EMERGING TECHNOLOGIES COORDINATING COUNCIL

Demand Response Technology Assessment and Delivery

Accelerating Tech Transfer of California's EPIC Projects

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ETCC Webinar: February 26, 2020

Technology Assessment & Delivery

DR Innovation

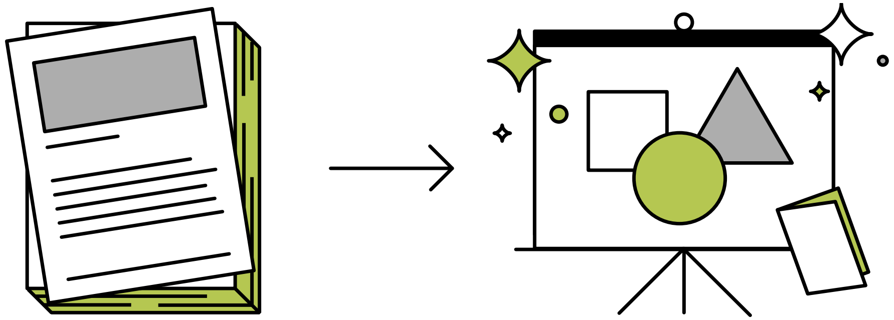
made more valuable for Southern California Edison's customers.

What is EPIC?

The California Energy Commission’s Electric Program Investment Charge (EPIC) program invests in scientific and technological research to accelerate the transformation of the electricity sector to meet the state’s energy and climate goals.

What is TA&D?

A process developed by SCE and EPRI to accelerate the sharing of learnings from the California Energy Commission's EPIC Research projects.



Why TA&D?

- CA has ambitious energy policy goals
- EPIC is the research vision for these goals
- Technology Transfer needs a boost
- SCE and EPRI have mutual goals for technology advancement
- TA&D is one of the paths to bringing EPIC research to SCE's customers

What we are covering today

1

What is TA&D

the purpose of the EPRI TA&D program to SCE’s EM&T Stakeholders

2

TA&D Framework

the TA&D process and objectives for CEC Technology Transfer

3

TA&D Projects

first round of EPIC projects going through the TA&D Framework

4

Discussion, Q & A

around opportunities to use TA&D to support the CEC’s goals for California

The TA&D Framework

Perform a technical review of all documentation, updates and presentations related to a specific EPIC project.

Conduct interviews with the EPIC Project Lead for a deeper understanding of the project goals, activities and current status.

Develop an easy to understand narrative of the "story," including project goals, current findings and emerging opportunities.

Provide key stakeholders with comprehensive collateral to inspire additional engagement.

Create a visually engaging infographic to share real time findings and suggested next steps with key stakeholders at SCE.

Utilize a Logic Model customized for TA&D to identify missing pieces, leverage points, possible outcomes, and recommended actions.

How Stakeholders Engaged

1

Attended
TA&D update meetings

2

Participated
in technical discussions

3

Collaborated
with other business units

4

Integrated
the learnings into your work

5

Transferred
outcomes to your utility's activities

Product 3002017834: Technology Assessment and Delivery (TA&D): Assessing the Potential of CEC's EPIC Projects in Demand Response
https://membercenter.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002017834

Selected EPIC Projects

- Smart Inverters/ Smart Consumer Devices
- Transactive Load Management
- Vehicle-Grid Integration
- Customer-centric Demand Management
- Flexible Control Strategies

