advise and influence end use customer purchasing decisions. They specialize in certain types of controls, either for HVAC equipment generally, or demand response specifically. Controls engineers are hired only for the largest facilities with complex HVAC and control systems, primarily chiller systems with EMS.

Enrollment

Although upstream incentives facilitate equipment installation upfront, the utility cannot accrue the full benefits of their investment unless customers enroll in a DR program and participate in DR events through shedding load. Customer enrollment is a key challenge for upstream incentives, but also creates significant opportunities. Enrollment is an additional step beyond the sales process, and thus introduces a variable to closing the deal with customers.[5]

DR program enrollment also requires direct engagement with the end use customer, which is fundamentally counter to the upstream incentive model. The distributor, who has little direct customer contact, needs to first educate their contractors on DR programs, train contractors on selling DR programs to customers, and convince and motivate those contractors to enroll end use customers in DR program. As noted above, contractors have the greatest opportunity to facilitate DR program enrollment since they work directly with end use customers. The pilot addresses these challenges by providing additional incentives for enrollment, as well as information, training, and education to help them do so.

[5] Critical peak pricing (CPP) is particularly challenging to explain to end use customers. Imagine a contractor or other market actor trying to explain that CPP is a utility tariff that offers differentiated electric rates based on time of day and system load conditions. Customers may require a rate analysis to determine the impacts of going on the new rate before making their decision to enroll, which is time consuming. For many customers, adopting the CPP tariff can result in a net savings in their utility bill, but this typically requires that customers actively control or shift their loads during CPP days. Customers generally discount their savings from the off-peak period rates and balk at high utility bills in months when CPP days are called.

A key activity of the pilot is to explore alternative approaches to DR program enrollment. Any industry actor can enroll a customer in a DR program once ADR equipment is installed and enabled. Controls installers, DR aggregators and utility account representatives all have inherent motivations to enroll customers for DR programs. Like HVAC contractors, controls installers have high touch points with customers and are knowledgeable and experienced with DR. Aggregators have contracted commitments to utilities for a specified amount of kW resource from end use customers in DR programs. An SCE account representative's primary responsibility is to enhance end use customer experience with SCE by providing education, enrollment and other energy program assistance. If these industry actors are made aware of customers with ADR ready technology that are not enrolled, they could assist pilot participants with DR program enrollment without additional financial incentives.

Finally, if enrollment is unsuccessful initially, market actors have the opportunity to return to the site at a later time and make another attempt to enroll the customer. The lifetime of HVAC equipment and controls is 10 to 15 years, which can exceed the turnover rate of engineering and management staff at a facility. A new owner or facility team who moves in to the building resets the opportunity to approach and engage them about DR.

Initial Pilot Design

Feedback from market actors contributed significantly to shaping the incentive design. At a minimum, the pilot would offer incentives to HVAC distributors. However, contractors would also need to participate given their direct contact with end use customers for DR program enrollment. Measures incented by the pilot would initially consist of thermostats, unitary ac controllers, and VRFs. Chillers incentives would not be offered initially, but this measure may be introduced later on. While chiller projects offer large load shed opportunities for DR, the range and complexity of these systems vary greatly and involve a diversity of market actors. Additional data and information need to be gathered in order to develop a reasonable incentive design for chillers.

Market actors interviewed recommended that both distributors and contractors should receive incentives for installing, and enabling HVAC equipment for ADR. A majority of market actors interviewed also agreed that additional incentives would be needed to motivate participants to enroll end use customers into DR programs. Respondents felt that starting with higher incentives at the beginning of the pilot is preferred, to generate participant interest and build momentum for the pilot. Higher incentives initially would also offer greater latitude in testing different strategies for enrollment, and offer greater motivation for distributors and contractors to promote ADR equipment.

There was debate however over whether distributors and contractors should receive the full incentive for ADR-enablement or split the incentive equally between distributors and contractors. One controls manufacturer interviewed felt strongly that the market actor who closed the sale should be acknowledged for their efforts fully by receiving the total incentive. It was pointed out that splitting the incentive between contractors and distributors could hinder or depress sales in which only one market actor influenced the customer. Second, either participant could not be sure whether the other party passed on their share of incentive to the end use customer in the form of overall project cost savings. These points were sufficiently compelling for the project team to shape the incentive design towards full incentive payment to participants.

The initial pilot will include a select group of HVAC distributors and contractors, who have some experience developing ADR projects, or at a minimum, are aware of DR as a demand side resource. This is because even the most forward thinking HVAC distributors and contractors still have knowledge gaps relating to the benefits of selling ADR technology with HVAC equipment. As a pilot, resources would focus on education and training of a small group of willing and motivated participants.

