Energy Information Administration
Energy Conference 2015

Energy Storage: State of the Industry

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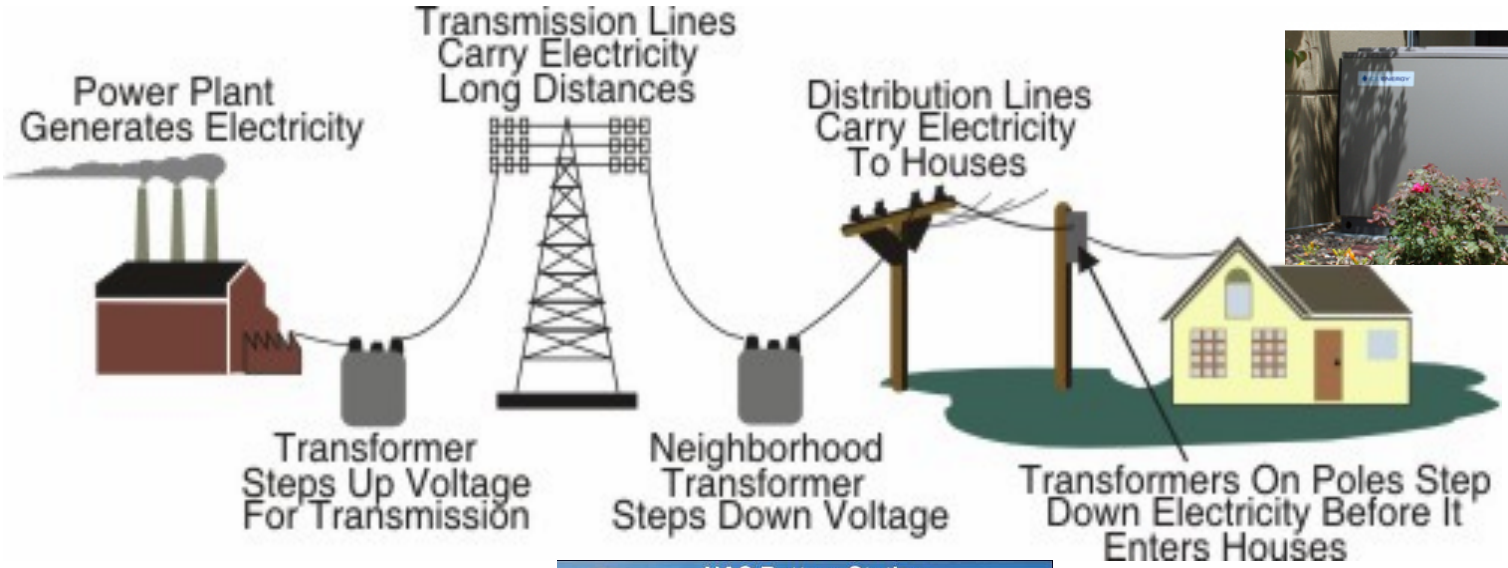
www.energystorage.org

Storage Technologies: Across the Grid



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Trajectory of the Industry

"just one word…"

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Trajectory of the Industry

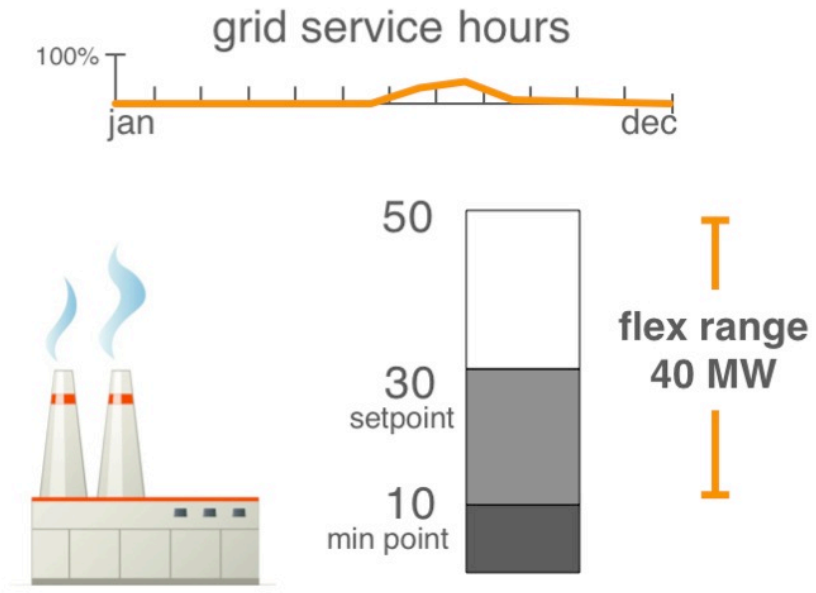
According to market research firm IHS, energy storage growth will “explode” from .34 GW in 2012-2013 to 6 GW by 2017 and over 40 GW by 2022.

