

# ADR Development and Deployment for HVAC Distributors – Final Report

*DR18.10*



*Prepared by: Energy Solutions for*

*Emerging Markets and Technology Program  
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## EXECUTIVE SUMMARY

This project worked to increase the market availability of OpenADR Alliance certified controls solutions by engaging heating, ventilation, and air conditioning (HVAC) distribution sales channels. The goal of this project was to increase the market availability of OpenADR Alliance certified controls solutions by engaging heating, ventilation, and air conditioning (HVAC) distribution sales channels. Project objectives and activities were developed to directly address distributor feedback from the 2013-2015 SCE Upstream HVAC with Automated Demand Response (ADR) Pilot, in order to remove critical barriers and advance ADR development and deployment. Project objectives consisted of:

- **Identify OpenADR-certified HVAC control solutions** for each distributor and understand sales practices.
- **Engage with** HVAC distributors to inform them of Auto-DR Program requirements and opportunities to utilize incentives.
- **Technical support** to make selected controls solutions more ADR-capable out-of-the-box, and more easily ADR-enabled during installation.
- **Refine upstream ADR program design.** Incentives, project delivery, application and enrollment are vital ADR program elements, and need to more closely reflect distributor business models and evolving market conditions.

## PROJECT FINDINGS

### **Market Capacity for Selling OpenADR Certified and ADR-Capable Products.**

Feedback from distributors who participated in the 2013 pilot highlighted that choosing the right technology and making an effective and efficient sales proposition was a major barrier to selling OpenADR certified technologies. The Project Team hypothesized that OpenADR-certified products have expanded since the 2013 pilot, but that assistance was still necessary to help distributors choose additional products develop sales strategies. The goal of this activity was to provide any assistance that would increase the availability and sales of OpenADR solutions.

Four distributors stocked OpenADR 2.0 certified solutions for the commercial market. None stocked VENS but would be willing to do so if there was greater and more consistent customer demand. The Project Team successfully increased the OpenADR product offerings for one distributor, who started carrying Zen Ecosystems thermostats in 2019. The distributors vary in their response to this lack of demand, with some being more proactive about sales, and others not promoting ADR at all. Many are interested in distributor incentives to help increase controls sales.

**Inform and Educate HVAC Distributors.** The goal of this activity was to support the overall project objectives by informing distributors about state code and utility ADR program requirements and about how to take advantage of the market opportunity to sell OpenADR controls. Distributor staff varied in the level of understanding of ADR programs, but most controls staff were familiar with ADR and the concept of dynamic tariffs. Staff understood the potential market opportunity of customer demand from CPP.

**Provide Technical Support to Manufacturers.** The Project Team assessed the OpenADR certified solutions that distributors already stocked for ADR capability “out-of-the-box”. The hypothesis was that, although controls are OpenADR certified, they vary in the ease to which contractors can enable them on-site for ADR participation.

Three smart thermostats and one EMS were evaluated. The scores were based on the existence and accessibility of a DR mode display, ease of installation, whether it met SCE’s Auto-DR stranded asset policy, and the availability of default strategies for ADR. The thermostats scored higher than the EMS. The Project Team also completed OpenADR signal testing with one thermostat manufacturer and confirmed that thermostat setpoints respond to an event signal from the DRAS. The Project Team also discussed with SCE, and after internal deliberations, the SCE Auto-DR Program Manager moved to update its stranded asset policy for Express Auto-DR applications.

## RECOMMENDATIONS FOR A REFINED UPSTREAM AUTO-DR PROGRAM DESIGN

The Project Team refined program design recommendations based on distributor feedback collected throughout this project and informed by the 2013 pilot project. First, the team concluded that distributor incentives would best facilitate sales of OpenADR products. Second, the team recommends streamlining and simplifying steps during project delivery and application processing to minimize distributor and contractor burden.

Project delivery could be streamlined by offering a single DR strategy option, automate or remotely connect controls to the DRAS, and having the distributor or contractor confirm controls installation and connection to the DRAS. ADR program application process can be simplified to four steps: including the ADR Program Terms & Conditions form during the initial sale, collecting customer information during installation (contractor), verifying DRAS connection (manufacturer) and submit ADR incentive application (distributor), and reviewing and paying ADR incentives (program implementer). The DR program enrollment would be simplified to just Critical Peak Pricing.

The team also developed new incentives recommendations based on an updated analysis of incremental measure costs of thermostats and EMS. For thermostats, incentive range from \$16-32/ton or \$270-360/unit. The Project Team also presented a few ADR incentive design options for EMS controls for SCE to consider.

## NEXT STEPS

There are several pathways that the upstream program design recommendations for ADR in this report could be incorporated into programs at SCE. The first pathway is layering ADR incentives onto existing upstream energy efficiency programs as part of integrated demand side management. Drawbacks to this option are administrative complexity and limited eligibility (high-efficiency equipment). The second pathway is adding an upstream incentive option to the existing AutoDR Program at SCE. This would pay distributors for certified controls sold to small and medium HVAC projects under 500 kW of peak demand currently eligible for the Express application process. A third pathway is implementing a standalone upstream ADR Program. The last option offers the most flexibility in terms of project and measure eligibility and is the simplest administratively. However, coordination with the SCE Auto-DR Program is recommended to better address DR program enrollment and active DR event participation by customers.

## ABBREVIATIONS AND ACRONYMS

ADR	Automated Demand Response
Auto-DR	SCE’s Automated Demand Response Program
DRAS	Demand Response Automation Server
HVAC	Heating Ventilation and Air Conditioning
VEN	Virtual End Node
LCBS	Light Commercial Building Solutions
RTU	Rooftop Unit
CPP	Critical Peak Pricing
OpenADR	Open Automated Demand Response
PG&E	Pacific Gas and Electric
SCE	Southern California Edison
SMUD	Sacramento Municipal Utility District
IMC	Incremental Measure Cost
IOU	Investor-Owned Utility
SMB	Small and Medium-sized Business (SMB)
SAID	Service Account ID

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## INTRODUCTION AND BACKGROUND

Technologies with demand management capabilities that can meet “fast and flexible” changing grid requirements play an important role in achieving California’s clean energy goals. Lawrence Berkeley National Lab (LBNL) developed a framework and terminology to describe the multiple types of demand management that California needs. This includes **shape**, which is facilitated by time of use rates that change the shape of a buildings energy usage profile over the entire year. **Shift** is about changing the load profile of when energy is used over the course of a day. **Shed** is traditional, event-based demand response and **shimmy** is fast DR to support ancillary services needed by the grid. LBNL’s report indicated that innovative end-use enabling technologies that can “shift and shimmy” will be essential for developing the pathways for future program and portfolio design for cost-effective DR resources in California.<sup>1</sup> California Public Utility Commission (CPUC) policy supports greater alignment of efficiency and demand response, as a cost effective strategy to address peak energy demand, reduce energy use, and lower the costs of reducing emissions and meeting clean energy goals.<sup>2</sup>

Additionally, CPUC’s Proposed Decision on Southern California Edison’s (SCE) 2016 Rate Design Window Application<sup>3</sup> required SCE to default its commercial customers to its Critical Peak Pricing (CPP) rate starting March 1, 2019. This includes small and medium-sized business (SMB) commercial customers under 200 kW. Furthermore, SCE adjusted its CPP window from 2pm – 6pm to between 4pm – 9pm. This development increased the urgency and value for SCE’s commercial customers to access technologies that actively manage demand and control energy usage during peak and critical peak periods. For solutions that are OpenADR certified, commercial customers can access SCE’s Auto-DR Program incentives to defray the cost of acquiring the technologies.

This project worked to increase the availability of OpenADR certified controls solutions by engaging heating, ventilation, and air conditioning (HVAC) distribution sales channels. This project built on the lessons learned from the Upstream HVAC with ADR Pilot that Energy Solutions implemented for SCE June 2013 – December 2015. This was the first known application of the upstream model to demand response by a utility in the U.S. As such, a significant aspect of the pilot focused on innovation of the design, in terms of the eligibility rules, policies, and incentives for implementation. Second, in combining demand responsive controls with the sale of high efficiency HVAC equipment, the pilot achieved the integrated demand side management objective. The Pilot enrolled three HVAC distributor participants

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<sup>1</sup> Lawrence Berkeley National Laboratory, Energy and Environmental Economics, Inc. and Nexant (March 2017), 2025 California Demand Response Potential Study: Charting California’s Demand Response Future. Final Report on Phase 2 Results. Prepared for California Public Utilities Commission.

<sup>2</sup> National Governors Association (August 2016), Aligning Energy Efficiency and Demand Response to Lower Peak Electricity Demand, Reduce Costs and Address Reliability Concerns.

<sup>3</sup> California Public Utilities Commission (May 2018), Proposed Decision for Application 16-09-003, Application of Southern California Edison Company for Approval of its 2016 Rate Design Window Proposals.

and two contractor participants and installed three projects. The Project Team engaged with key participants at all levels of the organization for education and outreach.

The lessons learned and recommendations from the 2013 Pilot were as follows:

- Lessons Learned
  - Including DR controls adds complexity to the HVAC equipment sales process.
  - HVAC controls and equipment sales staff are siloed.
  - Understanding the HVAC equipment delivery process is important to uncover opportunities to integrate ADR.
  - OpenADR is still relatively new.
  - High efficiency sales requirement limits eligible market.
  - Participants view DR as gaining competitive edge.
- Recommendations
  - Screen and provide short list of eligible OpenADR solutions for distributors.
  - Expand ADR incentives to include controls installed with both code-compliant and high-efficiency HVAC equipment.
  - Provide clear DR value proposition and simple messaging.
  - Continue educating the market.
  - Improve assistance for DR program enrollment.
  - Build on participant success.

For this 2019-2020 project, The Project Team worked primarily with six HVAC distributors responsible for over 70 percent of HVAC equipment sales in southern California, as well as three manufacturers' representatives.

## ORGANIZATION OF THIS REPORT

The project scope and organization are drawn from feedback provided by a participating distributor from the 2013 pilot:

“First, we had to find a technology to work with. Then, we had to learn how to install the new technology and integrate it with our system. Finally, we had to understand the technology well enough to be comfortable bringing it to a customer.”

The project consisted of 4 main activities. First, was helping HVAC distributors identify OpenADR solutions that they can sell. One of the lessons learned from the 2013 pilot was that giving HVAC distributors the entire certified products list from the OpenADR Alliance resulted in no response. Most distributors didn't have or didn't prioritize resources to select eligible solutions on their own. The Project Team needed to work with individual distributors to identify a complementary portfolio of controls solutions that fit with existing equipment offerings, including any OpenADR certified controls the distributors already sell. Once identified, the Project Team also met with the selected OpenADR manufacturer to understand their channel strategy. If the strategy was a good fit with the distributor, the Project Team facilitated discussions between the manufacturer and distributor and provided introductions. The results of

this research are provided in Chapter 1: Activity 1 – Identify OpenADR 2.0 Solutions by Distributor.

The second activity involved researching and understanding distributor sales practices. The Project Team researched existing distributor sales practices and explored opportunities for integrating ADR-capable solutions with those sales practices. The Project Team developed interview questions and talked with distributors sales staff about sales methods, existing channels, and strategies for packaged HVAC controls. The responses from these distributor interviews are provided in Chapter 2: Activity 2 – Distributor Sales Practices.

The third main activity involved technical support to HVAC distributors with the goal to make eligible solutions more ADR-capable out-of-the box. This included, for example, OpenADR signal testing of the controls solution with SCE’s demand response automation server (DRAS). The Project Team also reviewed OpenADR controls (smart thermostats and energy management systems) and gave each an “ADR-capable” score. The results of this research are provided in Chapter 3: Activity 3 – Technical Support and ADR-Readiness Assessment.

The fourth main activity consisted of distributor education and outreach on ADR in California. This included emails, phone calls, in person meetings, small group and larger lunch and learn presentations, and demonstrations of OpenADR technologies. Education topics included information about ADR programs by California IOUs, OpenADR communication protocol, DR requirements in Title 26, Part 6 building codes. The Project Team also discussed elements of plug-and-play controls, time-of-use and CPP, other DR programs, and the role of DR in California to enable renewable energy. Summaries of distributor engagements are provided in Chapter 4: Activity 4 – Distributor Education.

## STOCKING OF OPENADR CERTIFIED AND ADR-CAPABLE PRODUCTS

Of the six distributors the Energy Solutions Project Team engaged with, four currently stock OpenADR 2.0 certified solutions for the commercial market. Three stock certified thermostats for the small and medium-sized business (SMB) market: Pelican Wireless thermostats, Venstar thermostats, and Zen Ecosystems thermostats. One distributor stocks a certified Carrier certified gateway compatible with Carrier’s i-Vu energy management system (EMS). Currently none of the HVAC distributors carry third-party standalone OpenADR certified VEN products. However, the distributors can easily order VENs if their customers ask for them and would be more willing to stock VENs if there was demonstration of significant demand.

During this project, the Project Team engaged with distributors on expanding their current OpenADR-certified controls offerings. The Project Team was successful in increasing the OpenADR product offerings for one distributor, who started carrying Zen Ecosystems thermostats in mid-2019. The Team continues conversations with Honeywell contacts who remain interested in pursuing OpenADR certification of their EMS for light commercial applications and thermostats which are carried by these distributors.

## SALES PRACTICES AND PROMOTING ADR CONTROLS

The Project Team interviewed distributors about existing sales practices that distributors employ to promote and sell products, including DR-capable controls.

Distributors noted that their customers have not asked for demand response solutions. However, they expect that commercial customers defaulting to CPP this year, and particularly expiration of customer bill protection in 2020 will contribute to the demand for ADR solutions. Distributor A, Distributor B and Distributor C noted this point in particular. 2020 would be a good time to reengage with distributors.

The distributors vary in how they respond to this lack of demand for ADR. Both Distributor A and Distributor B actively promote ADR to their customers. Distributor C sees value in promoting controls that increase comfort, save energy, and increase system reliability. Distributor C notes that ADR can be implemented in a way that does not compromise occupant comfort. Distributor D sees a deemed incentive and streamlined application process as critical to upselling the OpenADR certified thermostats that they carry. Distributor F and Distributor E are not actively promoting ADR.

## TECHNICAL SUPPORT

Pelican Wireless and Zen Ecosystems received the first and second highest assessment ratings, respectively. Both Pelican Wireless and Zen thermostats provide a local gateway and VEN that conform to California utilities' ADR program requirements for stranded asset testing. The thermostat and gateway are relatively easy to install, though Zen Ecosystems technical documents provide more step-by-step instructions and tips for a less technical audience compared to Pelican Wireless. The Pelican Wireless thermostat automatically seeks its gateway once both are installed, which is a convenient feature. Pelican Wireless places their DR mode display access on the main page settings menu. This earned the product a higher score over Zen Ecosystems and Venstar thermostats, which require customers to go two to three levels into the online cloud websites to access the DR modes. Venstar commercial thermostats offer the same ADR-capable features as Pelican Wireless and Zen Ecosystems. A main challenge with Venstar thermostats is the absence of an onsite gateway.

Carrier's i-Vu is an EMS product for light to large commercial applications. The product includes an OpenADR certified software VEN that must be custom installed and works with the i-Vu Pro model only. Information about i-Vu installation and operation were gathered from discussions with the distributor, rather than first-hand observations of the EMS interface or the installation and configuration process.

The Project Team completed OpenADR signal testing with Venstar thermostats and their Skyport cloud using both the SCE test DRAS and PG&E test DRAS. The tests were successful and confirmed that Venstar thermostat setpoints respond to an event signal from the DRAS. The Project Team has offered DRAS signal testing support to two additional distributors for their Carrier i-Vu controls and Concierge EMS for light commercial applications.

