2024 Future Grid Study

Workshop #1
Identifying Operational Needs

GRIDWORKS

February 8, 2024 | 1-5pm Pacific
Virtual/Zoom

TODAY'S OBJECTIVES

A. **Update parties** on the current proceeding scope, the Commission's aims, and next steps

B. **Share expert and party perspectives** on the following question:

   What are the operational needs necessary to efficiently operate a high DER grid, unlock economic opportunities for DERs to provide grid services, limit market power, reduce ratepayer costs, increase equity, support grid resiliency, and meet State policy objectives?

C. **Co-create a list of operational needs** responsive to this question

D. Lay the **groundwork for the focus of our next workshop**, "*What are the existing gaps and barriers in achieving the needs identified above within our current Distribution System Operator (Utilities)?*"

AGENDA

#	Topic	Start Time	End Time
1	Introductions	1:00pm	1:10pm
2	Goals of the Commission	1:10pm	1:55pm
3	Introduce Concepts, Terminology and Objectives	1:55pm	2:05pm
	break	*2:05pm*	*2:15pm*
4a	Panel 1: Utilities and CAISO	2:15pm	3:00pm
4b	Panel 2: Thought Leaders	3:00pm	3:45pm
	break	*3:45pm*	*4:00pm*
4c	Panel 3: Advocates	4:00pm	4:45pm
5	Next Steps and Closing	4:45pm	5:00pm

ANNOUNCEMENTS

- Today's presentations and a recording of today's workshop will be available at gridworks.org/initiatives/california-future-grid-study/
- We want you to participate actively. Please do so using the Zoom "raise hand" function, chat, and slido.
- Good ideas may come to you after this workshop... please email them to maggiedj@gridworks.org by February 22. If they add to our objective, we will include them in ...
- ... a summary of this Workshop being prepared by Gridworks. Our summary will be distributed by March 2

HOW TO PARTICIPATE

Join at
slido.com
#7452 931

Slido

- Slido will be used to gather responses to **three** questions throughout the workshop
  1. Introductions
  2. Adding your comments to our operational needs wishlist
  3. Providing Gridworks Feedback

Zoom

- Please use the zoom chat to ask questions for our speakers. If they cannot answer during their panel, they will try to provide answers in the chat afterwards
- If you wish to speak, please raise your hand in zoom
- Please stay on mute unless you are speaking

HOW TO USE SLIDO

Join at
slido.com
#7452 931

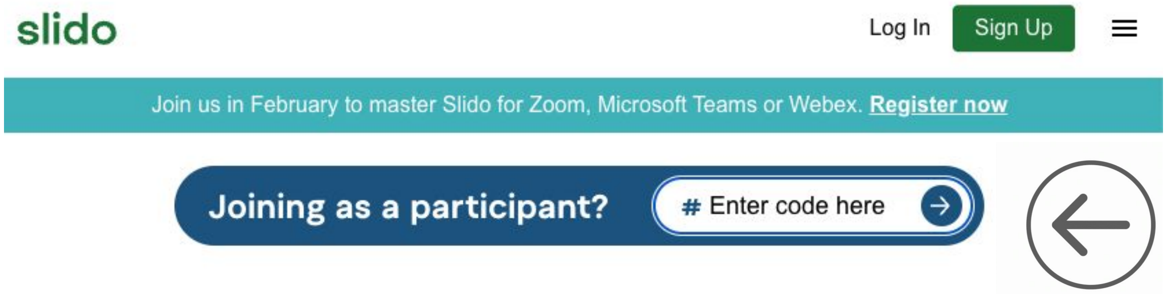
Join two ways:

1. Use your phone or tablet to scan the QR code

OR

2. Go to slido.com
   a. type in the code (7452931) into the dark blue box

Website view:



Using Slido:

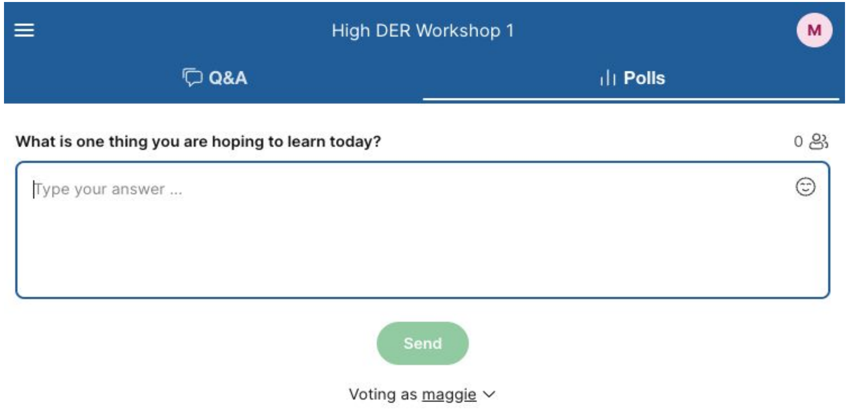
Use slido during our panel presentations to answer the workshop question anytime.

INTRODUCTIONS

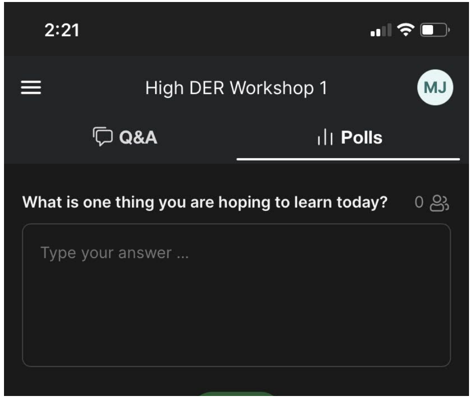
Join at
slido.com
#7452 931

- **What is one thing you are hoping to learn today?**

Slido Website View:



Slido Phone View:



GRIDWORKS

Proceeding No. R.

Join at
slido.com
#7452 931

California Public
Utilities Commission

Goals of the Commission

Commissioner Darcie Houck

February 08, 2024

Proceeding No. R.

Join at
slido.com
#7452 931

California Public
Utilities Commission

High DER Proceeding

Track 2 Workshop 1

February 08, 2024

Energy Division

Join at
slido.com
#7452 931

High DER Future Proceeding
(R.21-06-017)

Woon Jung

Senior Utilities Engineer

Grid Planning, Energy Storage and Non-Wires Alternatives

Contact: Woon.Jung@cpuc.ca.gov

California Public
Utilities Commission

Join at
slido.com
#7452 931

Three High DER Proceeding Tracks

1

Distribution Planning Process and Data Improvements

- Phase 1: Near-Term Actions
- Phase 2: Distribution Planning Process Improvements
- Topics:
  - IOU Distribution Planning Process Staff Proposal
  - Electrification Impacts and Potential Mitigation
  - Data Portal Improvements
  - Distribution Planning Community Input to Distribution Planning Needs

2

Distribution System Operational Needs and System Operator (DSO) Roles and Responsibilities

- Investigation of **operational needs** for a high DER future grid (2030-2035)
- **Gap analysis** of operational needs vs. the current capabilities of Distribution System Operators (Utilities)
- **Recommendation** to address identified gaps and **Future Grid development**
- Identification of future actions that could lead to a successor proceeding

3

Smart Inverter Operationalization and Grid Modernization Planning

- Phase 1: Smart Inverter Operationalizatio n
- Phase 2: Grid Modernization Planning and Cost Recovery
- Topics:
  - Business Use Cases for Smart Inverters
  - DER Dispatchability
  - Smart Grid Investment Planning

Join at
slido.com
#7452 931

Track 2 Scoping Questions (Revised Scoping Memo)

Track 2: Distribution System Operational Needs and System Operator Roles and Responsibilities

Question 1: What are the **operational needs** necessary to efficiently operate a high DER grid, unlock economic opportunities for DERs to provide grid services, limit market power, reduce ratepayer costs, increase equity, support grid resiliency, and meet State policy objectives?

Question 2: What are the **existing gaps and barriers** in achieving the needs identified above within our current Distribution System Operator (Utilities)? What are the **potential solutions** in overcoming these barriers?

ED Staff Presentation Overview

For Related Proceedings interacting with the "High DER Future" OIR:

- Transportation Electrification (R.23-12-008)
- Microgrids (R.19-09-009)
- Interconnection (R.17-07-007)
- Demand Flexibility (R.22-07-005)

1) What are the **Objectives** of your related proceeding ; and

2) How can "High DER Future" **grid operations help** (contribute) or **hinder** (Challenge) the objectives of your related proceeding?

Join at
slido.com
#7452 931

Vehicle-Grid Integration and High DER Future

Audrey Neuman

Senior Analyst

Transportation Electrification

Contact: Audrey.Neuman@cpuc.ca.gov

California Public Utilities Commission

Vehicle-Grid Integration and R.23-12-008

Proceeding Overview:

- Aimed at furthering policy related to transportation electrification, including:
  - TE grid planning to support charging infrastructure deployment;
  - BTM infrastructure investment to support state goals;
  - Vehicle-grid integration (VGI); and
  - Ongoing TE policy development and collaboration.

- **VGI focus:**
  - Establish goals and targets for the advancement of VGI, assess programmatic and policy interventions, and affordability considerations, with a focus on:
    - 1) technology enablement,
    - 2) rates and demand flexibility programs;
    - 3) TE grid planning.

- **VGI and High DER future challenges:**
  - Determine achievable potential for V1G and V2G;
  - Address identified technical barriers to enable widespread deployment of VGI technologies;
  - Identify price signals and incentive opportunities to encourage customer behaviour.

Join at
slido.com
#7452 931

Microgrids and High DER Future

Patrick Saxton

Senior Utilities Engineer

Grid Resiliency & Microgrids

Contact: Patrick.Saxton@cpuc.ca.gov

California Public
Utilities Commission

R.19-09-009: Microgrids Proceeding

- Microgrid does not have a fixed definition or imply a specific type of resources.
- For CPUC purposes, definition is in P.U.C. § 8370(d):

> "Microgrid" means an interconnected system of loads and energy resources, including, but not limited to, distributed energy resources, energy storage, demand response tools, or other management, forecasting, and analytical tools, appropriately sized to meet customer needs, within a clearly defined electrical boundary that can act as a single, controllable entity, and can connect to, disconnect from, or run in parallel with, larger portions of the electrical grid, or can be managed and isolated to withstand larger disturbances and maintain electrical supply to connected critical infrastructure.

- Current focus of R.19-09-009:
  - Development of tariffs to allow community microgrids (aka multi-property microgrids) to use utility distribution grid during microgrid islanding mode.
  - Implement Microgrid Incentive Program – Financial support for community microgrids in vulnerable and disadvantaged communities.

R.19-09-009: Microgrids Proceeding

- Microgrids can provide all the functionality of DERs, coordinate DERs and loads, and provide resiliency.
  - Site controllers can coordinate DERs and loads in some non-microgrid scenarios.
- High DER efforts on markets and services are broadly applicable to the DERs and loads within a microgrid that is in grid-connected mode.
  - High DER proceeding leads on these and microgrids proceeding ensures coordination.
- Common theme between proceedings is standardizing regulatory requirements.
  - For microgrids this increases the feasibility of project deployment.

R.19-09-009: Microgrids Proceeding

- High DER operations that include DERs and loads within microgrids in grid-connected mode are likely to be a source of blue-sky revenue for the microgrid.
  - This allows those resources and loads to meet multiple objectives and goals.
  - Achieved by treating DERs and loads in a microgrid in an equivalent manner as DERS and loads outside of microgrids.
  - Example – Storage within a microgrid may need to maintain a minimum state of charge for resiliency purposes but the incremental portion of the storage is available for market and program participation.
- If rules and eligibility for High DER operations have substantive differences for the DERs and loads within microgrids in grid-connected mode:
  - Unlikely to make most efficient use of available resources.
  - Less likely to create viable pathways for development of microgrids.

Join at
slido.com
#7452 931

Interconnection and High DER Future

Jose Aliaga-Caro
Utilities Engineer
Interconnection and Distribution Engineering

Contact: Jose.Aliaga-Caro@cpuc.ca.gov

California Public
Utilities Commission

Interconnection Proceeding

Current Rulemaking R.17-07-007 Objectives

- Streamline interconnection of generating distributed energy resources
- Incorporate the results of the Integration Capacity Analysis into the interconnection process through Limited Generation Profiles (LGP) (Issue 9, D.20-09-035)
  - Draft Resolution E-5296 (mailed on 1/21/24) adopts three different 24-value profiles and provides customer choice

Interconnection Support for High DER Future & Rulemaking (R.21-06-017)

- Supports of a High DER future by enabling interconnection of generating systems through Rule 21
- Firm/Non-Firm interconnection agreements build on Limited Generation Profiles
  - LGP offers a variable export schedule as firm capacity with no ability to increase the export
  - In Firm/Non-Firm Capacity agreements (SIOWG) the LGP would become the firm-capacity limits, while allowing for additional non-firm capacity to meet grid needs

Interconnection Challenges

- How to avoid "stranded capacity" and grid upgrades
- Ensuring upgrades are performed only when the limit of the grid capacity has been reached while ensuring the safety and reliability of the grid
- Responsibility of Future Upgrades: Ratepayers or Developers or a shared mechanism?

Conceptual LGP and Firm/Non-Firm Capacity Agreements

Join at
slido.com
#7452 931

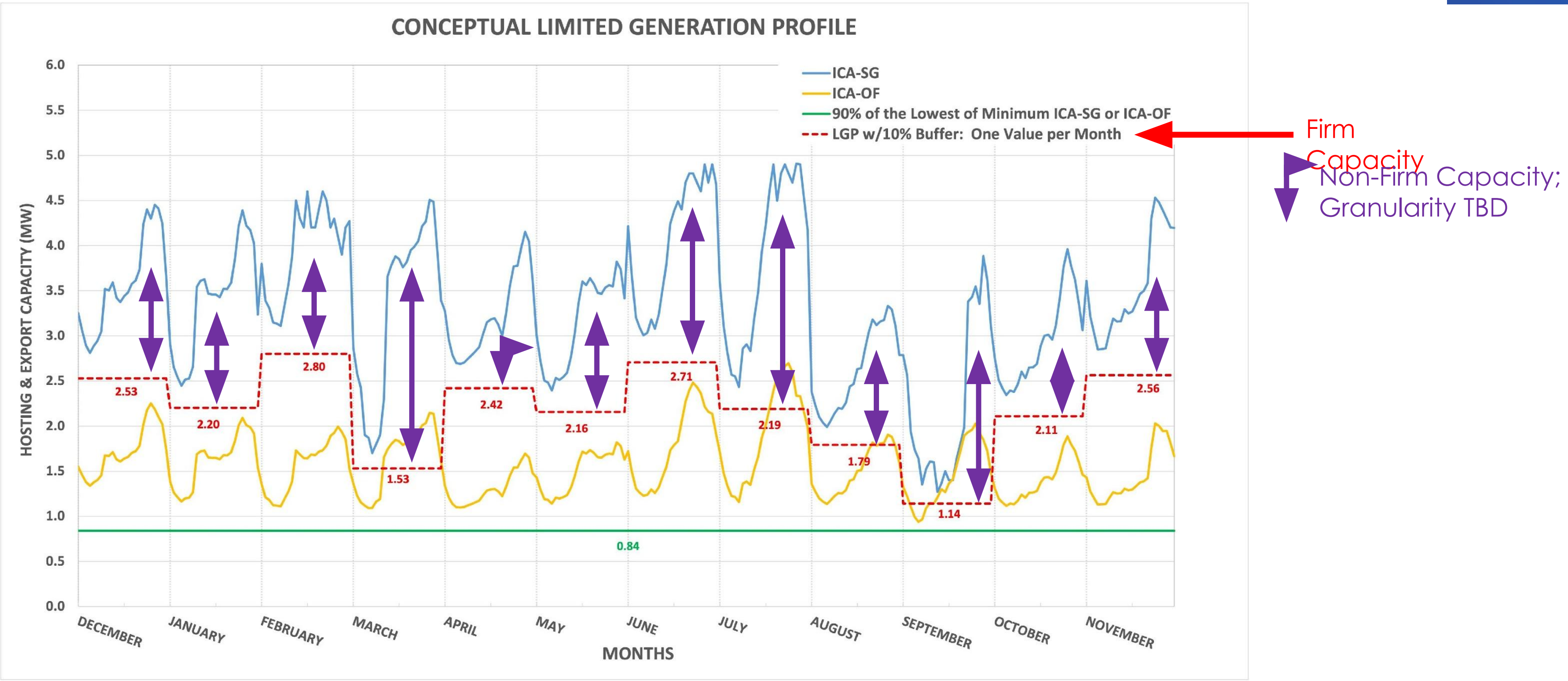


Figure 1: Conceptual illustration of the use of Limited Generation Profile using only one identical value per month (i.e., 12 different values per year). ***Note: A 12-value LGP is shown for simplicity. Draft Resolution E-5296 allows for three different profiles.***

California Demand Flexibility and High DER Future

Achintya Madduri, PhD
Senior Analyst
Retail Rates

Contact: Achintya.Madduri@cpuc.ca.gov

California Public Utilities Commission

Demand Flexibility OIR (R.22-07-005)

Summary and Goals

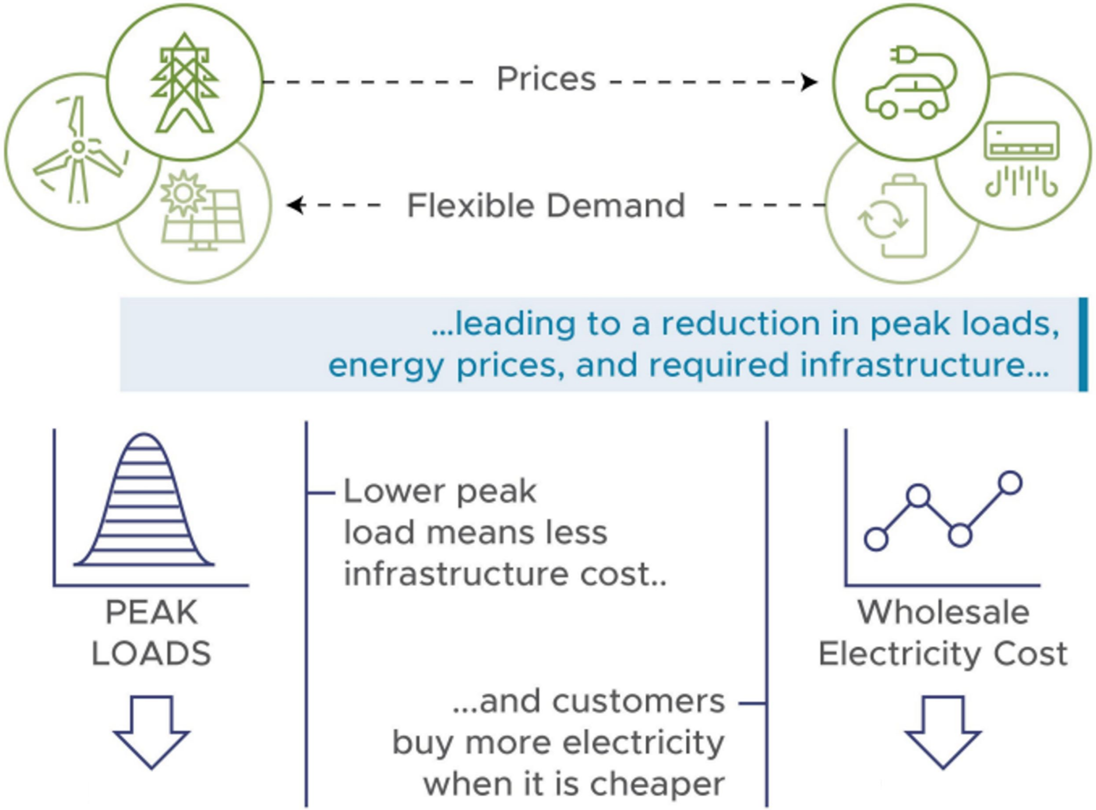
1. **Develop policies to achieve widespread customer adoption of automated demand flexibility solutions throughout the state**
   - Reduce long-term system costs through more efficient pricing of electricity to:
     - Make electricity bills more affordable and equitable, and,
     - Enable widespread building/transportation electrification.
   - Develop scalable solutions that accommodate participation by both bundled and unbundled customers
2. **Ensure IOUs comply with CEC's adopted Load Management Standards (LMS) Amendments for dynamic hourly, cost-based rates**

Tie-in to High DER Proceeding

1. **How can IOUs utilize dynamic distribution prices to delay/reduce distribution system upgrades?**
2. **How can existing DSO systems be used to enable dynamic distribution prices?**

Vision for Demand Flexibility

Join at
slido.com
#7452 931



- Widespread adoption of demand flexibility solutions
- Reduced peak loads, energy prices, infrastructure needs
- Reduced cost of service

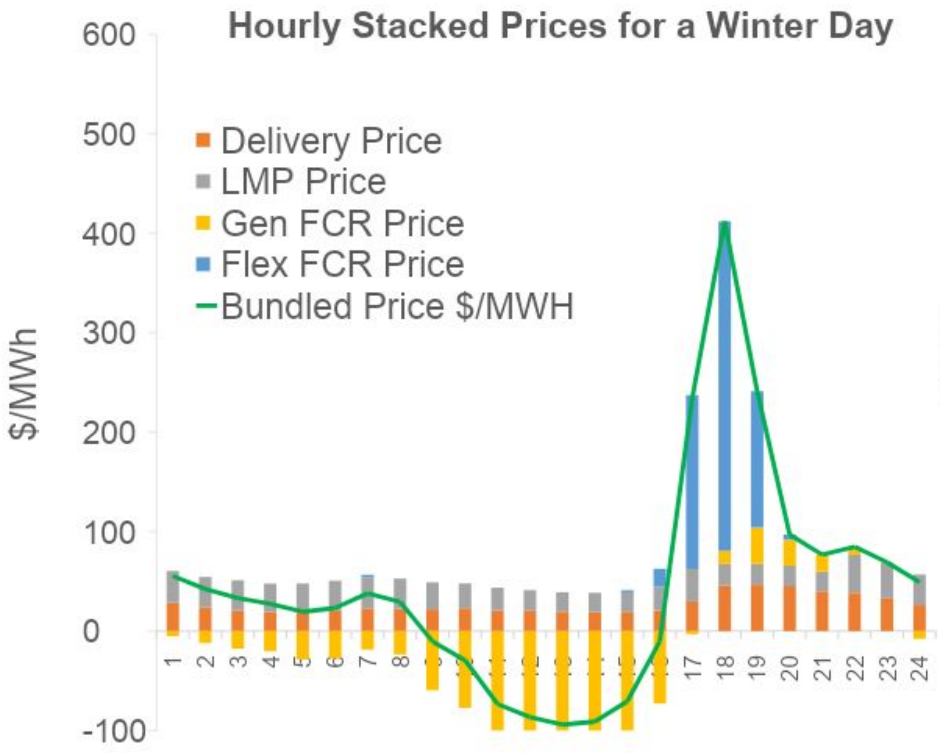
Image Source: PNNL DSO+T Study January 2022