GTM/ESA: U.S. Energy Storage Monitor

- The U.S. installed 61.9 MW of energy storage in 2014, up 40% from 2013, and completed 180 individual installations.
- 2015 is expected to be the biggest year in the market's history with 220 MW of deployments, two times the capacity installed in 2013 and 2014 combined.
- 90% of 2014 energy storage deployments by capacity were in front of the meter, while 10% were behind the meter.
- 70% of all 2014 energy storage deployments (measured by capacity) used lithium-ion batteries.
- The vast majority of energy storage deployments in the U.S. take place in a small number of markets with the right policy, regulatory drivers, and wholesale market designs.

Courtesy GTM Research/ESA U.S. Energy Storage Monitor

Value: Energy Storage as Flexible Resource

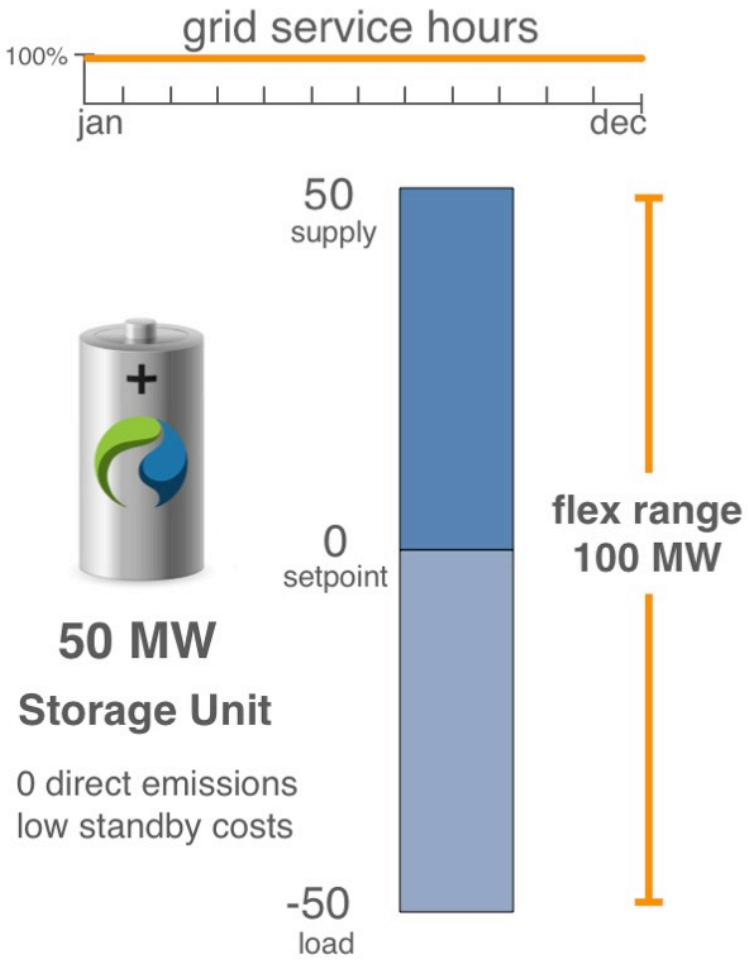


50 MW

Gas Peaker

- out of merit generation
- significant standby costs
- standby emissions

minutes to dispatch



50 MW

Storage Unit

- 0 direct emissions
- low standby costs

seconds to dispatch