SCE's Auto-DR Program's current stranded asset policy requires all sites to demonstrate that if the cloud service goes away, there is a backup local VEN on site to receive an OpenADR event signal so that the customer can continue participating in DR events. On the other hand, cloud-based controls offer smaller customers the opportunity to access energy management services previously limited to larger facility owners at lower price points. SCE can mitigate stranded asset risk by limiting total incentives paid to cloud-only solutions without on-site VENs each year. Following internal deliberations, SCE ADR Program Manager moved to update its policy to waive stranded asset testing for Express Auto-DR applications, which apply to customers 499 kW of peak demand and smaller.

## DISTRIBUTOR EDUCATION AND OUTREACH

Distributor sales managers and staff varied in the level of understanding and knowledge of ADR programs, and the Project Team tailored outreach and education strategies for each distributor accordingly. While the Project Team shared information about ADR with the distributors, we also asked distributors for their input on the upstream ADR program design. Feedback from distributors thus far is universally supportive of an upstream program for ADR, and distributors have shared that this would greatly increase their sales of ADR controls. This is particularly true for Distributor C and Distributor B which have dedicated controls sales divisions, as well as Distributor A and Distributor D who want to increase thermostat sales.

While distributors appreciate the educational information exchange including lunch and learns, a bit of relationship capital is used up for each engagement and request of their time. Distributor A and Distributor B expended considerable time and effort working with the Project Team related to the Manage Your Power pilot with SCE. The Project Team is being cautious about asking more from these two distributors before the value of their pilot participation is demonstrated. SCE's promotion of Manage Your Power to its customers is critical for distributors to increase certainty of market demand for carrying OpenADR certified products (see Appendix G: Background on SCE's Manage Your Power Pilot for additional background). Since SCE's original plans for large-scale promotion to customers about Manage Your Power didn't occur, the Project Team recommends SCE follow up efforts to do so.

Chapter 6: Recommendations for Upstream ADR Program Design provides updated ADR program design recommendations, and builds on those provided in the 2013 Pilot final report<sup>4</sup>. The updated recommendations are based on data and information gathered from distributor engagement across the four activities, as well additional distributor input on program design. Sections in the chapter cover incentives, project delivery, program application, and enrollment.

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<sup>4</sup> Johnston, Jeff; MacCurdy, Alex; Oster, Carey; Wang, Katherine (January, 2016), Upstream HVAC with ADR Pilot: Results and Recommendations. Prepared by Energy Solutions for Southern California Edison.

## PROJECT OBJECTIVES

This project aims to increase the market availability of OpenADR Alliance certified controls solutions by engaging HVAC distribution sales channels. It builds upon the 2013-2015 Upstream HVAC with Automated Demand Response (ADR) Pilot that Energy Solutions implemented for Southern California Edison (SCE). Since that engagement, awareness of demand response in California has also grown among distributors and manufacturers, who remain keenly interested in a new upstream ADR pilot or program.

A key takeaway from the pilot came in the form of feedback from one distributor – that implementation of OpenADR solutions is complicated, often to the point of being prohibitive. It requires first finding an OpenADR technology to work with; then, learning how to install the technology and integrate with the distributor's existing system; finally, understanding the technology well enough to bring it to a customer.

This project's objectives and activities were developed in order to address this distributor's feedback point by point. The hypothesis is that addressing these critical barriers will effectively advance ADR development and deployment for all HVAC distributors. Project objectives therefore consist of:

- **Assist with identification of** OpenADR-certified HVAC control solutions that distributors can deploy and promote, and understand distributor sales practices for bringing new products to their customers.
- **Engage** with HVAC distributors to inform and educate them on Auto-DR Program requirements, eligible Program technologies, and demand response requirements in the Building Energy Code Title 24, Part 6.
- **Technical support** to make selected controls solutions more easily ADR-enabled by distributors and contractors during installation. This involves sharing the procedure and troubleshooting with manufacturers to connect their controls with the utility DR automation server and conduct event signal testing. Separately, assessing the controls to identify any gaps and further development needs to make the controls solutions fully ADR-capable out-of-the-box.
- **Refine upstream ADR program design.** Incentives, project delivery, application and enrollment process are vital ADR program elements for HVAC systems that need to more closely reflect distributor business models and evolving market conditions.

# CHAPTER 1: ACTIVITY 1 – IDENTIFY OPENADR 2.0 SOLUTIONS BY DISTRIBUTOR

The purpose of Activity 1 was to work with each distributor to identify a complementary portfolio of OpenADR certified solutions that fit with the existing HVAC equipment offerings. The Project Team researched and highlighted any OpenADR certified controls the distributors already sold and worked with distributors to identify other potential eligible technologies, either through OpenADR certification of existing controls offerings, or through adding new products to their lines.

This section describes the current and potential OpenADR offerings at the six distributors. Key takeaways are aggregated here, with additional information available in the Activity 1 Memo delivered to SCE in July 2019.

## METHODS

The research plan included preparing interview questions and conducting online research of distributor websites to identify products carried by these distributors that are listed on the OpenADR Alliance certified products list. Distributor Leads were selected and assigned according to existing prior relationships.

Interview questions fell into 2 categories: Identification of current and potential OpenADR product offerings (Activity 1) and understanding distributor sales channels (Activity 2). Discussions with distributors were allowed to flow organically and therefore information was collected on both categories of questions throughout the engagement process. Interview questions are listed in Appendix C: Distributor Interview Questions. A summary table of products carried by the target distributors is also provided in the Appendix B: ADR Solutions Table.

## OPENADR PRODUCTS SUMMARY

Products offered by the distributors that are OpenADR certified and applicable to commercial customers, include the following:

- Zen Ecosystems Zen thermostat.
- Pelican Wireless thermostats.
- Carrier I-Vu EMS that can be combined with ALC's software add-on VEN for an OpenADR certified solution.
- Commercial thermostats by Venstar, which include free access to Venstar's Skyport, an OpenADR-certified cloud VEN.

Among the OpenADR certified products, three have been offered by distributors for more than two years. The Zen Ecosystems thermostats was just added as an offering by one distributor in 2019. Following conversations with the Project Team, this distributor decided to purchase and stock a large amount of Zen Thermostats. In return, Zen Ecosystems hired a dedicated staff for them. This distributor's main motivation to carry Zen Thermostats was in preparation for the anticipated demand this summer as SCE commercial customers were defaulted onto CPP rates. They were also interested in participating in SCE's Manage Your Power pilot to promote Zen Thermostats. These products are also discussed in more detail in the Key

Takeaways from Chapter 3: Activity 3 – Technical Support and ADR-Readiness Assessment.

## NON-OPENADR PRODUCTS AND POTENTIAL PRODUCTS

Each of the six distributors also stocks non-OpenADR HVAC controls. Majority of these controls are thermostats. Several of these controls are ADR-capable, but not OpenADR-certified. Even more of these products have Wi-Fi or other communication abilities and therefore have the potential to be ADR-capable if paired with an OpenADR-certified VEN gateway. The Project Team asked each distributor how they could add OpenADR products to their product offerings or expand upon the OpenADR products already available. In order to facilitate ADR incentive eligibility of these products, the Project Team pursued 1) encouraging manufacturers to certify controls that are ADR-capable and 2) identifying an OpenADR-certified VEN that could be combined with their existing ADR-capable controls.

Currently, none of the HVAC distributors carry standalone OpenADR certified VEN products. However, they have access to VENs if their customers ask for them and would be more willing to stock VENs if there was demonstration of significant demand. Having VENs on hand in their inventory requires distributors to purchase a minimum quantity to put on their shelves. There is a carrying cost associated with this decision with upfront money outlay and depreciation of the inventory. There needs to be market activity – for example if utility incentives or consumer preferences increase demand for VENs, to justify new stocking decisions.

Several distributors are in various stages of expanding their current OpenADR-certified controls offerings. One distributor carries the Honeywell Light Commercial Building Solutions (LCBS) Economizing Commercial Thermostat which connects to the LCBS expandable cloud-based platform. This distributor is very interested in this product becoming OpenADR-certified, and a contact at Honeywell said that certification is a priority of theirs and is anticipated for later in 2020. The Project Team contacted Honeywell about this certification and continues to engage with them on behalf of the distributor.

Distributor B mentioned that they would like to pair all controls sales going forward with a simple third-party OpenADR-certified gateway, and they would also like to be able to go back to prior sales and upsell a simple gateway to those customers. They are interested in a simple gateway which is less expensive than GRIDlink. Distributor F currently stocks Honeywell thermostats, and one branch manager mentioned that he would be interested in those being OpenADR-certified but only if demand becomes demonstrated.

The Project Team was successful in increasing the OpenADR product offerings for one distributor, who started carrying Zen Ecosystems thermostats in mid-2019. We are continuing conversations with Honeywell who remain interested in pursuing OpenADR certification of their thermostats and EMS for light commercial applications which are carried by these distributors. Otherwise, new product additions are limited without stronger demand from utility programs or customers.



## CHAPTER 2: ACTIVITY 2 – DISTRIBUTOR SALES PRACTICES

The purpose of Activity 2 was to understand distributors' sales methods, channels, and strategies for packaged HVAC controls, and to discuss opportunities and options to integrate demand response capabilities with sale of packaged HVAC controls.

The Project Team contacted six HVAC distributors, as well as three manufacturers' representatives, about their sales practices. The sales strategy interview questions that the Project Team developed were designed to gather information on the following sub-topics, which are summarized in this section. Additional information is available in the Activity 2 memo delivered to SCE in February 2020:

- Customers & Market Notes
- Sales Volumes for HVAC Controls
- Demand for and Promotion of ADR
- Sales Strategies
- Controls Sales Strategies
- Curation of Products and New Equipment
- Incentive Program Design

### METHODS

Similar to Activity 1 methods, the Project Team developed additional interview questions related to understanding distributor sales channels. Distributor Leads were selected and assigned according to existing prior relationships. Discussions with distributors were allowed to flow organically. Once OpenADR products interviews and research were satisfied, or as the conversations naturally developed, the conversations with distributors shifted to understanding their sales methods, channels, and strategies for packaged HVAC controls, and exploring opportunities for integrating selected ADR-capable solutions with those sales practices. Through the process of engaging with distributors about Activity 1 topics, the Project Team refined and added to the Activity 2 questions list based on initial insights.

### SALES VOLUMES FOR HVAC CONTROLS

Volumes of controls sales varies significantly distributor to distributor in terms of how much of total business is associated with controls sales, and how often controls are sold alone or with HVAC units. For some distributors, this information is confidential. Summaries below include the distributors we spoke with where we can share the information.

The portion of HVAC sales that include controls varies from 10-20 percent, to a high of 90 percent across distributors. On the low end, one distributor explained that this is because most HVAC sales are replacements, so the sites already have existing controls.

## DEMAND FOR AND PROMOTION OF ADR

All distributors that were engaged with offered similar feedback that there is a lack of demand for ADR from their customers. Distributor D mentioned that, even though their thermostat is ADR-capable, demand for that capability is very low. The Project Team attributes this in part to low market awareness.

The distributors vary in how they respond to this lack of demand for ADR. Both Distributor A and Distributor B actively promote ADR to their customers. Through participation in SCE's Manage Your Power pilot this year with The Project Team (see Appendix G: Background on SCE's Manage Your Power Pilot for background information), Distributor A proactively reached out to their territory managers to promote their OpenADR thermostat offering with their contractor customers. Distributor A's message to contractors was that SCE's commercial customers will be hit with super high bills this summer as a result of CPP rates and will need a way to manage their electricity costs. Distributor A noted however that the sales messaging to contractors was "about a solution to a problem they didn't know about".

A contact at Distributor B shared that he "brings [ADR] up with the customer, not the other way around". His strategy for promotion of ADR is to target energy managers, bringing up Title 24 requirements for demand response, and the OpenADR requirement for utility incentive programs. Distributor B was also open to the idea of using bundling as a strategy to sell ADR.

Distributor B's management holds educational lunch and learns for their internal controls sales managers and staff, and was interested in using that forum to educate their sales people on ADR. In August, The Project Team presented a lunch and learn to Distributor B's controls sales managers about the new dynamic tariffs and business opportunity. Distributor B wants to push DR controls as a growth strategy for their business, into load management solutions. They specifically mentioned the desire to add VENS to their installed base to open the door to other sales. Distributor B also registered staff on the Trade Pro Connect platform for SCE's Manage Your Power pilot this year with the Project Team.

Distributor C sees value in promoting controls that increase comfort, save energy, and increase system reliability. Currently they have not seen demand from customers for ADR so there isn't an effort to promote OpenADR products. If there was interest from a customer, Distributor C would prefer to add a VEN to their controls system rather than sell a thermostat.

Distributor F is not actively promoting ADR. One territory manager indicated that they expect the utilities such as SCE to assume responsibility for promoting it. Distributor F noted that none of their contractors have asked for ADR but if the market begins to demand it, they will sell it.

Distributor E does not receive demand for ADR and promoting ADR would not work with their business model. Their relationships with their national accounts customers are for equipment sales and equipment service. They are not a controls or energy management services company.

## CONTROLS SALES STRATEGIES

With limited exceptions, distributors currently do not upsell controls and will wait for customers to ask for them. Unless the distributor businesses model specifically targets the light commercial market and lacks internal controls expertise such as Distributor A, distributors prefer to sell energy management systems for larger

projects rather than thermostats. Thermostats are considered low revenue, low margin items compared to energy management systems, which are purchased for larger and more complex (therefore higher revenue) projects.

A couple distributors interviewed, including Distributor A and Distributor D, pointed out that targeting service contractors for controls sales is a better strategy. Service contractors are interested in developing ongoing relationship with the customer over the long term. They benefit from smart controls that offer diagnostic tools and remote communications capabilities that allow the contractor to diagnose issues with the HVAC system. This gives the service contractor a better chance to bring the right tools with them to the job site, reducing the costs of site visits. Contractors can also use the information and data from smart controls and energy management systems to develop a long-term maintenance plan for the customer, extending equipment life.

Distributor A noted that they haven't upsold controls to date primarily because "we're really not a controls outfit." Distributor A relies on its territory managers, which are essentially account managers who develop long term relationships with contractors, for indirect sales of controls. It's easier to strategically sell to these contractors compared to a "random contractor walking up to the counter for a one-off replacement."

Distributor A noted that it can be challenging to convince these larger contractors to sell a new technology such as their OpenADR thermostat offering. Distributor A noted that larger contractors also prefer energy management systems and larger projects than thermostats for small projects. The approach Distributor A has taken for the first time this year, is telling their customers that a new tariff will be rolling out that will result in costly utility bills this summer and that Distributor A carries the product (OpenADR thermostat) that will help customers manage their bills.

Distributor B noted that contractors often request only equipment pricing. The controls sales team tries to upsell controls when there is a bid for equipment. Distributor B gave an example with chiller sales, where they'll check if contractors also need pumps, cooling tower, valves, and actuators.

Distributor C sales engineers/account managers don't push controls if there isn't a request for controls from contractors or customers. Account managers most often pass on bidding low margin small items and instead go for larger sales. Distributor C wants to develop larger ADR projects with VENS and energy management systems.

Distributor D responded that their contractors are interested in thermostats. In many cases customers just want the thermostat to have simple control, such as on/off and changing temperature. Distributor D's dealers push diagnostics and monitoring benefits of controls all the time. These capabilities are becoming more common and getting cheaper. Contractors can get email alerts if a customer unit is about to fail. Efficiency is the main selling point for diagnostics and monitoring of controls and thermostats however, not DR.

While Distributor F almost always bundles controls with other HVAC equipment, this is not done with the OpenADR thermostats they carry. Contractors and customers interested in controls beyond thermostats are referred to a separate department with dedicated experts on each of the various makes of controls that Distributor F distributes. The Ontario branch manager guesses that their branch sells about the same amount of Pelican and Honeywell thermostats. If ADR becomes more widely recognized, Distributor F would be interested in some Honeywell thermostats becoming OpenADR certified.

