

<b>DOCKETED</b>	
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# Distributed Energy Resources Research Roadmap

Hosted by Gridworks

7.25

Oakland Center - Merritt 1 Room

Please go to <https://energy.webex.com/ec>

Access code: 922 825 508

Meeting Password: No password is required

# WORKSHOP AGENDA

Welcome and Overall Workshop Purpose	10:00am - 10:05am
Introductions - Project Orientation	10:05am - 10:30am
Introduction to the Roadmap Methodology	10:30am - 11:15am
Initial Chapter Overviews	11:15am - 12:00pm
Lunch	12:00pm - 1:00pm
Soliciting Research Needs (1)	1:00pm - 1:45pm
Exercise Assessment	1:45pm - 2:00pm
Soliciting Research Needs (2)	2:00pm - 2:45pm
Next Steps	2:45pm - 3:00pm
Adjournment	3:00pm

# DER RESEARCH ROADMAP PRIORITIZATION METHODOLOGY

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JULY 25, 2019

# DER Roadmap Website

<https://ww2.energy.ca.gov/research/distributed-energy-resource-roadmap/>

## Distributed Energy Resources (DER) Roadmap

In 2018, the California Energy Commission initiated a project with Navigant Consulting, Inc. to help ensure that Electric Program Investment Charge (EPIC) funds are strategically focused and sufficiently narrow to make advancements on the most significant technological challenges along with new analysis that is needed that identifies and prioritizes research, development, demonstration and deployment (RDD&D) gaps to achieving California's goals for integrating high penetrations of distributed energy resources (DER). This roadmap will focus on assessing the technology cost and performance of emerging technologies that best facilitate greater penetration of DER into the grid, as well as on identifying the data needed to advance DER policy and increase the availability of financing.

For questions, please contact:

Liet Le  
California Energy Commission  
Phone: 916-327-1450  
E-mail: [Liet.Le@energy.ca.gov](mailto:Liet.Le@energy.ca.gov)

News media, please call: Media & Public Communications Office – 916-654-4989.

### Proceeding Information


- ▶ Workshops, Notices, and Documents
- ▶ Submit comments (19-MISC-01)
- ▶ [Docket Log](#) (19-MISC-01)

## Today's Purpose: Primary Outcomes


1. Solicit Additional Research Needs for the DER Research Roadmap
2. Receive Feedback on Currently Identified Research Needs
3. Preliminary Priority Identification

# ROADMAP STRATEGY OVERVIEW


## Energy System Goals




**Sustainability**  
The operation of the power system in a manner that contributes to the reduction of pollutants, considering environmental, social and economic factors.




**Affordability**  
The ability of the system to provide electric service at a cost that does not exceed customers' willingness and ability to pay for those services.




**Reliability**  
Uninterrupted delivery of electricity with acceptable power quality in the face of routine uncertainty in operation conditions.



**Resiliency**  
The ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions, including deliberate attacks, accidents, or natural disasters.



**Flexibility**  
Ability of the grid to respond to future uncertainties that stress the system in the short term and may require adaptation in the long run.




**Security**  
The ability to resist external disruptions to the energy supply infrastructure caused by intentional physical or cyber attacks or by limitation of access to critical materials.


Source: Grid Modernization Laboratory Consortium (DoE) Metrics Analysis

*What do these technologies need to do?*


## Market Barriers




**Cost**  
The component, production or operational costs of the resource are above what is required for adoption.




**Uncertainty**  
Limited information on the immediate or future performance of the resource restricts potential uses.



**Valuation**  
The resource is not adequately compensated for benefits it is providing to the power system.



**Coordination**  
Complexity of the interactions between various participants in the ownership and utilization of the resource limits adoption.



**Capability**  
The performance characteristics of the technology are not sufficient to replace existing solutions.

*What are the current limitations?*

## Research Solutions

Step 1: Identify Research Needs	Step 2: Initial Screen	Step 3: Sort Opportunities	Step 4: Priority Screen	Step 5: Sort Opportunities	Step 6: Schedule Activities
CEC-Desired Research TAC-Identified Needs Public Workshops Needs		High Potential Watch List No Further Review		High Priority Watch List	Roadmap Recommendation

