DOCKETED	
Docket Number:	19-MISC-01
Project Title:	Distributed Energy Resources (DER) Roadmap
TN #:	229805
Document Title:	Presentation - Distributed Energy Resources Research Roadmap Prioritization Workshop
Description:	Slidedeck 9-17-19
Filer:	Liet Le
Organization:	Navigant and Gridworks
Submitter Role:	Public
Submission Date:	9/20/2019 11:26:39 AM
Docketed Date:	9/20/2019

Distributed Energy Resources Research Roadmap Prioritization Workshop

Hosted by Navigant and Gridworks
9/17/2019, 10am –3pm
Google Community Space,
188 The Embarcadero, SF

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Workshop Agenda

Introductions and Methodology Review	**10:00 - 10:30**
Roadmap Methodology Implementation	**10:30 - 11:05**
Research Needs Survey Results	**11:05 - 11:35**
Focused Conversation	**11:35 - 12:00**
Lunch Break	**12:00 - 1:00**
Workshop Context	**1:00 - 1:15**
DER Research Category Naming Discussion	**1:15 - 1:45**
Research Urgency Conversation	**1:45 - 2:15**
Group Resolution	**2:15 - 2:45**
Wrap	**2:45 - 3:00**

Join The Meeting Remotely:

***Via Computer*:** Please go to
https://energy.webex.com/ec
Access code: **923 892 772.**
Meeting Password:
No password is required

***Via Telephone*:** (no visual presentation):
Call **1-866-469-3239**
(toll free in the U.S. and Canada)

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Today's Purpose: Primary Outcomes

1. Leave the workshop with confidence that we have categories of research needs that are well defined and organized.
2. Assess the relative importance of each category of research needs.
3. Zero in on any Research Needs are urgent and therefore need to be defined more specifically.
4. Come to a group resolution about what we recommend for the Research Roadmap.

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Workshop Introductions

15 Second Personal Introduction

- Your Name
- Your Organization

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Introduction and Methodology Review

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Research Needs Prioritization Surveys

- The DER Research Needs Template:
  - https://docs.google.com/spreadsheets/d/1KGIWLPva9pco4zCCNBEcKGRDVWiQYLNIhtM1I55Vsts/edit?usp=sharing
- Grid Development Survey: https://www.surveymonkey.com/r/JZW8NRL
  - DER Aggregation
  - Distributed Grid Management
  - Energy Flexible Load Assets
- DER Technologies Survey: https://www.surveymonkey.com/r/QKXLV37
  - VGI
  - Resiliency
  - Energy Storage
  - Communications

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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.

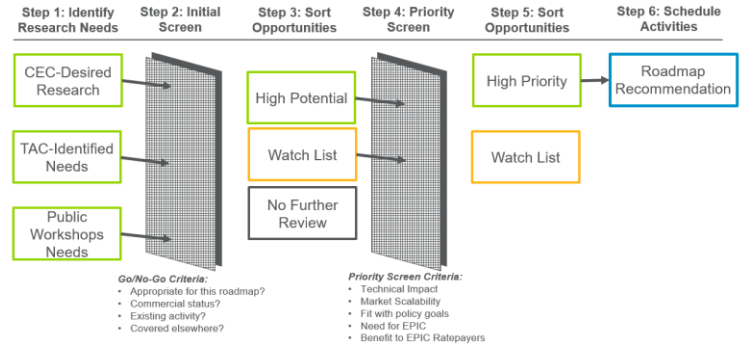
Valuation
The resource is not adequately compensated for benefits it is providing to the power system.

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



What research can resolve the issues?

