DOCKETED	
Docket Number:	20-EPIC-01
Project Title:	Development of the California Energy Commission Electric Program Investment Charge Investment Plans 2021-2025
TN #:	238420
Document Title:	Presentation for EPIC Workshop on Load Flex 6-21-21
Description:	N/A
Filer:	Misa Werner
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/22/2021 11:34:28 AM
Docketed Date:	6/22/2021

Electric Program Investment Charge: 2021-2025 (EPIC 4) Investment Plan Workshop

Unlocking Flexibility from Customer Load Management and Distributed Energy Resource Technologies

June 21, 2021

EPIC 4 Investment Plan Process, Timeline, and Public Participation

EPIC 4 - Unlocking Flexibility from Customer Load Management and Distributed Energy Resource (DER) Technologies

June 21, 2021

9:30 AM - 3:00 PM

(Listed times are general guidelines only)

Introduction (9:30-9:40)

1. Panel: Research needs for unlocking flexibility in the Industrial, Agricultural, and Water Sectors (9:40-10:50)
   Moderator: Christian Fredericks, CEC
   A. David Meyers, Polaris Energy Service (will log in at 9:20 am)
   B. Peter Fiske, Lawrence Berkeley National Laboratory
   C. Pepe Bolorinos, Stanford University
   D. Ammi Amaranth, Electric Power Research Institute
   E. Alex Woolf, Lineage

2. Panel: Research needs for unlocking flexibility in the Buildings Sector (10:50-12:00)
   Moderator: David Hungerford, CEC
   A. Rachel Kuykendall, Sonoma Clean Power
   B. Mark Martinez, Southern California Ediso
   C. Carmen Best, Recurve
   D. Peter Klauer, California Independent System Operator
   E. Mary Ann Piette, Lawrence Berkeley National Laboratory

Break (12:00-1:30)

3. Panel: Research needs for unlocking flexibility in Electric Vehicle Charging (1:30-2:40)
   Moderator: Ben Wender, CEC
   A. Ted Bohn, Argonne National Lab
   B. Jasna Tomic, CalStart
   C. Joseph Gottlieb, Rhombus Energy Solutions
   D. Jackie Pierro, Nuvve
   E. Tom McCalmont, Paired Power

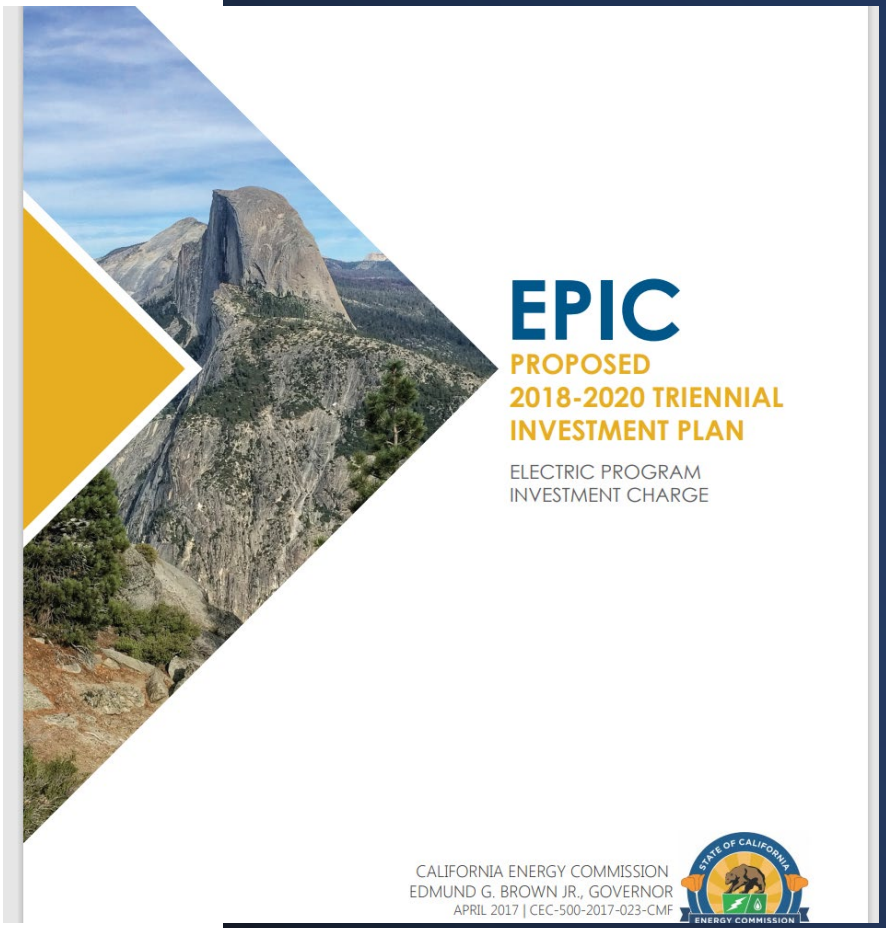
Public Comments

Closing Remarks

Adjourn (by 3:00 PM)

EPIC Investment Planning Background

- The CPUC requires each EPIC administrator to submit an Investment Plan.
- Investment Plans lay out the proposed research investments for the funding period.
- The EPIC 4 Plan will describe the CEC's proposed investments for funding collected from **2021-2025**.
- CEC develops its plan through an open and transparent stakeholder process.
- The previous CEC EPIC Investment Plan can be found at: https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M185/K575/185575884.PDF
- Draft Proposed EPIC Interim Investment Plan 2021 https://efiling.energy.ca.gov/getdocument.aspx?tn=236221



EPIC 4 Investment Plan Research Themes

Decarbonization

Reduce GHG emissions and use of fossil fuels.

Resilience and Reliability

Manage through and recover from *large-area or long-duration outages.*

Reduce the frequency or impact of *small-scale or short-duration disruptions* in electric service.

Entrepreneurship

Support clean energy entrepreneurs developing breakthrough technology solutions from idea to market.

Affordability

Improve the affordability of energy services for all electric ratepayers.

EQUITY is an overarching theme for EPIC investment planning. Initiatives will include funding set-asides for projects in under-resourced communities and other equity-targeting elements.

EPIC 4 Plan Schedule

Task / Event	Date(s)
Public workshops to solicit stakeholder input on specific topic gaps	May – July 2021
Public workshop to get input and feedback on the CEC's draft research initiatives being considered for the EPIC 4 Investment Plan	August 4, 2021
EPIC 4 Investment Plan considered at CEC Business Meeting for approval	September 2021 (tentative)
EPIC 4 Investment Plan submitted to CPUC	October 1, 2021 (tentative)
CPUC Decision on EPIC 4 Plan expected	Spring-2022 (tentative)
The first EPIC 4 solicitations released	Summer-Fall 2022

EPIC 4 Workshops

Workshop Title and Description	Date
Unlocking Flexibility from Customer Load Management and Distributed Energy Resource (DER) Technologies	Monday, June 21, 2021 9:30 a.m.
Building Decarbonization	Monday, June 28, 2021 9:30 a.m.
Hydrogen Technology	Thursday, July 1, 2021 1:00 p.m.
Offshore Wind Energy R&D Opportunities for EPIC 4	Wednesday, July 14, 2021 1:00 p.m.
Industrial Decarbonization	Friday, July 16, 2021 9:30 a.m.
Technology Advancements for Energy Storage	Tuesday, July 20, 2021 9:30 a.m.
Improving the Bankability of New Clean Energy Technologies	Thursday, July 22, 2021 10:00 a.m.
Draft Initiatives for EPIC 4	Wednesday, August 4, 2021 9:00 a.m.

Stakeholder Input Form

- Download at https://www.energy.ca.gov/media/5703
- Submit to Docket 20-EPIC-01
- Due July 2

ELECTRIC PROGRAM INVESTMENT CHARGE 2021-2025 (EPIC 4)
RESEARCH CONCEPT PROPOSAL

The CEC is currently soliciting research concept ideas and other stakeholder input for the EPIC 4 Investment Plan. For those who would like to submit an idea for consideration, we ask that you complete this form and submit it to the CEC by 5:00 p.m. on **July 2, 2021**.

To submit the form, please visit the e-commenting link, https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-EPIC-01, enter your contact information, and then use the "choose file" button at the bottom of the page to upload and submit the completed form. Thank you for your input.

1. Please provide the name, email, and phone number of the best person to contact should the CEC have additional questions regarding the research concept:

   Click or tap here to enter text.

2. Please provide the name of the contact person's organization or affiliation:

   Click or tap here to enter text.

3. Please provide a brief description of the proposed concept you would like the CEC to consider as part of the EPIC 4 Investment Plan. What is the purpose of the concept, and what would it seek to do?

   Click or tap here to enter text.

4. In accordance with Senate Bill 96, please describe how the proposed concept will **"lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals."** For example, what technical and/or market barriers or customer pain points would the proposed concept address that would lead to increased adoption of clean energy technologies? Where possible, please provide specific cost and performance targets that need to be met for increased industry and consumer acceptance. For scientific analysis and tools, what data and information gaps would the proposed concept help fill, what specific stakeholders will use the results, and for what purpose(s)?

   Click or tap here to enter text.

5. Please describe the anticipated outcomes if this research concept is successful, either fully or partially. For example, to what extent would the research reduce technology costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the technology at scale?

   Click or tap here to enter text.

6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.

   Click or tap here to enter text.

7. Please provide references to any information provided in the form that support the research concept's merits. This can include references to cost targets, technical potential, market barriers, etc.

To stay involved in EPIC 4:

Visit CEC's website for workshop info, presentations, docket, e-commenting, and EPIC listserv sign up: www.energy.ca.gov/epic4

Submitting Written Comments:

The Stakeholder Input Form and Workshop Comments may be submitted using CEC's **e-commenting** system: https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-EPIC-01

See this event's **notice** for **e-mail and U.S. Mail** commenting instructions: https://efiling.energy.ca.gov/getdocument.aspx?tn=238093

For all comments, please include docket # **20-EPIC-01** and "EPIC 4 Investment Plan" in the subject line and on the cover page. Comments for this workshop are due **June 28, 2021.**

Workshop Format

- **Panel 1: Research needs for Unlocking Flexibility in the Industrial, Agricultural, and Water Sectors**
- **Panel 2: Research Needs for Unlocking Load Flexibility in the Buildings Sector**
- **Panel 3: Research Need for Unlocking Load Flexibility in the Electric Vehicle Charging Sector**

Format

1. Panelists will provide introductory remarks
2. Moderators will provide questions and guide the discussion
3. Attendees: Please type your questions and comments in the Q&A in Zoom. CEC staff may respond in writing or during the public question session.
4. Public questions and comments can also be taken at the end of the workshop

EPIC 4 Workshop - Unlocking Flexibility from Customer Load Management and Distributed Energy Resource Technologies

1. **Panel: Research needs for unlocking flexibility in the Industrial, Agricultural, and Water Sectors (9:40-10:50)**

   Moderator: Christian Fredericks, CEC

   A. David Meyers, Polaris Energy Service

   B. Peter Fiske, Lawrence Berkeley National Laboratory

   C. Pepe Bolorinos, Stanford University

   D. Ammi Amaranth, Electric Power Research Institute

   E. Alex Woolf, Lineage

POLARIS ENERGY SERVICES

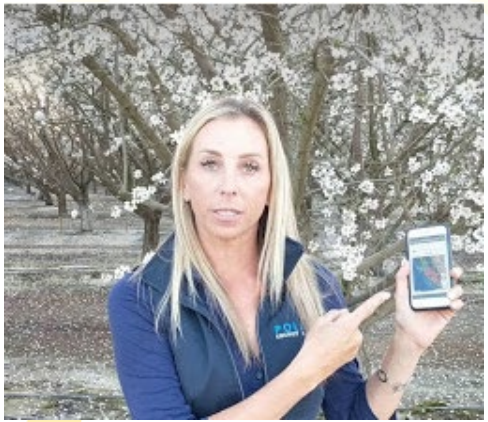
Agricultural Demand Flexibility

- Unlocking Flexibility from Customer Load Management and Distributed Energy Resource (DER)

June 21, 2021

Who Is Polaris?

