Getting Microgrids to Market: Regulatory and Business Models for Resilience

NARUC-NASEO Microgrids State Working Group Webinar

JULY 1, 2020 | 3:00 – 4:00 PM ET

Moderator: **Hon. Diane X. Burman,** New York State Public Service Commission

Speakers:

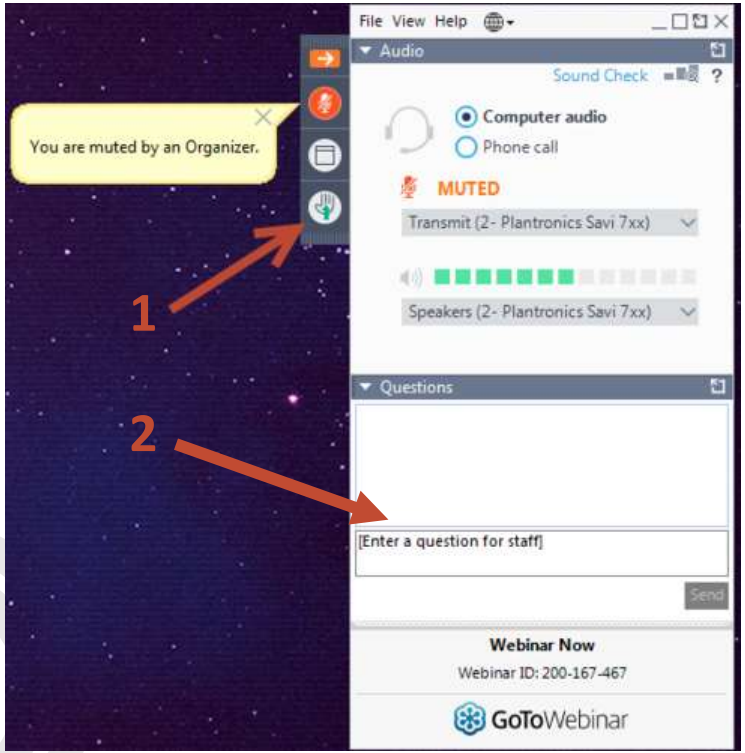
- **Jeff Morris,** Director, State Government Relations, Schneider Electric
- **Mark Feasel,** President, Smart Grid, Schneider Electric
- **Anne Hoskins,** Chief Policy Officer, Sunrun
- **Tefford Reed,** Senior Director, Advanced Products, Sunrun

QUESTIONS

Submit questions two ways:

1. Raise your hand and the moderator will call on you to unmute your line

2. Type a question into the question box



NARUC-NASEO Microgrids SWG Webinar: Getting Microgrids to Market - Regulatory and Business Models for Resilience

Business Model Innovation in the New Energy Landscape

Jeff Morris, Director State Government Relations
Schneider Electric North America

"Embracing Digital Transformation to deliver economic value to your business"

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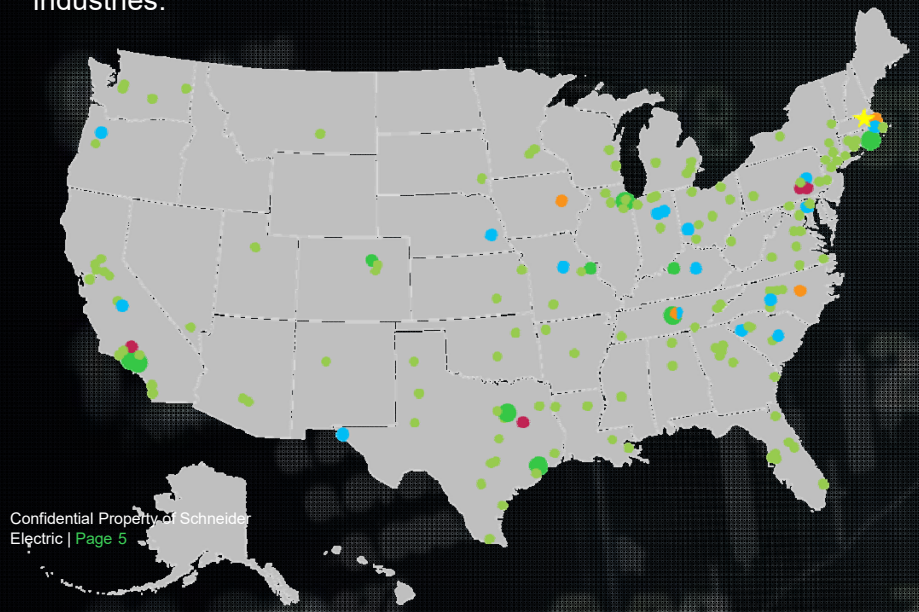
Schneider Electric in the US

Leading the digital transformation of energy management and automation in homes, buildings, data centers, infrastructure, and industries.



- Corporate offices
- Distribution centers
- Field / sales offices
- Manufacturing facilities
- R & D centers
- ASCO facilities

Schneider Electric USAHeadquarters
800 Federal St, Boston ONE Campus
Andover, MA 01810 se.com/us

$7.7B in revenues, 2018 ~19,000 employees

Major U.S. sites
Dallas, TX (2223 Employees) Boston, MA; Nashville, TN; West Kingston, RI; Lake Forest, CA;

300+ microgrids in the U.S.

#24 of companies that are changing the world,
Fortune 2016

#12 of Global 100 Most Sustainable Corporations

Acknowledged in CDP's "Global Climate 500 Performance Leadership Index" and "Dow Jones Sustainability Index"

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Policy Considerations for removing barriers to Microgrid

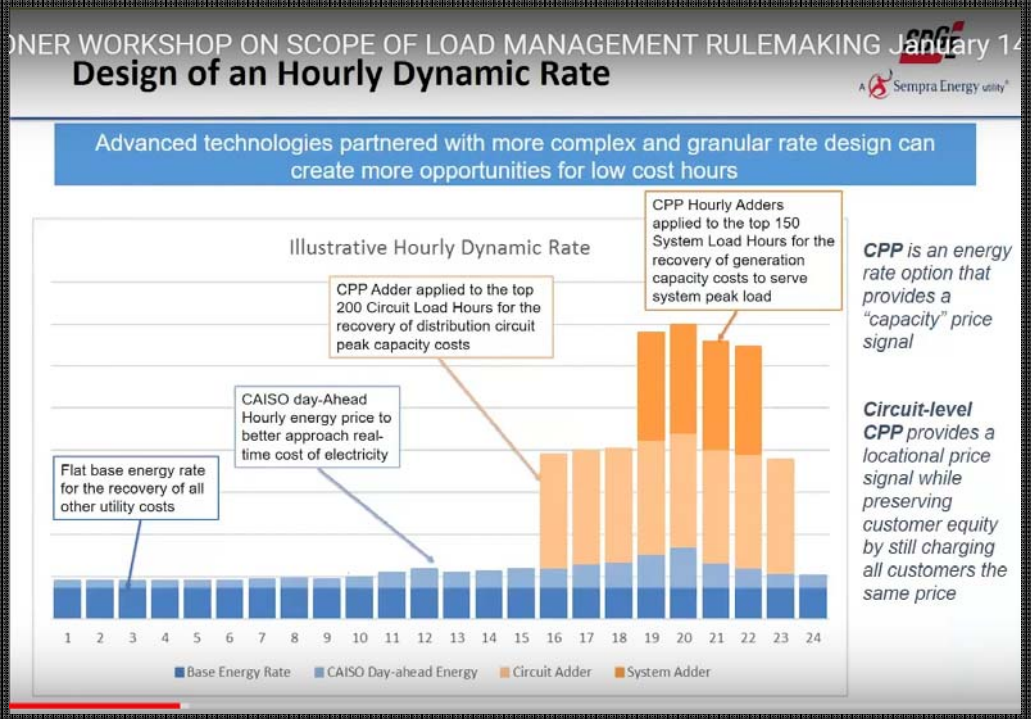
- Establish clear rules for ownership and operation of microgrids. Across all States regulatory confusion is a barrier to moving customer projects forward.
  - Create new tariffs or a retail market tariff for islandable microgrids as they inherently improve the hosting and peaking capacity of circuits they are connect to unlike other DERs or require utilities conduct dispatchable services by contracting with microgrids at retail level for services
  - Be agnostic on relationship structures behind meters. If necessary, outside of Consumer Protection Act, mimic price listing tool used in devolution of local land line telephony to VOIP. Allow transactive energy behind meter to exchange all values not just energy value.
  - Allow ownership & operation of third party microgrids and Energy as a Service (EaaS) or public private partnerships (P3) for microgrids. Utility microgrids usually require rate-basing in an overall rate class that may not see the benefits directly. Third party microgrids are competitive since EaaS can be financed outside of that framework.
  - For utility built microgrids clear transparent procurement processes that are technology neutral but aligned with State policy goals. A comparison should be done on cost between rate of return based facilities and third party.

