

Federal Policy and Storage, including FERC Orders 841 & 2222

NECPUC Storage Workshop

June 4, 2021

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Customized Energy Solutions



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.

Presence

Headquartered
Philadelphia, PA



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

>300 MW Energy Storage
assets under
Management

Awards and Recognitions



Inc. 5000 – Eleven Time Honoree, Philadelphia 100 - 2001, 2004 – 2012, 2019
Best Places to work: 2014, 2016

2016 Energy Storage Association Brad Roberts Award Winner

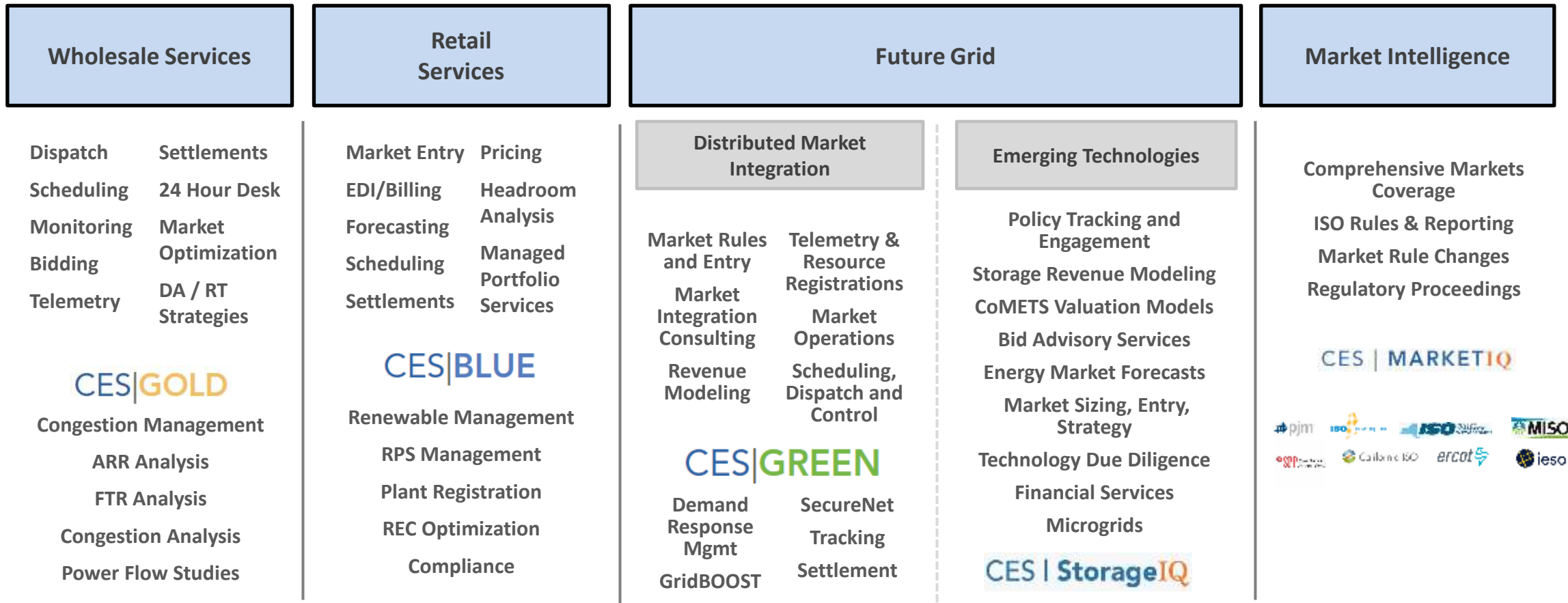
Clients

500+ Clients
Worldwide



Our consulting services enable competitive energy suppliers, technology providers, project develop/owner/operators, utilities and customers to prosper through change, by turning knowledge into value

CES Business Lines



CES has advised clean energy trade associations on wholesale market policy, and supported comments to FERC on what became Order 841 and Order 2222.