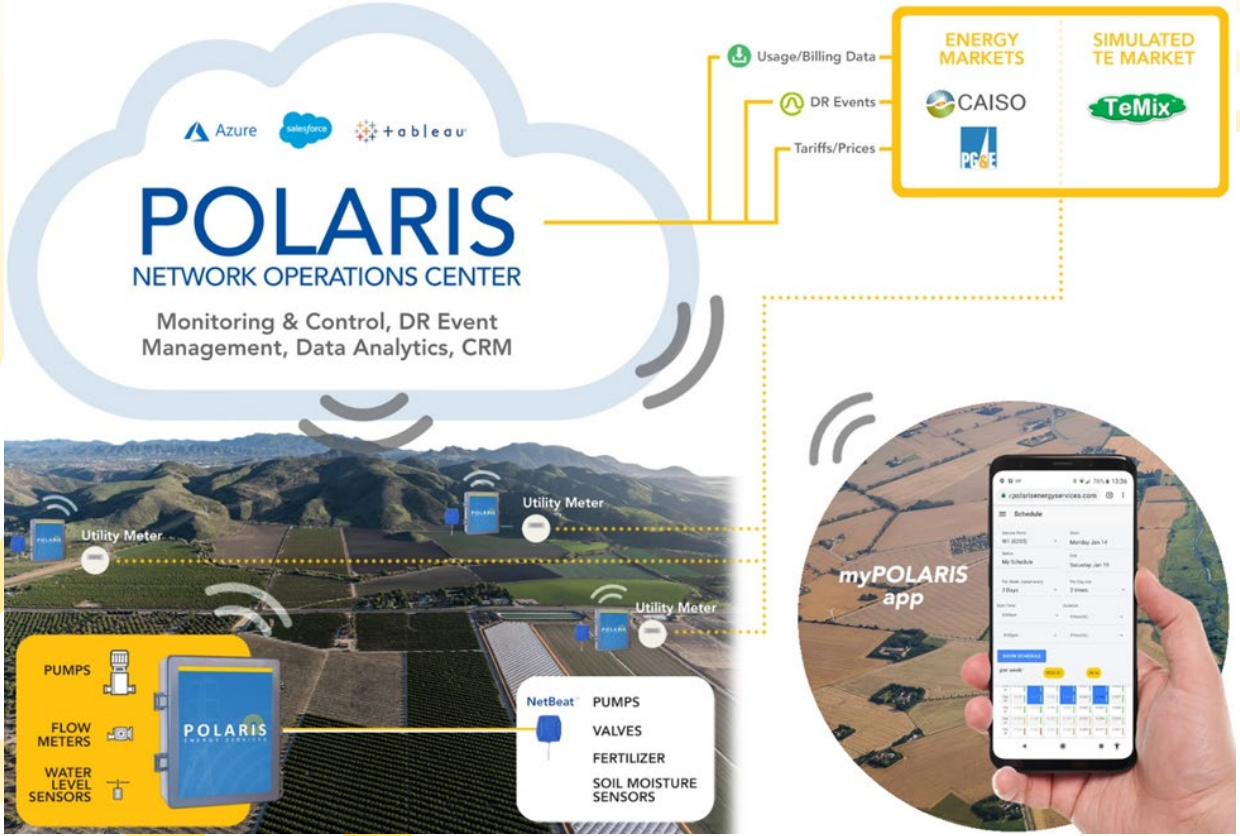
- Leading agricultural energy management provider for energy users and utilities
  - 500+ irrigation and conveyance pumps on network with 75 MW Peak Load Under Management (300 MW monitored)
- Load Management Automation
  - Full ADR customer lifecycle management: Qualification, Incentive Management, Systems Integration, Project Management, Program Participation, M&V
- DR Program Management and Aggregation
  - Recruit, enable and manage DR resources
  - Event execution and network readiness
  - Aggregate load and manage settlements
- Research & Development
  - EPIC : *Technologies and Strategies for Agricultural Load Management to Meet Decarbonization Goals*
  - BIRD: *Integrated Irrigation & Energy Management*
  - *EPIC: Accelerated Deployment of Irrigation Pumping Demand Flexibility*



POLARIS
ENERGY SERVICES

How Does Polaris Do It?

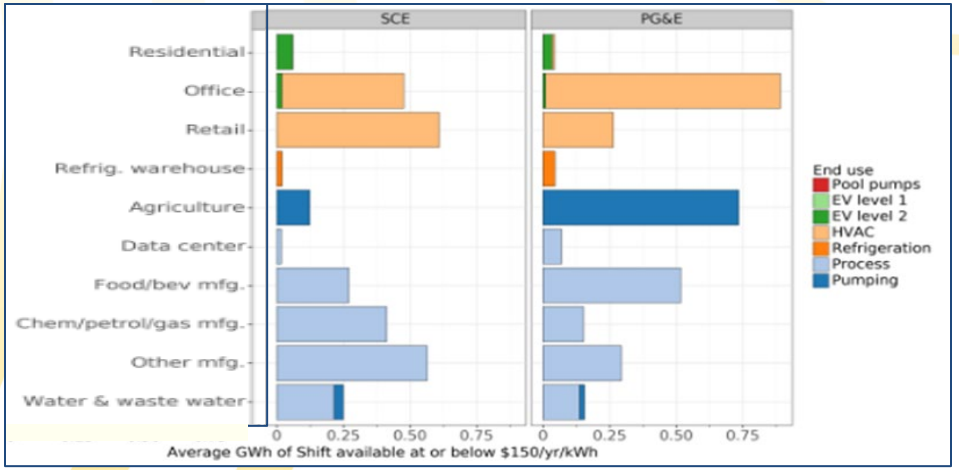
- Comprehensive platform from the energy market to the valve in the field
- Situational awareness and management for large portfolios of energy assets
- Integrations with energy users' preferred control systems

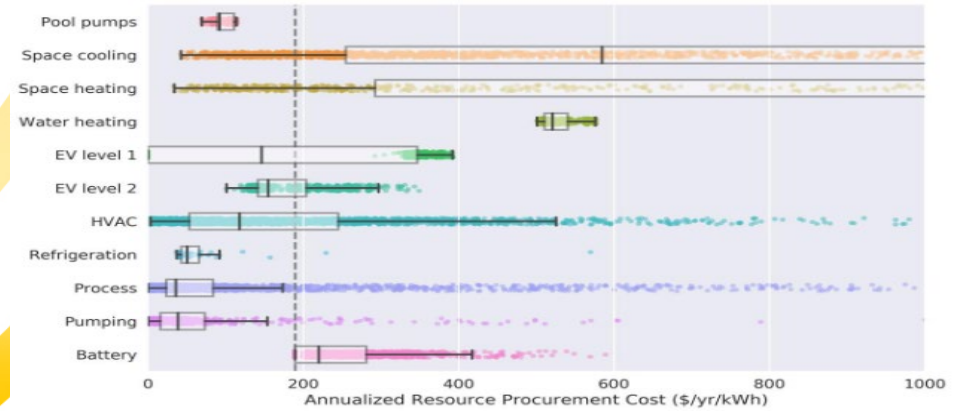


POLARIS ENERGY SERVICES

The agriculture sector has untapped flexible demand

- Large, binary (on/off) loads
- Dual-use storage potential (reservoirs, canals)
- Relatively flat daily profiles
- 850 GWh/day achievable shift from the Ag sector* can reduce carbon emissions from generation in CA by 2%
- 1/10 the cost of shift from residential space cooling (smart thermostats)



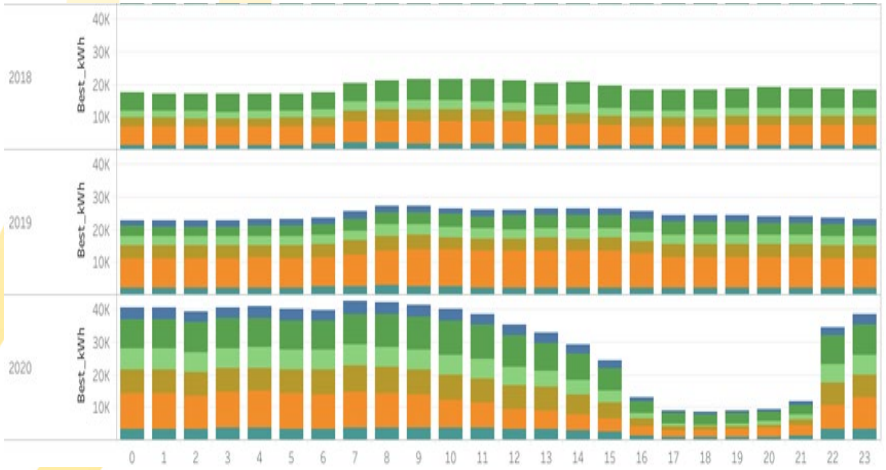


*LBL Energy Technologies Area: Opportunities for Automated Demand Response in California Agricultural Irrigation, 2015

EPIC Project Demonstrated Feasibility of Shift

- 67% of load shifted from ramp hours of 94% that can potentially be shifted
- Energy users responded to signals for an average $0.14/kWh in incentives
- Reported improved crop and 30% labor savings
- ROI on automation investments for farmers range from 7-41% based on energy savings alone

Hourly Total Usage by Pump Before and During Transactive Energy Pilot: Apr - Jun



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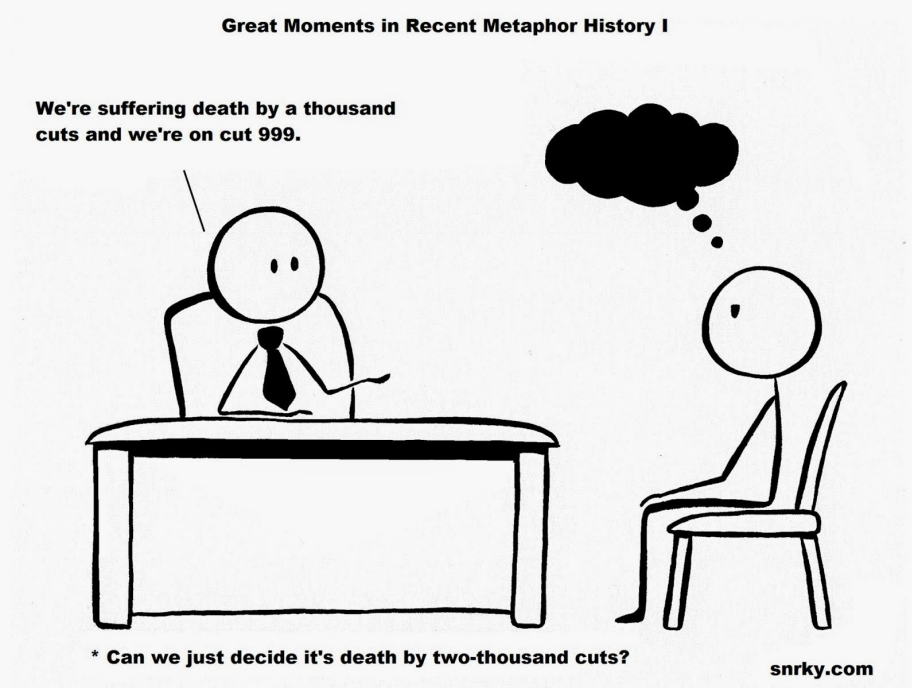
Ag Load Management Suffers Death By 1,000 Cuts

- Program structures align poorly with ag operations, significantly derating actual load
- Processes, visibility and rules are extremely cumbersome for customers or the 3rd-party providers who work with them
- Ag Energy Users have to choose TOU Response **OR** Demand Response