Policy Considerations for removing barriers to Microgrid

- Direct all utilities to have established public diagrams for interconnection of microgrids and other DERs. Standard transparent process and design will accelerate economic growth.
  - Many utilities are conducting DER planning by choice, rule or law. DER plans should clearly identify where any microgrid can improve the hosting or peaking capacity on a circuit.
  - Remove Departing Load Charges (DLC) from Microgrids. The customer investment in microgrids will cause avoided CAPEX at substations which will cost ratepayers as EVs drive peak demand and PVs congest peak hosting capacity at circuits below substations.
  - Update Stand-by Charges to support community resilience and unleash dynamic microgrid services.
- Modernize outdated energy efficiency rebate programs for equipment/appliances that can communicate as system with microgrid platforms in the form of Grid interactive Efficient Buildings.
  - Washington, California and Oregon moving to CTA-2045 communications port for large demand generating appliances/equipment. Water tanks now but EV charging, HVAC, heat pumps, large discretionary electric motors, freezers/refrigeration. Energy Star is last century's solution.

Policy Considerations for removing barriers to Microgrid

- San Diego Gas and Electric (SDG&E) has digitized their distribution system and can see the value for microgrids and DERs at locations on circuits used in their "Power Your Drive" demand pricing pilot. CEC workshop 1/14/2020
  - Circuits below substations are unique, do not align with overall capacity issues on distribution system and offer more value than wholesale markets.

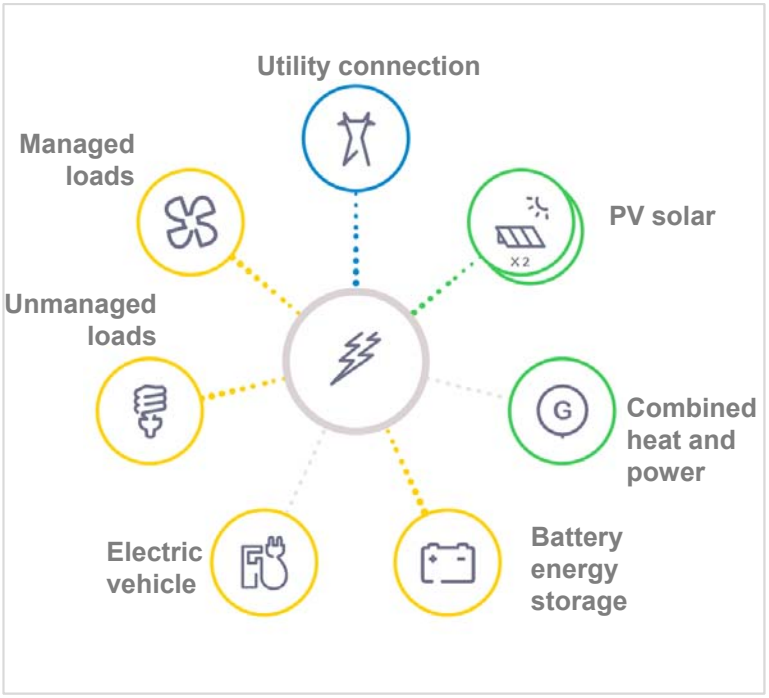


Emerging Opportunities for Microgrids in States

- FEMA is creating a resilience program – Building Resilient Infrastructure and Communities (BRIC). BRIC is designed to make maximize resiliency in critical infrastructure. This not only for the electric grid but for critical infrastructure dependent on the electric grid.
  - States needs to develop in their DER planning resiliency opportunities that hardens multiple pieces of critical infrastructure in cities and counties with microgrids. Look at FEMA's seven critical infrastructure nodes. Making more than one node resilient that are near each other should be a policy outcome.
  - Resolve right of way issues (ROW) for microgrids. Right of Way or over the fence work is currently a huge impediment to growth in any situation but in particular to the BRIC opportunity. Allowing access to ROW will allow neighboring critical facilities to gain efficiencies of multiple assets multiple facilities run as a system. Federal military bases moving ahead because they own their own right of way.
- Create a Grid Modernization Fund to assist utilities to digitize their circuits below substations in order to avoid costly hardware CAPEX expenditures in substations to accommodate the new telecommuter work force and allow them to see actual location and time value of microgrids and DERs.

Digitization and the decommoditization of energy

Digitization allows consumers to optimize energy to their business objectives.



Cost

- Lower/more predictable energy costs.
- Utility tariff optimization.
- Capital expenditure avoidance.
- Incremental value streams from energy markets.

Resilience

- Protect power sensitive/critical assets from poor power quality.
- Oasis during grid instability for students, faculty, and guests – shelter in place.

Sustainability

- Reduce carbon footprint.
- Attract and serve carbon sensitive students and faculty.
- Improve brand image.

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Energy in an Unpredictable World

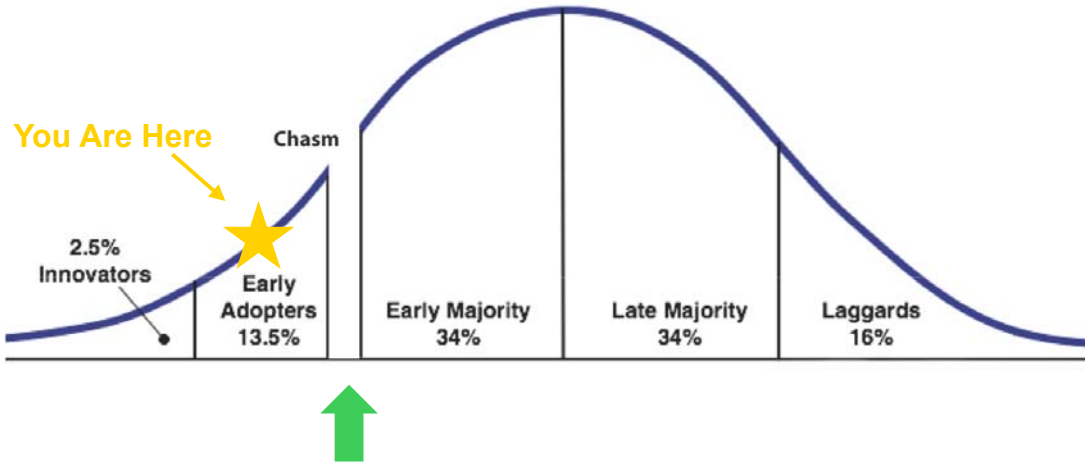
In our connected and urbanizing world, the ramifications of energy disruptions are much different than a decade ago

- Cellphone towers lost during California Public Safety Shutoffs impede ability of safety workers to collaborate
- The transition of healthcare to the home left many vulnerable during recent outages
- Food supply chains are threatened giving rise to indoor agriculture

Our approach to critical infrastructure must pivot to a new reality in which lower energy-intensity loads must be addressed (shopping centers, elder care, food processing, banks etc.)

