ASWB ENGINEERING

EXPANSION OF THE DEEMED AUTO-DR EXPRESS SOLUTIONS

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Presented To:
SDG&E, SCE and PG&E Emerging Technology Teams

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Executive Summary

The Demand Response Emerging Technology (DR-ET) teams of San Diego Gas & Electric (SDG&E), Southern California Edison (SCE), and Pacific Gas & Electric (PG&E) were engaged in discussions to develop strategies to increase adoption of Auto-DR into Small and Medium Businesses (SMB).

Goals

The DR-ET teams asked ASWB Engineering (ASWB) to study how to improve uptake on the existing Small and Medium Business (SMB) Auto-DR solutions— "Auto-DR Express" and "FastTrack" —and develop a program model that all three utilities could adopt.

Existing Program Overview

In the past, Auto-DR projects were focused on large commercial or industrial sites. These Auto-DR programs were vendor driven, so their higher cost and additional instructional overhead necessitated projects that had larger incentive amounts.
The SMB community has historically been underserved by Auto-DR programs. Vendors and aggregators perceive SMB customers as not cost effective to engage.

Research Methodology

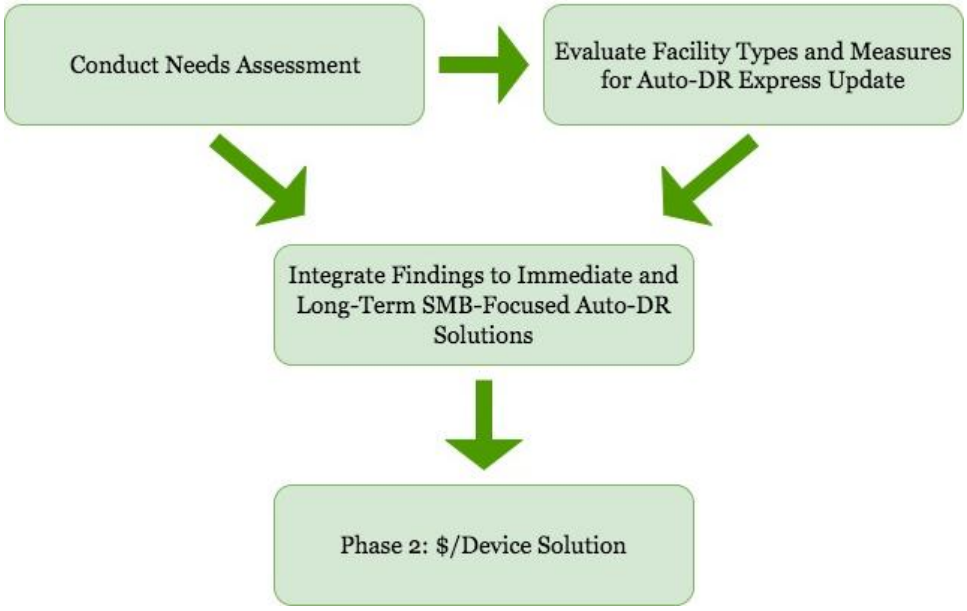

Figure 1: Research Methodology

ASWB conducted a needs assessment by interviewing vendors and customers who have participated in Demand Response (DR) or are new to it, along with utility stakeholders to learn what needed to be addressed to increase SMB uptake. Requests from vendors and customers were taken into consideration when evaluating the additional facility types to include in Auto-DR Express.
ASWB also evaluated 10 years of Auto-DR participant data and other DR pilots to determine the consistency of the load shed performance of the requested facility types. This allowed ASWB to

determine which facility types and measures that had not previously been considered for Auto-DR Express were a good fit for program updates.
These activities resulted in three recommended solutions to increase SMB uptake of ADR programs:

1. **Immediate -** Adopt a modified Auto-DR Express offering to address vendor and customer needs, such as a streamlining the offering between all three IOUs, expanding the facility eligibility and made one-time incentive calculations easier .
2. **Long-Term SMB Program Redesign** – Include a direct install option in a full program redesign intended to increase participation from SMB. Direct install will address vendor and customer concerns with difficulties in providing on-going incentives, reducing confusion during selection of DR programs, eliminate the concern of too many touchpoints and address cash flow concerns.
3. **Dollar Per Device (Phase 2**) - The dollar per device solution ($ per device) was requested by the IOUs after ASWB presented the immediate and long-term solutions. This solution, referred to as Phase 2 in this document, utilized databases from vendors to create a $/Device proof of concept. The tool provided incentives per unitary AC controller for retail sites. ASWB documented additional databases and considerations for future efforts were documented as well.

Results Overview

ASWB interviewed a total of 22 stakeholders including vendors, customers and IOUs. Our summarized conclusions are:

1. There is a large need for customer/vendor education.
    a. Vendors are not adequately educated on Auto-DR program requirements, or DR benefits to the customer.
    b. Customers still think DR means "shutting everything down."
2. DR and Auto-DR programs need to be streamlined for SMB customers.
    a. One time and on-going incentive payment structure needs to be more concrete for customers and vendors.
    b. Vendors and aggregators have limited time available for SMB customers.
        i. In their limited time available, the vendors often do not have time to provide a program introduction, along with information on enrollment and provide a business case for DR.

ASWB used feedback from the surveys to prioritize review of eligible facility types. The top criteria for if a facility type is good fit for Auto-DR Express is whether a deemed kW calculator could accurately estimate the load shed potential for the facilities. After evaluation, the following facility types were added.

- Non-refrigerated warehouses
- Fast food/restaurants
- Hospitality (hotels & motels)

In addition to additional facility types, ASWB surveyed customers and vendors to evaluate whether any additional measures should be included in the Auto-DR Express tool. However, based on vendor feedback, the majority of vendors said the number of measures was confusing for a customer, and preferred less measures. Analysis of which measures were most commonly selected by vendors and which had the most consistent participation was conducted. The results showed that the most aggressive measure was not consistent in event performance (likely due to the measure being too aggressive), and the least aggressive measure had never been selected in the Auto-DR Express program. ASWB decided to consolidate the measures by removing the least

common and the most aggressive measures to allow the more consistent participation needed from a deemed kW program.
Based on the surveys and analysis of facility types and measures, ASWB developed the following solutions to address the uptake of SMB customers in the Auto-DR Express programs:
Immediate Adoption – ASWB developed a tool that all three IOU Auto-DR incentive programs can use immediately. It addresses vendor/customer desires to streamline programs participation by:

- Combining the calculations for all three IOUs into one document;
- Making the file available offline to provide vendors easier access to load shed calculations;
- Expanding eligible facility types and sizes; and
- Consolidating available measures.

The tool also functions as an incentive reservation application and includes E-signature functionality. The tool has been provided to the DT-ET teams, and at least two of the IOUs are considering using this tool for their Auto-DR incentive programs in 2019.
SMB-Specific Program Redesign–ASWB recommends developing a direct install program to achieve the long-term SMB engagement goals of the Auto-DR incentive programs. At a high level, this program will:

- Install devices at no cost to the customer, which addresses customer concerns regarding cash flow and uncertainly of on-going financial benefits of DR.
- Combine direct install with standard participation options, which will reduce the amount of necessary program touchpoints, reducing vendor overhead for SMB projects, which has traditionally been a concern for vendors.
- Pre-approve vendors and their cloud reporting services to provide quicker project verifications, while providing the utility more visibility into customer behavior and performance.

ASWB discussed such an option with Auto-DR vendors and several were interested in the structure and stated they would be willing to work with the IOUs to provide their data for M&V.
$ Per Device - ASWB created a proof of concept incentive calculator that provides Auto-DR incentive amounts based on the number of Unitary AC controllers in a retail facility. The correlation between number of Unitary AC controllers and Peak kW load shed in retail facilities achieved R^2 of 0.76, indicating a significant and predictable relationship. Using past Auto-DR participant and vendor-provided data shows that estimating load shed incentives on readily collected equipment data is feasible, but a full roll-out for all facility types will require additional datasets on installed equipment.

Next Steps

The next step for increasing SMB uptake in Auto-DR Express is to pilot the proposed long-term solution. Including IoT devices with cloud functionality would also address AB793's requirement to "develop a program to provide incentives to a residential or small or medium business customer to acquire energy management technology for use in the customer's home or place of business[1]". Such IoT devices allow access to real time databases which would also allow the utility to meet the pilot objectives set in 3.5.2.3 to "yield useful data within the budgets provided[2]".
It is ASWB's professional opinion that such a pilot not only best serves the needs of SMB customers, while meeting CPUC decisions regarding SMB outreach in disadvantaged communities, but will also provide more useful data at lower M&V costs via IoT devices.

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[1] AB-793 Energy efficiency.(2015-2016) https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB793
[2] CPUC Decision 18-11-029 – Application of Pacific Gas and Electric Company for Approval of Demand Response programs, Pilots and Budgets for Program Years 2018-2022. Section 3.5.2.3(Page 72)

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Background

In 2006, SCE's Technical Assistance and Technical Incentives (TA&TI) program was introduced to incentivize vendors and customers to increase DR participation by providing evaluation of DR potential, equipment installations, and DR automation. The TA&TI program, which later would be called the Auto-DR incentive program, was originally created for larger customers. To participate, customers were required to have a facility peak above 200 kW and go through a preliminary assessment and then a technical audit, before applying and reserving Auto-DR incentives to offset Auto-DR implementation costs. These steps were considered necessary at the time, as DR potential for various facility types was not yet well known and the load shed potential of industrial processes can vary from facility to facility.

Auto-DR incentives based on the post-install load shed test required thorough and potentially costly audits and the customer bore the risk of reduced incentives if the actual load shed potential was lower than estimated. For these reasons, vendors targeted larger industrial customers who could shed more kW, leaving SMB customers out of the target market for Auto-DR.

In 2010, SCE stated intentions to expand their Auto-DR programs to include more facility types. They surveyed vendors and customers who confirmed that the audits were too costly for smaller sites and the post-install incentives were a risk that smaller customers were not willing to take. SCE requested ASWB to provide a solution to address the audit requirements and remove the risk of uncertainty associated with the Auto-DR incentives. ASWB came up with a deemed program structure, which removed the preliminary and technical audits, and replaced them with four inputs:

- Climate zone
- Peak kW
- Facility type
- Selected DR measures

By making the load shed and associated incentives deemed, this structure also removed the risk for customers who may not receive the incentives they were expecting after the load shed test. Initial facility eligibility was only for retail, office, and grocery stores between 100 to 199 kW.

In 2015, SCE expanded the deemed program eligibility to all customers in the GS3 tariff, which includes all facilities with a peak demand between 100 to 499 kW. In 2016, PG&E ADR adopted similar calculations for their Auto-DR Express program, named "FastTrack" program[5], but extended eligibility further to 1 to 499 kW.

Introduction

Assembly Bill 793 mandates that utilities must "develop a program to provide incentives to a residential or small or medium business customer to acquire energy management technology for use in the customer's home or place of business[6]" by 2017.

When SCE reviewed the participation of SMB in the existing Auto-DR Express offering, it found that despite the Auto-DR express program addressing vendor concerns regarding SMB Auto-DR projects that were collected upon initial release of the Auto-DR express program, SMB program uptake was lower than expected. The DR-ET teams of SDG&E, SCE, and PG&E requested ASWB to evaluate the Auto-DR Express programs and develop strategies to increase SMB participation. The DR-ET teams established the following objectives to evaluate areas of study and improvement:

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[5] *Auto-DR Express and FastTrack are similar deemed program offerings from SCE and PG&E, respectively. For the purposes on this document, all future references to the tool will be "Auto-DR Express".*

[6] AB-793 Energy efficiency.(2015-2016)
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB793

Key Objectives
Expand SMB participation of the Auto-DR Deemed Express program
Conduct a Statewide Needs Assessment to better assist vendors with the "Express" and "FastTrack" programs
Identify and interview key stakeholders in the existing program designs for "Auto-DR Express" and "FastTrack" to identify strengths, gaps, or needs
Review the eligible measures and add additional facility types
Analyze participants in the existing database to true up "deemed" kW values
Provide short- and long-term solutions for the IOUs to increase Auto-DR Express uptake

Table 1: Key Objectives

In July of 2018, the findings were presented to the DR-ET teams from SDG&E, SCE and PG&E. In that presentation, the Auto-DR Express updates were reviewed. However, as the calculation structure of the Auto-DR Express tool stayed the same and the tool still required facility Peak kW as an input. The DR-ET teams determined the requirement of peak kW as an input for incentive calculations was still an issue for vendor/customer participation in the Auto-DR Express programs.
In order to address the peak kW issue, the DR-ET teams requested a modification to the Auto-DR Express program structure that would remove the peak kW requirement by calculating Auto-DR incentives based on easily observable facility data, namely the number of installed thermostats and unitary AC controllers. This "$ per device" solution would allow vendors and customers to get concrete Auto-DR incentive estimates at the time of sale based on facility type, number of devices sold and climate zone. This solution is referred to in this document as Phase 2.

Approach and Methodology

To complete the key objectives for the project that are listed above, the following Technical Approach and Methodology was used:

- Conduct a needs assessment by interviewing program participants and utility stakeholders.
- Evaluate potential for additional facility types and measures by reviewing existing Auto-DR databases, looking into new potential industries for Auto-DR application and reviewing utility DR program pilots.
- Integrate findings from efforts listed above into a new Auto-DR Express tool, and a new program design for 2018 and beyond that focuses around the needs of SMBs.

1. Conduct Needs Assessment

To understand barriers to uptake, and vendors/customers perspective on the usability of the Auto-DR Express program, ASWB started with a market survey by interviewing key stakeholders that have been involved in DR, Automated DR and Auto-DR Express. ASWB developed surveys and conducted interviews with the stakeholders to gain an understanding of the current experience of the program from all perspectives and identify gaps and needs in the current program designs. The

results of the needs assessment were used to identify what factors to address and review in the database evaluation and Auto-DR uptake solution.

2. Evaluate Potential for More Measures and Facility Types

Since 2011, vendors have made many requests to SCE's Auto-DR team to increase the number of facility types allowed. However, due to lack of Auto-DR participant data to validate those facility types for a deemed program at that time, SCE decided to keep eligibility for the tool to offices, retail facilities and groceries stores.
Since then, ASWB has verified Auto-DR implementations for over 3,000 Service Accounts. The larger database would prove useful in re-evaluating the list of SMB participants in Auto-DR, and see if any other facility types would be a good fit for a deemed kW program. When selecting the sites and measures to focus on for the Auto-DR facility type expansion, customer and vendor feedback from the surveys were taken into consideration.

