

EPC-15-074

Knowledge Transfer Final Report

Meeting Customer and Supply-side Market Needs
with Electrical and Thermal Storage, Solar, Energy
Efficiency and Integrated Load Management
Systems

Prepared for
California Energy Commission

Prepared by
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I. Executive Summary

Increasing amounts of distributed energy resources (DERs), such as solar, wind and energy storage, present opportunities to optimize and balance California’s electricity grid through demand response participation in wholesale energy markets. The Center for Sustainable Energy (CSE) and its industry partners SolarCity (doing business as Tesla Inc), Conectric Networks, Olivine Inc and DNV-GL, tested the ability of DERs to cost-effectively accomplish their main purpose of meeting on-site electricity needs while also providing services to the grid.

This project, EPC-15-074, Meeting Customer and Supply-side Market Needs with Electrical and Thermal Storage, Solar, Energy Efficiency and Integrated Load Management Systems, configured and tested two DER portfolios. The first portfolio consisted of five schools within the Chino Valley Unified School District equipped with solar and energy storage. The second portfolio consisted of two Hilton hotels (Garden Inn San Diego Old Town and Mission Valley) integrated with advanced energy efficiency sensors and controls. Results of these demonstration studies have allowed stakeholders to better understand the technical, institutional and regulatory barriers to facilitating DER participation in supply-side markets. The goals of CSE’s technology/knowledge transfer activities were to convey data and information gained from the project and make it available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies and others.

CSE has more than 20 years of experience administering marketing, education and outreach for a diverse portfolio of clean energy and energy efficiency technologies and programs.

The following collateral were identified to support knowledge transfer activities:

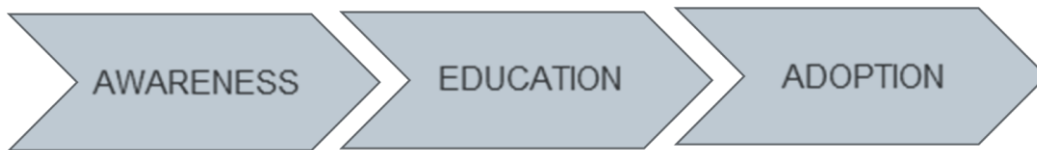
- Create an external, web-based interface to communicate program lessons learned
- Develop materials that present findings to various target audiences
- Present recommendations to audiences on- and off-site (tours and events)

This knowledge transfer final report provides a summary snapshot of the knowledge transfer collateral and metrics that were tracked toward achieving the knowledge transfer goals. It conforms to the California Energy Commission (Energy Commission) guidelines contained in project EPC-15-074 scope of work, task number 13.

II. Summary of Knowledge Transfer Strategic Approach

The general objective of transferring knowledge from the project team to interested observers meant moving members of various audience types through the journey from initial awareness of the demonstration pilots to the application and adoption of specific DER technologies, practices and policies. Specifically, this implied engaging with audiences from the beginning—those who have never heard of this project—through to those who are consuming information and communications from it and all the touch points in between. All marketing was thus developed to reach target audiences where they were in their journey by providing the right level and amount of information they need to move to the next phase of the journey, as shown in Figure 1.

Figure 1: Overview Diagram of Audience Journey



Our approach divided into individual strategies based on key audience type, which was further subdivided into detailed tactics framed by goals, key performance indicators and tracking metrics tied to strategic outreach channels per given audience type.

Audiences

Reaching people involves understanding and speaking to their specific needs and CSE, in our knowledge transfer plan report, set out to categorize people into different target audiences. Table 1 recaps our identification of audience split, which allowed us to provide more resources to larger audiences.