- The custom engineered, highly bespoke solutions to hardening energy infrastructure of the past will not work
- Capital-intense solutions will not work for these types of consumers

Crossing the Chasm in the New Energy Landscape



The offer required to cross the chasm:

- Allows consumers to co-optimize for energy and process
- Aligns ownership of assets to those with a prospectus based upon long term stable returns.
- Delivers an enduring outcome for the economic useful life of the asset
- Shields consumers from technical risk of emerging technology

Early market participants are advanced energy prosumers who can quantify the value of improved reliability, flexibility, sustainability, and security to their corporate mission.

Reaching the larger market now requires overcoming high barriers to entry:

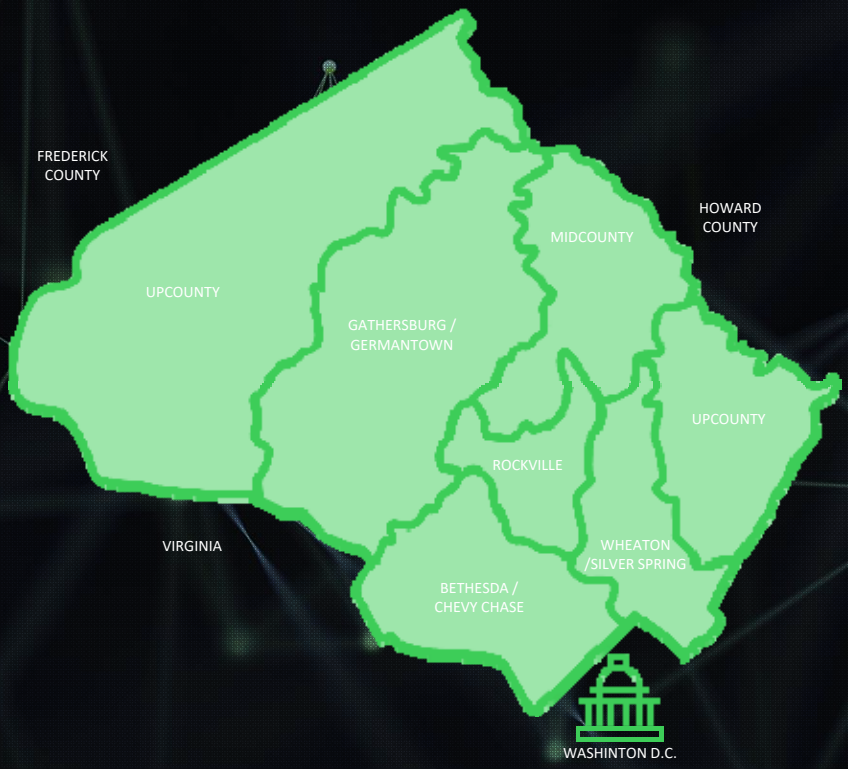
- Technology
- Regulatory
- Financial

About Montgomery County, Maryland

Approximately
1M people

High-tech,
knowledge-based
economy

400+ facilities
9M sq ft of real estate
3k vehicles
9k employees



Leader in advanced energy and sustainability

11 megawatts of solar across 18 sites

- More than 430,000,000 kWh of clean energy annually
- Procure 100% clean energy for County facilities
- U.S. DOE's Combined Heat and Power for Resiliency Accelerator

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Montgomery County - Energy as a Service Case Study

Situation

After a series of wide-spread grid outages, Montgomery County set out to find partners to help mitigate the impact of future disasters to its over 1M residents.

The community is committed to decreasing carbon footprint

The electrical infrastructure at the public safety headquarters was old, and needed to be replaced before failure.

The County has tight budget controls and access to capital is difficult

Approach

- Delivered via innovative, public-private Energy-as-a-Service model eliminating up-front costs
- Infrastructure upgrades (low- and medium-voltage gear)
- Integration of existing generation assets.
- New Solar and Gas CHP generation
- Advanced controls and monitoring
- Advanced cybersecurity

Outcomes

- Improved resiliency of county operations by upgrading existing aging electrical distribution infrastructure
- Provide the ability to island operations for >7 days without grid support
- Mitigated risk of escalating energy price over 15 years.
- Upgrade infrastructure including new electric vehicle charging without capex
- Reduce greenhouse gas and other emissions

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Montgomery County Microgrid

Business Model Evolution

Thank you!

Mark Feasel
President, Smartgrid North America
Schneider Electric

Jeff Morris
Director, State Government Relations
Schneider Electric

Life Is On Schneider Electric

sunrun

Smart, Clean Neighborhood Grids

NARUC/NASEO Microgrids Webinar

Anne Hoskins, Chief Policy Officer
Tefford Reed, Senior Director Advanced Products

July 1, 2020

Key Topics

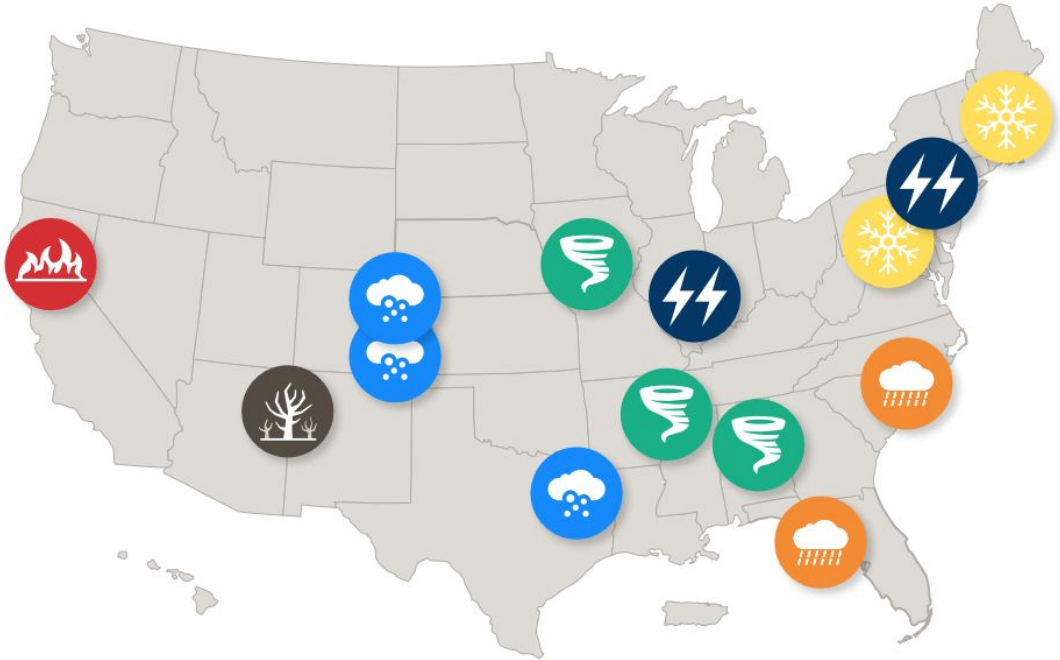
- Why Microgrids?
  - Regulatory development
- Key Building Blocks: Distributed Solar Plus Batteries
- Battery Aggregation and Virtual Power Plants
- Neighborhood Microgrids

Why Microgrids?