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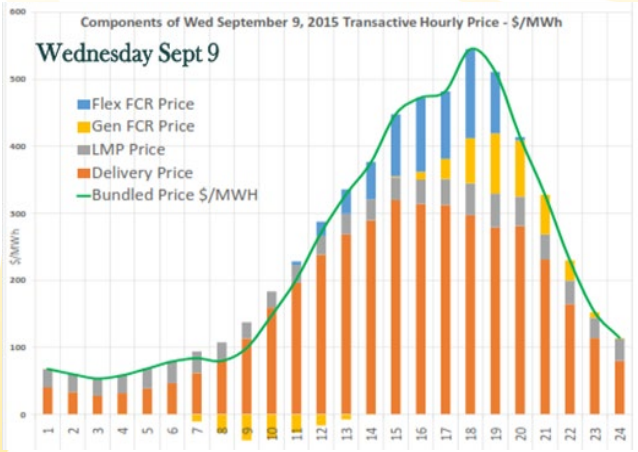
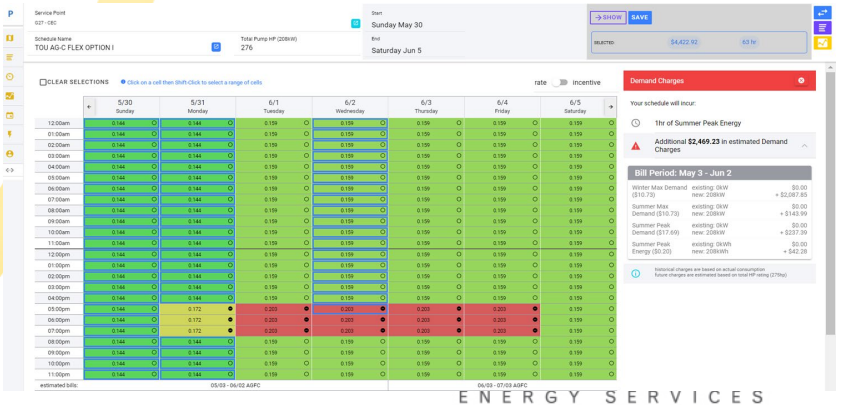
A Simple Solution

- Provide a simple, strong price signal
  - Bundle all charges, including demand
- Enable weekly scheduling (average 3.5 days-ahead
  - Forecast or transaction
- Embed energy management in adoption of automation in the Ag sector through inecentives





Recommendations for EPIC

- Technology exists – increase weighting to deployment and scale
- Focus on market and business model innovation as much as 'hard tech'
- Build on previous and concurrent projects
- Assert the role of EPIC in research – require regulated utilities to build on, not replicate

POLARIS
ENERGY SERVICES

POLARIS ENERGY SERVICES

Thank You!

LEGAL NOTICE

Peter Fiske,
Lawrence Berkeley National Laboratory

Pepe Bolorinos, Stanford University

Research Needs for Unlocking Flexibility in the IAW Sectors

Panel Discussions

Ammi Amarnath
Sr. Technical Executive

CEC Workshop
June 21, 2021

About EPRI – The Electric Power Research Institute

Independent

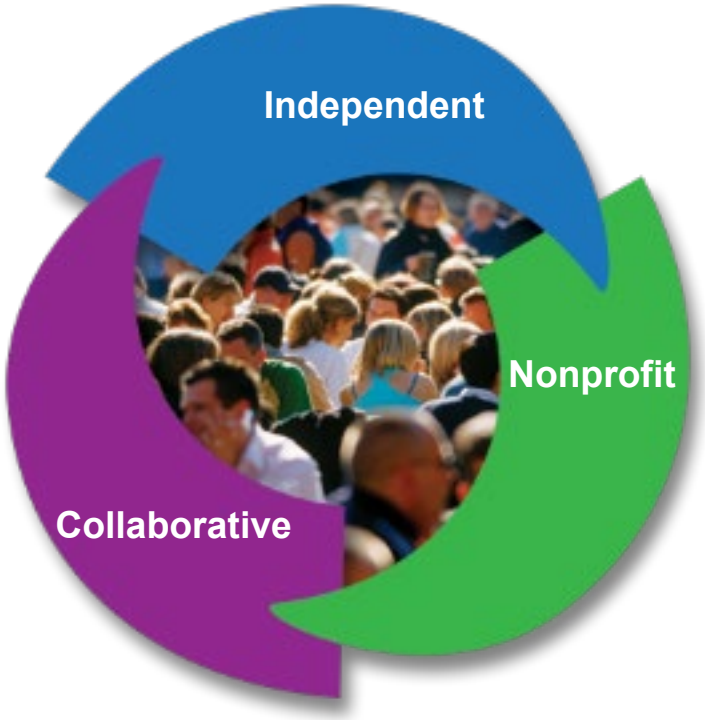
Objective, scientifically based results address reliability, efficiency, affordability, health, safety and the environment

Nonprofit

Chartered to serve the public benefit

Collaborative

Bring together scientists, engineers, academic researchers, industry experts



EPRI's Role

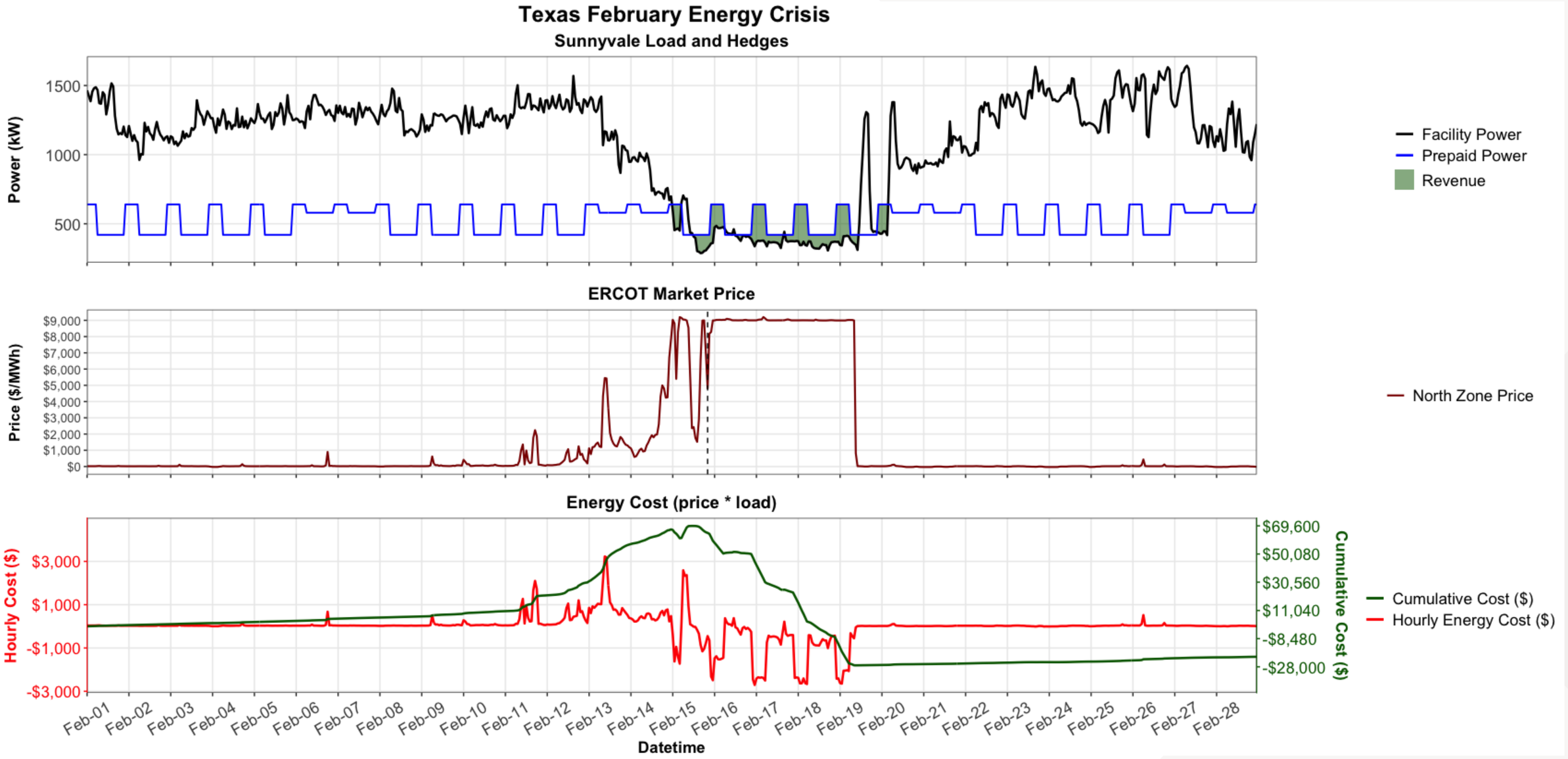
Help Move Technologies from Development to the Commercialization Stage…

Technology Acceleration & Implementation!

My Experience in IAW RD&D

- Working in the Clean Energy Sector for about 30 years
- Mostly in the Energy Utilization Space
- Led EPRI's Industrial Technology RD&D activities as related to Process Industries
- "Restarted" the Energy Efficiency Program at EPRI in 2007
- Currently a Tech Exec in the Electrification & Customer Solutions Research Area
  - Involved in EE/DR RD&D as related to IAW Sectors
- IAW Sectors – Widespread adoption of flexible operations has been challenging
  - Productivity, Product Quality, Emissions, Labor, Profitability etc take center stage in industrial operations

Alex Wolf, Lineage


Texas February Energy Crisis
Sunnyvale Load and Hedges
Power (kW)
1500
1000
500
Facility Power
Prepaid Power
Revenue
ERCOT Market Price
Price ($/MWh)
$9,000
$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
North Zone Price
Energy Cost (price * load)
Hourly Cost ($)
$3,000
$1,000
-$1,000
-$3,000
$69,600
$50,080
$30,560
$11,040
-$8,480
-$28,000
Cumulative Cost ($)
Cumulative Cost ($)
Hourly Energy Cost ($)
Feb-01
Feb-02
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Feb-26
Feb-27
Feb-28
Datetime

Lineage

CALPINE ENERGY SOLUTIONS

Lineage Logistics, LLC
Attn: Accounts Payable
46500 Humboldt Drive
Novi, MI 48377

Account Number: [redacted]
Invoice Number:
Invoice Date:
Payment Terms:
Page 1 of 5

Did You Know?

Should you have questions after reviewing your invoice, email your Account Analyst Erin McNamara at CSAccountAnalysts@CalpineSolutions.com, or call 1-877-273-6772, Option 1, Dial 0, Ext. 8110.

HOW ARE WE DOING? We are always looking for additional ways to ensure your satisfaction. If you would like to share about excellent customer care you've received or ways to improve our service, we'd love to hear from you! Please email us at wecare@calpinesolutions.com or write to us at: Calpine Energy Solutions / Customer Care / 401 W A Street, Suite 500 / San Diego, CA 92101

ACCOUNT SUMMARY INFORMATION

Previous Balance		$3,720.81
Payment Received		$(3,720.81)
Account Balance Before Current Charges		$0.00

CURRENT CHARGES

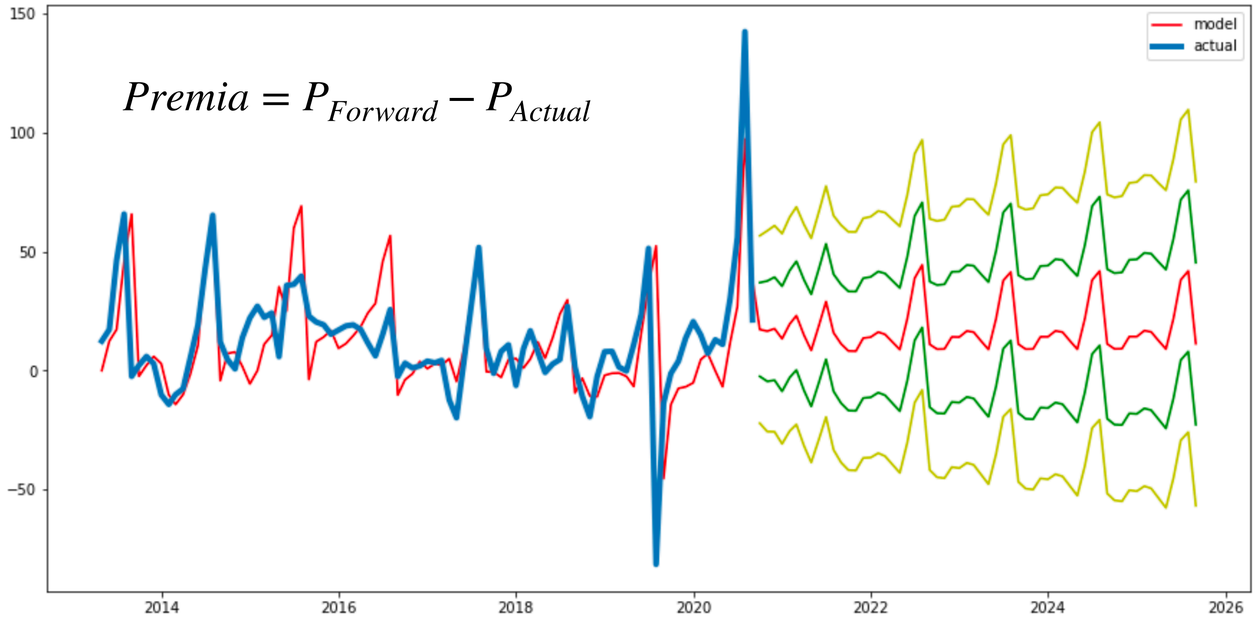
Physical Energy-Current	$(32,536.90)	
Energy Charges		$(32,536.90)
Other Charges		$1,402.05
Total Current Charges		$(31,134.85)