- Utilizing the results of surveys to identify customer/vendor requests for Auto-DR eligibility expansion
- Evaluating the performance and accuracy of load shed predictions for SMB facilities to see if a certain facility type or measure could be included in the Auto-DR Express update

3. Revise Auto-DR Express Tool and Program Design

ASWB incorporated the results from surveys and analysis of measures/facility types in an immediate and long-term solution.

Immediate solution: Update existing Auto-DR Express/FastTrack tools

- Add additional facility types based on vendor/customer feedback and database analysis
- Revise/review measures based on vendor/customer feedback and database analysis
- Modify existing Auto-DR express tool to address vendor feedback about Auto-DR Express

Long-term solution: SMB program redesign- Modify existing program design to suit requirements tailored to SMB

- Full program redesign; Current Auto-DR Express program structure is based on a large commercial and industrial Auto-DR program and is not a perfect fit for SMB.
- Address additional market barriers vendors faced with sale of DR to SMB based on needs assessment
- Standardize program offerings. Develop Auto-DR participation packages to streamline and simplify program structure

4. Develop $ per Device Tool to Simplify Calculations

To develop the $ per device incentive calculator, following methodology was used:

- Evaluate what datasets are needed for the cross-reference database to convert existing Auto-DR Express tool to a $ per device tool.
- Secure databases needed from manufacturers to create cross-reference database.
    - Gain support from vendors by creating a business case to assist in $ per device effort.
    - Review database outputs to select datasets needed.
- Compile data to cross-reference existing data on facility size and load shed kW.
- Create regression models to predict facility load shed potential based on $ per device.
    - Evaluate whether datasets were able to provide a solid correlation needed for $ per device metric.
    - Test $ per device metric against existing facility data for accuracy of tool.
- Create a $ per device tool for IOUs.

Needs Assessment

ASWB developed surveys and conducted interviews with the stakeholders to gain an understanding of the current experience of the program from all perspectives and identify gaps and needs in the current program. Interviews were conducted interviews with five categories of stakeholders using tailored surveys to highlight their experience: New Vendor, Past Vendors, New Customer, Past Customers, and Utility Program Stakeholders/Program Implementers. See Appendix Section 1 for the questions for each survey. There were a total of 22 responses across all categories.

Breakdown of Survey Responses by Category		
Category	**Qty of Responses**	**Percent of Total Responses**
Utility Stakeholders and Implementers	4	18%
Past Vendors	11	50%
New Vendors	5	23%
Past Customers	2	9%
New Customers	0	0%
Total	22	100%

Table 2: Survey Responses by Category

The results provided feedback on the difficulties of selling Auto-DR from various perspectives and were used as criteria to address the immediate and long-term program updates. The results were grouped in the following areas:

- Vendor Feedback
- SMB-Specific Feedback
- Customer Feedback
- IOU feedback

Vendor Feedback

The majority of the Past Vendor survey interviews were conducted over the phone with ASWB staff members. The following are past vendors that took part in the survey:

- CPower Energy Management
- EnTouch Controls
- Encycle
- GRIDlink Technologies
- Honeywell
- Melrok
- THG Energy Solutions
- Universal Devices, Inc.
- Vacom Technologies
- Verde Energy USA
- Yardi Systems
- Zen Ecosystems

The following are vendors who have not been through the Auto-DR program that took part in the survey:

- Center for Sustainable Energy
- Pelican Wireless
- Servidyne
- Transformative Wave

The surveyed vendors covered a large portion of Auto-DR participants, with their projects adding up to 583 Service Account (SA) and 67 MWs in the SCE territory. Full summaries of each of the interviews are in Appendix section 1.
Key barriers that Vendors identified:

- Cumbersome Paperwork. The Auto-DR Express paperwork process is difficult and takes too long to keep the customer interested.
- Lack of Awareness. Many vendors are unaware of the Auto-DR Express program.
- Uncertainty on eligibility. Vendors are uncertain of whether their facility qualifies for Auto-DR Express and don't know how to find out if they could qualify.
- Customer benefits are not understood. An overwhelmingly large number of interviewees did not understand the customer benefits of DR.
- Overcoming perceived negative impact on customer comfort. Vendor sales staff are not adequately educated on customer benefits nor have the ability to calculate financial incentives that would enable them to outweigh the potential impact on comfort.
- Administrative costs for SMB customers. SMB Auto-DR projects per site incentives are low. SMB Auto-DR projects can't afford the administrative cost to complete program paperwork as well as upfront upgrade costs.
- Need multiple communication channels. Customers strongly preferred the online survey, and all vendors contacted preferred phone interviews.
- Vendors need more tools and training.

* For a summary of each individual interview, please see Appendix 1.

Small Medium Business Feedback

To look specifically at the SMB sector, the vendors were asked to provide benefits, challenges, and any other lessons learned from experiences they had when working with the SMB sector. Table 2 gives the SMB synopsis based on the vendor feedback.

Small Medium Businesses Vendor Synopsis	
Benefits	SMB are easier to keep in contact with the decision makers which means they can proceed with projects faster since the approvals and decision process is more streamlined.
Challenge: Education and Resources	▪ SMB customers usually are not educated on DR. ▪ SMB also have less time available for education on utility programs than a larger customer with a portfolio or energy manager. ▪ Vendors are also unable to quickly provide exact initial or on-going financial benefits of DR during sale. This practically eliminates the SMB's interest in DR projects as SMBs do not have resources to invest on things without a clear business case. ▪ Vendors find it does not always pay to work with SMB since it is the same amount of effort for a large incentive customer as for a small incentive SMB customer.

Ineligibility Reasons	▪ Some were ineligible for Auto-DR because they are not able to dual-enroll in Auto-DR programs and non-Auto-DR programs. ▪ Peak kW is too low.
Conclusion	SMB-focused solutions need to be quick for vendors to sell and clear for SMB customers to understand. The benefits to the customer need to be consistent, which allows for vendors to become familiar with how to sell DR and Auto-DR

Table 2: SMB Synopsis

Customer Feedback

There were only two responses from past customers and no new customer responses. The two customers we received responses from were Costco Wholesale and Mitsubishi Electric Automotive America. According to Costco, the most difficult part of DR was the disruption to business. Costco also expressed concerns about the impact on revenue streams, the inability to control the frequency of events (events multiple days in a row were not preferred), and risk to product or business. While the customer response rate was low, valuable feedback about customers was acquired indirectly through vendor feedback about their customers.

Customer Understanding of DR Programs

When vendors were asked about their customers' awareness of DR compared to Energy Efficiency (EE), the customer awareness of EE was almost double that of their awareness of DR (see Figure 1). While EE programs have had a lot of marketing and outreach to customers, the vendors felt DR has not had the same kind of exposure and is not as well understood as EE.

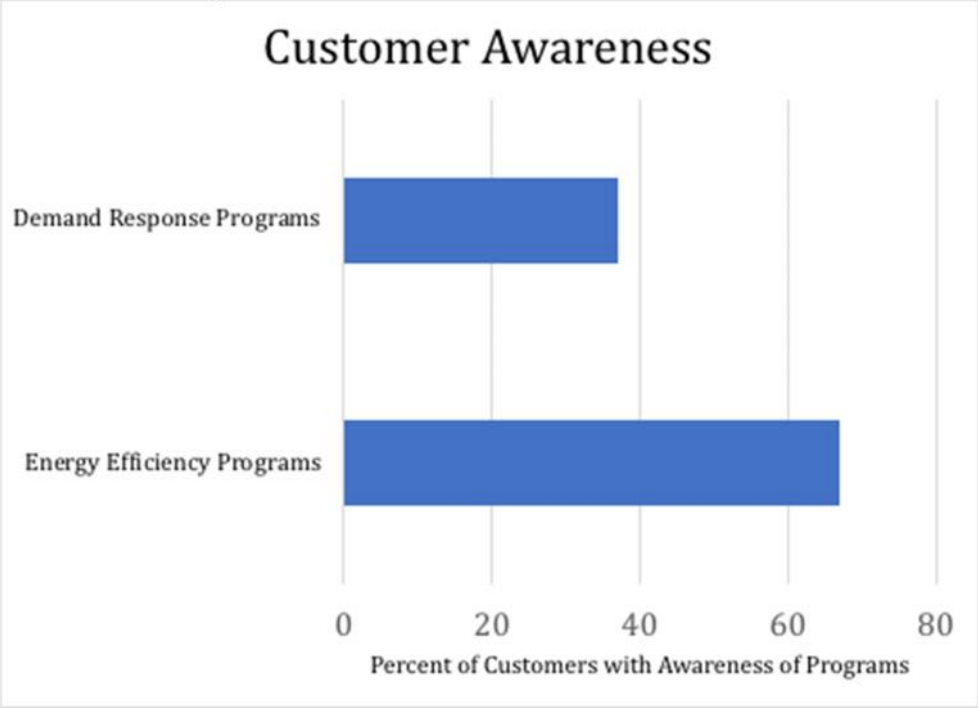

Figure 2: Customer Awareness of DR and EE Programs

Lack of Awareness - In discussions with vendors, we heard that DR is much harder to explain to a customer than energy efficiency programs and requires more steps to benefit from DR implementations. DR can also potentially affect the operation of the business, whereas EE does not, and the frequency and duration of the DR-events is unpredictable. EE has immediate energy savings, but Auto-DR takes time: incentives for event participation may require the customer to wait until the next summer for DR season.
Lack of Understanding - Customers do not understand DR and have the misconception that DR means "shutting everything down". Since that would be inconvenient or uncomfortable, customers were not always receptive to hearing DR opportunities.

Customer Impact

58% of vendors who had implemented Auto-DR projects reported that their customers had "a great deal" to "moderate amount" of complaints about the Auto-DR implementations at their facility, typically about impacts to occupant comfort.

Utility Stakeholders and Program Implementers

Responses were received from all three Utility Stakeholders (SCE, SDG&E and PG&E) and the PG&E ADR Program Implementers (Energy Solutions). Stakeholders were asked how their participants learn about DR programs. Feedback from the stakeholders showed that word of mouth, stakeholder and company contacts, and email were the most effective marketing for Auto-DR programs (see *Figure*).

Figure 3: Participant marketing and outreach

Summary of stakeholder and implementer feedback:

- Customer awareness of DR incentive programs is as low as 30%, indicating a need for more effective marketing and advertisement.
- Customer and account representative knowledge about DR was also a large concern, mainly regarding misunderstanding about the calculation process and customer requirements.
- When asked what improvements stakeholders would like to see in the DR programs, the main responses were increasing cost effectiveness of individual programs and customer satisfaction with Auto-DR.
- IOUs were also concerned with decreasing administrative and M&V costs.
- 100% of participants responded "Yes" when asked if simplifying the incentive programs or condensing them would improve customer experience.

Key Findings

Customer and vendor education is greatly needed.

- Customer's awareness of Energy Efficiency is nearly double that of DR.
- Vendors are not adequately educated on many aspects of DR.
    - Auto-DR incentive programs:
        - Lack of understanding of Auto-DR program requirements/processes
        - Unable to calculate/provide one-time incentive estimates
    - DR programs:
        - Convincing customer to sign up for a DR program is difficult, vendors need more education on how to sell DR
        - Unable to calculate/provide on-going incentive estimates
- Customers still think DR means "shutting everything down."

The program must be streamlined to optimize for SMB customers.

- IOU feedback: Current program offerings are too complex, and simplification of the program will increase uptake.
- Vendors found three different IOU Auto-DR programs—each with their own incentive amounts, paperwork and program eligibility—to be difficult to track and explain to customers.
- Vendors are unable to provide incentives at time of sale.
- There are too many steps. Having the customer enroll in both the utility Auto-DR program and with a 3rd party DR aggregator is difficult, especially without concrete incentive numbers.

Future DR Considerations for SMB Customers

It is clear from discussions with vendors and market potential studies[7] that a shift in DR focus is needed to maximize the benefits of Auto-DR technologies. The current DR program structure focuses on traditional DR for resource adequacy. The future "Fast and Flexible" DR will utilize technologies that enable facilities to participate in the real-time market services or frequency regulation market. This means DR technologies in the future should provide fast response, frequency regulation and locational dispatch capabilities and consistent load shed.

[7] *2025 California Demand Response Potential Study - https://drrc.lbl.gov/publications/2025-california-demand-response*

Traditionally, Auto-DR projects were focused on large commercial or industrial sites because the programs were vendor driven and needed larger incentives to cover higher system cost and additional educational overhead.
As a result, initial projects in the Auto-DR program were mainly industrial sites. Though this provided large kW load shed for the program, industrial sites are generally clustered in certain cities and do not have the kW distributed across the service territory. Industrial sites often need long lead times and have issues with participation in consecutive event days. This means that fast response, locational dispatch, and consistent participation/load shed are not the strong suits industrial sites.
SMB represents a lot of untapped potential for DR, specifically when it comes to consistent, fast response, and locational dispatch capabilities. SMB Auto-DR implementations do not have the same constraints. SMB sites generally will allow distribution of load shed across the service territory, especially in the case when a chain of stores participates. If implemented correctly, SMB sites participating with HVAC or lighting measures can respond within minutes and provide consistent participation across all events. With smart thermostats and HVAC and lighting controllers coming down in cost, Auto-DR implementations has become more cost effective for SMB and, in the case of HVAC implementations, can often be completely paid for using the existing utility incentive structure.
However, talking to vendors that deal with SMB, Auto-DR has not been on their sales strategy, even among vendors that know of the Auto-DR incentive programs.
In addition to low available incentives, additional barriers vendors have with SMB are the customer's mis-understanding of DR. The HVAC and lighting vendors stated they are essentially selling "comfort" and DR is perceived to conflict with this message. The vendors limited knowledge of DR and the available incentives is often not enough to convince the customer to participate in DR.
Talking to DR aggregators, they often have little interested in SMB facilities in their DR portfolio unless the SMB facility is part of a chain. Reasons cited were similar to the vendor concerns: time investment, paperwork, and utility processing time would be the same for an SMB customer as for a larger customer with larger potential load shed incentives. In addition, having to explain DR participation requirements, signing up the customer and on-going incentive management for an SMB takes the same resources as a customer with larger load shed potential. Feedback has been incorporated in the immediate and long-term solutions listed in section "Auto-DR Express tool and program redesign".