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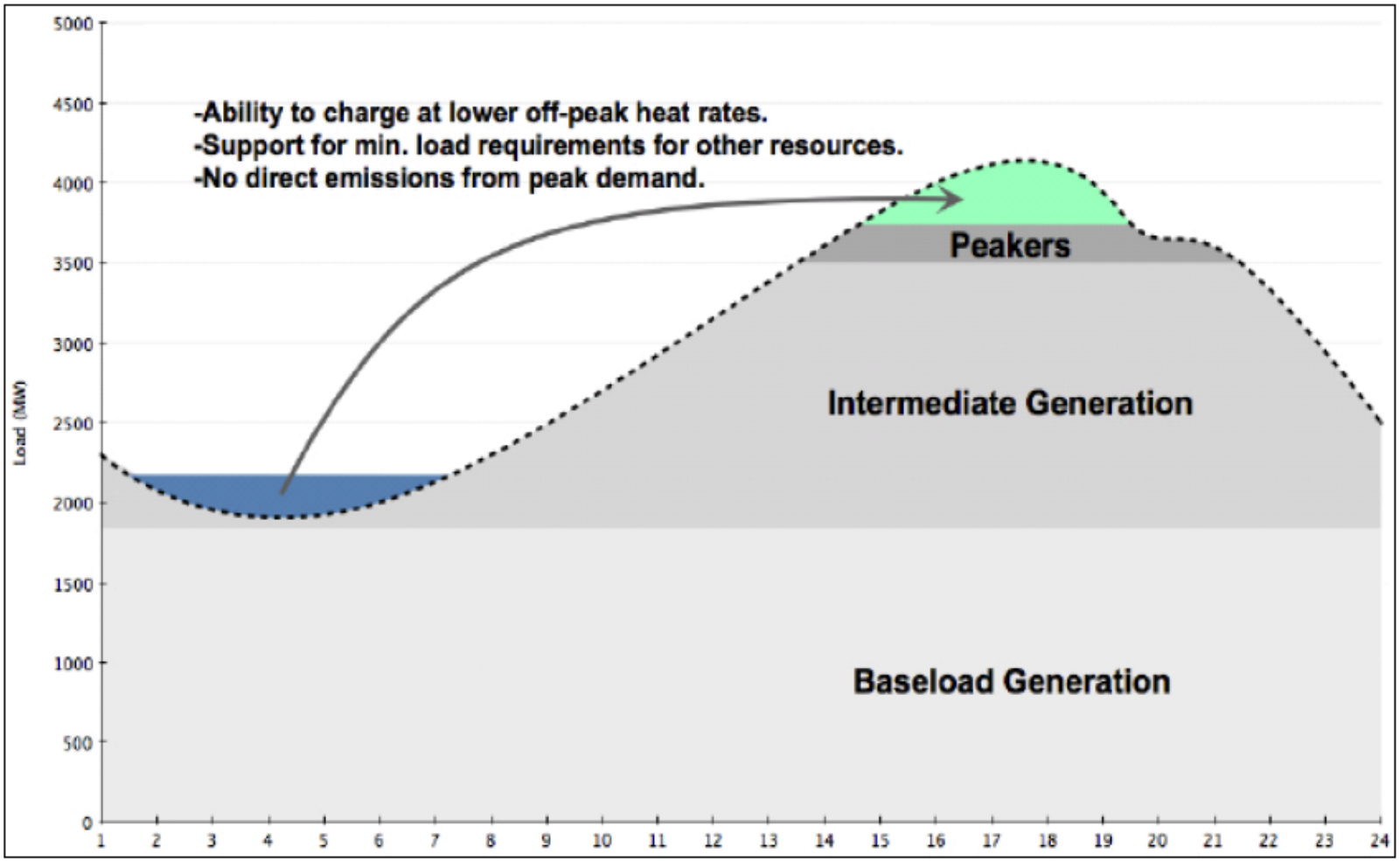
Value: Energy Storage for Peak Shaving



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Value: Energy Storage for T&D Deferral, Transmission Capacity Relief, Frequency Regulation, Spinning Reserve

Photo Courtesy S&C Electric

Value: With Coal—Energy Storage for 15% Output Increase, 10% Efficiency Increase, 7% GHG Reduction

Photo Courtesy Alevo

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Value: Community Energy Storage for Peak Shaving, Reliability, VAR Support

Photo Courtesy S&C Electric

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Value: Energy Storage with Microgrid for Increased Efficiency, Reliability

Photo Courtesy Saft

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Value: Oncor Microgrid Project

- Four microgrids, nine distributed generation resources, indefinite islanding capability
- Two solar PV arrays (106 kW carport, 8 kW ground mounted), microturbine, two energy storage units (25 kW/ 25 kWh S&C community unit, 200 kW/400 kWh Tesla battery), four diesel generators

