DOE-OE Energy Storage Technology Advancement Partnership (ESTAP) Webinar

FERC Order 2222: How it will level the playing field for distributed energy storage and other DERs

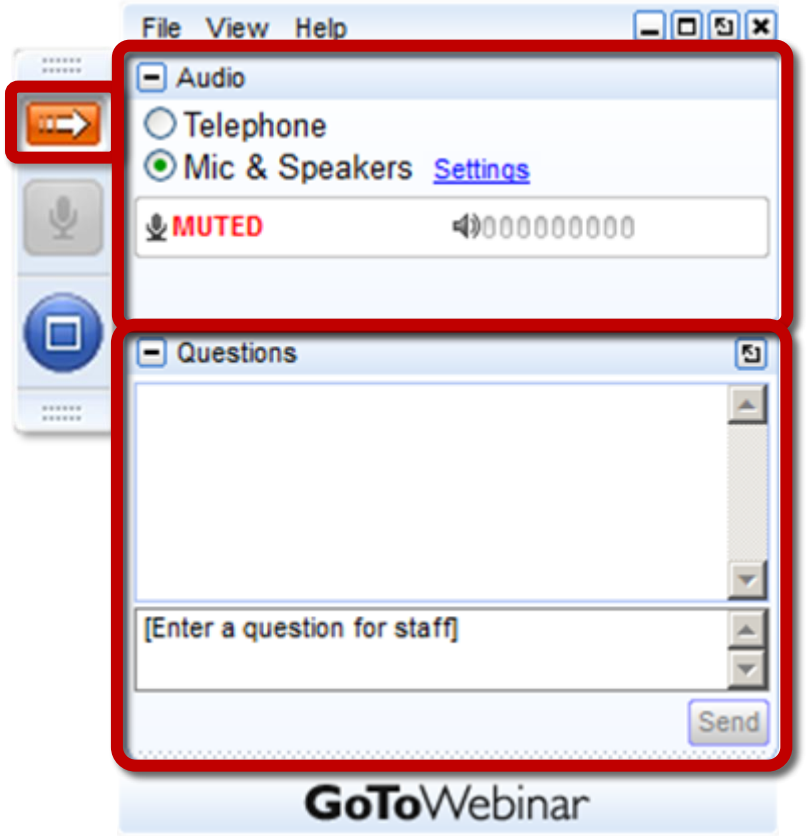
December 10, 2020

U.S. DEPARTMENT OF ENERGY

Sandia National Laboratories

CleanEnergy States Alliance

Webinar Logistics



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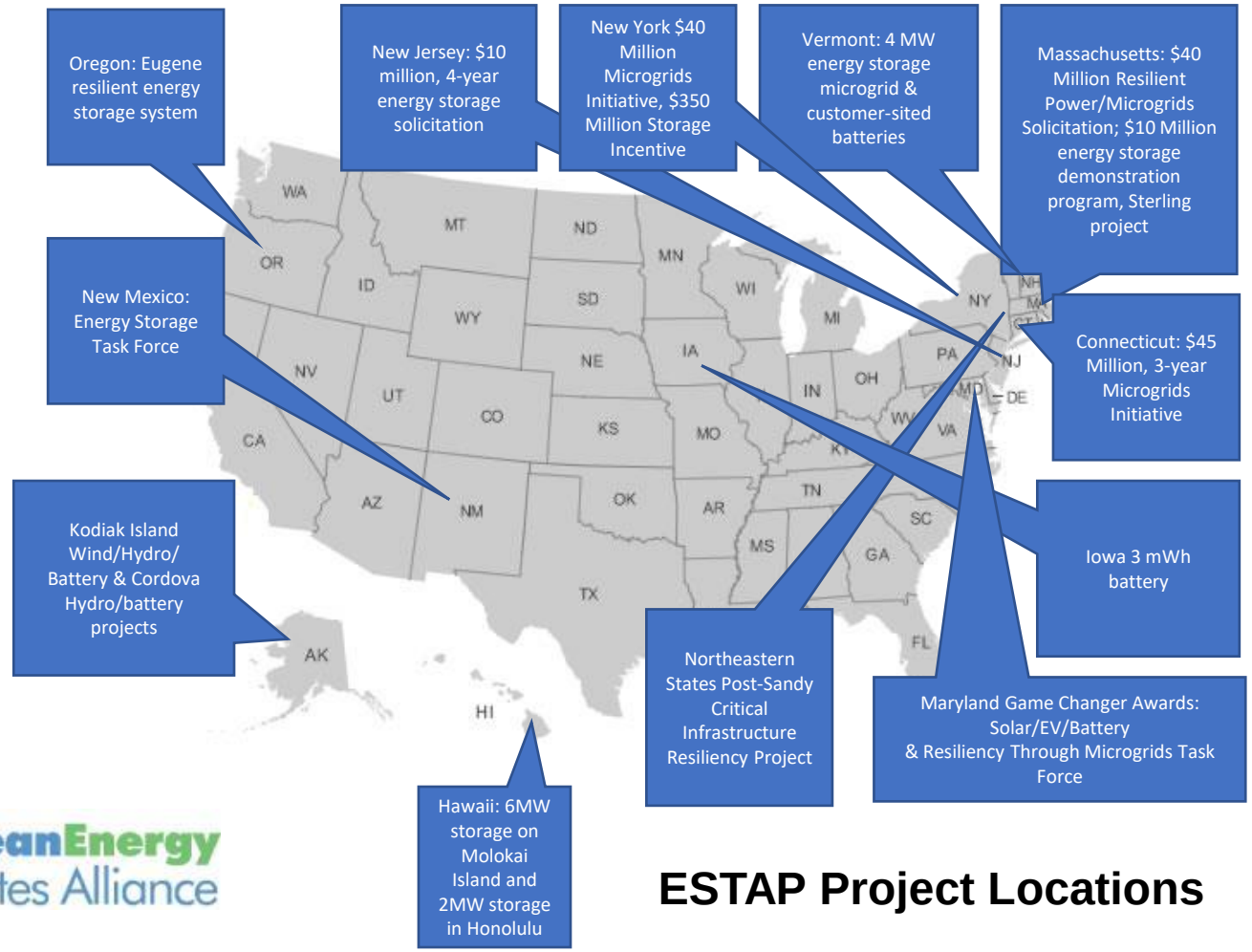
DOE-OE Energy Storage Technology Advancement Partnership

