

Clean Energy Group Webinar

Energy Storage in FERC Territories

Hosted by

Todd Olinsky-Paul

Project Director, Clean Energy Group

Friday, January 9, 2015



Housekeeping



All participants are in “Listen-Only” mode. Select “Use Mic & Speakers” to avoid toll charges and use your computer’s VOIP capabilities. Or select “Use Telephone” and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

You will find a recording of this webinar, as well as previous Resilient Power Project webinars, online at:

www.cleangroup.org/ceg-projects/resilient-power-project/webinars/

and at

vimeo.com/channels/resilientpower

About Clean Energy Group (CEG)

Clean Energy Group is a leading national, non-profit advocacy organization working in the US and internationally on innovative technology, finance and policy programs in the area of clean energy and climate change.



About the Resilient Power Project

CEG's Resilient Power Project helps states and municipalities to implement clean resilient power solutions. Through the project, CEG helps states develop new partnerships, supports new public financing tools, connects public officials with private industry, engages federal resources, and works with state and local officials to support greater investment in resilient power deployment.

www.resilient-power.org



Today's Guest Speakers

- **Judith Judson**, Director of Emerging Technologies- North America, Customized Energy Solutions



**Customized
Energy Solutions**

Customized Energy Solutions

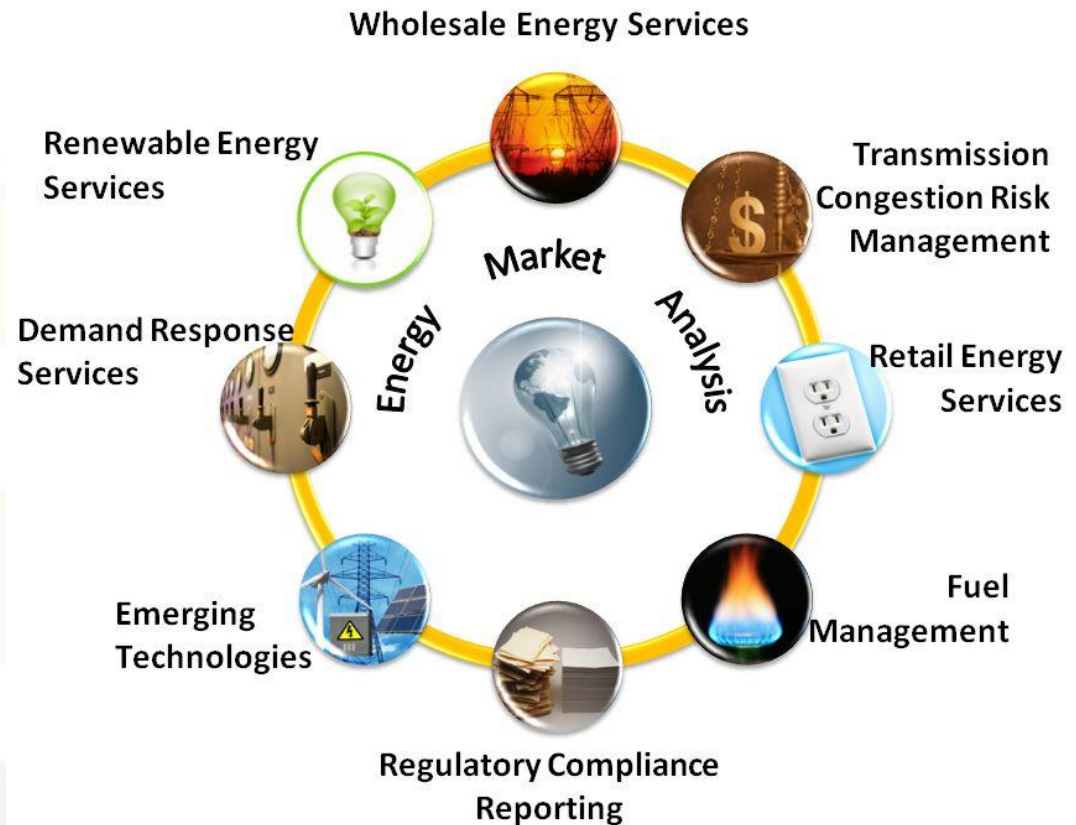
Energy Storage in FERC Territories

Judith Judson

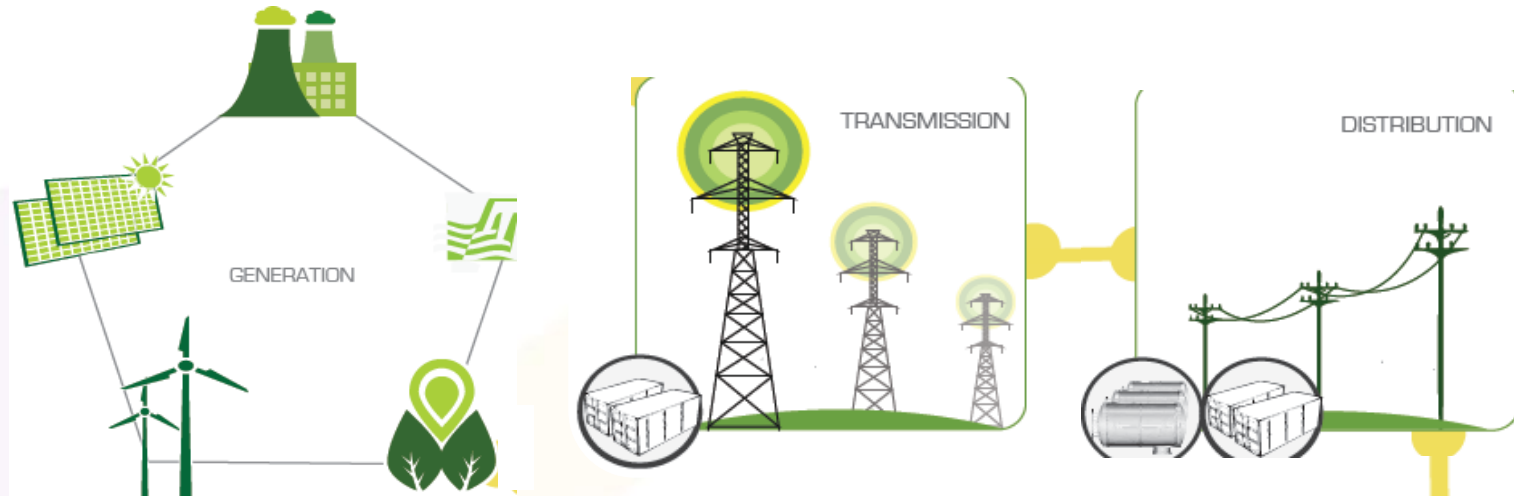
Director of Emerging Technologies – U.S.

Customized Energy Solutions Introduction

- At the forefront of competitive electricity markets
- Over 350+ clients
- Over 3000 MWs under management, including energy storage
- 100+ staff members
- Regional offices across US and Canada



Storage Provides Value Across Electric Grid



Opportunity: Enables greater efficiency and reduced cost by balancing supply and demand over both short and long periods

Challenges: Monetizing the benefits of storage, finding cost-effective applications



Why Storage?

Without technological breakthroughs in efficient, large scale Energy Storage, it will be difficult to rely on intermittent renewables for much more than 20-30% of our Electricity.

Dr. Steven Chu, Former DOE Secretary Feb. 2010

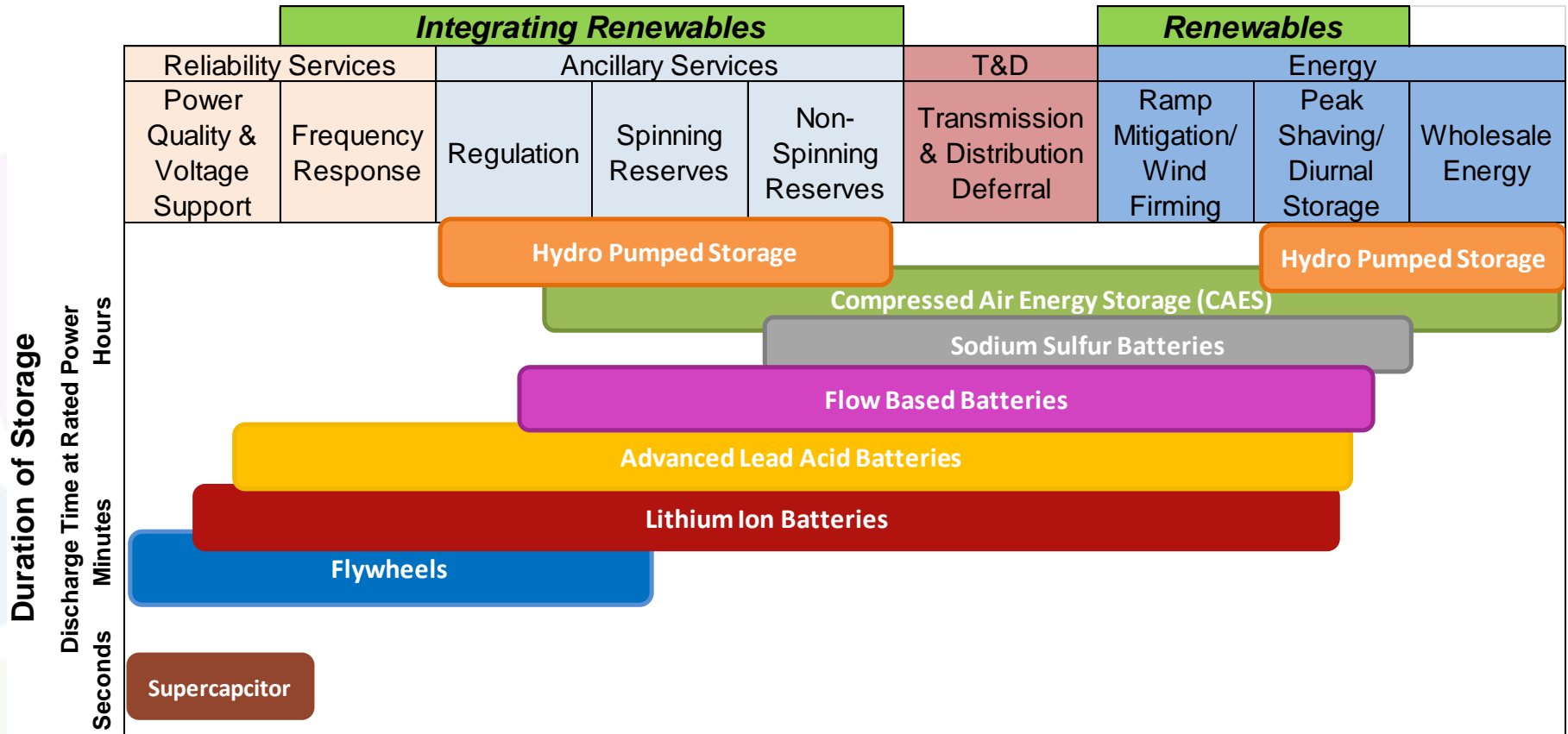
I personally believe storage changes everything...All these [storage] technologies permit the addition of large amounts of intermittent resources to the system and help strengthen operations. They will be a dream-come-true for PJM dispatchers.”