Table 1: Targeted Audiences for Knowledge Transfer

Audience	Role	Program Benefits	Projected Audience Split
Commercial site managers & energy managers	Participate in bidding into the wholesale market while meeting on-site electricity needs	Earn revenue in the wholesale market while still meeting on-site energy needs	30%
Consultants (e.g., subcontractors Olivine, DNV-GL, etc.)	Conduct audits, assessments and system evaluations using data and research	Research that helps back their advisory services	20%

Audience	Role	Program Benefits	Projected Audience Split
Vendors (e.g., Tesla, Conectric)	Install DER technologies	Sales tactic to acquire new customers	30%
Regulatory bodies (e.g., CAISO, Energy Commission, CPUC)	The client and other connected regulatory bodies	Research that helps inform their regulatory policies	15%
Technical Advisory Committee	Representatives from regulatory bodies, consultants, academics	Research that their audiences would be interested in	5%

Channels

CSE’s strategic approach recognized that some channels were more effective with certain target audiences than others.

The following table recaps our strategy that indicated which channels would be used to reach each target audience.

Table 2: Channels for Reaching Target Audiences

Audience \ Channel	Commercial Site Managers and Energy Managers	Vendors	Consultants	Regulatory Bodies	Technical Advisory Committee
<i>DIGITAL</i>					
Emails					
Reports, infographics, blueprint flowchart					
Webinars					
Website					
<i>IN-PERSON</i>					
Conferences and trade shows (presentations)					

Channel \ Audience	Commercial Site Managers and Energy Managers	Vendors	Consultants	Regulatory Bodies	Technical Advisory Committee
Content kit					
Tours and events					
<i>MEDIA</i>					
Trade publications					

Strategy, Tactics and Results by Target Audience

Commercial Site Managers/Energy Managers and Vendors

User Journey Recap

CSE determined that the first interaction these personas would likely have with this project would be one of the following paths:

- Learning about EPIC STEEL at a conference or trade show presentation
- Through word of mouth at industry association events

The next steps would then be to visit the project website, which would lead them to white papers and project information. If interested in the project for their own commercial site, they would likely do one or more of the following actions:

- Download and review white papers
- Review the case studies
- Register for a webinar
- Download the flowchart blueprint
- Download and review the final report

Results

The results of our commercial site managers / energy managers and vendors audience outreach and knowledge transfer are described below with a summary of KPI metrics and collateral developed.

Paid

1. Attend and secure speaking roles at relevant trade shows and conferences

Executed by project team with no support from marketing team

Conversion metric: Secured speaking engagement

KPIs accomplished

- 15 speaking engagements

- More than 750 people in total audience

Earned

2. **Engage trade media with case study/building tour/interview opportunity with subject matter expert**

Conversion metric: Published news story in trade media

KPIs accomplished:

- 2 articles published in trade media
- Unique monthly visitors of up to 10,000

Shared

None identified

Owned

Develop, evaluate and optimize

1. **Website content**

Including project homepage, reports, case studies, white papers, webinars, site tours, one-pagers and email sign-up

Conversion metric: Downloads of online resources

KPIs accomplished

- 207 unique pageviews/259 total pageviews
- 119 sessions
- Sessions averaged 02:16 minutes
- Downloads: 31

2. **Digital/printable collateral**

The original plan intended to use digital and print collateral to drive visits to the website. However, due to project delays, timing did not allow for these communication tactics.

3. **Targeted email communications**

The original plan intended to use email communications to drive visits to the website. However, due to project delays, timing did not allow for these communication tactics.

4. **Webinar series**

The original plan intended to develop a webinar series to drive visits to the website. However, due to project delays, timing did not allow for these communication tactics.

Consultants

User Journey Recap

CSE determined in the knowledge transfer plan report that this persona's first interaction with this project would likely take one of the following two paths.

- Business development team member hears about EPIC STEEL at a conference or trade show presentation
- Learns about project through word of mouth at industry association events

The next steps would then be to visit the project website, which would have led them to white papers, webinars and facility tours. If interested in the project for their own commercial site, they would have likely do one or more of the following actions:

- Download and review white papers
- Review the case studies
- Register for a webinar
- Register for a portfolio site tour
- Download the flowchart blueprint
- Download and review the final report

Results

Using the channels outlined in the overview, the following tactics aimed to reach these target audiences where they spend their time. Tactics are broken out into paid, earned, shared and owned platforms and are defined by a conversion metric and measured by KPIs.