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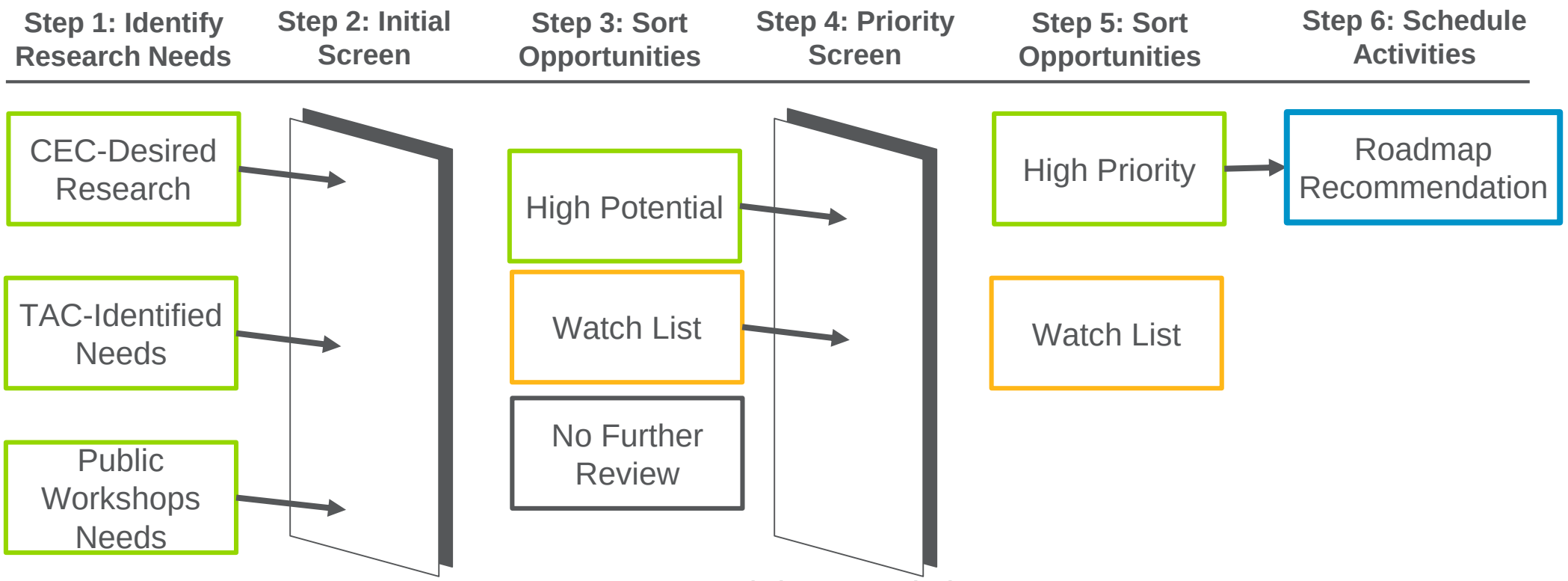
ROADMAP METHODOLOGY



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

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STEP 2: INITIAL SCREEN

Appropriate for this roadmap?	Technologies impacting solely the bulk power system and questions arising from policy barriers will be filtered.
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.
Existing activity?	Research topics already sufficiently under investigation will be filtered.
Covered elsewhere?	Research topics that would be better covered by another research entity will be filtered.

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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?

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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%

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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?

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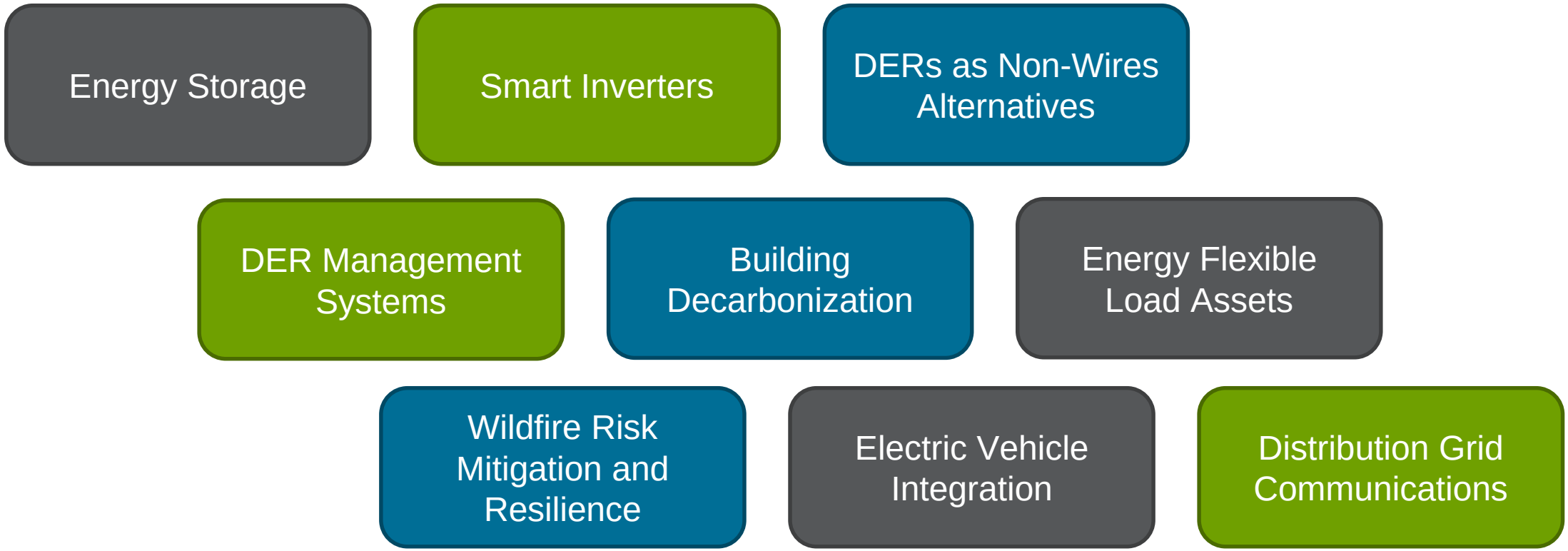
Current Research Needs Areas:



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Research Needs Screening

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Research Needs Still Under CEC Review

Research Need	Go/Watch/ No	Appropriate for Roadmap?	Commercial Status?	Existing Activity?	Covered Elsewhere?
Removing Barriers to Biogas					
Bioenergy for Local Resilience					
Monetize Bioenergy					
Assess Office Lighting Solutions					
Evaluating EV Adoption in DAC					
Derive Capacity Value of Variable DR					
Power Flow Controllers Development					
VGIWG Support + Funding					
VGIWG Use Case Demonstration					

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Research Needs Still Under CEC Review

Research Need	Go/Watch/ No	Appropriate for Roadmap?	Commercial Status?	Existing Activity?	Covered Elsewhere?	Notes:
Secure DER Communication Protocol						Combined with "Secure Communications for DERs"
Residential EMS for Panel Upgrade Deferral						Combined with "NEC-Approved HEMS..."
3 Ideas for Building Decarbonization						Combined with "Assess Flexibility of Coordinated ..."
Understanding Occupant Comfort in DR						Combined with "Load Shift Participation/Adoption"
Price API for Device Makers						Believe exists through CAISO OASIS; outside of scope
Biomass for Energy Recovery						Biomass generation is commercially mature
Design Guidance for Resilience						Combined with "PV Resilient Racking"
Utility Upgrade Review Process						Changes to planning process out of scope for technical roadmap
Load Management Solutions Demonstration						Combined with "DER Controls to Minimize..."
DER Aggregation Demonstration						Combined with "Assess Flexibility of Coordinated..."
Customer Engagement						Combined with "Load Shift Participation / Adoption"
Connected Controls for Load Management						Combined with "Heat Pump / Electrification Asset..."
DER Security Framework						Combined with "Secure Communications for DERs"
Protecting Medical Baselines						Combined with "Systems Integration for Power Outage Life Safety"
Modeling DER Price Response						Combined with "Assess Flexibility of Coordinated..."
Communication Protocols for Local Capacity Management						Combined with "DER Controls to Minimize Integration Costs"
Improve DER Visibility						Combined with "Low Cost Telemetry"
Fuel Efficient Tire Standards						Not DER specific; outside of scope
Consumer Engagement and Response to DER/Flex Load						Combined with "Load Shift Participation / Adoption"
VGI Valuation Framework and Methodology						Appears to be covered by DRP demonstration projects

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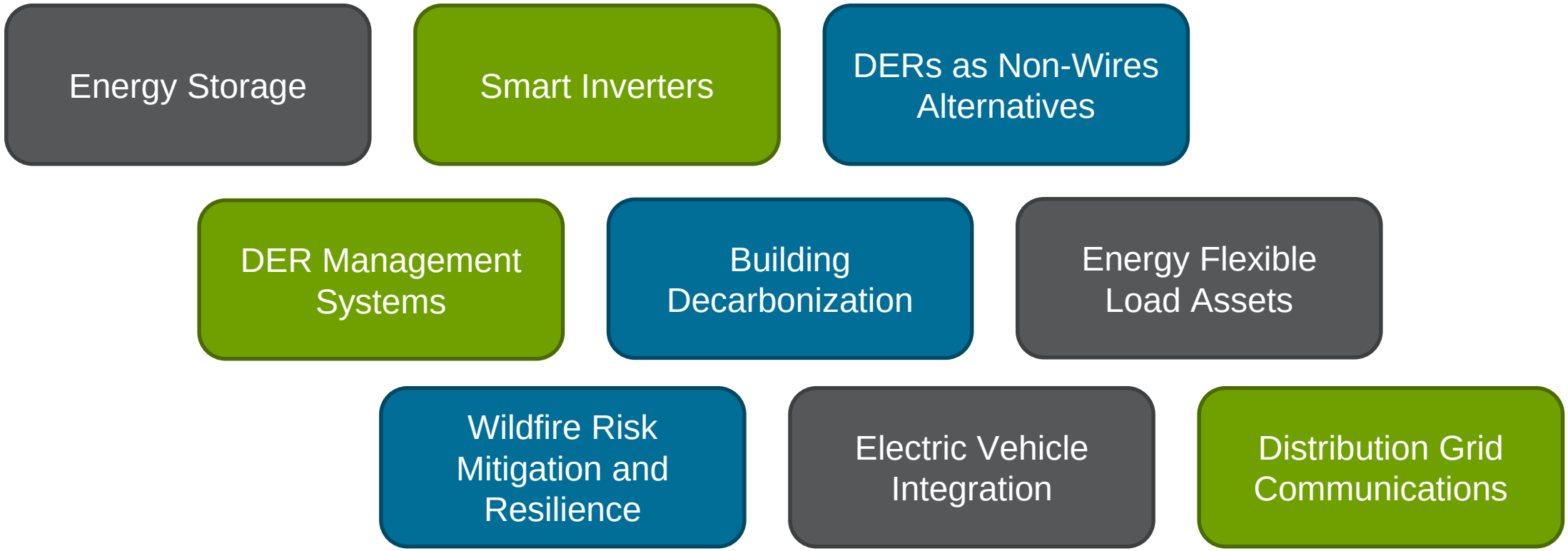
Current Research Needs Areas:



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Research Needs Survey Results and Rankings

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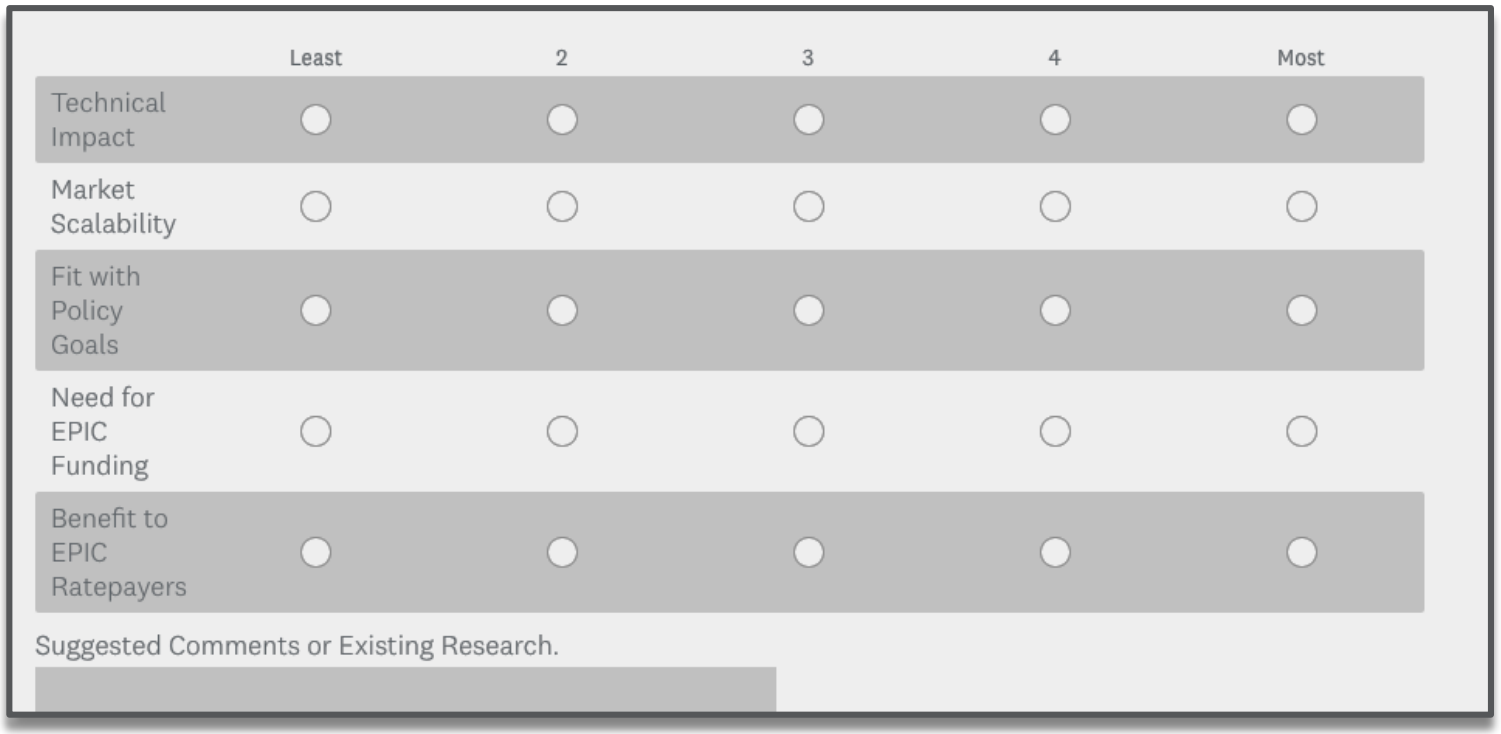
DER Research Need Prioritization Survey



	Least	2	3	4	Most
Technical Impact	○	○	○	○	○
Market Scalability	○	○	○	○	○
Fit with Policy Goals	○	○	○	○	○
Need for EPIC Funding	○	○	○	○	○
Benefit to EPIC Ratepayers	○	○	○	○	○

Suggested Comments or Existing Research.