Background on FERC, ISOs/RTOs, FERC Orders on Electric Storage

FERC and Wholesale Electricity Markets

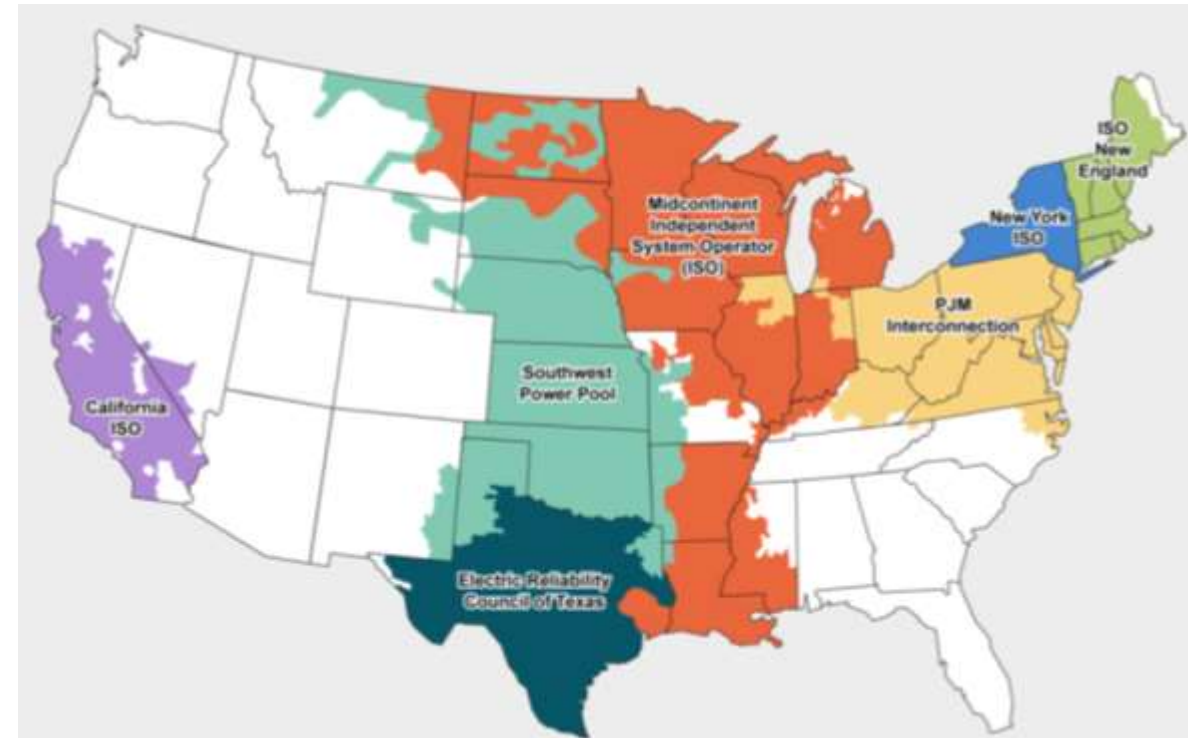
The Federal Energy Regulatory Commission (FERC) is an independent agency that regulates the interstate transmission and wholesale sales of electricity in the U.S.

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:

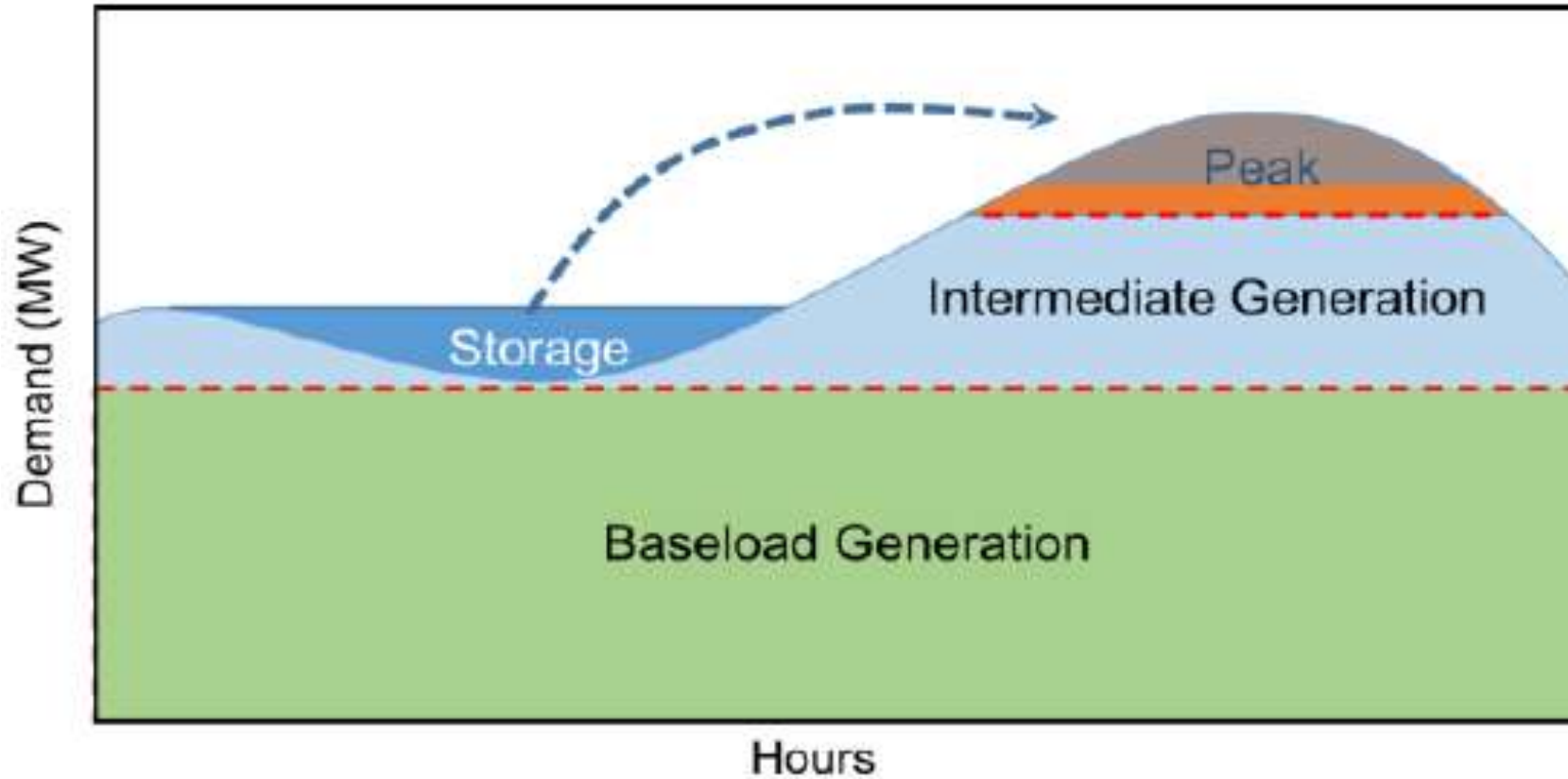
- Capacity / Resource Adequacy (in some ISOs)
- Energy
- Ancillary Services (vary by ISO)
 - Frequency Response
 - Frequency Regulation
 - Ramping
- Operating Reserves
 - Spinning or Synchronized Reserves
 - Non-Spinning or Non-Synchronized Reserves
- Reactive Supply / Voltage Control
- Black Start