**Go/No-Go Criteria:**

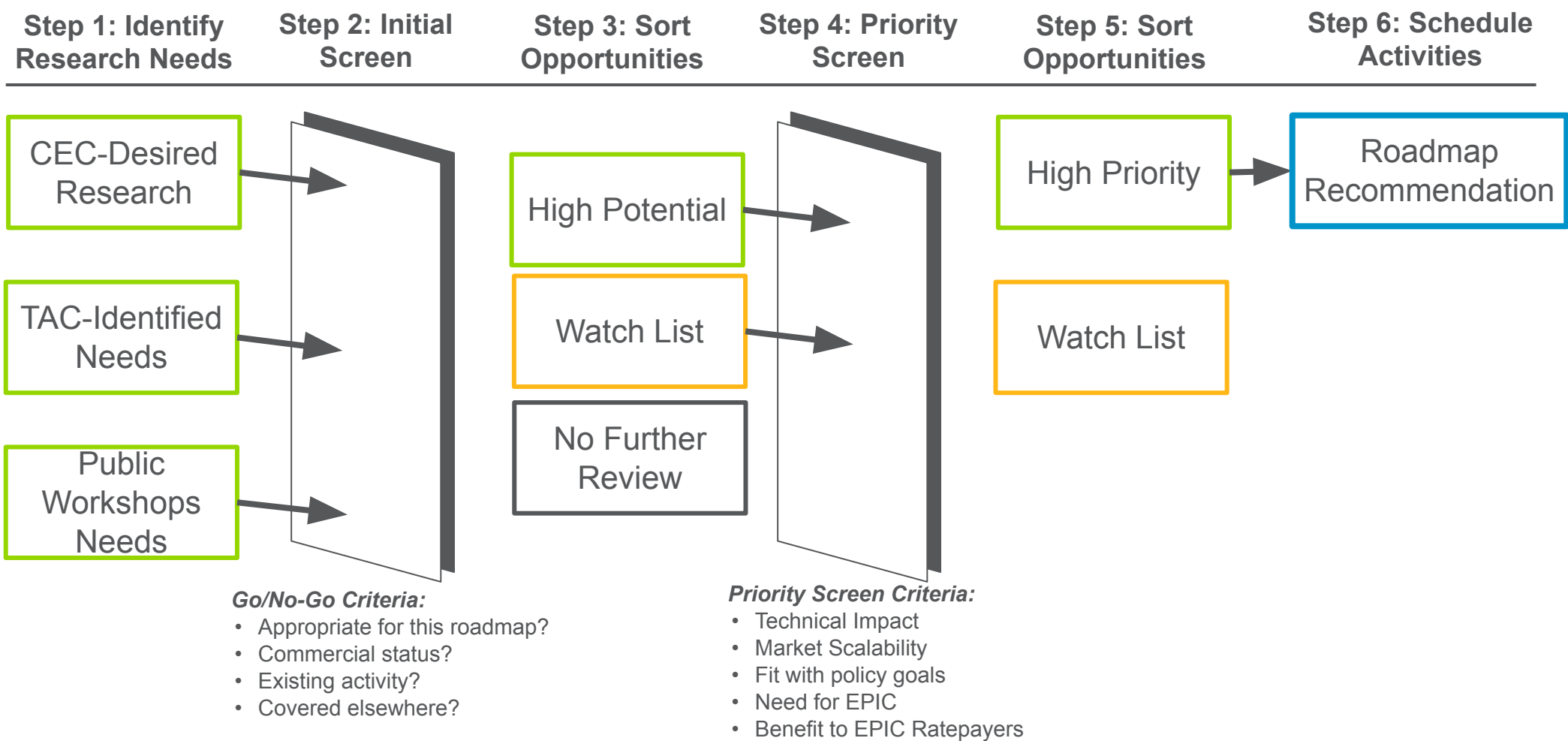
- Appropriate for this roadmap?
- Commercial status?
- Existing activity?
- Covered elsewhere?

**Priority Screen Criteria:**

- Technical Impact
- Market Scalability
- Fit with policy goals
- Need for EPIC
- Benefit to EPIC Ratepayers

*What research can resolve the issues?*

# ROADMAP METHODOLOGY



# PROJECT SCHEDULE

Date	Milestone	Description	Actors
5.29.19	TAC Meeting	DER Research Roadmap TAC	TAC Members, Navigant, CEC staff
7.25.19	Step 1 Workshop	This workshop will introduce a prioritization methodology to rank potential DER research needs and produce the final Research Roadmap and solicit input from stakeholders on what additional research needs should be assessed.	Gridworks, TAC Members, Stakeholders
Post-Workshop	Step 2	Initial screening of research needs	Navigant + CEC Staff
Post-Workshop	Step 3	Sorting of research needs	Navigant + CEC Staff
August 2019	TAC Input into Step 4	TAC members provide preliminary scoring of research needs	Navigant + CEC Staff + TAC Members
September 2019	Step 4 Workshop	Publically review the preliminary scoring of research needs	Gridworks, TAC Members, Stakeholders
Post-Workshop	Step 5+6	Prioritize and schedule opportunities	Navigant + CEC Staff
Early October 2019	TAC Input	TAC input on draft status	TAC Members