2 Surveys released 8/14

Energy Technologies: 6 responses

Grid Development: 10 responses

Respondents:

- **CEC**
- **CAISO**
- **SCE**
- **CalETC**
- **LBNL**
- **Sonoma Clean Power**

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STEP 4: PRIORITY SCREEN

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?

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Metric	5	4	3	2	1	Weight
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Benefit to EPIC Ratepayers	Significant	Semi-significant	Moderate	Modest	Minimal	20%

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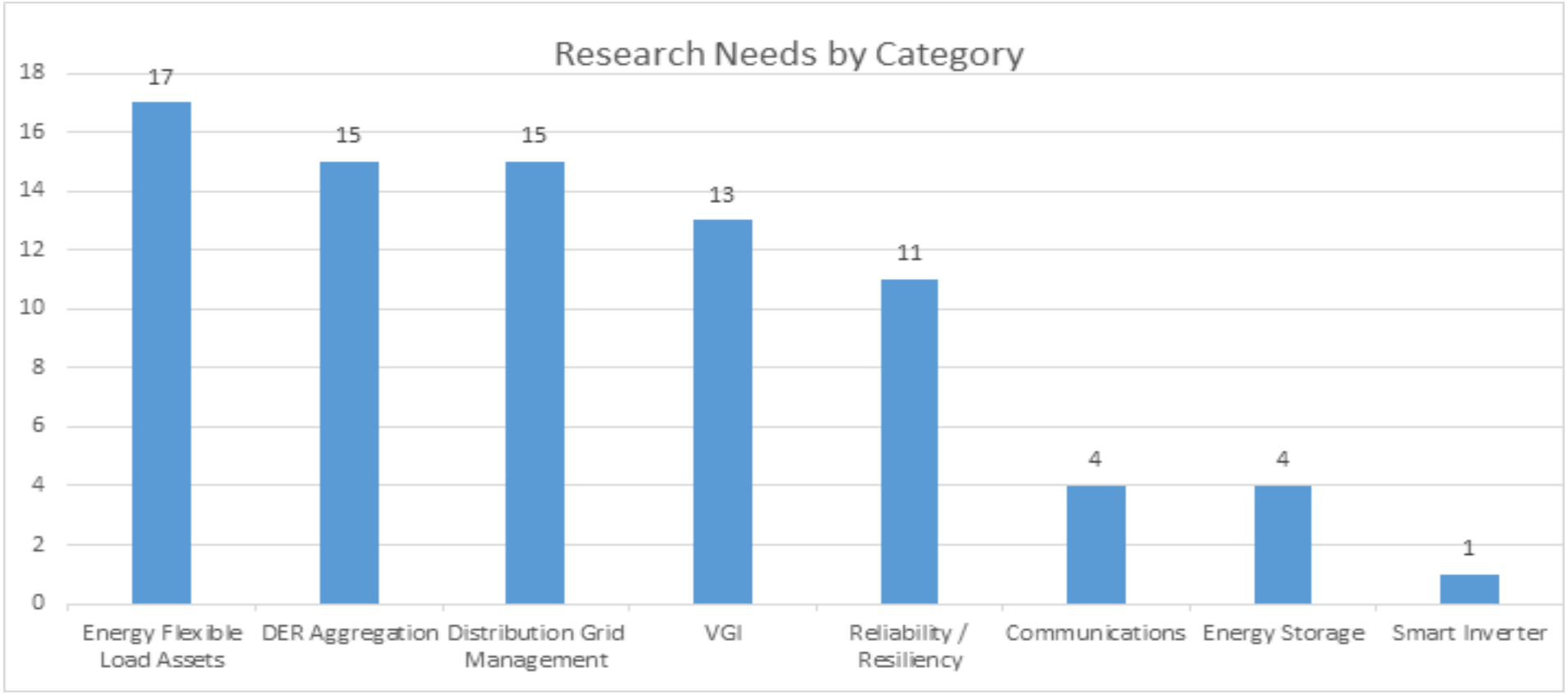

**Building Decarbonization Research Needs included in Energy Flexible Load Assets*

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10 Highest Ranked Research Needs

Rank	Research Need	Score	Category
1	Low Cost Telemetry for Aggregated DER	3.71	Communications
2	Characterize costs of DR automation in new buildings	3.68	Energy Flexible Load Assets
3	V2Bus for Resiliency	3.63	VGI
4	Secure Communications for DER	3.60	Communications
5	PSPS Grid Support Fuel Research	3.58	Distribution Grid Management
6	NEC Approved HEMS to Reduce Upgrade Costs	3.55	Energy Flexible Load Assets
7	Risk Mitigation for High Impact Low Probability Events	3.43	Reliability / Resiliency
8	Enhancing Commercial Buildings Monitoring and Control	3.42	Energy Flexible Load Assets
9	Assess Second Life EV Batteries	3.39	Energy Storage
10	Load Modifying Participation Models	3.38	Distribution Grid Management