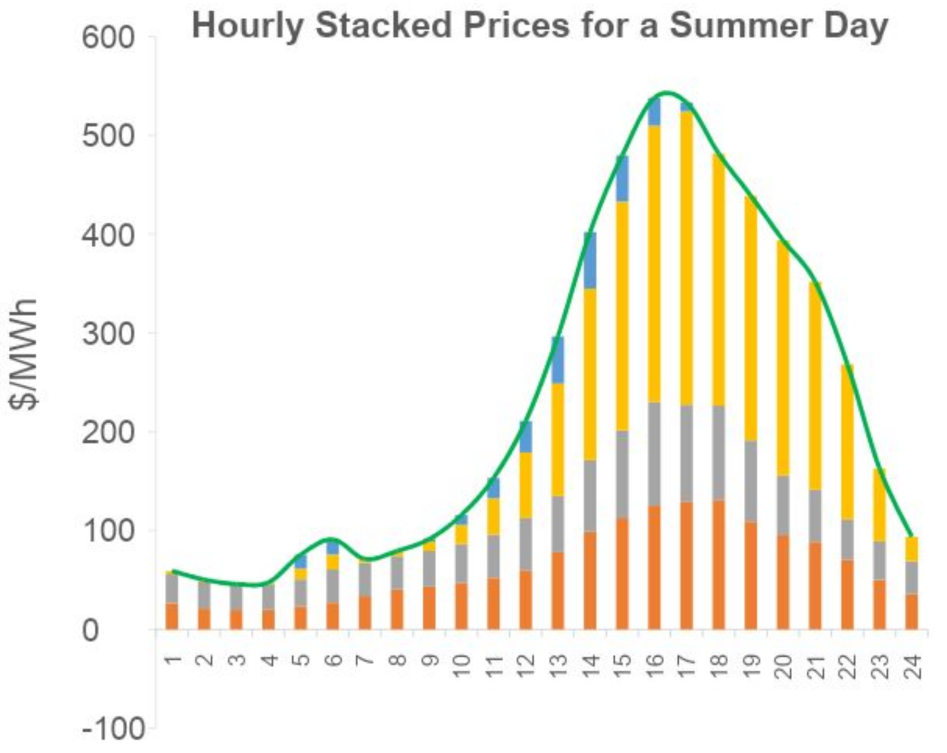
California Flexible Unified Signal for Energy – CalFUSE "Framework"

Three Pillars		Six Elements
Price Presentation	→	Element 1: Standardized price access
Rate Reform (Three-prong strategy)	→	Element 2: Real-time energy prices
	→	Element 3: Real-time capacity prices
	→	Element 4: Bi-directional prices
Customer Options for Energy Optimization	→	Element 5: Subscription option
	→	Element 6: Transactive option

SCE CalFUSE Pilot – Illustrative Winter/Summer Prices

Composite Hourly Prices based on Hourly Capacity Utilization & CAISO LMP



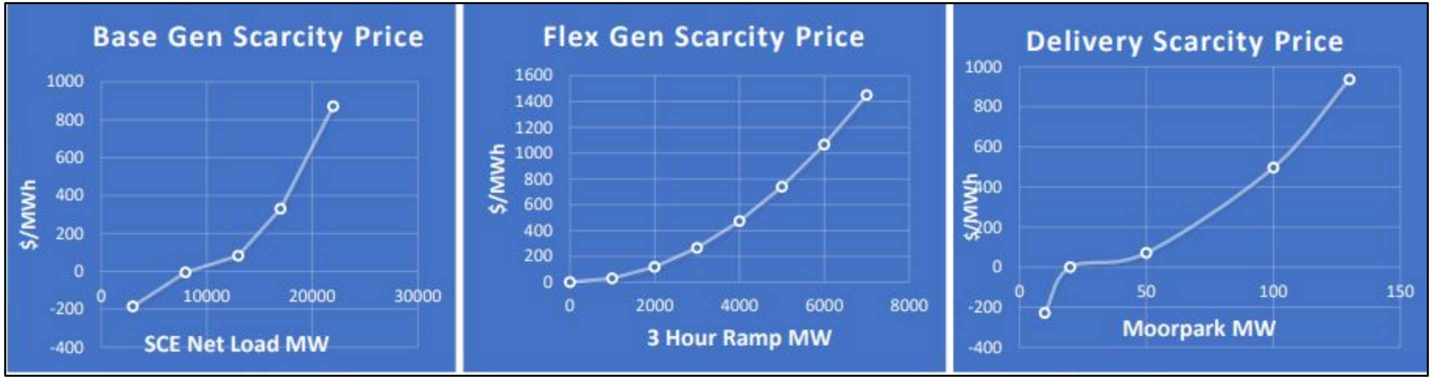


FCR = Fixed Cost Recovery

Source: SCE/TeMix/UD "RATES" Pilot funded by CEC (EPIC)

Form for Dynamic Generation/Distribution Prices

Join at
slido.com
#7452 931



- **ED Staff Recommendation: Dynamic prices should be scarcity prices (function of load)**
  - System load for generation, local distribution load for distribution
- **Challenge for High-DER Future: Can existing IOU systems be used to enable the systems/process for dynamic pricing?**
  - Currently CalFUSE pilots are relying on 3rd-party forecasts for generating distribution load forecasts
  - Example solution: Integrate SCADA data with price machine to generate local distribution load forecasts

Join at
slido.com
#7452 931

Contact Information:

High DER Future Proceeding: Woon.Jung@cpuc.ca.gov

Transportation Electrification Proceeding: Audrey.Neuman@cpuc.ca.gov

Microgrid Proceeding: Patrick.Saxton@cpuc.ca.gov

Interconnection Proceeding: Jose.Aliaga-Caro@cpuc.ca.gov

Demand Flexibility Proceeding: Achintya.Madduri@cpuc.ca.gov

California Public
Utilities Commission

Backup Slides

High DER Future Proceeding: Woon.Jung@cpuc.ca.gov

We Anticipate a High-Penetration Distributed Energy Resource (DER) Future

"This OIR anticipates a high-penetration DER future and seeks to determine how to optimize the integration of millions of DERs within the distribution grid while ensuring affordable rates."

– High DER OIR at p. 9

"This OIR neither seeks to set policy on the overall number of DERs nor does it seek to increase or decrease the desired level of DERs. This OIR focuses on preparing the grid to accommodate what is expected to be a high DER future and capture as much value as possible from DERs as well as mitigate any unintended negative impacts."

– High DER OIR at p. 10

Join at
slido.com
#7452 931

Concepts, Terminology & Objectives

Jay Griffin, Gridworks

GRIDWORKS

Overview of Future Grid Workshop Series

Join at
slido.com
#7452 931

Workshop #1 Identify Operational Needs	Workshop #2 Gap Assessment	Workshop #3 Develop Recommendations
• Focus: Scoping Question 1	• Focus: Scoping Question 2	• Focus: Scoping Question 2
• Develop list of future grid needs through panel discussions	• Identify gaps between current operations and future grid needs	• Recommend to the Commission actions to address identified gaps.

Post Workshop:

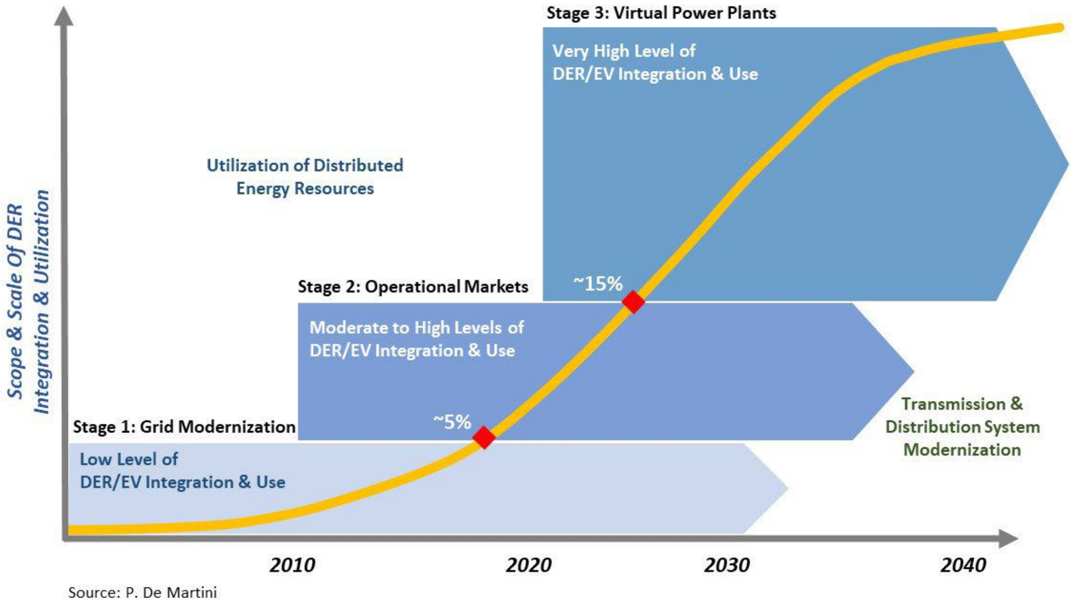
Gridworks assembles workshop reports into the *Future Grid Study:*

- provides account of identified operational needs, gaps, barriers, and required actions.

Parties comment on Gridworks' *Future Grid Study*, forming a record for decision-making.

What are “operational needs”?

Join at
slido.com
#7452 931



Source: US Department of Energy, *Distribution System Evolution*, p. 3.

CA utilities will need to upgrade operational capabilities for High DER Future

“Operational Needs”:
New or enhanced capabilities required to reliably operate a distribution grid with High DER penetration

Today’s Goal:
Co-create list of operational needs for High DER Future

GRIDWORKS

Today: Focus on Distribution Grid Operations

Join at
slido.com
#7452 931

Distribution Grid Operations: Safe, reliable and resilient operation of a distribution system.[1]

Involves:

- regular reconfiguration or switching of circuits and substation loading for scheduled maintenance, isolating faults, and restoring electric service; and
- active management of voltage and reactive power.

Includes:

- physical coordination of DER and microgrid operation and interconnections to ensure safety, reliability and resilience; and
- physical coordination of DER services and scheduled and real-time power flows between the distribution and transmission systems.

Today's discussion does not include distribution planning, market operations, or alternative system operator models.

[1] Source: US Department of Energy, *Modern Distribution Grid Volume 1: Objective Driven Functionality*, pp. 2-3.

GRIDWORKS

Examples of Operational Needs for High DER Future

Join at
slido.com
#7452 931

	Operational Need	Gap	Solution/Barrier
Fully enabling community microgrids	Seamless transition between grid-connected and island modes	Limitations on distribution operations IT systems	Scope support for community microgrids in future IT upgrades
EV fleet charging	Improve charge management to avoid overloading distribution infrastructure	Communications with operator to schedule limits on granular timeframes	Implement recommendations from SIOWG on load flexibility

10 Minute Break

Please be back at 00:00

GRIDWORKS

Join at
slido.com
#7452 931

Join at
slido.com
#7452 931

Panel 1:
Utilities & CAISO

Devin Rauss,
Southern California Edison

Quinn Nakayama,
Pacific Gas & Electric

Kirsten Petersen & Christopher Franco,
San Diego Gas & Electric

Jill Powers,
CAISO

GRIDWORKS

High DER: Future Grid Study, Workshop One

Operational Needs

Join at
slido.com
#7452 931

February 8, 2024

Agenda

Join at
slido.com
#7452 931

What Does Success Look Like?
Expected Future Customer and Their Grid Needs
Future Operational Needs to Meet Customer Expectations
Questions

Join at
slido.com
#7452 931

What Does Success Look Like?

Where Are We Now and Where Are We Going?

In the face of significant change, the utility role is evolving and expanding, but the core objectives remain consistent:

- Maintain a grid that is _**safe, reliable, clean, and affordable**_ to all in support of achieving state decarbonization goals at lowest cost

From Grid-Centric to _Customer-Centric_

- Until now, utilities have primarily used grid-centric operational tools
- The future DSO will enable more customer-centric operations

From traditional DERs* to focus on _Transportation Electrification_

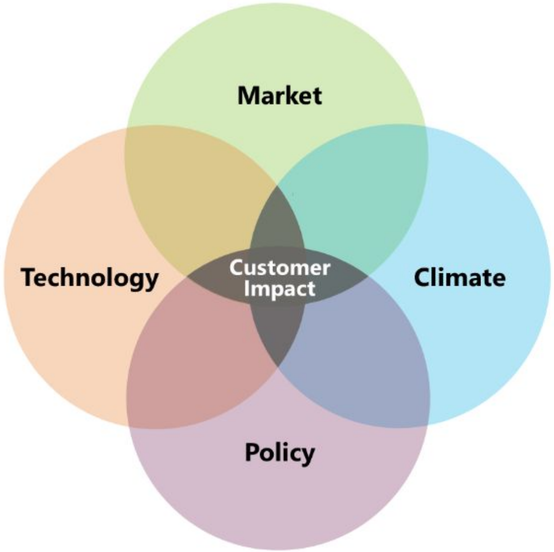
- Customer behavior, adoption, and needs drive change on the grid
- TE is the primary driver of change – and opportunity

From Fragmentation to _Orchestration_

- Grid operations are limited by existing tools
- Grid Orchestration is built upon the full understanding of locations, assets, and behaviors

*DERs include electric storage resources, intermittent generation, distributed generation, demand response, energy efficiency, thermal storage, and electric vehicles and their supply equipment (per CPUC and FERC).

External Factors Are Necessitating Change



Leverage Advanced Grid Management:

- Optimize the grid and operationalize assets to unlock load management flexibilities across different system levels
- Continue to operate the grid safely and reliably

Address Customer's Growing Needs:

- Support customers' electrification needs
- Adapt to additional challenges presented by climate change

Harness Customer as Partners:

- Enable customers and developers to make cost-effective technology choices
- Enable effective orchestration of the grid as a whole

Achieve State Goals:

- Achieve California's ambitious decarbonization targets
- Maintain affordability and improve equity

What Is Needed to Achieve Success?

Technology Evolution

- IOUs need to successfully execute on their existing in-flight Grid Modernization Plans.
- Effectively develop and implement new solutions as they are identified, such as Vehicle-to-Grid.

Policy Advancement

- Develop policy foundation to enable full grid orchestration, along with supportive rules to align and prioritize across needs.
- Encourage competition to mitigate market power concerns.

Customer Journey

- Ensure customers are engaged, informed, and empowered.
- Promote equity for all customers, including disadvantaged communities, and both DER owners and non-owners.

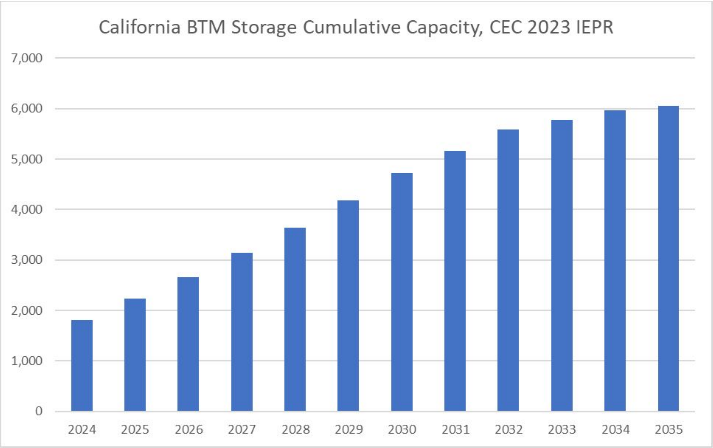
Join at
slido.com
#7452 931

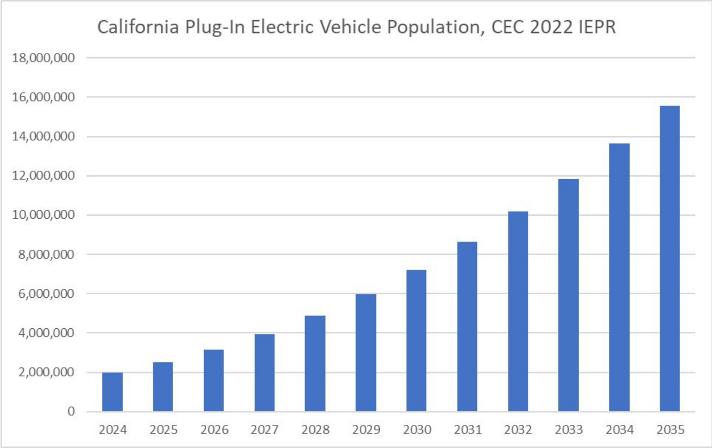
Expected Future Customers and Their Grid Needs

The Landscape of Technology Capabilities is Rapidly Changing

Join at
slido.com
#7452 931

- While projected growth of solar, storage, and building electrification will continue to play a role within the DER landscape, the sheer size of the projected Electric Vehicle growth and capabilities, not just as a flexible load, but with a potential as a 2-way power flow technology, will have an overweight impact that must be carefully considered





Grid Orchestration: Supporting Customers, State Policy, and Reliability

Join at
slido.com
#7452 931

Supporting customers

Use Case – Reducing Service TX Upgrades

- Optimizing EV charging loads may allow customers to get home L2 charging without waiting for panel and/or service TX upgrades

Risk of uncertainty/non-performance

- Service TX failure results in outages to customer(s) during high load/need times
- Customers need to wait for service tx upgrades before getting L2 charging, potentially disincentivizing adoption

Use Case – Flexible Interconnection

- Customers can modulate loads on set schedules and thus can interconnect on constrained circuits prior to wires upgrades

Risk of uncertainty/non-performance

- Upstream protective device operates on over-current resulting in multi-customer outages

Supporting electrification

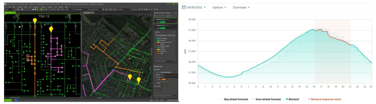
Use Case – Reducing Electrification Investments

- Flattened load curves may result in certain situations to reduce investments required to meet electrification load growth forecasts

Risk of uncertainty/non-performance

- New business loads (e.g. EV loads, data centers, etc.) will be unable to interconnect to the system, exacerbated with now delayed capital investments
- California's state goals for de-carbonization are delayed and economic growth is hampered
- Potential for overloaded circuits causing outages reducing local reliability and power quality

Supporting reliability



Use Case – Local Reliability

- Operators ability to call upon and reduce loads can enhance circuit switching abilities, minimizing outages and decreasing duration

Risk of uncertainty/non-performance

- Outage impact may be even greater than originally as upstream protective devices are triggered on over-current

Use Case – System Reliability

- System emergency conditions can be mitigated through DER dispatch (e.g. demand response)

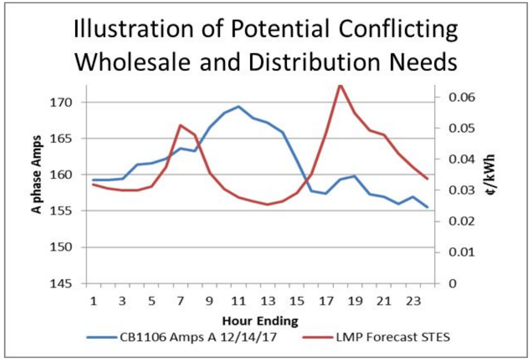
Risk of uncertainty/non-performance

- Further mitigations will be required in order to ensure system integrity (e.g. rolling black outs)

PG&E SDGE SOUTHERN CALIFORNIA EDISON

Grid Orchestration: Energy Systems are Not Perfectly Correlated

Needs are not perfectly aligned, and so orchestration is needed to resolve conflicts



- Various local and system needs can be uncorrelated, or even worse, negatively correlated
- By only meeting and orchestrating the needs of the energy system as a whole, constraints can be even exacerbated for the grid
- Orchestration is required during those periods of conflict, whereby the needs of the hyper local are coordinated with the higher level and macro system
- Tariffs and/or policies may be needed to determine to support this orchestration, while also optimizing for customer value and considering customer preferences

Grid Orchestration Meets Transportation Electrification

Customers engagement will be key, and requires an investigation into the unknown

EVs: Transportation vs. a valuable grid asset

- How customers engage, and feel empowered about the utilization of their vehicle as an energy asset *is still unknown*.

Customer's engagement may change rapidly over time

- EV battery capacity continue to have step-change developments (e.g. solid state batteries)
- Customers become more comfortable with energy availability

More industry study is needed

- Customer optionality due to diversity in customer profiles
- Highly flexible program designs as the customer journey continues to evolve.