1. Resiliency during climate events. Wildfire threats in California are resulting in utility-controlled power outages.
2. Local reliability. Power system planning is top down and does not address specific local energy needs.
3. GHG emissions. Centralized fossil-fueled electricity pollutes local areas and impacts greenhouse gas emissions goals.

Customers want reliable and resilient energy

Billion-Dollar Extreme Weather Disasters In The US, 2018



Western Wildfires
California Firestorm, Summer-Fall

Plains Droughts
Southwest/Southern, 2018

Hail Storms
Rockies & Plains, August 6-7

Tornadoes & Severe Weather
Central & Eastern, July 19-22
Southern & Eastern, April 13-16
Southeastern, March 18-21

Severe Weather
Central & Eastern, May 13-15
Central Northeastern, May 1-4

Hurricane
Hurricane Florence, September 13-16
Hurricane Michael, October 10-11

Winter Storm
Northeast, March 1-3
Northeastern & Eastern, January 3-5

This map denotes the approximate location for each of the **14 separate billion dollar weather and climate disasters** that impacted the United States during 2018.

Microgrid Policy/ Regulatory Development in CA

2017 - Joint Agencies adopt the *Roadmap for Commercializing Microgrids in California*.

2018 - Governor signs SB 1339 into state law.

2019 - PG&E and SCE begin Public Safety Power Shutoffs (PSPS) during wildfire season in California.

2019+ - California PUC Microgrid Rulemaking, divided into three phases:

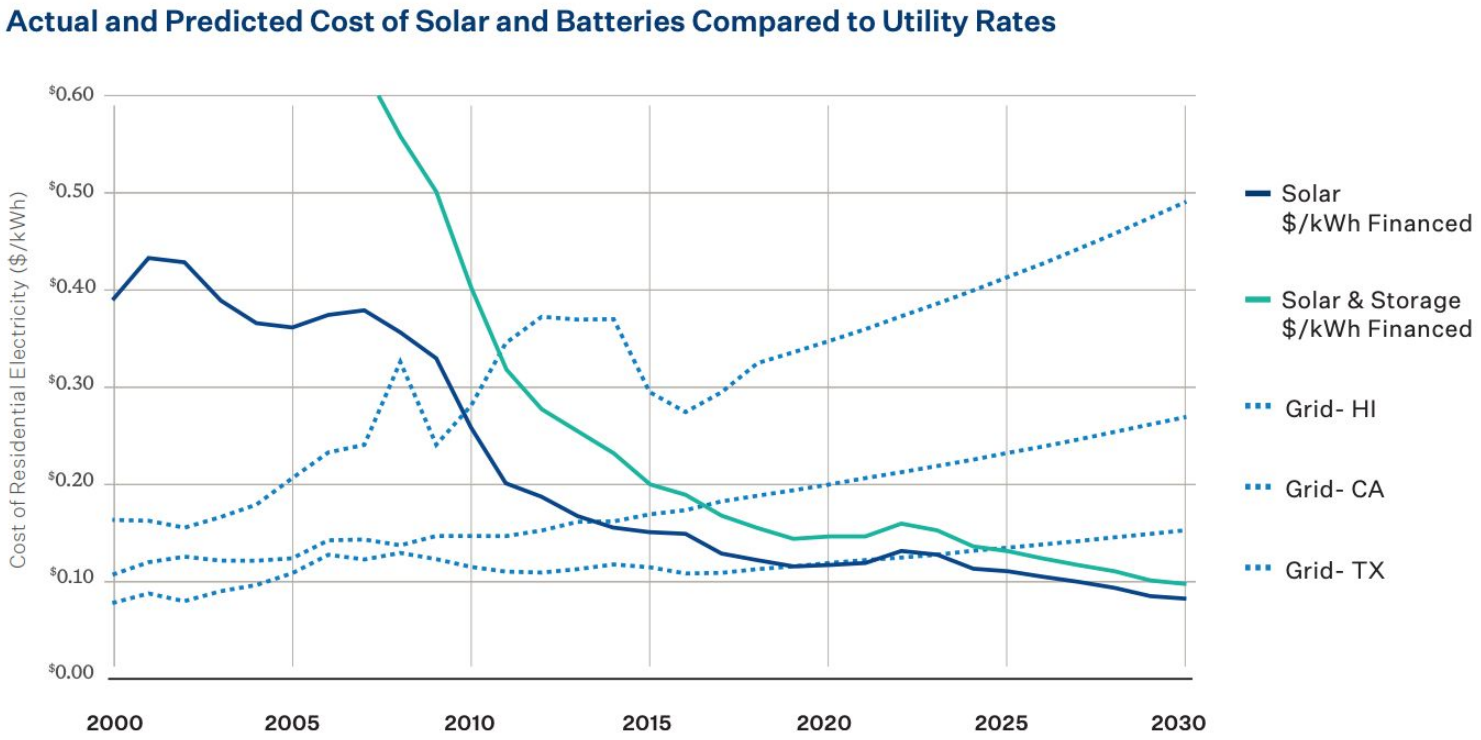
Phase 1 (2020)	**Phase 2 (2021)**	**Phase 3 (TBD)**
Short term solutions that can be implemented by wildfire season in 2020. CPUC approved short term fossil solutions and several proposals to both expedite interconnection and makes several modifications to NEM tariffs.	Identify and implement regulatory changes and standards needed for microgrid development. Ensure microgrid development also achieves state goals of lowering GHGs and customer resilience during climate events.	Ongoing implementation of SB 1339 and future resiliency planning.

Home batteries accelerate transition to consumer-centered resources.

Power outages are increasing in frequency and home batteries enable backup power for customers.