# STEP 1: IDENTIFY RESEARCH NEEDS

1. ***Consider the barriers identified in the Technical Assessment***
2. ***Identify initiatives that could overcome the barriers***
3. ***Describe characteristics of Research Opportunities to use in prioritization***

## Standardized Research Opportunity

- Brief Description
- EPIC Investment Area
- Policy Goals Addressed
- Barriers Resolved
- Metrics Impacted
- Market Scalability
- Level of Effort
- Pre-requisites or Dependencies

*Discussed in detail  
in the next section*

### CEC-Identified Research

- Solicited through Technical Assessment process
- Produce example Standardized Research Opportunities from the Technical Assessment

### TAC-Identified Needs

- Provide TAC with examples, request they include any additional
- Review opportunities so far at TAC meeting (5/29)

### Public Workshop Needs

- Technical Assessment Workshop (3/25)
- Research Needs Workshop (7/25)
  - Refresh Roadmap process
  - Introduce Standardized Research Needs format
  - Invite additions

## EPIC INVESTMENT AREAS

### Applied Research and Development

Activities to support pre-commercial technologies at applied lab or pilot stages

**\$159.8M\***

### Technology Demonstration and Deployment

Installation and operation of pre-commercial technologies at real-world scale

**\$173.2M**

### Market Facilitation

Commercialization assistance, local government regulatory streamlining, market analysis, and program evaluation

**\$66.6M**

*\*California Department of Finance  
Projections for EPIC 2018-2020 Period*

## STEP 2: INITIAL SCREEN

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Appropriate  
for this  
roadmap?

Technologies impacting solely the bulk power system and questions arising from policy barriers will be filtered.

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Commercial  
status?

Research topics in areas that have achieved full commercial status will be filtered. Pre-commercial services are not filtered, even if provided by commercial technologies.

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Existing  
activity?

Research topics already sufficiently under investigation will be filtered.

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Covered  
elsewhere?

Research topics that would be better covered by another research entity will be filtered.

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## STEP 3: SORT OPPORTUNITIES

### High Potential

Research activities that are immediately appropriate for research solicitations by CEC.

### Watch List

Research activities that should not be immediately pursued on the DER Roadmap, but could be through another CEC effort.

### No Further Review

Research activities that should not be pursued by CEC.

## STEP 4: PRIORITY SCREEN

### Priority Screen Process

- Develop numerical scale to quantify opportunities with TAC
- Grade opportunities using scale with CEC and TAC
- Process research opportunities
- Produce ranking

Technical  
Impact

How much is this research effort expect to improve the DER performance metrics?

Market  
Scalability

How much can the performance improvements benefit the energy system?

Fit with  
policy goals

How effectively does the research achieve California's energy system goals?

Need for  
EPIC

How necessary is EPIC research funding to performing this research?

Benefit to  
EPIC  
ratepayers

How much do EPIC ratepayers benefit relative to the estimated cost of the project?