The Energy Storage Technology Advancement Partnership (ESTAP) is a US DOE-OE funded federal/state partnership project conducted under contract with Sandia National Laboratories.

ESTAP Key Activities:

1. Facilitate public/private partnerships to support joint federal/state energy storage demonstration project deployment
2. Disseminate information to stakeholders
   - ESTAP listserv >5,000 members
   - Webinars, conferences, information updates, surveys.
3. Support state energy storage efforts with technical, policy and program assistance



ESTAP Project Locations

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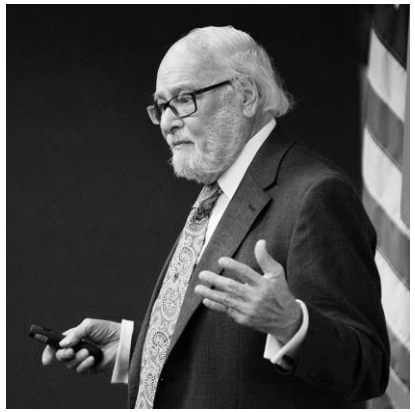
Thank You!



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Today's Webinar Speakers

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Vice President – Distributed Market Integration, Customized Energy Solutions

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Senior Project Director, Clean Energy States Alliance (moderator)

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FERC Order 2222: How it will level the playing field for distributed energy storage and other DERs

Clean Energy States Alliance

December 10, 2020

Agenda

1. Background on FERC, ISOs/RTOs, DERs
2. Order 2222 Background and Overview
3. What 2222 Says, What it Doesn't Say
4. Examples of DERs, Economics
5. Existing Barriers
6. What 2222 Means – New Opportunities
7. New Challenges, What to Watch Out for
8. Implementation Outlook

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Customized Energy Solutions

Established in 1998, **Customized Energy Solutions (CES)** is a consulting and services company that assists clients in managing and staying ahead of the changes in the wholesale and retail electricity and natural gas markets. Serving hundreds of clients, Customized Energy Solutions offers best-in-class hosted energy market operations platforms and a wide spectrum of consulting services. CES is committed to promoting economic development through the advancement of transparent, efficient, and non-discriminatory wholesale and retail electricity and natural gas markets.

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Headquartered
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Over 175 Associates across 9 Regional offices in United States, Canada, India, Japan & Mexico. We support clients in all 7 US ISOs and RTO's

Resources

>11,000 MW assets under Active Management

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Best Places to work: 2014, 2016

2016 Energy Storage Association Brad Roberts Award Winner

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Our consulting services enables competitive suppliers, technology providers, marketers, utilities and customers to prosper through change, by turning knowledge into value

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- ARR Analysis
- FTR Analysis
- Congestion Analysis
- Power Flow Studies

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- EDI/Billing
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- Headroom Analysis
- Managed Portfolio Services

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- Plant Registration
- REC Optimization
- Compliance

Future Grid

Distributed Market Integration

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- Market Integration Consulting
- Revenue Modeling
- Telemetry & Resource Registrations
- Market Operations
- Scheduling, Dispatch and Control

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- Demand Response Mgmt
- GridBOOST
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- Tracking
- Settlement

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- Bid Advisory Services
- Energy Market Forecasts
- Market Sizing, Entry, Strategy
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CES has advised clean energy trade associations on wholesale market policy, and supported comments to FERC on what became Order 841 and Order 2222.