Evaluate Potential for New Measures and Facility Types

General feedback from the vendor/customer interactions was there was a need to expand the Auto-DR Express offerings beyond the current offerings for retail, office and grocery. Additional facility types requested by the vendors were refrigerated and non-refrigerated warehouses, hospitality, fast-food, water districts and agricultural pumping, indoor agriculture and EV chargers.
The criteria for a facility to be a good fit for Auto-DR express are as follows:

- Standard DR measures (not one-off measures that are facility-specific as the case with industrial sites)
- Consistent load shed potential across multiple sites of same facility type
- Consistent load shed potential for a given site across multiple events
- Accurate way to predict load shed potential based on high level facility data
- Majority of the facility type is Small and Medium businesses

To evaluate the consistency and the accuracy of the load shed, past participants of the Auto-DR program were analyzed using the SCE database and then filtered for SMB participants (under 500 kW). below includes the top ten SMB facility types based on the number of Service Accounts (SA). It should be noted the cost/kW represents the total project cost divided by approved load shed kW, and that total project costs often include full EMS upgrades that are needed for Auto-DR implementations, but provide many additional benefits to the customer. The Average Cost/kW is not the total incentive allocated, as the actual incentives provided to the customer are capped at $300/kW in SCE & SDGE, and $200/kW in PG&E territory.

Top 10 SMB Facility	SIC Code	Count of SA	Average Cost/kW[8]**	Description
1	5411	334	$130	Grocery stores
2	4941	213	$92	Water supply
3	5943	121	$259	Stationery stores
4	5331	116	$712	Variety stores
5	5311	113	$226	Department stores (excludes leased depts.)
6	7991	88	$619	Physical fitness facilities
7	5945	59	$834	Hobby, toy, & game shops
8	6512	58	$285	Operators of nonresidential buildings
9	7011	42	$275	Hotels (except casino hotels) & motels
10	5731	39	$276	Radio, television, & consumer electronics stores

Table 4: Analysis of SMB Auto-DR Past Participants

After research and analysis of potential facility and load shed types, it was concluded that the following list of facility types are a good fit for Auto-DR Express. Analysis of past participants for consistent load shed potential and survey results and Itron's California Commercial End-Use Survey (CEUS)[9] were taken into consideration when determining the new facility types for consideration.

Proposed New Facility Types:

- Non-Refrigerated Warehouse
- Hospitality
- Fast food

The proposed facility types are sites that had many successful Auto-DR implementations with a common set of DR measures and consistent load sheds across various sites and events. This would allow the deemed kW to be an accurate representation of the load shed potential of the facility.

The following list are facility types or load shed measures that we considered including in the Auto-DR Express/FastTrack program but decided not to include them at this time:

- Refrigerated Warehouses
- Electric Vehicle Chargers
- Water Districts & Agricultural Pumping
- Indoor Agriculture

Some of these facility types were not recommend for inclusion in the deemed Auto-DR express program due to concerns over consistent participation. Data showed that the high variance in load shed potential of these sites make them a better fit for the utility's Auto-DR Customized Incentive program option. For example, analysis of the data for water districts showed that one pumping station would run for a few hours a month, whereas another pumping station in the same water district would run nearly 24-7. The same applied to refrigerated warehouses, some customers chose to shut down the entire site's refrigeration system, but others had a variety of products

[8] The cost/kW represents the total project cost divided by approved load shed kW. In some cases, the total project cost is for a full EMS upgrade, not Auto-DR specific costs.

[9] www.energy.ca.gov/ceus/

stored and could only shut down a portion of their facility. Sites with highly variable load shed potential like these would not be a good fit for a deemed program design.
Indoor Agriculture and Electric Vehicle chargers were not included in the deemed program because not enough data is available to finalize a deemed load shed kW. There have been no Auto-DR projects from an indoor agricultural site in SCE and PG&E, so the load shed potential, and consistent participation record is unknown. Review of the PG&E's iChargeForward pilot program concluded that the load shed potential of these sites are also not consistent enough yet for Auto-DR Express.

Measure Evaluation

Initial intent of measure evaluation was to see if vendors/customers wanted new measures to be included in the Auto-DR Express options. It was found that though vendors wanted more facility types for Auto-DR Express, they generally found the existing measure options too confusing. To address this, we reduced the eligible measures in the updated Auto-DR Express tool, limiting them to the following 3 measures:

Duty Cycling – 20 minutes off/hour

Previously, customers could choose HVAC shutdowns of 10, 20, or in certain cases 30 minutes off per hour. Analysis of what has been submitted and tested showed that no one has submitted a project with a 10-minute duty cycle. Analysis of customer event performance revealed that some ultimately find the 30 minutes/hour too aggressive after a year of participation. The moderate strategy of 20 minute/hour was concluded to be more representative of what a customer would choose and better aligns future customer performance with the deemed kW.

Space Temperature Increase – 4 Degree Space Temp Increase

Previously, customers could choose 2, 4, or 6-degree space temperature increases. Similar to duty cycling, analysis of what has been submitted and tested shows that no one has submitted a project with a 2-degree space temperature increase and many customers are concerned that an increase of 6 degrees is too extreme. The moderate strategy of 4-degrees space temperature increase was concluded to be more representative of what a customer would choose and better aligns future customer performance with deemed kW.

Lighting Dimming – 20, 30, or 40%

It was decided to not modify the measure selections for lighting dimming and to keep the existing options of 20, 30 and 40% dimming. There have not been enough Auto-DR projects submitted with lighting dimming to know what customers generally used as default. Feedback suggests that 40% dimming is not too aggressive for customers participating in Auto-DR, so no changes were made to this measure.

Revise Auto-DR Express tool and Program Redesign

Experience with the IOU programs along with the feedback regarding SMB uptake by vendors and aggregators highlighted a need for a potential program change. As previously mentioned, the existing Auto-DR Express program design was based off the Auto-DR Customized program (for commercial and industrial). These are very different customer sectors with different needs and resources. To increase SMB uptake of the Auto-DR Express program, there is a need for a DR program that is designed for and focused on customer needs. Two solutions to increase SMB uptake and participation were developed: an immediate solution and a long-term program re-design.

Immediate Program Updates

Objectives for the program updates that could be immediately implemented are as follows:

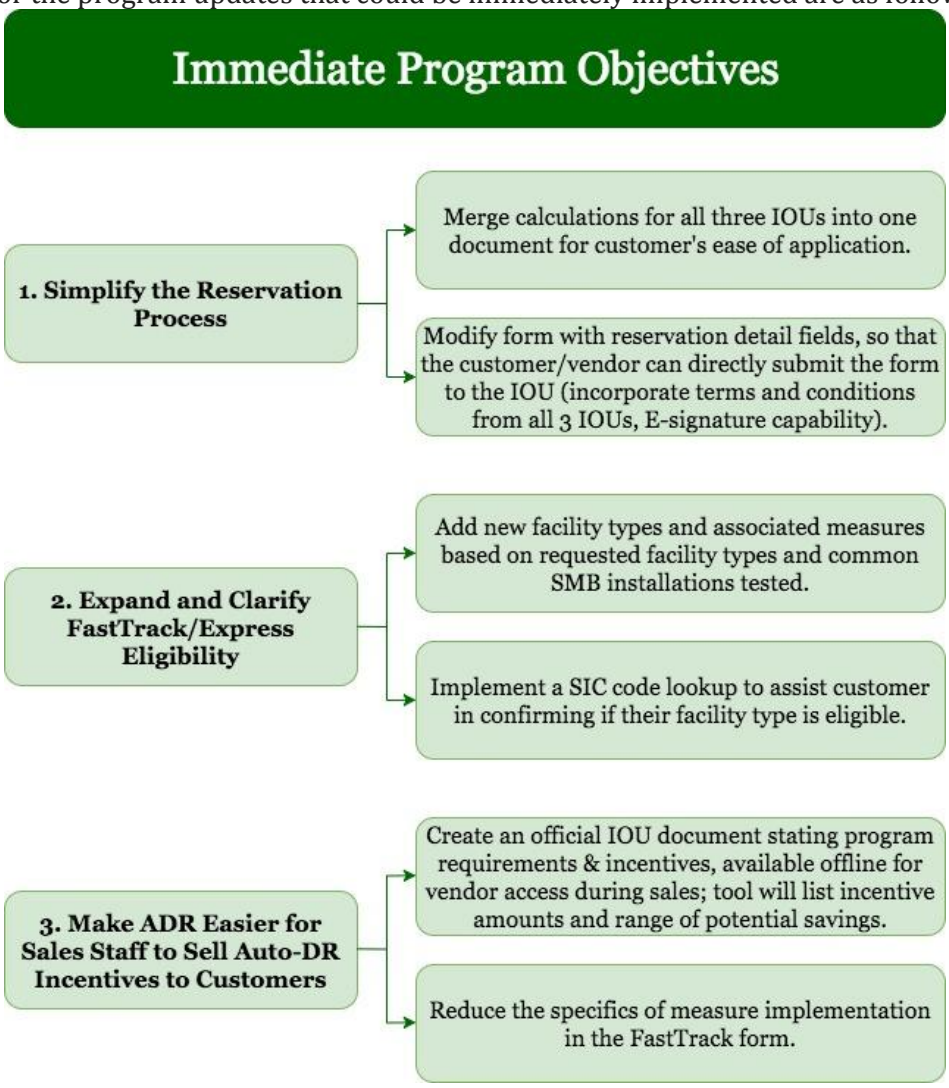

Figure 4: Immediate Program Objectives

Results

Simplify the Reservation Process: Create a tool combines incentive calculation for climate zones in all 3 IOUs. This addresses 3.4.5 of the CPUC Decision 18-11-029 where parties agreed the approach for calculating Auto DR control incentives should be consistent across the three utilities[10]. The terms and conditions for the Auto-DR programs from all 3 IOUs are included, along with an E-Signature option to allow the customer to submit the offline document as a program application[11].

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[10] CPUC Decision 18-11-029 – Application of Pacific Gas and Electric Company for Approval of Demand Response programs, Pilots and Budgets for Program Years 2018-2022. Section 3.4.5 Page 56. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M248/K670/248670669.PDF

[11] It should be noted ASWB concluded the IOU legal teams would need to be involved to make this document legally binding, which was outside the scope of this project.

Figure 5: Updated Auto-DR Express reservation form, Customer Information tab

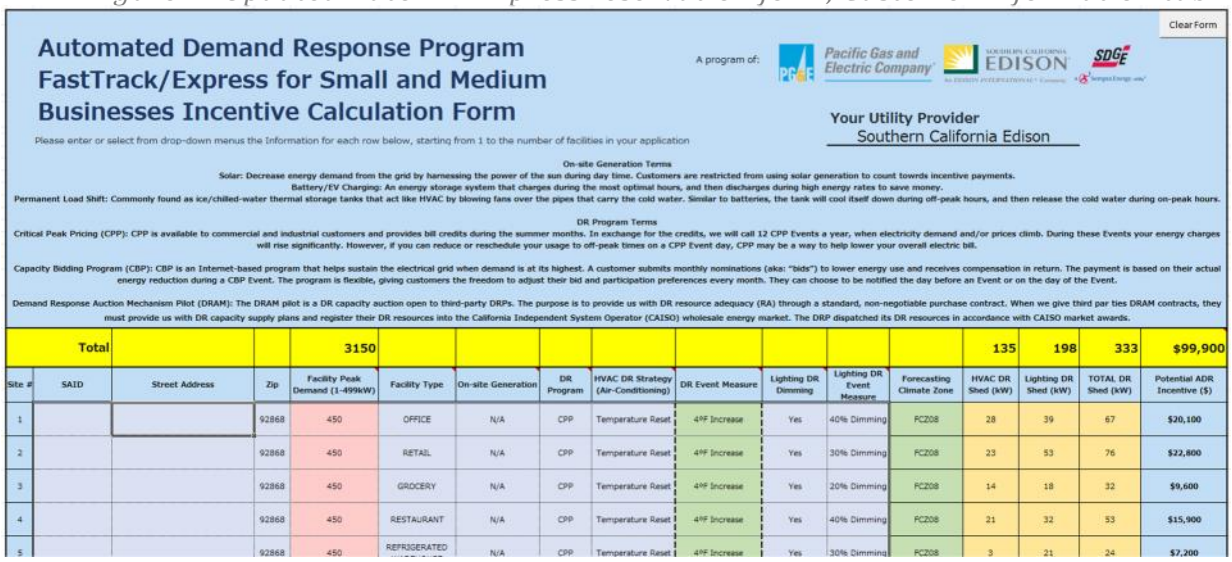


Figure 6: Updated Auto-DR Express reservation form, Site Calculation & Incentives

Expand and Clarify FastTrack/Express Eligibility: Facility types determined to be a good fit for Auto-DR Express (Cold storage warehouse, non-refrigerated warehouse, hospitality and fast food) were added to the incentive calculation tool and linked to a SIC code lookup to clarify eligibility.

Make ADR Easier for Sales Staff to Sell Auto-DR: The tool meets the objective by being an offline document that vendors can use during time of sale. The previous tool provided load shed kW and incentives but was only available offline in for one IOU program (the PG&E Fastrack program). The list of measure options was pared down to reduce customer confusion and better reflect consistent, repeatable measures.

The updated Auto-DR Express form is a complete and working document ready for utility adoption. Midway through this project, ASWB provided the document to the DR-ET teams of all IOUs for feedback. In discussions with the IOU Auto-DR program management teams, it was confirmed that the Auto-DR programs of 2 IOUs were considering implementation of this tool in the early part of 2019.

Initial feedback from vendors is positive, they are interested and prepared to submit new projects using the Updated Auto-DR Express application process.

SMB-Specific Program Redesign

In the recent work to explore the Auto-DR SMB uptake, it was confirmed that vendors and Auto-DR service contractors had little awareness of the simpler Auto-DR Express method to calculate Auto-DR incentives. Auto-DR equipment installation and enablement is not a task most contractors are familiar with even though there are several successful technologies and systems that incorporate Auto-DR capabilities.