Join at
slido.com
#7452 931

Future Operational Needs to Meet Customer Expectations

Evolving Grid Calls for Growing Operational Needs

Join at
slido.com
#7452 931

Evolving Operational Needs

Future
Large amount of load growth, especially TE and BE.
Conflicting management needs between different system levels

Complex and advanced grid management and orchestration, optimized asset management through advanced analytics

Present and Near Term
Bi-directional power flow
Growing number of DERs, especially EVs
Increasingly dynamic and flexible loads

Smart grid, grid intelligence and grid management systems

Past
Uni-directional Power Flow
Large primary/front-of-meter systems
Operate manually

SCADA, planning and forecasting tools

Grid Management Capabilities

Operational Needs – Capabilities

Join at
slido.com
#7452 931

Advanced grid orchestration built upon visibility and data

Ability to see/model increasingly more assets and customer technology adoption

Ability to process the large volume of data and assist operators in making data-based decisions

Optimized asset management using operational and analytical tools

Reliable communication for load management capabilities

Efficient and secure grid architecture from grid edge to operation center

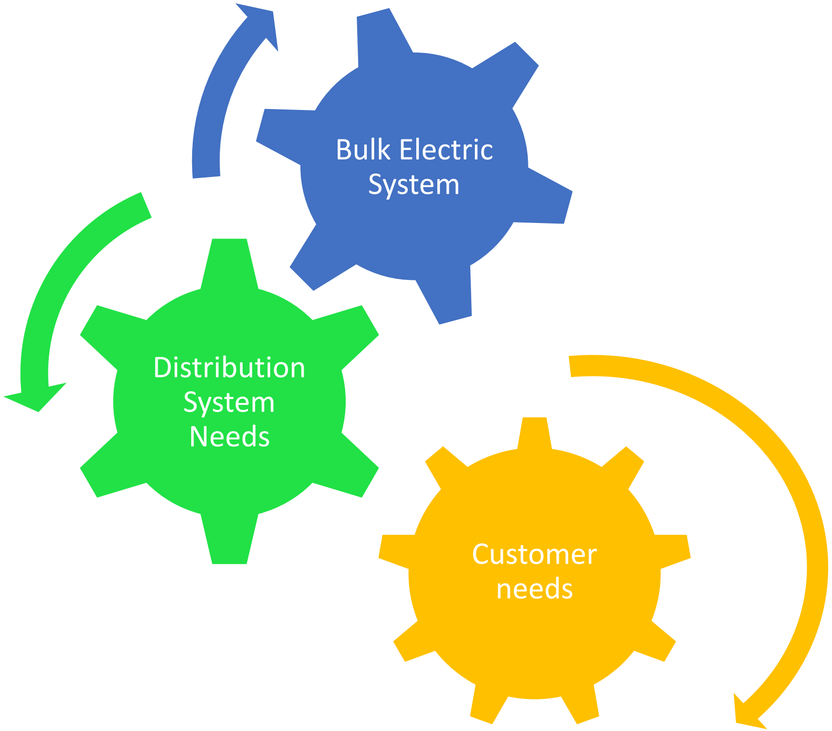
Balancing needs across different operating levels

Evolving needs requires careful balancing across different levels

Ability to assess, analyze and come up with solutions balancing needs

Operational Needs – Prioritization, Optimization and Conflict Resoluti

Join at
slido.com
#7452 931



- Operational hierarchy
- Determine whether balancing individual devices or aggregation
- Anticipate emergency vs typical dispatch
- Identifying compromises to mitigate customer inequity

Customer Experience is the Core of Grid Orchestration

- Support the customer of the future
- Define the customer's role in balancing future energy needs
- Communicate program participation opportunities

DERs and the Future Grid: New Capabilities and Opportunities

Category	New Capability	Description	Customer Benefit
DER/Smart Inverter Communication	**DER Visibility**	Real-time awareness of DER status and output	Improve reliability through better understanding of current grid conditions.
	DER Scheduling and Dispatch	Signal *participating* DERs to provide output at specified time (Day-ahead and real time)	Enable customers to provide grid services (and be compensated)
Operational planning and analysis	**Short-term Forecasting**	Highly granular forecast of DER output for next 24 hours	Improve reliability through better anticipation of expected grid conditions.
	Advanced Grid Analytics	Analyze grid conditions (current and forecasted circuit loading, DER output, etc.) to identify potential issues and suggest remedies	Improve reliability through anticipation of both grid problems and mitigations
	Grid/DER Optimization	Optimize use of grid assets and DERs to provide maximum value	Reduce expense and maximize opportunities for customer to provide grid services. Eventually, enable local pricing.
T&D Interface	**Advanced CAISO Coordination / Communication**	Mutual sharing of DER schedules, operations, constraints	Enable multiple uses, avoid operational conflicts. Eventually, enable market coordination
Physical Infrastructure	**Grid infrastructure Automation**	Real-time monitoring and automated grid control enabled by Intelligent sensors, switches, protection, communication devices	Improve reliability by responding faster to emergencies and changing grid conditions. Enable more granular ability to re-configure the distribution grid to re-route power during abnormal conditions

Join at
slido.com
#7452 931

Q&A

Appendix

Join at
slido.com
#7452 931

California ISO

2024 Future Grid Workshop #1 -Identifying Operational Needs

Jill Powers
Market Policy Development, Demand Response & DER Sector Manager

ISO perspective of a grid with high amounts of DER

The ISO must consider how to maintain reliable operation of the transmission grid under various high DER use cases:

- DERs controlled and managed under intelligent power control systems responding to grid signals such as dynamic retail rates which are ‘grid informed’ or to meet customer needs.
- DERs aggregated into virtual power plants which can participate directly in ISO markets or be dispatched based on distribution system needs.
- DERs expected to be inflexible and somewhat immune to external signals.

Each of these DER scenarios will impact the grid in different ways

System operators must work together to maintain a reliable grid as DER deployment continues to accelerate.

Areas needing advancement and continued collaboration include:

- Visibility and Situational Awareness
- Reliability Coordination
- Communications and Data Sharing

Visibility

- Coordinated visibility of specific DER information to understand and anticipate their impacts on grid operations.
  - technology type, location, size, operational behavior and performance.
  - at various granularities (aggregated and/or device level)

What's needed:

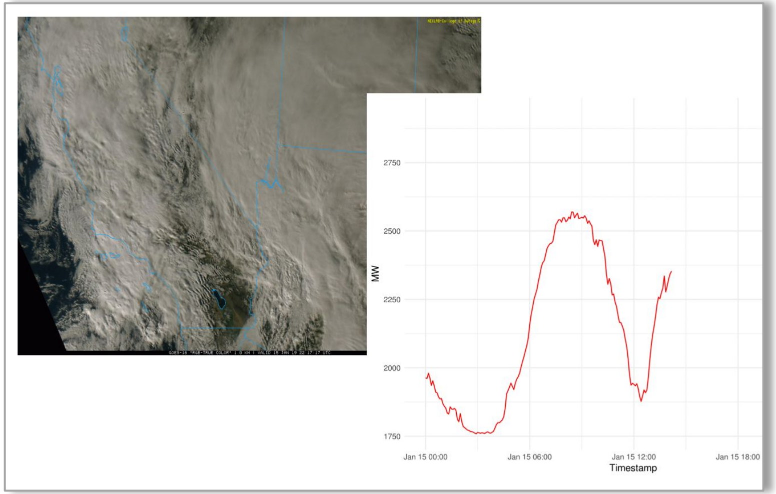
Enhanced data collection, access, and reporting

1. For planning and forecasting processes to improve grid asset utilization;
2. short term load forecasting accuracy; and
3. ISO market optimization and dispatch.

Need data for operational forecasting
Need data to understand DER response

Situational awareness of both market participating and non-participating DERs is critical for CAISO operations

- Behind-the-meter solar has been the most impactful DER for CAISO operations thus far.
  - rapidly moving demand actuals when DER generation drops off due to cloud coverage (~725 MW example)



- Understanding the impact of all types of DERs under various uses is critical to situational awareness and reliability.
  - expect transportation electrification to present greater complexity

Reliability Coordination

- The ISO does not model the distribution system.
- The ISO cannot ensure that a resource dispatched through a wholesale market award or controlled through ISO EMS telemetry is safe or feasible to the distribution system.
- Additionally, the ISO must be able to anticipate how operation of non-market participating DERs may impact the transmission system.

What's needed:

A framework to coordinate operation of DER resources when they are providing services to the distribution system or to the bulk electric system to ensure the feasibility of those services and preserve reliability.

Communication and information sharing

- Reliability or feasibility checks must be performed and communicated in the day-ahead and real-time timeframes leading up to the provision of services to the grid between the grid operators and the entities representing the DERs including aggregators and Scheduling Coordinators.

What's needed:

A communications platform and information sharing framework used to advise appropriate entities, in the appropriate timeframe, the status and feasibility of DER activity in relation to grid operations and reliability.

to cover the uncertainty of what grid will need to respond to from the DER scenarios.

Summary of areas needing advancement and continued collaboration to prepare for a high DER future

- Forecasting DERs' load modifying affects on actual load consumption in the operational time-frame.
- Predicting the short term load forecast conditions so that sufficient capacity is committed at least cost for reliable operation of the grid.
- DER impacts on long-term load forecasts that inform infrastructure planning decisions.
- Current limitations in the coordination and communication between operators of the transmission and distribution systems.
- Lack of understanding of what additional communications will be needed and availability of robust communication framework to facilitate these communications.

DERs and the Future Grid: New Capabilities and Opportunities

Category	New Capability	Description	Customer Benefit
DER/Smart Inverter Communication	**DER Visibility**	Real-time awareness of DER status and output	Improve reliability through better understanding of current grid conditions.
	DER Scheduling and Dispatch	Signal *participating* DERs to provide output at specified time (Day-ahead and real time)	Enable customers to provide grid services (and be compensated)
Operational planning and analysis	**Short-term Forecasting**	Highly granular forecast of DER output for next 24 hours	Improve reliability through better anticipation of expected grid conditions.
	Advanced Grid Analytics	Analyze grid conditions (current and forecasted circuit loading, DER output, etc.) to identify potential issues and suggest remedies	Improve reliability through anticipation of both grid problems and mitigations
	Grid/DER Optimization	Optimize use of grid assets and DERs to provide maximum value	Reduce expense and maximize opportunities for customer to provide grid services. Eventually, enable local pricing.
T&D Interface	**Advanced CAISO Coordination / Communication**	Mutual sharing of DER schedules, operations, constraints	Enable multiple uses, avoid operational conflicts. Eventually, enable market coordination
Physical Infrastructure	**Grid infrastructure Automation**	Real-time monitoring and automated grid control enabled by Intelligent sensors, switches, protection, communication devices	Improve reliability by responding faster to emergencies and changing grid conditions. Enable more granular ability to re-configure the distribution grid to re-route power during abnormal conditions

Join at
slido.com
#7452 931

Panel 2:
Thought Leaders

Jenny Riez,

Australian Energy Market Operator (AEMO)

Bryan Hannegan,

Holy Cross Energy

Debbie Lew,

Energy Systems Integration Group (ESIG)

GRIDWORKS

Join at
slido.com
#7452 931

Operational experiences with distributed PV in Australia

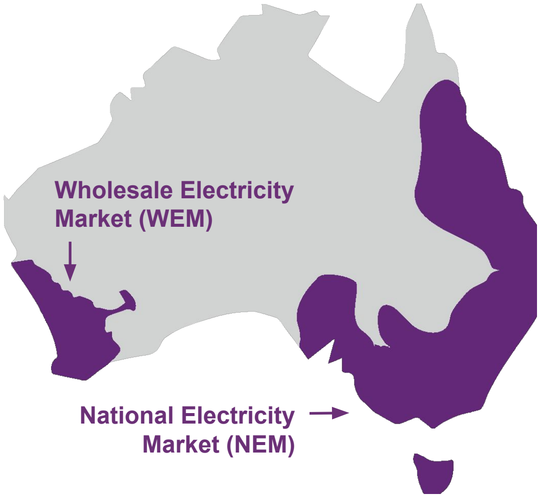
Gridworks

8 Feb 2024

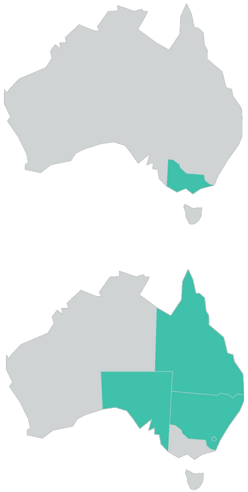
About AEMO

- AEMO is a member-based, not-for-profit organisation.
- We are the independent energy market and system operator for the National Electricity Market (NEM) and the WA Wholesale Electricity Market (WEM), and system planner for the NEM.
- We also operate retail and wholesale gas markets across south-eastern Australia and Victoria's gas pipeline grid.

Electricity



Gas

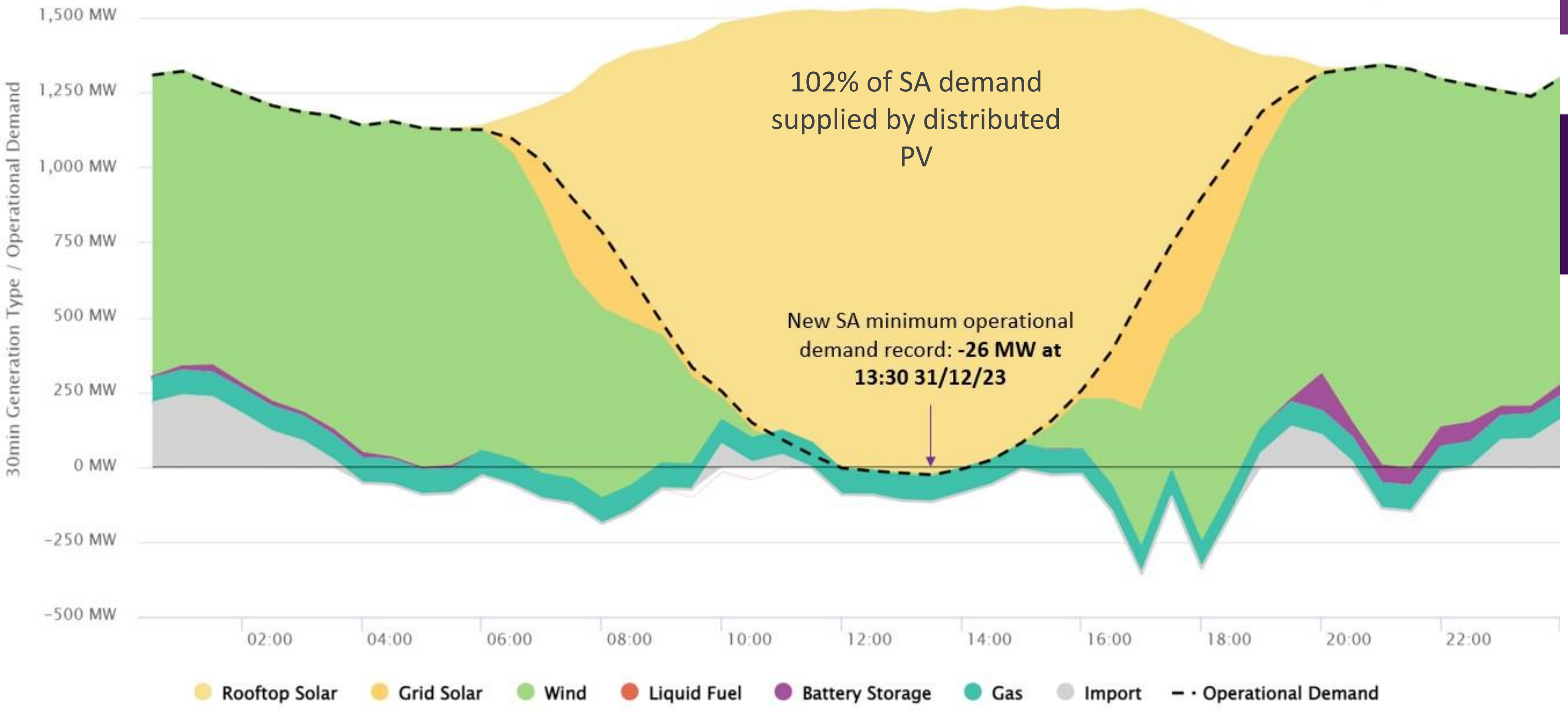


NEM
(11-36 GW)

South Australia
(1-3 GW)

One double circuit AC interconnector to the rest of the NEM

South Australia minimum operational demand record



Join at
slido.com
#7452 931

AEMO

Learnings to date

Technical performance standards

- **Disturbance ride-through capabilities** – ensure suitable standards
- **Compliance** – measure & ensure suitable governance

Dispatchability

- **Emergency backstop capability** – Early: implement simple ability to curtail active power & ensure suitable compliance
- **Integration into scheduling and dispatch** – iterate towards more sophisticated capabilities (but start simple and learn by doing)

Visibility

- **Data** – start collecting early & ensure accurate
- **Models** – determine inputs required for development

Roles and responsibilities evolving

- **Original Equipment Manufacturers (OEMs)** – critically important, escalated engagement into new functions
- **Customer metering** – new capabilities? Governance challenges

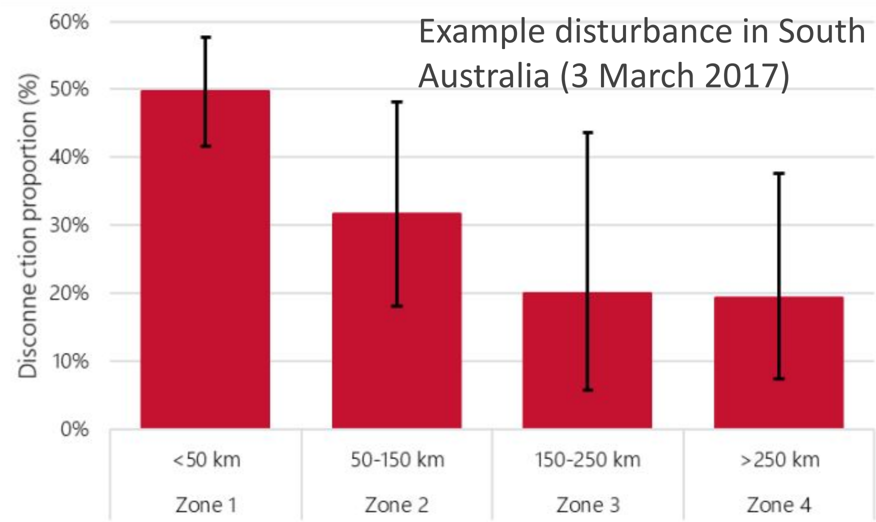
Cybersecurity

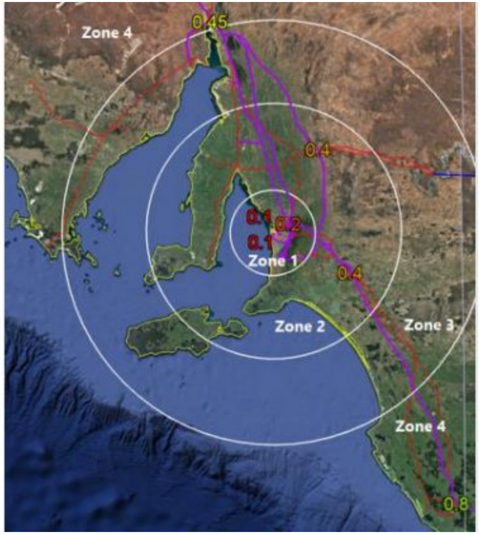
- Growing concern

Distributed PV (DPV) shake-off

- Up to 40% of DPV in a region can disconnect in response to a fault

Example disturbance in South Australia (3 March 2017)





- If unaddressed, major security issues
- 2019-2020: Defined new disturbance ride-through requirements in standards (similar to IEEE1547-2018)
- Found only ~40% are compliant with new standards
- Have improved to ~80% by working with OEMs
- Improved governance required
- Must address very early – change is slow, and retrofit very challenging

AEMO (May 2021) Behaviour of distributed resources during power system disturbances

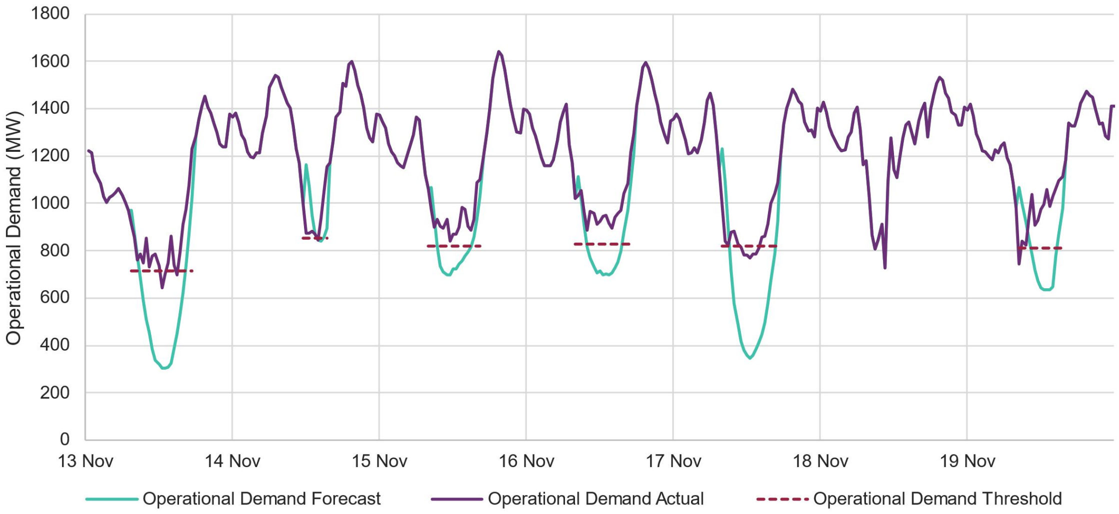
AEMO (April 2023) Compliance of Distributed Energy Resources with Technical Settings
AEMO (Dec 2023) Compliance of Distributed Energy Resources with Technical Settings: Update

Incident: 12-19 Nov 2022

Join at
slido.com
#7452 931

AEMO

- 12 November 2022: Severe weather leading to synchronous separation of SA
- Operated majority of SA as an island until 19 November 2022
- Included operation through some periods of high generation from DPV
- Necessitated 400-600 MW of DPV curtailment
- Main reason was to manage frequency impacts of possible DPV shake-off in response to a fault
- ~2/3 of the response via Enhanced Voltage Management (increase distribution voltages to reduce DPV generation)
- Poor compliance with "Smarter Homes" requirements
  - Customer must appoint a Relevant Agent who can manage their DPV when required
  - Only ~40% response rate
  - Biggest erosion of response is from incorrect commissioning).
  - Working with OEMs to improve.