## STEP 4: PRIORITY SCREEN DETAILS

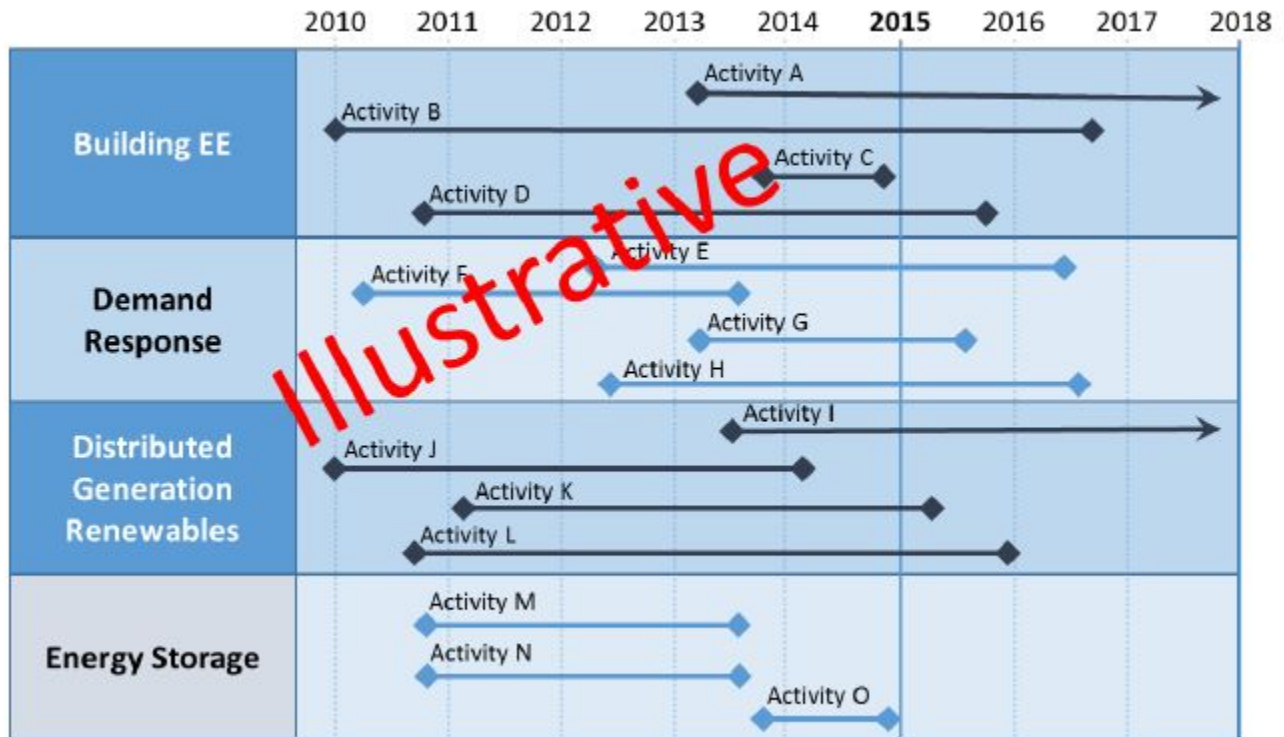
Metric	5	4	3	2	1	Weight
Technical Impact	Significant	Semi-significant	Moderate	Modest	Minimal	20%
Market Scalability	Significant	Semi-significant	Moderate	Modest	Minimal	15%
Fit with Policy Goals	Core to goals	Semi-core to goals	Relevant to goals	Semi-relevant to goals	Not relevant to goals	30%
Need for EPIC	Critical to success	Semi-critical to success	Beneficial to success	Semi-beneficial to success	Unnecessary for success	15%
Benefit to EPIC Ratepayers	Significant	Semi-significant	Moderate	Modest	Minimal	20%

## STEP 5/6: PRIORITIZE AND SCHEDULE ACTIVITIES

1. *Identify prioritized research that exceeds cut-off.*
2. *Sort into short (1-3 year), medium (3-5 year), and long term (5+ year) efforts.*
3. *Produce coordinated schedule for solicitation development.*

### Scheduling Criteria

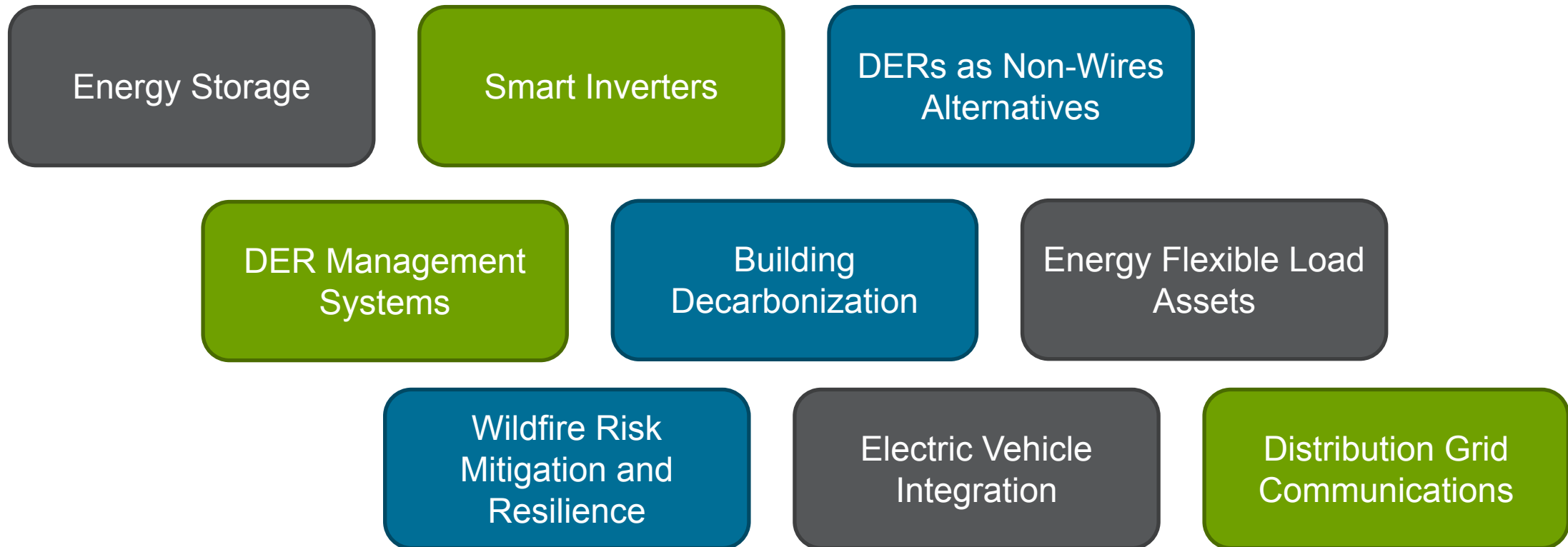
- Pre-requisites
- Time to market
- Time to value