While the immediate Auto-DR Express solution provides a deemed incentive to the customer for one-time incentives, DR program enrollment/aggregator sign-up for on-going participation incentives still utilize the previous enrolment structure made for large commercial and industrial customers. A direct install strategy using trained and qualified Auto-DR direct install contractors with pre-approved DR participation packages agreed to by vendors and aggregators would be a viable solution.

The program redesign is based on meeting the following objectives:

- Full program redesign. The current Auto-DR Express program structure is based on a large commercial and industrial Auto-DR program and is not a good fit for SMB.
- Address additional market barriers vendors faced with sale of DR to SMB based on needs assessment.
- Standardize program offerings. Develop Auto-DR participation packages to streamline and simplify program structure.

The following section details the SMB-specific solution that was developed by ASWB to address the objectives listed above.

Direct Install Program Design

The proposed long-term solution allows for a streamlined experience for customers, vendors, and aggregators. Customers will only need to interact with a vendor once, sign an application, and get an installed system that provides consistent on-going incentives. Vendors benefit from a direct install pay structure, which minimizes overhead costs from multiple customer touchpoints. Utilities will have less costly M&V and project validation costs, while gaining additional visibility into customer participation. IOUS will also have more distributed load shed potential across their service territory, compared to industrial DR. Aggregators will be able to acquire large groups of SMB participants, all with a mandatory participation agreement, without having to manage individual SMBs customer directly.

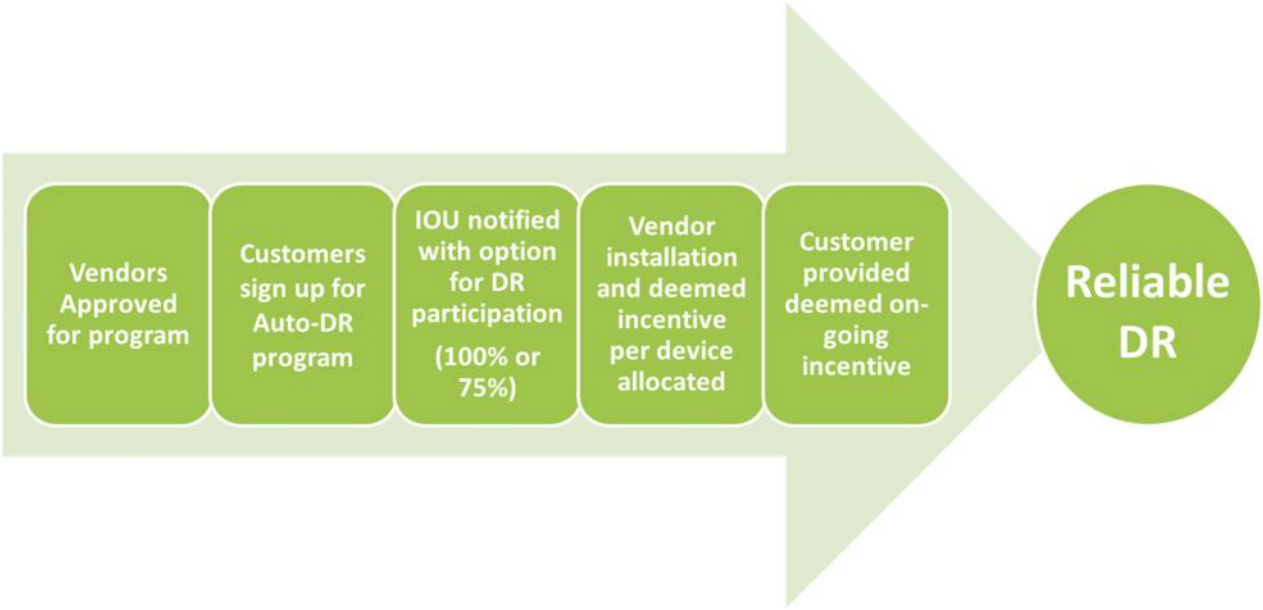


Figure 7: Direct Install Program Process

Considerations for Direct Install Solution

Develop standard Auto-DR participation package

- Require participation of 100% or 75% of all events
- Considerations for shorter duration but fast response packages, allowing Auto-DR to focus on less on resource adequacy but on shimmy DR as well
- Measures should be limited in aggressiveness, minimizing occupancy discomfort or event fatigue
- Focus on reliable and consistent participation from all participants, rather than occasional large kW that is unpredictable
- All packages will not require any upfront costs and on-going incentives will be deemed, as long as customer meets participation requirements
- Packages focus on addressing customer/vendor concerns of comfort and uncertainty of one-time and on-going incentives

Vendor Approval

- Work with vendors to develop Auto-DR solutions to fit the direct install model, creating packaged measures covered by the exiting incentive structure.
- Vendors need to be pre-approved, and meeting certain reporting and participation criteria:
  - Vendor sales teams will need to understand implementation packages and set customer expectations correctly
- Once a customer enrolls in the direct install program, the vendor will install the equipment, provide report for IOU that confirm the site is installed as submitted to request their one-time incentive
  - Report requirements will need to be set for the specific technology
- Pre-approved vendors with validating through reporting/trending will allow for less M&V and reduced field time, reducing FTE program operating cost

Participation Performance

- Vendor will be responsible for ensuring their Auto-DR system responds to the IOU events and the implemented measures initiate as intended

- Opt out of the event will be controlled by the vendor and must meet the implementation package's participation requirements
    - Vendor will provide reports for IOUs to confirm the site participated in DR events with their selected implementation package
    - If reports show too many of one particular vendor's customer's are allowed to opt out, the vendor's eligibility for the Auto-DR direct install program will be put on hold until the issue is resolved.
    - Example--Excessive opt out requests from one particular vendor may mean that vendor's sale team is not setting correct customer expectations.

On-going Incentives

- Standard Implementation packages and associated on-going incentives will be worked out with aggregators before program rollout
- Less time and resources to pull SMB customers into their portfolio: Implementation packages have mandatory participation and the terms and conditions have already been agreed to by the customer
    - Aggregator would interact with IOU's Auto-DR team, select which implementation package they're interested in, and sign those customers into their portfolio without needing to interact with individual customers.
    - IOU Auto-DR team would then move the selected customers onto that specific Aggregator's DR program
- Less risk for aggregators as the vendors are responsible for meeting participation requirements and IOU Auto-DR teams are responsible for making sure participation is maintained
- Customer would receive their portion of the on-going incentive from the IOU. This makes it so there are less customer touchpoints and switching their load shed from one aggregator to another would be transparent

Develop $ per Device Tool to Simplify Calculations

Phase 1 of the Expansion of the Deemed Auto-DR Express Solutions revealed that acquiring a facility's peak kW is difficult for vendors, which makes it difficult for them to calculate Auto-DR incentives at the time of sale. To address this, a kW estimation tool was created which was based on easily observable facility data, namely installed controllers, such as thermostats, unitary AC controllers, and lighting controllers.

Creating this calculator would require information not typically collected as part of the current Auto-DR application process, such as the number of devices observed on site during project screening. To assist in this effort, ASWB obtained commitment from the thermostat and RTU controller vendors who previously participated in DR to provide information on participating facilities.

Vendor Outreach and Data Acquisition

ASWB theorized that a correlation between peak kW and number of devices could be made using some combination of the following facility data sets:

- Information from Public Sources
    - Utility
    - Climate Zone

    - Typical building size for type
- Information from Vendors (facility information)
    - Peak kW
    - HVAC kW
    - Customer name/type
    - Facility size (sqft)
    - Zip Code
    - Number of their devices installed

Several vendors were contacted for support on providing sanitized databases of their installed sites. The databases were claimed to provide the facility information and # of devices needed to create the $/device tool.

However, it was discovered during Phase 2 that many vendors were unable to provide any data and the two databases that were received did not include all the information needed for the $/device effort. ASWB had the following findings should a similar effort be undertaken in the future:

- Provide a sales pitch upfront for the vendor on participation in utility study.
    - Vendors are not motivated to provide data without incentives. The perceived value to sales staff of improving the Auto-DR Express tool did not necessarily resonate with the individuals in their corporation that could provide the data.
    - Interest increased after informing vendors that of hundreds of thousands of SMB customers will default onto a DR tariff in 2019.
- Confirm the database exists with the data needed
    - ASWB found cases where such a database did not exist or lacked the data that vendors originally claimed were available.
- Confirm all necessary parties in the vendor organization understand and are committed to the effort
    - One vendor stepped up with commitment at the sales team level, but ran into issues when the engineering team was too busy to pull the database

In light of this, ASWB mined their database built from 10 years of Auto-DR verifications.

The final available datasets were:

- Facility Type
- Zip Code/Climate Zone
- Utility
- Peak kW of facility
- # of devices installed
    - Unitary HVAC Controls (RTUs)
    - Thermostats

Regression Analysis Variables and Methodology

Initial analysis of Unitary AC controllers and peak kW was done separately by each climate zone. Each facility type was analyzed separately, and # of installed Auto-DR devices was plotted against facility peak kW for each climate zone. Results of this is shown in the table below.

Unitary AC controllers				
CZ	**Facility Type**	**# of data points**	**Equation**	**R^2 value**
3	Retail	9	y = 14.722x + 42.962	R^2 = 0.6639
	Office			
	Theater			
	Food Store/Restaurant	3	y = 13.4x + 111.4	R^2 = 1
4	Retail	19	y = 4.4003x + 105.77	R^2 = 0.276
	Office			
	Theater	1		
	Food Store/Restaurant			

5	Retail	3	y = 13.315x + 19.121	R^2 = 0.9864
	Office			
	Theater			
	Food Store/Restaurant			
7	Retail	2		
	Office			
	Theater			
	Food Store/Restaurant			
8	Retail	27	y = 9.6995x + 116.03	R^2 = 0.2537
	Office	4	y = 5.9214x + 206.86	R^2 = 0.8476
	Theater	4	y = 14.004x + 59.935	R^2 = 0.7248
	Food Store/Restaurant	3	y = 3.7778x + 444.44	R^2 = 0.2292
9	Retail	19	y = 12.584x + 96.981	R^2 = 0.5336
	Office	3		
	Theater	4	y = 10.687x + 91.077	R^2 = 0.769
	Food Store/Restaurant	1		
10	Retail	25	y = 14.427x + 50.746	R^2 = 0.7708
	Office	2	y = 95.667x - 92.667	R^2 = 1
	Theater	8	y = 11.565x + 98.947	R^2 = 0.9719
	Food Store/Restaurant	2	y = 18.2x + 231.4	R^2 = 1
	Warehouse	2		
11	Retail	1		
	Office	1		
	Theater			
	Food Store/Restaurant			
12	Retail	1		
	Office			
	Theater			
	Food Store/Restaurant			

Table 3: Summary Table of RTU Model Results

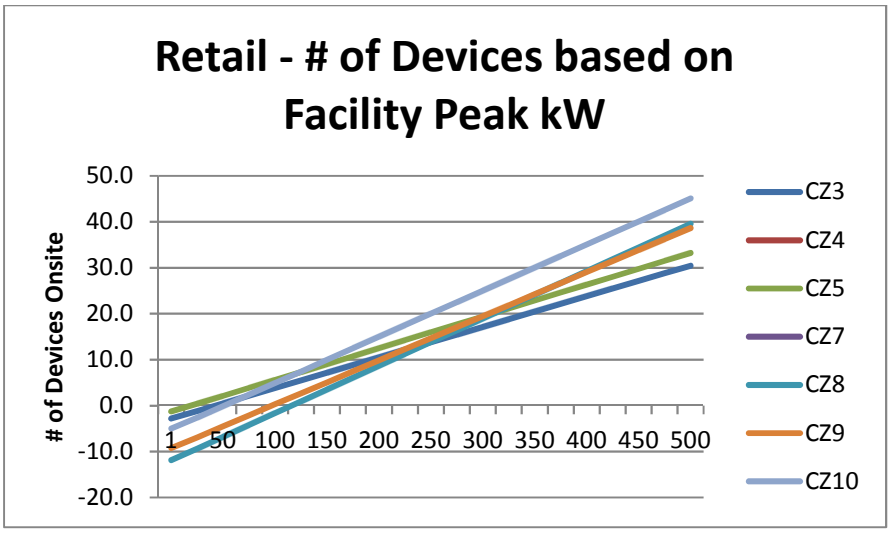


Figure 8:#Unitary AC controllers based on Peak kW

Figure 8 shows the various linear trendlines for different climate zones for the # of Unitary AC controllers based on Peak kW for retail facilities. Climate zone effects on facility kW were then accounted for by factoring in CEUS HVAC kW, to normalize the datasets to one climate zone (CZ8). An X intercept of 0 was applied as well, which provided the following result:

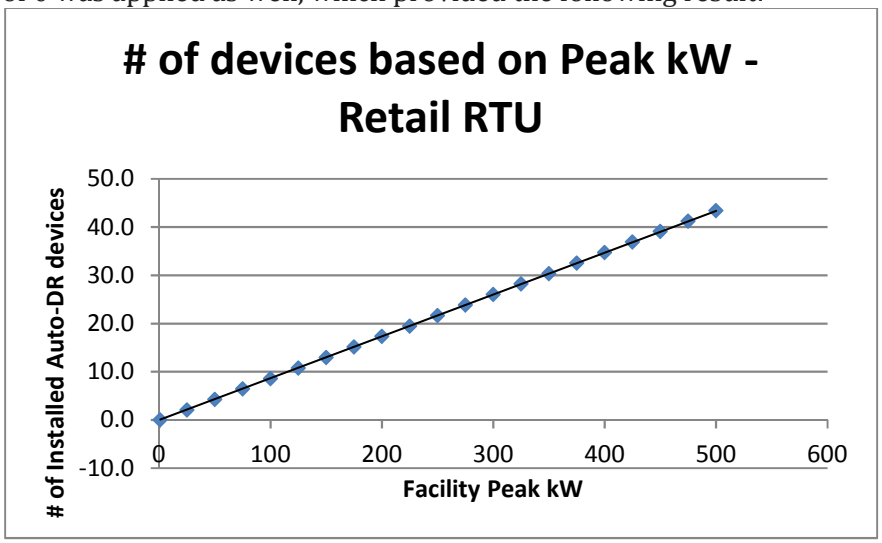


Figure 9: Normalized # Unitary AC controllers based on Peak kW

However, this simplified method treated all CZs with equal weight, despite some CZs having much less data points and worse correlations. In addition, the X intercept was created through an offset of the resulting trendline, which mean the # of devices were modified to meet a certain fit.