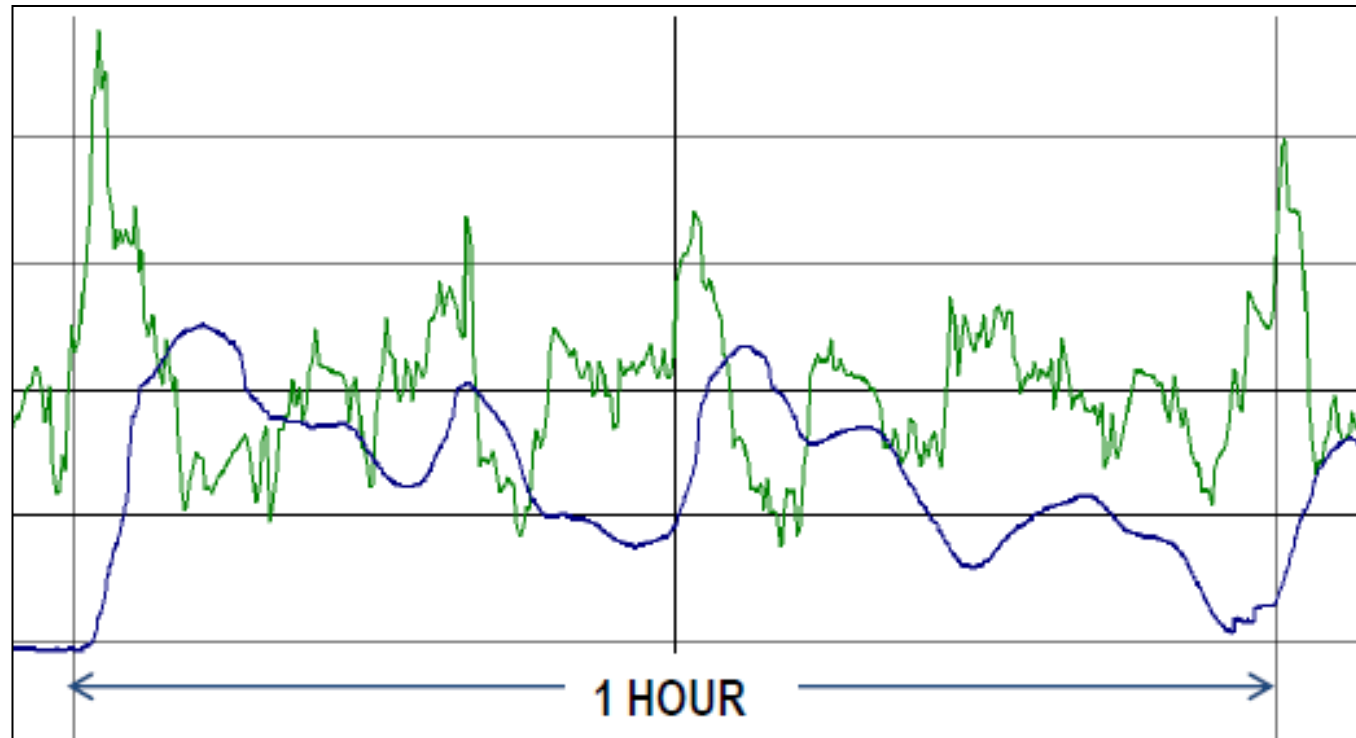
FERC Orders Benefitting Energy Storage

- **Order 890** (RM05-17 and RM05-25)
 - Preventing Undue Discrimination and Preference in Transmission Service
- **Order 755** (RM11-7)
 - Frequency Regulation Compensation in the Organized Wholesale Power Markets
- **Order 784** (RM11-24)
 - Third-party provision of ancillary services and the accounting and financial reporting for storage facilities
- **Order 792** (RM13-2)
 - Small Generator Interconnection Agreements and Procedures
- **Order 841** (RM16-23)
 - Electric Storage Participation in Markets Operated by RTOs and ISOs
- **Order 842** (RM16-6)
 - Essential Reliability Services and the Evolving Bulk-Power System – Primary Frequency Response
- **Order 845** (RM17-8)
 - Reform of Generator Interconnection Procedures and Agreements
- **Policy Statement on Multiple Services** (PL17-2)
 - Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery

Energy Storage Wholesale Market Design – v1.0



Energy Storage Wholesale Market Design – v2.0



c. 2012 – PJM – Frequency Regulation

Order 841

Aspirations

- “To **remove barriers** to the participation of electric storage resources in the capacity, energy, and ancillary service markets operated by RTOs and ISOs.”
- “To **enhance competition** and, in turn, help to ensure that the RTO/ISO markets produce just and reasonable rates.”
- “Furthermore, due to electric storage resources’ unique physical and operational characteristics ... our actions here will help **support the resilience** of the bulk power system.”
- **Leveling the playing field** for energy storage resource market participation

Order 841

Order 841 - Scope

- **RTOs/ISOs to “revise tariffs” establish a “participation model” for “electric storage resources” that recognizes their “physical and operational characteristics” to facilitate participation**
 - PM: set of market rules (tariff and manual language, and software) - that enables the participation - of resources with particular physical and operational characteristics - in the (RTO/ISO) markets
- Five parts
 1. Eligibility to Participate in All Markets
 2. Eligibility to Bid, Be Dispatched, and Set Prices as Wholesale Seller and Buyer
 3. Bidding Parameters and State of Charge Management
 4. Minimum Size Requirement
 5. Treatment of Energy Used to Charge
- **Much flexibility given to RTOs/ISOs**
- Expected to be (mostly) fully implemented across ISOs by 2022
- **Does not address many important issues:** DERs, interconnection, storage as transmission, multi-technology (hybrid) resources