FERC and Wholesale Electricity Markets

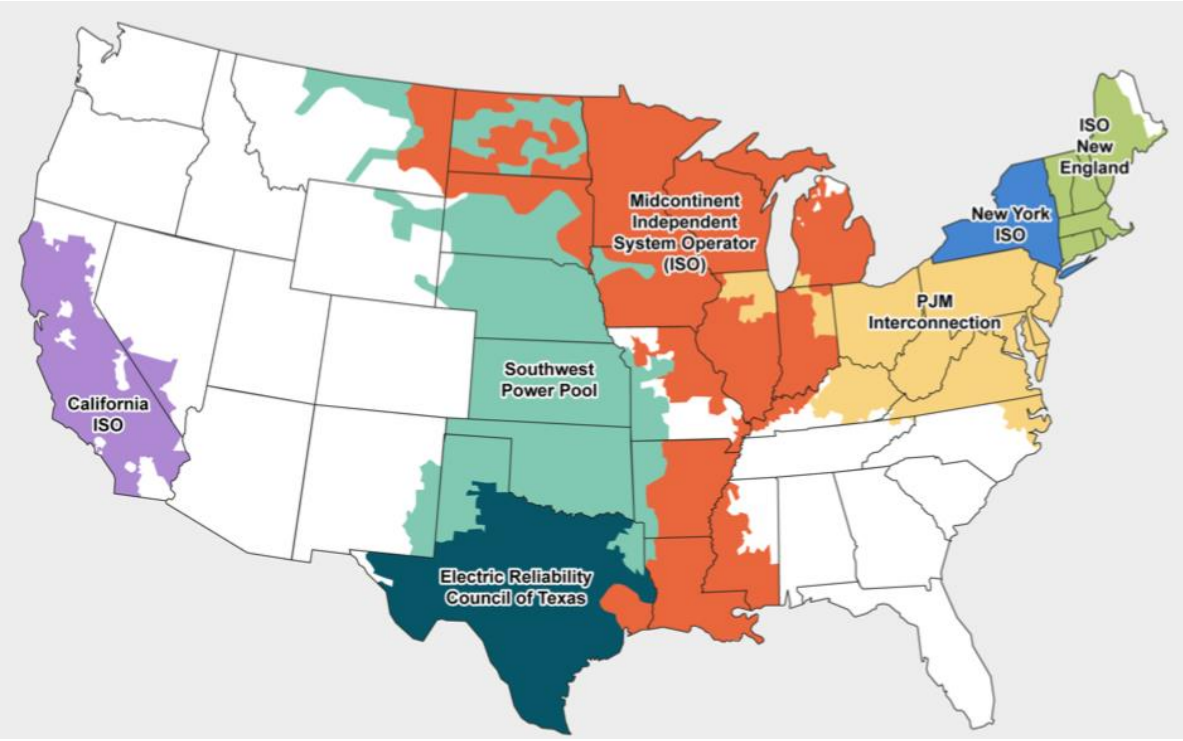
The Federal Energy Regulatory Commission (FERC) is an independent agency that regulates the interstate transmission and wholesale sales of electricity in the U.S.

Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) cover 2/3 of U.S.

- Grid Operation, Power System Planning, Market Administration

ISO/RTO Market Products:

- Capacity / Resource Adequacy (in some ISOs)
- Energy
- Ancillary Services (vary by ISO)
  - Frequency Response
  - Frequency Regulation
  - Ramping
  - Operating Reserves
    - Spinning or Synchronized Reserves
    - Non-Spinning or Non-Synchronized Reserves
  - Reactive Supply / Voltage Control
  - Black Start



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What are Distributed Energy Resources?