Paid

1. Attend and secure speaking roles at relevant trade shows and conferences

Executed by project team with no support from marketing team

Conversion metric: Secured speaking engagement(s)

- 15 speaking engagements
- More than 750 people in total audience

Earned

None identified

Shared

None identified

Owned

Develop, evaluate and optimize

1. Targeted email communications

The original plan intended to utilize email communications to drive visits to the website. However, due to project delays, timing did not allow for these communication tactics.

2. Webinar series

Conversion metric: Secured webinar engagement(s)

- 1 webinar in August 2019
- More than 100 attendees on the webinar

The original plan intended to develop a webinar series to drive visits to the website. However,

due to project delays, timing did not allow for these communication tactics.

2. Website content

Including project homepage, reports, case studies, white papers, webinars, site tours, one-pagers and email sign-up

Conversion metric: Downloads of online resources

KPIs accomplished

- 207 unique pageviews/259 total pageviews
- 119 sessions
- User sessions average time: 2:16 minutes
- Downloads: 31

Technical Advisory Committee

Persona Recap

The project Technical Advisory Committee (TAC) was made up of representatives from regulatory bodies, consultants and academics in the industry with expertise in energy efficiency, energy storage and demand side management and response. They were primarily interested in the research and outcomes of the demonstration project. CSE leveraged expertise and relationships with TAC members to transfer findings from this demonstration.

Tactics

Using the channels outlined in the overview, the following tactics aimed to reach these target audiences where they spend their time. Tactics are broken out into paid, earned, shared and owned platforms and are defined by a conversion metric and measured by KPIs.

Paid

None identified

Earned

None identified

Shared

1. Content kit

The original plan intended to develop a content kit for partners to drive visits to the website. However, due to project delays, timing did not allow for these communication tactics.