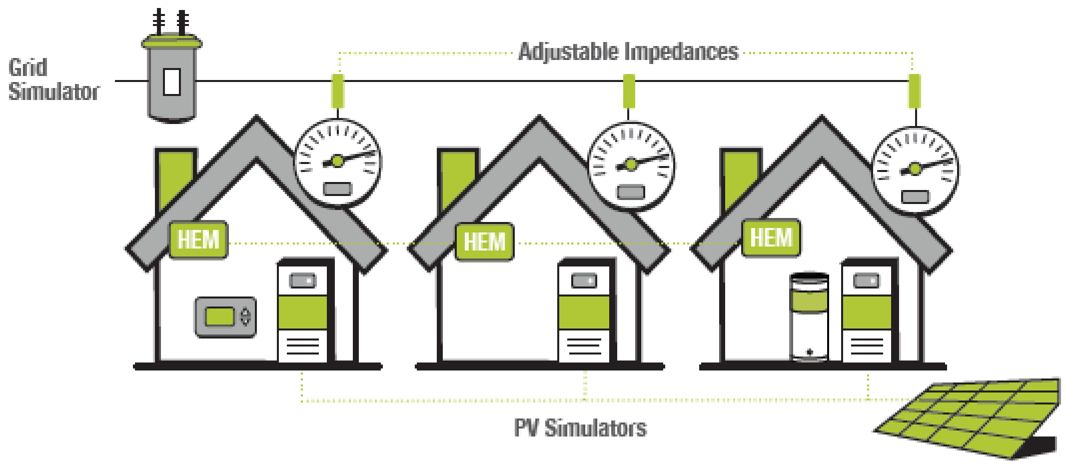
Smart Inverters/ Smart Consumer Devices

CEC EPC-14-079

Assessing the Ability of Smart Inverters and Smart Consumer Devices to Enable More Residential Solar Energy

1

Smart Inverters



Lab Testing

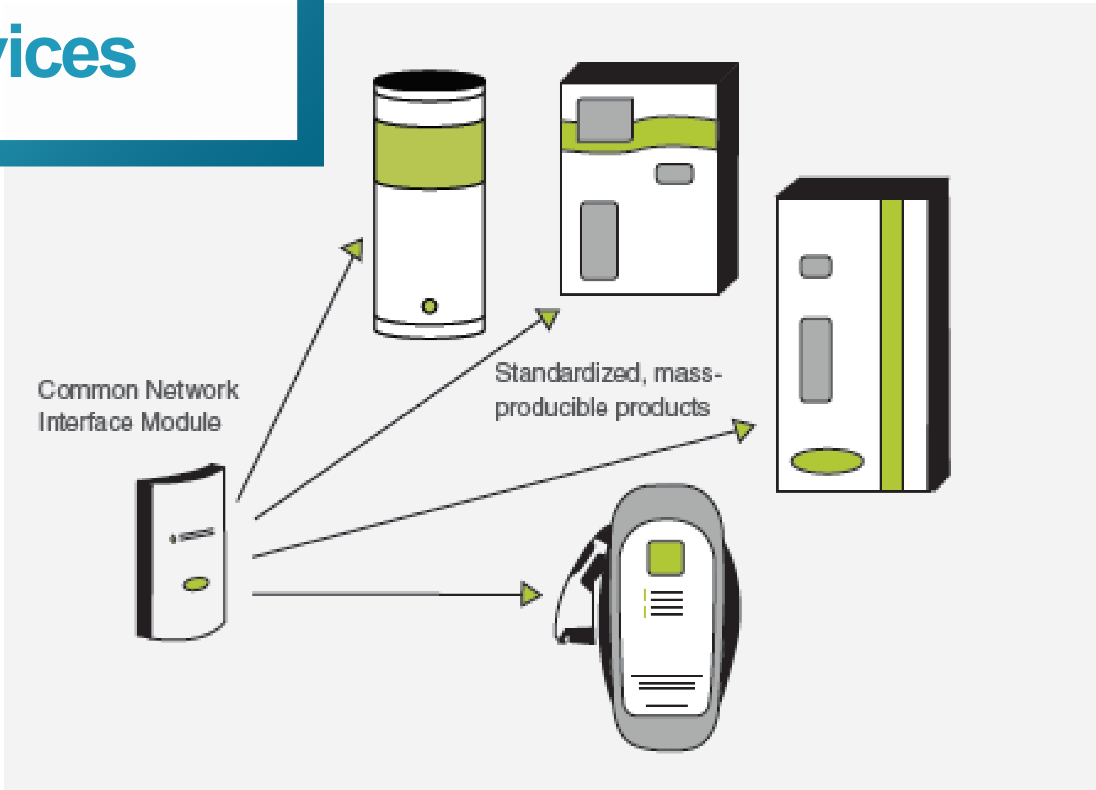
- Three simulated homes, each with a solar inverter and a collection of controllable devices.
- Bulk impedances inserted between the homes at the common tie point to the transformer.
- Lab testing carried out in two steps: multi-inverter testing and tests with inverters plus controllable devices.

