



# **Lab Summit**

**meeting recap**





# thank you!

Thank you for being a part of e-Lab Summit 2017! Without your participation and perspectives, the collective work advanced at Summit would not have been possible. As you return to your work, we hope that the insights and connections that you made in New Mexico support you in meaningful and actionable ways. We wish you luck in all of your endeavors, and hope to see you at a future e-Lab event!

The e-Lab team



# ground rules

you can say **who was there**  
and **what was said**  
but **not who said what\***

*Please remember these rules as you share the outputs of your work at Summit, including the contents of this document.*

*\*without their permission*



# follow-up

## **Offers of support from the e-Lab team**

Don't hesitate to contact us with follow-up questions, comments, or requests related to e-Lab. For instance, we're happy to:

- make introductions to other Summit participants, e-Lab network members, or RMI staff
- share information on the collaboration frameworks we use (e.g., types of complexity, 4 ways of talking and listening)
- work with you to refine the Summit for 2018
- send copies of RMI reports or other analyses, briefs, etc.
- explore ways for you or your organization to get more involved with e-Lab, including as a full member

Please contact Mark Silberg ([msilberg@rmi.org](mailto:msilberg@rmi.org)) with any follow-ups.





# e-Lab Accelerator

## What is e-Lab Accelerator?

e-Lab Accelerator is an invitation-only, four-day working meeting to accelerate high-impact and innovative projects at the electricity system's distribution edge.

## Why attend e-Lab Accelerator?

We'll help you unlock opportunities to drive projects forward more effectively, and collaboratively. Specifically, Accelerator will give teams:

- **A structured working session** to make progress on their project or initiative
- **A rich learning experience** featuring experts on the latest thinking on new utility business models and distributed resources in the U.S. electricity sector
- **Tools and training** to conceptualize problems in collaborative and innovative ways
- **New alliances** to form a broader support network with other teams working on similar projects
- **A unique environment** conducive to creativity and breakthrough ideas

## Is e-Lab Accelerator for you?

Accelerator teams comprise 5-8 people representing multiple project stakeholders. Successful teams bring together the right combination of vision, experience, knowledge, and commitment to a project that can accelerate change in the electricity system. Projects must be actively under development at varying levels of maturity.

**May 1-4,  
2018**

**Sundance  
Mountain  
Resort,  
Utah**



# pod topics

Smart Heating Electrification

Infrastructure Planning and New Mobility

Blockchain and Transactive Energy

Rate Design Pathways

Value Stacking for DERs

Distributed Grid Infrastructure

Utility Business Model Pathways

LMI-Focused Utility Business

**your  
pod's  
recap is  
in the  
next  
section**



# value stacking for DERs

**Pod Session Recap**





# list of values

The discussion of value streams opened with a CPUC/CAISO list of grid services (right). The table is organized by service domain on the left. A DER is eligible to provide services in its own domain, and any domain below it. These are primarily grid services, and don't include a wider range of values.

<i>Service Domain</i>	<i>Service</i>
<b>Customer</b>	TOU bill management
	Demand charge management
	Increased PV self-consumption
	Back-up power
<b>Distribution<sup>1</sup></b>	Distribution capacity/deferral
	Reliability (back-tie) services
	Voltage support
	Resiliency/microgrid/islanding
<b>Transmission</b>	Transmission deferral
	Black start
	Voltage Support
	Inertia
	Primary frequency response
<b>Wholesale Market</b>	Frequency regulation
	Imbalance energy
	Spinning Reserves
	Non-spinning reserves
<b>Resource Adequacy</b>	System RA capacity
	Local RA capacity
	Flexible RA capacity