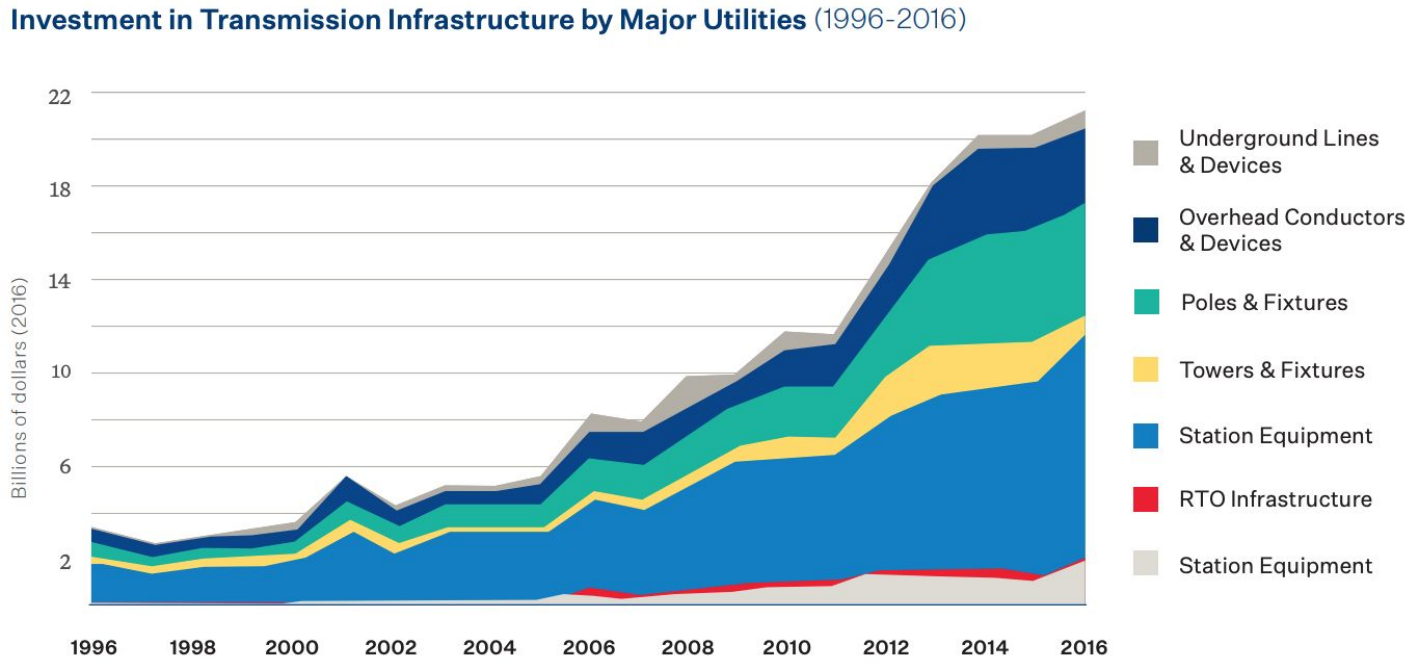
Distributed home solar and batteries are more nimble and cost effective than continuing to over-invest in bulky centralized infrastructure.

With scale the cost of technology declines

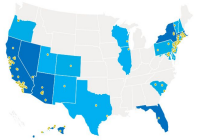


This graph compares the historical and future cost to deliver a kilowatt-hour of electricity to a residential customer from rooftop solar, rooftop solar paired with energy storage, or from the grid in Hawaii, California and Texas. When all-in delivery costs are considered, the trend towards cost advantage of distributed resources becomes clear.[3]

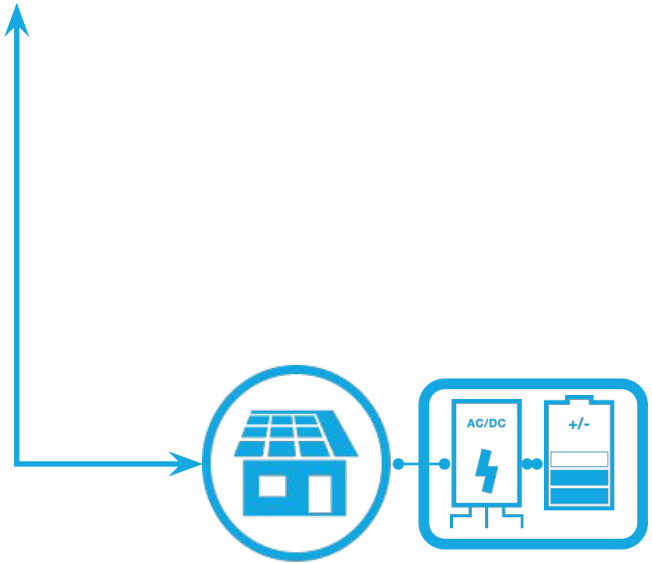
….but the cost to deliver is increasing



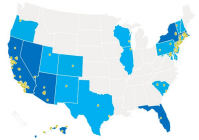
Brightbox: our home solar and battery service