Field Testing

- PV systems will be outfitted with smart inverters, providing California Rule 21 revisions.
- Controllable loads will be deployed to test effectiveness and customer acceptability of load management strategies.

2

Smart Consumer Devices



SUCCESSES TO DATE

- Lab testing justifies moving onto field testing
- Developed a distributed control algorithm with PV-aware scheduling of flexible loads
- Algorithm is fully distributed and requires no communication with the utility
- System architecture can be extended to support DR-control and storage objectives

RECOMMENDED NEXT STEPS

- Secure field test location (multiple homes on the same transformer)
- Engage participants through partner utilities
- Add Extension for DR to field tests – engage champion to support this addition
- Consider system as an integrated application for future models of ZNE homes

Signals for Transactive Load Management

CEC EPC-15-045

Transactive Incentive Signals to Manage Electricity Consumption (TIME): A System for Transactive Load Management (TLM)

TIME

Research Methodology

1 Transactive Load Management Signal Design

Create a single TLM pricing signal that could work for both supply and demand.

2 TLM Signal Software Development and Project Integration

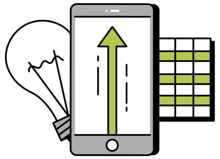
Implement the pricing signals and communicate them across the eight separate EPC projects.

TIME

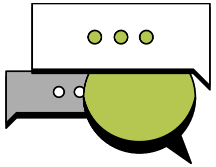
Key Findings

Price-based Signal
Simulation successfully developed.

OpenADR Protocol
can deliver hourly pricing signals.



Day-Ahead Market
Provides platform for rebate design.



Real-Time Pricing
Could motivate customers to conserve.