Highest Ranked Needs by Category

Category	Research Need	Weighted Score	Overall Rank
Communications	Low Cost Telemetry for Aggregated DER	3.71	1
Energy Flexible Load Assets	Characterize costs of DR automation in new buildings	3.68	2
VGI	V2Bus for Resiliency	3.63	3
Distribution Grid Management	PSPS Grid Support Fuel Research	3.58	5
Reliability / Resiliency	Risk Mitigation for High Impact Low Probability Events	3.43	7
DER Aggregation	DER Controls to Minimize Integration Costs	3.34	11
Energy Storage	Assess Second Life EV Batteries	3.39	9
Smart Inverter	Dynamic PV Modelling	2.38	47

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Average Score per Category

Category	Weighted Score
Communications	3.66
Energy Flexible Load Assets	3.26
Energy Storage	3.09
Distribution Grid Management	3.04
VGI	2.98
DER Aggregation	2.86
Reliability / Resiliency	2.75
Smart Inverter	2.38

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10 Lowest Ranked Research Needs

Rank	Research Need	Score	Category
51	Procurement Assessment Platform	2.07	DER Aggregation
50	Fencing for PV Resiliency	2.20	Reliability / Resiliency
49	PV Resilient Racking	2.27	Reliability / Resiliency
48	DER Impact Modeling Tools	2.29	DER Aggregation
47	Dynamic PV Modelling	2.38	Smart Inverter
46	Realtime Estimation of PV Power	2.41	Distribution Grid Management
45	PV Hardware Resiliency (Fire)	2.44	Reliability / Resiliency
44	EV Charging Device Performance Standards	2.55	VGI
43	PV Hardware Resiliency (Weather)	2.61	Reliability / Resiliency
42	Valuing Operation Flexibility	2.61	Distribution Grid Management
41	EV Load Management Evaluation	2.68	VGI

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Distribution Grid Management

Rank	Research Need	Score
1	PSPS Grid Support Fuel Research	3.58
2	Load Modifying Participation Models	3.38
3	Enabling DER to Support FLISR Operations	3.30
4	Demonstrate DER Grid Balancing Services	3.24
5	DER Contribution to Bulk Flexibility	3.23
6	DER Ramping Research	3.07
7	Local DER Transaction Platform	3.06
8	Sensors for Circuit Deenergization	2.99
9	Utility Owned Submeters on AMI Network	2.83
10	Hosting Capacity Expansion Planning & Operational Controls	2.79
11	Valuing Operation Flexibility	2.61
12	Real time Estimation of PV Power	2.41

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Reliability / Resiliency

Rank	Research Need	Score
1	Risk Mitigation for High Impact Low Probability Events	3.43
2	Valuing Resiliency for Microgrids	3.32
3	Systems Integration for Power Outage Life Safety	3.12
4	Residential DC Microgrid	2.70
5	Plug and Play Power Distribution	2.69
6	PV Hardware Resiliency (Weather)	2.61
7	PV Hardware Resiliency (Fire)	2.44
9	PV Resilient Racking	2.27
10	Fencing for PV Resiliency	2.20

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Energy Flexible Load Assets

Rank	Research Need	Score
1	Characterize costs of DR automation in new buildings	3.68
2	NEC Approved HEMS to Reduce Upgrade Costs	3.55
3	Enhancing Commercial Buildings Monitoring and Control	3.42
4	Fuel Shifting as a Load Shift Resource	3.28
5	Coordinate Water Heater Design and Controls with Grid	3.21
6	Evaluate the impact of Demand Response on Market Decisions	3.20
7	Explore Residential Grid Responsive Systems	3.19
8	DER Performance in New Construction	3.02
9	Improving B2G Coordination	2.82

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VGI

Rank	Research Need	Score
1	V2Bus for Resiliency	3.63
2	Assess EV Charging Technology Efficiencies	3.14
3	Communications Standards into Hardware (V2G)	3.10
4	Model EV Charging and Price Responsiveness	2.93
5	VGI Data Program	2.86
6	EV Load Management Evaluation	2.68
7	EV Charging Device Performance Standards	2.55

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DER Aggregation

Rank	Research Need	Score
1	DER Controls to Minimize Integration Costs	3.34
2	Assess Flexibility of Coordinated Customer DER	3.30
3	Bottom Up Integrated Planning	3.22
4	DER Recycling	2.94
5	DER Impact Modeling Tools	2.29
6	Procurement Assessment Platform	2.07