SOLAR
AS A SERVICE



Virtual Power Plants, Non Wire Alternatives



SOLAR AS A SERVICE

Hawaiian Electric

HI SELF-SUPPLY

SDGE A Sempra Energy utility

PG&E

SOUTHERN CALIFORNIA EDISON

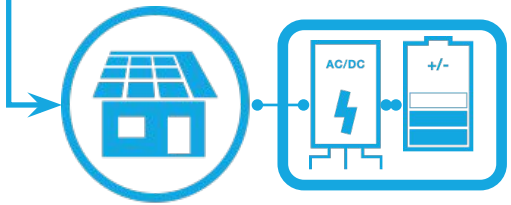
CA TIME-OF-USE

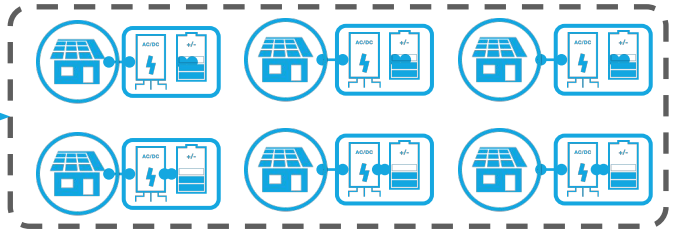
GRID SERVICES

- Clean
- Location-specific
- Firm
- Dispatchable

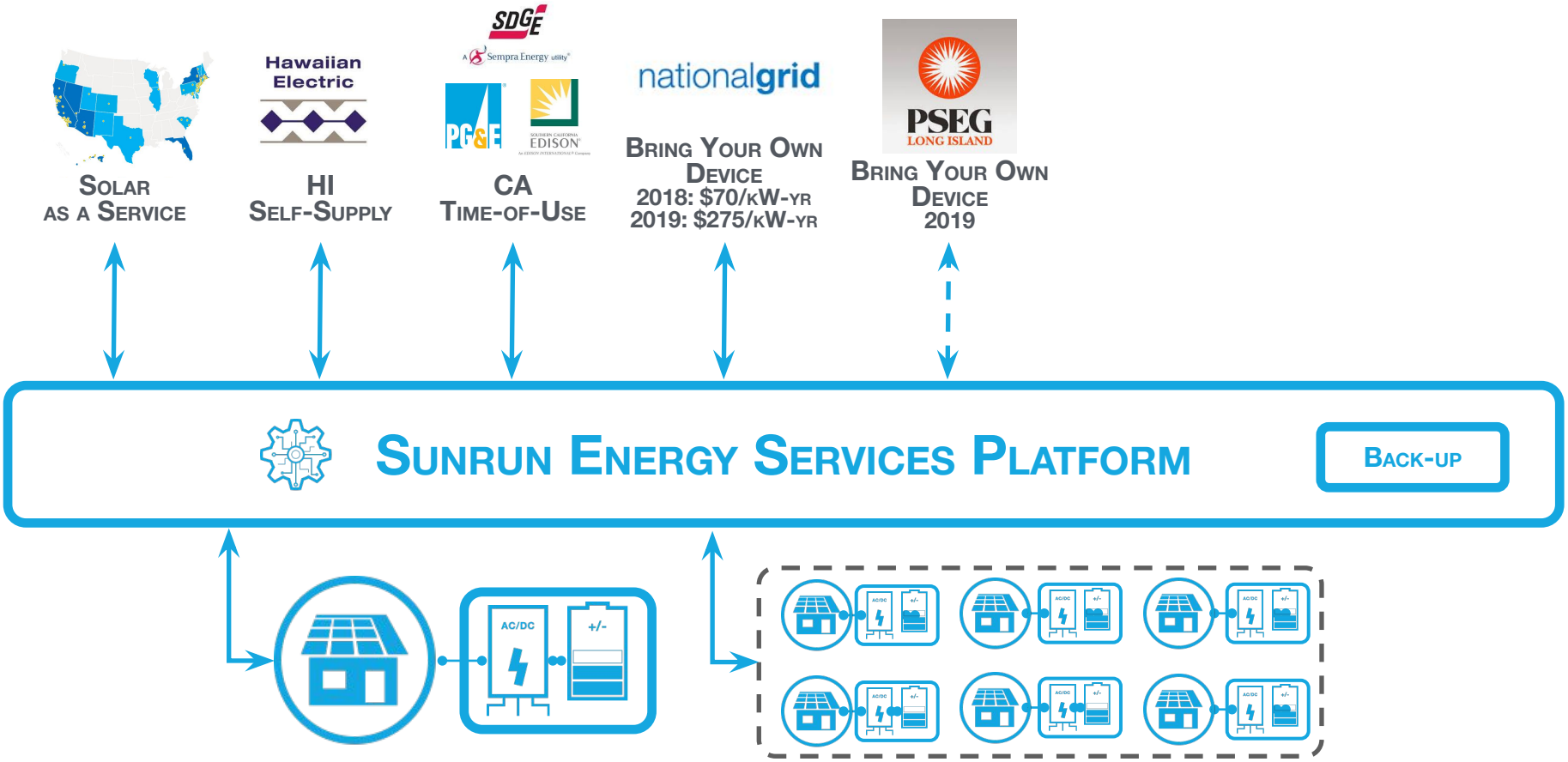
SUNRUN ENERGY SERVICES PLATFORM

BACK-UP

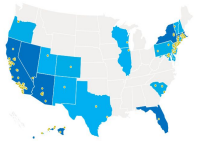




The Northeast is leading with BYOD programs



Sunrun won 20 MW of resi solar battery capacity in ISO-NE



Solar as a Service

Hawaiian Electric

HI Self-Supply

SDGE — A Sempra Energy utility — PG&E — Southern California Edison

CA Time-of-Use

nationalgrid

Bring Your Own Device
2018: $70/kW-yr
2019: $275/kW-yr

PSEG Long Island

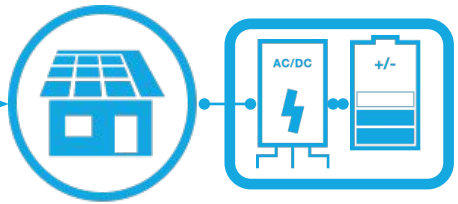
Bring Your Own Device 2019

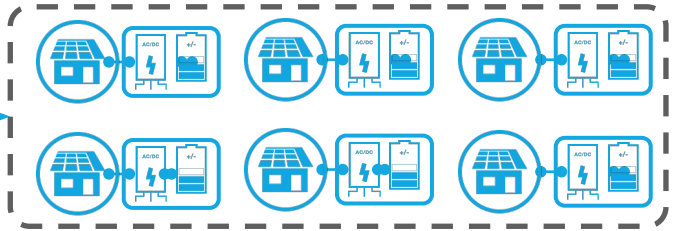
ISO new england

Contract
2022: 5000 homes
NEMA, SEMA, NH, VT, RI

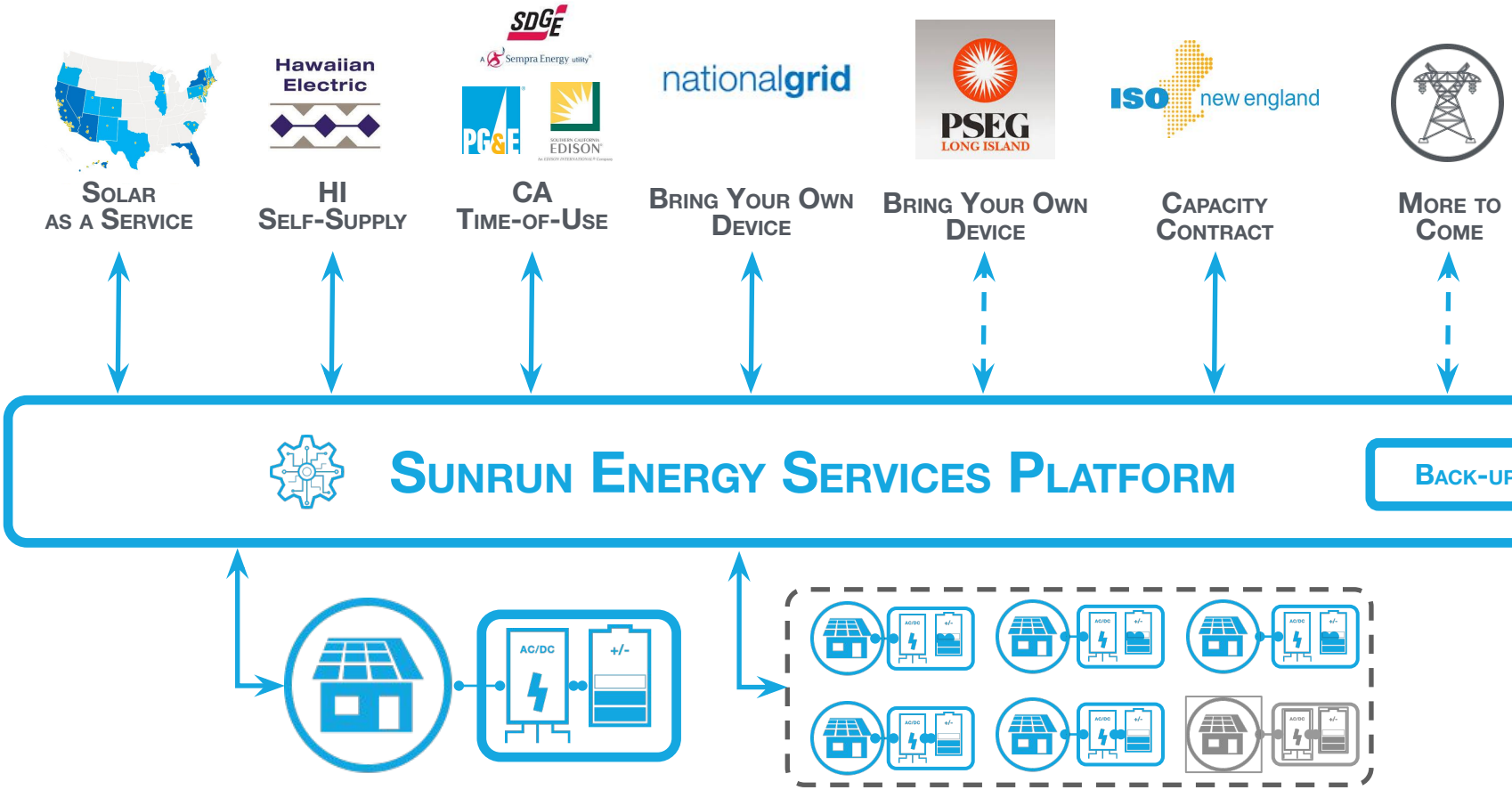
Sunrun Energy Services Platform

Back-up





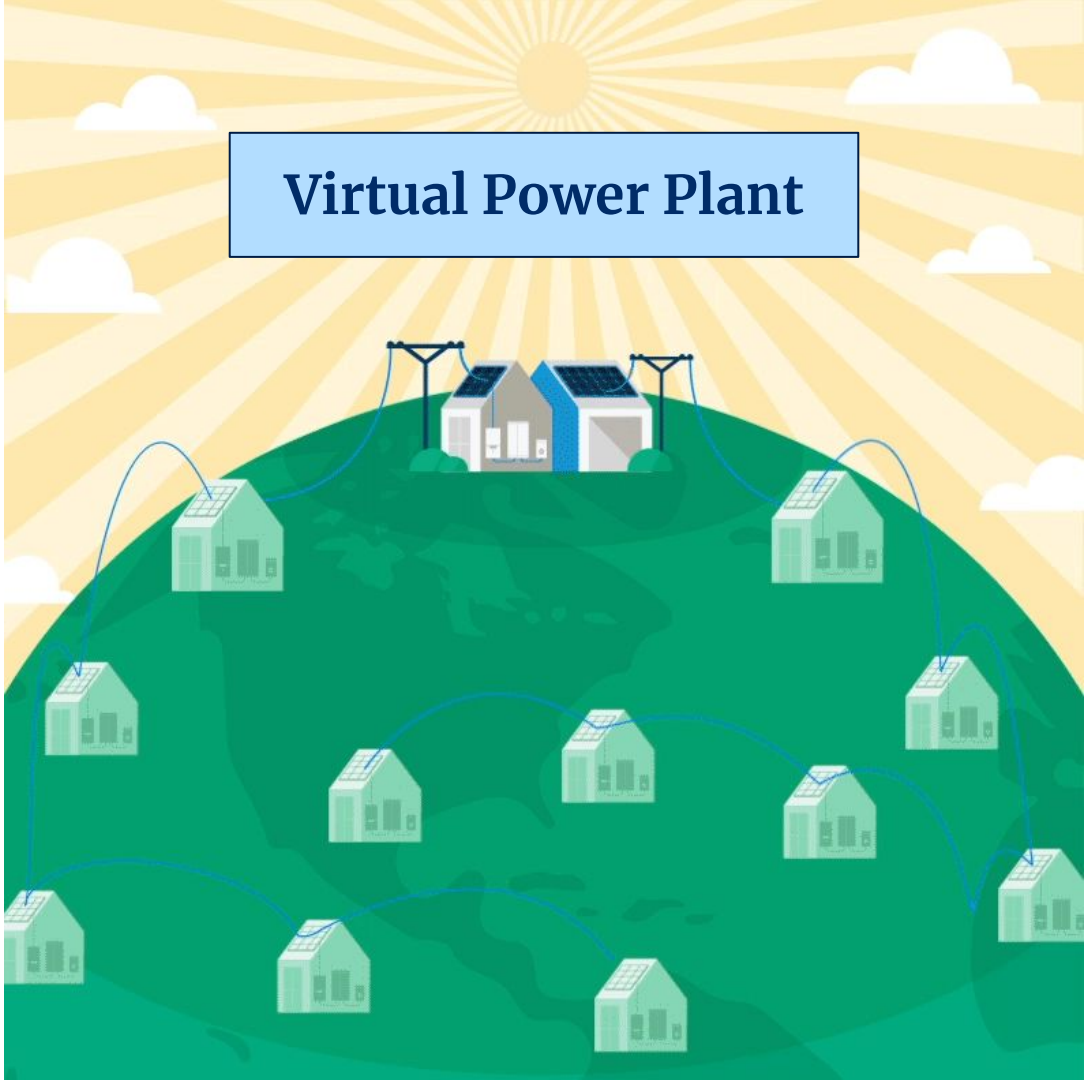
Energy Services Platform Creates a Sharing Economy



Building not to disrupt but to displace