Owned

Develop, evaluate and optimize

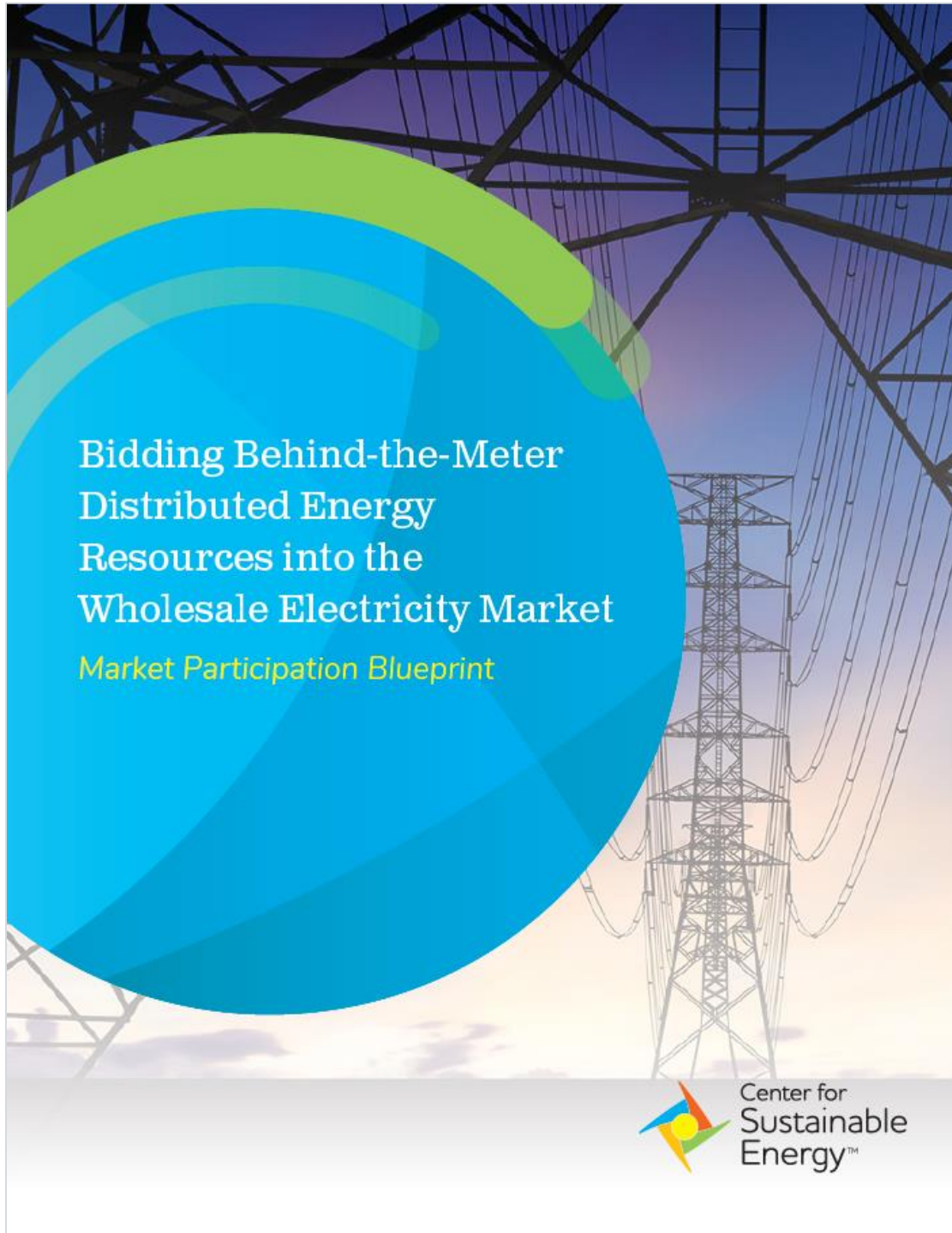
2. Targeted email communications

The original plan intended to utilize email to drive visits to the website. However, due to project delays, timing did not allow for these communication tactics.

Outreach Collateral Materials

Project Fact Sheets

CSE created a final market blueprint report to educate potential customers and vendors on steps to assess market potential and market enrollment processes at CAISO.



Dedicated Project Webpage

CSE developed a dedicated project website used as the central information hub for project final reports and collateral outreach materials, e.g., fact sheets, webinar announcements and records, etc. The current website is located at <https://sites.energycenter.org/btmbidding>.

Bidding BTM Resources into the Market
TESTING SCHOOLS & HOTELS

PORTFOLIOS MARKET PARTICIPATION BLUEPRINT RESULTS AND RESOURCES EVENTS CONTACT

BIDDING BTM RESOURCES INTO THE MARKET

TESTING SCHOOLS AND HOTELS

Expanding participation of distributed energy resources (DERs) into wholesale electricity markets leads to more effective use of DER assets by generating value-add savings and benefits for the electric utility grid while lowering utility costs for customers. Specifically, we're looking at portfolios of select schools and hotels to better understand the real-time barriers and outcomes these entities experience when they attempt to bid their excess behind-the-meter (BTM) resources into the wholesale electricity market.

This Center for Sustainable Energy-led project is a four-year demonstration funded by the California Energy Commission to establish a blueprint to guide energy managers, vendors and customers of on-site DERs to become direct participants in California's wholesale electricity market.

[VIEW PORTFOLIOS](#)

Bidding BTM Resources into the Market
TESTING SCHOOLS & HOTELS

PORTFOLIOS MARKET PARTICIPATION BLUEPRINT RESULTS AND RESOURCES EVENTS CONTACT

BTM BIDDING INTO THE WHOLESALE MARKET: RESULTS AND RESOURCES

The broad purpose of this project is to demonstrate how DERs respond to current, planned and potential price signals from both existing retail utility tariffs and the wholesale electricity market.