AEMO (May 2023), [Trip of South-East – Tailem Bend 275kV lines on 12 November 2022]()

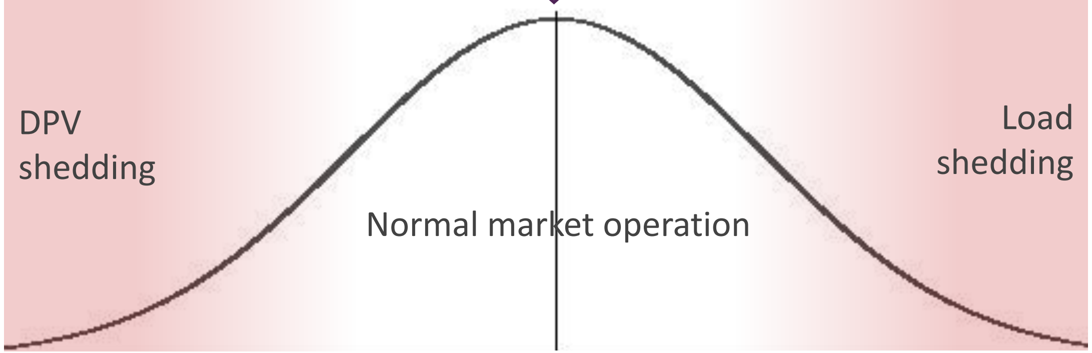
Active DER management

Join at
slido.com
#7452 931

Different kinds of active DER management required:

DER market integration
- Used regularly
- More sophistication required – **iterate towards this**
- Focus on managing customer exports

Emergency backstop capability
- Used rarely, last resort
- Can be simple
- Large MW capability required
- Turn DER fully off if needed
- **Need early**

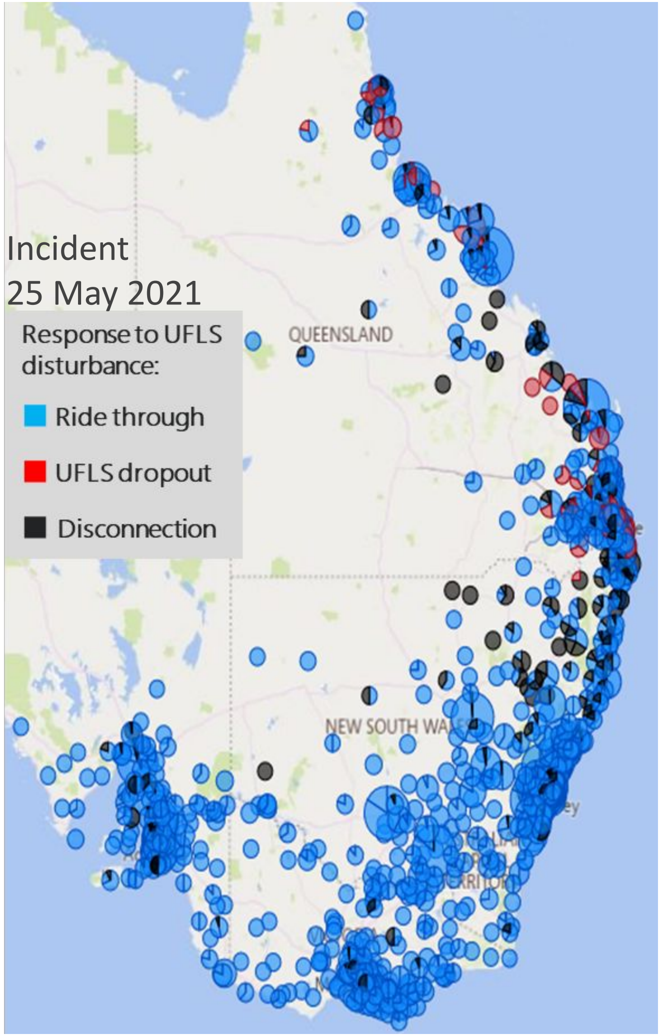


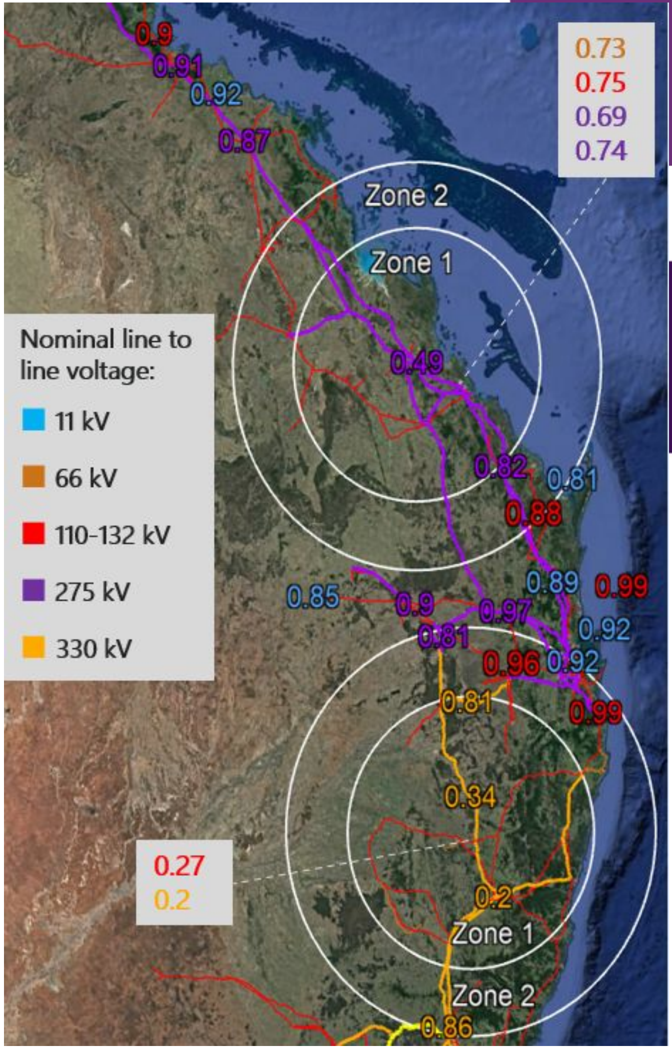
Visibility

- Underpins model development & maintaining performance requirements
- Extensive new datasets required
  - Installed capacity of DPV at each transmission bus
  - High speed monitoring (~20ms) at a range of radial load/DPV sites in both transmission and distribution networks
  - Device-level measurements from a representative sample of devices (1-5s resolution, representative by vintage, OEM, size, location. Care on bias.)

AEMO (May 2021) [Behaviour of distributed resources during power system disturbances]

AEMO (Oct 2021), [Trip of multiple generators and lines in Central Queensland and associated under-frequency load shedding on 25 May 2021]



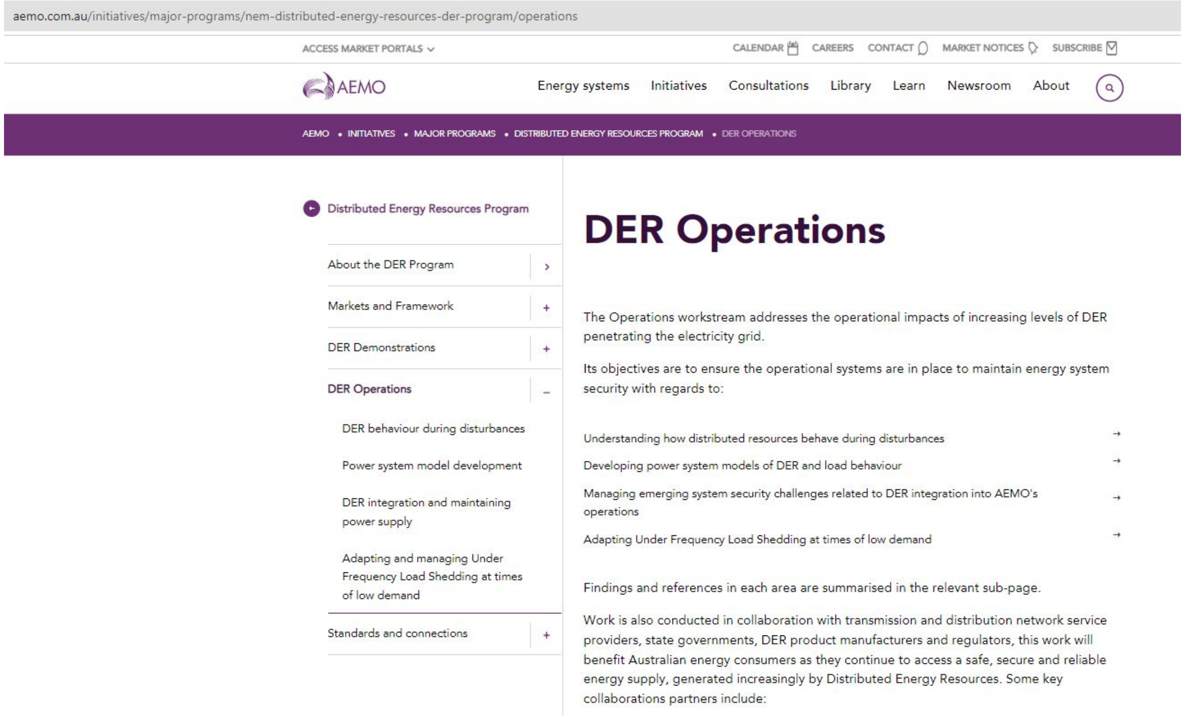


For more information

Join at
slido.com
#7452 931

AEMO

https://aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-der-program/operations



Join at
slido.com
#7452 931

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

For more information visit

aemo.com.au

Join at
slido.com
#7452 931

Operational Needs for a High-DER Future

Bryan Hannegan, President and CEO

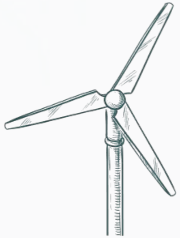
HOLY CROSS ENERGY
ESTABLISHED 1939

Your community. Your co-op. Your choice.

Join at
slido.com
#7452 931

About Holy Cross Energy

Holy Cross Energy (HCE) provides safe, reliable, affordable and sustainable energy and services that improve the quality of life for our members and their communities.



In 2023, 50% of our power supply came from wind, solar, biomass and hydroelectric power, as well as coal mine methane recovery.

Founded in 1939, we serve more than 46,000 members in scenic Western Colorado with:

275 MW Peak Deman d	3,100 Miles Distributio n Lines
120 Miles Transmissio n Lines	170 Employee s

Our Journey to 100% Clean Energy

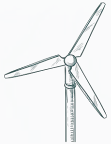
These actions will allow HCE to achieve its vision of:

- 100% carbon-free power supply by 2030
- Carbon-neutral or better across the enterprise by 2035

in a way that ***does not sacrifice affordability, safety, or reliability*** for the sake of sustainability.

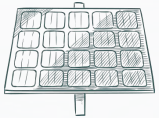
Energy Efficiency

Obtain additional reduction of electric sales from existing uses.



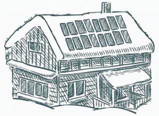
Cleaner Wholesale Power

Incorporate new, clean, dispatchable resources into HCE's power supply mix.



Local Clean Energy Resources

Continue our existing agreements for energy from local biomass, hydro, and solar projects



Distributed Energy Resources

Support installation of distributed solar systems, ideally paired with battery storage and/or flexible demand

Smart Electrification

Encourage expanded use of electricity for transportation, building heating and cooling, and industrial processes.

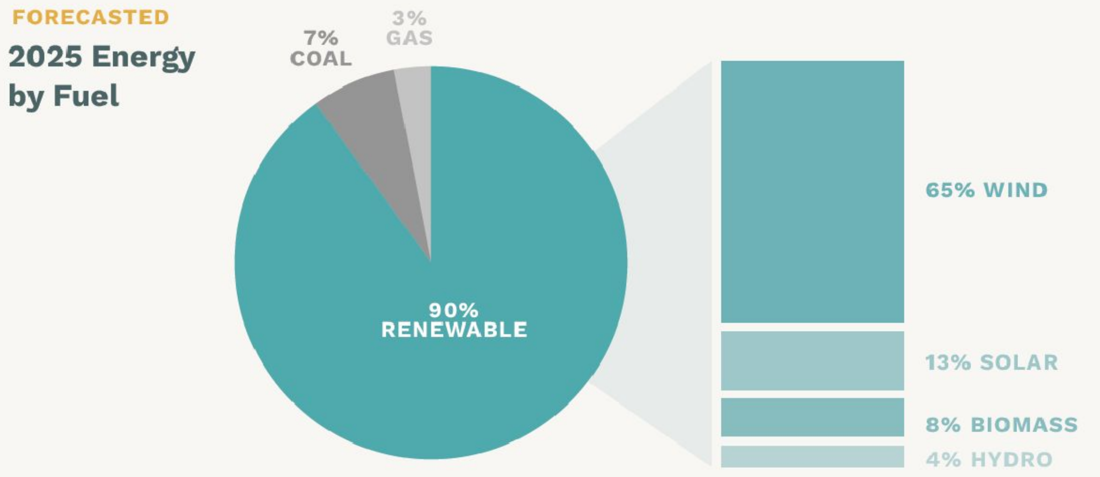
Join at
slido.com
#7452 931

Our Progress Thus Far

New Resources Developed or Under Contract:

Eastern Colorado
- 150 MW wind
- 30 MW solar

HCE Service Area
- 5 MW solar
- 4.5 MW hydro
- 4.5 MW/15 MWh solar+storage
- 10 MW/20 MWh solar+storage
- 10 MW/20 MWh solar+storage



The remaining non-renewable energy in the HCE power supply mix in 2025 is related to wholesale purchases from Public Service Company of Colorado (Xcel Energy). With HCE's currently contracted resources and because of Xcel's Clean Energy Plan (80% renewable in 2030), HCE expects to reach between 95% and 100% renewable energy in the year 2030.

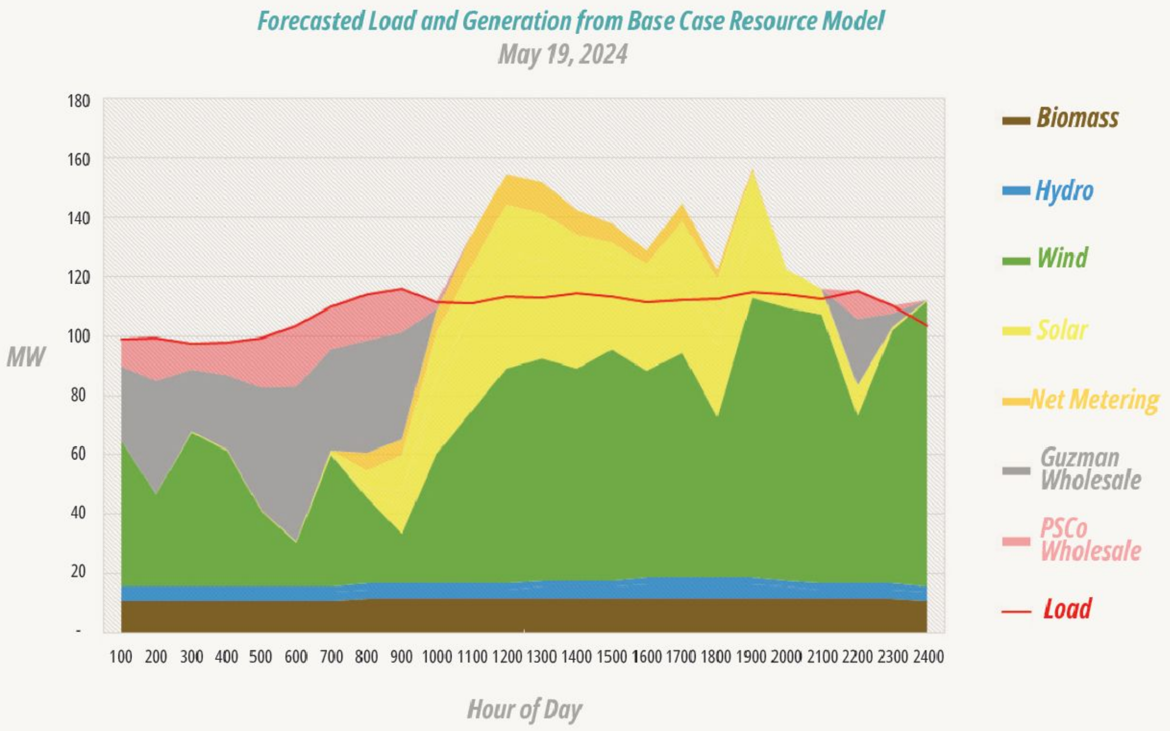
Join at
slido.com
#7452 931

Implications of High Renewables

- Significant new forms of supply variability (and financial risk)

- In general:
  - oversupply during midday solar production peaks
  - oversupply during low demand overnight hours
  - undersupply during peak demand hours (mornings and afternoons)

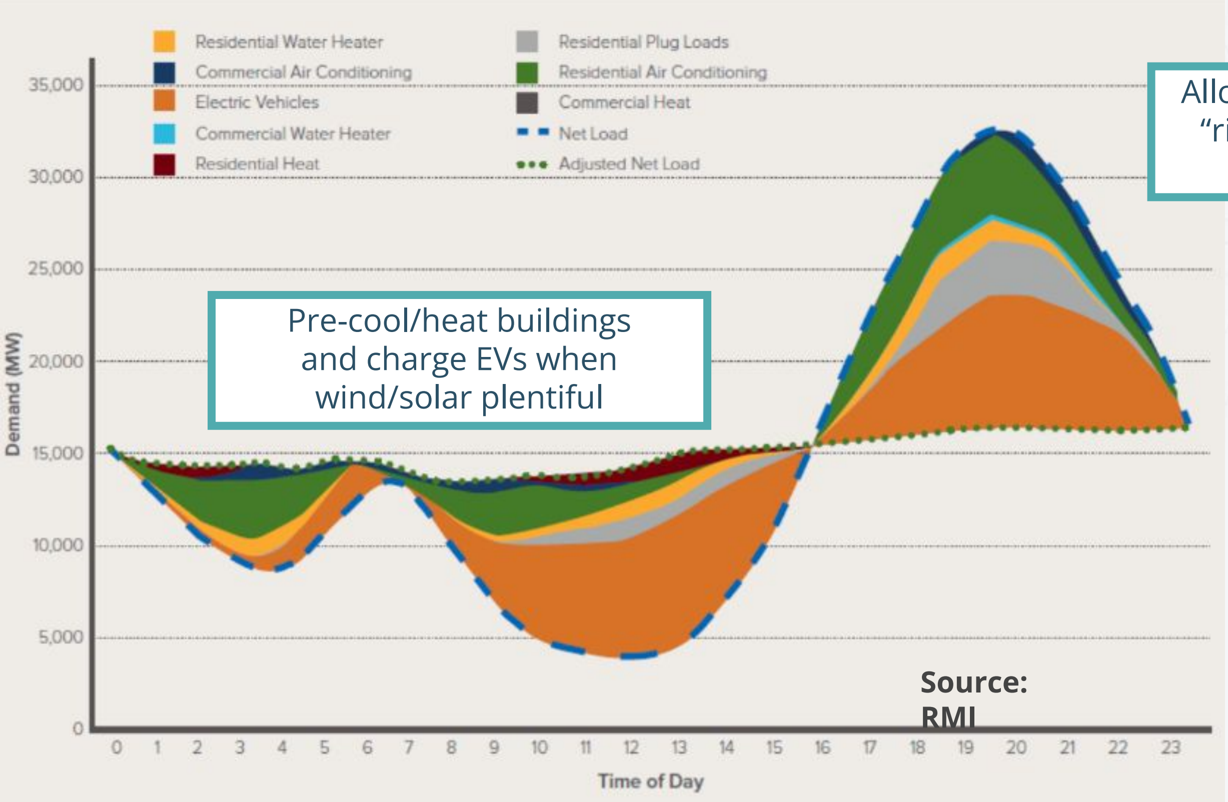
- Role of distribution utility becomes one of balancing
  - flex demand to meet available supply (+ stored energy)
  - opportunity for DERs



Flexible Demand is Key

Join at
slido.com
#7452 931

Distributed Energy Resources (DERs) must provide important services to help balance supply and demand



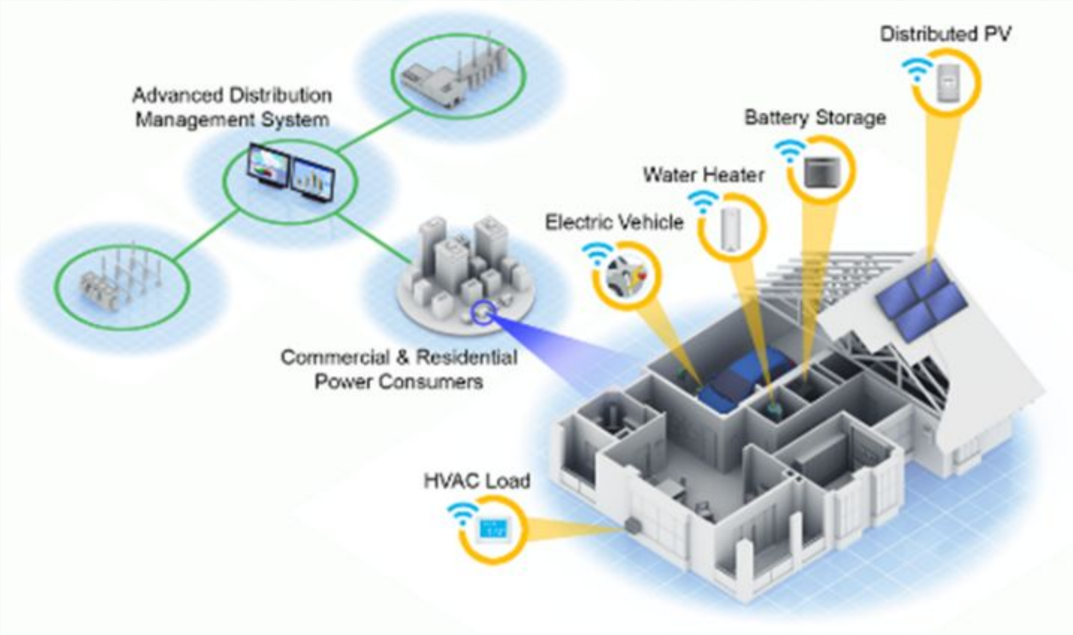
Pre-cool/heat buildings and charge EVs when wind/solar plentiful

Allow building to "ride through" peak

Discharge from batteries to address PM solar ramp (incl. V2G)