Utility AND Competitive Partnership

- ISO New England
- BYO Device, New England
- Oakland, California
- Los Angeles, California (proposed)
- HECO, Oahu, Hawaii
- SCE and O&R



Existing Solutions Take Us Only Part Way

SCENARIO 1

Normal Operation

Utility Support

Transmission & Distribution

Solar + Storage Behavior

Grid Services & Time-of-Use

SCENARIO 2

Community Backup

Utility Support

Distribution Only

Solar + Storage Behavior

*Share Power**

** DERs cannot share power during outages today*

SCENARIO 3

Individual Backup

Utility Support

None

Solar + Storage Behavior

Individual backup

Only scenarios 1 & 3 are possible today. In the future, widespread rooftop solar and battery storage on individual homes could be leveraged to share power and backup other ratepayers during a transmission outage.

Next Frontier: Clean Neighborhood Grids

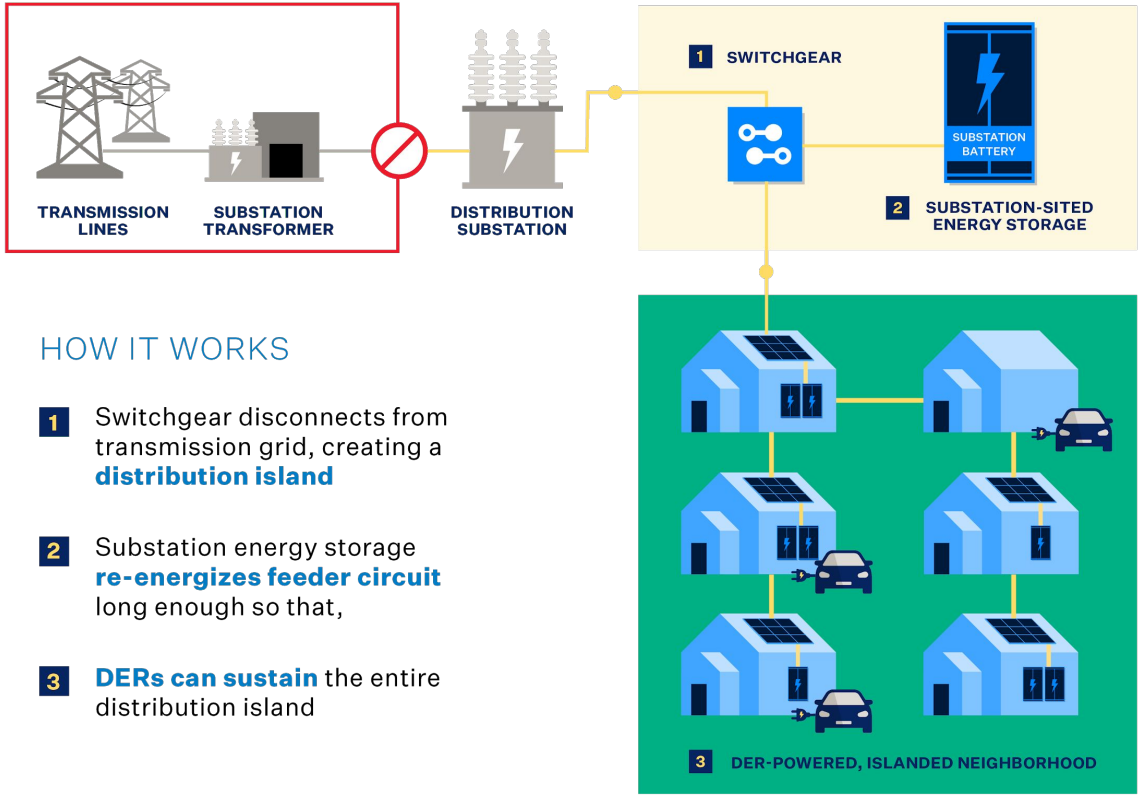
Proposed Solution

- Majority of electricity to be from renewables that are **generated and stored on-site**
- Ability to **share power and support the local needs** within the distribution network
- Ability for feeders to **temporarily disconnect at the substation**, and stay powered