Terry Boston , CEO, PJM, May 2010

The need for regulation services can dramatically increase as the amount of variable renewable resources is increased. Local storage is among the best means to ensure we can reliably integrate renewable energy resources into the grid.

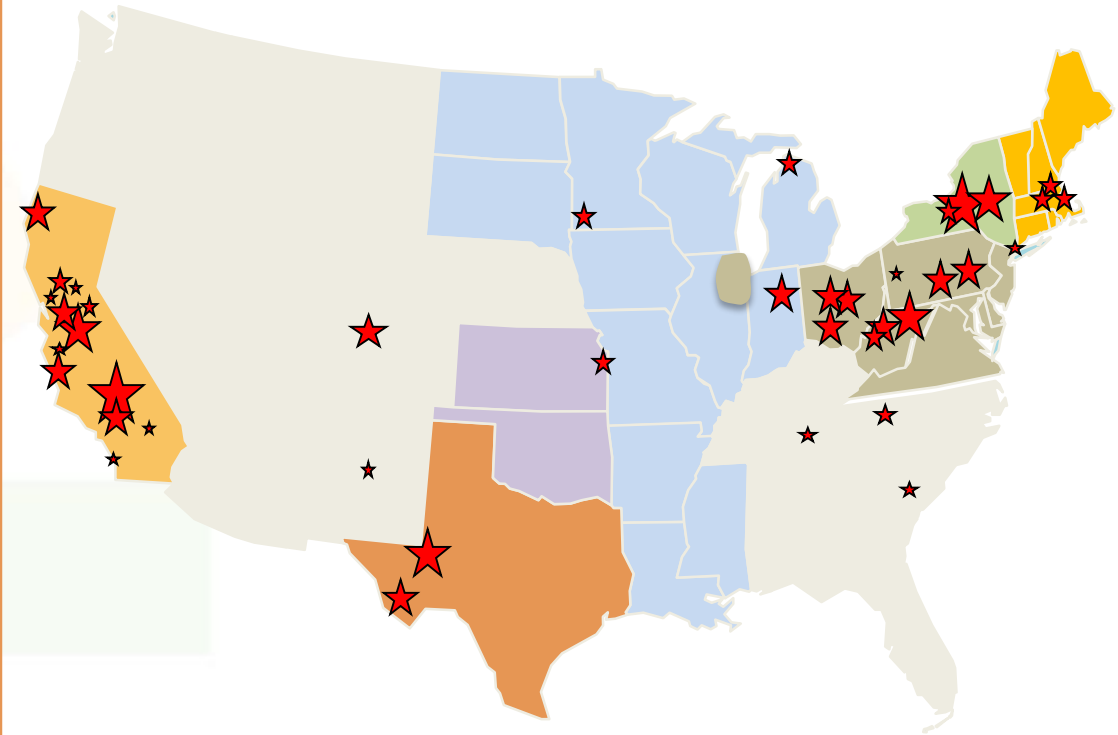
Chairman Jon Wellinghoff, FERC, March 2010