841 – Observations / Issues / Lessons Learned

- Each ISO's market designs for storage are different
- “Technically capable of providing a service” – left up to ISO
- Storage technological capabilities vs. regulations -> vs. software
- Clunkiness of DA offers / hourly markets / 15-minute dispatch run cycles
- Regulatory change takes a long time
- Don't build a nice structure on a suboptimal foundation
- Noticing frontier of DER / BTM markets

Going Beyond 841

- Order 841 compliance is not the end of the road on storage
- Further enhancements:
 - Appropriate capacity value
 - Markets that enable and reward flexible use
 - Optimize storage resource dispatch, over a longer time horizon
 - Enable dual/multiple use
 - Hybrid resource interconnection and market participation rules
 - Storage as a transmission asset
 - Injections from BTM
 - Full DER participation

Distributed Energy Resources, Existing ISO DER models, and FERC Orders 2222 & 2222-A

Distributed Energy Resources (DERs) and Notable Examples

- Small-scale energy resources that can be aggregated to provide power, connected to the distribution grid or behind customer meters, generally <20 MW
- Sunrun aggregates 20 MW into ISO-NE's Forward Capacity Market
- Green Mountain Power – Tesla team up for distributed storage
- Con Ed's Brooklyn Queens Demand Management project
- SCE's Preferred Resources Program for nuclear replacement

Common theme in most cases is value stacking

DER Value Stacking

- Decarbonization of electricity supply
- Consumer direct cost reduction
- Resiliency and Reliability
- T&D investment deferral
- Grid services

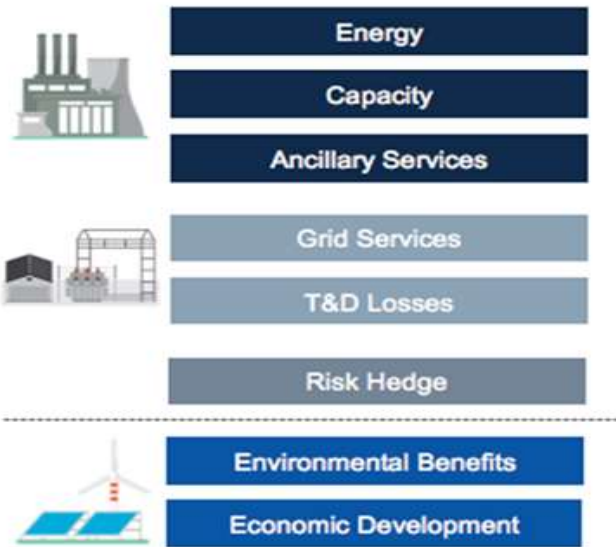
Traditional Generation Valuation



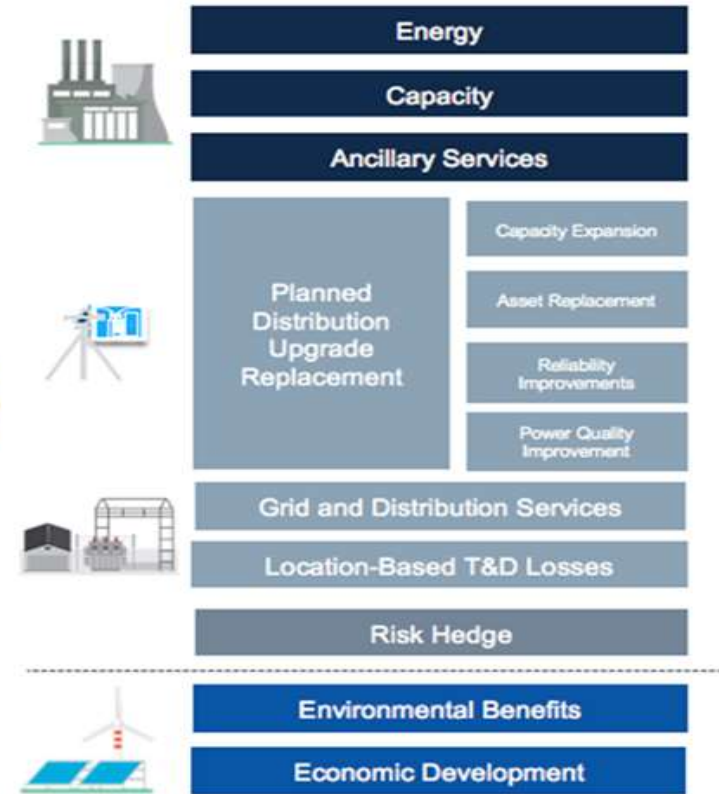
- Revenue Generating Value
- Cost Mitigation Value
- Risk Reduction Value
- Non-Revenue Value