# RESEARCH NEED DEFINITIONS

Brief Description	What research would be performed?
EPIC Investment Area	Which of the CEC EPIC Program Areas would be the funding source?
Policy Goals Addressed	Which of California's policy goals would be addressed by this research?
Barriers Resolved	Which barrier or barriers will this research alleviate?
Metrics Impacted	How much is the research expected to improve DER technical metrics?
Benefit to EPIC Ratepayers	How would EPIC ratepayers benefit from this research?
Pre-requisites or Dependencies	What other research would this opportunity enable? Is there any research that would be a pre-requisite?

## Current Research Needs Areas:



Please note that this is not an exhaustive or ordered list and can be expanded to reflect newer priority areas

## Current Contributors:

Gridworks would like to recognize the work done by several contributing TAC organizations including:



Contributions from these groups will be reflected under the appropriate research needs areas within the room.

# Research Needs Template

[Template  
Accessible Here](#)

DER Research Needs Template	
1. Brief Description	
<div>Short description of project. If it is similar to existing or planned research but provides additional value, please note.</div>	
2. EPIC Investment Area	
<div>Select a Research Area</div>	
3. Policy Goals Addressed	
Name of Goal	Description how the research supports the requirement
4. Barriers Resolved	
Barrier	Description how the research resolves the barrier
5. Metrics Impacted	
Metric	Estimation of impact
6. Benefit to Ratepayers	
Select a Benefit Category	How will the research provide this benefit?
Select a Benefit Category	How will the research provide this benefit?
Select a Benefit Category	How will the research provide this benefit?
7. Level of Effort	
<div>Rough estimate of project cost and timeline</div>	

## EPIC Investment Areas:

1. Applied Research and Development
2. Technology Demonstration and Deployment
3. Market Facilitation

# Ratepayer Benefit Categories (1/3)

## Ratepayer Benefit Categories

- 1a. Number and total nameplate capacity of distributed generation facilities
- 1h. Customer bill savings (dollars saved)
- 1b. Total electricity deliveries from grid-connected distributed generation facilities
- 1i. Nameplate capacity (MW) of grid-connected energy storage
- 1c. Avoided procurement and generation costs
- 1d. Number and percentage of customers on time variant or dynamic pricing tariffs
- 1e. Peak load reduction (MW) from summer and winter programs
- 1f. Avoided customer energy use (kWh saved)
- 1g. Percentage of demand response enabled by automated demand response technology (e.g. Auto DR)

## Ratepayer Benefit Categories (2/3)

### Ratepayer Benefit Categories

- 2a. Maintain/Reduce operations and maintenance costs
- 2b. Maintain/Reduce capital costs
- 2c. Reduction in electrical losses
- 2d. Number of operation of distribution grid devices
- 2e. Non-energy economic benefits
- 2f. Improvements in system operation efficiency from increased flexibility
- 2g. Energy Security

# Ratepayer Benefit Categories (3/3)

## Ratepayer Benefit Categories

- 3a. GHG Emissions reduction
- 3b. Criteria air pollution emission reductions
  
- 4a. Outage number, frequency, duration reductions
- 4b. Forecast accuracy improvement
- 4c. Public safety improvement
- 4d. Utility worker safety improvement
- 4e. Reduced flicker and other power quality improvements
- 4f. Increase in system monitoring capabilities
  