Storage Technologies



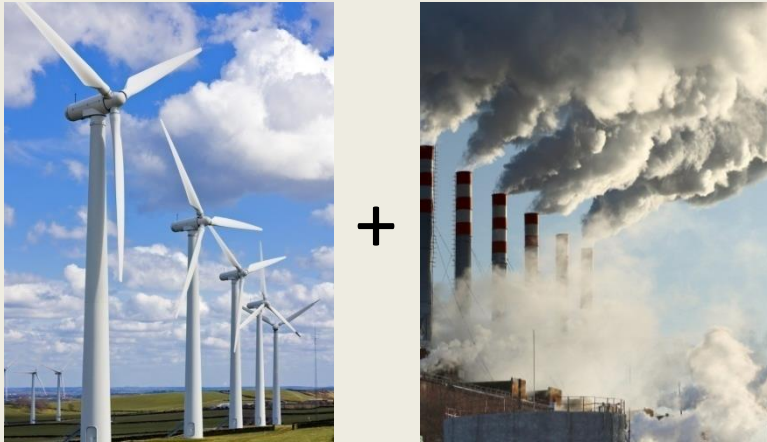
U.S. Storage Market: Current Status

- **Today 275 MW+ of Advanced Storage Projects in US**
- **Most projects in areas:**
 - With ISO/RTO markets
 - Favorable policies for storage
 - Remote areas with high energy prices (Hawaii and Alaska)
- **Over 50% of projects built to provide Frequency Regulation**



Frequency Regulation

Conventional Regulation



- Regulation provided by generators varying output
 - Decreases efficiency
 - Increases fuel consumption
 - Requires more maintenance
 - Increases emissions

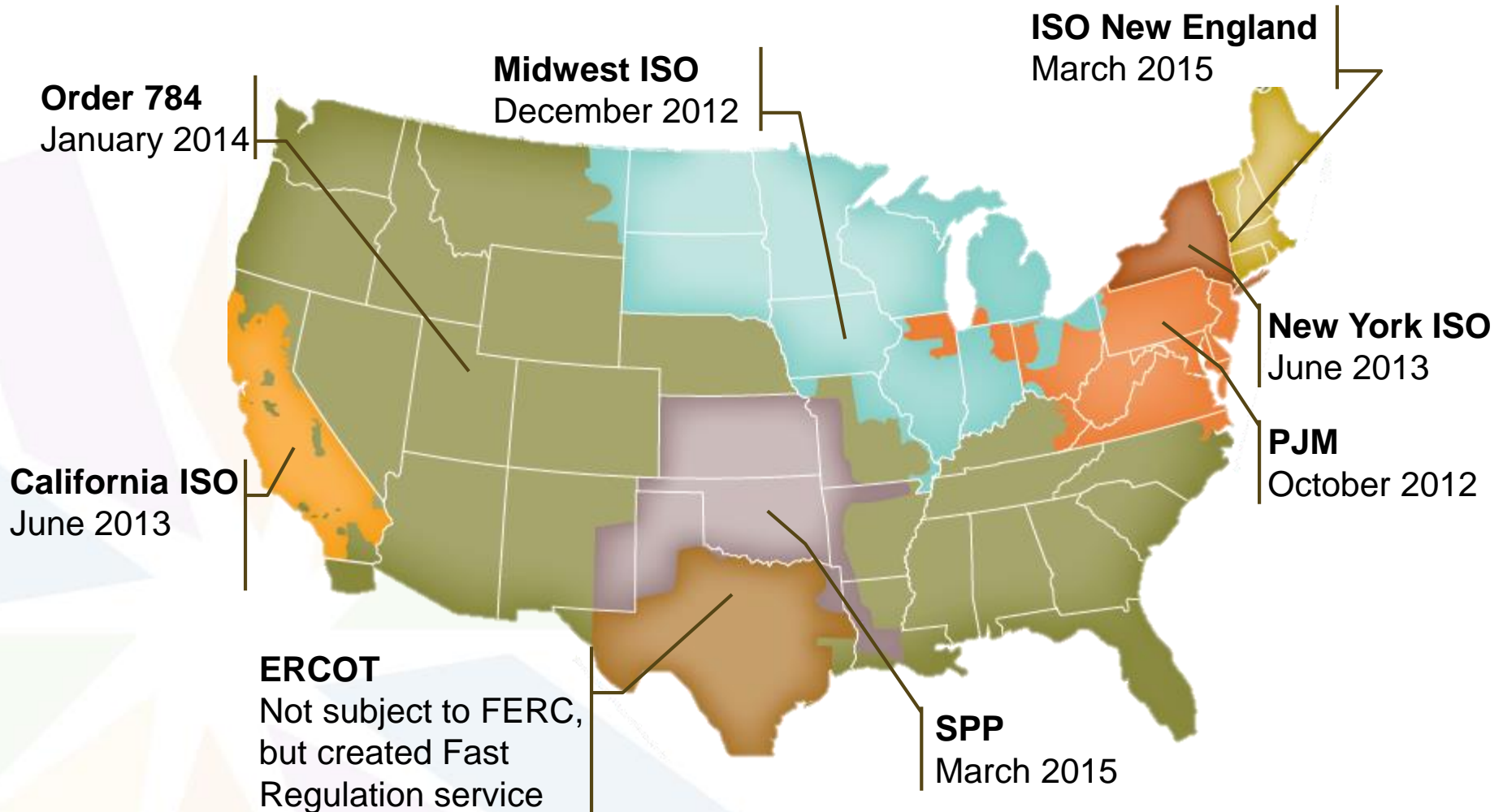
Better Solution: Storage



- Store energy when supply exceeds load; inject energy when load exceeds supply
 - High round trip efficiency
 - Low operating cost
 - Near instantaneous response
 - Zero direct emissions