Total Amount Due **$(31,134.85)**

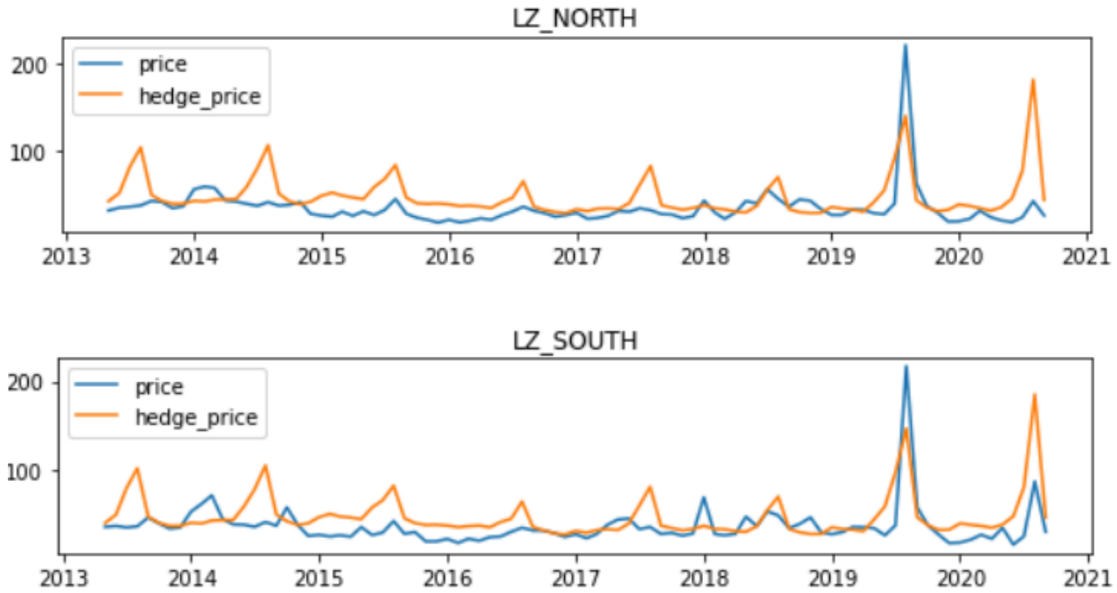
Please see billing details on the following pages.

Lineage

Hedge Premium: N. Texas | 1-yr advance



Hedge Premia | 1-yr advance



SARIMA Model

Trend Elements
Three trend parameters (from ARIMA)

- **p**: Trend AutoRegression order
- **d**: Trend Difference order
- **q**: Trend Moving Average order

Seasonal Elements
Four seasonal parameters that are not part of ARIMA:

- **P**: Seasonal autoregressive order.
- **D**: Seasonal difference order.
- **Q**: Seasonal moving average order.
- **m**: The number of time steps for a single seasonal period.

Lineage

EPIC 4 Workshop - Unlocking Flexibility from Customer Load Management and Distributed Energy Resource Technologies

2. Panel: Research needs for unlocking flexibility in the Buildings Sector (10:50-12:00)

Moderator: David Hungerford, CEC

A. Rachel Kuykendall, Sonoma Clean Power

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C. Mark Martinez, Southern California Edison

D. Peter Klauer, California Independent System Operator

E. Mary Ann Piette, Lawrence Berkeley National Laboratory

Rachel Kuykendall, Sonoma Clean Power

Carmen Best, Recurve

SOUTHERN CALIFORNIA EDISON®
Energy for What's Ahead℠

CA IOU Demand Response Emerging Technologies

Unlocking Flexibility from Customer Load Management and Distributed Energy Resource Technologies

EPIC Workshop June 21, 2021

Mark S. Martinez – Southern California Edison

Demand Response Emerging Technologies

- California's **Demand Response Emerging Technologies** (DRET) programs fund research on innovative technologies, software, and products that can enhance customer DR participation, flexibility, and grid reliability.
- The DRET programs are administrated by Southern California Edison (SCE), Pacific Gas & Electric (PG&E), and San Diego Gas & Electric (SDG&E) and are authorized by the California Public Utilities Commission (CPUC) for the 2018-2022 DR program cycle.

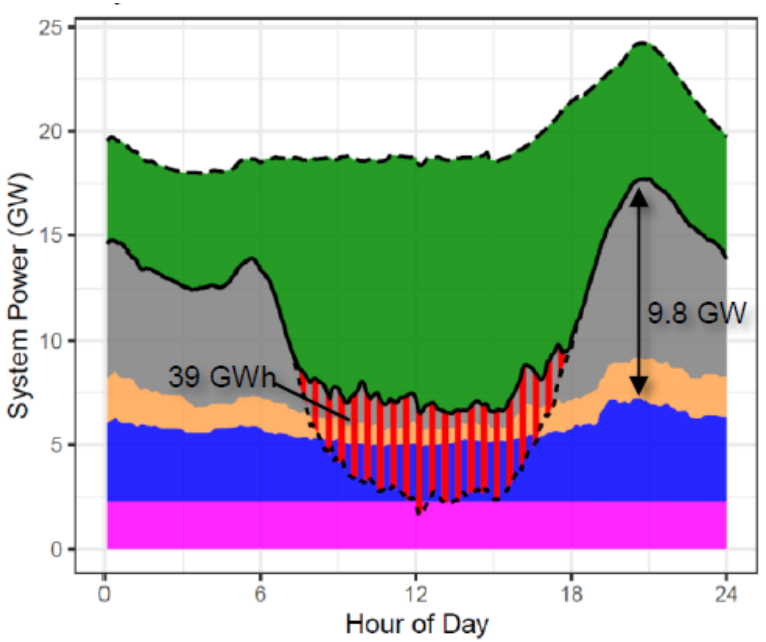
SOUTHERN CALIFORNIA EDISON®
Energy for What's Ahead®