Source: RMI

Operational Requirements



- Grid operator visibility and situational awareness
- Fast, secure and private communications infrastructure
- Grid-responsive and interoperable hardware devices
- Software optimization platforms (multiple levels)
- Innovative programs and equitable financing options
- New utility business model

Join at
slido.com
#7452 931

Join us on our Clean Energy Journey

For more information –

www.holycross.com
Follow us on X & Facebook

Bryan Hannegan
President and Chief Executive Officer
LinkedIn - bhannegan

Join at
slido.com
#7452 931

Operational Needs for a High DER Future

Debra Lew
Associate Director, ESIG

ESIG
ENERGY SYSTEMS
INTEGRATION GROUP

CPUC/Gridworks Workshop
Feb 8, 2024

ESIG DER Integration Series

Join at
slido.com
#7452 931

ESIG

- DER Integration into Wholesale Markets and Operations
  - Structural participation models
  - Aggregation review
  - Operational coordination between key actors including outages, overrides
  - Communications and data sharing
  - Interconnection
- Lessons Learned for the US Context
  - UK
  - Australia
- Transition to a High DER Electricity System

https://www.esig.energy/der-integration-series/

Operational needs with DERs

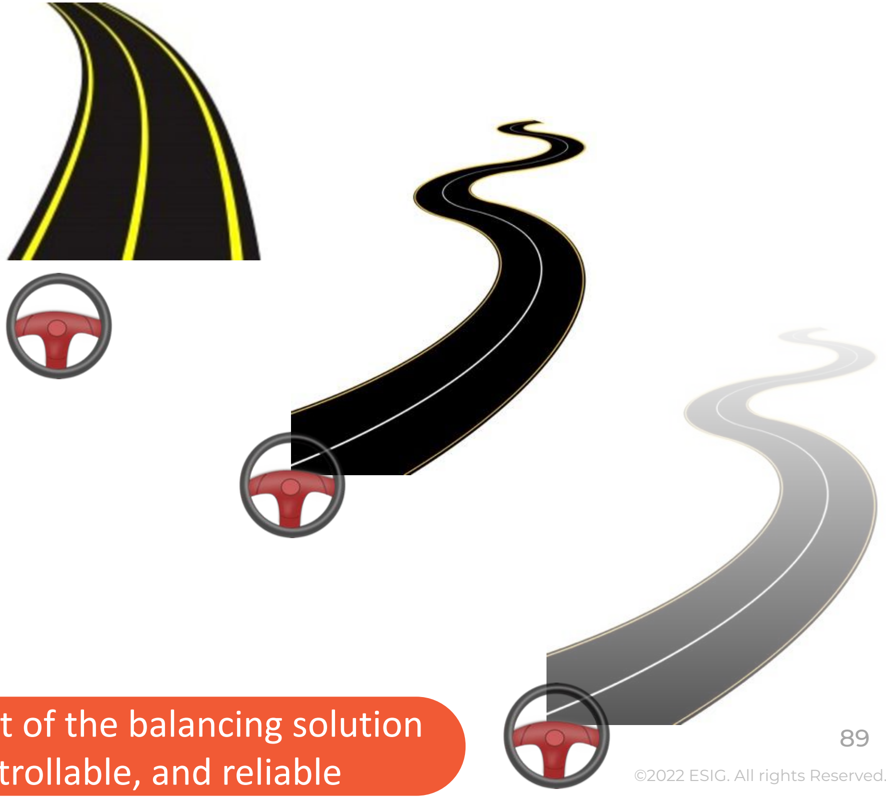
Join at
slido.com
#7452 931

ESIG

The system operator needs to forecast loads and resources to position the system and then to balance the system in real-time.

We need visibility of high levels of DERs and to understand behavior of DERs in order to forecast their consumption/generation (if they are not being dispatched). This role doesn't need to be the ISO's.

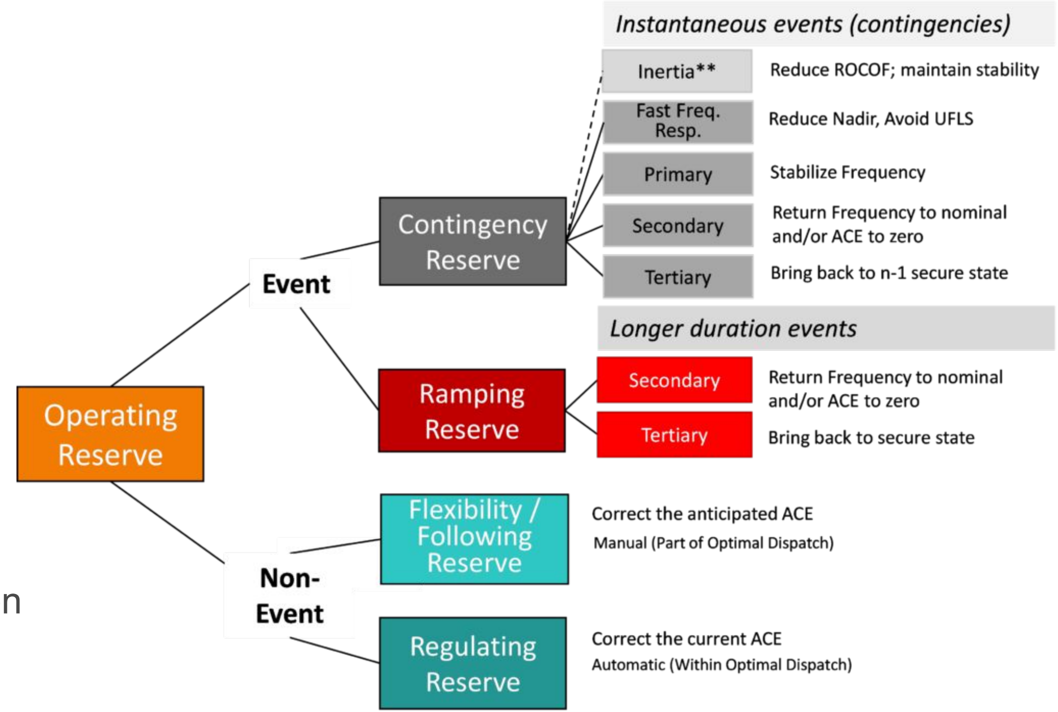
We need to be careful of high levels of DERs that in aggregate act as a large resource because that can increase regulation reserve needs, or cause stability issues.



A resource that is a large part of the balancing solution needs to be visible, controllable, and reliable

Reserve requirements

- We hold reserves to protect against contingency events – eg loss of largest generator
- We hold operating reserves to control the supply/demand balance and to meet reliability standards - variability and uncertainty of load, wind, solar to determine reserve requirements
- Reserve requirements balance cost and reliability
- DER aggregations that move in a common way, for example to a price signal or a transmission fault, can be larger than the largest generator, which could cause issues



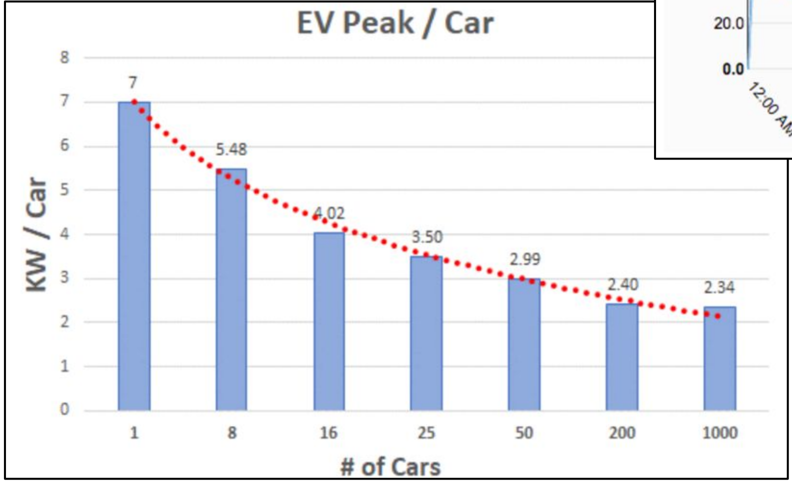
Graphic Ela, EPRI, "Setting Operating Reserve Requirements on an Evolving Power System", 2022

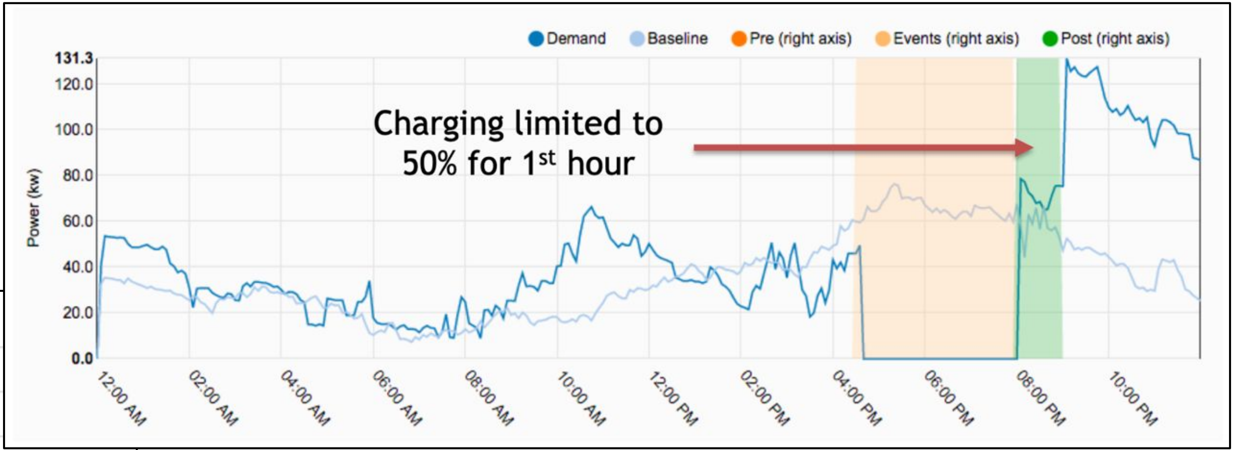
Step change effects of managed DERs

Join at
slido.com
#7452 931

ESIG

Natural diversity present in unmanaged DERs

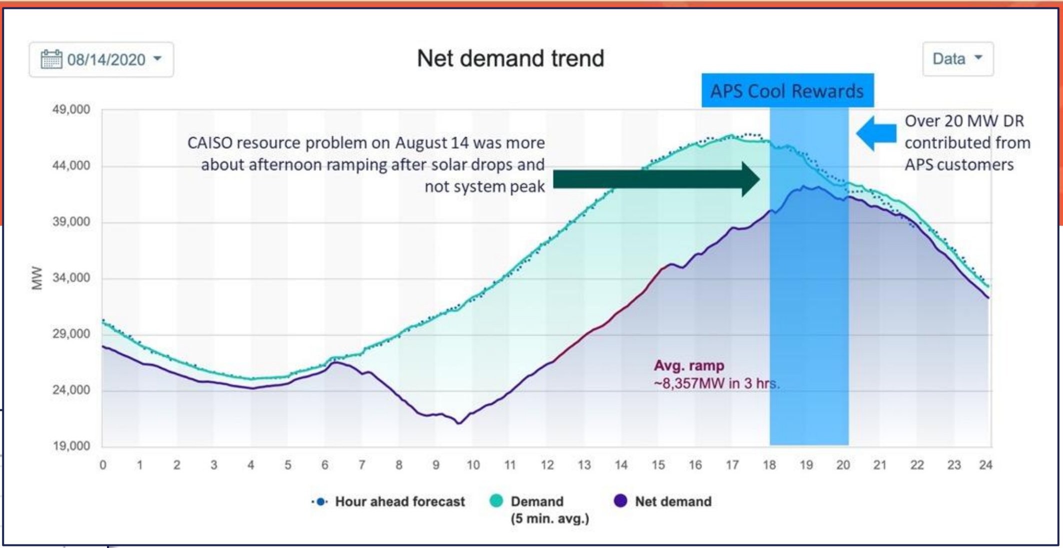




Managed DERs can have rebounds, which in turn will need to be managed.

A. Sukenik, Itron, Load Forecasting Overview, 2023, D. Smith, Green Mountain Power, IEEE PES GM,

APS orchestrates demand



Event Date	Average per Device Reductions Over the Event Period	Total Average Event Period Reductions	Total Peak Hour Reductions
14-Aug-20	1.25 kW	29.9 MW	37.9 MW
15-Aug-20	1.61 kW	38.6 MW	48.4 MW
17-Aug-20	1.19 kW	28.7 MW	35.8 MW
18-Aug-20	1.17 kW	28.2 MW	34.9 MW

APS uses retail pricing as a crude tool to shape demand. Then they use DER programs as a precise tool in real-time.

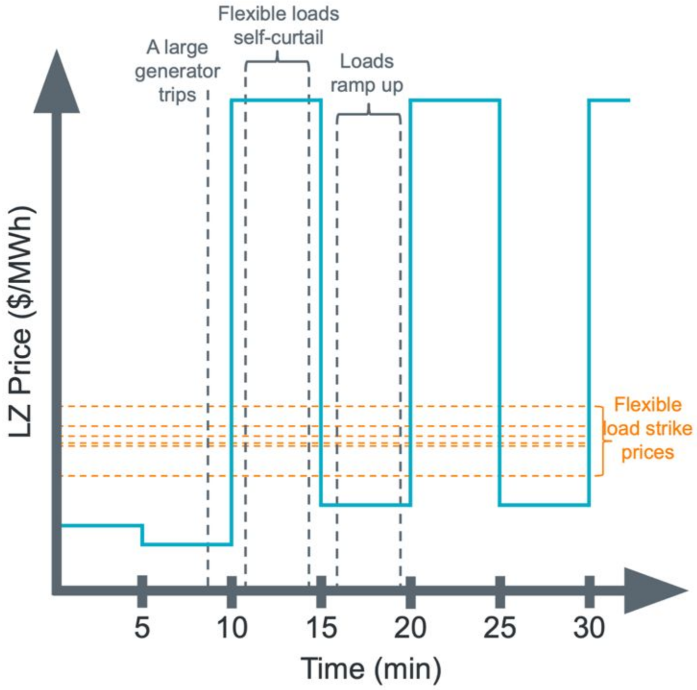
T. Hines, Tierra Resource Consultants for APS, ESIG LTLF Workshop June 2023 and IEEE PES GM July 2021

High levels of open-ended price response can lead to issues

Anything that makes large amounts of DERs act in a common-mode fashion should be carefully considered.

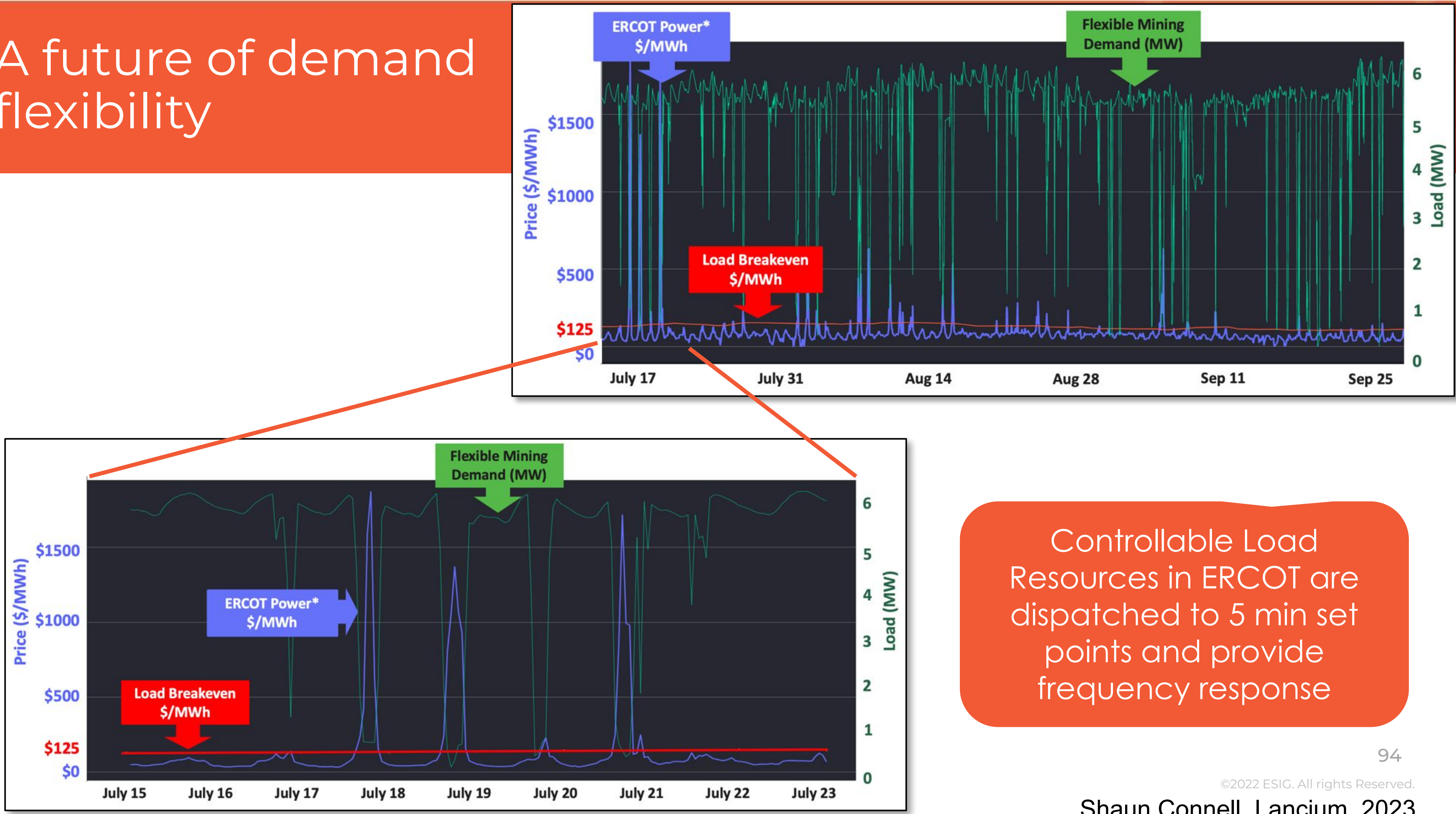
Prices-to-devices with fast controls/communications/automation could result in oscillatory behavior as devices chase prices, and in doing so, change prices.

It would increase the need for regulation reserves. At worst, it could cause a reliability event.



A. Springer, ERCOT, [ESIG Long-term Load Forecasting Workshop](#) June 2022

A future of demand flexibility



Controllable Load Resources in ERCOT are dispatched to 5 min set points and provide frequency response

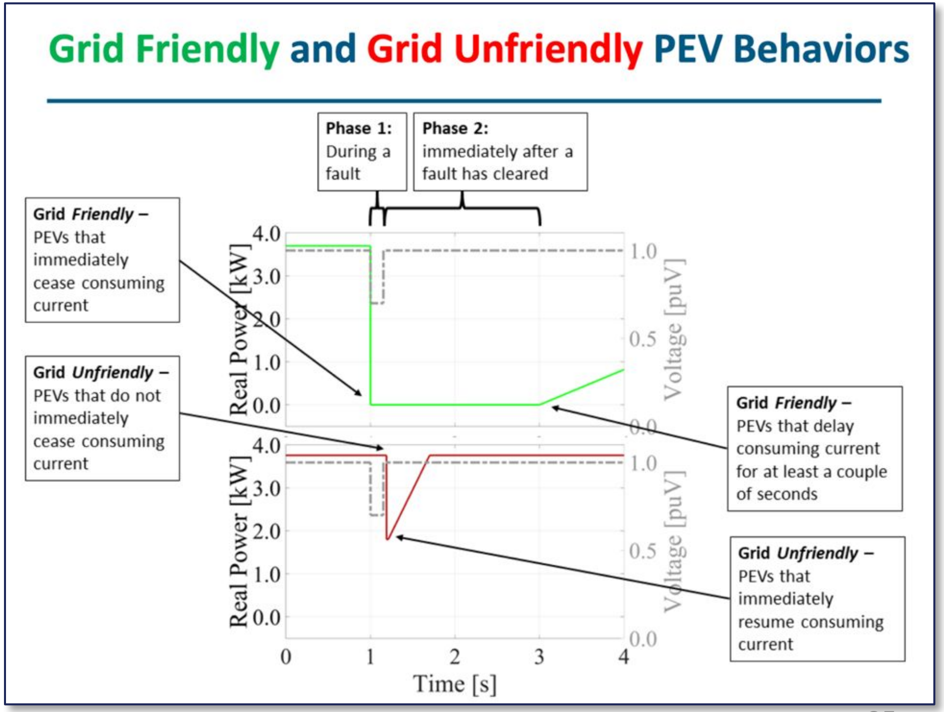
Shaun Connell, Lancium, 2023

DER behavior during disturbances will be important

Join at
slido.com
#7452 931

ESIG

- We need to consider interconnection requirements and how aggregated DERs behave during events such as transmission faults or loss of largest resource
- Avoid the Germany 50.2 Hz issue – reprogramming hundreds of thousands of inverters
- LBNL has found EV charging can be supportive or detrimental to the grid during fault-induced delayed voltage recovery events
- Some have suggested that EV chargers could provide frequency response services.