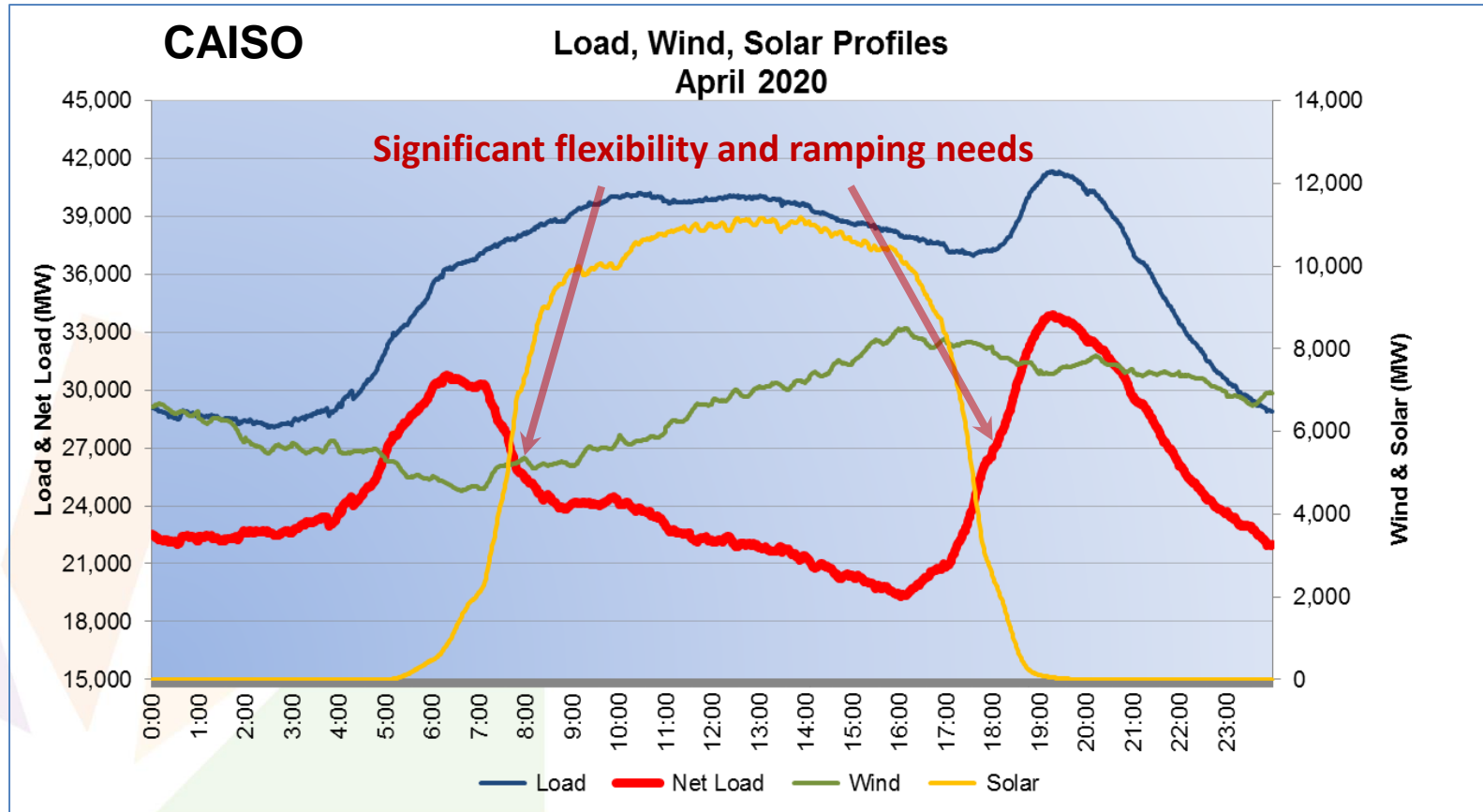
Frequency Regulation

Status of Orders 755 and 784 “Pay for Performance”