## CURATION OF PRODUCTS AND NEW EQUIPMENT

Distributors all vary in terms of the degree to which they actively and strategically introduce new products to stay ahead of the market needs, as opposed to waiting until the market demands something. For example, Distributor A and Distributor B have been the most forward-thinking when comes to ADR-capable technologies; actively trying to create demand and gain market share in advance of mass customer demand. Distributor F is on the opposite end of this spectrum, being completely reactive. Distributors also vary in terms of at what level these decisions are made. Distributor C has to go through the national/corporate level, whereas Distributor F branch managers have full control over what they choose to sell. Details specific to each distributor are provided in the February 2020 Activity 2 memo.

## CHAPTER 3: ACTIVITY 3 – TECHNICAL SUPPORT AND ADR-READINESS ASSESSMENT

In Activity 1, The Project Team worked with HVAC distributors to identify OpenADR certified solutions that they can sell. In Activity 3, The Project Team assessed the “out-of-the-box” ADR-capability for the subset of controls stocked by distributors that are already OpenADR certified. These included Zen Ecosystem’s thermostat, Pelican Wireless thermostat, Venstar thermostats, and Carrier’s i-Vu EMS. The Project Team provided technical support to Venstar, through signal testing with SCE’s and PG&E’s DRAS. The Activity 3 memo was delivered to SCE in December 2019 and includes screenshots from the technology interfaces. Those screenshots are omitted here for brevity.

ADR-capable applies to equipment that is 1) capable of receiving a DR event signal via a continuous Internet, cellular or equivalent broadband connection; and 2) capable of executing one or more DR load shed strategy options after receiving a DR event signal. ADR-enablement involves connecting to the utility’s demand response automation server (DRAS) and preprogramming the equipment to automatically execute a selected DR strategy.

### METHODS

Information for the assessment was gathered from:

- Review of each technology solution’s cloud-based interface.
- First-hand review of manuals and other technical resources provided by the manufacturers online.
- Interviews and conversations with the HVAC distributors.
- Interviews with ASWB Engineering technical staff, who have worked with both Zen Ecosystems and Pelican Wireless thermostats.

### ADR READINESS ASSESSMENT

Summary of ADR-readiness scores are shown below in Table 1. The Pelican Wireless thermostat earned the highest score for being OpenADR-capable “out-of-the-box” due to its ease of installation, existence of and easy access to a DR-mode display from the cloud homepage, and availability of an on-site OpenADR gateway in compliance with SCE’s ADR Program stranded asset policy. Zen Ecosystems’ thermostat score was a close second, followed by Venstar’s thermostats. While Zen Ecosystems also has a DR-mode display, it’s not readily visible from the Zen cloud homepage. Venstar’s thermostats is a cloud-only solution that lacks an on-site VEN. Carrier’s i-Vu requires customers to purchase a VEN add-on separately, which is only compatible with its i-Vu Pro model.

**TABLE 1. ASSESSMENT OF PLUG-AND-PLAY, OPENADR-READINESS OF CERTIFIED SOLUTIONS CARRIED BY SCE HVAC DISTRIBUTORS**

CERTIFIED SOLUTION	DR-MODE DISPLAY*	DR-MODE DISPLAY ACCESS**	INSTALLATION & CONFIGURATION***	ON SITE VEN OR GATEWAY*	OVERALL ADR READINESS/ FRIENDLINESS
Zen Ecosystems t-stat	1	2	2.5	1	6.5
PELICAN WIRELESS t-stat	1	3	2.5	1	7.5
Carrier I-Vu EMS with ADR software add-on VEN	0.5	1	1	1	3.5, more information needed
VENSTAR t-stats	1	2	2.5	0	5.5

\*0 = “no” 1 = “yes”,

\*\*1 = >2 clicks from homepage, 2 = 1 to 2 clicks from homepage, 3 = on homepage

\*\*\*1 = need controls engineer support; 2 = need contractor support; 3 = self-install

### ZEN ECOSYSTEMS THERMOSTATS

The Zen thermostat includes a local gateway (Almond router) that serves as the VEN for each site. The Almond gateway is connected via ethernet to the internet router, and accesses Zen Ecosystem’s HQ cloud energy management system. The Almond gateway sends information from the Zen HQ cloud to the on-site thermostats using Zigbee wireless communication protocol. Customers pay a \$25 per thermostat annual fee to access the ZenHQ cloud, which is necessary for DR participation.

#### DR MODE DISPLAY

The Zen HQ energy management interface provides a DR mode display which is 2-3 levels down from the main menu and not intuitive to access without instructions. From the main HQ cloud page, the user first goes to the “Groups” menu to select the site enrolled in DR. After locating the site, the user then clicks on the Settings icon next to the site. On the other hand, one convenience of putting the DR mode display under the Groups menu is that users can set or adjust their DR settings for all thermostats in the group – typically the facility or zone in a facility – all at once.

#### EASE OF INSTALLATION AND CONFIGURATION FOR ADR

Zen Ecosystems provides comprehensive step-by-step instructions for thermostat and gateway installation on their website. The instructions include written tips and notes along with an abundance of figures, diagrams, and online videos to support self-install. The company provides trained installers for customers who desire professional support. Each thermostat installation can be completed in as little as 20 minutes.

To connect the Almond gateway to a utility DRAS, all that is required from the contractor during installation is for the thermostats and gateway to be connected to the internet on site. The rest of the work is completed by Zen technical staff remotely, making ADR-enablement hands-off for the customer.

Zen Ecosystems thermostats has default DR settings on the ZenHQ cloud. The user can also set their own setpoint preferences for DR events via the scheduling menu of the ZenHQ cloud interface. DR participation using the cloud interface is free for customers, with no cloud subscription fee.

## PELICAN WIRELESS SYSTEMS THERMOSTATS

Pelican wireless thermostats include a local gateway that serves as the VEN for each site. The gateway is connected via ethernet to the internet router, and accesses Pelican's cloud-based energy management system. The gateway sends information from the Pelican cloud to the on-site thermostats using Zigbee wireless communication protocol. The cloud service is offered free to thermostat owners including participating in DR events, though a subscription fee of \$3 per thermostat per year is charged for customers who want the historical reporting feature.

### DR MODE DISPLAY

Pelican's online energy management interface provides a DR mode display. This display is readily accessed from the main website page. Demand response is clearly listed in the Admin menu, which makes it very easy and intuitive for the customer to locate the DR mode display.

### EASE OF INSTALLATION AND CONFIGURATION FOR ADR

Pelican provides basic written installation guides on their website. The guides include basic wiring diagrams and brief descriptions that assume the installer has some experience with electrical wiring. Once the gateway is installed, the thermostat connects to the gateway automatically. The thermostat then prompts the user or contractor through the remainder of set up including ADR prompts. Only the serial number is needed to set up the thermostat.

Connecting the gateway to a utility DRAS is made easy for the customer because the step is automated remotely through the cloud. All that is required is for the installer to connect the thermostats and gateway to the on-site internet. During set up, the installer enters the facility zip code in the setup screen and the utility's DRAS information is automatically populated on the setup screen.

Default temperature offset strategies are also pre-populated in the setup screen, which customers can adjust to their own preferences. Users can also program their preferences to respond to DR events via the cloud interface. The layout and organization of DR settings is intuitive and easy to use.

## CARRIER I-VU

The i-Vu is Carrier's building automation and energy management system. I-Vu consists of 3 models, the "Standard" or CIV-OPN, the "Plus" or CIV-OPNPL, and the "Pro" or CIV-OPNPR. Users must purchase the ADR software add-on, which is an OpenADR 2.0b certified VEN. The software add-on can only be used with the i-Vu Pro automation system. Information on i-Vu was gathered from discussions with the distributor.

#### DR MODE DISPLAY

The ADR-capable features are accessed in i-Vu's main controls interface, which is accessible via traditional web browsers. There is not a dedicated or designated ADR menu or page. Rather, ADR capabilities are dispersed throughout i-Vu's various existing menus.

#### EASE OF INSTALLATION AND CONFIGURATION

Carrier offers a user manual for the ADR software add-on. The manual includes minimal figures and visual aids. The complexity of the instructions indicate that installation, setup and configuration require the assistance of a Carrier controls expert. Furthermore, to use the ADR data in the software add-on, the user must "have the necessary ADR resource control programs", which must be additionally purchased from i-Vu's "Universal Controller SAL using Equipment Builder". Once an account is created for each DR program, ADR-enablement requires additional configuration to input Server, Market Context, profile, and other information. The installation and configuration process for i-Vu is significantly more involved and challenging compared to the thermostat products profiled in this report.

### VENSTAR THERMOSTATS

Venstar thermostats do not use local gateways; they are connected to a remote cloud only. The Skyport cloud was certified as a 2.0b VEN in 2017. The cloud service is offered free to thermostat owners, and SCE's residential customers can currently participate in DR events in the Smart Energy Program through Skyport.

#### DR MODE DISPLAY

Skyport's cloud includes a DR mode display that is located one level down from the main page. Once in the settings menu, ADR can be selected, and DR strategies can be configured for each thermostat within a facility. Thermostats can also be grouped in the Global Changes menu to allow a user to set or change DR preference settings for multiple thermostats all at once.

#### EASE OF INSTALLATION AND CONFIGURATION

Venstar provides comprehensive and written step-by-step instructions for installation that can be easily accessed via their website. The instructions include tips and notes along with an abundance of figures and diagrams to support self-install. Instructional videos are also available on installation, basic set up, and configuration. Venstar sales staff regularly train contractors on thermostat installation, at the facilities of the distributor that carries them. Venstar can push a firmware update over the internet to add the ADR feature to capable thermostats. Venstar can also remotely enable the ADR menu function for users on their Skyport account, which allows the customer to access and use the ADR functions.

### TECHNICAL SUPPORT IN OPENADR SIGNAL TESTING FOR VENSTAR

Energy Solutions and ASWB Engineering began signal testing between the Skyport cloud and SCE DRAS in May 2019. Venstar provided Energy Solutions with complementary thermostats, including a T8850 commercial Color Touch and T2050 commercial Explorer Mini. The remaining four thermostats are residential Color



Touch and Explorer models. The thermostats were connected to a power supply and linked to a Skyport online account (see Figure 1).

**FIGURE 1. VENSTAR THERMOSTATS TESTING SETUP**



### SCE DRAS TESTING:

The following summarizes the VEN connection and DRAS testing process:

1. ASWB Engineering sent Venstar VEN configuration instructions for connecting Skyport cloud VEN to the SCE test DRAS.
2. Venstar directed (pointed) the Skyport VEN to SCE test DRAS using the URL provided in the instructions.
3. Venstar queried the SCE DRAS to receive a VEN ID and a registration ID.
4. ASWB Engineering sent a request to SCE to associate the Orange Office VEN with ASWB's DRAS Account.

Once set up, ASWB Engineering confirmed the VEN was online and communicating with the DRAS. The program implementer can then create load shed events to confirm the space temperature setpoint increases and document the functionality of the Automated Demand Response system.

A load shed test with SCE DRAS was conducted on August 22, 2019 by ASWB Engineering. Staff confirmed that all thermostats automatically adjusted temperature setpoints by the programmed amount and reverted to original settings following the event.

### PG&E DRAS TESTING:

The Project Team conducted signal testing between the Skyport cloud and the PG&E DRAS following the successful SCE DRAS testing. The following steps were taken to conduct the PG&E DRAS testing:

1. Venstar reprogrammed the thermostats so they were directed (pointing) at the PG&E DRAS.
  - a. Once they were pointed at the DRAS, Venstar input a VENID that the Project Team had setup for them in the DRAS
2. The Project Team set up a load shed event, which was received by the central VEN and transmitted to all thermostats installed.
  - a. The Project Team confirmed the test was successful by visually observing the setpoint change on the Skyport user interface.
  - b. After the event concluded, the Project Team confirmed that the set point returned to pre-event levels.

The simple load shed test of all thermostats was completed in October. Staff confirmed that all thermostats automatically adjusted temperature setpoints by the programmed amount and reverted to original settings following the event. The thermostats were observed to respond immediately to the DRAS signal without any time lag. Note that the thermostats respond to the Skyport cloud which is the OpenADR VEN connected to PG&E DRAS. Skyport does not indicate receipt of DRAS signal and the Project Team is not able to observe time lags, if any, between the DRAS and Skyport. However once the thermostats became active, the setpoint change response was immediate.

After the load shed event was determined to be successful, the Project Team moved on to phase 2 of the testing – multi-resource VEN signaling. The multi-resource VEN signaling test was completed to confirm that the Skyport could initiate events for individual thermostats instead of all under its control. This signaling ability is needed for sites to be able to take place in programs that are dispatched locally, such as the Capacity Bidding Program (CBP). To setup the multi-resource testing, the Project Team worked with VENSTAR and PG&E on the following steps:

1. The Project Team generated a list of resource IDs to be tied to each thermostat.
  - a. For actual site setups, this resource ID will be a unique 10-digit identifier matched to the customer Service Account ID (SAID). However, since this testing was not completed at an actual facility, the resource IDs used here were a set of made-up 10-digit numbers
2. VENSTAR programmed each 10-digit resource ID into the Skyport cloud to correspond to each specific thermostat
3. PG&E aggregated these resource IDs together into an “aggregation ID”, which was programmed into the PG&E DRAS

The Project Team then worked with PG&E to setup a test to signal a subset of the thermostats included. Due to a change with the test DRAS being used to conduct the test, the test was delayed past June 2020. At time of this writing, the Project Team sent new connection instructions to Venstar to complete this portion of the testing before the project end date. Zen Ecosystems thermostats are participating in ADR events and can be signaled individually or in subsets. Pelican wireless claims their thermostats can be signaled in subsets, this should be formally tested and validated.

## ADR PROGRAM STRANDED ASSET POLICY

DRAS testing with Venstar thermostats revealed that their VEN is entirely cloud-based. The lack of a local VEN solution makes Venstar thermostats ineligible for SCE ADR incentives under the current Program rules. On the other hand, PG&E's ADR Program has waived stranded asset testing for nonresidential customers 499 kW and smaller since 2015. The Project Team opened discussions with SCE in fall 2019 regarding SCE ADR Program's stranded asset policy regarding all cloud-only solutions.

The Energy Solutions Project team interviewed SCE Smart Energy thermostat program manager Anthony Saucedo, ADR program manager Noel Bugarin, DR subject matter expert Mark Martinez, and DR subject matter expert David Rivers. Unlike PG&E's ADR program policy, SCE requires all ADR customers using cloud-based controls to pass a stranded asset test regardless of facility size or shed potential. The solutions must demonstrate that in the event that the cloud service goes away, SCE DRAS can still signal a local VEN (i.e. on site) so that the customer can continue participating in DR events. During the post-installation project inspection and testing, a test event signal is sent from the SCE test DRAS to the cloud, and separately also sent to the local VEN onsite.

In January 2020, the Project Team facilitated a call with six SCE staff and reviewed justifications for stranded asset policy. The Team noted market trends in cloud-based controls, and the lower cost benefit for customers adopting ADR under the current policy. The Team offered ideas on mitigating stranded asset risk and alignment with PG&E's policy. One suggestion was to limit total incentives paid to cloud-only solutions without on-site VENs each year. More justifications for updating SCE's cloud VEN policy are included in the Project Delivery section of Chapter 5: Conclusions. After internal deliberations, SCE ADR Program Manager moved to update its policy to waive stranded asset testing for Express Auto-DR applications, which apply to customers 499 kW of peak demand and smaller. The policy will be effective as of January 1, 2020.