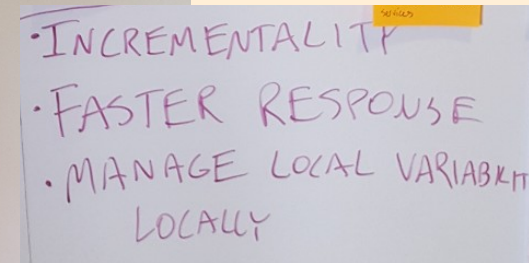
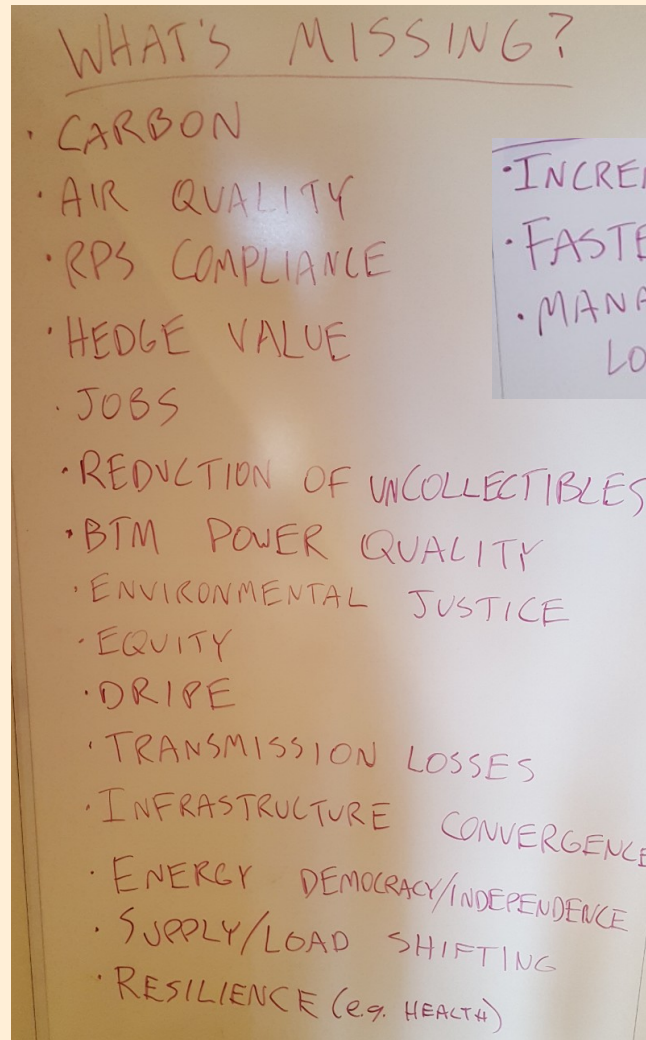






# list of values

To capture the broader range of values that DERs are capable of providing, the group had a brainstorming session to identify what was missing in the CPUC/CAISO framework. Many of these values are difficult to measure, but form a key component of the value proposition for DERs.





# use cases

To ground the discussion with examples, the group brainstormed use cases for DERs. Several people agreed to combine, resulting in the following 7 use cases. The group self-organized to discuss 5 of the 7 cases.

DER	Domain	Values Provided
Microgrid / Aggregation	Customer	Customer & distribution values
Energy storage	Distribution	Distribution & transmission/wholesale values
Energy efficiency & demand response	Customer	Customer, distribution, & societal values
Solar PV & energy storage	Customer	Customer & distribution values
Solar PV	Customer or distribution	Distribution & transmission/wholesale values
Fast responding DER	Customer	Customer, distribution, & transmission/wholesale values
QF Biogas Plant	Distribution	Distribution, transmission/wholesale, air quality, waste resources





# use case insights

The following insights were the result of our discussion on Day 2 (page 1/2):

**Column 1 (Yellow):**

- Eliminate arbitrary 120% rooftop capacity limit per house + see sunny rooftops as a community resource
- Make the most of what you have  
Build wisely to fill the gaps  
Ask continuously what you really need
- Why 14% ROI compared total destruction of our life support system
- Microgrid  
customer + distribution

**Column 2 (Yellow):**

1. IF THERE IS NO VOLT/VAR "MARKET", PERHAPS COMPENSATE <sup>THE ASSET OWNER</sup> FOR ONGOING MANAGEMENT (Q SINK/SOURCE)
2. "DO NO HARM" - PARTICIPATING IN ONE SERVICE SHOULD NOT IMPACT/AMPLIFY ANOTHER SERVICE
3. NO MECHANISM/VISIBILITY INTO NEGATIVE IMPACTS OF PROVIDING ~~OUT~~ A SERVICE, SO HOW DO WE SET REC<sup>S</sup>/COMPENSATION/PENALTIES
4. VAR = "VALUES ARE RELATIVE"