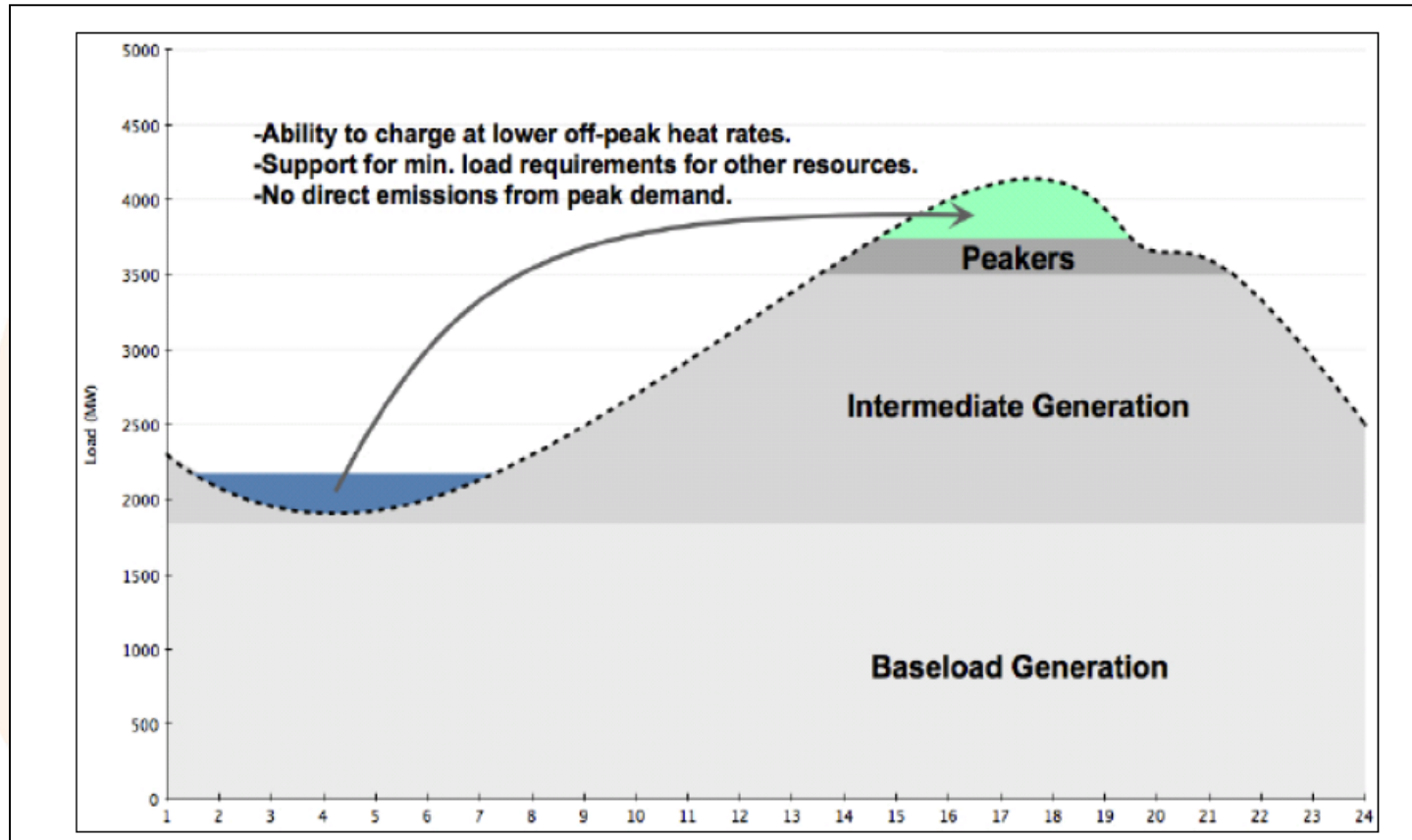
Flexible Ramping and Capacity



ISO/RTOs are starting to create ramping products to procure needed ramp capability for managing renewables