PG&E
Pacific Gas and Electric Company®

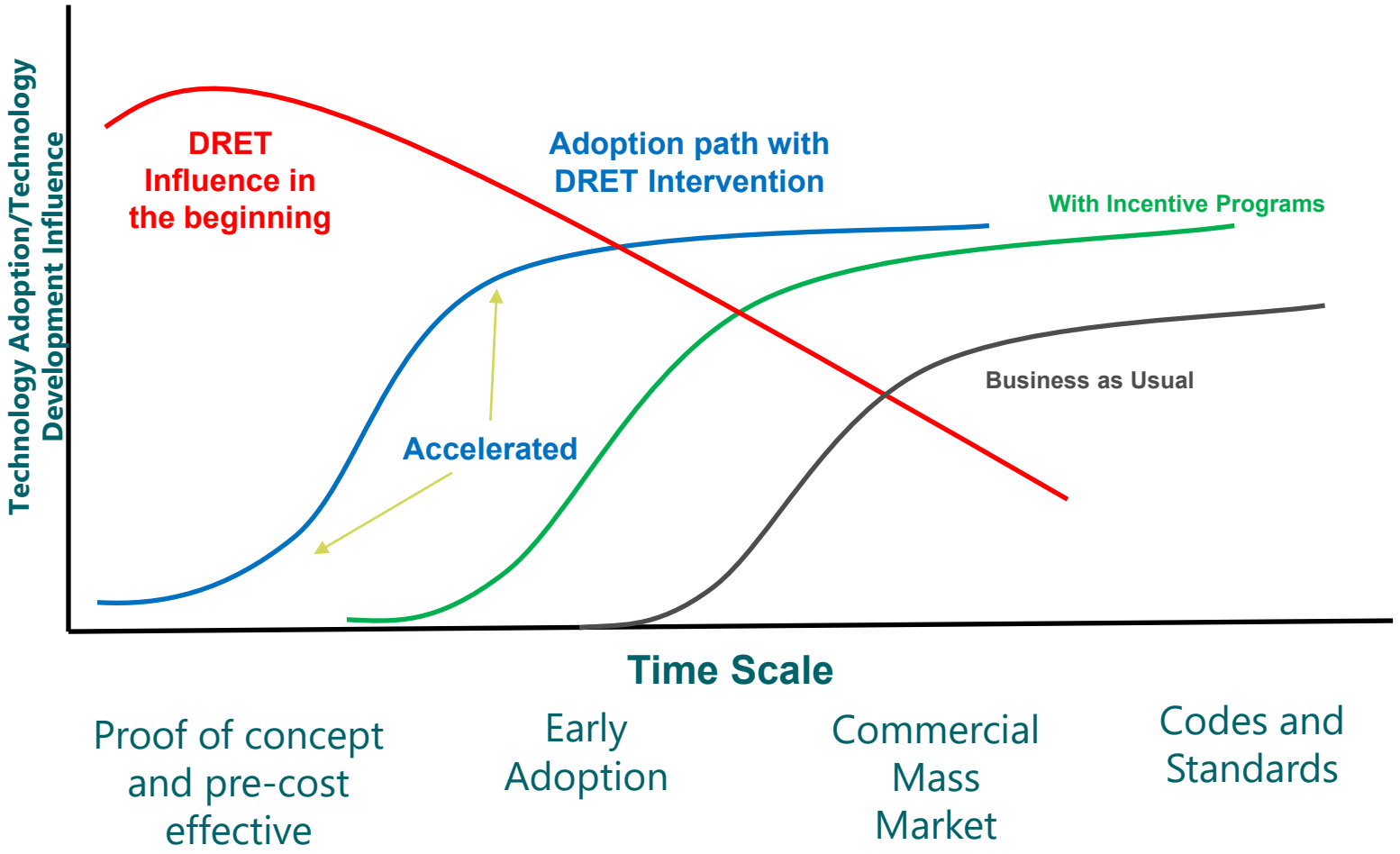
SDGE
A Sempra Energy utility

DRET is strategic for the future of DR

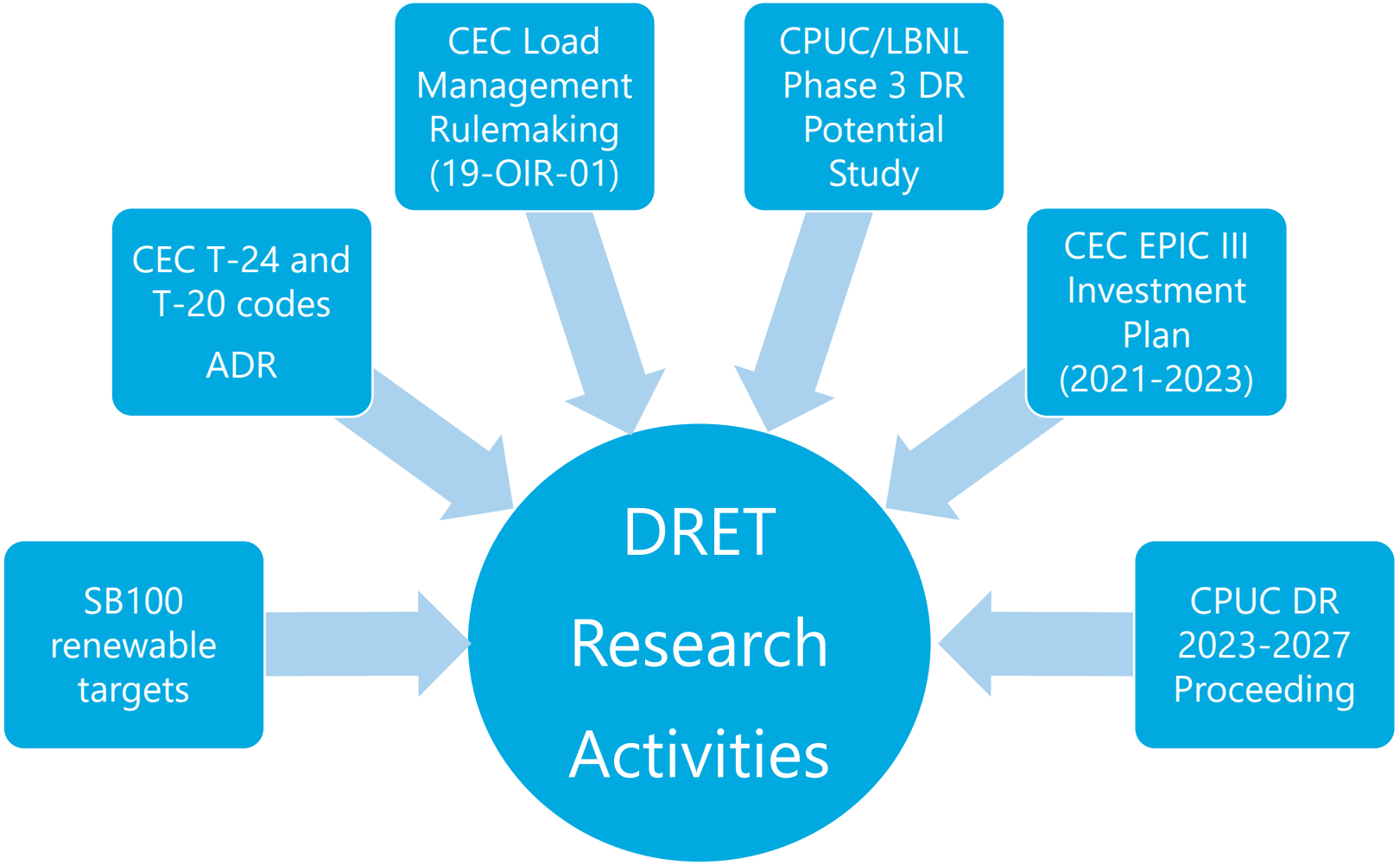
- **The DRET programs are designed to accelerate** developments in markets and technologies faster than traditional DR customer programs can adopt as innovation is often unscheduled and unexpected.
- **The DRET research provides critical information**, for utilities, policy makers, and industry partners to advance the envisioned energy future with rapid deployment of proven, cost-effective technologies.
- **DRET is an approved CPUC strategy** that can assist DR programs so that proven enabling technologies can be scaled and thereby expand the customer participation required to enable new forms of DR and dynamic tariffs that can enhance system flexibility.



Accelerating Flexible Innovation for IOU Customers



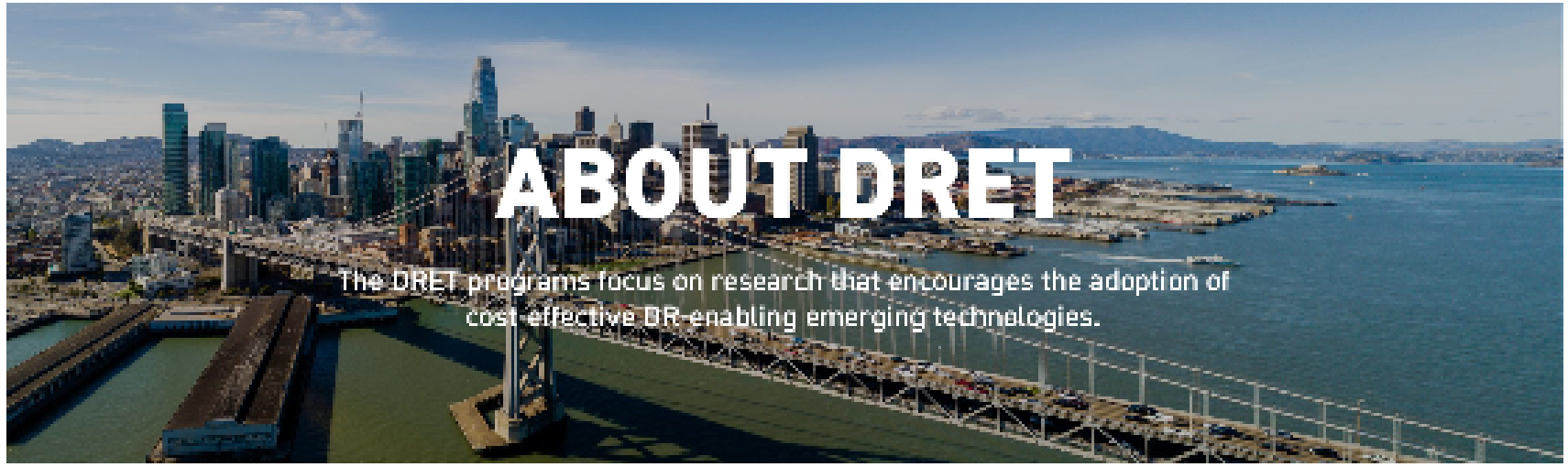
Key Drivers for DRET Research Activities



Learn more at www.dret-ca.com

DRET | DEMAND RESPONSE EMERGING TECHNOLOGIES

ABOUT DRET RESEARCH RESEARCH AREAS COMPLIANCE RESOURCES



The **Demand Response Emerging Technologies (DRET)** collaborative consists of three electric utility research programs in California that are investing more than $25 million over five years for the specific purpose of accelerating the market adoption of innovative demand response enabling technologies in all customer sectors to meet California's electric reliability and climate goals.

The programs in the DRET collaborative are funded by and also benefit electricity ratepayers from the state's three largest investor-owned utilities – Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E) and is authorized by the California Public Utilities Commission (CPUC) through 2022.

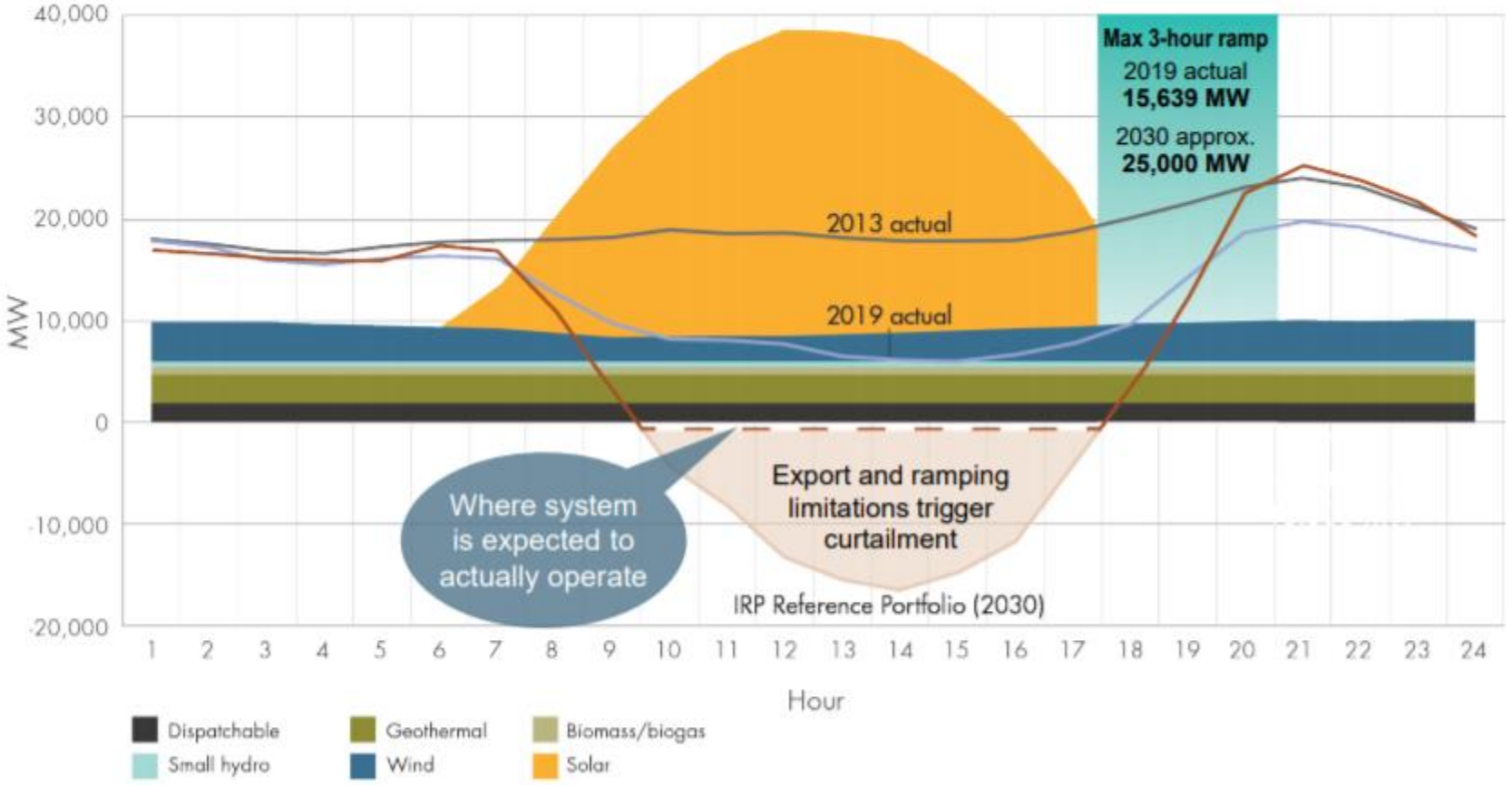
California ISO

Renewable Integration and Grid Needs

Peter Klauer
Senior Advisor, Smart Grid Technology

2021 EPIC Load Flexibility Workshop Panel:
Research Needs for Unlocking Load Flexibility in the Buildings Sector
June 21, 2021

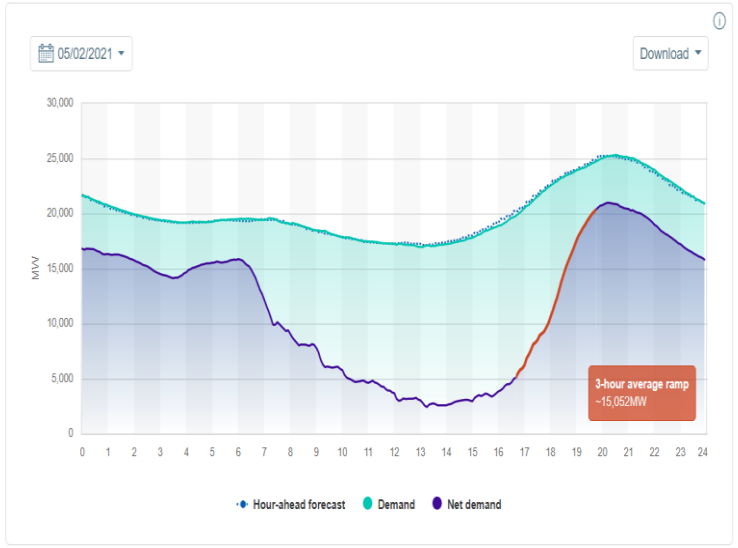
Ramping needs will likely continue to increase through 2030