- Small-scale energy resources that can be aggregated to provide power
  - Connected to the distribution grid or behind customer meter
  - Generally <20 MWs
- Technologies include, but are not limited to:
  - Photovoltaics
  - Energy Storage
  - EVs & Charging Equipment
  - Fossil Fuel Generators
  - Energy Efficiency
  - Auxiliary Load Control

TECHNOLOGIES	ENERGY
DISTRIBUTED SOLAR	Energy Generator
DISTRIBUTED SOLAR ADVANCED INVERTER FUNCTIONALITY	Energy Generator
BATTERY STORAGE	Energy Storage
INTERRUPTIBLE LOAD	Load Shaping
DIRECT LOAD CONTROL	Load Shaping
BEHAVIORAL LOAD SHAPING	Load Shaping
ENERGY EFFICIENCY	Reduce Load

Order 2222 Background and Overview

- History
  - Nov. 2015 panel on storage; 2016 ISO data requests and comments; NOPR
  - Feb. 2018 Order 841 on storage and new docket on DER; tech conf, comments; 2019 ISO data requests and comments
- Order issued September 2020. Directs **ISOs** to **remove barriers** to the participation of **DER aggregations** in **ISO markets.**
  - Defines DER, aggregator, ISO markets
  - Identifies existing barriers
  - Lists benefits
  - ISOs to establish "participation models" for DER aggregations that "accommodate physical and operational characteristics," which is similar to Order 841, which was for electric storage resources
- Compliance filings due 270 days after pub in the *Federal Register* (due July 2021)
- Implementation – ISOs to propose a "reasonable" date

What the Order Says

Each ISO to propose revisions to its tariff that do the following:

1. allow DER aggregations to **participate directly** in ISO markets, and establish DER aggregators as a **type of market participant**
2. allow DER aggregators to register aggregations under one or more **participation models** that **accommodate the** physical and operational **characteristics** of the aggregations
3. establish a **minimum size** requirement for DER aggregations that does not exceed 100 kW
4. address **locational requirements** for DER aggregations
5. address **distribution factors** and **bidding parameters** for DER aggregations
6. address **information and data** requirements for DER aggregations
7. address **metering and telemetry** requirements for DER aggregations
8. address **coordination** between the ISO, the DER aggregator, the distribution utility, and the relevant electric retail regulatory authorities
9. address **modifications to the list** of resources in a DER aggregation
10. address **market participation agreements** for DER aggregators

Other Interesting Things the Order Says

Other items of note:

- FERC has the jurisdiction to do this
  - DC Circuit Court of Appeals recently upheld FERC jurisdiction on distributed storage per Order 841
- No state “opt-out”
- “Opt-in” for small (under 4 million MWh per year) utilities
- A demand response (DR) resource can be a DER
- Does not affect existing DR rules
- An aggregation can contain a single resource
- Allow heterogeneous aggregations

What the Order Doesn't Say

- Not overly prescriptive for ISOs
- Interconnection
  - Declined to exercise jurisdiction over the interconnections of DERs to distribution facilities to participate in ISO markets *as part of an aggregation*
  - Does not require standard interconnection procedures and agreements
- FERC declined to take up any topics that were beyond the scope of the NOPR
  - E.g. Capacity market mitigation policies
- Doesn't require that existing market product/service requirements must change to accommodate DER aggregations
  - Must be "technically capable of providing a service"
- Doesn't require that ISO markets have to provide enough revenue to make project economics work