**Column 3 (Orange):**

Energy storage in front of the meter

**Column 4 (Pink):**

① CONFLICTS B/T WHOLESALE + DISTN. SYS.  
WILL DEPEND ON SPECIFICS OF PROGRAM

② HIERARCHY OF VALUES + PRIORITIES DEPENDS ON THE MARKET  $\Rightarrow$  REVENUE STREAMS

③  $EE \neq EE + DR \neq DR$   
What should we call this?

Behind-the-meter  
 $EE + DR$   
-maximize value





# use case insights

The following insights were the result of our discussion on Day 2 (page 2/2):

INSIGHTS

- 1) FOR SOME SERVICES, THERE IS A REQ'D LEVEL OF PERFORMANCE, BELOW WHICH THERE REALLY IS NO VALUE
- 1.2 2) SOME SERVICES ARE DISCRETE, AND OTHERS REQUIRE A HIGH LEVEL OF RELIABILITY
- 3) IMPLEMENTING THIS DER AT SCALE, VIA AN AGGREGATOR, MAY MITIGATE 1/1.2 SOMEWHAT
- 4) MANY OF THESE VALUES REQUIRE EXCLUSIVE USE AT A CERTAIN TIME

Behind-the-meter  
PV and energy  
storage, customer +  
distribution services

1) GENERATION RESOURCES REGARDLESS OF LOCATION (DER OR TRANSMISSION) PROVIDE AN INFINITE SUPPLY OF SVCS TO GRID.

2) IT IS NECESSARY TO UNPACK THE VALUES PROVIDED BY DER BEFORE ONE CAN UNDERSTAND ~~STAKEHOLDERS~~ ~~POTENTIAL~~ WHETHER YOU'RE GETTING TRUE VALUE

3) STACKED VALUES ALSO BECOMES ADDITIVE TO THE INHERENT VALUE OF THE RESOURCES.

4) IN COMPETITIVE MKTS WHOSE PRICING SIGNALS PROVIDE STRONG PAST FOR POTENTIAL D-LONG VALUE STREAMS

Grid Services  
T & D Ancillaries  
Duplicative or  
Additive

NY VALUE STACK TAXI  
- FRONT OF METER SOURCE  
- VALUE STACK COMPONENTS  
- ENERGY VALUE  
- CAPACITY  
- ENVIRONMENTAL  
- LOCATION SYSTEM BIAS  
- DISTRIBUTION BIAS VALUE  
(T & D BIAS)







# needs & next steps

On Day 3, the use case discussion groups transitioned towards identifying needs, and the actions that could be taken to address those needs.

WHAT IS NEEDED TO  
ENABLE LARGE-SCALE  
DEPLOYMENT OF YOUR  
USE CASE? (1-3 POST-ITS)

• WHAT IS ONE CONCRETE  
STEP THAT COULD BE  
TAKEN TO MOVE TOWARDS  
SATISFYING EACH NEED?  
(1-3 POST-ITS)





# needs & next steps

## Needed actions

**In sequence**

① Distribution system analysis  
To understand the system  
- sensors  
- gather data  
- analysis  
(UTILITIES)

② ID metrics trying to satisfy (i.e., traditional solution)  
technical + cost  
(UTILITIES, REGS, VENDORS?)

③ Assign relative values to services based on criticality (i.e., cost of failure)  
(UTILITIES, REGS)

④ ID TWO "BEST PRACTICES" & Roll Out Globally (FOR EXAMPLE TOU)

④ Prioritize / Establish Markets of products or min. needs w/in contracts  
(UTILITIES, REGS, VENDORS)