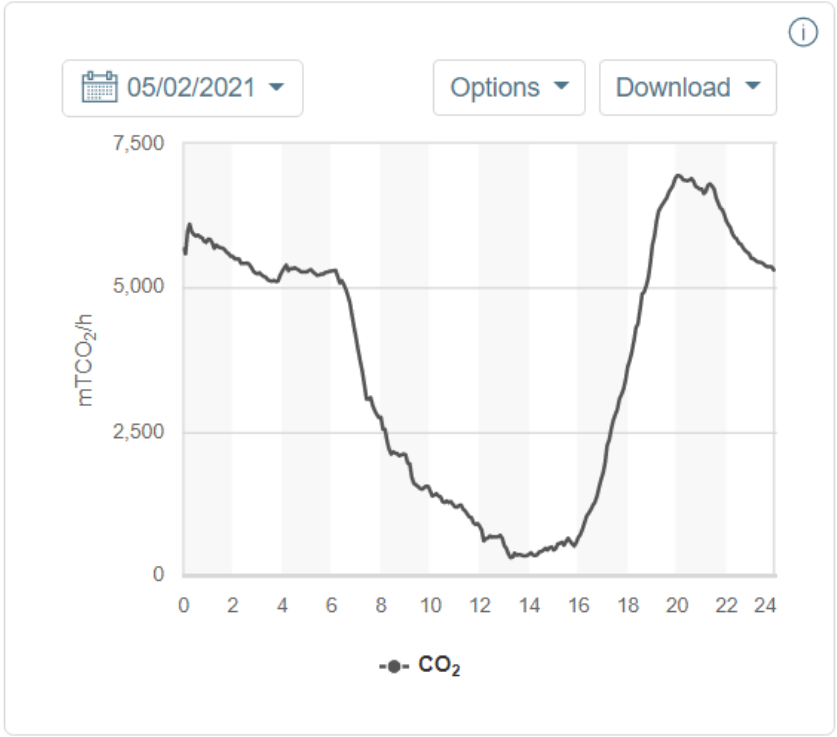
In the CAISO markets, operations, supply/demand, and emissions are well aligned with wholesale price signals

Example from May 2, 2021

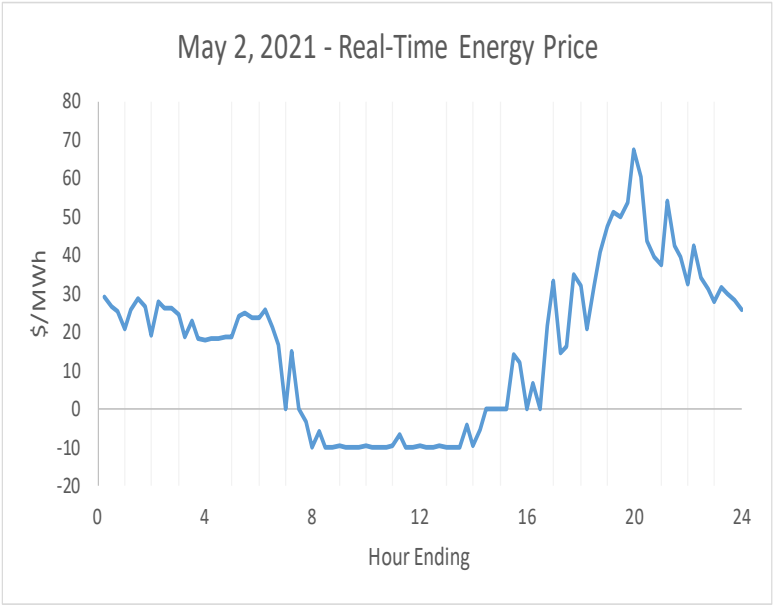
Net demand



CO2 emissions



Real-time Wholesale Energy Price



Energy component of locational marginal price only from fifteen minute market

Addressing renewable integration requires a highly flexible solution to address grid needs across 8760 hours

- CAISO strongly supports greater demand flexibility and new “grid informed” rate options that can generate beneficial flexible demand across all days and hours of the year
- CAISO supports load curtailment and load management through the ISO market with a focus on improved certainty and flexibility
- There is significant value in the ability of flexible loads to shape and shift loads through grid informed rate options and autonomous consumption modification based on real time grid conditions
- How do we quantify and distribute the savings resulting from operating the grid to a flatter load curve?

Research Needs to Advance Load Flexibility in Buildings

EPIC Load Flexibility Workshop Panel
June 21, 2021

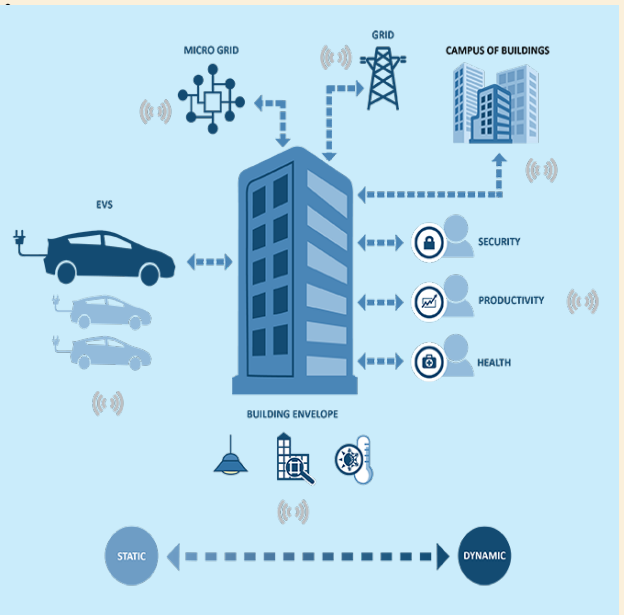
Mary Ann Piette
Division Director, Building Technology and Urban Systems
Lawrence Berkeley National Laboratory

BERKELEY LAB

ENERGY TECHNOLOGIES AREA

Six Key Recommendations for Future RDD&D

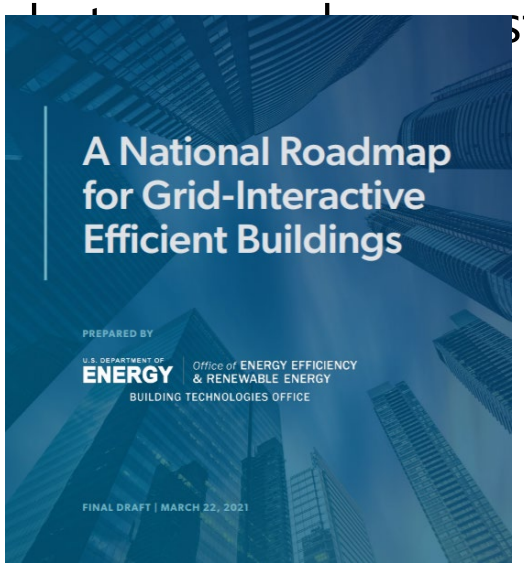
- **Thermal Energy Storage** – Create and evaluate new approaches to provide efficient and cost effective **TES**.
- **Controls and IT** - Develop and test new control and information technology to provide automated efficient demand flexible operations.
- **Integrated System Packages** - Create retrofit **ISPs** that promote combined energy efficiency and DF.
- **Evaluate Delivery Methods** - Support development and testing of user-friendly, affordable integrated whole-build DF control and evaluate costs and benefits.
- **Benchmark Demand Flexibility** - Develop metri collect and publish data to describe, performance, costs and benefits of **DF** in real buildings by type, climate, etc.
- **Distributed Energy Resources** - Develop and tes control and IT to integrate DF with **DERs** such as P electric storage and EVs.