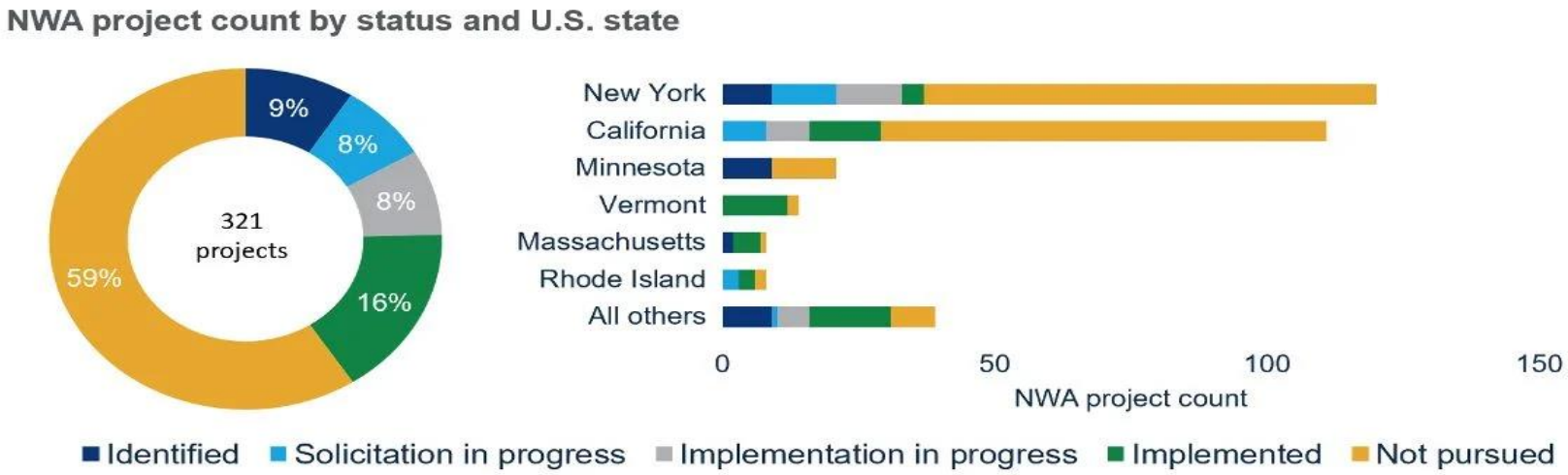
Notable DER Examples

- Sunrun aggregates 20MW into ISONE's Forward Capacity Market*
- Green Mountain Power – Tesla team up for distributed storage
- ConEd's Brooklyn Queens project
- SCE's Preferred Resources program
- Proliferation of roof top and community solar systems
- Combined Heat and Power systems for large consumers

*Common theme in most cases is singular focus on one particular revenue stream and non-market driven forces**

Other DER Projects

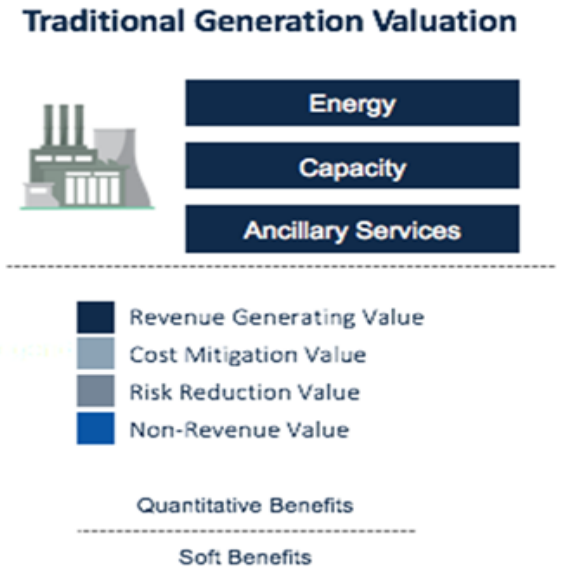
- Pennsylvania hospital system CHP co-gen sells excess capacity into PJM
  - *Required full PJM ISO interconnection process*
- A.F. Mensah aggregates BTM storage to participate in PJM frequency regulation market
  - *Project canceled when export limitations made it no longer economically feasible*
- Myriad NWA projects not advanced—most cited reason lack of cost effectiveness