## CHAPTER 4: ACTIVITY 4 – DISTRIBUTOR EDUCATION

Activity 4 was designed for supporting the overall project goals by informing and educating distributors about state code and utility ADR program requirements and about how to take advantage of the market opportunity to sell OpenADR controls. Much of the distributor engagement throughout the project included educational components, through continued conversations via phone calls, in-person meetings, and a lunch and learn events.

During the initial months of the project, the Project Team created a flyer, “Technology Upgrade Incentive Opportunities For Your Customer”, to pique distributors’ interest in embracing the market opportunity of selling OpenADR controls to customers in SCE, PG&E, and SMUD territories. Since the distributors engaged in this project operate in larger territories than just SCE’s service territory, giving them information on all utilities was seen as a way to emphasize the opportunity of tapping into these incentive programs. The flyer presents the basics on technology and customer eligibility, and the level of incentives available. See Appendix D: ADR Tech Incentives Flyer.

The Project Team also created an ADR incentives matrix, showing incentives dollar ranges for different types of projects based on SCE’s Express Auto-DR program. This was originally requested by Distributor D but was used as an outreach and educational material for other distributors as well. See Appendix E: Except from Tech Incentives Estimator.

Distributor-specific efforts are described in the subsections below. Additionally, the Project Team logged most emails, calls, and meetings in Salesforce. An excerpt from a Salesforce report export is provided in Appendix F: Outreach .

### DISTRIBUTOR A

One of the main goals with outreach to Distributor A was to help the distributor and their contractors participate in SCE’s Manage Your Power Pilot. Distributor A was primarily interested in the access to a new market for thermostats products through the Pilot. The Project Team met with Distributor A several times in July and August 2019 and communicated the benefits of promoting ADR certified thermostats to customers defaulted onto CPP.

The Project Team provided ongoing assistance to Distributor A through November for enrolling their contractors on the Manage Your Power platform. These activities included presentations about ADR and CPP to Distributor A’s territory managers. The Project Team learned through this process that contractors aren't desperate for new customers at this time, and that thermostat projects are low-profit jobs for them, especially with the SMB market. The Project Team offered to provide an additional lunch and learn similar to the one done for Distributor B. Distributor A suggested waiting until there is more market demand for ADR.

### DISTRIBUTOR B

A focus of outreach and education with Distributor B was to support the sale of an ADR solution to a large Distributor B customer by explaining ADR and the market opportunity of new peak hours 4-9pm. Although Distributor B did not ultimately

identify a customer, they did receive a fair amount of educational and technical support from the Project Team through this project, via a lunch and learn and phone and in-person meetings.

The lunch and learn was held at one of Distributor B's offices, and presented to the Controls Group in August 2019. The lunch and learn included an introduction by SCE project manager Navniel Pillay, a presentation by Energy Solutions on DR regulatory environment, and policies and programs in California followed by an OpenADR technology board demonstration by ASWB Engineering. Eight controls sales managers and engineers attended the event and were highly engaged. The sales managers asked numerous questions relating to ADR programs, the CPP tariff, OpenADR technology solutions, barriers and challenges, and potential markets. The lunch and learn presentation slides are included in full in the Activity 4 Memo. The main topics included:

- Demand management landscape in California.
- Automated demand response (ADR) and how it works.
- OpenADR certified technologies.
- Utility ADR programs in CA.
- Other eligible DR programs at SCE.
- Challenges and Opportunities.
- Live demonstration of OpenADR certified products.

## DISTRIBUTOR C

One of the main goals for education and outreach efforts with Distributor C was to understand what aspects of an upstream ADR incentives program would change the margin on controls and be a tipping point for Distributor C to invest more in ADR sales. To this goal, the Project Team had several in-person meetings with Distributor C's California Controls Sales Manager, including an in-person visit with SCE staff to Distributor C's main Southern California office.

In January 2020, the Project Team met with three Distributor C employees, who gave an overview of Distributor C's OpenADR solution for light commercial customers. The Project Team discussed ideas for a distributor incentive program for ADR, which was received with interest from Distributor C. A second in-person meeting included SCE's Project Manager and acting ADR Program Manager in February 2020. During this visit, Distributor C gave a live ADR demonstration with their controls system and discussed options for selling ADR capable controls. Discussions also included how Distributor C currently enables the controls systems via a 3rd-party OpenADR certified VEN. Distributor C's control sales manager noted that they would educate and train contractors to sell ADR-capable controls if provided with an upstream incentive program, but noted that contractors lack the expertise to discuss ADR with customers. Distributor C recommended that their own sales staff would approach the customer after contractor installs the equipment. Distributor C would develop an "ADR package" that Distributor C sales staff would sit down with customers and discuss. For both indirect and direct sales, Distributor C noted that they could provide the installation address and key data needed for an ADR application, without having to rely on contractors.

## DISTRIBUTOR D

Education and outreach to Distributor D was conducted primarily through direct conversations with their main controls partner, over phone via DRAS testing support. Both the distributor and the controls manufacturer were not fully aware of SCE's Auto-DR Program rules but were extremely interested in the current and potential eligibility of their ADR-capable thermostats.

In May and August 2019, the Project Team met in-person with Distributor D and the controls manufacturer at Distributor D's office. During the May meeting, Energy Solutions introduced the project and gave an overview of ADR in California, requirements in Title 24, Part 6 and other background similar to information presented in Distributor B's lunch and learn. In the August meeting, the group discussed DRAS signaling to the control partner's thermostat cloud. Prior to the meeting, the Project Team sent the controls partner a diagram of DRAS signaling (VTN to VENs) and listed required capabilities that the their VEN needed to support commercial customers, such as the ability to parse an OpenADR signal by SCE customer SAID and by DR program.

## CHAPTER 5: CONCLUSIONS

### STOCKING OF OPENADR CERTIFIED AND ADR-CAPABLE PRODUCTS

Of the six distributors the Energy Solutions Project Team engaged with, four currently stock OpenADR 2.0 certified solutions for the commercial market. Three stock certified thermostats for the small and medium-sized business (SMB) market: Pelican Wireless thermostats, Venstar thermostats, and Zen Ecosystems thermostats. One distributor stocks a certified Carrier certified gateway compatible with Carrier's i-Vu energy management system (EMS). Currently none of the HVAC distributors carry third-party standalone OpenADR certified VEN products. However, the distributors can easily order VENs if their customers ask for them and would be more willing to stock VENs if there was demonstration of significant demand.

During this project, the Project Team engaged with distributors on expanding their current OpenADR-certified controls offerings. The Project Team was successful in increasing the OpenADR product offerings for one distributor, who started carrying Zen Ecosystems thermostats in mid-2019. The Team continues conversations with Honeywell contacts who remain interested in pursuing OpenADR certification of their EMS for light commercial applications and thermostats which are carried by these distributors.

### SALES PRACTICES AND PROMOTING ADR CONTROLS

The Project Team interviewed distributors about existing sales practices that distributors employ to promote and sell products, including DR-capable controls. Distributors noted that their customers have not asked for demand response solutions. However, they expect that commercial customers defaulting to CPP this year, and particularly expiration of customer bill protection in 2020 will contribute to the demand for ADR solutions. Distributor A, Distributor B and Distributor C noted this point in particular. 2020 would be a good time to reengage with distributors.

The distributors vary in how they respond to this lack of demand for ADR. Both Distributor A and Distributor B actively promote ADR to their customers. Distributor C sees value in promoting controls that increase comfort, save energy, and increase system reliability. Distributor C notes that ADR can be implemented in a way that does not compromise occupant comfort. Distributor D sees a deemed incentive and streamlined application process as critical to upselling the OpenADR certified thermostats that they carry. Distributor F and Distributor E are not actively promoting ADR.

### TECHNICAL SUPPORT

Pelican Wireless and Zen Ecosystems received the first and second highest assessment ratings, respectively. Both Pelican Wireless and Zen thermostats provide a local gateway and VEN that conform to California utilities' ADR program requirements for stranded asset testing. The thermostat and gateway are relatively easy to install, though Zen Ecosystems technical documents provide more step-by-step instructions and tips for a less technical audience compared to Pelican Wireless.

The Pelican Wireless thermostat automatically seeks its gateway once both are installed, which is a convenient feature. Pelican Wireless places their DR mode display access on the main page settings menu. This earned the product a higher score over Zen Ecosystems and Venstar thermostats, which require customers to go two to three levels into the online cloud websites to access the DR modes. Venstar commercial thermostats offer the same ADR-capable features as Pelican Wireless and Zen Ecosystems. A main challenge with Venstar thermostats is the absence of an onsite gateway.

Carrier's i-Vu is an EMS product for light to large commercial applications. The product includes an OpenADR certified software VEN that must be custom installed and works with the i-Vu Pro model only. Information about i-Vu installation and operation were gathered from discussions with the distributor, rather than first-hand observations of the EMS interface or the installation and configuration process.

The Project Team completed OpenADR signal testing with Venstar thermostats and their Skyport cloud using both the SCE test DRAS and PG&E test DRAS. The tests were successful and confirmed that Venstar thermostat setpoints respond to an event signal from the DRAS. The Project Team has offered DRAS signal testing support to two additional distributors for their Carrier i-Vu controls and Concierge EMS for light commercial applications.

SCE's Auto-DR Program's current stranded asset policy requires all sites to demonstrate that if the cloud service goes away, there is a backup local VEN on site to receive an OpenADR event signal so that the customer can continue participating in DR events. On the other hand, cloud-based controls offer smaller customers the opportunity to access energy management services previously limited to larger facility owners at lower price points. SCE can mitigate stranded asset risk by limiting total incentives paid to cloud-only solutions without on-site VENs each year. Following internal deliberations, SCE ADR Program Manager moved to update its policy to waive stranded asset testing for Express Auto-DR applications, which apply to customers 499 kW of peak demand and smaller.

## DISTRIBUTOR EDUCATION AND OUTREACH

Distributor sales managers and staff varied in the level of understanding and knowledge of ADR programs, and the Project Team tailored outreach and education strategies for each distributor accordingly. While the Project Team shared information about ADR with the distributors, we also asked distributors for their input on the upstream ADR program design. Feedback from distributors thus far is universally supportive of an upstream program for ADR, and distributors have shared that this would greatly increase their sales of ADR controls. This is particularly true for Distributor C and Distributor B which have dedicated controls sales divisions, as well as Distributor A and Distributor D who want to increase thermostat sales.

While distributors appreciate the educational information exchange including lunch and learns, a bit of relationship capital is used up for each engagement and request of their time. Distributor A and Distributor B expended considerable time and effort working with the Project Team related to the Manage Your Power pilot with SCE. The Project Team is being cautious about asking more from these two distributors before the value of their pilot participation is demonstrated. SCE's promotion of Manage Your Power to its customers is critical for distributors to increase certainty of market demand for carrying OpenADR certified products (see Appendix G: Background on SCE's Manage Your Power Pilot for additional background). Since SCE's original plans



for large-scale promotion to customers about Manage Your Power didn't occur, the Project Team recommends SCE follow up efforts to do so.

## CHAPTER 6: RECOMMENDATIONS FOR UPSTREAM ADR PROGRAM DESIGN AND NEXT STEPS

An upstream program approach shifts the administrative and technical burden of project delivery further up the supply chain. Activating upstream actors (distributors and manufacturers) allows utility program staff to leverage fewer relationships and achieve a broader impact. Recommendations for improving ADR program design first tested in the 2013 pilot including are discussed in this chapter. The Project Team presents an updated upstream incentives design based on updated technology cost data. Project delivery, application process and DR program enrollment design recommendations are included later in this section to make participation as easy as possible for these key market actors. Comments regarding program design gathered from distributors are also shared in this chapter.

### DISTRIBUTOR COMMENTS ON UPSTREAM ADR PROGRAM DESIGN

The Project Team asked distributors for recommendations on what an upstream ADR program would ideally look like. We also asked them ways to streamline the current SCE Auto-DR incentives program to gather ideas for a future upstream program. Below is the feedback that we have received.

*Upstream incentive would spur ADR controls sales.* Distributor D shared that an upstream incentive would make them want to sell the control whenever possible. They would “be more creative with it and try to put controls where they wouldn't be sold usually.” With projects that are large – hundreds of thousands of dollars – the cost to add ADR is minimal and they would take advantage of every opportunity to do so. Distributor A would prefer the incentive to be upstream because then they could mark down the price of the thermostat at the time of sale. Distributor C shared that they would be very engaged in ADR sales if there were a distributor incentive for ADR. The incentive would enhance margins for controls and motivate sales engineers and account managers via commissions.

*Simplify the program design.* Distributor D recommended that the program should reduce the number of fields that contractors need to enter for the current Express ADR incentives application to two– zip code and SAID. Distributor C suggested developing a project form for contractors to collect project information, such as site address. Distributor A noted that if they deliver the unit, they have the site address. However, if the contractor picks it up from the shelf at Distributor A's shop or gets mailed to the shop, Distributor A won't know the installation address.

*Pre-calculated incentives based on number of thermostats or HVAC units.* Distributor D also asked for pre-calculated incentive amounts to simplify the process of estimating project benefits. Distributor D and Distributor C suggested incentives based on number of thermostats or number of HVAC units, as contractors and customers are unlikely to know the total site tonnage on retrofit projects. Distributor A preferred the incentive to be upstream to mark down the price of the thermostat at the time of sale.

## INCENTIVE DESIGN

This section presents an updated analysis of the incremental measure cost (IMC) and proposed incentive design for ADR-capable control solutions used with HVAC equipment.<sup>5</sup> This IMC and incentive analysis updates the incentive design and results from the 2013 SCE Upstream HVAC with Auto-DR Pilot.<sup>6</sup> In this 2019 project update, the Project Team re-examines smart thermostat incentives and evaluates EMS controls incentives for the light commercial market. For EMS, the Project Team focused on “lite” EMS solutions targeting small and medium facilities less than 500 kW in peak demand eligibility for Express deemed incentives.

## ANALYSIS METHODOLOGY AND ASSUMPTIONS

The Project Team analyzed IMC for both thermostats and control systems using the same general methodology. Summarizing the analysis methodology, project costs for both smart thermostat and lite EMS measures were collected from various manufacturers and distributors. IMCs were analyzed for a range of site characteristics, such as number of HVAC units, HVAC cooling capacity in tons, and kW load shed. The kW load shed was based on the most common DR strategies for HVAC, consisting of 2-, 4- or 6-degree global temperature adjustment. Incentive options were then developed based on a percentage coverage of IMC across the range of site characteristics analyzed, then balanced against \$/kW considerations.

The first step of the IMC analysis involved data collection. The following information was collected from equipment manufacturers and distributors or from invoices from completed projects available to the Project Team through PG&E’s ADR incentive program:

- Hardware costs, including both necessary and auxiliary equipment.
- Software costs, such as online user interfaces provided to the customer either in the form of subscription, cloud-based services, or software installed on a local control point.
- Installation and commissioning costs.
- Other additional costs, including upselling and to cover associated risks (see further explanation below).

“Upselling” refers to the act of selling something beyond what is specifically being requested by the customer or contractor. Distributors may upsell a more efficient HVAC unit or suggest adding components to the system, such as controls (thermostats, EMS, etc). Because it will likely increase capital costs, the distributor

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<sup>5</sup> An IMC analysis compares the costs of a proposed measure to the costs of a baseline measure. In this report, the baseline cost is the cost of purchasing one or more code-compliant HVAC units, and the proposed measure is the addition of controls that makes the HVAC unit ADR-enabled. The IMC analysis examined the costs of ADR-enabled controls solution, which were then used to estimate incentive levels necessary to assist in the sale of the technology.