Vehicle-Grid Integration

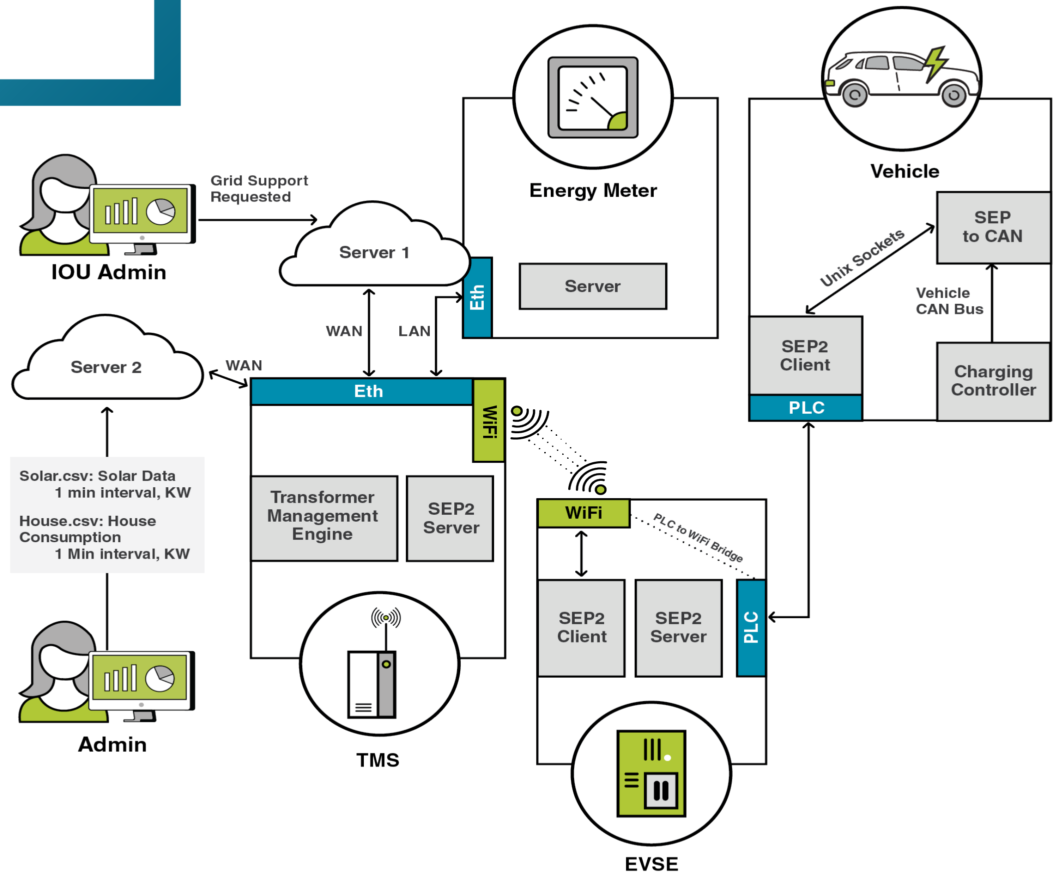
CEC EPC-14-086

CEC EPC-14-086: Develop a Distribution System Aware Vehicle to Grid Services for Improved Grid Stability and Reliability

EV Grid

Project Success Snapshot

System Software Integration



- Validated end-to-end interoperability and application of desired standards.
- TMS-automated energy management supports grid service requests.
- Simulated data verifies algorithmic functionality.
- Positive value proposition for EV owners.
- Grid-tied bidirectional charger and J3072 client control module integrated.
- System integration revealed compatible and interconnected grid interaction.
- Effective for residential transformer energy monitoring – community aggregation application.


Opportunities

- Adoption of interconnection requirements for onboard inverters that meet Rule 21.
- Capability of on-vehicle V2G inverters to meet Rule 21 revisions.
- Synchronization between different original equipment manufacturers (OEM) vehicles.
- Reducing signal response times to support ancillary fast response services.
- Better understanding of increased cycling on battery life and how this affects warranties.