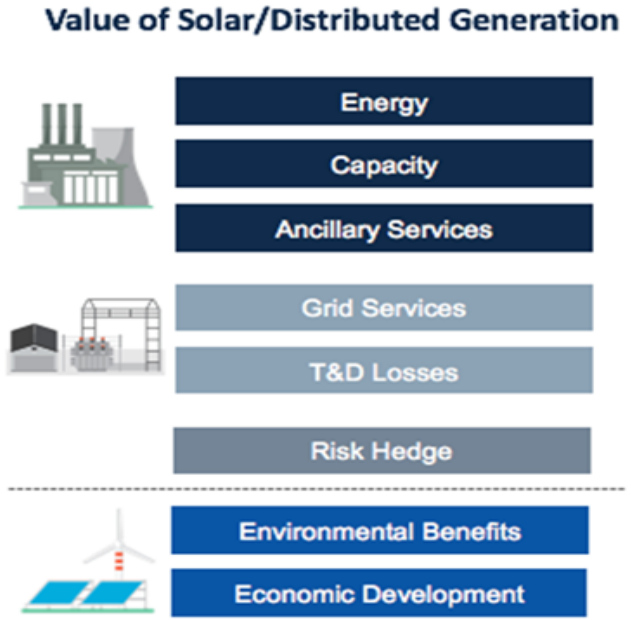


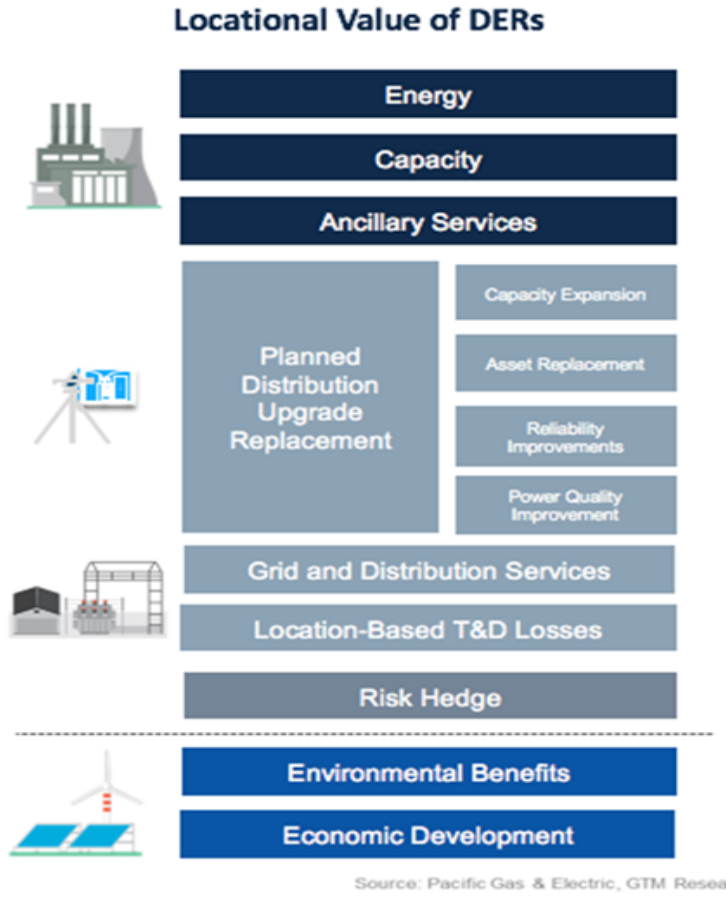
Source: Wood Mackenzie Grid Edge service, Wood Mackenzie Data Hub

DER Value

- Decarbonization of electricity supply
- Resiliency and Reliability
- T&D investment deferral
- Grid services