J. Eto, LBNL, [ESIG Spring Technical Workshop 2023](#)

DERs are like the Swiss army knives of the power system

Join at
slido.com
#7452 931

ESIG

Bulk power system needs

- **Capacity**
- **Energy**
- **Operating reserves**
- **Frequency response**
- **Avoid transmission upgrades**

Distribution system needs

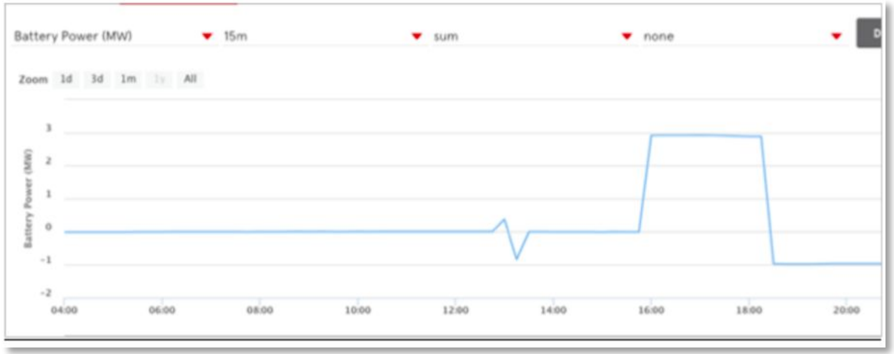
- **Avoid distribution upgrades**
- **Manage voltage**
- **Resilience**

Coordination to provide bulk power system and distribution services

Join at
slido.com
#7452 931

ESIG

- High value needs
  - Avoid the need for generation, transmission or distribution infrastructure
  - Backup generation during resilience events
- Green Mountain Power's home energy storage programs
  - Customers lease or buy battery storage systems
  - Battery provides backup power in case of outages; GMP prioritizes backup prior to extreme weather
  - GMP uses the batteries to reduce peak consumption which reduces their capacity obligation and their transmission charge, and also to provide regulation reserves
  - GMP estimates this value and reduces lease price accordingly



Doug Smith, Green Mountain Power, ESIG Fall Workshop, 10/19/21

Join at
slido.com
#7452 931

THANK YOU

Debbie Lew

Debbie@esig.energy

(303) 819-3470

10 Minute Break

Please be back at 00:00

GRIDWORKS

Join at
slido.com
#7452 931

Join at
slido.com
#7452 931

Panel 3: Advocates

Amin Younes,
Public Advocates Office

Samuel Golding,
Utility Consumers' Action Network (UCAN)

Kenneth Sahm White,
350 Bay Area

Lorenzo Kristov,
The Climate Center

Nikhil Vijaykar,
Joint CCAs

GRIDWORKS

Join at
slido.com
#7452 931

The Public ADVOCATES OFFICE

High DER Future Grid Study Workshop #1
Operations Needed

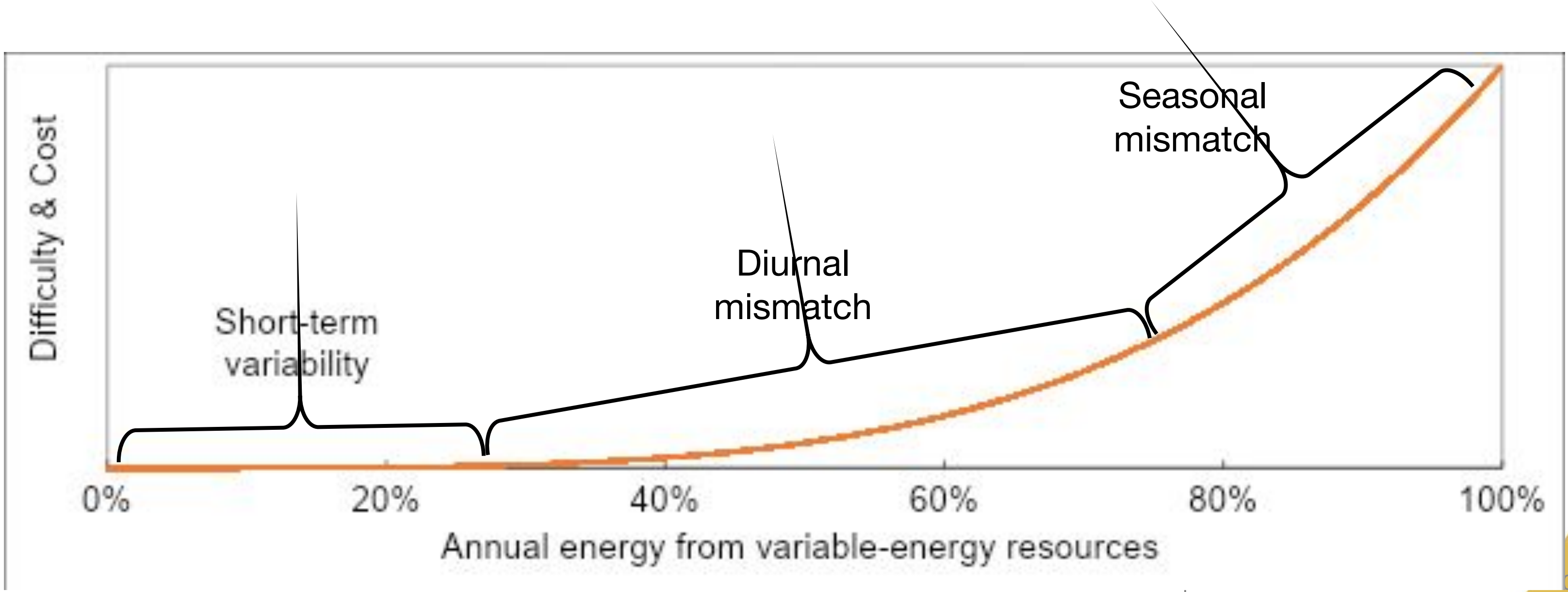
Amin Younes

Distribution Planning and Policy

February 8, 2023

Distributed Resource Growth Requires Grid Plannin

- By 2030, California will see substantial deployment of distributed energy resources (DERs): electric vehicle chargers, space and water heat pumps, rooftop solar panels. Some of these resources can modulate demand in response to remote signals.
- California's bulk power system will simultaneously be contending with high variable-energy-resource (VER) generation.
- Inadequate planning could result in resiliency and reliability challenges and inequitable outcomes.



Goal and Objectives

Join at
slido.com
#7452 931

- Aligning DER operation with the grid's needs holds potentially tremendous value to California's electricity ratepayers; shifting demand to periods of abundant supply (and optimizing existing resources) can reduce the costs of generation, transmission, and distribution infrastructure.
- Future grid operations and planning should provide the right signals to DERs so that they operate and locate when and where they maximize societal net benefit, considering the following objectives:
  I. minimize cost;
  II. maximize safety;
  III. maximize reliability;
  IV. minimize environmental impact; and,
  V. maximize equity.

Operations Needed to Meet Objectives

Join at
slido.com
#7452 931

The following operations are needed to meet our identified goals and objectives. Which entity will perform which operations should be discussed in workshops two and three.

1. Operate distribution grids: Maintain operational flexibility, voltage stability, safety, etc.
2. Maintain grid frequency: Ensure sufficient (local and bulk) inertia, generation capacity, and frequency response.
3. Plan and procure the distribution grid.
   - Forecast grid needs.
   - Optimize DER integration to defer or displace wires build.
   - Timely energize customers.
4. Set policy on, authorize, and implement interconnection; **establish DER operating limits** and (smart) inverter requirements.
5. Choose when to operate (*i.e.*, schedule) DERs.
6. Operate (*i.e.*, dispatch) DERs.
7. **Monitor/model DER and non-DER data and convey to transmission operator**
   - *e.g.*, develop the function $Net\ Demand = f(Price)$.

Operations Needed to Meet Objectives

Join at
slido.com
#7452 931

8. **Manage data access for all data relevant to distribution grid operation**: Track DER performance and interconnection characteristics, DER state-of-charge, cost of operation, historical performance, aggregator data, real-time prices. Manage confidentiality and data access.
9. Own and fund distribution grid. Some entities or entities must pay for grid infrastructure; ownership rights are typically associated with funding.
10. Own and fund DERs. Some entities or entities must pay for DERs; ownership rights are typically associated with funding.
11. **Set appropriate rates for consumption and generation based upon cost causation.**
    - Prevent market manipulation
12. System defense and restoration (*e.g.,* cybersecurity, emergency load reduction, resiliency, black start).
13. Measure meter data (including submetering) and settle bills.
14. Customers make informed consumption choices.

R. 21-06-017, Track 2: Future Grid Workshop #1

Operational Needs for California's High DER Future

February 8, 2024

Future Grid Operating Needs

"What are the operational needs necessary to efficiently operate a high DER grid, unlock economic opportunities for DERs to provide grid services, limit market power, reduce ratepayer costs, increase equity, support grid resiliency, and meet State policy objectives?"

- Objectives require displacing future utility T&D investments with 3rd party DERs, controls & services that maximize use of existing grid.
- Operating framework requires (1) market-enabling systems and (2) market reforms to enable LSE & DER aggregator service innovations.

Summary of Recommendations

1. Statewide platforms to enable functional operations
2. Market reforms to promote efficient operations

Summary of Recommendations

Statewide Platforms

- Data Hub: “API of APIs” ensures data access for all parties
- DER Register: database tracks location / capabilities of DER
- DER Market: facilitate trading & scheduling DERs, microgrid & CAISO coordination.

Market Reforms

- Shift to 5-/15- minute smart meter and CAISO load scheduling
- Implement LMS dynamic rates
- Expand DER submetering
- Allocate transmission costs to LSEs
- Enable Supplier Consolidated Billing
- Count Community-Scale DER as wholesale load reducers

Statewide Platforms

Essential facilities to ensure functional operations

Statewide Platform: Data Hub

Join at
slido.com
#7452 931

- Utilities control systems essential for DER service-based innovation.
- Substantial cost, friction, and lack of interoperability associated w/ accessing multiple data types siloed within each utility:
  - Advanced Metering Infrastructure (AMI) Network
  - Meter Data Management System (MDMS)
  - Advanced Distribution Management System (ADMS)
  - Distributed Energy Resource Management System (DERMS)
  - Customer Information System (CIS) & billing
- Similar challenges re: accessing useful data from aggregators / DERs.
- **Market requires standardized and extensible approach to ensure efficient data access and interchange across entities (utilities, LSEs, DER providers)**

Statewide Platform: Data Hub

Join at
slido.com
#7452 931

- Implements “API of APIs” across multiple utilities to standardize authorization, protocols, and data formats for 3rd party access.
- Data Hub structure:
  - Logical Data Model defines common model and format for required data
  - Individual utilities pull and normalize data from AMI network (headend), MDMS, ADMS, DERMS, and CIS systems upon request
  - Utility data flows through central web portal / standardized API to 3rd parties
  - LSEs / DER providers can provide data from DERs through Data Hub too
- Neutral third-party vendor runs central portal / API and manages 3rd party registrations and permissions.
- Updates overseen by representative council of industry stakeholders.

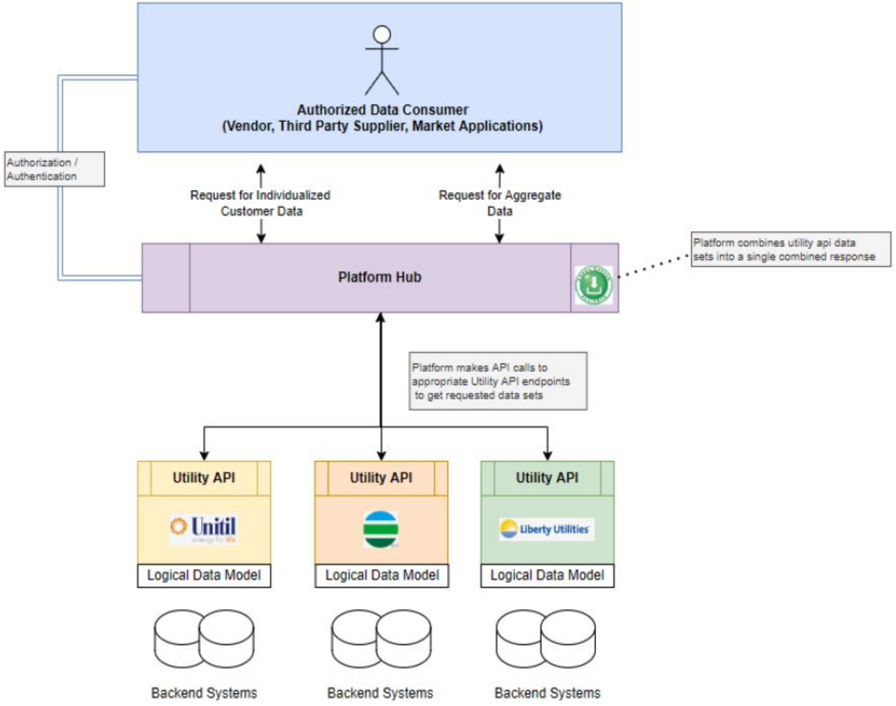
Example: New England Regional Data Hub

Join at
slido.com
#7452 931

DOE GRIP Grant Proposal: Regional Joint Utility Energy Data Hub

Advancing Community DER Enablement and Customer Analytics in New England

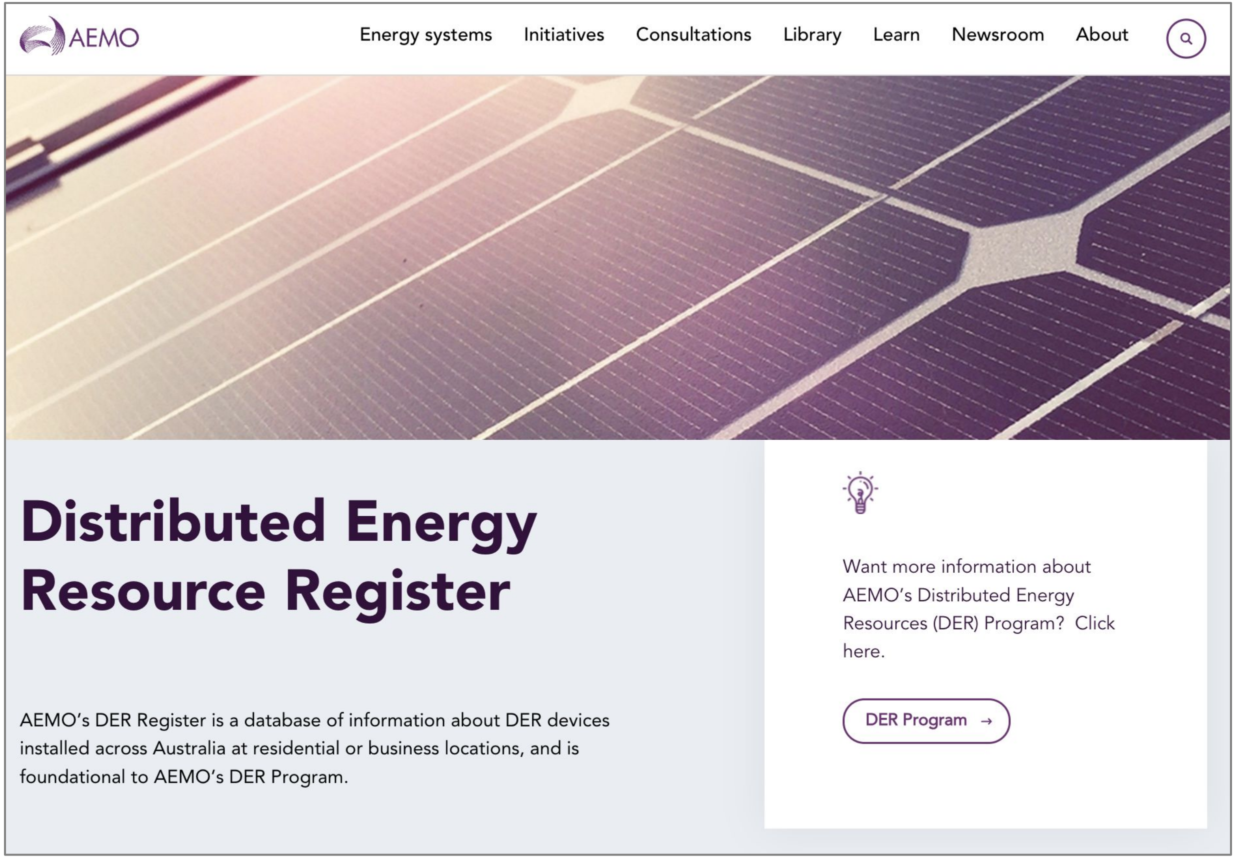
- MA, NH, CT utilities (VT, RI, ME interested too)
- Single API + format + 3rd party registration for sharing electricity & gas data across all utilities
- Starts w/ certified Green Button implementation
- Designed for extensibility: evolves to incorporate data from LSEs & DERs



Statewide Platform: DER Register

- Comprehensive database of DER:
  - Retail BTM.
  - Distribution-interconnected.
  - Microgrids.
- Provides accurate and up-to-date information: grid location, type, gen/load/storage capacities, asset / inverter tech specs, operating & contractual parameters (firm & non-firm import/export limits, etc.)
- Enhances market transparency, operations, planning for CCAs, ESPs, DER aggregators, utilities, regulators, and consumers.

Example: AEMO's DER Register (Australia)



https://aemo.com.au/energy-systems/electricity/der-register

Statewide Platform: DER Market

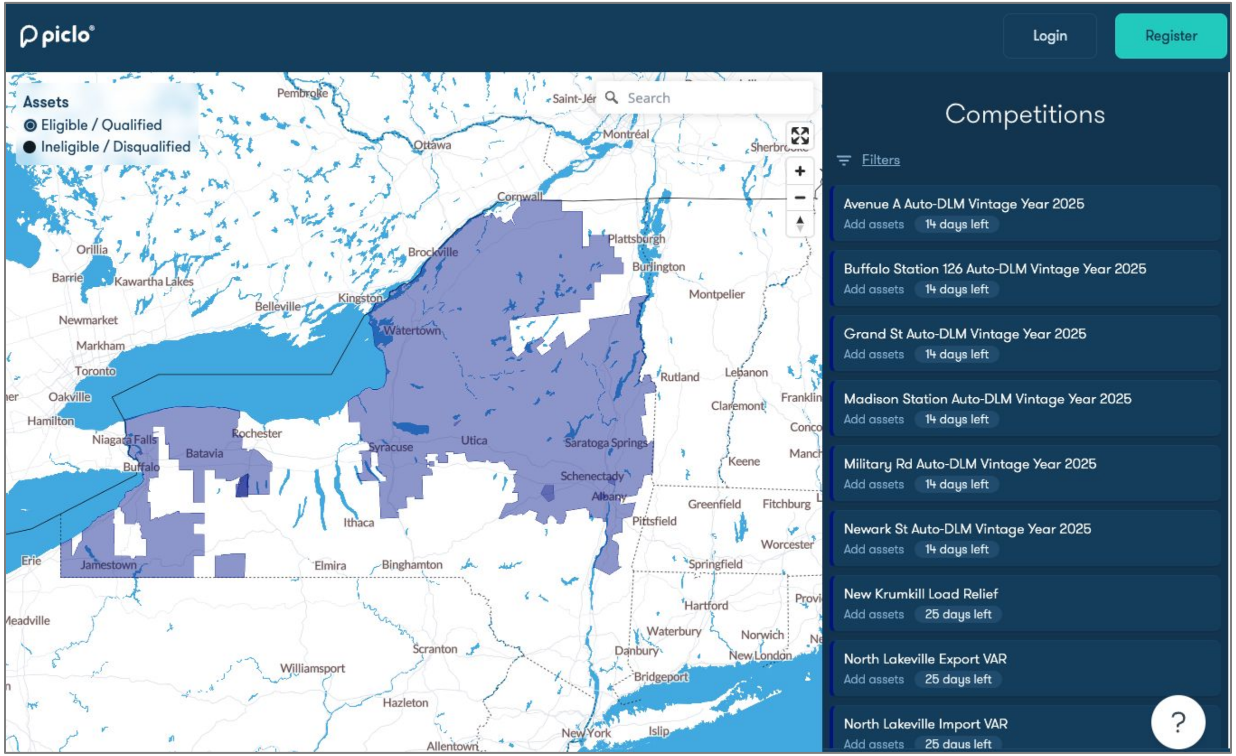
Join at
slido.com
#7452 931

- Statewide, distribution-level market platform.
- Facilitates scheduling and trading demand flex & DER services:
  - Integrates with DER Register to minimize transaction costs.
  - Utilities / LSEs advertise short <> long-term flex needs, initiate competitions, and accept / reject offers.
  - Operates in real-time or near-real-time.
  - Updates utilities / LSEs re: asset availability until time of dispatch.
- Standardizes contracts, market rules, asset monitoring, dispatch, settlement / invoicing, and compliance monitoring.
- Evolves to coordinate DER / demand flex with CAISO markets at T-D interfaces □ islanding of microgrids and regional zones.