An *Operational Strategies* report completed in 2018 details how the managing businesses of each portfolio, Tesla and Conectric Networks, have identified the unique capabilities, customer needs, constraints and price signals to frame a variety of operational optimization strategies that will be tested through actual operations in 2019. A number of preparatory and planning steps were required to ensure proper wholesale market participation. These steps are described in detail in the reports *Wholesale Market Integration Strategy* and *Metering and Telemetry Assessment with Test Plans*.

As market participation officially launches in third quarter 2019, we will provide early results on each portfolio's operational performance, price responsiveness and market participation observations in reports set for release in fourth quarter 2019. A broader cost-benefit analysis will be completed in early 2020 after several months of market participation observations and data are available.

[UPCOMING EVENTS](#)

REPORTS

<h4>PORTFOLIO SITE SELECTION</h4> <p>The primary goal of the project is to develop operational strategies that allow behind-the-meter, distributed electricity resources to be bid into the wholesale market — primarily as proxy demand resources (PDR) — while still maintaining their intended value and service to the customer. This report discusses the selection process in choosing the locations, customer types and technologies to be used in two separate portfolios.</p> <p>READ THE PDF</p>	<h4>WHOLESALE MARKET INTEGRATION STRATEGY</h4> <p>This report presents an overview of wholesale market participation requirements, challenges, and the revenue potential pertaining to two portfolios of DER for this project. Each portfolio will provide demand response services to the grid by participating in the CAISO day-ahead and real-time energy markets.</p> <p>READ THE PDF</p>	<h4>METERING AND TELEMETRY ASSESSMENT WITH TEST PLANS</h4> <p>This report provides an overview of metering and telemetry for two portfolios of DER for this project. Building upon previous reporting for STEEL, each portfolio is evaluated for its ability to satisfy all integration requirements relevant to metering and telemetry, prior to market participation: both real and simulated.</p> <p>READ THE PDF</p>
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III. Informing State Energy Policy

The following section summarizes the local and state policy developments that were informed by this project's analysis and observations.

State Policy Development

Key California policymaking forums that we engaged in through this demonstration project are described further.

Energy Commission

- 2020 Load Management Rulemaking Draft Scoping Memo (Docket No. 19-OIR-01): CSE provided comments in January 2020 in response to the specific questions posed by the Energy Commission to inform the scope of the Load Management Rulemaking Proceeding. CSE noted a key learning from this project that direct compensation from the wholesale market for behind-the-meter DER is comparatively smaller than avoided retail utility tariff costs, like demand charges for commercial-type customers; instead, allowing customers to choose more dynamic utility rates that mimic the price signals in the wholesale market could be an effective alternative means to signal wholesale market prices to customers and elicit more customer interest and investment in price-responsive technologies behind-the-meter.

Public Utilities Commission

- Demand Response (R.13-09-011): Rulemaking to enhance the role of demand response for resource planning. This proceeding considered changes to demand response programs that participated in the wholesale market. Specifically, the proceeding created the Supply-Side Working Group (SSWG) in which Olivine has participated as an active member. The SSWG sent a final report to the CPUC in late 2019, which included policy recommendations from Olivine that were in part informed by the STEEL project.
- Self-Generation Incentive Program (R.12-11-055): Over the three-year course of the project, CPUC solicited feedback on behind-the-meter storage's ability to participate in the wholesale market and whether SGIP-incentivized projects should be allowed to and/or required to participate in the market. CSE filed several sets of comments to the CPUC providing recommendations, lessons learned, and best practices on wholesale market as developed through the project. As a result, SGIP-incentivized energy storage systems are eligible to participate in demand response opportunities and in California's wholesale market.
- Energy Storage (R.15-03-011): This proceeding refined policies and program details for the Energy Storage Procurement Framework and considered recommendations from the California Energy Storage Roadmap, jointly developed by the CAISO, Energy Commission and CPUC. CSE participated in the Storage Multiple Use Applications (MUA) Working Group from February to August 2018. The MUA Working Group was identified in D.18-01-003 to conduct related storage rule refinement and discussion of issues. CSE noted that the Tesla batteries across the Chino Hills Schools in Portfolio 1 represented one of the few behind-the-meter storage resource that is

participating in the CAISO wholesale market as MUA resources. The MUA Working group final report was issued in August 2019.¹