As an IDSM pilot, ADR-capable controls equipment must be sold with a qualifying HVAC unit that meets minimum efficiency specified in the upstream efficiency program. The incentives offered consist of an ADR-enablement portion and program enrollment portion for most measures. The incentive amount is set to cover the majority of the incremental cost of each measure, based on cost data collected from the interviews and follow up analysis. For some sites, the entire cost of the controls upgrade may be covered.

Based on our experience and discussions with different market actors, we expect that the $-per-ton metric will lead to the best balance of maximizing market actor participation and minimizing utility risk for the ADR Pilot. The $-per-ton is the incentive metric used successfully by SCE's Upstream HVAC Program thus the market is already familiar with the metric. The $-per-ton metric allows for indirect tracking of kW load shed potential, based on typical kW/ton performance for a variety of HVAC equipment in current DR programs. While $-per-unit may relate more directly to ADR pricing, it could present a risk to the utility because it does not correlate directly with the load shed potential of HVAC equipment. Depending on the unit type and size, a single unit could produce anywhere from 0.1 kW to 100 kW of load shed, which could make the cost effectiveness of the program vary by orders of magnitude, depending on the size of the units installed. While a $-per-kW incentive metric directly correlates to DR performance, is an unfamiliar metric for the HVAC industry. It also requires calculations during the product delivery process that will pose a barrier to equipment sales.

For thermostats, incentives will be offered per thermostat for products connected to a vendor's proprietary cloud-base server, with a higher incentive amount offered for products communicating directly with SCE's DR automation server (DRAS). Incentives for thermostats are available for contractors only, and DR program enrollment is required. Today, thermostat installations are almost exclusively promoted and installed by contractors to end use customers. Providing a per thermostat incentive works seamlessly with how thermostats are currently sold by contractors. Using a per-thermostat ($-per-unit) incentive will therefore allow contractors to easily provide pricing estimates to their customer. The risk of going with a $-per-unit metric for thermostats instead of $-per-ton is limited, because the size range of unitary AC equipment that use thermostat controls is limited. A longer term objective is to promote factory mounted thermostats with unitary AC.

For unitary AC equipment, the pilot will offer a $-per-ton incentive to install and enable on board controllers for ADR. An additional $-per-ton incentive will be paid for installations where the customer also enrolls in a SCE DR program. The $-per-ton metric makes sense for this measure because of the wide variety of unitary AC equipment with wide variability in cooling capacities (tons of cooling). The $-per-ton metric conveniently tracks approximate kW shed potential, allowing market actors to promote many different products through one simple metric they are familiar with. Installations applying for thermostat incentives cannot also receive unitary AC controller incentives, and vice versa. This incentive option will be offered to both distributors and contractors. The total incentive amount will go to either the distributor or the contractor who has a signed invoice from the customer, and not shared between the two market

actors. The measure is open to all DR strategies, to allow the market actors to choose which ones they want to promote and customers to decide which ones they prefer.

For VRF systems, the pilot will offer a $-per-installation or project incentive to install and enable VRFs for ADR. An additional $-per-installation incentive will be paid if the customer also enrolls in a SCE DR program. VRF systems come with demand limiting features, regardless of the system size or complexity. ADR-enablement entails the addition of a communications gateway connected to the central controller and be minimally configured to shed load during a DR event. Therefore, the cost of ADR-enablement should not increase or decrease significantly with system size or complexity. This incentive option will be offered to distributors only. Because VRF technology is still relatively new in the U.S., manufacturers work closely with distributors at end use customer sites to install and commission the equipment. Thus distributors and manufacturers have direct contact with customers in all VRF installations.

Conclusion

The proposed Pilot will simultaneously test a variety of incentive designs that coincides with the diversity of HVAC equipment, HVAC controls, and their delivery channels in the marketplace. Given the currently fragmented nature of available ADR technology, the Pilot will initially offer incentives to both distributors and contractors for thermostats, controllers for unitary AC equipment, and VRFs.

The next steps include launching the pilot. Following pilot launch, activities will focus on processing applications, as well as continuing education and training of participating HVAC distributors and contractors. There is a need to foster relationships between the participants and ADR controls manufacturers to accelerate the learning process on ADR-enablement and enrollment. Additional research is also continuing for chiller systems. Depending on the findings, SCE may introduce this measure later in the pilot. Results, including kW of load shed made available, are pending following conclusion of the pilot at the end of 2014.

In the near term, the incentive design is intended to provide participation flexibility for market actors to incorporate the incentive into their overall sales strategy. The pilot will continue to assess the merit of different DR strategies, enrollment incentives, market actors participation, and incentive levels during implementation. Opportunities for improvement identified will be incorporated into the pilot. We envision that over the long term, the Pilot implementation team will work to stimulate market transformation by accelerating the integration of ADR-capable controls with HVAC equipment at the factory. Assuming the upstream HVAC with ADR pilot is successful, the model can be used for other potential measures in commercial lighting, motors, residential appliances. An assessment of these additional measures is needed to compare it against the commercial HVAC market potential.

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