A regression analysis factoring in climate zone characteristics was then developed to address this. Details for the final regression analysis are listed in the next section. It should be noted that the regression analysis was only conducted on Unitary AC controllers due to previous analysis showing datasets for other facility and device types not being robust enough for a conclusive result.

Lighting device data was not conducted as well, as there were no lighting databases provided by the vendors, and nearly all Auto-DR lighting projects in ASWB's database did not utilize any installed lighting controllers onsite.

Dollar per Device Calculation Methodology

Regression analysis was developed using excel based data analysis tool.
As a successful example, Unitary AC controllers (RTUs) at retail facilities are used below. The analysis results in an equation to calculate the number of RTUs based on the climate zone and peak demand (kW) at a facility.
The calculation methodology involved the following steps:

1. As the number of RTUs depends on the cooling/heating requirement at the facility as well as the peak load at the facility, climate zone and peak demand were considered as the independent variables to develop a regression.
2. Every climate zone has a specific cooling and ventilation requirement. As percentage of cooling and ventilation represents the condition in each climate zone, this data was taken from CEUS and used as one of the independent variables.
3. The second independent variable that can predict the number of RTUs is the peak building demand (kW). Peak demand values were researched for different building types across different climate zones and were considered as the second independent variable.
4. During the research, number of RTUs were also noted and considered as the dependent variable.
5. Using the above three data points, a regression analysis was performed that would estimate the number of thermostats based on the climate zone (as represented by cooling and ventilation %) and peak building demand (kW).
6. Analysis resulted in R-Squared value of 0.76 which indicates that the data is well fitted to the regression line and that climate zone and peak demand variables are good predictors for estimating the number of thermostats at a facility.
7. This calculation was then applied to the new incentive tool that calculates incentives based on the number of devices, facility type, and zip code.

From the regression analysis, a mathematical formula was developed to statistically calculate the number of devices and is shown below.

# of Devices = (% Cooling x -1.173056842) + (Peak kW x 0.054629408) + (-0.087938089)

Regression Summary

This summary represents the correlation of number of devices to climate zone and peak building demand (kW).

Regression Statistics	
Multiple R	0.872606029
R Square	0.761441282
Adjusted R Square	0.756019493
Standard Error	3.123898787
Observations	91
	Coefficients
Intercept	-0.087938089
CEUS % of cooling and vent	-1.173056842
Peak kW	0.054629408

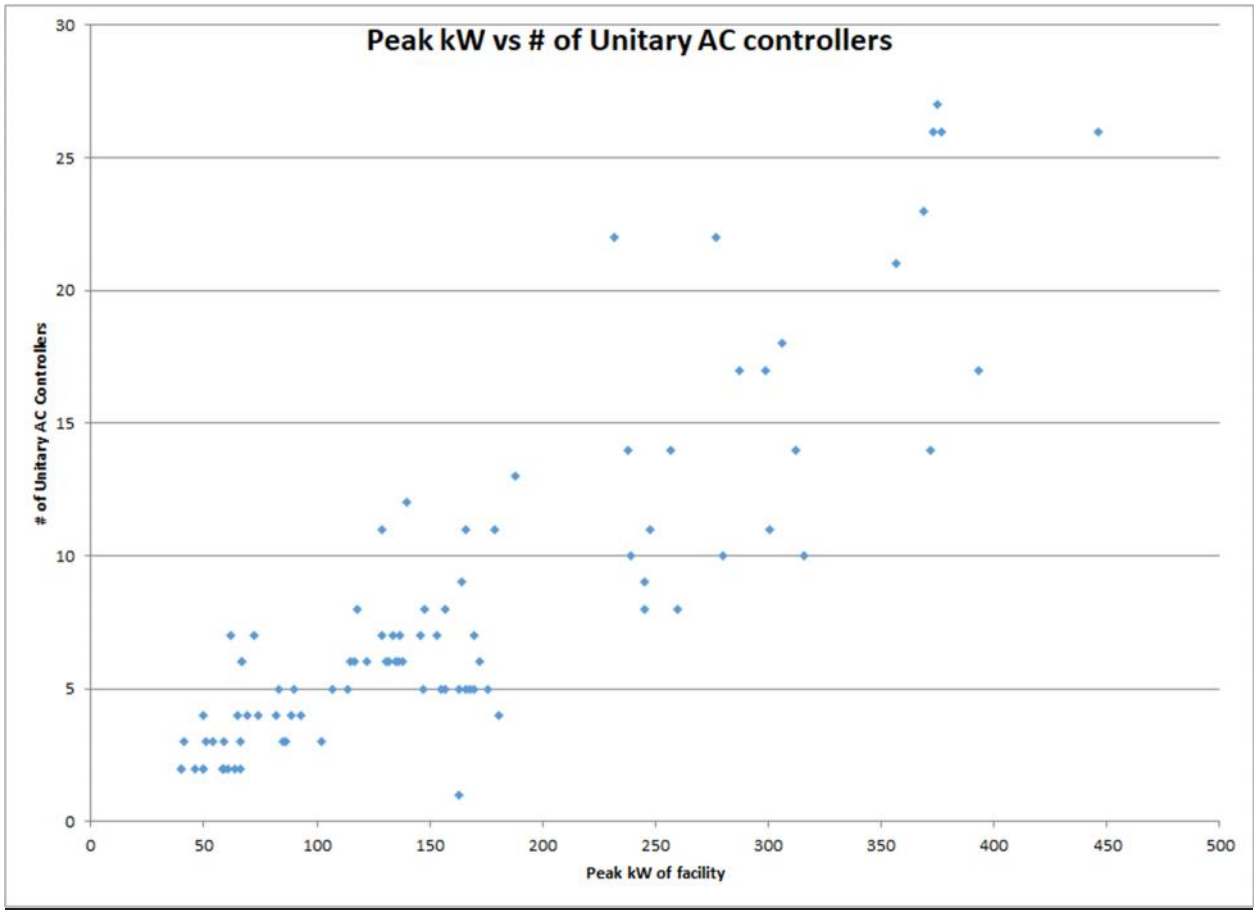
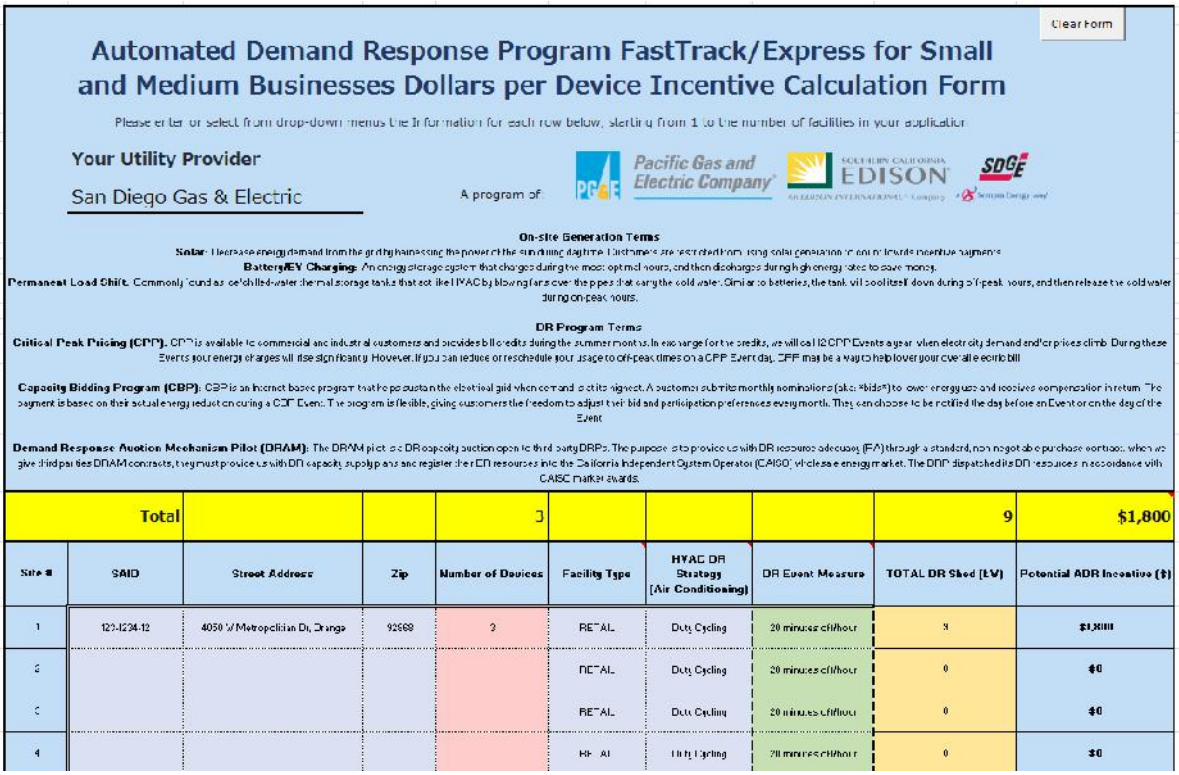


Figure 10: Regression Results of Peak kW and RTUs

Dollar per Device Incentive Calculator

ASWB utilized the analysis method above to develop a Dollar per Device Incentive Calculator for unitary AC controllers for retail facilities. Prior to completion, ASWB ran several facilities through the original Auto-DR Express tool and the dollar per device tool and concluded the tool yielded similar results as the original calculator, but without requiring knowledge of peak kW. The inputs have been simplified to only need the number of devices and zip code for each location to calculate the incentives.



Clear Form

Automated Demand Response Program FastTrack/Express for Small and Medium Businesses Dollars per Device Incentive Calculation Form

Please enter or select from drop-down menus the information for each row below, starting from 1 to the number of facilities in your application

Your Utility Provider

San Diego Gas & Electric

A program of Pacific Gas and Electric Company, Southern California Edison, SDGE

On-site Generation Terms

Solar: Decrease energy demand from the grid by harnessing the power of the sun during daytime. Customers are restricted from using solar generation to collect incentive payments.

Battery/EV Charging: An energy storage system that charges during the most optimal hours, and then discharges during high energy rates to save money.

Permanent Load Shift: Commonly found as ice/chilled-water thermal storage tanks that act like HVAC by blowing fans over the pipes that carry the cold water. Similar to batteries, the tank will cool itself down during off-peak hours, and then release the cold water during on-peak hours.

DR Program Terms

Critical Peak Pricing (CPP): CPP is available to commercial and industrial customers and provides bill credits during the summer months. In exchange for the credits, we will call 12 CPP Events a year when electricity demand and/or prices climb. During these Events your energy charges will rise significantly. However, if you can reduce or reschedule your usage to off-peak times on a CPP Event day, CPP may be a way to help lower your overall electric bill.

Capacity Bidding Program (CBP): CBP is an Internet based program that helps sustain the electrical grid when demand or costs are highest. A customer submits monthly nominations (aka "bids") to lower energy use and receives compensation in return. The payment is based on their actual energy reduction during a CBP Event. The program is flexible, giving customers the freedom to adjust their bid and participation preferences every month. They can choose to be notified the day before an Event or on the day of the Event.

Demand Response Auction Mechanism Pilot (DRAM): The DRAM pilot is a DR capacity auction open to third party DRPs. The purpose is to provide us with DR resource adequacy (RA) through a standard, non-negotiable purchase contract, when we give third parties DRAM contracts, they must provide us with DR capacity supply plans and register their DR resources into the California Independent System Operator (CAISO) wholesale energy market. The DRP dispatches its DR resources in accordance with CAISO market awards.

Total				3				9	$1,800
Site #	SAID	Street Address	Zip	Number of Devices	Facility Type	HVAC DR Strategy (Air Conditioning)	DR Event Measure	TOTAL DR Shed (kW)	Potential ADR Incentive ($)
1	123-1234-12	4050 W Metropolitan Dr, Orange	92868	3	RETAIL	Duty Cycling	20 minutes off/hour	9	$1,800
2					RETAIL	Duty Cycling	20 minutes off/hour	0	$0
3					RETAIL	Duty Cycling	20 minutes off/hour	0	$0
4					RETAIL	Duty Cycling	20 minutes off/hour	0	$0

Figure 11: $/Device Incentive Calculator

Results

A dollar per device incentive calculator was created for RTU controllers in Retail facilities using past Auto-DR participant data and data provided by vendors. Given enough data, including all facility types in the Dollar per Device Incentive Calculator is possible. However, at this time, retail is the only facility type with enough data on installed devices to achieve a significant R^2 value. This was a proof of concept that the methodology was feasible, but a full roll out for all facility types would need more databases.

Conclusion

As focus for DR moves from shed to shimmy, fast response, locational dispatch and consistent load shed will be prioritized over large industrial load shed. This makes Auto-DR a perfect fit for the future of California's renewable energy portfolio, as the measures implemented at SMB, and the distribution of SMB across the service territory will meet the requirements of shimmy and locational dispatch.

The updated Auto-DR Express tool is a working document ready for immediate integration into the existing IOU Auto-DR incentive programs. The tool consolidates application and calculations for all 3 IOUs to one document, which expanding facility eligibility and increase ease of use. Vendor feedback

regarding the tool has been extremely positive, who were especially glad to hear the potential for reduced utility paperwork and increased facility eligibility. The updates will increase SMB uptake of the Auto-DR incentive programs, as one vendor provided feedback that the updates to Auto-DR Express will allow them to push over 100 SMB sites through the program that were previously in-eligible. In addition, discussions with 2 IOUs showed that both IOUs were considering utilizing the new Auto-DR Express tool in 2019.

The $/device effort provided lessons learned, a proof of concept and a functional $/device tool. Discussions about the $/device tool had a lot of interest from vendor's sales staff, who said such a tool would be beneficial in their sales pitches to their customers. Lessons learned were to confirm the data points needed are available, and that the sources of data have the resources available to provide such data in a timely manner. The process confirmed that there can be a strong correlation found between facility sizing and # of devices. However, the dataset needs to be rather extensive as the regression analysis needs to account variables such as larger equipment and change in facility layouts as buildings become larger. The final $/device tool was tested and confirmed to be an accurate way to estimate load shed potential at the facilities.