<sup>6</sup> In the 2013 Pilot, Energy Solutions developed incentives for thermostats, rooftop air conditioning controllers, and variable refrigerant flow equipment controls. The 2013 pilot offered \$40/ton for unitary AC controllers and \$2,000 per project for variable refrigerant flow projects that were ADR-enabled. The incentives were doubled for projects where the distributor or contractor enrolled the customer in an eligible DR program. For thermostats, the 2013 pilot offered \$150 per unit for cloud-based VENS and \$250 per unit for on-site VENS.

spends additional time convincing customers that the “upsold” product will be more beneficial in the long run. Distributors may present to customers calculations showing greater energy savings, or non-energy benefits, such as increased comfort or ability to monitor unit performance. However, spending additional time with the customer increases the distributor’s risk for not closing the sale. Customers could feel that the distributor is running the costs up unnecessarily, or walk away from the sale in confusion or impatience. Thus, distributors must also spend resources upfront to develop an upsell strategy to be both simple, clear, and compelling for the customer to mitigate this risk.

OpenADR-certified controls are not commonly included in HVAC equipment sales, nor requested as a standalone sale. An additional element for upselling OpenADR controls is that the distributor will need to convince the contractor or building owner that the added steps of enabling the controls for demand response operation is worth the additional purchase costs. This need to upsell is accounted for in the IMC analysis as an “upselling adder” to recognize the additional distributor time investments needed.

Costs to enroll a customer in a DR program were not included. The Project Team assumed that each customer would be defaulted onto CPP. As such, there wouldn’t be time required for distributors to help customers choose a program.

#### LOAD SHED POTENTIAL METHODOLOGY

A common HVAC load shed measure of global temperature reset was assumed to be implemented at each site. Committing to just one load shed strategy simplified both the program design and the load shed potential analysis. The Project Team used data from SCE’s Express calculator to estimate the load shed associated with three temperature reset options listed below:

1. 2-degree temperature reset: 8% of available HVAC load.
2. 4-degree temperature reset: 12% of available HVAC load.
3. 6-degree temperature reset: 16% of available HVAC load.

The project team assumed that the default available DR strategy would be a 4-degree temperature reset. However, the 2-degree and 6-degree options were also analyzed in case SCE wanted to give flexibility to both the distributor and customer during the sales process. If SCE prefers to only include one DR strategy however, the Project Team recommends using the values associated with the 4-degree temperature rest measure.

In addition, the Project Team assumed that the equipment on site had an efficiency of 1 kW/ton, or 12 EER. While there can be a range of equipment efficiencies, a rate of 1 kW/ton represents the average efficiency of rooftop HVAC units and allows for easy translation between kW and tons.

The load shed capabilities of different sites was estimated to compare project costs to kW load shed. The IMC results help to determine the basic structure of the program design and incentive levels. Determining an incentive level will be a balance between covering enough of the IMC to move the market to sell ADR-enabled controls, while keeping the incentive low enough to have a cost effective \$/kW savings.

## INCREMENTAL MEASURE COST ANALYSIS

### THERMOSTATS

The Project Team analyzed IMC for OpenADR 2.0 certified thermostats identified in this project, including: Pelican Wireless, Zen Ecosystems, and Venstar. The table below summarizes the costs included for each technology, with examples of what is included in each category:

**TABLE 2. COST DATA COLLECTED FOR THERMOSTAT INCENTIVE ANALYSIS**

TECHNOLOGY	THERMOSTAT COSTS	AUXILIARY COMPONENTS (PER THERMOSTAT)	GATEWAY	CLOUD SERVER SUBSCRIPTION	AUXILIARY COMPONENTS (PER SITE)
Pelican Wireless	X		X	X	
Zen Ecosystem	X		X	X	X
Venstar Explorer/Explorer Mini	X	X		X	
Venstar ColorTouch	X			X	

Descriptions of thermostat cost components listed in Table 2 are as follows:

1. Thermostat: Physical device used to control the HVAC unit operation. Smart thermostats can either connect directly to the cloud server via a web connection (as in the case for Venstar) or first with a central connection point, or local gateway (further defined below) as is the case with both Pelican and Zen.
2. Auxiliary Components per Thermostat: Controls embedded within each thermostat that allows for it to communicate to the internet (if communication component is not already embedded in the thermostat itself).
3. Central Connection Point (OpenADR VEN, commonly called a gateway): A device typically installed at a rate of one per site. Thermostats with gateways communicate with this one point either over Wi-Fi or another communication protocol, which transmits the communication to the cloud server via Wi-Fi.
4. Cloud Server Subscription: Subscription costs necessary to enable connection to the manufacturer’s cloud control system user interface. Through this interface, the customer can manage and control thermostats as well as set preferences for and participant in demand response events. The subscriptions typically come as a per-thermostat-per-year cost.
5. Auxiliary Components per site: These devices are included if the thermostats are using a communication protocol other than Wi-Fi, such as ZigBee. These additional components translate the thermostats’ native communications to Wi-Fi to enable the thermostats to communicate via the internet.

Table 3 below summarize the costs collected for each category (hardware, software and install/commissioning):

**TABLE 3. THERMOSTAT CONTROLS SYSTEM COSTS USED IN INCENTIVE ANALYSIS**

	THERMOSTAT	CENTRAL CONNECTION	AUXILIARY (PER T-STAT)	AUXILIARY (PER SITE)	SUBSCRIPTION COST (PER T-STAT /YEAR)
No. of Data points	10	2	4	1	3
Avg.	\$134	\$190	\$55	\$600	\$11
Max	\$200	\$180	\$55	\$600	\$25
Min	\$70	\$200	\$55		\$0

To convert from total costs to IMC, a range of different site cooling characteristics were assumed. Table 4 below shows the site assumptions used for this analysis:

**TABLE 4. HVAC PROJECT SCENARIOS USED FOR THERMOSTAT CONTROLS INCENTIVE ANALYSIS**

SITE	# OF RTUs/THERMOSTATS	AVERAGE RTU SIZE	TOTAL SITE TONS	APPROX. FACILITY SQUARE FOOTAGE
1	2	7.5	15	6,000
2	5	7.5	37.5	15,000
3	10	7.5	75	30,000
4	2	10	20	8,000
5	5	10	50	20,000
6	10	10	100	40,000
7	2	20	40	16,000
8	5	20	100	40,000
9	10	20	200	80,000
10	2	25	50	20,000
11	5	25	125	50,000
12	10	25	250	100,000

This analysis assumes 1 thermostat per RTU. It should be noted, however, that as RTUs increase in size, they may be installed to serve multiple zones, which would result in more than 1 thermostat per RTU. However, there is typically a 1:1 ratio of thermostats to RTUs for light commercial installations.

Using this range of site RTU characteristics allows for a full picture of the IMC, as the number of RTUs will impact the number of thermostats installed (1 per RTU) and the number of total site tons affects the range of kW load shed and cost per ton.

There were 3 normalizing factors considered in calculating IMCs: \$/ton, \$/kW and \$/unit. The IMCs were determined by calculating the full project cost. The following equations show how these 3 factors were calculated:

*Total Project Cost*

$$= (\text{Thermostat cost} + \text{install and commission cost per thermostat} + \text{annual subscription cost per thermostat} + \text{auxiliary equipment cost per thermostat} + \text{upselling cost}) \times \# \text{ of thermostats} + \text{auxiliary equipment per site cost}$$

The upselling cost was set at \$350/project. This value is known to distributors as the cost of sale and was estimated on average to be about 3 hours of added labor, at a labor rate of \$120/hour.

Table 5 below shows the thermostat IMC analysis results for each of the factors considered:

**TABLE 5. COST ANALYSIS FOR OPENADR THERMOSTATS**

STATISTIC	\$/TON	\$/UNIT
Average	\$33.71	\$394.39
Standard Deviation	\$17.06	\$85.58
Min-Max	\$11.04 - \$88.67	\$260 - \$665

ENERGY MANAGEMENT SYSTEMS

Building energy management systems are defined by a combination of hardware and software used to control various processes taking place at a facility. Energy management systems come in various levels of sophistication- EMS and EMS Lite. This analysis focused on EMS Lite systems, which are more suitable for this upstream program design. A full-scale EMS has the ability to enact many more sophisticated strategies than a 4-degree temperature reset, making it a product more applicable to the existing custom automated demand response programs. EMS Lite systems are typically used to control more specific and limited operations, such as a building’s HVAC and/or lighting systems.

EMS require far more custom installation compared to thermostats. Therefore, the data collection was less focused on specific components and was instead based on the different project scenarios presented in Table 4. One manufacturer provided baseline costs associated with all installs and estimated a \$/HVAC unit addition. The other two manufacturers provided cost estimates for each scenario in Table 4, which were directly plugged into the analysis. All three manufacturers agreed that the main cost drivers are the number of package units and building square footage.

Cost data collected for EMS are summarized in Table 6. The costs below include the same upselling cost of \$350/project that was used in the thermostat analysis.

**TABLE 6. COST DATA COLLECTED FOR EMS INCENTIVE ANALYSIS**

ESTIMATED COST/UNIT	VENSTAR	CARRIER	TRANE
Hardware	X	X	X
Install + Commissioning	X	X	X
Upselling			X

Table 7 below shows the IMC analysis results for EMS. This analysis is only based on the controllable HVAC load. This likely underestimates the potential load shed since each of the EMS “lite” systems can easily be expanded to other electrical loads on site, such as lighting. SCE should consider adding additional upstream measures to best incentivize projects that are being completed to control more than just site HVAC loads.

**TABLE 7. COST ANALYSIS FOR OPENADR CERTIFIED EMS**

STATISTIC	\$/TON	\$/UNIT
Average	\$550	\$6,800
Standard Deviation	\$700	\$7,700
Min-Max	\$43 - \$3,500	\$1,000 - \$26,000

### INCENTIVE DESIGN RESULTS AND DISCUSSION

The following points should be considered when determining an incentive design and structure:

- OpenADR controls incentives should be seamlessly integrated into the overall sales process.
- Incentives should be high enough to encourage upselling while still maintaining program cost effectiveness.

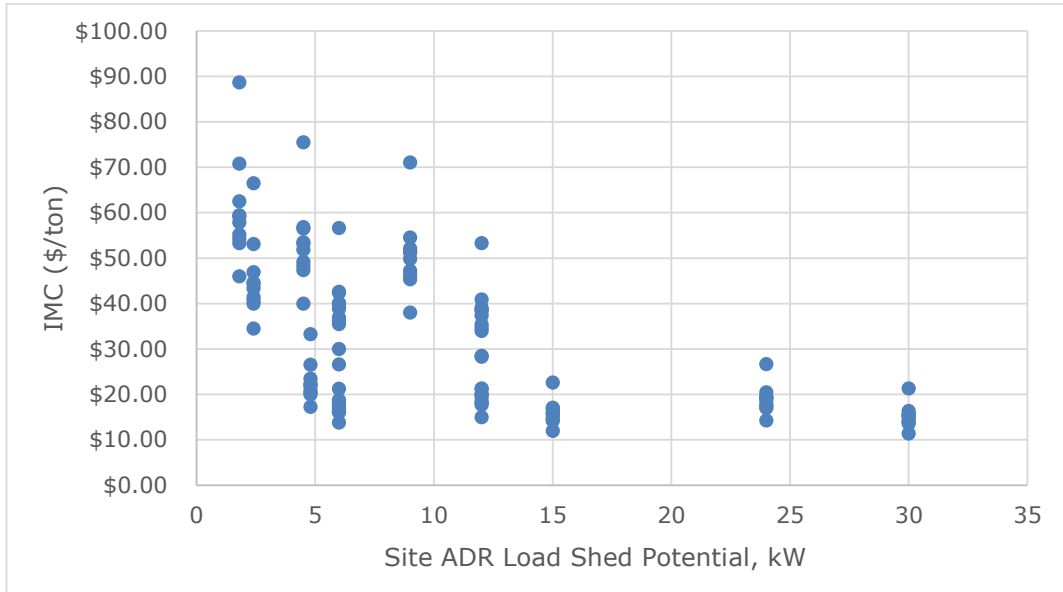
#### STREAMLINED INCENTIVE INTEGRATION

The upstream ADR incentive should help simplify a sale and not add complexity. Upselling from controls to OpenADR certified and enabled controls will already take some time. The distributor should not have to spend additional time calculating the incentive for a given project, as delays jeopardize the sale. These issues can be addressed by developing a deemed incentive that is based on units familiar and accessible to the distributor. Site cooling tons is one option as the distributor is already accustomed to using it from participating in programs such as the Upstream HVAC efficiency. The distributor could just add the controls incentive on top of the equipment incentive to arrive at the total site incentive. Other options include per RTU or per thermostat (usually a 1:1 ratio at lite commercial installations).

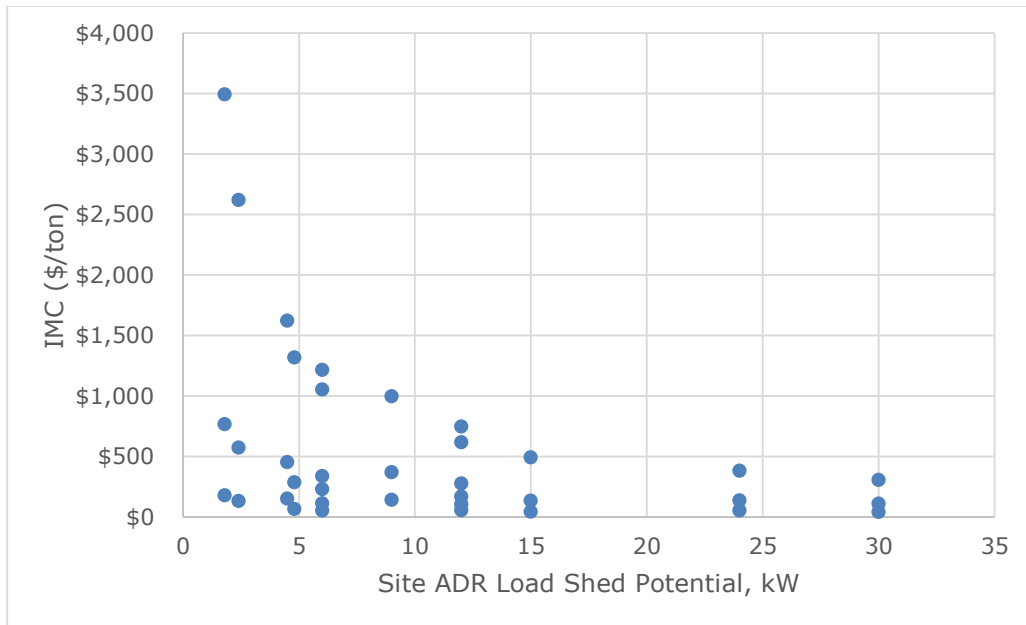
#### INCENTIVES BASED ON SITE TONNAGE MAY ENCOURAGE MORE SALES FOR HIGHER IMPACT PROJECTS

Basing the incentive on total site tonnage has the added benefit of likelihood to influence more OpenADR certified and enabled controls towards locations with proportionally higher kW impacts. The charts below show how the thermostat and EMS IMC in \$/tons varies as site kW load shed potential increases:





**FIGURE 2. RELATIONSHIP BETWEEN IMC AND SITE ADR LOAD SHED POTENTIAL FOR THERMOSTATS**



**FIGURE 3. RELATIONSHIP BETWEEN IMC AND SITE ADR LOAD SHED POTENTIAL FOR EMS**

As is shown in Figure 2 and Figure 3, the IMC decreases as the total site kW load shed increases. More of the IMC will be covered for higher kW load shed sites. These results make sense since one of the main project cost drivers for both thermostats and EMS is the number of rooftop units, regardless of tonnage per unit. Therefore, two projects with the same number of units but different tonnage per unit will have similar project costs, while the site with larger units will have a higher load shed

potential. For technologies like thermostats, where the purchase price (as opposed to lifetime cost savings) is the main sale driver, increasing the project cost coverage will have a significant impact on the number of closed sales. Therefore, assuming the goal is to help close more sales for projects with higher respective kW load shed potential, the incentive should be based on total site tonnage.