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Energy Storage

Rank	Research Need	Score
1	Assess Second Life EV Batteries	3.39
2	Evaluate Use Cases for Various Li-Ion Chemistries	3.27
3	Thermal Storage into Wholesale Markets	3.26
4	Storage Safety Standards	2.83
5	Battery Testing Protocols for Grid Applications	2.71

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Communications & Smart Inverter

Rank	Research Need	Score
1	Low Cost Telemetry for Aggregated DER	3.71
2	Secure Communications for DER	3.60

Research Need	Score
Dynamic PV Modelling	2.38

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Focused Conversation on Survey Results

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Discussion – Survey Results

During your Break:

What actions do these research needs and categories suggest?

…We'll pick up there after lunch

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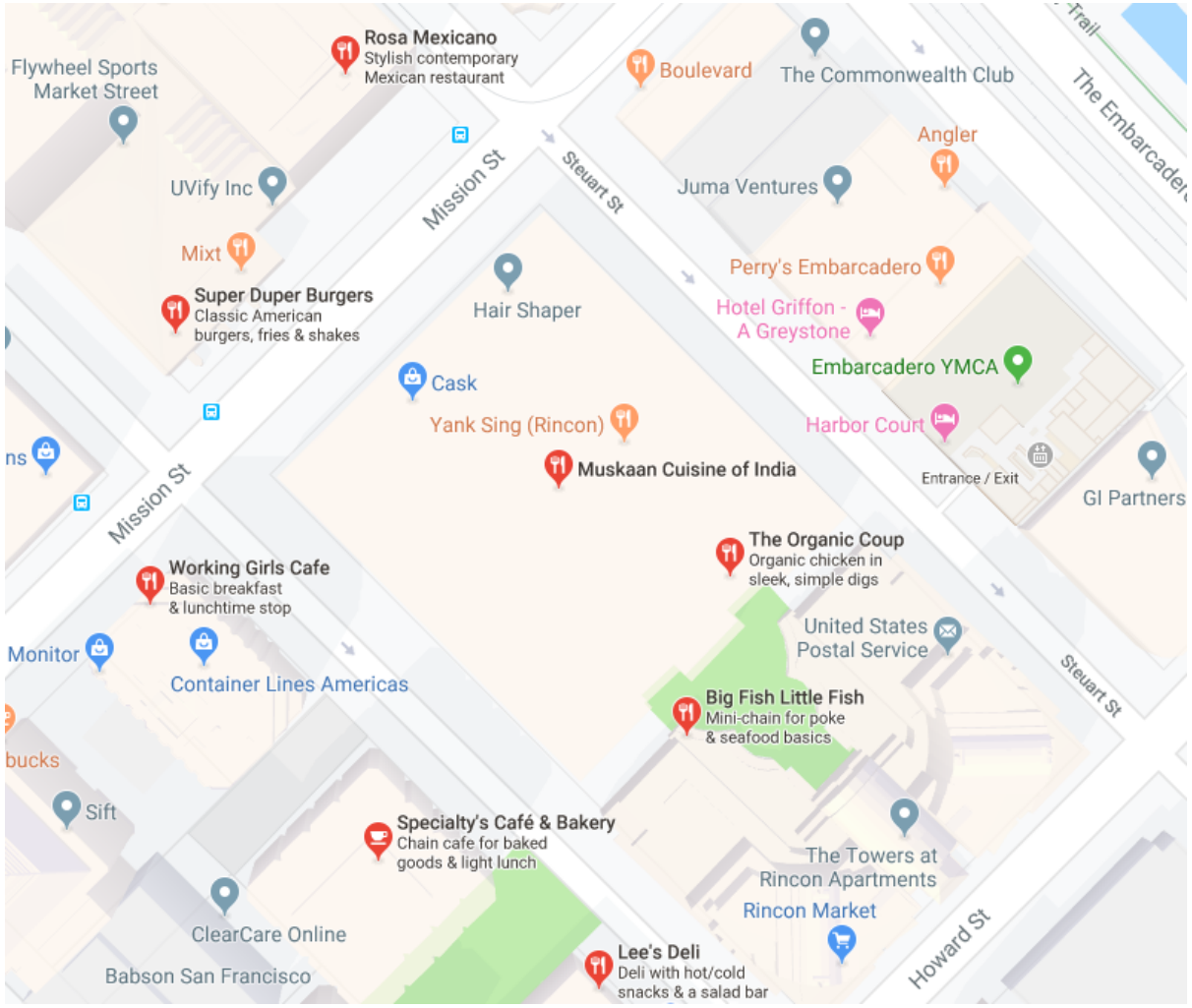
Discussion – Survey Results

Lunch Break

12 - 1 pm



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Today's Purpose: Primary Outcomes

1. Leave the workshop with confidence that we have categories of research needs that are well defined and organized.
2. Assess the relative importance of each category of research needs.
3. Zero in on any Research Needs that are urgent and therefore need to be defined more specifically.
4. Come to a group resolution about what we recommend for the Research Roadmap.