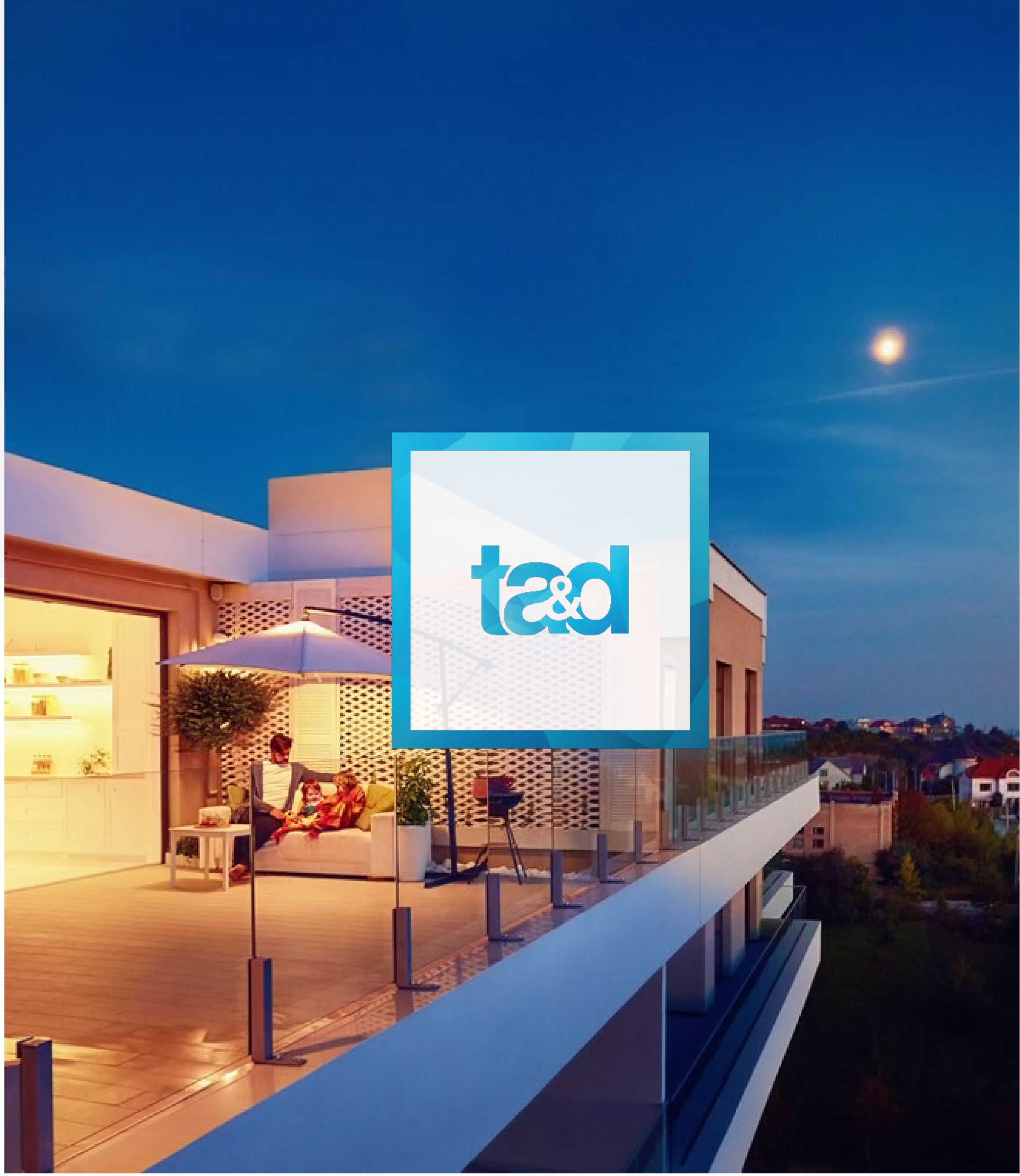
Suggested Next Steps

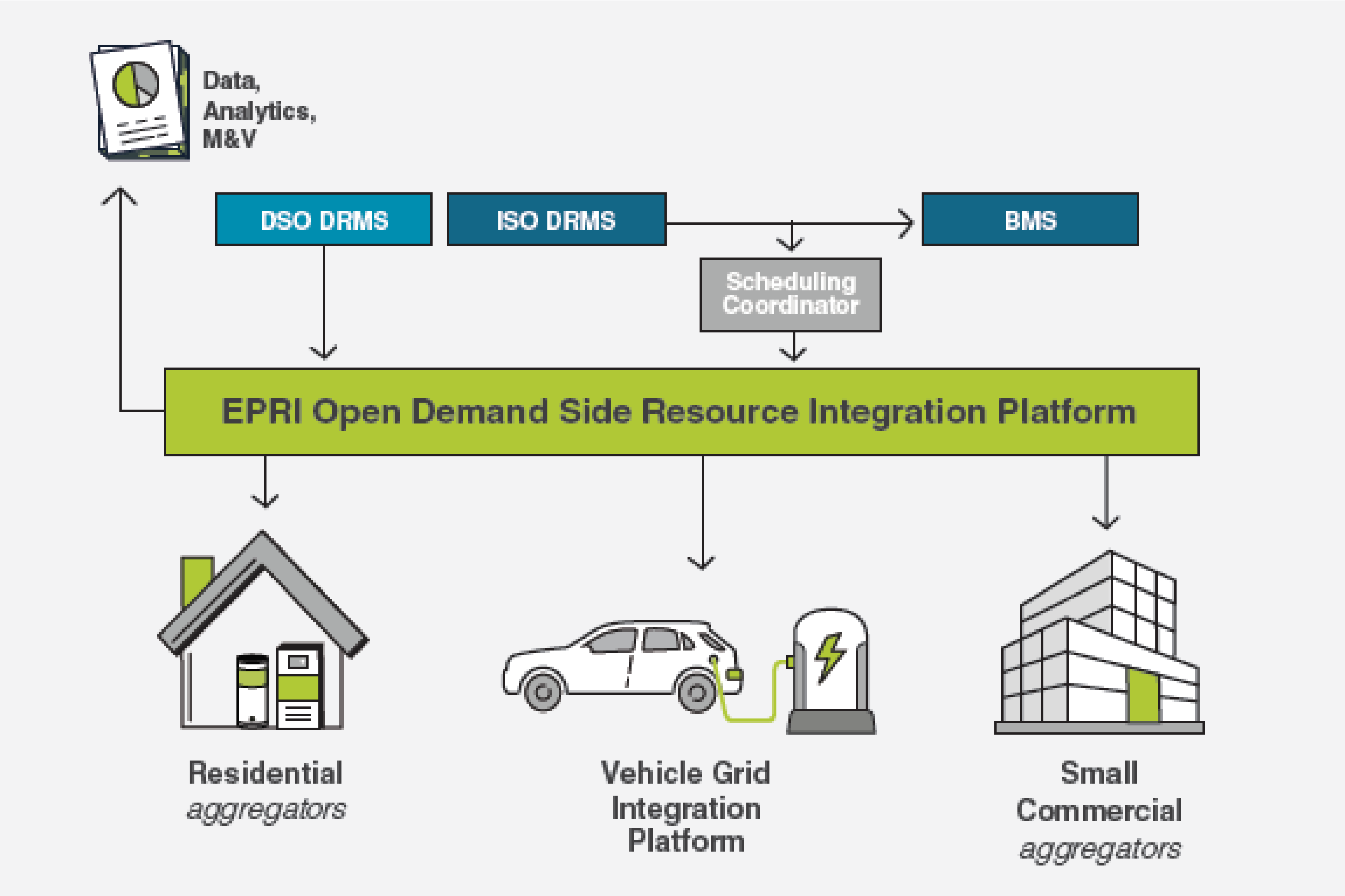
1. Define SAE J3072 interoperability, certification requirements and harmonized labeling.
2. Develop V2G incentive structures acceptable to customers.
3. Define clearer electrical integration standards.
4. Develop next-gen ‘edge of grid’ computing technology.
5. Address adoption of J3072 by utilities.
6. Test capability of on-vehicle V2G inverters to meet Rule 21 revisions.