California Independent System Operator

- Energy Storage and Distributed Energy Resources (ESDER) Initiative: Through this initiative, the CAISO continues to reform participation rules and models for energy storage systems and behind-the-meter resources. The changes made through this proceeding have had a direct impact on this demonstration project, and this project's lessons learned could directly inform future iterations of the ESDER initiative. CSE and Olivine participated in ESDER stakeholder meetings spanning both Phase III (2017-2018) and Phase IV (2018-current).²

¹ Multiple-Use Applications for Energy Storage: Final Working Group Report. CPUC Decision D.18-01-003 in Rulemaking R.15-03-011. Published August 9, 2018. URL: [http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/0EF9A015334951F8882582E4007ACC53/\\$FILE/R1503011-SCE%20MUA%20Working%20Group%20Report.pdf](http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/0EF9A015334951F8882582E4007ACC53/$FILE/R1503011-SCE%20MUA%20Working%20Group%20Report.pdf).

² CAISO ESDER Initiative, URL: http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage_DistributedEnergyResources.aspx

Appendix: Full List of Completed Events and Publications

Table A-1 lists the outreach collateral that CSE and project subcontractors have completed, including conference speaking opportunities and published materials.

Table A-1: Events and Publications Completed

Event or Publication	Description	Target Audience	Audience Size	Date
2017 CAISO Stakeholder Symposium	Pierre Bull and Jon Hart of CSE attended this event to conduct project outreach and gain a stronger understanding of key policies and technology applications impacted by the project.	Consultants, vendors and regulatory bodies	~20 individuals reached via breakout conversations	October 2017
Project Technical Advisory Committee (TAC) Meeting #1	Pierre Bull and Jon Hart of CSE led the meeting presentation with contributions from Elish Gilfenbaum of Tesla, Philip Kopp of Conectric Networks and Robert Anderson of Olivine.	TAC	7 TAC Members	October 2017
CEC Project Portfolio Site Visits Chino Hills and San Diego, CA	The project team hosted the CEC agreement manager to site visits at the Chino Hills High School with Tesla battery storage units and the Hilton Garden Inn Old Town San Diego outfitted with Conectric Networks smart efficiency sensors and controls.	Commercial site and energy managers vendors, regulatory bodies	7 individuals across both site hosts	October 2017

Event or Publication	Description	Target Audience	Audience Size	Date
2018 EPIC Symposium (CEC) Sacramento, CA	Project subcontractor, Philip Kopp of Conectric Networks, presented on his company's work using detailed data collection, equipment automation and ongoing strategy development to assist large hotels in participating in wholesale grid resource markets while reducing customer energy costs and meeting strict customer hospitality requirements.	Commercial site and energy managers, consultants, vendors, and regulatory bodies	~50 individuals attended the presentation ~20 individuals reached via breakout conversations	February 2018
Infocast Energy Storage Week San Francisco, CA	Jon Hart of CSE was a panel speaker at this event with topical conversations designed around energy storage implementation with an emphasis on sharing lessons learned and best practices.	Consultants, vendors, and regulatory bodies	~100 individuals attending the panel session	February 2018
Project TAC Meeting #2	Presentation delivered by Pierre Bull of CSE and Robert Anderson of Olivine	TAC Members	6 TAC members	March 2018
Inaugural Energy Storage Technologies and Applications Conference UC Riverside, CA	Jon Hart of CSE attended this event with primary themes focused on two pillars of energy storage technologies, including battery as well as system integration, operation, and business models for energy storage across a variety of applications.	Consultants, vendors, and regulatory bodies	~100 individuals attended the panel session	April 2018