#### SETTING THE INCENTIVE RATE TO BALANCE PROJECT COST COVERAGE VS COST EFFECTIVENESS

Incentives should be set as high as possible to cover the maximum amount of project cost. Covering project costs helps generate market interest and ultimately drives more awareness and adoption of the technology. However, this number cannot be increased without bounds. Ideally, incentives should not cover less than 50% of the IMC and also should not exceed the full IMC value itself.

In a 2017 proposed decision, the CPUC determined that a 75% average project cost cap is reasonable for ensuring cost-effectiveness of the program while providing high enough incentive levels to increase participation<sup>7</sup>. Therefore, the Project Team decided upon an incentive rate that offers 75% project cost coverage on average for the 4-degree temperature reset measure. On average means that the incentive covered an average of 75% of the total project cost for all technologies and scenarios listed in Table 4. Once that rate was determined, it was converted to a \$/kW value and applied to both the 2-degree and 6-degree temperature reset load shed amounts to calculate the corresponding \$/ton values. The results are presented in Table 8:

**TABLE 8. INCENTIVE RATES VS THERMOSTAT IMC COVERAGE PERCENTAGES**

MEASURE	PERCENTAGE OF PROJECT COST COVERED BY INCENTIVE (CAPPED AT 100% OF TOTAL COST)	INCENTIVE (\$/TON)	INCENTIVE (\$/UNIT)
2-degree temperature reset	65%	\$16	\$270
4-degree temperature reset	75%	\$24	\$310
6-degree temperature reset	85%	\$32	\$360

The incentives above correspond to a rate of \$200/kW, which is just lower than the average incentive rate currently offered in existing ADR incentive programs in California.

The same process was followed to estimate the incentive rate necessary to hit 75% project cost on average (without going over) for EMS installs (see Table 9). The values represent an incentive rate of \$2,250/kW, far above the \$300/kW incentive currently offered in the SCE Auto-DR Program.

<sup>7</sup> California Public Utility Commission (September 2013), R1309011 – Proceeding: Order Instituting Rulemaking to Enhance the Role of Demand Response in Meeting the State’s Resource Planning Needs and Operational Requirements.

**TABLE 9. INCENTIVE RATES VS EMS PROJECT COST COVERAGE PERCENTAGES**

MEASURE	PERCENTAGE OF PROJECT COST COVERED BY INCENTIVE (CAPPED AT 100% OF TOTAL COST)	INCENTIVE (\$/TON)	INCENTIVE (\$/UNIT)
2-degree temperature reset	65%	\$200	\$2,600
4-degree temperature reset	75%	\$300	\$4,000
6-degree temperature reset	80%	\$400	\$5,300

Table 10 and Table 11 below suggests \$/ton and \$/unit incentive rates based on the \$200/kW rate chosen for thermostats and the \$300/kW incentive rate currently offered by the SCE Auto-DR Express Control program:

**TABLE 10. EMS PROJECT COST PERCENTAGES VS INCENTIVE RATE (\$/TON)**

Measure	<u>MATCH TSTAT DISTRIBUTOR INCENTIVE OF \$200/kW</u>		<u>MATCH EXISTING SCE ADR PROJECT INCENTIVE OF \$300/kW</u>	
	\$/ton	Average % project coverage	\$/ton	Average % project coverage
<b>2-degree temperature reset</b>	\$16	10%	\$24	15%
<b>4-degree temperature reset</b>	\$24	15%	\$36	23%
<b>6-degree temperature reset</b>	\$36	23%	\$48	30%

**TABLE 11. EMS PROJECT COST PERCENTAGES VS INCENTIVE RATE (\$/UNIT)**

Measure	<u>MATCH TSTAT DISTRIBUTOR INCENTIVE OF \$200/kW</u>		<u>MATCH EXISTING SCE ADR PROJECT INCENTIVE OF \$300/kW</u>	
	\$/unit	Average % project coverage	\$/unit	Average % project coverage
<b>2-degree temperature reset</b>	\$250	10%	\$375	15%
<b>4-degree temperature reset</b>	\$375	15%	\$560	23%
<b>6-degree temperature reset</b>	\$500	20%	\$750	30%

Neither option hits the 50% project cost recommendation. The following information is presented to assist SCE in deciding on the appropriate incentive rate for EMS:

1. Maintaining the same incentive rate for EMS and thermostats (e.g. \$24/ton for both) would further streamline participation because distributors would have a single incentive value they could apply toward either.
2. The total kW load shed for EMS will likely be higher than what is being used in this analysis because it only assumes HVAC load will be controlled. EMS can easily be expanded to control other electrical loads, including lighting. SCE could consider increasing the incentive rate for EMS on the presumption that the actual kW load reduction will likely be higher than what is used here.
3. Distributors expressed that the EMS sales process is more sophisticated, and includes a range of analyses including return on investment (ROI) and risk mitigation, which means they have more tools to close the sale along with the incentive. Therefore, while a higher incentive will always be helpful, reaching 75% project cost coverage is not as crucial for EMS as it is for thermostats, which is typically sold based on total install cost alone

This analysis did not recommend incentives for EMS but rather presented a few options that SCE should consider when setting the incentive. The low-end incentive was set at \$200/kW (\$24/ton - \$36/ton and \$250/unit - \$500/unit depending on the chosen measure), which covers about 15% project cost on average and matches with the incentive recommended for thermostats. The upper end was calculated to be about \$2,250/kW (\$200/ton - \$400/ton and \$2,600/unit - \$5,300/unit depending on the chosen measure), which covers 75% of the project cost on average. A middle option based on the current Auto-DR Express incentive rate of \$300/kW was also included for comparison.

## DISTRIBUTOR FEEDBACK

The incentive design details presented above were shared with Distributor C, Distributor D and Venstar as part of follow-up meetings. Both Distributor C and Distributor D agreed that the incentive for thermostats should be based on the number of thermostats sold. Both also agreed that the project cost is dependent only on number of thermostats and isn't impacted by the size of the units being controlled. Distributor D also made the point that the contractor is unlikely to know the total site tonnage in a retrofit scenario because they won't need to access the roof where RTUs are located to install thermostats. Therefore, it would be difficult to collect the information necessary to submit as part of an application if the incentive is based on total site tonnage. Distributor C, however, made the point that basing the incentive solely on number of thermostats sold will make it difficult for the program to recognize sites that have a higher load shed potential, since that is based on site tons.

The project team decided to take the distributor's recommendation and base the thermostat incentive on the number of units sold. The site with higher load shed potential will realize more revenue through ongoing demand response participation, and the difference in potential incentive, shown in the table below, does not warrant adding an extra layer of complexity to the installation that could prevent it from moving forward:

Site	Number of RTUs	Total Site Tons	Total Incentive (Based on \$/thermostat)	Total Incentive (Based on \$/ton)
2	10	75	\$3,100	\$1,800
12	10	250	\$3,100	\$6,000

## PROJECT DELIVERY

An upstream ADR incentive model recognizes that demand response is not always a high priority for customers and instead leverages existing sales opportunities when customers are already in the market for equipment or controls. ADR projects are most successful when DR event participation compensation is an added value on top of other greater benefits to a customer's facility, business operations, or direct revenue potential. For instance, many controls technologies offer remote functionality, diagnostic capabilities, or data collection and insight into equipment or occupants that are the true drivers of customer interest and investment. Advanced controls can provide benefits such as the ability to anticipate equipment breakdowns or gain insight into how customers move within a store, enabling informed decisions on maintenance or product placement that can have a major impact on a business' bottom line. In comparison, demand response participation and its cost benefits can be an afterthought. Existing sales opportunities can be grouped into three types of transactions:

1. **HVAC equipment add-on:** When customers are looking to purchase one or more new HVAC units, whether due to equipment burnout or other reasons, they or their contractors typically go through HVAC distributors. An opportunity exists here for a distributor to upsell ADR controls – communicating thermostats or a new EMS – as an add-on to the existing equipment sale.
2. **Existing customer add-on:** In this scenario, distributors promote ADR controls (either thermostats or EMS) to their networks of HVAC contractors, who would attempt to upsell their existing customer installed base by offering to add ADR controls to already-installed equipment. Successful contractors rely on ongoing service contracts, as opposed to ad hoc equipment installation requests, for sustaining their businesses. Selling controls (absent of a new HVAC equipment sale) to existing customers under these service contracts is especially appealing for contractors, as new controls can provide remote monitoring, alerts, and troubleshooting features that identify further opportunities to provide maintenance services and add value to ongoing contractor's relationship with the customer.
3. **New customer request:** Unlike the previous two scenarios in which a distributor or contractor drives the sale of ADR equipment to a customer, this scenario has the customer in the driver seat. A customer may initiate a project with their contractor to install new thermostats or a new EMS without any new HVAC equipment.

The first two scenarios – HVAC equipment add-on and existing customer add-on – are ideal opportunities to leverage service provider relationships, market actor influence, and existing transactions to promote ADR controls adoption. For the former, the cost of HVAC equipment and the impact on facilities and occupants are much more significant to a customer than any standalone ADR project. ADR

incentives should be designed to enhance and enable the existing equipment sale. For the latter, distributors have an interest in leveraging their network of contractor relationships to upsell their existing customer base with new controls. Making it easier for them to do so for ADR controls will help unlock that market. The third scenario, in which new customers request controls equipment, is not expected to provide significant sales volume at this time and should not be the focus of an upstream ADR program.

## PROJECT DELIVERY RECOMMENDATIONS TO FACILITATE AN UPSTREAM ADR PROGRAM DESIGN

### EASE OF INSTALLATION & CONFIGURATION: LEVERAGE CLOUD ARCHITECTURE FOR VEN INTEGRATION

An upstream model carries benefits beyond moving the incentive calculation and sale into the hands of those most capable. Opportunities also exist for leveraging upstream actors on the installation front. Cloud-based VENs provide the greatest technical advantage in developing a scalable ADR program on the market today. Cloud-based VEN manufacturers can bring VENs online quickly without the need for specialized knowledge or effort on the part of installers or customers. For example: successfully installing and integrating a locally-based VEN requires the installer to 1) have technical experience installing and wiring the physical device, 2) know how to configure the OpenADR parameters of the VEN software, and 3) be familiar with the ADR program and OpenADR protocol to coordinate with utility or program implementer staff to complete configuration and troubleshoot if needed. A cloud-based device such as a communicating thermostat, however, only requires the ability to install the device (including connecting it to the cloud platform). The details of configuration and connection with the utility server can be handled between the device manufacturer and program staff. The significantly lower barrier of entry for the latter allows for a much larger pool of installers. An upstream-based ADR program approach with the intent to achieve scale should embrace this advantage, and initially restrict the eligible ADR measures to cloud-based ones.

Utilities have ongoing concerns that if the cloud provider were to go out of business, or a customer were to change aggregators or demand response service providers, the device would no longer function and thus become “stranded”. The customer would not dedicate the time, energy, and money to getting back online for DR program participation. The risks decline as cloud-based systems proliferate. Today it is common for hardware devices backed by cloud-based controls to be an integral part of a customer’s overall facility operations. The cloud server does far more than just relay DR signals, and its failure has a far greater impact on customers – especially when cloud controls are tied into HVAC equipment, as is envisioned through this upstream ADR approach. When cloud-based controls are used to operate a customer’s HVAC equipment on a daily basis, the scenario in which that customer elects not to bring those controls back online becomes far less plausible.

With cloud-based VENs, integration and enrollment becomes much simpler. Installers can focus on installing equipment and connecting to the cloud-based platform without having to coordinate with ADR program staff. ADR program staff can then work directly with the VEN provider to activate a device on the cloud-based network for participation in DR programs and to run any required tests. If an upstream incentive model helps leverage the relative selling power of distributors, a cloud-based device connectivity model has a similar impact in allowing a utility to easily activate significantly more customers for ADR by working with significantly fewer market actors.

#### EASE OF INSTALLATION/CONFIGURATION: PRE-CONFIGURE CONTROL SYSTEMS AND OPENADR VEN S

To streamline installation, ADR controls should be able to be activated for participation by any existing HVAC vendor whenever possible. For non-cloud devices, VENs should be shipped with the greatest possible amount of information pre-configured. At a minimum this should include the VTN URL and VTNID for the appropriate utility server and a username/password for OpenADR 2.0a VENs. So that 2.0a VENs can easily connect when on site, the provider should coordinate with ADR program staff to request a username and password prior to shipping the device to the customer. If applicable, the VEN should also include load shed strategies pre-programmed, although a typical HVAC installer should be able to configure a control system to achieve basic strategies such as a 4-degree temperature reset. In coordination with the utility, ADR program staff should pre-create VTN accounts that distributors can quickly access them for connection to the DRAS during installation. For OpenADR 2.0b VENs, the device manufacturer can bring the VEN online in the utility environment to complete VEN provisioning prior to shipping.

#### EASE OF INSTALLATION & CONFIGURATION: LIMIT LOAD SHED STRATEGY OPTIONS ACROSS ALL CONTROLS MANUFACTURERS AND DISTRIBUTORS

One of the main barriers for custom ADR projects is the many possible combinations of control strategies involving unique load shed calculations. If distributors are successful in upselling ADR to HVAC customers, the existing ADR program will not be able to keep up with a tailored set of measures and calculated load shed potential for each site. While the burden for this work can either shift from ADR program staff to distributors/installers/customers, none of these actors are versed enough in ADR to be successful. However, the process can be simplified to a degree that eliminates control strategy identification and load shed potential assessments. To achieve the latter, a mass market ADR program should allow as few eligible measures as possible. These measures should be consistent across all controls/VEN manufacturers and distributors and be pre-programmed into the controls systems that get installed for customers. For HVAC, the most universally applicable strategy across all HVAC equipment is a zone temperature reset, based on past ADR implementation experience.

Limiting load shed options to one strategy removes significant complexity for customers, but also does have the potential to limit the market in the long run – both for customers able to achieve greater load shed and those for whom a 4-degree change creates a negative occupant experience. One option to provide greater customer flexibility is to work with controls manufacturers to have devices programmed with three different load shed strategies – Basic (4-degree reset), Lite (2-degree reset), and Green (6-degree reset). Devices would ship with the Basic default, and customers would be able to easily adjust the strategy up or down without knowledge of sophisticated load shed strategies. Utilities can also expand the program offerings in the future to include additional simple load shed strategies, or strategies that work for specific types of HVAC equipment, but initially a mass market program should prize simplicity. If a customer or vendor wishes to implement a different load shed strategy, they should go through the custom ADR program.

#### SIMPLIFY PROJECT VERIFICATION: STREAMLINE AND SHORTEN THE PROCESS

The current project verification process for the custom ADR program creates an unnecessary burden on project vendors. Testing every installed VEN with a program staff member on site to observe requires significant coordination and often lengthens the window between the completion of a project and the payment of an incentive – a

period in which either customers or project vendors are floating the project capital. To simplify the process, the ADR program should consider a project complete when the distributor or contractor has visually confirmed a project is installed and connected to the VTN. This can be achieved without an on-site inspection – visual confirmation can be provided via a cell phone camera, and the VEN connection can be verified directly in the VTN interface. The ADR program can also require a test if needed, which can also be triggered remotely via the VTN interface and verified via evaluation of a customer's 15-minute interval data. The entire process between installation completion and authorization of payment should be possible within 2-3 business days.