- 5a. Other metrics

# Sample Research Need: Energy Storage - Assess Second Life Electric Vehicle Batteries

Energy Storage: Assess Second Life EV Batteries									
1. Brief Description									
The degradation of EV batteries through many cycles will eventually begin to affect battery capacity. Recognizing that a battery with a diminished capacity may no longer be suitable for electric vehicles, they have the potential to be a valuable resource for secondary applications such as aggregated battery storage. Many first generation electric vehicles are approaching the time when their original batteries are no longer suited to vehicular use, meaning the supply of these reduced capacity batteries will begin to quickly expand.									
Initial research at the UC Davis RMI Winery Microgrid Project and by the Honda Research and Development Company has been conducted, but the need for further investigation and outreach is merited to assuage customer concerns and ensure that EV batteries are reused.									
2. EPIC Investment Area									
Technology Demonstration and Deployment									
3. Policy Goals Addressed									
California AB 2868	Alternative source of storage that is easily aggregated with potential for utility scale storage								
CPUC E-4791	Nascent market to provide secondary/transportable storage to support grid reliability.								
Other?									
4. Barriers Resolved									
Cost - Competition	Sourcing degraded batteries would constitute a nascent secondary market at a lower cost than pristine batteries.								
Other?									
5. Metrics Impacted									
Installed capacity	Significant potential increase in capacity as EVs continue to become a larger market force and the secondary battery market develops								
Other?									
6. Benefit to Ratepayers									
2F	Increased storage will provide greater grid flexibility								
1I	Available and cheaper storage procurement to increase installation								
Other?									
7. Level of Effort									
Exploring the potential should be a 18-24 month project that can utilize projected scale of the secondary market to estimate future implementation. Additional details were not available in the technical assessment, this would need additional information for consideration through the Research Roadmap process.									

# Sample Research Need: Electric Vehicles and Smart Charging - Communications Standards into Hardware

<b>VGI - Communications Standards into Hardware (V2G)</b>	
<b>1. Brief Description</b>	
<i>As a forward looking part of the V2G market, stakeholders generally recognize that the potential benefits to V2G implementation are significant. As a result, substantial effort has been put into the development of communication standards for V2G. As they develop many of these standards have been included in newer infrastructure projects, including the Electrify America charging network. By seeking to include these V2G standards in hardware, the developing electrification network will reach a critical mass more quickly and be ready to realize the value of V2G connectivity.</i>	
<i>Common communication standards also work to enable vehicle-to-grid services as EV penetration continues to scale into the future. The standards also provide a development base for third party service providers.</i>	
<b>2. EPIC Investment Area</b>	
Market Facilitation	
<b>3. Policy Goals Addressed</b>	
Alternative Fuel Standards (R. 13-11-07)	Developing standards for the equipment and infrastructure
Rates and Infrastructure for Vehicle Electrification (R. 18-12-006)	Standards to facilitate infrastructure development and tariff design to enable transportation electrification.
Other?	
<b>4. Barriers Resolved</b>	
Incomplete Standards	Inclusion of existing communication standards helps to unify current infrastructure
Other?	
<b>5. Metrics Impacted</b>	
Percentage of vehicles capable of bi-directional charging	Unified communication standards will ensure that the any vehicle with hardware that supports bi-directional charging will also have the appropriate communications standards to support charging
Other?	
<b>6. Benefit to Ratepayers</b>	
2A	Standardization on infrastructure will help ensure interoperability
2B	Reduces the need for redundant infrastructure to service alternative standards
Other?	
<b>7. Level of Effort</b>	
<i>This endeavor is likely a medium term (2-5 year) project. Additional details were not available in the technical assessment, this would need additional information for consideration</i>	

# Sample Research Need: Energy Flexible Load Assets - Characterize Costs of DR Automation in New Buildings

## Energy Flexible Load Assets - Characterize costs of DR automation in new buildings

### 1. Brief Description

Management of building loads represents a significant portion of California's potential carbon reduction potential. Many of the new distributed resources exist behind the meter and there are significant technical opportunities to use building assets and automation to support and increase the efficiency of grid operations. Additionally, as the electric grid shifts to a more significant penetration of non-dispatchable resources, the burden of balancing supply and demand falls increasingly on flexible resources like batteries and responsive loads.

An especially attractive opportunity in demand response is integrating automated demand response technologies into new building projects. Some of the most pressing unknown future quantities in grid management are the integration of automated demand response and the associated costs for new buildings. By seeking to characterize general costs for different levels of automation in new buildings there will be a great advantage to driving the deployment of automated demand response.

Developing a generalized cost characterization will facilitate understanding the cost-benefit analysis that goes into the deployment of new DR technology. With this understanding there will also be opportunities to identify and deploy financing tools for new construction, providing a deeper pool of demand response resources to the grid.

### 2. EPIC Investment Area

Technology Demonstration and Deployment

### 3. Policy Goals Addressed

FERC Order 745 (2011) Necessary to outline cost to develop cost-effectiveness bids

Other?

### 4. Barriers Resolved

Uncertain value to customer Characterizing the cost of automation in new buildings helps to begin to frame cost-benefit analysis for customers

Lack of available financing Developing a cost model is a vital step to identifying existing financing tools that could be appropriated for use as a part of the solution set

Other?

### 5. Metrics Impacted

DR Enablement Costs Develops an additional lens of cost for consideration

Number of connected devices Outlining cost factors may increase the appeal of DR automation in new buildings

Other?