Demand Side Resource Integration Platform (DSRIP)

CEC EPC-15-075

Customer-centric Demand Management using Load Aggregation and Data Analytics





Successes

- Development of a DER-vendor agnostic data models supports data aggregation and control.
- Lab setup demonstrated an orchestrated response (water heater, battery, smart thermostat) to a single load shed signal.

Challenges

- Control strategies for water heaters that successfully mitigate needle peaks and unexpected heat-ups.
- A layered control strategy that maintains customer’s comfort/ energy goals and overall grid benefits.
- An understanding of customer’s tolerance for automated controls on customer-sited end-devices.

DR Control Strategies

CEC EPC-16-026

Develop and Pilot Test Flexible Demand Response Control Strategies for Water Pumping Stations and Industrial Refrigeration Plants

Water Pumping

Project Status

Taxonomy for flexible water pumping has been developed. Additional activities completed to date include:

- Identified DR strategies and operational constraints for pilot testing
- Designed DR decision support tool for Day-ahead and Day-of Water Operations, which has been vetted by Water Operations personnel
- Completed plant operator interviews and collected initial data
- Installed sub-metering and implemented SCADA connection
- Identified security policy and approved Cloud-based data exchange with SCADA Historian

Next Steps

- Implement Cloud server and interface to enable Cloud-base data exchange interface with SCADA Historian and FEMS System.
- Develop and test the FEMS database and software.
- Demonstrate DR strategies for flexible water pumping within water operational constraints.
- Understand operator tolerance for engaging response from water pumps.

Industrial Refrigeration

Project Status

The Mira Loma refrigerated warehouse has been in operation for the past several years, utilizing an existing cloud-based supervisory controls system to meet food safety standards. Data communication between the refrigerated warehouse controls system at the site and a remote server in the cloud has been established.