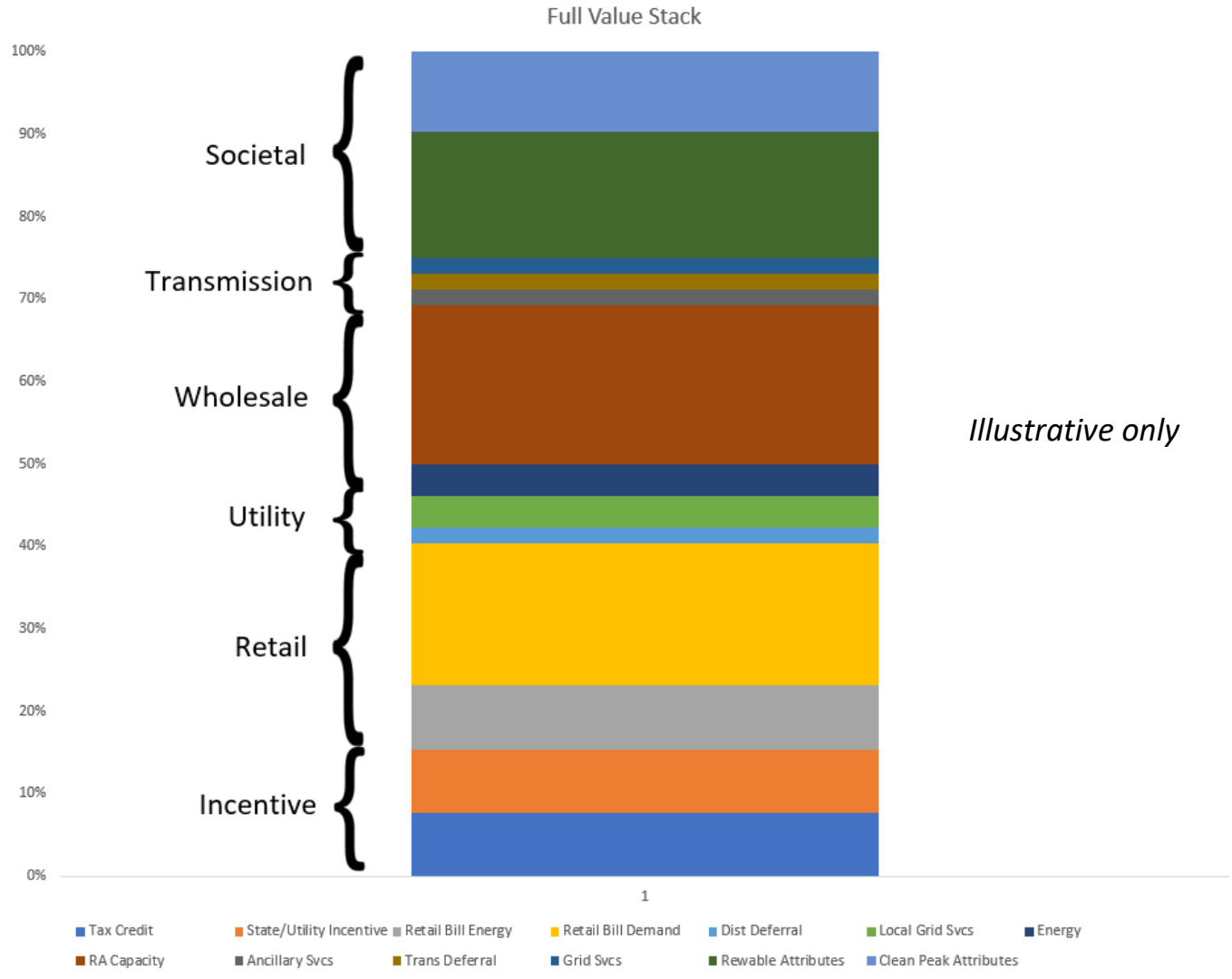
DER Economics

- DER can potentially provide value across a diverse spectrum from retail bill management to infrastructure reliability
- DER deployment to date largely driven by economics focused on one or a small number of potential value streams, most notably utility Net Energy Metering and/or retail demand charge management
- Broader adoption must be driven by ability to recognize multiple value streams (value stack) and (more) market-based forces

FERC Order 2222 [is intended to] create this structure of value stackability

Value Stacking

- Are all potential value streams available
- If not, is it
  - By rule
  - Technically infeasible
- Order 2222 is intended to eliminate the ‘by rule’ unavailability
- Full(er) value stack ➔ greater DER deployment



Illustrative only

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Existing Market Barriers to DERs

- High minimum size to participate
- Existing participation models (e.g. DR) not sufficient – limits operations and services
- Lack of visibility of DERs by ISO / lack of coordination between DSO and ISO
- Lack of clarity and specificity in rules
- Onerous technical requirements
- Some rules say, “you can’t do this.” e.g. can’t net inject from behind the meter
- Inability to aggregate FOM resources
- No or limited rules for hybrid / heterogeneous resources

Creative solutions to full(er) participation in multiple value streams have been achieved, demonstrating the indomitable spirit of innovators

New Opportunities

- Greater deployment as economic hurdles become less difficult to clear due to the ability to more effectively value stack
- Greater utilization of DER resulting from greater participation opportunity
- Value recognition across a broader range of the participation spectrum creates opportunities for new and creative business models—moving away from single revenue stream asset ownership/financing models to multiple revenue stream, energy as a service subscription models
- Ability to aggregate heterogenous resource types (technologies) across meter boundaries, i.e., FOM and BTM resources in same aggregation, should lead to realization of full promise of Virtual Power Plant concept

Virtual Power Plant

A network of decentralized generation, storage and flexible load operated as a single resource on the electric grid