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Consensus Workshop

Group exercise to:

1. Leave the workshop with confidence that we have categories of research needs that are well defined and organized.
2. Assess the relative importance of each category of research needs.

Guiding Question :

"A Priority Area of DER Research Is…..?"

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Naming The Research Needs Categories:

- What **3 – 7 words** will be most descriptive of all the needs in this category?
- What title will include all of the insights represented in the research needs?
- Considering the guiding question, what insight is being pointed to?

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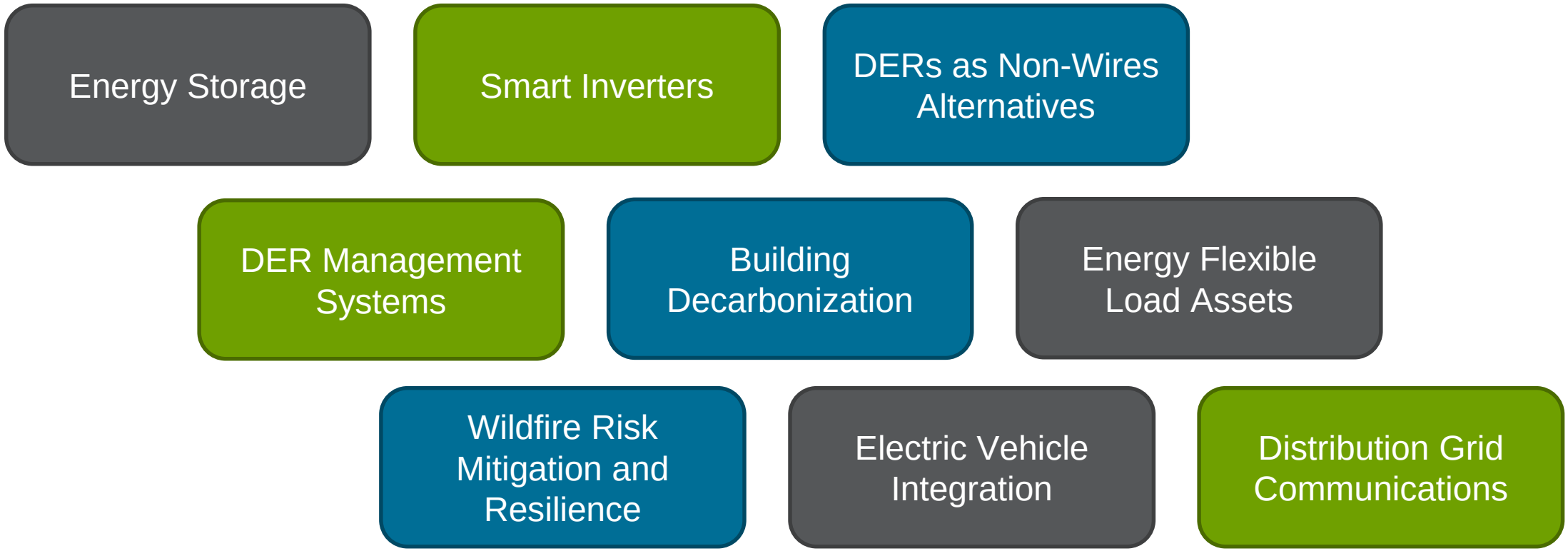
Current Research Needs Areas:



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Research Need Category Name Review

“The Priority Areas of DER Research Are…..?”

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Focused Conversation

Facilitated open conversation to zero in on any Research Needs that are urgent and therefore need to be defined more specifically.

Facilitated by Mac Roche, Gridworks

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Focused Conversation

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Focused Conversation

1. Our first question will be for every attendee to answer, but after that anyone can respond.

1. This is an opportunity to brainstorm without worrying about having all of the right answers.

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Introductory Question For Everyone to Answer:

Of the Research Needs we've reviewed, which is most urgent?

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Focused Conversation Review

“The most urgent Research Needs are…..?”

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Today's Exercises

Group Resolution:

Facilitated conversation to resolve as a group what we recommend for the Research Roadmap.

Facilitated by Matthew Tisdale, Gridworks

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Conclusions and Action Items

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What comes next:

Gridworks will:

- Circulate notes from today's meeting
- The team will integrate feedback from today
- Prepare results to share at the next meeting and receive feedback

Action Items Identified in today's meeting:

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Thank You!

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