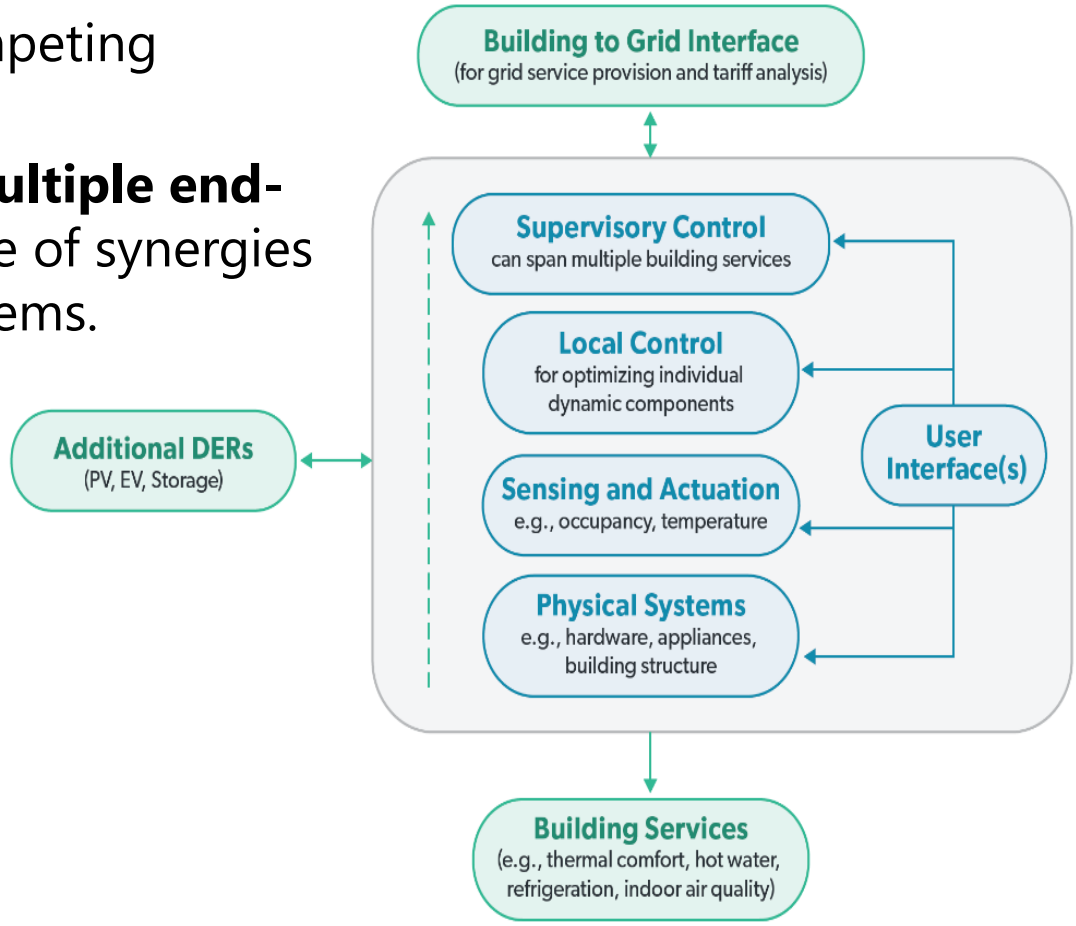


R&D is need to Integrate Physical Hardware and Software Systems

2 types of technology integration

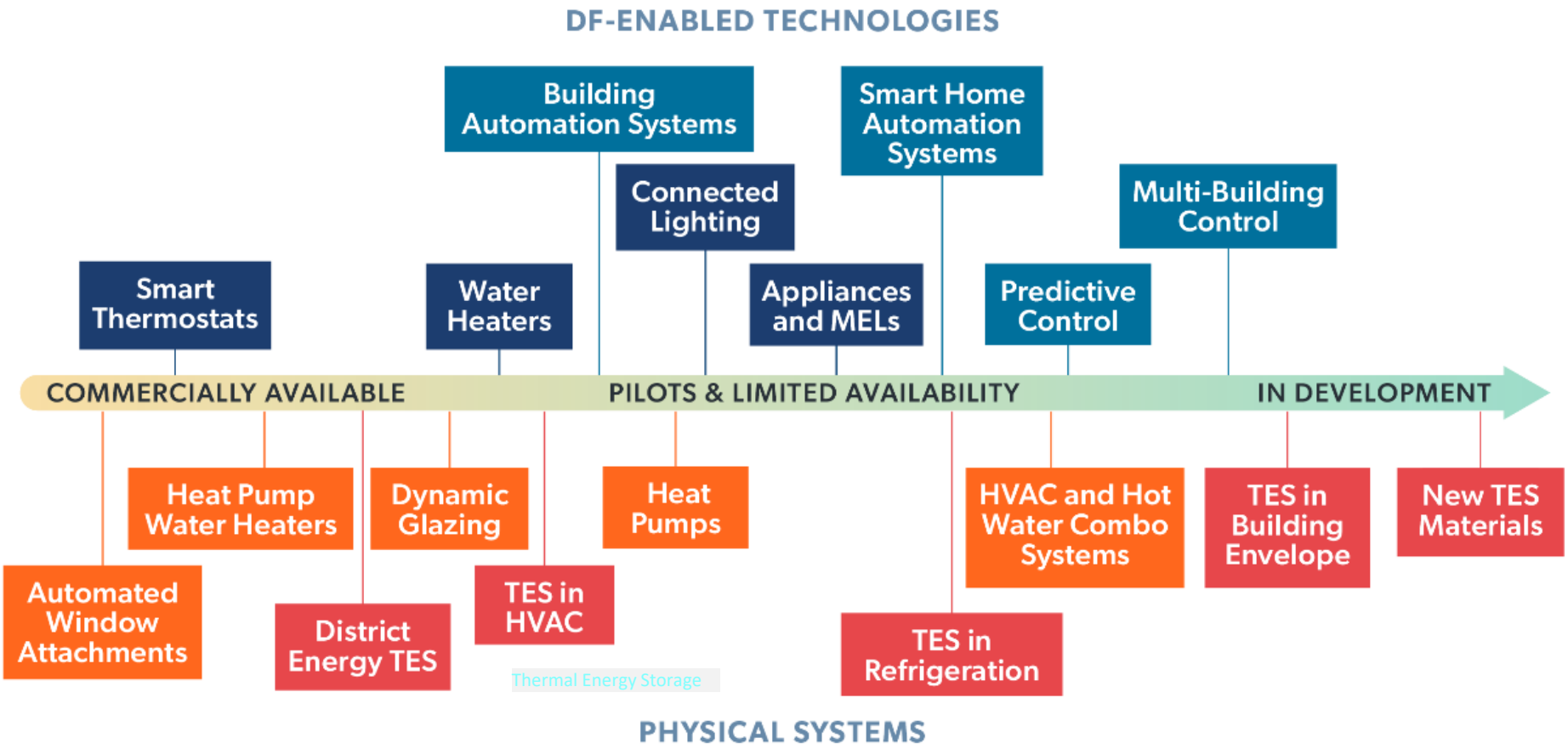
1. **Integration between layers -** maximizes performance and avoids conflicts between competing objectives.
2. **Integration across multiple end-uses -** takes advantage of synergies [illegible]stems.





DF will Unlock New Opportunities to improve Efficiency and Grid-Interactivity of Building Technologies

Technology Pipeline, with Examples for Each Technology Layer

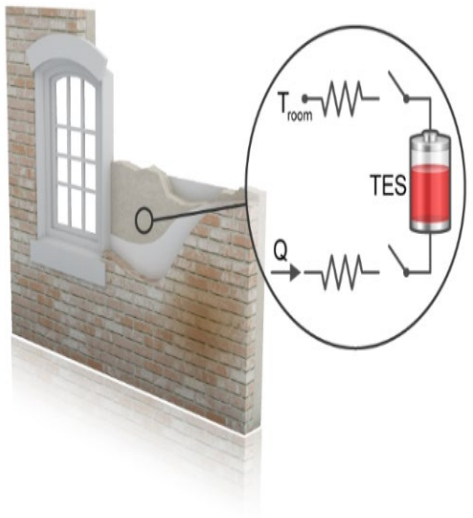


GEB TECHNOLOGY LAYERS

- Supervisory Control
- Local Control
- Physical Systems
- Thermal Energy Systems

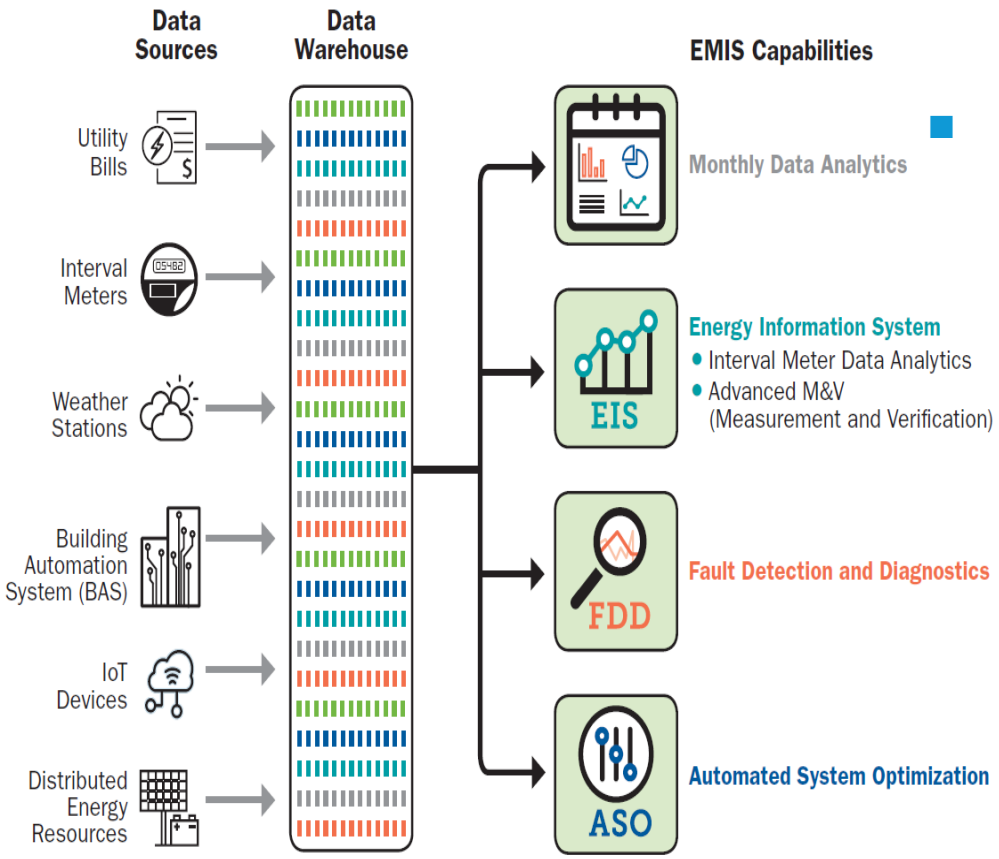
Thermal Energy Storage R&D Needs

- Develop improved **measurement methods and standards** for all TES storage mediums, ice, water, PCMs, etc.
- **Develop and evaluate cost and benefits of TES** Integrated with space heating and cooling, refrigeration, hot water, district energy, or envelope systems.
- Improve **prediction of storage and automated control,** and tools to help design how to integrate TES with other systems.
- **Develop dynamically tunable TES** materials that can modify switching temp or characteristics for summer and winter.
- **Develop thermal circuits** elements, diodes, switches, and transistors, to control directional heat and mass transfer



Create Next Gen Energy Management and Information Systems (EMIS) that include Automated Demand Flex Controls

CURRENT STATE OF THE ART OF EMIS

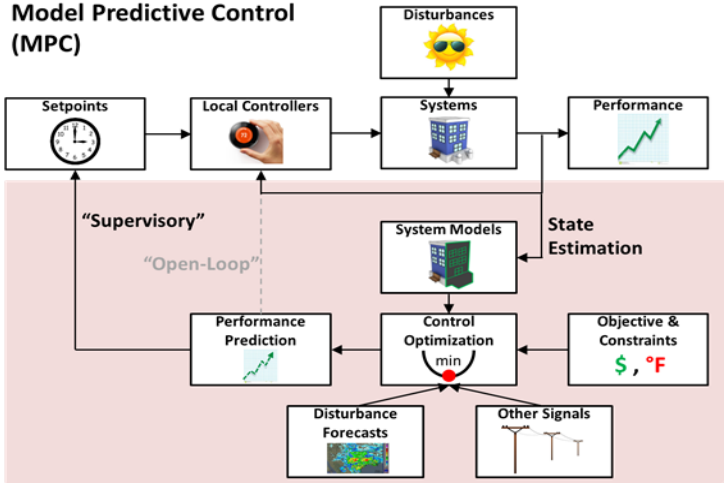


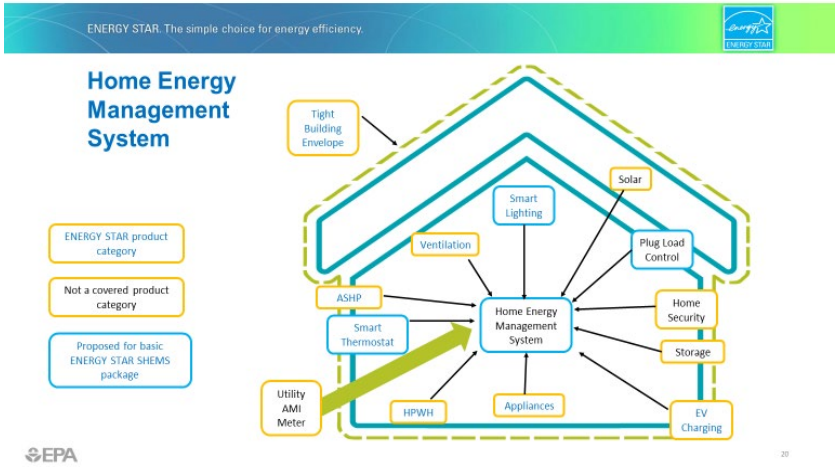
- State of the art EMIS provide meter data analytics, continuous fault detection, and control optimization.
- To realize low-energy/carbon, demand-flexible buildings, new capabilities must be developed, tested, and incorporated into commercial EMIS :
  - Automated commissioning
  - Enhanced fault root cause isolation
  - Incorporation of DF controls
  - Associated performance metrics by end-use and whole building

Enabling Technologies and Practices

- **Controls and IT** - Support development of user-friendly, affordable integrated whole-building **predictive control** and grid service delivery.
  - Evaluate how to enable greater use **of open communication protocols and semantic interoperability** using standards such as BRICK, Haystack, BACnet, OpenADR, and others, while evaluating and ensuring cybersecurity.
  - Develop decision support tools to help evaluate DF and DER selection.

- **Benchmarking DF** - Develop and publish data sets that provide metrics, costs, and benefits of **DF and DER integration technology** in real buildings and industrial applications.
  - Develop standard methods for data collection and analysis, and measurement and verification of DF technologies and strategies.





Break (12:00-1:30)

This session will end, and you will need to log back in at 1:30.

Webinar ID: 927 0621 5380

Password: EPIC2021

EPIC 4 Workshop - Unlocking Flexibility from Customer Load Management and Distributed Energy Resource Technologies