A clear conclusion from the thorough stakeholder discussions is that without change to the existing program design, the Auto-DR programs are not going to achieve the desired program participation. The immediate Auto-DR Express update developed from this project is a step in the right direction, but DR for SMB still has barriers such as low time and incentive resources, difficulty for vendors and customers in understanding what DR is, selecting and enrolling in the right DR program and the uncertainty of on-going incentives.

Vendors mentioned how their sales staff often have one meeting with an SMB customer, where the decisions of what the customer will purchase needs to be made. If Auto-DR cannot be fully explained in that time without de-railing the sale, the vendor will not try to sell the Auto-DR programs. Simplicity in program design and participant experience is key for DR participation from SMBs. There needs to be a program design where the explanation of benefits, enrollment in on-going incentives, and installation can be done with the customer in one touchpoint.

The solution to this is to implement the direct install program structure detailed in the SMB-Specific Program Redesign in this report. This long-term solution would focus on providing a direct install program for smart thermostats or Unitary AC controllers to SMB customers. As Auto-DR installations are not a simple task, a well-qualified vendor neutral installer can make a difference. Consolidated standardized implementation packages will create a simpler Auto-DR program that vendors and installers can learn.

Listing deemed on-going incentives provided by the utility will provide clear benefits to the customer for DR participation. Most SMBs do not understand their electric bill and in the past, SMB Auto-DR participants are often are unclear how much they have earned under their existing DR programs. The program redesign with clear and consistent payment structures will assist with being able to verify the savings from their DR participation, while assisting the utility by increasing the persistence of the load shed from their Auto-DR program participants.

The low cost of smart thermostats and unitary AC controllers allows for the direct install program to be a no-cost option to the customer without exceeding the existing Auto-DR incentive structures. No cost options are also ideal for bringing SMB into the world of utility Smart Grid/DER solutions. This is because SMBs often do not have capital availability for an Auto-DR program that requires the customer to front the costs. No cost to the customer will also address the common scenario where the tenant does not own the building, which in the past results in no interest for the tenant to participate in any capital improvement projects.

A pilot of the proposed solution is recommended as requested in 3.5.2.3 of CPUC decision 18-11-029[12]. To keep measurement and verification costs down, the pilot would require all vendor's Auto-DR solutions to be IoT devices, and meet minimum reporting, functionality and trending capabilities that meet the Auto-DR M&V firm's requirements. Including IoT devices with cloud functionality would also address AB793's requirement to "develop a program to provide incentives to a residential or small or medium business customer to acquire energy management technology for use in the customer's home or place of business[13]". Such IoT devices would also allow the utility to meet the pilot objectives set in 3.5.2.3 to "yield useful data within the budgets provided[14]".
Next steps to implement such a program design would be:

- List requirements for standard implementation packages
  - Work with aggregators to set program participation requirements and payment structures.
- Vendor interaction
  - Open program to all Auto-DR solution providers, listing maximum device cost along with reporting requirements.
  - Work with vendors to vet their cloud-based reporting systems to meet reporting requirements.
  - Educate vendor's sales staff on program requirements to maintain eligibility in direct install program.
- On-going payments
  - Set payment structure for customers to receive incentives directly from the utility, labeled clearly in a format such as bill credit.
- Set reporting and payment structure from aggregators to DR participation.

It is ASWB's professional opinion that such a pilot not only best serves the needs of SMB, but the utilization of IoT devices provides more useful data and less M&V costs, while meeting CPUC decisions on pilots for SMB outreach in disadvantaged communities.

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[12] CPUC Decision 18-11-029 – Application of Pacific Gas and Electric Company for Approval of Demand Response programs, Pilots and Budgets for Program Years 2018-2022. Section 3.5.2.3 Page 72.
[13] AB-793 Energy efficiency.(2015-2016)
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB793
[14] CPUC Decision 18-11-029 – Application of Pacific Gas and Electric Company for Approval of Demand Response programs, Pilots and Budgets for Program Years 2018-2022. Section 3.5.2.3 Page 72.

APPENDIX

Section 1 : Survey Questions

New Customers

1) Are you the person who deals with utility incentive programs in your organization?
2) Is there anyone at your organization that knows more about utility incentives that would like to take this survey?
3) Please feel free to send the link below:
4) Where did you hear about these Demand Response (DR) incentive programs?
5) How familiar are you with Demand Response or Automated Demand Response?
6) Do you have any questions about what DR is or what benefits it provides to you or others?
7) Would you like to know more about Automated Demand Response?
8) Have you heard of smart homes and the type of devices currently on the market?
9) Have you upgraded your home device?
10) Have you heard of smart homes and the type of devices currently on the market?
11) Have you upgraded your home device?
12) What is preventing you from upgrading your home devices?
13) Have you heard of any summer discount plan for your home residential AC unit?
14) Solar, Batteries and EV chargers can affect and/or increase a facility's ability to participate in Demand Response. To account for a changing energy landscape, in general do you know the capacity (kW) at your facilities for the following, if any:
15) How would your business be affected if:
16) How would your business be affected if the following happened in the summer:
17) Are you aware of the Auto-DR Express (SCE) or FastTrack (PG&E) programs?
18) Based on the description above, would that interest you or your company?
19) How willing would you be to dim your lights or increase space temperatures at your business for a few hours in any of these conditions for just 12-15 days out of a year for incentives?
20) Would you be willing to upgrade your lighting & HVAC controllers if incentives were offered?
21) What are the factors or concerns that would prevent your facility from participating in DR events? (select all that apply)
22) How important is each of the following factors in motivating your organization to participate in the Auto-DR Program:
23) Do you have any questions or comments about Demand Response or Automated Demand Response?

Utility Program Stakeholders

1. Have you managed other DR programs in the past? If so, for how long?
2. How long have you been managing this program?

3. How do participants learn about the program? [Probe on marketing strategies, other programs, etc.]
4. What are the high level goals of the program? Are there quotas you are aiming to reach regarding participation or savings numbers?
5. Are there any demographic segments that are more likely to participate in [Program] than other demographic segments? Are any segments more likely to drop out once enrolled?
6. Why do some customers upgrade their equipment, but do not participate in events?
7. Do you have any complaints about the current ADR Programs?
8. What improvements would you like to see made to the program? What would be the benefits?
9. How many customers are aware of your Demand Response incentive programs?
10. Do you market the ADR Express Program to equipment-capable participants who are not already participating in the program? If so, how does that coordination work?
11. Are there any challenges in selling the current utility incentive programs?
12. What is the customer feedback experience during an event? Is there past customer satisfaction research we could look at? If so, what were the main findings?
13. Do you think simplifying the incentive programs or condensing them will improve customer experience?
14. Are there plans to change the incentive amount in the future?
15. How many customers choose the 50% cycling option over the 100% cycling option? Is that dependent on time of enrollment?
16. According to participant complaints, their system was sometimes not working, the installation time took longer than initially promised, or the installation was done incorrectly which resulted in loss of money. What steps have you taken to address these complaints?
17. How well-trained are the technicians installing the equipment? Are they able to fully educate the customer about the technology and answer any questions?
18. Do you think we could start a training program to teach Auto DR to technicians?
19. Did you ever have customers that were not eligible for Automated Demand Response, and why?
20. Which technology did your customer show the greatest interest in?
21. What kind of misunderstandings did your customers initially have?
22. Which upgrades did your customers install in their facility?
23. Did customers have any complaints about the new changes?
24. What additional features did participants want to see?
25. Do you have suggestions or comments about anything we forgot to mention?

Past Customers/Vendors

1) Introduction: The goal of our project is to collect as much information as possible to improve statewide AutoDR Express (FastTrack) participation in small and medium businesses. We are looking for possible ways to streamline the process and create a more attractive program.
2) What products or services does your company provide?
3) What motivated you or your organization to participate in Demand Response?
4) Did you, or your customer, receive a Technology Installation incentive from SCE (or PG&E)?
5) Since receiving incentives requires customers to sign up for a demand response program, what program did they sign up for? (Prompts: Demand Bidding Program(DBP), Capacity Bidding Program (CBP), Critical Peak Pricing (CPP if in SCE) or Peak Day Pricing (PDP if in PG&E territory), Real-Time Pricing (RTP), Time-of-use Base Interruptible Program (BIP), Optional

Binding Mandatory Curtailment, Scheduled Load Reduction Program, Pumping and Agricultural Real-Time Pricing

6) Our records indicate you participated in the "xx" demand response program in 20xx. Do you recall this and if so how was your experience with the Program?
7) Are you still participating in the same Demand Response Programs, or did you switch to another?
8) What were the main factors that contributed to your company in adopting ADR technology?
9) Which Utility is the easiest to work with?
10) Would the program be more attractive if the program paid for itself, or as much as possible, from the customer's perspective, so the customer doesn't have to go back and forth with the money?
11) Would an identical offering for all 3 IOUs of Auto-DR express increase the interest in Auto-DR for your company
12) Would incentive offerings be more attractive if the utilities offered them as a yearly lump sum, or from a month-to-month basis?
13) What is the hardest part in selling AutoDR and their incentive programs?
14) What customer sector do you work with?
15) What % of that sector have peak demands less than 500 kW? Less than 200 kW?
16) What % of customers is aware of utility incentive programs?
17) Does your firm offer services on a local, statewide, or national level?
18) Do your customers have solar or electric vehicles?
19) Are you aware of the Auto-DR Express (SCE) or FastTrack programs?
20) Are you aware of any other Express/Deemed DR incentive programs in other utilities
21) If Yes - What 3 things would you change about the Auto-DR express program if it was up to you
22) If not would you like a brief description? (Need 4 sentence program description) If yes, why aren't you participating in it?
23) What are the benefits or challenges with working with smaller customers?
24) What major benefits did you promote about Demand Response?
25) Would a SOW template or any other template be useful for vendors/contractors to provide to the customer?
26) Are there any frequently asked questions that sway the customer's decision, if so what are they?
27) Did you ever have customers that were not eligible for Automated Demand Response, and why?
28) Which upgrades did your customer install in their facility and what upgrades did your customer want to see?
29) What kind of misunderstandings did your customers initially have?
30) Did customers have any complaints about the new changes?
31) What additional features did participants want to see?
32) Based on your current knowledge, how well do you understand the following terms
    a) Demand Response
    b) Automated Demand Response (ADR)
    c) Load Shed
    d) Load Shifting
    e) Demand Response Event
    f) Demand Response Automation Server (DRAS)
    g) Time of Use Pricing
    h) Critical Peak Pricing
    i) Customer Specific Summer Baseline (CSSB)
33) To your expectations, how would you rate
    a) Your current experience with the ADR Program
    b) The training you received for the ADR programs

c) The reference documentation and instructions to be clear and informative
d) The program policies being easy to understand

34) How important is each of the following factors in motivating your organization to participate in the ADR Program
a) ADR Program technology incentives
b) DR Program participation incentives
c) Opportunity to contribute towards environmental goals
d) Opportunity to increase profits with new technology

35) Do you have any questions or comments about Demand Response or Automated Demand Response?

36) Additional Questions

Survey Summaries

New Vendors

Center for Sustainable Energy Survey Summary:

Overall, CSE is leading California energy commission multiyear programs to increase the adoption rate of ADR technology by training the workforce and performing installation statewide. The ADRE Project was made to expand the qualification of ADR technicians and the SMB participation.

Interview with Encycle:

- Provides Energy Management System controllers for HVAC and working with smart thermostats
  - Hasn't worked with ADR Express yet because customer based isn't right
- Customers are frustrated with the paperwork like CISR and M&V forms
  - They should just put all the needed documents together with one signature
  - SDGE feels faster to work with because they don't require a 3rd party to access interval data
- For participation incentives, some big customers prefer month to month payments but small customers prefer yearly
- Some complaints about DR is that there are too many events being called like almost every day
  - CBP is called for 2 hours every day at least
- Partnered with Nevada Energy, PJM, and NYISO to do DR
  - East coast is harder to deal with because they don't have smart meters already installed, compared to west coast
  - East coast still emails you about DR events which requires vendors to go a further step to manually set up those events daily for their customers
- One large warehouse retail customer with solar had issues because they couldn't verify how much load was actually shedding

- Challenges with smaller customer is that they are picky with how many events are called in comparison to bigger customers
- Energy team wants to get involved with the Green Button program because as a registered 3rd party they don't need to apply with CISR form for customer information, now they can almost instantly access customer data
- Suggestions from Katrina Nelson
    - Reduce the amount of paperwork and number of events being called because it's almost every day in the summer
    - Needs there to be a template telling people what DR is and what to expect
    - Need to quick the process because customers delay signing things because utilities take so long
    - Green Button initiative allows 3rd party vendors to instantly access a customer's interval data

Interview with Pelican

- Pelican provides cloud controlled services for HVAC for light and medium commercial buildings
    - Started to incorporate DR after OpenADR2.0 came out and was approached by 3 IOU's
- Equipment installed by Pelican is DR-capable, but not always DR-enabled
    - Pelican focuses on what is valuable to the customers
    - DR is more valuable to utilities and grid stability
    - Customers don't understand DR, so they will most likely not bother with it even if given 100% incentives
- Utility bills with all these tariffs become confusing for the customer to understand
    - Resulting in angry customers and unable to interpret utility bills, which discourages customers from learning
- Having identical programs across all three IOU's would help the sales people, but it isn't the main barrier
- Offers energy efficiency and demand response services nationally and Canada
    - Majority of customers are commercial, but there's lot of high schools too with high kW
    - Customers are already interested in the thermostats, but energy efficiency helps to sell by adding additional accessories, such as CO_2 and economizer control
- Pelican currently has difficulty with being approved by SCE because of their cloud based controls
- Pelican doesn't focus in selling DR, but the energy savings instead
    - It becomes confusing to the customer when they try to sell the utility control over their thermostats
- Customers have to be fundamentally comfortable
    - Biggest priority to the customer is how easy it is to install
    - Main concerns aren't about energy reduction, customers don't see the value
- Sometimes the customer has old HVAC equipment and the repair costs are high because they don't have enough money to replace it
    - Customers would blame the HVAC not properly working on the newly installed smart thermostat
    - But smart meters can read when the HVAC can't keep up with the load