Example: Piclo Flex Platform (National Grid, NY)

Join at
slido.com
#7452 931

- Piclo Flex — 60k flex assets / 19GW in EU — just launched in NY:



https://usa.picloflex.com/dashboard

Market Reforms

Actions to promote efficient operations

Shift to 5-minute Supply / Demand Balancing

- Retail meter data and wholesale load scheduling should align with generation real-time markets (5- and 15-minute dispatch intervals).
- Utility AMI Networks should:
  - Shift to 15-minute interval collection for mass market customers
  - Allow LSEs to collect more granular interval data collection for subsets of customers (e.g., 5-minute interval usage for DER & demand flex customers)
  - Provide updated smart meter data to LSEs every morning in advance of CAISO's day-ahead demand bid submission deadline.
- CAISO load scheduling & settlements should align by shifting to 5- and 15-minute intervals.
- Going forward: enhanced framework should be devised to coordinate the evolution of utility AMI networks, statewide DER Market

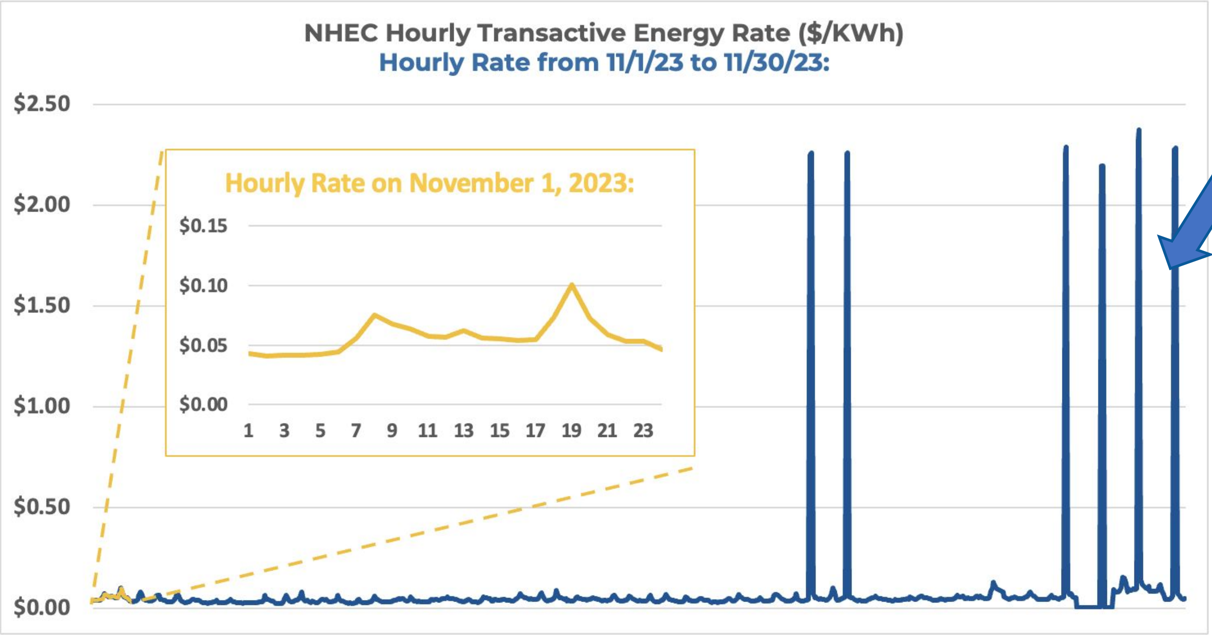
Dynamic Pricing + LSE Transmission + DER Submetering

Join at
slido.com
#7452 931

- Retail pricing structures for DERs and consumers should accurately reflect network limitations and the marginal costs associated with importing and exporting energy at specific times and locations.
  - Baseline: LMS-compliant rates implemented in 2027+
  - Enhancement: transmission costs should be allocated to CCAs / ESPs based on their individual monthly coincident peak demand (12CP basis)
- Submetering protocols should be expanded:
  - Expansion from EVSE to inverter-based resources and smart devices.
  - Requires standardized integration into data management, electronic data interchange (EDI), billing, load settlement functions.
- Combination allows controllable loads & DERs to be exposed to meaningful dynamic rates (including bypassable transmission costs) while non-controllable loads remain on customer’s

Example: Transactive Energy Rates (New Hampshire)

- NH Electric Coop "prices to devices" dynamic rate (import & export)
- Eligible technologies: submetered EVSE + battery inverters
- … sion costs (12CP)

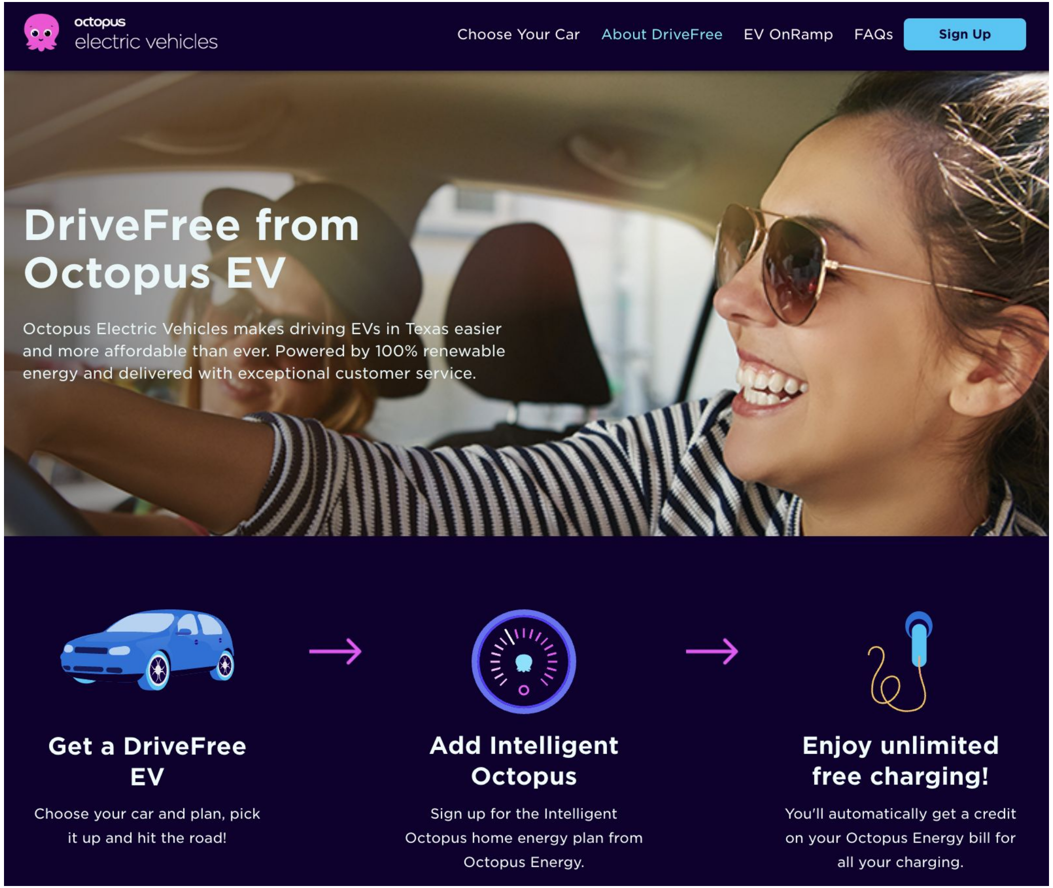


https://www.nhec.com/energy-management/transactive-energy-rate-program/

Supplier Consolidated Billing

- Supplier consolidated billing should allow CCAs / ESPs to assume responsibility for presenting a single bill to customers (inclusive of energy, capacity, distribution, transmission, and policy adders).
- Significant mitigation of utility market power (CCAs / ESPs no longer limited by what utilities cannot or will not enable).
- Positions CCAs / ESPs to intermediate complex T&D rates and provide simpler pricing structures with cost-saving services for customers.

Example: Octopus Energy (Texas)



Account for Community-Scale DER as Load Reducers

Join at
slido.com
#7452 931

- DER connected to distribution grid can operate under PUC jurisdiction (instead of registering as a supply resource w/ CAISO).
- CCAs / ESPs should be allowed to fully count community-scale DER (<5MW) as wholesale load reducers to lower wholesale energy + RA obligations + transmission costs.
  - Market mechanism incentivizes CCAs / ESP to contract to build out DER fleet.
  - Dynamic pricing structure ensures DER dispatched to lower peak loads.
- Integration with DER Market & DER Register lowers costs and ensures T-D coordination.

Questions?

Join at
slido.com
#7452 931

Jane Krikorian
jane@ucan.org

UCAN
UTILITY CONSUMERS' ACTION NETWORK
San Diego's Utility Watchdog

Samuel Golding
golding@communitychoicepartners.com

COMMUNITY CHOICE PARTNERS
SECURING YOUR COMMUNITY'S ENERGY FUTURE

Appendix: Summary of Recommendations

Join at
slido.com
#7452 931

Statewide* Platforms to Enable Functional Operations:

1. **Data Hub:** “API of APIs” ensures data interchange between all entities.
2. **DER Register:** database tracks location & capabilities of DERs.
3. **DER Market:** facilitates scheduling & trading DERs □ islanding □ T-D coordination w/ CAISO markets and operations.

* Deployed across IOU territories but open to municipals to join (lowers costs / standardizes market)

Market Reforms to Promote Efficient Operations:

1. **Shift smart meters & wholesale settlements to 5- / 15-minute intervals:** strengthens price-based supply/ demand balancing capacity of market.
2. **Implement LMS dynamic rates:** ensures de minimis price optimization opportunity for DER aggregators serving utility supply customers.
3. **Expand DER submetering:** enhances consumer protection by allowing only controllable loads & DERs to be exposed to dynamic pricing (avoids forcing whole house / business onto dynamic rate).
4. **Allocate transmission costs to LSEs on a 12CP basis:** boosts price signal + incentivizes CCAs / ESPs to promote year-round DER and demand flex.
5. **Implement Supplier Consolidated Billing:** frees CCAs/ESPs to provide innovative

Join at
slido.com
#7452 931

High-DER Grid Modernization Workshop #1: Identifying Operational Needs Panel 3

Sahm White, 350 Bay Area

February 8, 2024

350BayArea

Join at
slido.com
#7452 931

350 Bay Area

350 Bay Area is a 501c(3) non-profit organization

- focused on ensuring a sustainable climate and associated environmental and economic justice for all,
- with a reach of over twenty-two thousand people, primarily concentrated in the nine Bay Area counties.

We comment from both an environmental and ratepayer perspective, concerned with economic and environmental impacts of energy policy and planning
meaning that we focus on advancing state goals, including equity, affordability, emissions, and land use.

350BayArea

Join at
slido.com
#7452 931

Our focus today will be on the highlighted items
touching briefly on the other subjects
allowing others to address in more depth

- ***Overview***

  The Role of the Electric Grid in Meeting our Demand for Energy

  (functional roles determine operational needs)

- ***What are the operational needs necessary for the following purposes:***

  1. *efficiently operate a high DER grid,*
  2. *unlock economic opportunities for DERs to provide grid services,*
  3. *limit market power,*
  4. *reduce ratepayer costs,*
  5. *increase equity,*
  6. *support grid resiliency,*
  7. *meet State policy objectives?*

350BayArea

Join at
slido.com
#7452 931

Role of the Electric Grid in Meeting our Demand for Energy

Operation starts at load, working from the bottom up

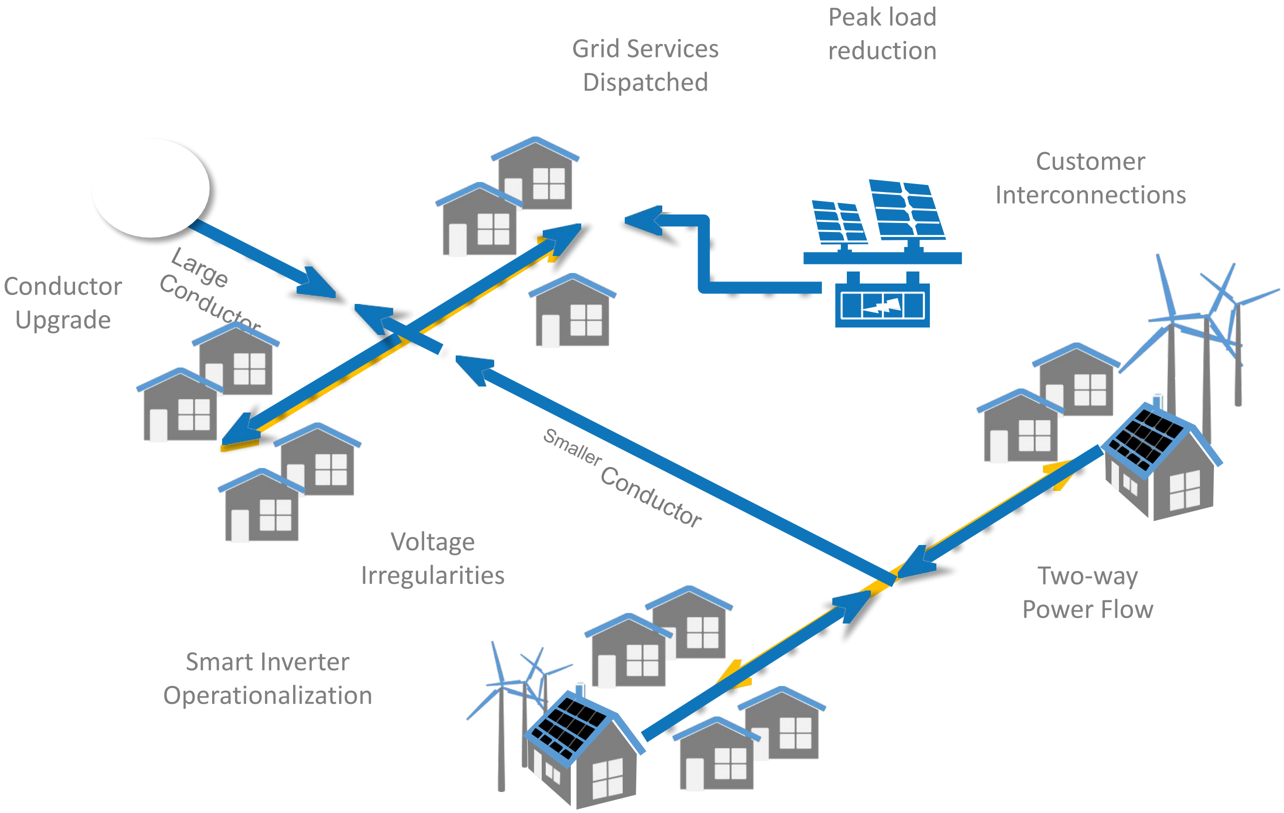
- To address the operational needs for the distribution system, it is *important to first understand the core function of our electric grid*, which is to distribute power to help (or assist) in meeting our demand for energy, equitably and cost effectively.

- Increasingly, the distribution system is no longer a one-way flow from a substation to loads, but a *multidirectional scalable interaction* between distributed energy resources (DER) and *intermingled* loads.

- At any location we may find loads, generation, storage, communication and control equipment potentially capable of meeting onsite loads and serving nearby loads -- a miniature version of the larger grid.

Evolution of the Distribution Grid and DERs

Join at
slido.com
#7452 931

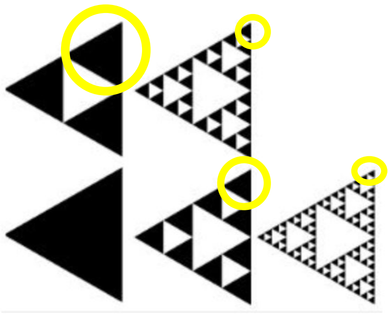


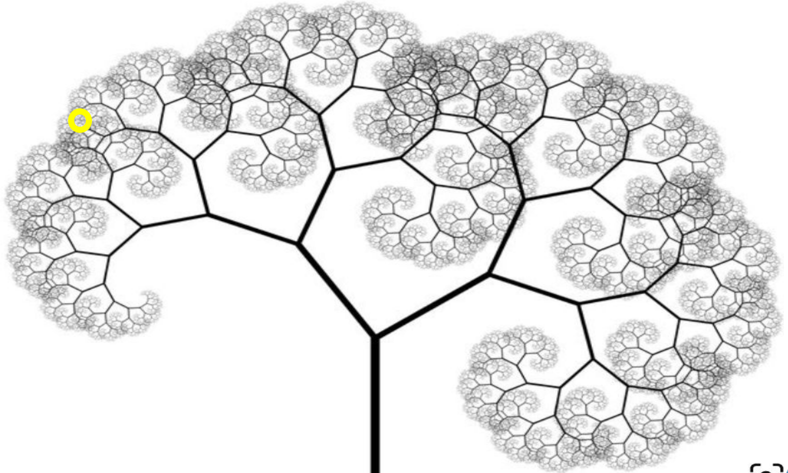
Public

Role of the Electric Grid in Meeting our Demand for Energy

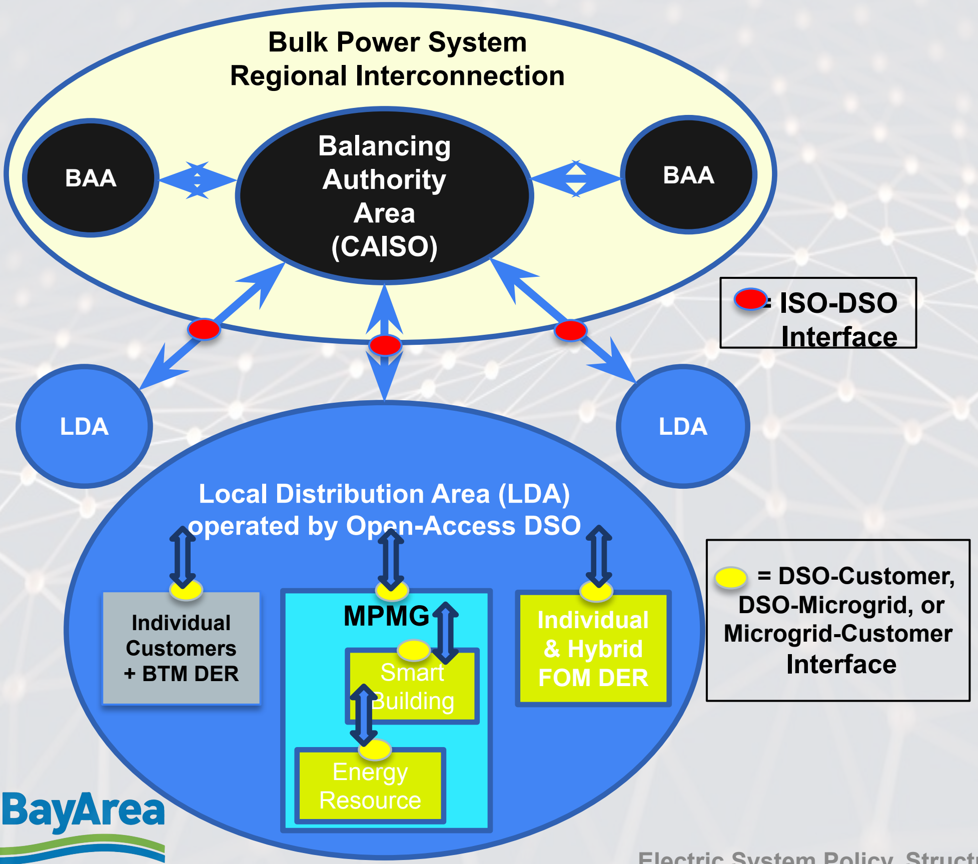
Operation starts at load, working from the bottom up

- The distribution system connects all of this in a *layered architecture* which is *replicated at every junction*, approaching a fractal design, from homes to ISO.
    - This is important - it means that *each layer or node only interacts electrically with the rest at either end of its points of connection*,
    - *Everything* beyond those points *can be treated as a single aggregation*.





Layered Architecture:
Focuses on the interfaces between layers



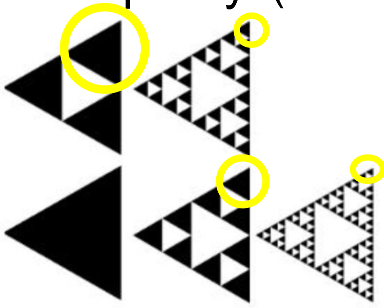
- Main layers are Bulk System; Distribution System; Customer/DER
  - Multi-customer microgrid may exist in between Dist. System & Customers
- Interfaces allow for bi-directional flows
- Each layer needs to manage its interfaces with adjacent layers above & below
- Focus on interfaces

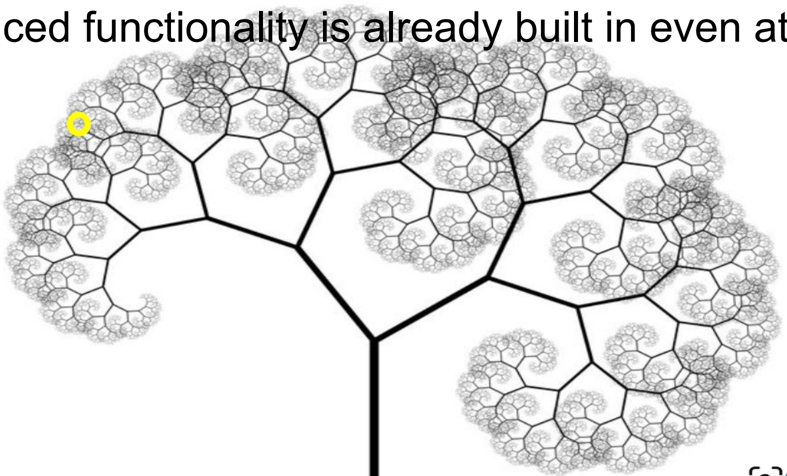
  => Operator of each layer does <u>not</u> need visibility or control of assets within the layer below

Role of the Electric Grid in Meeting our Demand for Energy

Operation starts at load, working from the bottom up

- This has the potential to *greatly simplify operation and optimization* because it allows operational data to reflect a single value at each junction.
  - There is no need for a system to process all the details of each component or resource across multiple layers –
- Resources can be *managed locally* to reflect local constraints and available capacity. (advanced functionality is already built in even at the consumer level)





350BayArea

Join at
slido.com
#7452 931

Role of the Electric Grid in Meeting our Demand for Energy

Operation starts at load, working from the bottom up

This matters because demand is met through resources, and

- *this starts with DER,* because all demand begins *where the load exists*, DER *includes* loads and mitigations, and is the *first* layer in meeting demand and mitigating the impact of loads.
  - DER (BTM *and* FOM) includes EE, DR, DG, ES, EV, and aggregations within buildings or microgrids of all sizes
- **Less load = less demand = less grid capacity costs at each layer**
  - (i.e. less *peak coincident load capacity at the next larger layer*)

350BayArea

Join at
slido.com
#7452 931

What are the operational needs necessary for the following purposes:

1. *efficiently operate a high DER grid,*
2. *unlock economic opportunities for DERs to provide grid services,*
3. *limit market power,*
4. *reduce ratepayer costs,*
5. *increase equity,*
6. *support grid resiliency,*
7. *meet State policy objectives?*

1. Efficiently operate a high DER grid

- Efficient operation requires semi-optimal *utilization of all available distributed energy resources*
  - DER: are comprised of all types of EE, DR, DG, ES, EV etc, including buildings and microgrids
  - Semi-optimal: perfection is not required
- Utilization requires having enabling systems in place, i.e. any available means for DER to receive and respond to information with *reasonable* timeliness and *sufficient* certainty
  - Information is not the same as "control". Information can be a signal or data (including tariff-based or "live" pricing, AMI data, local grid conditions, and forecast or reserved capacity needs).
  - Information can be stored or measured at the DER location and/or communicated through any available medium, including internet connection, cellular, wired, or radio signal, or any series of systems
  - *DER may react to data autonomously, or respond to coordinated control signals*
- Coordination of individual DER should include layered aggregation
  - each aggregation seen as a single entity in the next layer.
  - This greatly simplifies operation and offers security over single point failure
- *Efficient* operation means *least net cost*
  - based on cost effectiveness tests including the Societal Cost Test and Avoided Cost Calculator
  - each test has inherent limits