③ EPR1 STUDY TO ASSIGN "CRITICALITY" TO "DER" OFFERINGS

④ Globally Regulatory TO CONSIDER "DER" VALUE COST NEEDS

EE and DR  
Behind-the-Meter  
Maximizing Total  
Value





# needs & next steps

Storage on Distribution System Providing Distribution & Transmission Services

## NEED

NEED

1. VISIBILITY INTO VALUES & NEEDS WHICH REFLECT LOCATION, TIME QUALIFICATIONS & REQUIREMENTS

MUST FIT W/IN COST/VALUATION FRAMEWORK

NEED

2. EXPLORE METHOD(S) TO SIMPLIFY/ SUITE OF VALUES INTO AGGREGATE SIGNAL(S) TO SUPPORT BUSINESS MODEL

## Framework

ITERATING PROCESS FOR CONCRETE STEP

1. DECIDE ON ALLOCATION FRAMEWORK
  - + SOCIALIZED V. INDIVIDUAL
2. ID REQ'D PER VALUE
  - + STATIC, DYNAMIC, LOCATION
3. DEFINE BUSINESS MODEL/PLAN
  - + WHO NEEDS WHAT DATA
4. DEFINE COMPENSATION AS A FCT<sup>N</sup> OF ABOVE

?)

### Do. R&D

Simplify & agg.  
info streams: Per  
value stream?

### - R&D

Simplify T&D  
Coordination  
info streams?  
(eg aggregate  
constraints)