### 6. Benefit to Ratepayers

1E Peak load reduction by moving space or water heating off peak through automatic DR

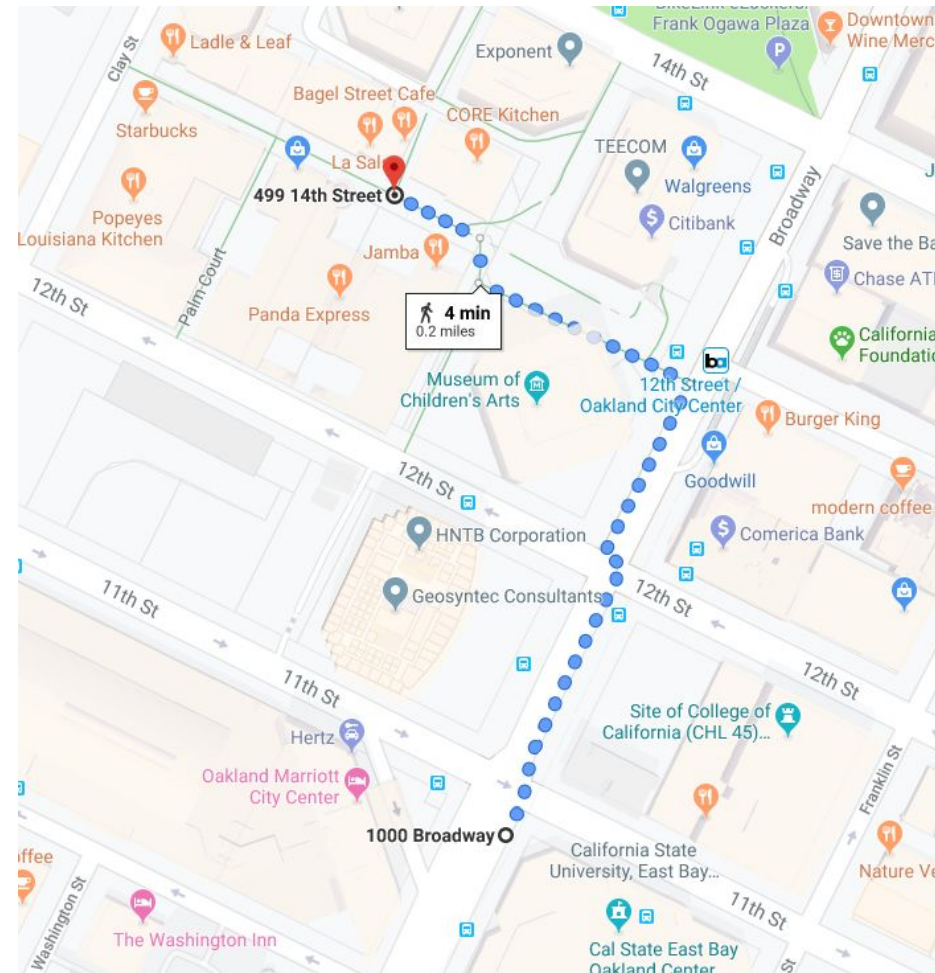
Other?

### 7. Level of Effort

Short term (12-24 month) study to develop a cost framework for a variety of building types and identify existing market trends that may facilitate future DR automation installation. Additional details were not available in the technical assessment, this would need additional information for consideration through the Research Roadmap process.

# Break for Lunch

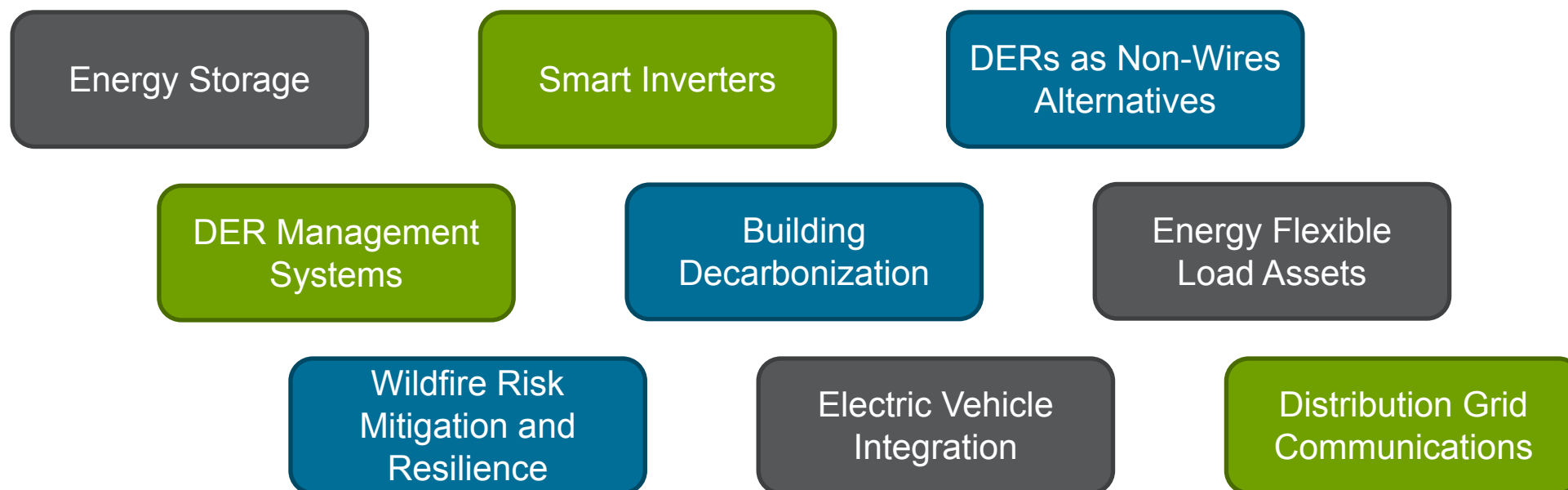
The nearby Oakland City Center has a variety of quick bite locations within a short walking distance.