Benefits

- **Individuals:** Clean, local, and resilient power
- **Utility:** Continued service to ratepayers even during transmission outages
- **Society:** Increase adoption of rooftop solar and battery storage will reduce carbon emissions, grow the economy, and empower communities

Neighborhood Grid Concept



HOW IT WORKS

1. Switchgear disconnects from transmission grid, creating a **distribution island**
2. Substation energy storage **re-energizes feeder circuit** long enough so that,
3. **DERs can sustain** the entire distribution island

Technical Development Required

- **DER Level Controls**
  For the ability to detect grid segmentation, and operate to support an islanded segmented system when needed.

- **Substation Level Controls**
  For the ability to operate with and send signals to feeder level DERs to maintain a segmented system.

- **Local Area & Supervisory Controls**
  For the ability to manage local load, using forecasting and optimization to ensure reliable power supply within segmented system.

- **Grid Interactive Controls**
  For distribution circuits to be able to detect signals and segment from the larger distribution and/or transmission grid when needed.

Additional Frameworks Required

- **Distributed System Operators (DSO) Management**
  For load shaping and grid service needs coordination during normal grid conditions, and segmented grid operations during abnormal grid conditions, ensuring power quality and reliability is maintained within existing utility standards.

- **Autonomous DER Coordination Capability**
  For DERs along distribution network to coordinate with each other and the segmented distribution grid, overseen by the DSO, to support the segmented distribution network.

- **Marketplace for Segmented Grid**
  For the ability of participants along the segmented grid to optimize resource allocation via instruments like price signals and transactive energy.

- **Diversity of DERs**
  For systems on the distribution network to include intelligent load control, solar and storage, electric vehicles, fuel cells, etc.

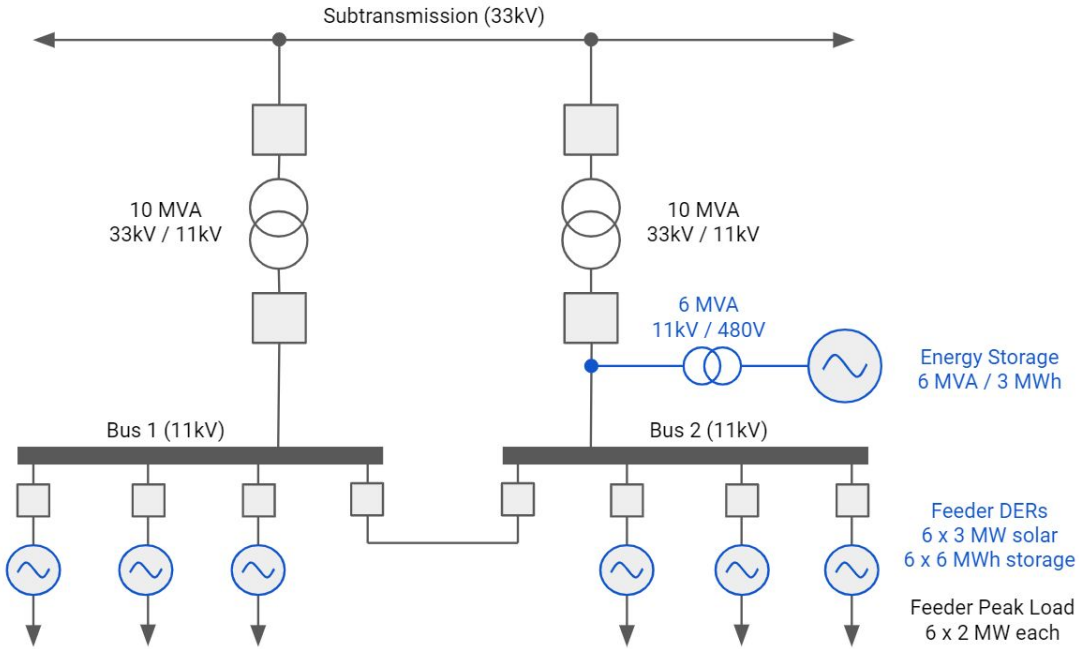
Additional Considerations

- **Larger DERs allow for greater generation & flexible response**
  The larger a rooftop solar installation, the more generation; the larger the storage system, the greater amount of energy can be stored for resiliency. Neighborhood grids benefit when individual systems are large as possible.

- **Customer and DER system economics constrain system size**
  Existing rate structures provide little incentive to oversize systems located behind-the-meter. Under most residential and commercial tariffs, oversized systems provide no incremental value or can negatively impact the customer value.

- **Encourage appropriate system sizes for neighborhood grids**
  New paradigms must be established to signal to ratepayers that they can be a bigger part of the local reliability solution.

Example Engineering Diagram of Substation and Distribution Circuit Design



Thank You.

sunrun

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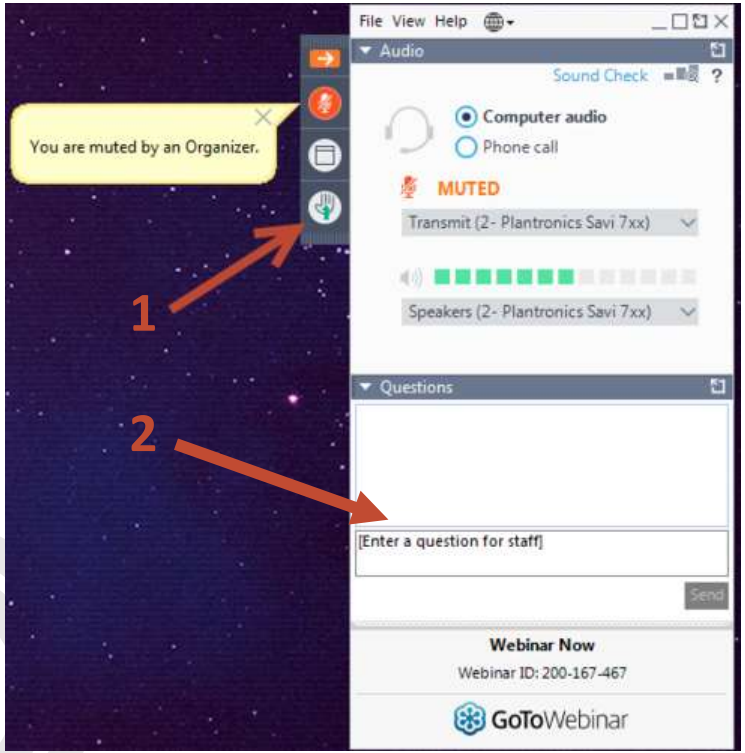

THANK YOU

This concludes the public webinar.

Members of the NARUC-NASEO Microgrids State Working Group are invited to remain on the webinar for a members-only discussion.