## AUTO-DR PROGRAM APPLICATION AND DR PROGRAM ENROLLMENT

This section looks at the submission of ADR Program incentive claims and enrollment of SCE customers into an eligible DR program in an upstream program approach. We lay out the roles of upstream market actors and how they affect the SCE customer journey in the incentive application and DR enrollment process. We also discuss different options for how an upstream ADR program could be structured. There are three market actor levels to consider in the upstream ADR design that could interact with the customer: contractors, distributors, and manufacturers.

After reviewing lessons from the 2013 pilot and considering the feedback received from market actors regarding sales practices for controls, *the Project Team believes a distributor-focused upstream ADR program would be most successful*. While contractors and manufacturers could also participate, we determined they would not be ideal recipients of upstream ADR program incentives. Manufacturers and contractors both benefit from and have key roles to play in a distributor-based ADR incentive program, however. Depending on the measure (i.e., thermostats or EMS), the contractor will have larger or lesser involvement with the sales and documentation elements of the program, respectively. Below we discuss the benefits and barriers for each level of the market in an upstream ADR program.

### LEAD GENERATION AND UPSELLING ADR: PRIORITIZE HVAC DISTRIBUTORS

Upselling for ADR falls on either the distributor or manufacturer, depending on how the sale is being made<sup>8</sup>. Though contractors have the direct customer touch point potential to influence sales, if the distributor can upsell the ADR product to the contractor, that customer touch point is less important. Distributors need the resources to quickly do incentive calculations and adjust the sales price to the contractor and provide ADR information to the contractor to pitch to the customer. The customer touch point varies; larger retail chains frequently work directly with distributors or manufacturers through national accounts, whereas smaller customers are more likely to work directly through a contractor.

#### **Contractor Challenges and Opportunities:**

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<sup>8</sup> Manufacturers sell EMS to distributors or directly to customers. Distributors typically sell EMS directly to customers and thermostats to contractors.



Contractors are well positioned, but least likely to be successful in an upstream ADR program as the responsible party for submitting incentives. They have potentially the strongest direct customer touch point (unless customer is buying directly from the distributor), and the customer generally does not know what products are available or best for their site, therefore look to the contractor for direction. The contractor could recommend ADR certified controls to the customer and use the incentive to lower the price and explain the other non-ADR related benefits of greater controls on top of bill savings during the summer. On the other hand, contractors are more likely to want to take the easiest and fastest path and to not lose the sale. Contractors therefore are likely to fall back on products they have installed and maintained successfully in the past, as time is the most important factor.

Upselling can just as easily happen at the point of sale between contractor and distributor, as mentioned above, and distributors have a better understanding of the technology options. Contractors also generally have more time constraints and less staff available for administrative tasks, such as gathering information and submitting incentive claims for utility programs.

While selling equipment is a distributor's main function, it is a fraction of the contractor's business. Contractors make the bulk of their business on HVAC repair and maintenance. Furthermore, early retirement (high-efficiency replacement) projects are a small percentage of total contractor jobs, so contractors are not able to sell ADR for every customer visit. They are also less motivated because they are product agnostic, whereas distributors and manufacturers are invested in pushing specific products that they sell. Contractors are not as familiar with the ADR certified technology itself, and many have never encountered the technology at all. Distributors and manufacturers are more up to date with various technologies and can provide guidance to the contractor.

#### **Manufacturer Challenges and Opportunities:**

Manufacturers would be the second-best option for submitting claims and receiving incentives because they are the most familiar with the technology. They also have better control over DRAS connectivity and trouble-shooting this step if their product connection is cloud-based. An incentive program might also motivate them to develop more ADR products or make current ones even more market-friendly (i.e. default DR measures set, cloud-based connection, etc.).

However, traditional manufacturers are two steps removed from the customer so there is more risk involved in gathering all the necessary information they would need for an application. They would need to depend on the distributor to convince the contractor towards ADR certified controls, but without at least a partial pass-through incentive there is not much motivation.

#### **Distributor Challenges and Opportunities:**

The distributor is in the middle of the sales chain between the manufacturer and the contractor, having direct access to both along the supply chain. This is beneficial for upselling at point of sale and ensuring there is adequate product on hand so there is no lag time between contractor request and delivery. Contractors will not wait for a product to be special ordered if not directly requested by a customer and will go with a more standard offering that is in stock. Distributors are in a position to recommend ADR certified products in lieu of replacing the product that burned out or a standard product offering and can explain to the contractors that customers will benefit from advanced controls through increased functionality (explained in Project Delivery) and reduced energy usage during peak periods if they are on CPP. Later in this section we discuss how distributors can confirm CPP enrollment. Added value for the

customer builds trust between them and the contractor and could result in a long-term maintenance contract between the two as well.

The point of sale between a distributor and a contractor is also a prime opportunity to offer packaging controls with HVAC equipment and save the contractor an extra trip to a parts supplier for simple thermostats, which frequently happens separately from the larger HVAC equipment purchase through the distributor.

A drawback to this model is the lack of direct customer contact, unless they are purchasing directly through the distributor which can happen. Also, more outreach and education would be required at the beginning than a manufacturer focused program, due to the sheer number of distributor branches and sales staff. If you envision a triangle, manufacturers are at the top and as you work down the supply chain, the number of branches and staff involved expands.

#### **Alternative structures:**

There are also other models to consider, such as vertically-integrated companies like Distributor C. They are a manufacturer but also do some of their own distribution and installation. An upstream ADR program is most ideal for this model because of the internal communication and company-wide training that can happen, making them more streamlined. Other structures which this program could work especially well for are companies like Distributor B and Distributor F who have dedicated controls teams that are more motivated to upsell controls.

Distributors and manufacturers are the most likely to handle incentive application process for the following reasons: they have administrative staff or sales staff who can add the task to their workload (common in other upstream programs) and they have more motivation in selling their specific products.

## **ADR APPLICATION PROCESS AND INCENTIVE CLAIM FOR UPSTREAM MARKET ACTORS: STREAMLINE AND SIMPLIFY**

In the existing ADR application process, the multitude of policies and processes that customers and market actors have to learn are burdensome and can deter customers from pursuing ADR. Controls and thermostat installs in particular are smaller revenue generating projects for contractors so it can be a harder sell, especially in the summertime when they are busy with larger HVAC projects. First, the market actor needs to learn and understand all the requirements of the SCE Auto-DR program. Specifically, determining eligibility has been a difficulty for market actors who may start down the road of discussing ADR with customers only to find out they are not eligible. Having a program implementer to help guide customer and market actors is highly useful and helps avoid these issues, but it would still be time-consuming to have to go back and forth between the customer and program implementer.

Completing the application in the current ADR program is cumbersome for whichever party is filling it out. The online application website is difficult to locate, and the user instructions are dozens of pages long and not readily available from the website. The process of creating an account for both customers and users are cumbersome, and the user needs to navigate through efficiency application pages before arriving at the ADR application page. An upstream approach with simplified processes and measures would help increase customer adoption of ADR certified products and participation in the program.

This section proposes a process for distributors to fill out an ADR incentive application and how it gets approved. An overview of the process flow is provided first, followed by a discussion on the details of each step in the process.

#### STREAMLINED APPLICATION PROCESS FLOW SUGGESTED FOR UPSTREAM PROGRAM:

1. Customer decides to purchase controls with their new construction or retrofit HVAC project with their distributor or contractor. The distributor or contractor prepares a bid with the ADR Terms & Conditions form, clear calculations on return on investment for upgrading to ADR enabled equipment.
2. Contractor, distributor and upstream program implementer (program implementer) collects additional necessary customer and project information for ADR application.
3. Distributor, either directly or in coordination with manufacturer and program implementer, verifies connection to DRAS and submits the ADR application.
4. Program implementer reviews application and supporting verification document for completeness and processes incentive payment.

#### SIMPLIFY APPLICATION PROCESS: REDUCE INFORMATION COLLECTED

For a distributor to submit an ADR incentive application, they would gather the following information, most of which can happen at the point of sale:

- Customer contact info
- Site address
- Control measure make and model
- Installer or contractor contact info
- Customer site HVAC equipment make and model, which gives tonnage (optional)

The remaining items could be collected from the contractor (indirect sale) or directly from the customer by the distributor in a direct sale. The information can be collected either after the sale or at point of sale depending on the sales process (i.e. if the contractor has this conversation with the customer before or after purchase):

- Demand Response strategy (e.g., temperature setpoint change)
- Proof of customer approval to participate in ADR events

For EMS, one distributor recommended preparing an Auto-DR document package that their sales staff can walk through with the customer either directly or after the new EMS has been installed by the contractor to upsell the Auto-DR capabilities. In their view, the typical contractor lacks the knowledge in controls and ADR to be able to clearly sell the benefits to the customer. For thermostats, another distributor recommended that contractors can take more of the lead in collecting project information and customer signatures for the incentive application. Thermostats are traditionally sold to customers through contractors. Contractors are comfortable with thermostats and the value proposition for ADR can be simplified to emphasize the upfront project incentive and ongoing bill savings of load management and DR event participation.

#### VERIFY DRAS CONNECTION THROUGH THE MANUFACTURER

Once the install has occurred, the distributor reaches out to the manufacturer to connect the VEN to the DRAS. To streamline the DRAS connection process, DRAS accounts can be pre-created by the program implementer, which distributors can share with the manufacturer. The distributor also includes in their application, which DRAS account(s) are used at the site, so the implementer can update the DRAS

account with the customer name. The program implementer confirms that the newly installed device is connected to SCE's DRAS. If it isn't connected, the program implementer can work with the manufacturer to do so. Cloud-based solutions makes this process much easier. Technology that requires DR measures be programmed on site are more difficult as that requires additional communication/training of the contractor and confirming that the programming is done correctly. For on-site programming of controls, the manufacturer, distributor or program implementer can visit the site to confirm that the DR measures were set, and correctly. This creates some friction as it requires communication with the customer and scheduling time between the customer and program implementer. As noted in the Project Delivery section, wherever the controls solution supports it, the verification process can be simplified by remote confirmation with the support of the contractor via photos taken following commissioning. Coordination with the device manufacturer's device cloud or utility VTN interface are options to confirm or VEN connection and online status.

#### VERIFY ELIGIBILITY AND ENROLLMENT THROUGH THE DISTRIBUTOR OR CONTRACTOR

Next, the program implementer confirms that the customer is enrolled in a DR program. The program implementer could request a list of enrolled customers from SCE and match customers to confirm.<sup>9</sup> Alternatively, the distributor or contractor could ask the customer for a copy of their utility bill to confirm that customer receives service from SCE and is on a CPP tariff.

The program implementer would also confirm that an installation verification form is signed by the customer. The verification form includes the ADR Terms & Conditions that the distributor reviews with the customer. This form should be as simple as possible, with the customer agreeing to adjusting their space temperature by either four or six degrees for up to fifteen times per year. One option would be for the contractor to share the signed form with the distributor directly, either via email or in person, so they can add it to their incentive claim. The program implementer would share the customer information and DR strategies with SCE.

#### PAY DISTRIBUTOR INCENTIVES IN TWO TO FOUR WEEKS

Lastly, either the program implementer or SCE pays the ADR incentive to the distributor. In upstream efficiency programs, Energy Solutions pays participants within 2 weeks of claim approval on average. Alternatively, SCE could continue managing the incentive payments, but this would require additional communication between the program implementer and SCE and likely be a longer wait time for the distributor.

### DR PROGRAM ENROLLMENT: SIMPLIFY TO ONE OPTION

In the current SCE Auto-DR program, customers choose from among several demand response programs. For larger customers with dedicated energy managers, this can be empowering – customers can analyze each offering and choose whichever one best aligns with their needs. For smaller customers with limited time or expertise for

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<sup>9</sup> In other upstream programs, Energy Solutions built and operates a platform for SCE that automatically verifies incentive claims by matching customers to eligibility information, such as eligible equipment and measures. A DR program matching feature would need to be added to the platform for an upstream ADR program.

studying the options, having to choose between DR programs can be confusing and even overwhelming. Requiring distributors to be familiar with the details of multiple DR programs and potentially coordinate with multiple aggregators to complete enrollment is also too burdensome. Utilities should offer one default program to pair with the upstream ADR incentives to simplify the transaction. In California, Critical Peak Pricing (CPP) provides the most universally applicable and least complex option for enrolling customers in an eligible demand response program. Customers can work with their utility and an aggregator to enroll in another program such as the Capacity Bidding Program if they prefer, but the assumption is that most customers will have limited DR program knowledge and are unlikely to spend time investigating the relative benefits of one program vs. another or one aggregator vs. another. Most California customers will also already be defaulted onto CPP. Regardless of location, removing the program selection variable again simplifies the ADR model for both customers and project providers to boost adoption.

With our recommendation of a single DR program (CPP) for ADR, the program implementer would just need to confirm CPP enrollment before paying out the incentive. Any ask of a contractor to collect additional documents or signatures outside of their normal process presents a potential risk for the sale, so it is ideal that this program would only target CPP enrolled customers. Others would go through the current custom downstream process. It is important that the distributor also knows whether they will receive an incentive so they can adjust the price, therefore they need to know if a customer is on CPP at point of sale. There are two possible ways to go about this:

- **Provide implementer a list of CPP enrolled customers.** Depending on customer data security, we recommend SCE provide a list of CPP enrolled customers to the program implementer. The implementer checks for the distributor if customers are enrolled in CPP and therefore immediately eligible for ADR incentives. This would greatly help with distributor upselling and could even motivate distributors to be proactive with their outreach to push ADR certified products. Distributors could also cross reference with this list when contractors come in and avoid pursuing incentives if they know a customer is ineligible or know when to push the upselling of ADR certified products.
- **Copy of utility bill from customer.** The distributor or contractor could ask the customer for a copy of their utility bill to confirm that customer receives service from SCE and is on a CPP tariff. The advantage of this approach is that it doesn't require the distributor or contractor to check with the program implementer, which can slow down the sale process. On the other hand, the added friction of tracking down a utility bill by the customer may suppress number of Auto-DR applications.
- **Guarantee that the process for switching a customer to CPP is quick and reliable.** This can be done by SCE as long as the customer signs off prior to installation. If customers are not already enrolled in CPP or existing eligible DR program such as CBP, the market cannot be responsible for transitioning them to an eligible DR program beyond including an agreement form with their bid to get customer sign off for switching to CPP and enrolling in ADR. The program implementer, working with the SCE Account Rep can then formally switch the customer from non-CPP to CPP.

## NEXT STEPS

There are several pathways that the upstream program design recommendations for ADR in this report could be incorporated into programs at SCE. The first pathway is layering ADR incentives onto existing upstream energy efficiency programs as part of integrated demand side management, such as SCE’s commercial upstream HVAC program. Drawbacks to this option include administrative complexity and limited eligibility to high efficiency equipment. The administrative complexity arises from the need to process both efficiency and ADR technology incentives, which can be exacerbated if both the upstream efficiency program and ADR program are implemented by different third parties. If the efficiency program targets above-code measures only, this constrains the potential market for ADR controls sales. During the 2013 pilot and this 2019 project, distributors noted their preference for bundling controls sales with all new equipment sales.

The second pathway is adding an upstream incentive option to the existing AutoDR Program at SCE. To simplify implementation, this pathway would pay distributors for certified controls sold to small and medium HVAC projects under 500 kW of peak demand currently eligible for the Express application process. ADR incentives would be deemed and based on \$/unit or \$/thermostat. Utility customers would receive a DR enrollment assistance and participation incentive portion of the existing downstream Auto-DR program. This pathway would limit market size as well since only projects eligible for Express Auto-DR incentives would qualify. It also has some implementation complexity as well, in terms of processing both upstream incentives and downstream incentives in one program. However, one important advantage of this pathway is close coordination between technology incentives for controls and customer enrollment and DR participation.