## Soliciting Research Needs (1):

Team members will be floating through the room to help answer questions.

[Template Accessible Here](#)



# Soliciting Research Needs: Exercise Assessment

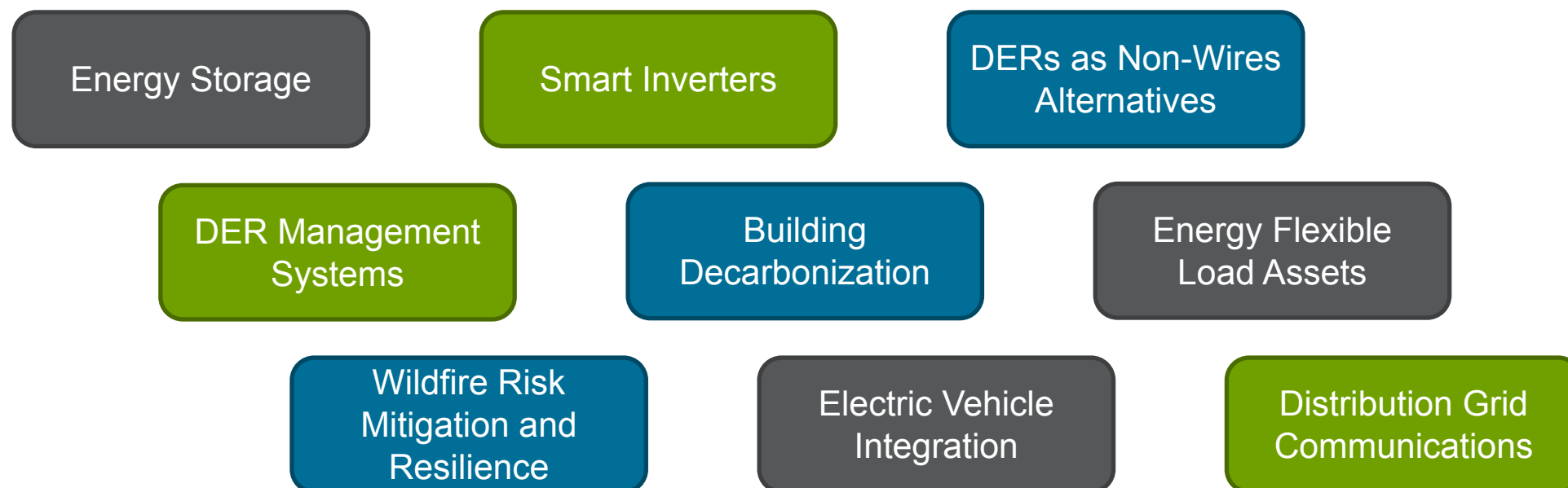
## Soliciting Research Needs Part 1 Discussion

- Productive additions to Research Needs?
- Effective use of time?
- Any concerns?

## Soliciting Research Needs (2)

Team members will be floating through the room to help answer questions.

[Template Accessible Here](#)



## Soliciting Research Needs: Summary

Roundtable: Each participant's highest priority research need or area that wasn't already present.

## What comes next:

- Circulate notes from today's meeting
  - The team will look to integrate feedback from today
  - Review new submissions
  - Apply the preliminary screens
  - Prepare results to share at the next meeting and receive feedback
- 
- Please submit any additional research needs with the provided form by August 9

## Adjournment:

**We would like to thank you for your time and participation today.**

Please keep your eyes open for our next workshop for the DER Research Roadmap, tentatively scheduled for September 17, 2019 at the Google Community Center