- Suggestions from Mark Willens
    - Educating customers about DR in general and making it more popular
    - Allow them to monitor their kW and educate the customers on their power usage
    - Use cloud system to collect kW data and estimate load shed

Interview with Servidyne

- Servidyne works as energy and sustainability consultants for mainly large commercial buildings
    - Performs energy audits, demand response audits, and LEED consulting
    - Previous parent company previously did DR because they had a platform that could incorporate ADR
    - Not working with any ADR technology at this point
- A yearly lump sum is preferred to be most enticing
- Main customers consist of large commercial buildings like offices, healthcare, and education
    - About 50% of them already know of DR
- Servidyne not interested in being an ADR provider, but rather as ADR auditor
- Barry is involved with LEED and they're discussing DR possibilities
- Average office buildings around 200,000 sq. ft. have about 500 kW load

Interview with Transformative Wave

- Company provides energy efficiency services, HVAC control products, and energy management software
    - Currently designing lighting and refrigeration controls
- Company was motivated in helping customers saving energy and demand response was a feature they utilized
- Some problems arose for large chain customers as their company policy had internal problems in paying the upfront cost
    - We can possibly alleviate this problem with upfront money
- Smaller customers usually have terrible HVAC systems, so it's harder for the customer to receive savings as they have to upgrade or repair their system and it becomes more of a risk factor
    - Energy Solutions had a special program where they offered huge incentives for HVAC
- PG&E is easier to work with on the energy efficiency side, while SCE is getting better with the programs
- It would be easier with the one lump sum approach and providing an approved list of aggregators for customers
- An identical program between all 3 IOU's would make things easier for national accounts
- The hard part about selling ADR is that most customers aren't savvy with their energy usage so there's an extra sale in convincing the customer
    - It would help if there are good testimonials
- The issue with long term payment plans is that the tenant doesn't always own the building
    - The next tenant may not want to participate in demand response or want to take over the payments

- Benefits of smaller sites is that they can wrap up needed kW to shed when they're spread out
    - Challenge is when a customer has only a single site
- Some customers don't realize their HVAC equipment is in poor condition until someone evaluates the site
- Customers are asking for refrigeration to be added in so they can monitor their system usage
- Suggestions from Joe Schmutzler
    - Make the Customer Summer Specific Baseline easier to understand
    - The 100% upfront incentive for the Express model sounds great
    - Add refrigeration to the ADR programs

Interview with CPower

- One of two California utility approved Aggregator Manager Portfolio service providers
    - Other states they are in the energy efficiency market as well
    - PJM and NYSERDA are big markets for them
- Ultimately the customer's decision when choosing automated or manual DR
    - Automated best case because there's benefits economically and reliability
- Customers don't like being performance based because there are so many events
    - As long as they perform, CPower is neutral on whether you should have a performance based or deemed kW incentive amount.
- Things to change about ADR Express is to have shorter inspection and confirmation cycles
- Working with smaller customer you have to build up the trust that the technology will work for them because they don't want to do a capital investment on something they don't understand
    - Customers have to wait up to 60 days for their incentive money back
- Customers misunderstood by thinking that utilities will shut down their business without advanced notice
- Customers want to see load shed quicker and better functions
- Program policies and reference documentation for ADR is lacking and unclear
- It is going to be more common having 20 minute demand response events
    - Shorter events are harder for manual DR customers, so automation is better
- Suggestions from Diane Wiggins
    - Customers are being asked to give more, but are receiving less in return
    - More events are called and they're less incentives than other states
    - Customers want to get their money back as soon as possible
    - Improvements to the program policies and documents to be more clear

Interview with enTouch

- Previously tried to do ADR, but had little luck with it
    - Worked with Energy Solutions to set up advanced technologies demonstration, but later gave up on it
- Provides cloud based services and support to customers

    - HVAC controllers, lighting, and 24/7 customer service, educating customers, develop solutions
    - 90% of customers from light commercial such as retail, restaurants, gyms, hospitals
    - 10% of customer from schools, colleges, campuses
    - 100% of customers under 500 kW and 80% under 200 kW
    - Will support the customer as much as possible remotely unless necessary to send someone out
- Currently doesn't work in the DR business, but OpenADR certified
    - Customers think 4 hour events are too long and can't afford the business to take it
    - Customers hope there are shorter segments
- It becomes difficult when small size customers have to wait up to 8 weeks for everything
    - IOU's need to be on the same page and make things fasters
    - There are delays when trying to deploy before summer because there is a rush during this time
- DR is always successful in large commercial and really large retail, but not in light commercial
- They were motivated to join ADR when OpenADR2.0 came out
    - It was possible for them to develop much more sophisticated solutions
- The 60/40 split is good for large corporations because internally they have to budget their funds so incentives help push it towards the agenda
    - Yearly lump sum ongoing participation incentives would be better to show the large check to the boss instead of 12 small ones
- Their software incorporates a lot of features, but they aren't always used
    - It has the ability to handle solar loads, but no one really uses it because in Texas the payback is really long
    - It has the ability to do ADR but it's hard to sell when they fear being shut down
- Customers are getting reactive to the changing scene rather than proactive about it
    - Corporations only care about making a profit not being environmentally conscious
- Suggestions from James Walton
    - Shorten the events from being 4 hours long to something much smaller
    - Yearly lump sum incentives look better when presented to the boss
    - Need to get all utilities on the same page so the program is more streamlined
    - The program has a lack of publicity because most people don't even know what DR is

Interview with Gridlink Technologies

- Provides hardware, end nodes and Gridview which is a server
    - Server side does analytics, software downloads, exporting data, software updating, and remotely upgrade from OpenADR1.0 to OpenADR2.0a/2.0b
    - VEN communicates with IOU DRAS and their system simultaneously
    - Analytics can collect data and provide trends and maintenance
    - One of their roles is to work on providing baseline calculations for utilities
- Experienced with all California Demand Response programs with 400-500 installs
- Originally worked in SCADA, but then partnered with an internet server group to combine industrial customers with internet controls

- A problem with DR is the poor network connection; which is a challenge small customers face because they don't allocate money to getting a strong network
- Gridlink provides services internationally to industrial and large commercial customers
- Challenges with customers is that they quit after the first year of participation or if they become stranded assets
- Customer would like to see reliability when an event occurs so they aren't charged with a penalty when it's an equipment failure
- Sometimes the equipment is plug-and-play but when more is needed the customers blame the VEN or server
- Suggestions from Alex Bryant
    - Customers that participate need to have a reliable network connection if they don't have one already
    - Develop a method for dealing with stranded assets

Interview with Honeywell

- Honeywell in their energy sector, develops and manufactures VEN smart thermostats along with Automatic Building Energy Management Systems
    - Custom installation work and solutions depending on the customer needs
    - New Lyric thermostat compatible with smartphones and voice controlled devices, Alexa and Google
- Biggest problem with the incentive programs is the documentation process as hours are consumed printing out the forms, filling them out, and then scanning them again
    - We want a tool that can ease the whole document process
    - People are tired from document fatigue
- Design issue with IOU DRASS, which locks an individual VEN per Service Account
    - Customers want to access their VEN on multiple Service Accounts
    - SCADA systems can run multiple sites with one VEN
- Honeywell is working on a fast frequency response pilot program to include a lot of DR participants to stabilize the grid in the sub 1 minute range events
- Program would be better if it was internally funded
    - Suggests no incentives, but lower prices to encourage on-going participation
    - Have a consistent tariff and prices across 3 IOU's to support said program
    - The current 60/40 method requires too much administrative support and frustrating
- Some customers were not eligible for ADR because cost implementation was too high
    - Challenges of smaller customers is that project cites are fixed cost and have a bigger impact on the total project
- Customers don't understand there's flexibility in operation, so Honeywell matches the best program for the customer
- Suggestions from George Bell
    - Performance reports provided to customers would spur continued participation
    - Improve the internet connection between VEN and DRAS
    - It would help if there was a business representative from IOU to help support the customer's decision
    - It would be nice to develop a tool to see a clear picture of financial benefits

- We can create a reference sheet of pumps and their classification to develop pre-calculated load shed and get applicants to enter information about their pumps and we can get their deemed value

Interview with MelRok

- Their platform is cloud based and they develop hardware with real time monitoring ability
  - The energy management system communicates with their gateway called the Touch
  - It communicates with energy meters and sensors with BACnet, Modbus, and other internet protocols
  - Developed fast frequency response with Berkeley National Lab, but currently don't have any customers that use their platform for ADR
  - Selling ADR to the customer is hard, so they manage peak demand instead because of larger incentives
- One of their customers signed up for ADR Custom, but it took 9 months for the utility to come test the site, and by that time the customer switched to an energy efficiency program
  - With so many programs, there are limits to matching EE + DR programs that work together
- We should never incentivize people to save money by not buying energy
  - People try to gain at the system and then policymakers keep debating the baseline
  - We should just set higher rates during different times of the year
- One of his customers was defaulted to CPP and his bill went through the roof
  - Perhaps ADR should be thrown out and just establish higher rates if they want to use more energy
- Has more experience with SDG&E because they're working with the emerging technologies
  - Pushing for home area network use with smart devices to manage loads
  - Demonstrated that they can control a place with 25 homes and with less than a second cut power to all the pool pumps, but have not commercially deployed it
- ADR programs should be based on penalizing the customer's behavior not rewarding them
  - You can't convince the masses without penalties
- Lump sum at the beginning of the year > monthly incentives > lump sum at the end of the year
- To improve the education, consultants should teach ADR to vendors and aggregators
  - IOU's should spend money on classes and promoting ADR
  - Consultants can interview the vendors to find changes in the program
- Small customers have difficulty getting their payment back because they shed so little
  - We should focus on customers with security systems because they're more interested in spending money on their facility
  - The incentive rates are based on climate zones and MelRok's existing customers in OC get really low rates compared to hotter climate zones
- ADR isn't the most efficient way to save the environment because it's mainly for the utility
- Suggestions from Michel Kamel
  - Change the name Automated Demand Response to something more friendly and not something like big brother sounding, perhaps, Flexible Load Management or name sounding like it would benefit the customer instead of utility
  - We should switch to time of use and set higher rates at different times of the year so the customer would use demand response to limit the power usage
  - IOU's should invest into educating aggregators and vendors about ADR

Interview with THG Energy

- THG Energy provides DR hardware and software solutions for medium commercial customers and act as aggregators/curtailment service providers
- Deregulated markets have the ability to create their own programs and quickly change policies, compared to a regulated market like California which can take time to make changes
    - The technology incentives are exclusive to California
    - Deregulated markets don't have incentive programs, more like just money saving programs
- PGE has more flexible pilot programs compared to SCE
    - CBP runs smoothly, and THG has no DRAM position, so customers go to IOU
- THG Energy was attracted to the technology incentives and incentive opportunities
    - Automation was the key to entering the commercial sector
    - Commercial sector is more flexible than industrial sector
- The incentive application takes too long and drags on
    - PGE process feels more streamlined and a little cleaner than SCE process
    - Puts stress on customer side and vendor side
- THG strives to provide a no out of pocket solution
    - This saves the customer trouble from having to cut a check
    - They developed a streamline process internally, and we would like to take a look
- Consistent revenue streams for customers would keep them interested
    - A lot of pilot programs are paying flat monthly amounts that are also higher
    - A flat incentive payment would be very beneficial for schools and fluctuating loads
- Hardest part to sell is convincing a customer to upgrade their facility and having it autonomously take control
    - Some customers give their tenant THG's number when the building gets too hot during summer
    - Larger technical incentives and larger incentives per event would help
- With solar increasing in popularity, it shifts the load peak to a later time
    - This affects schools, offices, and facilities that close around the same time
    - THG trying to integrate this into the load management
- Benefits working with smaller customers is that it is more streamlined and approved faster
    - A challenge is getting their return-on-investment because they're smaller
- Customers that received incentives for Demand Response from 7-8 years are not eligible for Automated Demand Response
- THG Energy designs and manufactures their own hardware and software for ADR
    - In their software, they already coded in a real time visualization of energy usage
- Suggestions from Cory Kowal
    - Customers would like to see metering, visualization of real time energy use
    - Would like to see incentive programs for performance monitoring

Interview with Universal Devices Inc.