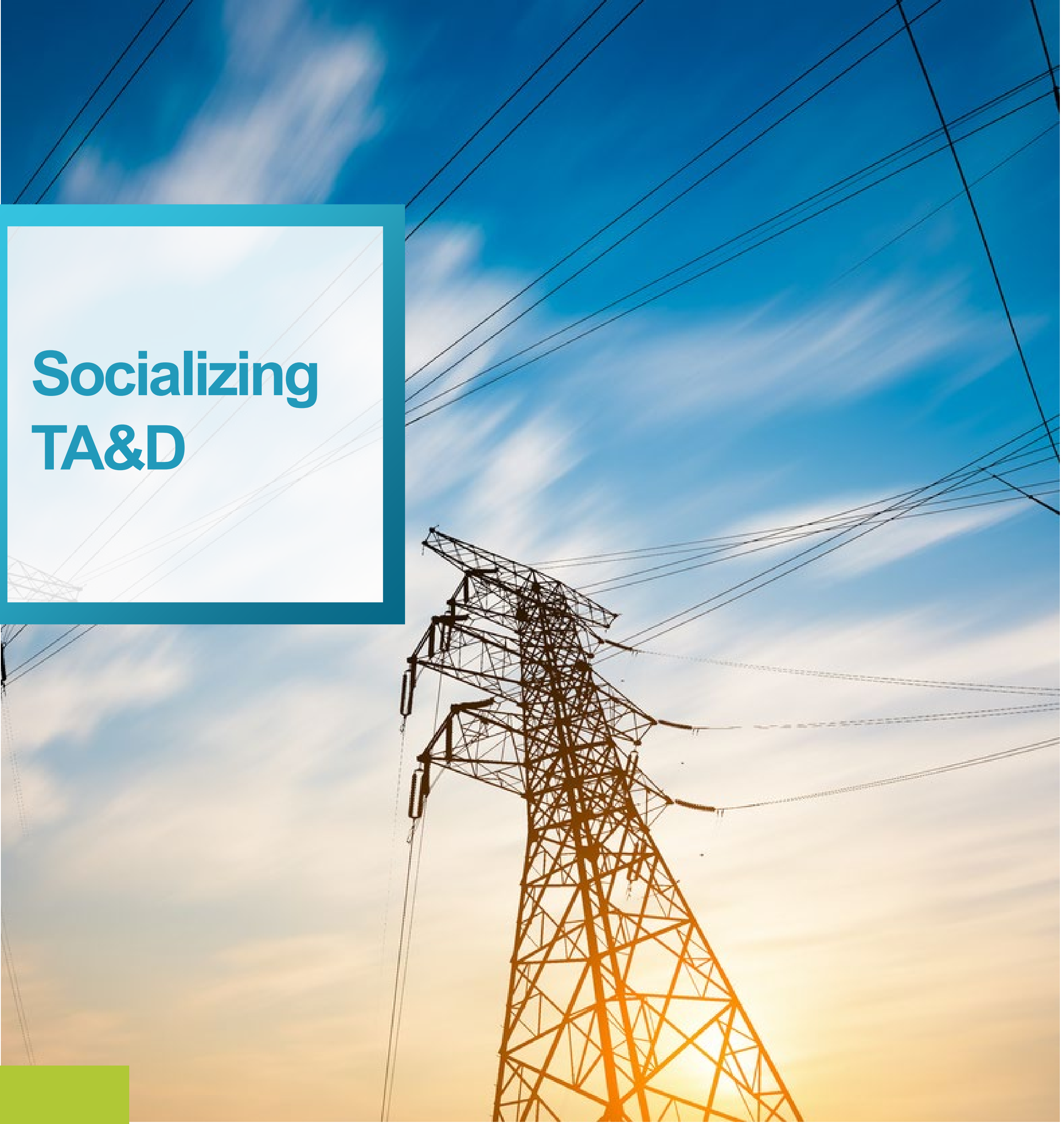
Next Steps

- Address privacy concerns to help expedite metered data sharing.
- Set up OpenADR2.0 b signal communication from a VTN to a VEN in the cloud and to the remote server in the cloud
- Conceptualize, test and demonstrate refrigeration system controls strategies for DR
- Monitor, collect and analyze operational data, and assess control schemes.
- Prepare report.

Outcomes and Next Steps

For TA&D

Using the TA&D Framework to Expand Technology Transfer of EPIC Projects in CA



Socializing TA&D

Outcomes

- Two Working Sessions with EM&T group
- EPRI Transactive Energy Symposium
- EPRI Technical Update Published
- EPRI Technology Transfer Award on Flexible Demand Response

Next Steps

- ETCC Webinar – Happening now!
- ACEEE Summer Study 2020 – Paper accepted
- Looking to inform and inspire more EPIC PMs to participate in TA&D
- EPRI Technology Transfer Award on Flexible Demand Response

Available for public download:

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Open Discussion

- TA&D was designed to accelerate the technology transfer from the CEC's EPIC program for SCE's Emerging Markets and Technology DR program
- What is the feedback from the webinar participants from this initial phase of the project?
- How might the TA&D process be a model to accelerate the tech transfer of other emerging research activities in California?

Thank you!

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