The third pathway is implementing a standalone upstream ADR Program. This option offers the most flexibility in terms of project and measure eligibility and would be the simplest administratively. HVAC Distributors will prefer that the program allow all commercial code-compliant HVAC equipment to be eligible for ADR controls incentives. This makes available the largest market for distributors and the most appealing in terms of sales benefits. Implementation is simpler given that program focuses on technology incentives to distributors for sale of OpenADR certified controls and enabling them on site via contractors. Challenges of this pathway include customer enrollment and active DR event participation, which could be mitigated via closer coordination with SCE’s Auto-DR program and recommendations discussed earlier in this chapter.

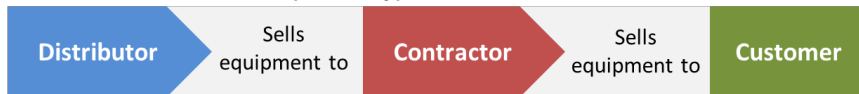
## APPENDIX A: HVAC MARKET NOTES

**Error! Reference source not found.** The HVAC market supply chain includes traditional HVAC distributors that sell HVAC equipment and HVAC controls, as well as other products. They primarily sell to contractors, who install, maintain, and provide other services such as energy management to commercial (and residential) end users. Direct sales to end users are a secondary sales channel for these HVAC distributors (see Figure 4 **Error! Reference source not found.**). Typically, direct sales involve national retail chains or other large commercial customers, as well as institutional or municipal customers such as schools and colleges. Where these distributors sell to contractors, they have limited ability to influence customer decisions, such as enrolling and participating in demand response. In direct sales, HVAC distributors are able to engage with and influence customer decisions to consider controls and demand response.

Distributor business models span the spectrum of decentralized to fully integrated. A couple distributors the Project Team worked with have dedicated controls teams that sell both thermostats and EMS. Distributors without internal controls sales and engineering staff prioritize thermostat sales to contractors. One distributor focuses almost exclusively on HVAC equipment sales and does not provide controls or energy management services. HVAC distributors carry products from selected manufacturers (brands) and is one aspect that distributors use to differentiate themselves. One distributor in SCE territory exclusively sells one brand of HVAC equipment and controls.

**FIGURE 4. INDIRECT VERSUS DIRECT SALES CHANNELS AND IMPLICATIONS FOR INFLUENCING CUSTOMER PURCHASING DECISIONS**

### Indirect Sales Channel (Primary)



- Distributor has no contact with the customer.
- Distributor can indirectly influence the customer through the contractor.

### Direct Sales Channel (Secondary)



- Distributor sells equipment directly to a customer, typically a national account and/or service agreement.
- The distributor can directly influence the customer’s decision-making process.

There are also manufacturer representatives for mechanical and HVAC equipment. These companies provide custom, engineered systems for large to medium commercial facilities. Since the engineers specify custom engineered systems, they do not stock HVAC equipment or controls. All three companies that the Project Team contacted use Climatech for controls, which is a large controls contractor that specializes in designing and installing central energy management systems.

Climatech’s main product line is Johnson Controls energy management systems, which does not have an OpenADR certified solution. Since this project focuses on ADR program design for HVAC distributors, we have not prioritized engagement and outreach with manufacturer representatives.



## APPENDIX B: ADR SOLUTIONS TABLE

**TABLE 12. ADR SOLUTIONS BY DISTRIBUTOR**

	<b>Distributor A</b>	<b>Distributor E</b>	<b>Distributor F</b>	<b>Distributor B</b>	<b>Distributor C</b>	<b>Distributor D</b>
Certified OpenADR Thermostat Solutions	Yes		Yes	Yes		Yes
Certified OpenADR Energy Management Control Solutions				Yes		
Certified OpenADR VEN Gateway	Order when needed			Order when needed	Order when needed	
Non-OpenADR Certified, ADR-Capable Controls	Yes - thermostats	Yes - thermostats	Yes - thermostats	Yes - thermostats	Yes – thermostats and EMS	Yes – thermostats and EMS
Potential Products	Interested in certifying Honeywell LCBS thermostat. Familiar with Gridlink VEN			Familiar with Gridlink VEN. Interested in pairing all new controls sales with a minimal OpenADR-certified VEN.	Pairs 3rd party OpenADR VEN with OpenADR controls system.	

## APPENDIX C: DISTRIBUTOR INTERVIEW QUESTIONS

### INTERVIEW/DISCUSSION QUESTIONS REGARDING OPENADR SOLUTIONS:

1. Identify ADR Solutions
  - a. OpenADR certified products - *Show and/or read list of OpenADR-certified HVAC controls*: These are great because they are already eligible for ADR program incentives! Can you please confirm that you currently sell all of these OpenADR-certified HVAC controls? Are there any we missed?
  - b. Controls with load control capabilities but not OpenADR certified - *Share list from distributor website research*.
    - i. Did we miss any products that are DR-capable but not OpenADR certified? (This means remote communication ability (wifi or cellular) and the ability to initiate load limiting strategies)
    - ii. Would you be interested in certifying any of these products?
    - iii. Are you interested in speaking with the controls manufacturer about certification? Our Project Team could help you reach out to the manufacturer
2. *For any controls that were identified during this conversation*: Can the controls control other equipment (e.g., lighting) or are they HVAC-dedicated controls?
3. Are you aware of the new Title 24 ADR requirements for new construction? Discuss T24 DR requirements, leverage T24 slides from VRF manufacturer webinar
4. Do you have questions about these OpenADR certified devices that can help you narrow down or choose what you would be interested in selling?
5. Do you have a resource that you could share with us that includes all the model numbers that you carry?

### INTERVIEW/DISCUSSION QUESTIONS REGARDING SALES PRACTICES

1. Who are your customers?
2. What percentage of your sales (by volume or revenue) involve HVAC controls?
3. Where is the demand for controls coming from? Which types of customers and which sectors?

- a. Generally, what are the types of customers who are unlikely to ever be interested in controls? Are there customers don't try to sell to (low likelihood of success, making it less worth their time).
4. Have you received any inquiries for ADR with inquiries about controls?
5. What is your company's process for adding new products and equipment to your line card for sale?
6. Once the new product is added, what is your company's process for promoting and pushing it? How do you launch sales of your new products and getting your customers to buy it?
7. What other methods do you employ to get contractors interested in specific products? E.g. contractors, consumers (retail, office, restaurants, hospitality – small to medium businesses, large commercial), others?
8. Do you see value in promoting products that we identified to customers, and what are and what are the values/benefits you highlight?
9. What controls are sold to SMB customer segment? What would a sale of ADR enabled controls look like? (*maybe mention Manage Your Power*)
  - a. Are controls sold as a dedicated offering or as an add on to HVAC equipment? Is there a segment of the controls offering that customers would be buying alone or are these sales always/normally a ride along with the HVAC equipment (*how often are thermostats sold by themselves vs with other equipment*)?
10. When there is a bid for just equipment, are there instances where you try to upsell them on controls? If yes, can you elaborate on what that entails, how do you do it?
11. If the current customer ADR incentive were paid to you the distributor, does that change your sales strategy? And How or in what ways?
  - a. Do you currently use bundling as a sales strategy for any types of products?
  - b. How can we bundle the ADR controls into existing bundles? Can we create some new bundles?

# APPENDIX D: ADR TECH INCENTIVES FLYER



## Technology Upgrade Incentive Opportunities For Your Customers

Through participation in an automated demand response program, non-residential customers in SCE, PG&E, and SMUD territories are eligible to receive financial incentives for upgrading their controls or EMS with OpenADR certified technologies. This financial incentive could be the push a customer needs to pursue a major retrofit.



\*For retail and office customers with 50-499 kW demand, and food stores with 100-250 kW demand. All other customers receive \$200/kW in SCE territory.

### Eligibility:



#### Technology

OpenADR certified product or controls combined with an OpenADR certified product. Find out more here: [www.products.openadr.org](http://www.products.openadr.org)



#### Customers

- Non-residential customers in SCE, PG&E, and SMUD territory
- Willing to install OpenADR certified products and participate in Demand Response events

### How to Access These Customers:

Connect Energy Solutions to your contractors in these territories to get started on the TradePro Connect platform. TradePro Connect connects contractors with customers who are seeking bids for these equipment upgrades. To discuss your contractor base or direct sales pathways with Energy Solutions, please contact Colleen Butterfield ([cbutterfield@energy-solution.com](mailto:cbutterfield@energy-solution.com) or 510-482-4420, ext. 271).

To view the TradePro Connect website, please visit [www.tradeproconnect.com](http://www.tradeproconnect.com).

Contact: Colleen Butterfield, Energy Solutions  
 phone: (510) 482-4420 ext. 271 email: [cbutterfield@energy-solution.com](mailto:cbutterfield@energy-solution.com)

Energy Solutions provides consulting support for the SCE ADR Program and is the program implementer for the PG&E Automated Demand Response (ADR) and SMUD PowerDirect® ADR Programs.



# APPENDIX E: EXCEPT FROM TECH INCENTIVES ESTIMATOR

B	C	D	E	F	G
<b>Utility</b>		<b>Office/Retail</b>			
SCE		<b>Building's Average Peak kW (June - Sept)</b>	<b>4F Space Temp Reset</b>	<b>6F Space Temp Reset</b>	
		50	\$1,100 - \$1,600	\$1,600 - \$2,400	
		100	\$2,000 - \$2,800	\$2,900 - \$4,200	
		150	\$2,800 - \$4,000	\$4,200 - \$5,900	
		200	\$3,700 - \$5,200	\$5,500 - \$7,800	
		250	\$4,600 - \$6,400	\$6,900 - \$9,600	
		300	\$5,400 - \$7,600	\$8,200 - \$11,000	
		350	\$6,300 - \$8,900	\$9,500 - \$13,000	
		400	\$7,200 - \$10,000	\$11,000 - \$15,000	
		450	\$8,100 - \$11,000	\$12,000 - \$17,000	
		<b>Food Stores</b>			
		<b>Building's Average Peak kW (June - Sept)</b>	<b>4F Space Temp Reset</b>	<b>6F Space Temp Reset</b>	
		50	\$800 - \$1,400	\$1,200 - \$2,200	
		100	\$1,200 - \$2,100	\$1,700 - \$3,100	
		150	\$1,500 - \$2,700	\$2,300 - \$4,100	
		200	\$1,900 - \$3,400	\$2,800 - \$5,000	
		250	\$2,200 - \$4,000	\$3,300 - \$6,000	
		300	\$2,600 - \$4,600	\$3,900 - \$7,000	
		350	\$2,900 - \$5,300	\$4,400 - \$7,900	
		400	\$3,300 - \$5,900	\$4,900 - \$8,900	

## APPENDIX F: OUTREACH LOG

**TABLE 13. OUTREACH EVENTS BY DISTRIBUTOR**

Distributor	In-Person Meeting Dates	Calls and Emails
A	4/29, 10/1	3/28, 4/2, 5/24, 6/25,7/30
E		5/20, 5/21, 6/12,7/22, 8/7
F		5/1, 5/9, 5/15, 5/28,6/7
B	5/30, 8/13	4/23, 7/30, 8/29,10/3, 10/23
C	4/24; (2020):2/18 2/21	(2019): 3/18, 4/29, 9/12,10/15, 12/4; (2020):1/27, 2/11, 2/21
D	5/22, 8/2; (2020): 3/11	6/5, 6/24, 7/12, 8/1
HVAC Manufacturer Reps (3)		8/15, 8/16
VEN Manufacturers (2)	9/16	8/6, 8/8

# APPENDIX G: BACKGROUND ON SCE'S MANAGE YOUR POWER PILOT

## INTRODUCTION

Manage Your Power™ is a new web-based tool designed to overcome the challenges faced by traditional ADR programs in serving smaller customers. Small and medium-sized business (SMB) customers are less likely to have the in-house experience, knowledge, or time to identify an ADR solution and find a qualified service provider to install and commission it. Customers interested in ADR projects look to the SCE ADR program for recommendations, but SCE's vendor neutrality requirements do not allow ADR program staff to direct customers to a specific contractor. Likewise, contractors that already provide energy efficiency services to smaller customers may not have knowledge of OpenADR-Certified products, leading to ADR-capable equipment being installed in the field but not activated for participation in demand response programs. They, too, need to be connected with qualified ADR service providers to complete projects. Manage Your Power™ streamlines procurement of ADR solutions such that customers and energy efficiency contractors alike can quickly find the right OpenADR products and ADR contractor services to scale adoption of ADR technologies in the SMB space. With a start work date of August 1, 2018, the platform can be ramped up in two months. This includes: configuring the platform and Manage Your Power™ website to meet SCE needs, enrolling and training contractor organizations in SCE territory that are qualified to provide ADR installation and commissioning services, and supporting SCE in marketing and outreach efforts to engage customers in using the platform.

## PLATFORM OVERVIEW

The SCE ADR Program's commitment to providing vendor-neutral program implementation creates a unique challenge when looking to scale adoption of ADR enabled equipment among smaller customers with a peak load under 500 kW. These SMB customers are less likely to pursue ADR projects due to the logistical barriers of understanding the program and customer requirements, identifying the right technical solution, and finding a qualified trade ally to provide installation and commissioning services. Manage Your Power™ addresses those barriers with an innovative approach to customer ADR project support:

**Customer Experience** – Manage Your Power™ uses an online procurement platform that allows customers, SCE staff, Energy Solutions staff, and other project developers to search for qualified contractors serving their area, request, evaluate, and select bids to complete ADR and IDSM projects, schedule services, and provide feedback on their experience via short, automated satisfaction surveys.

By integrating this comprehensive functionality into one platform, Manage Your Power™ allows customers to take control of the procurement experience, feel empowered to make educated decisions on the products and services they are procuring, and break through the logistical barriers that often prevent customers from completing projects. This functionality is also available for contractors already engaged by customers to implement energy efficiency projects. Easily finding OpenADR-qualified providers to enable AutoDR-capable equipment will help maximize the value delivered to customers from OpenADR equipment and leverage

Title 24 ADR requirements to increase SCE’s connected ADR load. Manage Your Power™ makes the process of finding ADR services simple and convenient while also allowing SCE and Energy Solutions to remain vendor-neutral.

**Project Development** – Manage Your Power™ also offers customers and project developers tools to help assess, visualize, and sell project feasibility, conduct site assessments from a phone or tablet, create project scopes, and solicit contractor bids. The tools include:

- **Virtual Site Survey.** Using a phone or tablet, the person conducting the assessment (e.g. customer, auditor, or SCE customer service representative) answers a series of structured questions with decision tree logic, takes photos of facility conditions, and adds notes to help scope the project for installation contractors.
- **OpenADR product directory with an integrated ADR Express calculator.** This tool allows customers and project developers to identify incentive-eligible ADR products and quickly calculate potential incentive amounts.

Using these tools, customers and project developers systematically determine project feasibility and answer the common questions every installation contractor will need to know to provide a bid. The goal is to minimize the number of site visits, each of which incurs project cost and time spent – both by contractors visiting customers and customers rearranging their schedules to accommodate contractor site visits.

**Trade Ally Management** – As the Program Manager, Energy Solutions, working with SCE, defines program eligibility requirements, including licenses, insurance, qualifications, project application needs, certifications, and required trainings. Service providers enroll their organization and create profiles for their staff, then submit the required documentation for the program they want to enroll in. The platform monitors dozens of key service metrics as transactions occur, including responsiveness to customer requests, bid prices, punctuality, customer feedback, and more. The detailed data and analytics allow star performers to elevate their brand while helping other service providers understand how they can improve their performance. Over time, contractors that perform good work at a fair price receive more work because customers have transparency into their previous performance, trainings, and certifications. This end-to-end process automation reduces risk for buyers, facilitates competition among sellers (technology and services), provides contractors analytics on their services and access to a library of e-learning modules, and ensures SCE’s program operates in compliance with SB 350’s Responsible Contractor Policy.