3. Panel: Research needs for unlocking flexibility in the Industrial, Agricultural, and Water Sectors (9:40-10:50)

Moderator: Ben Wender, CEC

A. Ted Bohn, Argonne National Lab

B. Jasna Tomic, CalStart

C. Joseph Gottlieb, Rhombus Energy Solutions

D. Jackie Pierro, Nuvve

E. Tom McCalmont, Paired Power

Ted Bohn,
Argonne National Lab

Jasna Tomic,
CalStart

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Rhombus Energy Solutions

Jackie Pierro,
Nuvve

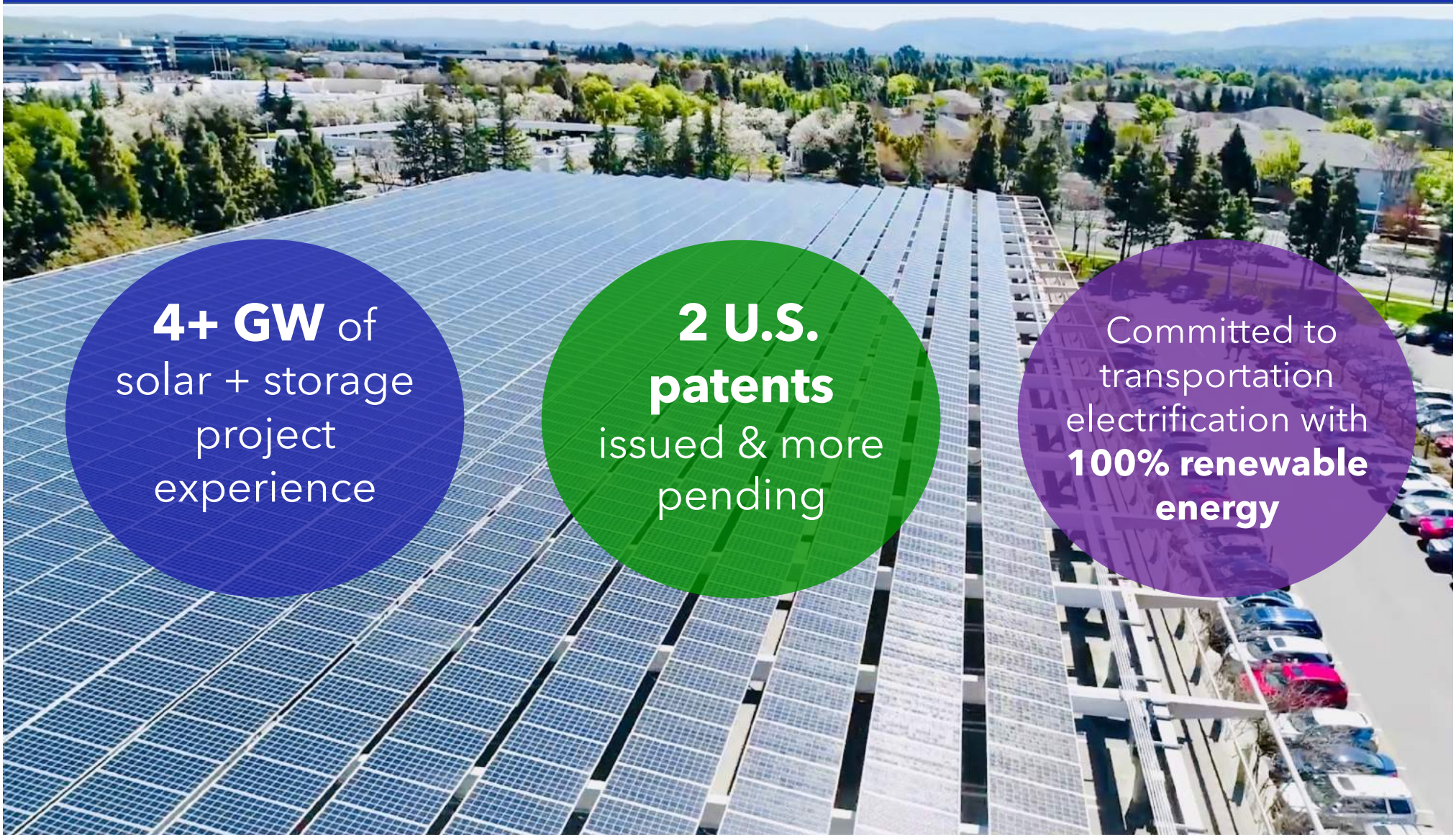
PAIRED POWER

DC-DC EV Charging Solutions w/ DERs

June 2021

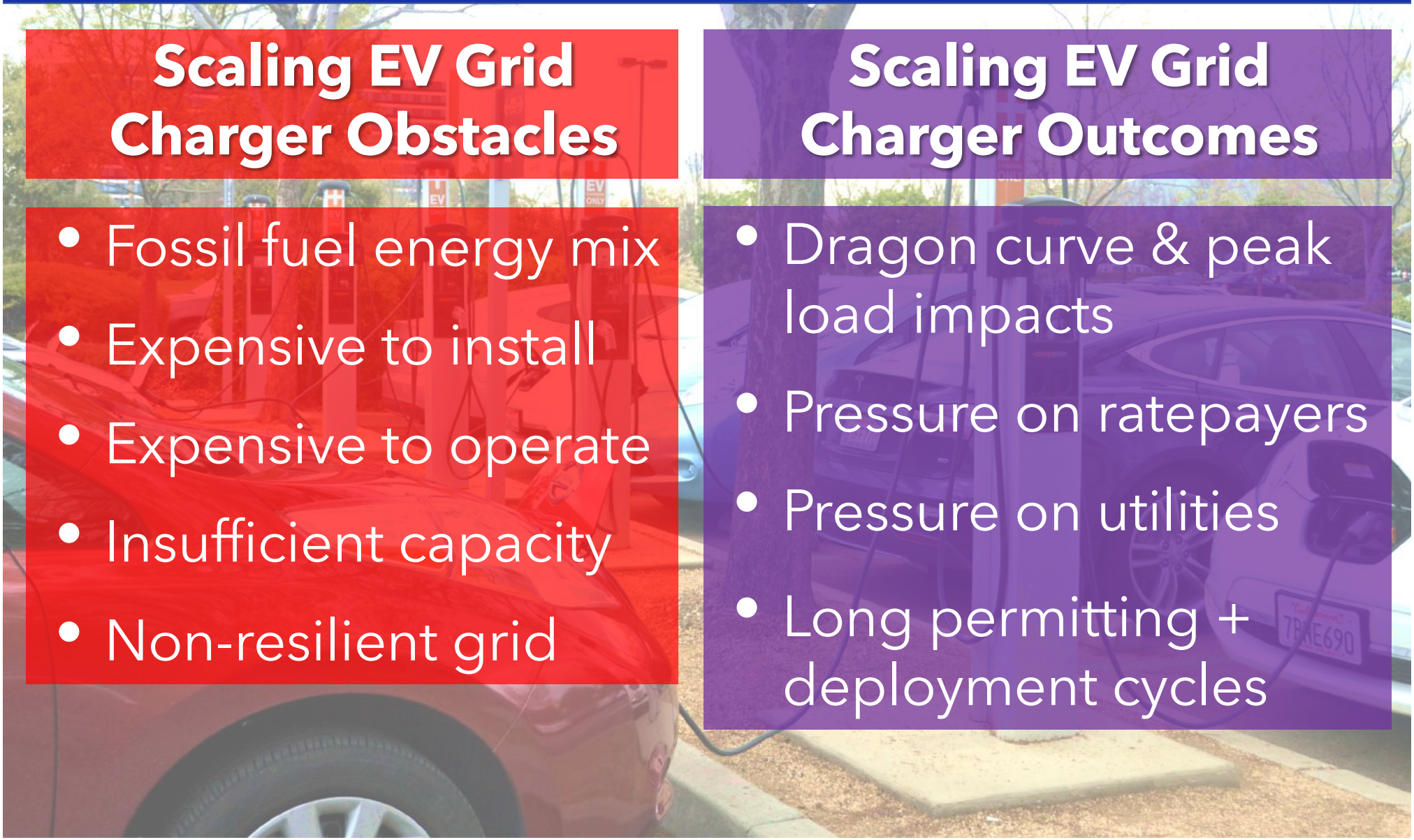
Tom McCalmont
CEO

Paired Power Background



PAIRED POWER

EV Charging Infrastructure Challenges



Scaling EV Grid Charger Obstacles

- Fossil fuel energy mix
- Expensive to install
- Expensive to operate
- Insufficient capacity
- Non-resilient grid

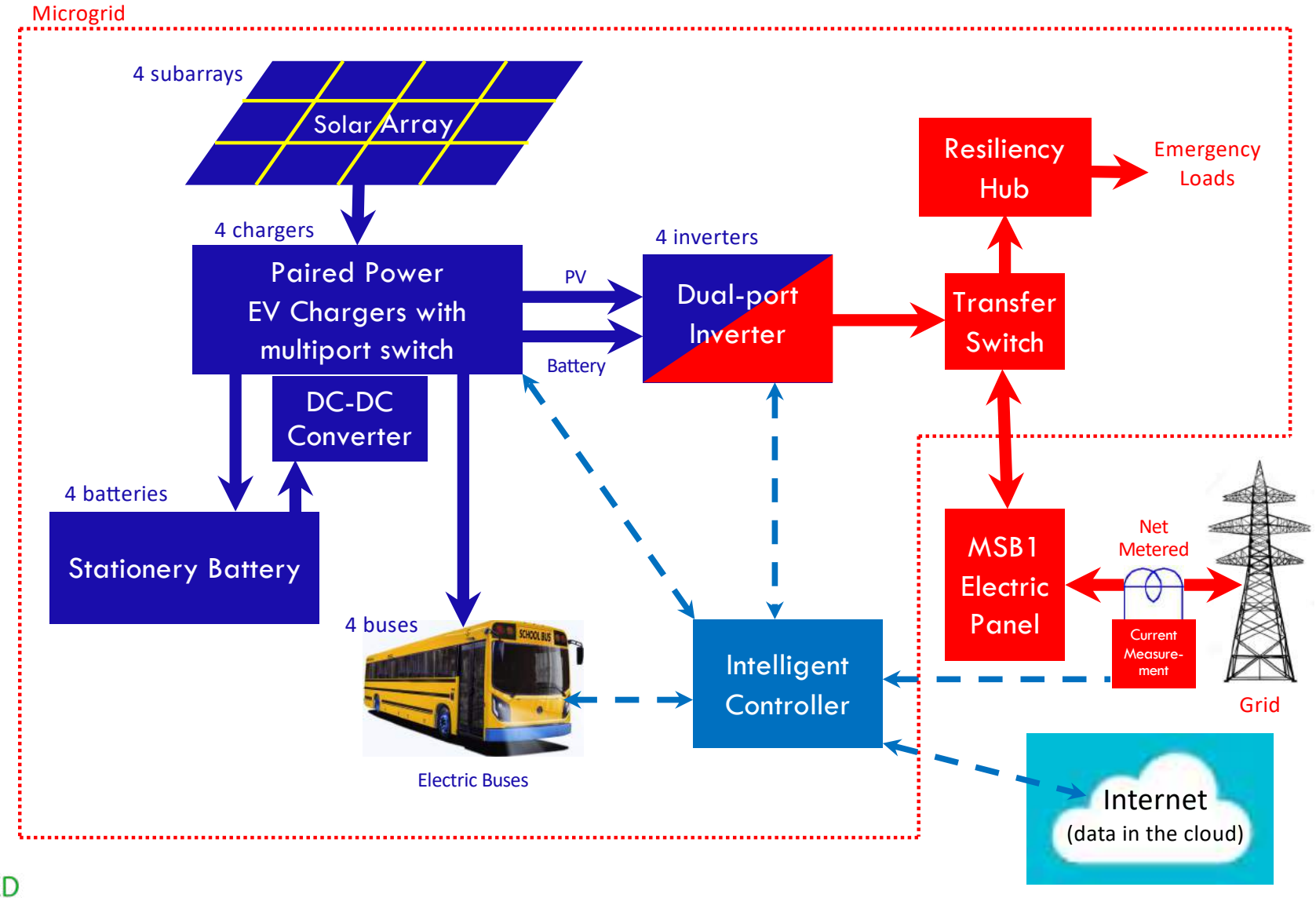
Scaling EV Grid Charger Outcomes

- Dragon curve & peak load impacts
- Pressure on ratepayers
- Pressure on utilities
- Long permitting + deployment cycles

PAIRED POWER

Paired Power EV Charging Solution

DC-DC Architecture w/ DERs



Paired Power EV Charging Benefits

Commercial Solar

Battery and Microgrids

Smart EV charging

DC-DC Architecture w/ DERs

- ☑ 100% Renewable
- ☑ 100% Resilient
- ☑ Islanded or Grid-connect
- ☑ Greater Energy Efficiency
- ☑ Scalable
- ☑ No Utility Upgrades
- ☑ Vehicle to Grid Capable

PAIRED POWER

Lead the Charge. Drive Solar!

PAIRED POWER

PUBLIC INPUT SESSION

Stakeholder Comments on the Scope of the EPIC 4 Investment Plan

- 3 minutes per commenter, 1 commenter per organization
- Please clearly state your name and affiliation
- Use the raise hand function in Zoom and wait to be called upon to unmute
- Type questions/comments into the Q/A window

https://www.online-stopwatch.com/full-screen-stopwatch/

Next Steps

To stay involved in EPIC 4:

Visit **www.energy.ca.gov/epic4.**

Submitting Written Comments and EPIC 4 Plan Concepts:

Please use CEC's **e-commenting** system:
https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-EPIC-01

See **notice** for **e-mail and U.S. Mail** commenting instructions:
https://efiling.energy.ca.gov/getdocument.aspx?tn=238093

Workshop Comments are due June 28, 2021.

Stakeholder Input Forms are due July 2, 2021. (Download at https://www.energy.ca.gov/media/5703)

Thank You