* Source: CAISO

Peak Capacity/Peak Shaving

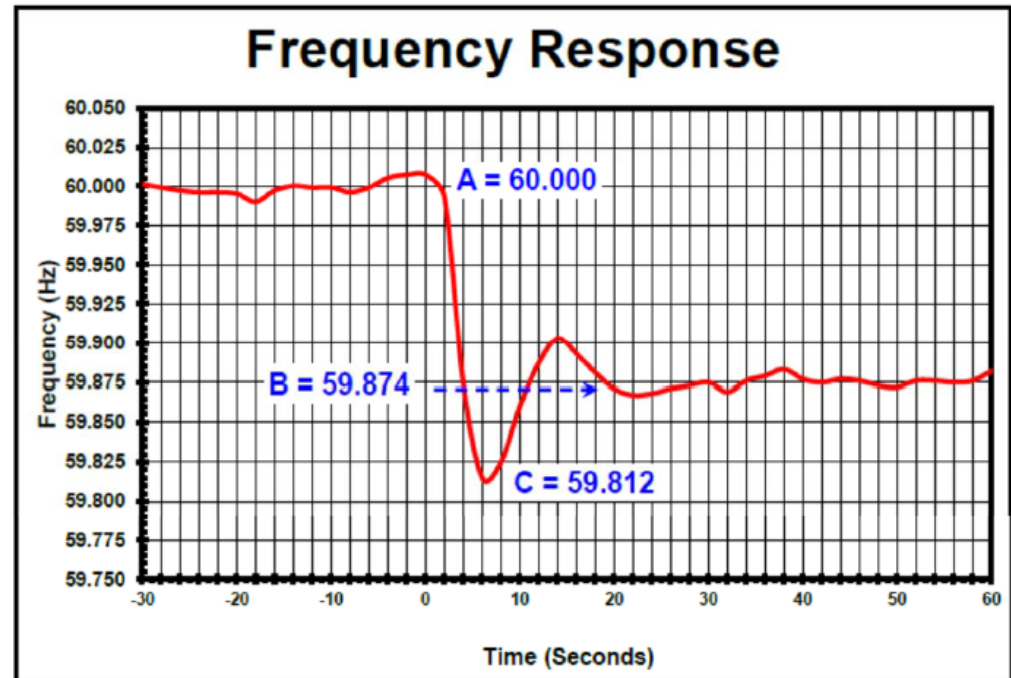


* Source: AES Energy Storage

Opportunities both on the grid-side and customer-side of the meter

Frequency Response: New Opportunity

- FERC 794 issued early in 2014
- Mandates the amount of frequency response needed from each balancing authority
- First 10 – 20 seconds is critical
- FERC considering whether should be compensated product
- ERCOT has proposed new fast frequency response product



NERC "Frequency Response Initiative Report" October, 2012, page

Drivers of Storage Market Growth in Next 5 years

- Growth in Renewables
 - High renewable energy penetration driving Policy Makers to encourage Storage
 - New ISO/RTO market products to address renewables: Ramping, Frequency Response, Flexible Capacity
- Pay-for-Performance pricing for Frequency Regulation
- Utility concerns about grid resiliency
- Growing interest in Distributed Energy Resources (DERs)
- Cost of technology is coming down

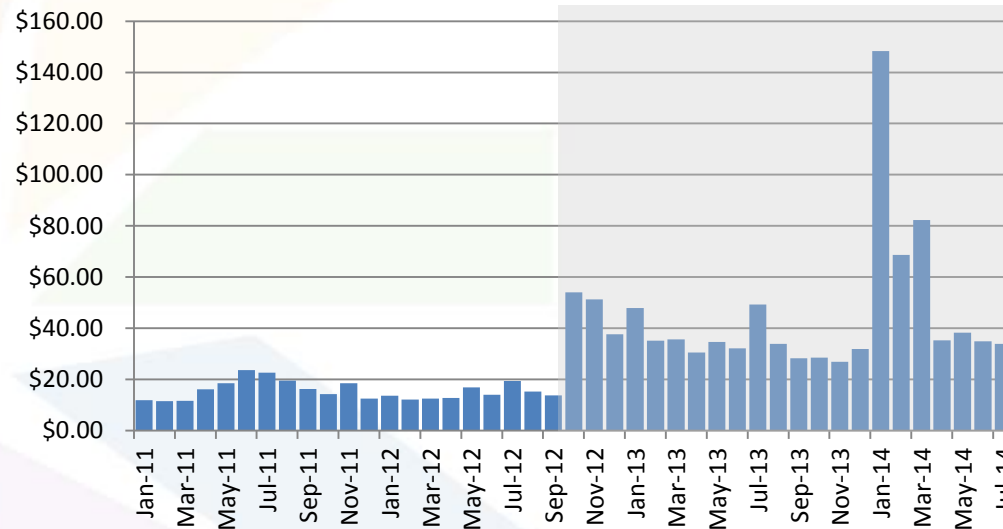
California

- State mandated 1.3 GW Procurement of Storage by 2020
 - First utility RFPs in 2014
 - Transmission, Distribution and Customer-sited
 - Southern California Edison (SCE) announced it is procuring 260 MW of energy storage to meet local capacity requirements
- ISO/CPUC rules to enable storage to qualify as Resource Adequacy (Capacity) and Flexible Capacity
 - 4 hour duration for Resource Adequacy
 - Flexible Capacity is 90 minutes in either direction, 3 hours from full charge to discharge
- Implemented Pay-for-Performance Regulation market in 2013
- CAISO will create separate Ramping Up and Down product in 2015
- Self Generation Incentive Program: up to \$1.62/Watt

PJM

- Performance-based Regulation in October 2012
- ~100 MW of Storage in operation, 360 MW in the Queue
- Benefited consumers by reducing regulation procurement by over 20%, while increasing payments to storage

Fast Storage Revenue \$/MW/hour



PJM

- PJM proposing to add storage into Capacity market
 - **Capacity Storage Resources:** “any hydroelectric power plant, flywheel, battery storage or other such facility solely used for short term storage and injection of energy at a later time to participate in the PJM energy and/or Ancillary Services markets and which participates in the Reliability Pricing Model.”
- No minimum duration requirement for storage
- New ability to combine resources to make one offer into the auction within same LDA (Locational Deliverability Area)
 - **Capacity Storage Resources, Intermittent Resources (renewables), Demand Resources, Energy Efficiency Resources**
- Creates new benefit for pairing storage with renewables