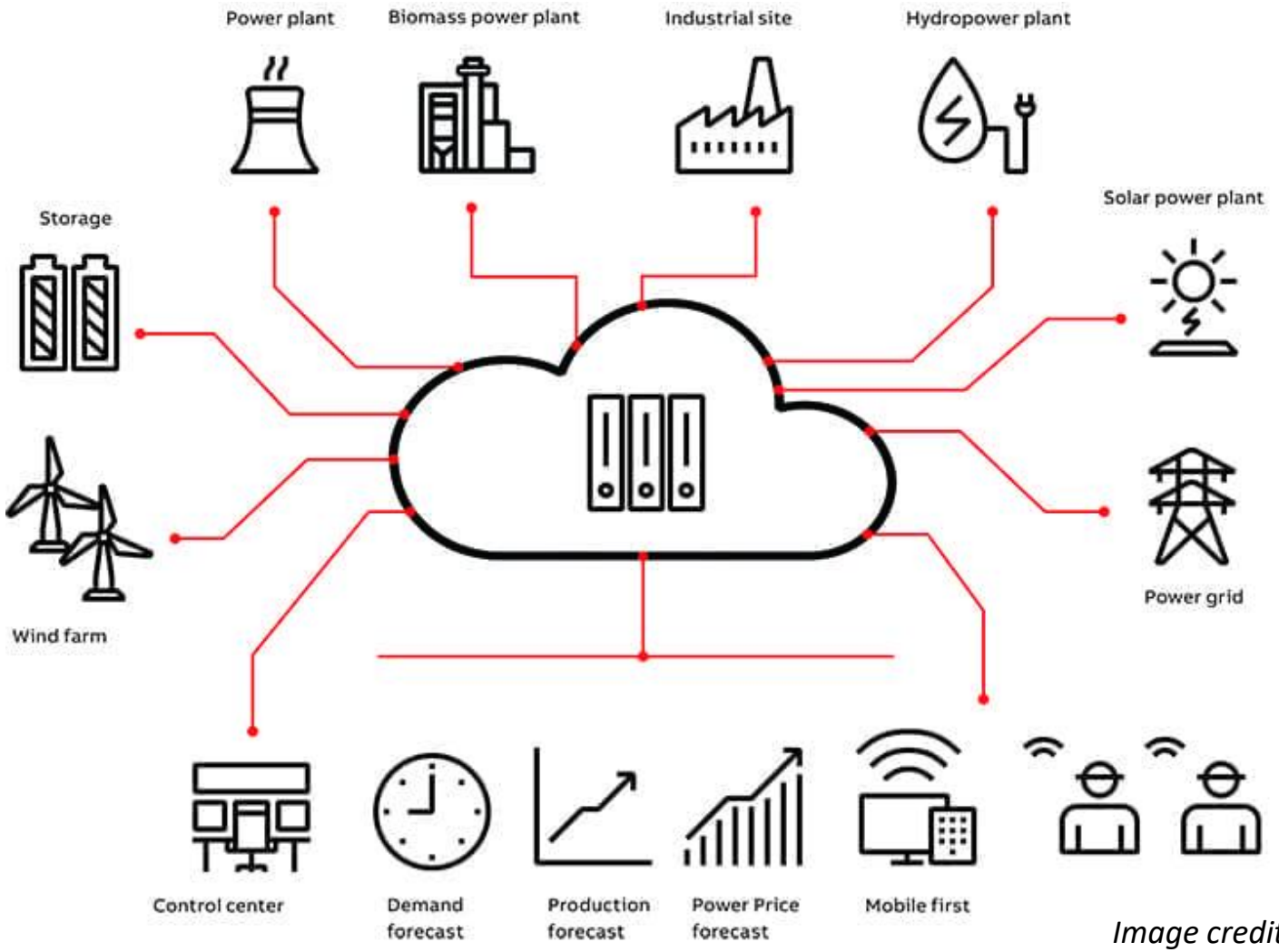

Image credit: ABB

New Challenges; What to Watch Out For

- Much flexibility left to individual ISOs
- Achieving coordination between ISOs, utilities, regulators – how will questions of jurisdiction be resolved? Particularly with regard to interconnection and deliverability
- Striking right balance between giving utilities a say and avoiding undue barriers?
- How will heterogeneous aggregations be handled?
  - Will this effort lay groundwork for hybrid resource enhancements?
- Will dual participation (wholesale + retail) really be fully enabled?
- Will maximum capacity requirements be too low?
- How broad will locational requirements for aggregations be?
- Will information / data requirements be too onerous?

Order 2222 Implementation Outlook

- Much flexibility left to individual ISOs
  - Just like Order 841, likely to be significant differences in market designs across ISOs
- First, ISOs will file compliance proposals with FERC, which will included proposed effective dates
  - Stakeholders can file comments
  - At some point, FERC will rule
- Either in parallel or once FERC rules, ISOs will work on non-tariff document changes and software changes
  - Software changes can take a long time

Opinion on RTO/ISO Compliance

Order 841

- Initial assessment of RTO/ISO compliance:
  - Topic letters and numbers correspond to Order layout
  - Starred RTOs/ISOs submitted request for clarification
  - Red = not in compliance, yellow = not sure, green = in compliance

Topic / RTO/ISO	CAISO*	ISO-NE	MISO*	NYISO	PJM*	SPP*
B. 1. Participation Model 2. Qualification Criteria 3. Existing Market Rules						
C. 1. Eligibility to Provide all Services						
2. Ability to De-Rate Capacity						
D. 1. Participate as a Seller and Buyer 2. Prevent Conflicting Dispatch 3. Make Whole Payments						
E. Bidding Parameters						
F. SOC Management						
G. Minimum Size						
H. 1. Price for Charging Energy 2. Metering & Accounting						

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Lessons Learned

Order 841

- Regulatory change takes a long time
- Anticipate change
- Don't build a nice structure on a suboptimal foundation
- After bad regulations, bad software is your worst enemy
- Details matter
- Check end-to-end functionality

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Thank you!

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This webinar was presented by the DOE-OE Energy Storage Technology Advancement Partnership (ESTAP)

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Using Overbuilding + Curtailment to Achieve 100% Clean Electricity
Tuesday, December 15, 3-4pm ET

Closing the Energy and Transportation Affordability Gap for Connecticut's Low- and Moderate-Income Households
Thursday, December 17, 1-2pm ET

Solar+Storage Fire Safety Training: Single and Multifamily Residential
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