2. Unlock economic opportunities for DERs to provide grid services

- The Smart Inverter Operationalization Working Group (SIOWG)
  - focused on utilization of *existing* advanced inverter functionalities
  - identified numerous high priority use cases and business cases
  - based on technological readiness, cost, scale, and timeline
- Standard tariffs and contracts are needed
  - designed to *support stacked value uses* of resources
    - Traditional contracts and tariffs often inhibit enrolling and utilizing DER for multiple purposes.
    - Stacked value recognizes any available capacity across all resources in aggregate instead of reserving each resource for a single role and leaving capacity underutilized.
- DSO as the nexus (?)
  - to simplify signaling (layered coordination)
  - *to simplify single point access to revenue streams* (market and utility/tariff)

Join at
slido.com
#7452 931

4. Reduce Ratepayer Costs
5. Increase Equity (Reduce Inequity)

- **Focus on least net total costs over time, including grid costs**
  - Utilizing cost effectiveness tests, including the Societal Cost Test, plus Avoided Cost Calculator
    - each test has inherent limits, which must be accounted for, including future transmission costs
- Inequitable energy burdens start with costs
  - DER access *and operational utilization* reduces energy burdens
  - $50 Billion cost of unmitigated electrification (EIS phase 1 study)
    - Public Advocates analysis shows *even the simplest mitigation cuts this by half*
      Distribution Grid Electrification Model Findings
  - Up to **$120 Billion in *avoidable* costs** by 2050 through optimization of DER operation compared with the Business-as-usual case (Vibrant Clean Energy study)
    https://www.vibrantcleanenergy.com/wp-content/uploads/2021/07/VCE-CCSA_CA_Report.pdf
  - Up to **$60 Billion in *additional avoided* transmission costs** by 2050 (Clean Coalition analysis of local resource potential)
    https://clean-coalition.org/policy/transmission-access-charges/#:~:text=We%20know%20our%20solution%20works,encouraging%20more%20clean%20local%20energy
- Savings require easy DER engagement and pricing for energy and services

350BayArea

6. Support grid resiliency

- The ability to modify demand and utilize local resources to meet both local and system level demand will increase flexibility, strongly supporting resilience and reliability, even to the point of localized islanding.
- Enormous DER capacity in coming decades
  - **15 GW** of BTM rooftop solar today, (*potentially much greater in future years*)
  - FOM distributed generation - *barely tapped potential,* greater than rooftop solar
  - BTM and FOM energy storage
  - Flexible building loads
  - **80+GW** of EV battery deployment by 2030 (= ~**8GW** of DR/flexible demand)
  - Bi-directional V2X potential

Join at
slido.com
#7452 931

7. Meet State policy objectives

- This requires *all of the above*
- State policy objectives are very large and wide ranging, and ultimately focused on meeting needs at each location.
- The grid is what allows resources to be shared between locations, both locally and system wide.
- Crucially, beyond the grid's operational needs, the policies, programs, and tariffs must avoid barriers to, and appropriately encourage deployment of and utilization of, DER.
  - *We can only utilize these resources to the degree that they are available, and DER are a huge resource.*

350BayArea

Additional Slides

Join at
slido.com
#7452 931

350BayArea

Join at
slido.com
#7452 931

The High-DER Future Is Both Necessary and Inevitable

Necessary => Today's needs & societal goals require local energy solutions

- Worsening climate disruption, grid vulnerability, energy inequities
- Bulk system & wholesale market are still needed, but not sufficient

Inevitable => DERs keep improving in performance, cost & ease to deploy

- Customers, businesses, and communities see benefits and will deploy

The challenge for policy makers, the industry and all of us =>

- What policies will leverage the use of DER, maximizing the benefits for all while adapting to rapid DER proliferation?

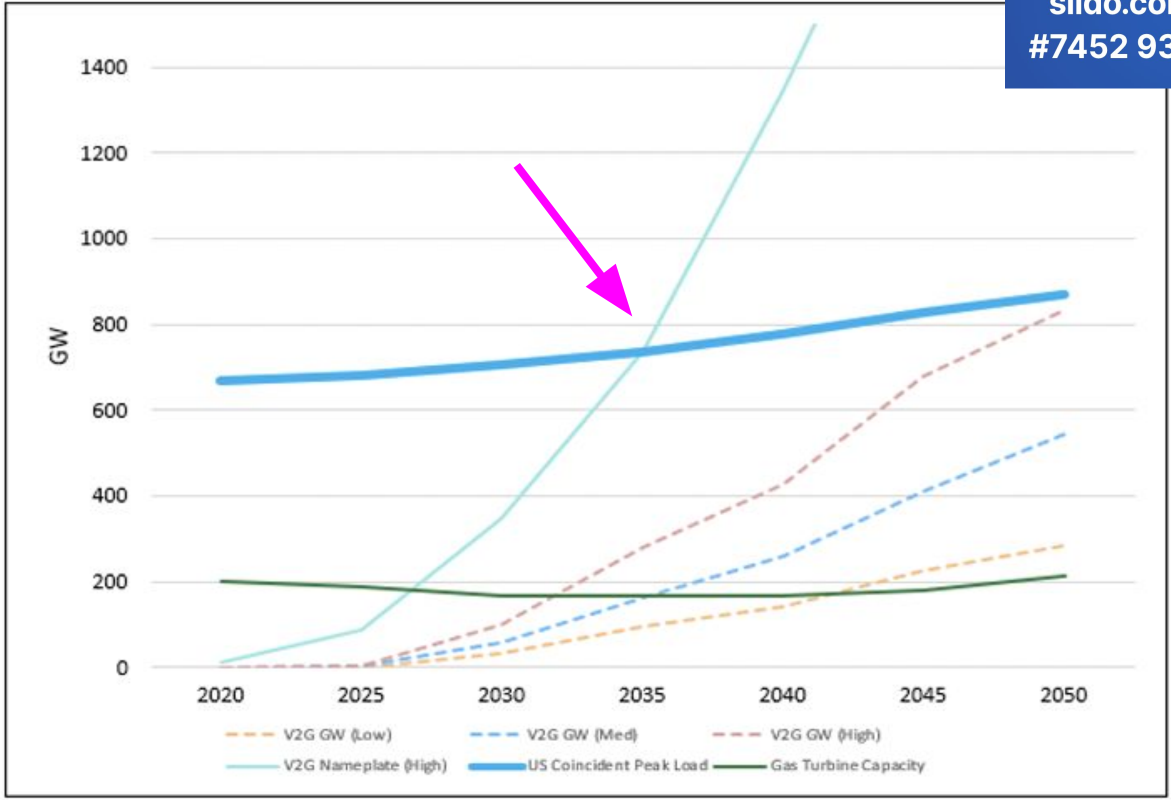
350BayArea

Example:

Total nationwide EV battery capacity will exceed peak US electricity demand in 2035[1]

CEC estimates 8 million EVs in CA by 2030

= Total California EV battery capacity will be greater than all existing CAISO resources



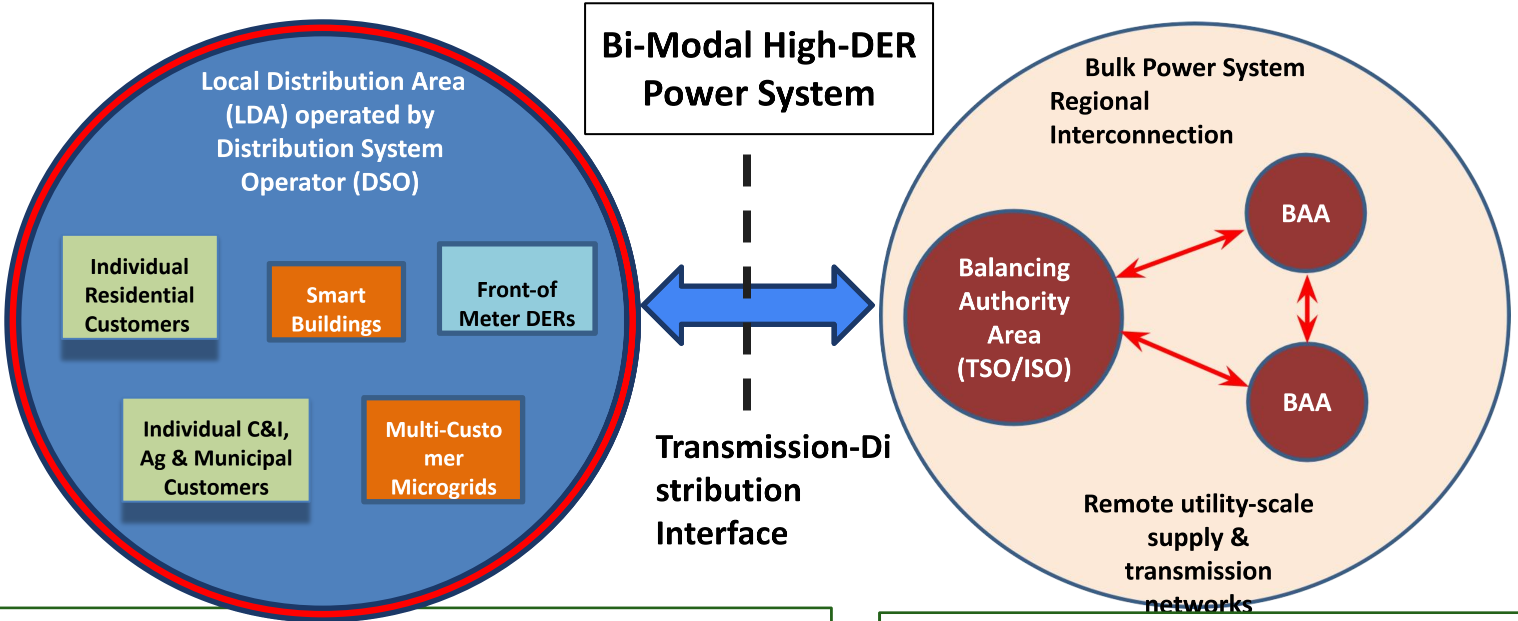
[1] Presented at an October 2022 EPRI Webex. Based on EIA projections of EV populations

350BayArea

the climate center

The High-DER Future Grid: a participatory distribution network complements the bulk system

Join at
slido.com
#7452 931



- Distribution network connects all network participants: customers, smart buildings, community resources & microgrids
- DSO integrates DER cost-effectively to minimize bulk system impacts
- Local DER can supply a major share of new electrification demand

- Bulk power system moves renewable energy from production areas to load centers
- Supplements local production with regional energy diversity & bulk transactions

350BayArea

Credit: Lorenzo Kristov

Policies for a bottom-up energy transition

Implement bottom-up resource & system planning processes

- Start from local energy needs & priorities, then plan outward in concentric circles — customer premises => block => neighborhood => campus => town/city/county
- Bulk system & wholesale market provide final, residual supply after serving as much demand as possible with locally owned & operated DERs
- Maximize PV + storage systems on the built environment
- Incorporate high-DER scenarios into power system planning

Integrate energy planning into city/county planning

350BayArea

Credit: Lorenzo Kristov

Thank you

Email us at
info@350bayarea.org
Or visit www.350bayarea.org

Join at
slido.com
#7452 931

Identifying Operational Needs — Comments for Panel 3 —

High-DER Future Grid, Workshop #1, February 8, 2024

Lorenzo Kristov, PhD, Principal Market Architect
Electric System Policy, Structure, Market Design

the climate center

The Question for Today’s Workshop *

Join at
slido.com
#7452 931

“What are the operational needs necessary to

- *efficiently operate a high DER grid,*
- *unlock economic opportunities for DERs to provide grid services,*
- *limit market power,*
- *reduce ratepayer costs,*
- *increase equity,*
- *support grid resiliency, and*
- *meet State policy objectives?”*

* All items are addressed individually on slides 7-13

The Core Structural Element Needed *

Join at
slido.com
#7452 931

The core structural element needed to achieve all seven goals and maximize the societal, system & customer benefits of DERs is:

- **an open-access distribution network & transactive distribution-level markets**
- ***that enables all DERs, on both sides of the end-use customer meter, to economically transact energy & grid services.***

The <u>operational needs</u> of the distribution system operator (DSO) <u>derive from this core functional role</u> — to operate a transactive network & markets reliably, efficiently, in accordance with open-access principles, & in coordination with CAISO.

*** Benefits and rationale are explained on slides 7-13**

Operational Needs *

Join at
slido.com
#7452 931

The open-access transactive network requires the DSO to

- Define grid services DERs can economically provide
  - E.g., compensate DERs & Aggregators for flattening circuit-level peaks (load & supply “ducklings”) to increase hosting capacity without upgrading circuits
- Conduct non-discriminatory procedures for procuring, dispatching & compensating DERs
  - Market mechanisms that receive & clear bids (day-ahead & day-of) linked to current distribution system conditions & transmit results to participants
  - Establish real-time communication with participating DERs
  - Conduct solicitations for longer-term grid services contracts
  - Accurately measure DER grid service performance & perform settlement
- Integrate DER grid services into distribution network planning

* Operational needs are identified by analogy to CAISO’s core functional role as operator of the bulk system & wholesale market; to be refined in designing the transactive network & markets

Operational Needs * – continued

Join at
slido.com
#7452 931

The open-access transactive network requires the DSO to

- Provide up-to-date network information to local governments, tribes, LSEs, DER developers & CBOs seeking to plan & deploy DERs
- Coordinate with CAISO operations & markets (day-ahead & real-time) at T-D interfaces to manage bulk system impacts of DER activities
  - Clear DSO markets in time to provide accurate forecast to CAISO DA & RT markets on expected net flows across T-D interfaces
  - Transmit customer meter data & current distribution system conditions to LSEs to support their CAISO bidding & scheduling
  - Support direct DER participation in CAISO markets through timely provision of current system conditions & non-discriminatory curtailment procedures

* Operational needs are identified by analogy to CAISO's core functional role as operator of the bulk system & wholesale market; to be refined in designing the transactive network & markets

Maximizing the Benefits of DERs

Communities & customers of all types want DERs

- DER costs & performance keep improving while grid costs keep rising
- *Grid defection* becomes increasingly cost-effective for customers with financial resources — businesses & affluent homeowners
- Grid defection will worsen energy inequities

The open-access transactive network is the better alternative

- Rewards customers for staying connected & participating
- Makes DERs accessible to more customers by providing revenue opportunities to defray DER investment cost

How does an open-access transactive network contribute to achieving the goals?

Join at
slido.com
#7452 931

Unlock economic opportunities for DERs to provide grid services

The open-access transactive network will

- **Enable DER owners to monetize the capabilities of their assets**
- **Incentivize DER owners, Aggregators & LSEs to optimize DER performance to support grid functioning & offset needs for grid investment**
- **Stimulate private investment in DERs & DER aggregation technologies**

Join at
slido.com
#7452 931

Achieving the goals — 2

Reduce ratepayer costs

The open-access transactive network will

- **Make it commercially viable to deploy local supply to meet local demand, reducing need for bulk system G & T investment**
- **Incentivize DER Aggregators & LSEs to coordinate customer DERs to flatten circuit & transformer load profiles, reducing D investment needs**
- **Enable ratepayers who deploy DERs to monetize the performance of their assets**
- **Incentivize private investment in DERs to reduce ratepayer risks related to DER performance & obsolescence**

Achieving the goals — 3

Join at
slido.com
#7452 931

Increase equity

The open-access transactive network will

- **Democratize electricity services**
- **Enable Energy Justice communities to own & operate participating DERs to generate revenue & build community wealth**
- **Make DERs more affordable to low-income ratepayers by monetizing the capabilities of their assets**
- **Incentivize DER Aggregators & LSEs to engage customer DERs to increase hosting capacity in distribution constrained areas**
- **Reduce use & speed removal of fossil peakers & BUGs in EJ communities**

Achieving the goals — 4

Support grid resiliency

The open-access transactive network will

- Support commercialization of microgrids by enabling them to function as dispatchable resources under blue-sky conditions to provide grid services
- Stimulate private investment in grid-forming front-of-meter DERs to support islanding during grid outages
- Enable layering of system architecture to prevent propagation of grid failures to larger areas

Achieving the goals — 5

Join at
slido.com
#7452 931

Limit market power

Sources of market power

1. control of bottleneck asset — distribution interconnection
2. control of bottleneck asset — grid & customer data
3. leveraging monopoly advantage in competitive services

The open-access transactive network requires the DSO regulatory framework to address 1, 2, 3

4. Locational advantage for needed grid services

The open-access transactive network & growing DER deployment will stimulate competition to provide grid services

Achieving the goals — 6

Meet state policy objectives

The open-access transactive network will

- **Accelerate *electrification* by incentivizing deployment of local supply resources to meet local electrification demand growth**
- ***Reduce fossil peaker use* by rewarding optimal DER performance**
- **Enhance local *energy resilience* by stimulating private investment in microgrids**
- **Advance *Energy Equity* by enabling locally-owned DERs to monetize their performance capabilities to earn revenues to offset their costs and build wealth for EJ communities => <u>democratizing energy services</u>**

Achieving the goals — 7

Join at
slido.com
#7452 931

Efficiently operate a high-DER grid

The open-access transactive network will

- Provide transparent, reliable mechanisms for DER owners to transact economically for energy & grid services needed by the DSO
- Incentivize DER owners, Aggregators & LSEs to optimize DER performance to meet grid operational needs
- Create incentives for all participants to shape DER behavior & flatten net load profiles to respect system constraints & make day-to-day network operation more stable & predictable

Join at
slido.com
#7452 931

Thank you.

Lorenzo Kristov
LKristov91@gmail.com

Electric System Policy, Structure, Market Design

the climate center

Join at
slido.com
#7452 931

Enabling DER Programs that Provide Distribution System Value: CCA Perspective

A Presentation for the California Public Utilities Commission's 2024 Future Grid Workshop #1 in Track 2 of R.21-06-017

Nikhil Vijaykar
Partner, Keyes & Fox
Counsel to Joint Community Choice Aggregators

February 8, 2024

KEYES&FOX LLP

Join at
slido.com
#7452 931

Joint Community Choice Aggregators

SAN DIEGO COMMUNITY POWER

SILICON VALLEY CLEAN ENERGY

SAN JOSE CLEAN ENERGY

Sonoma Clean Power

PENINSULA CLEAN ENERGY

Ava Community Energy

KEYES&FOX LLP

Join at
slido.com
#7452 931

Community Choice Aggregators Run a Diverse Set of DER Programs

- CCAs already run a number of solar, storage, demand response and other DER programs
- CCA DER programs generally optimize around wholesale market conditions by encouraging dispatch during / load shifting away from peak hours
- CCAs' relationship with their communities and local governments make them well-positioned to help DER programs meet both grid and community needs

KEYES&FOX LLP

Examples of CCA DER Programs

Ava Community Energy's **Resilient Home** program (in partnership with Sunrun) provides incentives to solar + storage customers and allows Ava to dispatch the batteries every weekday during peak evening hours.

With over 1,000 residential solar and storage systems under management, Ava delivery peak load management on a daily basis.

Sonoma Clean Power Authority's **GridSavvy Rewards** program automates load shifting away from peak times.

It offers customers discounts and incentives to purchase and connect smart devices, such as EV chargers, smart thermostats and water heaters.

SCP is also developing battery optimization programs for residential customers.

Silicon Valley Clean Energy's **GridShift** program leverages vehicle telematics to control and optimize residential customers' EV charging at home.

Customers receive bill savings by automatically shifting EV charging load to off-peak hours.

GridShift also aligns EV charging with low-carbon generation hours on the grid.

Peninsula Clean Energy's **Solar and Battery Backup** program (in partnership with Sunrun) provides incentives to solar + storage customers and allows PCE to dispatch batteries every weekday during peak hours.

PCE's **Managed Charging** Program aligns EV charging with high solar daytime hours and aims to shift load away from the 4pm-9pm peak window.

San Jose Clean Energy's **Peak Rewards** is a Behavioral Demand Response program that provides incentives to commercial customers intended to shift load away from peak hours during days of the year when electricity is in short supply.

SJCE plans to provide a program that allows automated DR for both residential and commercial customers.

Join at
slido.com
#7452 931

CCAs Lack Sufficient Information and Incentive to Optimize Programs Based on Distribution System Needs

- CCAs lack information on the "operational needs" of the grid, distribution system constraints, and the locations of their customers on the distribution grid
- While the Distribution Investment Deferral Framework aimed to surface those needs, CCAs continue to lack granular information on why DER projects are not picked up through the DIDF
- Shared understanding of standards for acceptable DER projects and corresponding economic signals are currently unknown or unavailable to CCAs and other DER providers

KEYES&FOX LLP

Join at
slido.com
#7452 931

With Better Information, CCA Programs Can Provide Greater Value to the Distribution System

- CCAs' DER programs can provide better value to the distribution grid (and, at minimum, avoid *increasing* grid stress) if CCAs had more information on grid conditions/needs

- For example: better information on feeder capacity would help CCAs determine where best to install a bank of EV chargers; real-time signals on grid stress would help CCAs dispatch solar+storage programs (including outside of peak hours) or curtail customer usage through DR programs at appropriate locations

KEYES&FOX LLP

Key Takeaways

- CCAs already run a variety of DER programs that are generally optimized around wholesale market conditions
- CCAs lack sufficient information and incentive to optimize DER programs based on distribution system needs
- CCA DER programs can provide better value to all customers with better information on grid constraints and economic signals that incentivize solutions to those constraints

Join at
slido.com
#7452 931

Questions?

Nikhil Vijaykar
nvijaykar@keyesfox.com

KEYES&FOX LLP

Join at
slido.com
#7452 931

NEXT STEPS

- Email additional comments on Scoping Question 1 **by February 22**
  - send to Maggie Dunham Jordahl (maggiedj@gridworks.org)
- Workshop #1 Summary posted on the Gridworks California Future Grid Study page and distributed via email by **March 2**
- Join us for Workshop #2 on **March 12 from 1-5pm**
- Please take a moment to fill out a slido feedback survey

Join at
slido.com
#7452 931

HOW CAN WE HELP?

MATTHEW TISDALE
mtisdale@gridworks.org
JAY GRIFFIN
jgriffin@gridworks.org
NEHA BAZAJ
nbazaj@gridworks.org
MAGGIE DUNHAM JORDAHL
maggiedj@gridworks.org

GRIDWORKS

www.gridworks.org