Event or Publication	Description	Target Audience	Audience Size	Date
New York Energy Market Summit	Pierre Bull of CSE was a panel speaker on panel, <i>Lessons Learned Managing Demonstration Pilot Projects</i> . [Note that funding for conference registration, travel and accommodations was provided by Center for Sustainable Energy.]	Consultants, vendors, and regulatory bodies	~75 individuals attended the panel session	August 2018
6th Annual HOMER International Microgrid Conference San Diego, CA	Pierre Bull of CSE was a panel speaker at this event focused on distributed energy resources technology, design and applications.	Consultants and vendors	~150 individuals attended the conference presentation ~15 individuals reached via breakout conversation	October 2018
Peak Load Management Alliance (PLMA) Future of DER Compendium	The PLMA publishes an annual compendium highlighting innovative technology approaches to reducing peak load. The Spring 2019 issue featured this demonstration project in an article that was lead-authored by Pierre Bull and Jon Hart of CSE. The PLMA also provided a publication webinar and presentation of the Compendium at the 39 th Annual PLMA Conference.	Consultants, vendors, and regulatory bodies	~100 individuals attended the webinar ~150 individuals attended the conference presentation	April-May 2019

Event or Publication	Description	Target Audience	Audience Size	Date
Wiley Natural Gas & Electricity Volume 36, Issue 1	Jon Hart and Pierre Bull of CSE drafted key sections in an article on the project, discussing behind-the-meter resources' ability to provide multiple-use-applications. The article is expected to be included in the August issue of Wiley's journal.	Consultants, vendors, and regulatory bodies	monthly newsletter distribution e-mail list numbering in the thousands.	July 2019
7th Annual California Energy Summit 2019 hosted by Infocast, Inc.	Jon Hart of CSE spoke about the project on a panel titled, "Integrating Distributed Energy Resources (DERs) into Wholesale Energy Markets."	Consultants, vendors, and state and local regulatory bodies	~50 audience members	July 2019
Local Government Sustainable Energy Coalition (LGSEC) webinar hosted by CSE	Jon Hart of CSE spoke about the two portfolios as a case study for the LGSEC webinar hosted by CSE on Aug 28, 2019.	Regulatory bodies, vendors and consultants	~100 webinar attendees	August 2019
Renewable Energy Markets Summit 2019	Jon Hart of CSE spoke about the project at the Summit in San Diego in early September.	Consultants, vendors and state and local regulatory bodies	~150 audience members	September 2019
Getting to Zero Forum 2019	Pierre Bull of CSE spoke about the project at the Forum event in Oakland on October 11, 2019. The forum aimed to continue the work of the 2018 Global Climate Action Summit with a focus on scaling up energy and zero carbon buildings.	Regulatory bodies, commercial site and energy managers, vendors and consultants	~150 audience members	October 2019
Community Choice Energy Summit	Pierre Bull of CSE spoke about the project at the Summit on Jan 22, 2020.	Regulatory bodies, vendors and consultants	~100 audience members	January 2020

Event or Publication	Description	Target Audience	Audience Size	Date
CEC EPC-15-074 Final Project Presentation	Members of the project team, including ...	Regulatory bodies	expect 5-10	March 2020
2020 ACEEE Summer Study on Energy Efficiency in Buildings	Jon Hart and Pierre Bull of CSE submitted an abstract on the project to the selection committee of Summer Study event (taking place in Pacific Grove, CA in August 2020). CSE was notified of abstract selection in late Jan 2020 into Panel 12, Smart Buildings, Smart Grid.”	Regulatory bodies, advocates, utilities, vendors and consultants	expect 50-100	August 2020



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