- Universal Devices Inc. manufactures ADR equipment and develops OpenADR software
    - One of the first spec. editors for OpenADR

- In Title 24, IOU's need to establish at least 1 specific standard for Automated Demand Response before establishing even more
    - They're current policies are too vague and most people don't even understand how to implement
- We can use ADR to display real time pricing for customers
    - It isn't fair for customers to not know what they are paying
- Smart meters capable of reading kWh + OpenADR2.0b = EM&V done either at VTN or VEN
    - 99% is there already, just need to make a policy standard to implement into residential
- CEC Grant GF0-15-311-Group 2
    - Title: Complete and Low Cost Retail Automated Transactive Energy System (RATES)
    - For behind-the-meter load management and integration with Alexa
- Suggestions from Michel
    - Policymakers need to start creating specific standards and not just vague requirements

Interview with VaCom

- VaCom works mainly with commercial and industrial refrigeration controls and performance monitoring
    - They are implementers interested in saving customer's money
    - They provide additional features and support to customers
- They used to receive technology incentives, but lately have been doing food processing
    - In food processing refrigeration, there is limited amount of variables to change so DR is not as available
    - Some refrigeration systems use ammonia and are mostly single speed, so you would need to make major modifications and add modulation techniques for ADR
- IOU's need to create more uniform policies and regulations
    - For the same project, SCE was more different with slightly changed rules
    - For 60/40 split, SCE requires 12 months since EM&V, but PGE will deliver incentives after DR season is over regardless of the 12 months
- Walk-in boxes like Walmart have smaller systems that are more standardized and its load shed ability can be pre-calculated which would help Express
    - Concerns about food safety especially dairy and medium temperature range
    - Low temperature ranges (Freezer) should be safe within a 10°F increase which can take anywhere from 30 minutes to a couple hours depending on the traffic
- Issue with incentive programs is that event credits are confusing and hard to understand
- VaCom would like to see incentive amounts increase
- Working with smaller customers are much easier and projects are faster
    - Even with small sites, they're big customers with chains
- VaCom promotes DR with cost savings and equipment upgrades with incentive money
- Customers were interested in variable speed drives in the equipment
- Most common misconceptions that customers have is that DR means turning everything off
- Participants want to see higher efficiency tied in with DR for the future
    - One thing is that as equipment gets higher efficiency, DR has less load to shave off
    - If we used pre-calculated values, then we would have to update it every time a newer more efficient equipment is installed
- Suggestions from Kyle

- More incentives would be useful by more savings for the energy project and less of an impact in the demand period
- Statewide needs to be more consistent with rates and rules
- Explain how many credits are worth per event because it's inconsistent
- Previously had customers on PDP, but quit because there wasn't additional savings and too many complications with the contractor
- IOU's should create a same day and day ahead program
- CBP is limited to get in and more of a headache than it is worth normally

Interview with Zen Ecosystems

- Zen is a cloud based energy management platform, with smart communicating thermostats, with VEN gateway devices
- Make utility programs identical for IOUs
- Right now the easiest utility to work with is SCE
- Most of the 'hang ups' they get:
  - Customized: 60/40 split- inconvenient process of payment
  - Express: hard to navigate the approval process
- Customer concerns:
  - Retail – changes in the lighting/AC can affect sales
  - Frequency of event scare off customers
- Want to expand from the 3 categories
  - Basically he wants anyone who is in in the 0-499 kW and able to shed to be eligible for the program
    - Retail
    - Fast food
    - Office
    - Service (auto services, tires, etc.)
    - Dry clean
    - Warehouse
    - Schools
      - Portables – communicate with ZigBee
    - Dentist/medical
    - Any other SMB
- Says about 75% of customers under 500 kW
- Says typically customers are 80% interested in EE and 20% interested in DR
- Main Challenges:
  - Timeline of whole process
  - Review/approval/incentive/install/M&V
- Need to take into account the DRAS account email problem – should not need to create dummy email for each SA
- New customers are worried about losing control of lights and thermostats, and want the ability to opt-out
- The problems that occurred after installation was initial configurations, the thermostats would be in heating when it's supposed to by cooling, and half the time it's the HVAC system that's wrong
- Suggestions from Ty Peck

- For Express program there should be no limit to facility type, just evaluate SMB customers from 1-499 kW
- Look into warehouse services, like auto services and places that aren't affected by online sales
- Utility approval process should be easier
- Forms should be easily edited

Program Implementer and IOU Stakeholders

Survey Summary of Energy Solutions
Energy Solutions administers the ADR program for PG&E. Some of the main issues with selling DR is that it is complicated to install and have long [project] timelines. The main sell point to customers is the upgrades they get. Mostly the ineligibility to enroll in ADR programs is that they were either not eligible for the programs, they didn't want to work with an aggregator, or NEMA didn't allow PDP enrollment at PG&E. A large misunderstanding of customers were they can't opt out of events. Overall a lot of kinks still need to be worked out.

Survey Summary of PG&E
It seems the respondent was largely confused by the survey, and answered most questions with another question, such as: If applicable, can you provide details on how your contacts learned about the DR program, and the response was "How do you define 'contacts' here?". Most customers are afraid that DR is going to affect productivity or tenants' comfort, and therefore DR is largely misunderstood. Additionally SMB would like to be focused on, and EE, DR, and ADR are the main challenges in selling current utility incentive programs.

Survey Summary of SDG&E
Overall, some of the main improvements that would like to be made in the program is improve cost effectiveness of DR programs. The main challenge is DR is hard to sell and calls are variable therefore cash flow is variable as well. The math of how DR works exactly is found to be largely misunderstood.

Survey Summary of SCE
Most customers are large commercial, industrial and agricultural customers that learn through their Account Manager. One concern wanting to be addressed is the opportunity to improve and streamline the incentive process. Another main concern is how to improve customer satisfaction with the ADR programs. Some of the limitations include the incentive structure and there were some customers that did not meet the 30 kW process or did not fall under any of the express categories.

Past Customers

Survey Summary of Costco
This survey was not completed, and Costco answered it had not participated in the DR Field even though they received a technology installation incentive from their utility.

Survey Summary of Mitsubishi Electric Automotive America
The main reason this customer did not participate is the rate increase would effectively outweigh the incentive offered by the utilities for DR. The biggest worry was the disruption of business ADR would cause.

Regression ANalysis Output

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.87260603
R Square	0.76144128
Adjusted R Square	0.75601949
Standard Error	3.12389879
Observations	91

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	2741.054736	1370.52737	140.440964	4.11332E-28
Residual	88	858.7694398	9.75874363		
Total	90	3599.824176			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.08793809	2.920913275	-0.03010637	0.9760504	-5.89263944	5.71676326	-5.89263944	5.71676326
CEUS % of cooling ar	-1.17305684	5.648341568	-0.20768164	0.83595742	-12.3979488	10.0518351	-12.3979488	10.0518351
Peak kW	0.05462941	0.003261014	16.7522743	4.1019E-29	0.048148827	0.06110999	0.04814883	0.06110999

Unitary AC Controller database

Facility name (Sanitized)	Facility Zip Code	Climate Zone	Utility	Facility Type	# of devices installed	Peak kW	Load Shed kW	Year Tested
	93230	3	SCE	Retail	11	301	78.8	2012
	93561	3	SCE	Retail	14	257	45.3	2012
	93274	3	SCE	Retail	18	306	40.4	2012
	93277	3	SCE	Retail	5	358	50.6	2012
	93277	3	SCE	Retail	2	61	11	2016
	93274	3	SCE	School	78	827	149.8	2012
	93274	3	SCE	School	80	664	195	2012
	93274	3	SCE	School	50	744	96.7	2012
	93720	3	PG&E	Restaurant	23		32	2016
	93304	3	PG&E	Retail	12	140	34	2014
	93727	3	PG&E	Retail			504	2015
	93308	3	PG&E	Food Store	9	232	56	2014
	93720	3	PG&E	Food Store	24	433	59	2014
	93720	3	PG&E	Retail	10		35	2013
	93309	3	PG&E	Retail	14	238	38	2013
	93117	4	SCE	Retail	10	316	95.3	2012
	93117	4	SCE	Retail	2	59	9.1	2016

	93117	4	SCE	Retail	6	136	??	2014
	95124	4	PG&E	Theatre	16	280	68.1	2012
	95128	4	PG&E	Retail	8	118	10	2014
	95119	4	PG&E	Retail	11	129	22	2014
	94043	4	PG&E	Retail	7	62	6	2014
	95688	4	PG&E	Retail	8	148	22	2014
	94568	4	PG&E	Retail	7	129	24	2014
	93906	4	PG&E	Retail	4	50	9	2014
	93955	4	PG&E	Retail	5	107	15	2013
	95035	4	PG&E	Retail	13	188	30	2013
	94568	4	PG&E	Retail	6	117	n/a	2013
	94533	4	PG&E	Retail	5	155	22	2013
	94520	4	PG&E	Retail	6	172	24	2013
	95020	4	PG&E	Retail	4		22	
	95407	4	PG&E	Retail	9	164	25	2014
	95123	4	PG&E	Retail	5	176	25	2014
	94087	4	PG&E	Retail	8	157	22	2014
	95129	4	PG&E	Retail	4	181	27	2014
	95014	4	PG&E	Retail			106	2011 & 2012
	94537	5	PG&E	Retail	27	375	50	2015
	94063	5	PG&E	Retail	3	41	5	2014
	94608	5	PG&E	Retail	7	134	22	2013
	93215	7	SCE	Retail	17	287	47.4	2012
	93555	7	SCE	Retail	17	299	95.4	2012
	90401	8	SCE	Retail	8	506	64	2012
	92647	8	SCE		8	818	103.1	2012
	92688	8	SCE	Manufacturing	26	688	74.3	2012
	92618	8	SCE	Restaurant	20	556	113.2	2012
	92868	8	SCE	Restaurant	20	484	85	2012
	91320	8	SCE	Office	27	313	67.9	2013
	90631	8	SCE	Office	3	281	64.5	2013
	92603	8	SCE	Office	47	516	113.9	2013
	90620	8	SCE	Restaurant	11	484	99.7	2014
	92804	8	SCE	Retail	9	245	37.7	2012
	92821	8	SCE	Retail			108.9	2012
	92627	8	SCE	Retail	10	239	7.8	2012
	92879	8	SCE	Retail	12	425	61.6	2012
	93060	8	SCE	Retail	11	166	??	2012
	93003	8	SCE	Retail	14	372	110	2012
	92618	8	SCE	Retail	22	277	109	2012
	90278	8	SCE	Retail	26	373	99.2	2012

	92647	8	SCE	Retail	35	240	61.2	2015
	90620	8	SCE	Movie theater	31	491	117.1	2012
	92832	8	SCE	Retail	5	90	19	2016
	92704	8	SCE	Retail	3	86	18.2	2016
	90631	8	SCE	Retail	8	260	56.8	2014
	93010	8	SCE	Retail	11	248	47.3	2014
	91360	8	SCE	Retail	6	67	11.4	2016
	90230	8	SCE	Retail	3	54	9.2	2016
	92630	8	SCE	Retail	2	58	6.5	2016
	92782	8	SCE	Retail	3	85	17.8	2016
	92821	8	SCE	Retail	2	40	7.9	2016
	92657	8	SCE	School	22	586	106.3	2012
	92708	8	SCE	Retail	5	147	35.1	2015
	92656	8	SCE	Office	5	203	73.8	2012
	92821	8	SCE	Retail			176.3	2015
	90503	8	SCE	Retail	7	170	??	2014
	92832	8	SCE	Retail	6	131	??	2014
	90250	8	SCE	Retail	6	132	??	2014
	92602	8	SCE	Retail	7	153	45.8	2014
	91362	8	SCE	Retail	7	137	33.9	2014
	93003	8	SCE	Retail	6	138	25.9	2014
	92868	8	SCE	Retail	5	114	27.4	2014
	90275	8	SCE	Theatre	12	115		2015
	92627	8	SCE	Theatre	12	286		2015
	93065	8	SCE	Theatre	13	300	20.6	2014
	90701	9	SCE		4	227	30	2013
	91007	9	SCE	Restaurant	13	473	129.2	2012
	93534	9	SCE	Retail	7	72	19	2015
	90602	9	SCE		7	224	61.8	2012
	90745	9	SCE	Retail	26	377	61.9	2012
	91790	9	SCE	Retail	9	418	61.6	2012
	91765	9	SCE	Retail	8	245	72.7	2012
	90815	9	SCE	Retail	21	357	58.4	2012
	90640	9	SCE	Retail	14	312	66.1	2012
	93551	9	SCE	Retail	8	435	82.4	2012
	91790	9	SCE	Retail	8	418	61.6	2012
	90638	9	SCE	Retail	38	488	88.5	2012
	91016	9	SCE	Retail	17	393	47.2	2012
	90241	9	SCE	Movie theater	21	248	82.5	2012
	91016	9	SCE	Movie theater	26	382	115	2012
	90660	9	SCE	Movie theater	27	411	117.1	2012

	90262	9	SCE	Retail	4	74	21.4	2016
	90755	9	SCE	Retail	4	65	11.9	2014
	91011	9	SCE	Retail	2	46	5.3	2016
	93551	9	SCE	Retail	2	50	10	2016
	90808	9	SCE	Retail	3	66	10.6	2016
	90242	9	SCE	Retail	2	64	7.6	2016
	90638	9	SCE	Retail	6	115	24.8	2015
	90703	9	SCE	Retail	6	135	??	2014
	90712	9	SCE	Retail	11	179	51.9	2014
	90602	9	SCE	Theatre	10	221		2015
	91302	9	SCE	Office	5	584	101.1	2012
	91710	10	SCE	Office	7	577	51	2013
	92234	10	SCE	Movie theater	34	467	126.2	2016
	91764	10	SCE	Restaurant	18	559	92.7	2012
	91763	10	SCE	Retail	4	93	28.2	2015
	92346	10	SCE	Retail	1	163	36.7	2015
	91709	10	SCE	Movie theater	42	587	163.2	2012
	92553	10	SCE	Movie theater	33	507	179	2012
	92345	10	SCE	School	20			
	91763	10	SCE	Restaurant	13	468	63.6	2014
	92234	10	SCE	Movie theater	34	478	85.4	2016
	91764	10	SCE	Retail	23	369	74.8	2012
	91739	10	SCE	Retail	19	447	84.9	2012
	92584	10	SCE	Retail	26	446	123.5	2012
	92374	10	SCE	Movie theater	25	403	115.8	2012
	92882	10	SCE	Retail	5	83	19.4	2016
	92553	10	SCE	Retail	3	102	20.8	2016
	92392	10	SCE	Retail	4	69	16.4	2016
	92260	10	SCE	Retail	10	280	46.7	2014
	92223	10	SCE	Retail	4	82	15.9	2014
	92584	10	SCE	Retail	4	89	18.5	2014
	91763	10	SCE	Retail	6	67	11.5	2016
	91730	10	SCE	Retail	2	66	20.4	2016
	91710	10	SCE	Retail	2	50	8.6	2016
	91761	10	SCE	Warehouse	4	474	19.9	2016
	92340	10	SCE	Retail	3	51	10.7	2016
	92545	10	SCE	Retail	2	40	7.3	2016
	92591	10	SCE	Retail	3	59	7.6	2016
	92562	10	SCE	Theatre	19	343	136.4	2012
	92374	10	SCE	School			204.4	2014
	92562	10	SCE	Retail	6	122	25.4	2015

	91761	10	SCE	Warehouse	7	358	53.6	2013
	91763	10	SCE	Retail	7	146	??	2014
	91764	10	SCE	Retail	5	166	47.9	2014
	92553	10	SCE	Retail	5	168	38.2	2014
	92592	10	SCE	Retail	5	163	46.4	2014
	92562	10	SCE	Retail	5	170	34.1	2014
	92336	10	SCE	Retail	5	157	37.6	2014
	91730	10	SCE	Retail	22	232	62.9	2012
	91730	10	SCE	Theatre	10	198	45.8	2014
	92509	10	SCE	Theatre	25	376	34.2	2014
	92518	10	SCE	Office	4	290	43.9	2012
	90022	11	SCE	Manufacturing			114.5	2012
	90040	11	SCE	Office			122.5	2015
	90059	11	SCE	Retail	3	77	21.5	2016
	93514	12	SCE	Retail	19	363	55.7	2012