Quantitative Benefits
Soft Benefits

Value of Solar/Distributed Generation



Locational Value of DERs



Source: Pacific Gas & Electric, GTM Research

Existing Wholesale Electricity 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
- Some rules say, “you can’t do this.” e.g. can’t net inject from behind the meter
- Onerous technical requirements, e.g. metering
- Inability to aggregate FOM resources
- No or limited rules for hybrid / heterogeneous resources
- Interconnection

Creative solutions to full(er) participation in multiple value streams have been achieved

CAISO DER Model

- Distributed Energy Resource Provider (DERP)
- Eligible Services – DA and RT Energy, DA and RT Reserves; Regulation possible; (not RA/Capacity)
- Size - Agg min cap = 0.5 MW. Agg <20 MW if multiple P-Nodes. Individual resources in an agg <1 MW.
- Aggregation – within a Sub-LAP (zone)
- Metering - Metered by Sched Coord, local reg auth / util approved OK
- Telemetry - Energy Market: Telemetry not required unless resource is >10 MW, Ancillary Services (Spinning & Non-Spinning): Required (regardless of capacity), provision of status every 4 seconds
- Interconnection – ISO or state options
- Implemented 2016

NYISO DER Model

- Distributed Energy Resource (DER) model
 - 2+ resources, or 1 DSR/BTM
 - Requirements – dispatchable, in ISO market 24/7/365
- Eligible Services – all (Capacity, Energy, Ancillary Services), as long as all resources in agg are eligible
- Size - Agg min cap = 1 MW, individual facilities in an agg <20 MW. No max size.
- Aggregation – at a node
- Metering – generally same interval metering as for other resources required
- Telemetry – generally same 6-sec telemetry as for other resources, but will consider alternate approaches for small DERs
- Interconnection – ISO or state options
- Expected to be implemented by 2022

Order 2222



Order 2222 Background and Overview

- History
 - Nov. 2015 panel on storage; 2016 ISO data requests; NOPR; Feb. 2018 Order 841 on storage and new docket on DER; tech conf; 2019 ISO data requests. 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 originally due July 19, 2021
 - MISO, SPP, PJM, and now ISO-NE have received extensions to Feb-Apr 2022
- **Implementation – ISOs to propose a “reasonable” date**

What 2222 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 2222 Says

- FERC has the jurisdiction to do this
 - DC Circuit Court of Appeals upheld FERC jurisdiction on distributed storage per Order 841
- No state “opt-out”
- “Opt-in” for RERRAs of small (under 4 million MWh / year) utilities
- Avoid double counting of services
- 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

Order 2222-A

- Issued March 18, 2021
- Rejects most requests
- Confirms the Commission's jurisdiction
- Clarifies state opt-out is allowed for DR-only DER aggregations
- Confirms the RERRA opt-in for small utilities
- Declines to do more on interconnection including for QFs
- Clarifies that restrictions to avoid double counting of services are OK
- 7 requests for clarification or rehearing submitted, were denied, but will be considered

What the 2222 Orders Don'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*
 - Do 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
- Don't require that existing market product/service requirements must change to accommodate DER aggregations
 - Must be “technically capable of providing a service”
- Don't require that ISO markets have to provide enough revenue to make project economics work

What to Watch Out For on 2222

- 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 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?

Considerations

Considerations

- Storage and DERs offer value, not just costs
- Coordination across organizations, including with market participants, will be key
- Clarity is important for project developers / owners / operators
- Don't build a nice structure on a suboptimal foundation
- Software – communications, signals, data – can be leveraged
- The necessary (monetizable) value streams have to come from somewhere to get projects developed

Thank you!



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