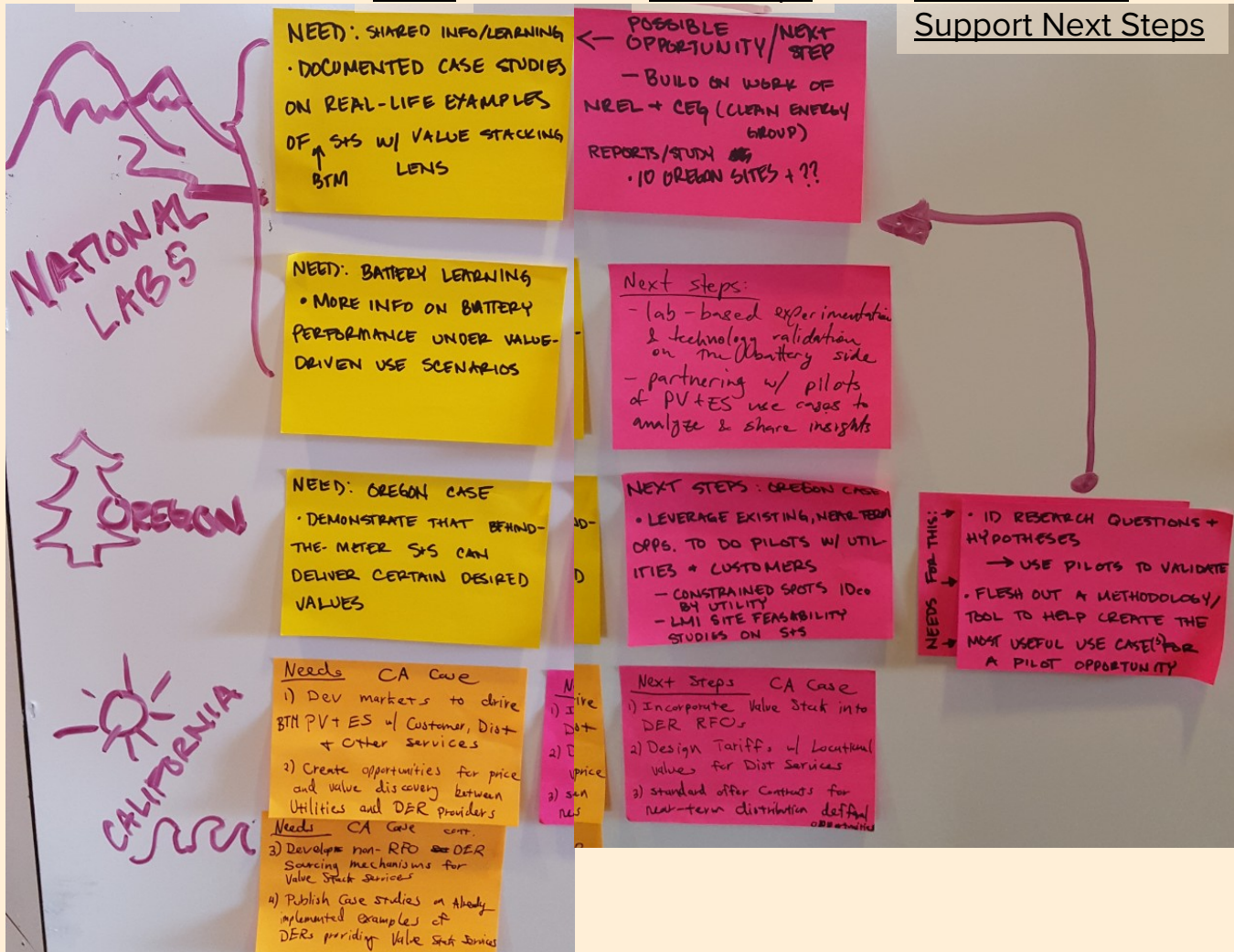
# needs & next steps

Who

Need

Next Steps

Addl Needs to  
Support Next Steps



Solar +  
Storage  
Behind-the-  
Meter  
Providing  
Customer &  
Distribution  
Value





# needs & next steps

## What's needed? Proof!

- 1.) proof case - Disaggregate THEN stack!  
Ex: BTM solar w/smart inverter in a reactive power analysis  
\* ideally tech, scale, ownership - agnostic
2. Can we mimic transmission formula at distribution level?  
- Assuming applicability AND requisite visibility into location-specific challenges on distribution grid....

## Next Steps

- 1.) a. what must be amended in terms of measurability?  
b. How do you scale down, and with what degree of locational specificity?  
c. If infeasible, can it be enabled with a new technology?  
★ d. Pilot w/actual data?  
- Test w/other services extracted from transmission framework?

Example Transmission Level services we could also test.

- ★ Id
- Transmission Enhancement Chgs/costs
  - Line Loss
  - Spot RT/DA
  - Basis risk / congestion
  - frequency reg ↑, reg ↓
  - resp reserve / spinning / synch reserve
  - Emergency response service
  - load response / LAAR
  - non-spin / non-synch reserve
  - Capacity
  - Black start

Moving a head to full deployment...

- 2.) a. Regulatory enablement -- e.g., tariffs
- b. Deployment (potentially w/ partner)
- c. Evaluation of benefits, costs, resulting value ... in careful consideration of time element

Rinse & Repeat

Solar Behind-the-Meter w/ Smart Inverter Providing Reactive Power



# needs & next steps

Aggregation/Microgrid on Distribution System  
Providing Distribution & Transmission Services

## Enablers —

- Community Energy Systems
- Goal - Enable community-level decision making on sources & use of energy  
⇒ toward resilient communities

- Establish unbundled T & D<sup>2</sup> tariffs where rate designs reflect impact on system (flat is better)

- Establish value streams<sup>3</sup> for services below and beyond the sub-station
  - D (- D asset deferral)
  - D (- " congestion relief (ICA)
  - T (- T asset deferral)
  - T (- Frequency reg & PFR

- Engage utility collob. as D service provider w/ local government.
  - Asset investment oppts.
  - Compensation for functional capabilities (Smart Distribution)

- Next steps

## - Next steps

- Identify community + utility + sub-station for a pilot
- Formulate respective benefits for planning & implementing the pilot

- innovative rate design
- Compensation for services
- infrastructure planning
- innovative utility compensation



# key themes for enabling value stacking



## **Defined vs. Undefined**

While some value streams are currently well-defined and compensated, many others are yet-to-be compensated or may never be compensated.

## **Hierarchy of Values**

Some values/services are critical to reliable grid operations and will take precedent over others. Compensation structures must account for this.

## **T&D Coordination**

Coordination between transmission and distribution system operators will need to be improved so that services don't conflict, or cause unintended side effects.

## **Researching Needs & Value Streams**

Some research and analysis will need to be done to establish system needs and the relative value that DERs can provide, across the dimensions of time and location.

## **Testing Use Cases**

Values provided by DERs must be validated in real-world applications through demonstration projects. Results should be disseminated as case studies.

## **Defining Compensation Structures**

New compensation structures (e.g., tariffs, market services, etc.) will need to be established for many of the value streams identified.





# thank you!