New York

- NYISO initiatives:
 - Implemented rules for storage to provide Regulation in 2009
 - Pay-for-Performance Regulation in 2013
 - Currently considering rules for wholesale participation of behind-the-meter generation and distributed resources
- NY PSC “Reforming the Energy Vision”
 - “Re-invention of the grid”, create competitive distribution services market
 - December 12, 2014: Order encouraging utilities to develop distributed energy resources (DER) demonstration projects
- Green Bank: \$1 billion
- Microgrid incentives: \$40 million
- NYC/Con Ed: \$2,100/kW incentive for behind-the-meter storage
- Con-Ed RFI: Substation Deferral using Demand Management

Midcontinent ISO

- Frequency Regulation
 - Implemented rules for storage to in 2009
 - Pay-for-Performance implemented in 2012, however storage is dispatched with a slow signal today
 - New initiative in 2015 to create a fast dispatch signal for storage
- Ramping product in 2015
- More actively considering non-transmission alternatives, such as storage, in its transmission planning

ERCOT (Texas)

- Fast Responding Regulation Service
 - Pilot in 2013, Implemented in 2014
 - **31% reduction** in the rate of change of frequency
 - **43% reduction** in the rate of change in the deployment of conventional Regulation
- Future of Ancillary Services (FAST) initiative
 - Creating new products -- Fast Frequency Response
 - Expected in 2018/2019
 - May have “pay-for-performance” mechanism
- Austin City Council: 200 MW of fast response storage resources by 2024
- Oncor Study: 5,000 MW of distributed storage beneficial to grid

ISO New England

- Alternative Technologies Regulation Pilot 2008
- Implementing Order 755 Regulation market in March 2015
- State initiatives for Storage
 - Massachusetts: Grid Modernization, Energy Resiliency Grants
 - Connecticut: Microgrids
 - Maine: Non-transmission alternative pilot

Southwest Power Pool

- Implementing “Pay-for-Performance” Regulation in 2015
- No rules currently for integrating storage in market
- May have ramping product in future

Other State Initiatives for Storage

Hawaii

- 200 MW Storage RFP for Ancillary Services (closed)
- Storage required for renewable interconnection
- Fast Response DR pilot program

Washington

- State grants for Storage
- Pending Legislation: Storage must be included in utility Integrated Resource Plans

Oregon

- Storage RFP expected

New Jersey

- Storage + Solar RFP: \$5 - 10 million
- Energy Resiliency Bank

Arizona

- APS: RFP in 2018 for 10 MWh storage; 2016 All-Source RFO

Thank You!




Please email me if you would like a complimentary sample of our Storage IQ report

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Analyze · Simplify · Implement

March 2014 Volume 1 – California (CAISO, CPUC, CEC, SCPA)

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Highlights from March 1 – March 15, 2014

- **Long Term Procurement Program (LTPP) Track 4:** On March 13, 2014, the CPUC issued the Final Decision in LTPP Track 4
 - The CPUC has authorized SCE and SDG&E each to procure 500 to 700 MWs no later than the year 2022.
 - The CPUC directed the Investor Owned Utilities (IOUs) to seek a certain minimum portion of this additional capacity from preferred resources or energy storage: 400 MW for SCE and 200 MW for SDG&E.
 - The Decision specifically directs SDG&E to procure at least 25 MW from energy storage.
- **Resource Adequacy Flexible Capacity Update**
 - The ISO's final flexible capacity proposal has relevant changes to the effective flexible capacity design for storage resources.
 - The Effective Flexible Capacity (EFC) of energy storage resources selecting the full flexible capacity option is based on the MW output range that the resource can provide over three hours of "charge/discharge at a constantly increasing charge/discharge."
 - The ISO views this as a way to incorporate the charging capability of a storage resource into its EFC.
 - The ISO will bring this proposal to the Board for approval on March 20, 2014, and will file with FERC soon after to implement the changes in time for the 201 RA compliance year.
 - The proposal is still not consistent with the CPUC's QC and EFC calculations for storage.
 - The CPUC will hold a workshop on April 9, 2014 as part of the Track 3 RA proceeding.
 - The workshop will address changes to the staff proposal on methodologies for calculating the qualifying capacity (QC) and EFC of energy storage and Demand Response (DR) resources.
- **Southern California Public Power Agency (SCPPA) Request for Proposal (RFP):** On March 17th, SCPPA revised its Storage RFP.
 - On March 17th Southern California Public Power Authority (SCPPA) revised its RFP for a Renewable Energy and Energy Storage Projects that was initially released on February 1, 2014. Instead of having responses due by December 1, 2014, SCPPA is now urging prospective responders to the RFP to submit them before April 1, 2014.

CES Storage IQ Service provides Market Intelligence on ISO/RTOs, State PUC and FERC activities



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Thank you for attending our webinar

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