Value: Santa Rita Jail Microgrid, 2 MW, 4 MWh battery

Photo Courtesy Windpower Engineering Development

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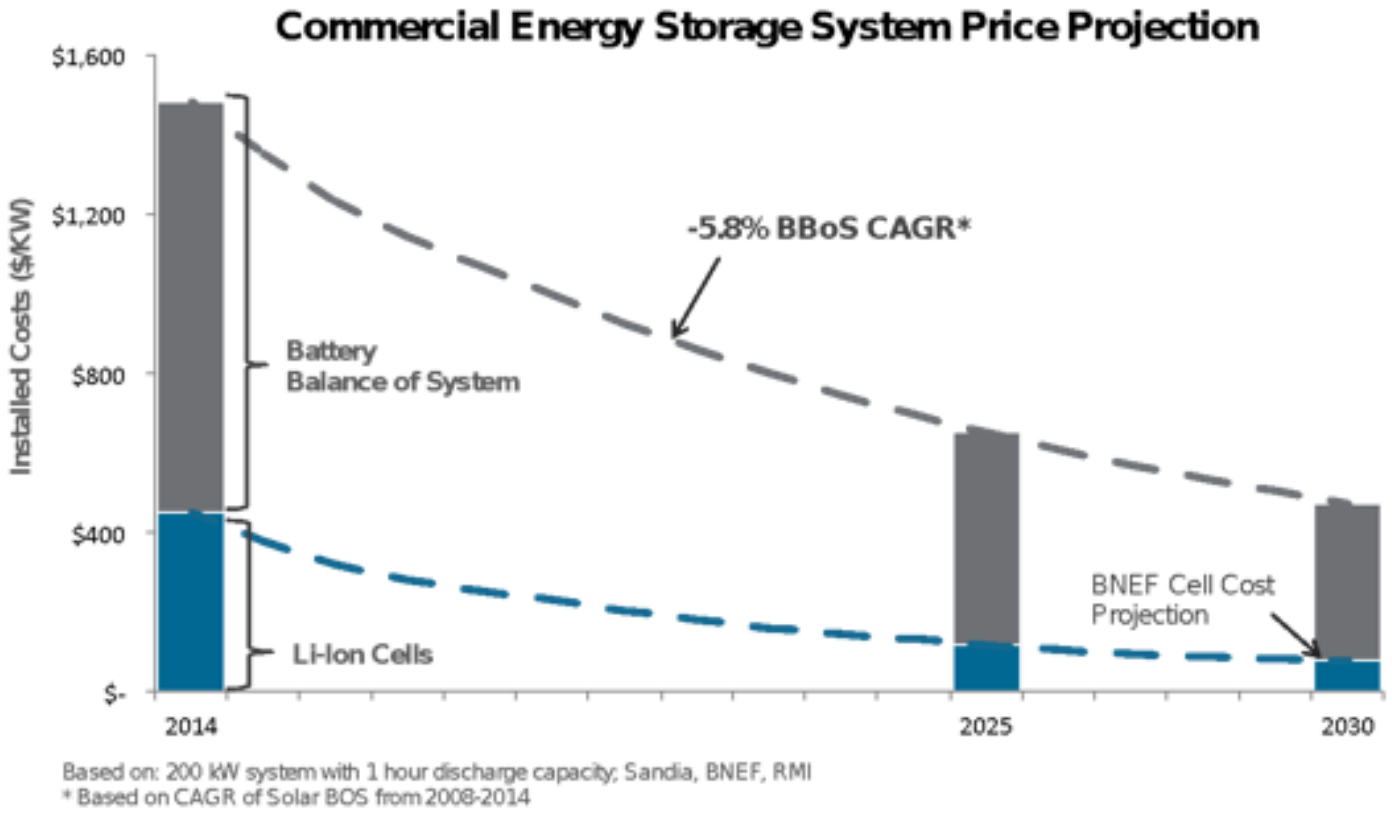
Value: Residential Energy Storage Back-Up for Rooftop Solar Support

Photo SMA Courtesy PV-Tech

Cost: Declines Predicted

- Navigant: current cost 4-hr battery $720–$2,800/ kWh depending on scale (battery only $500-700)
- Oncor: $350/kWh installed cost projection based on discussions with vendors, consistent with industry sources
- Morgan Stanley: battery-only costs may reach $125– $150/kWh down from the $500/kWh
- Tesla: battery-only cost $110/kWh

Cost: Illustrative Trajectory (RMI)



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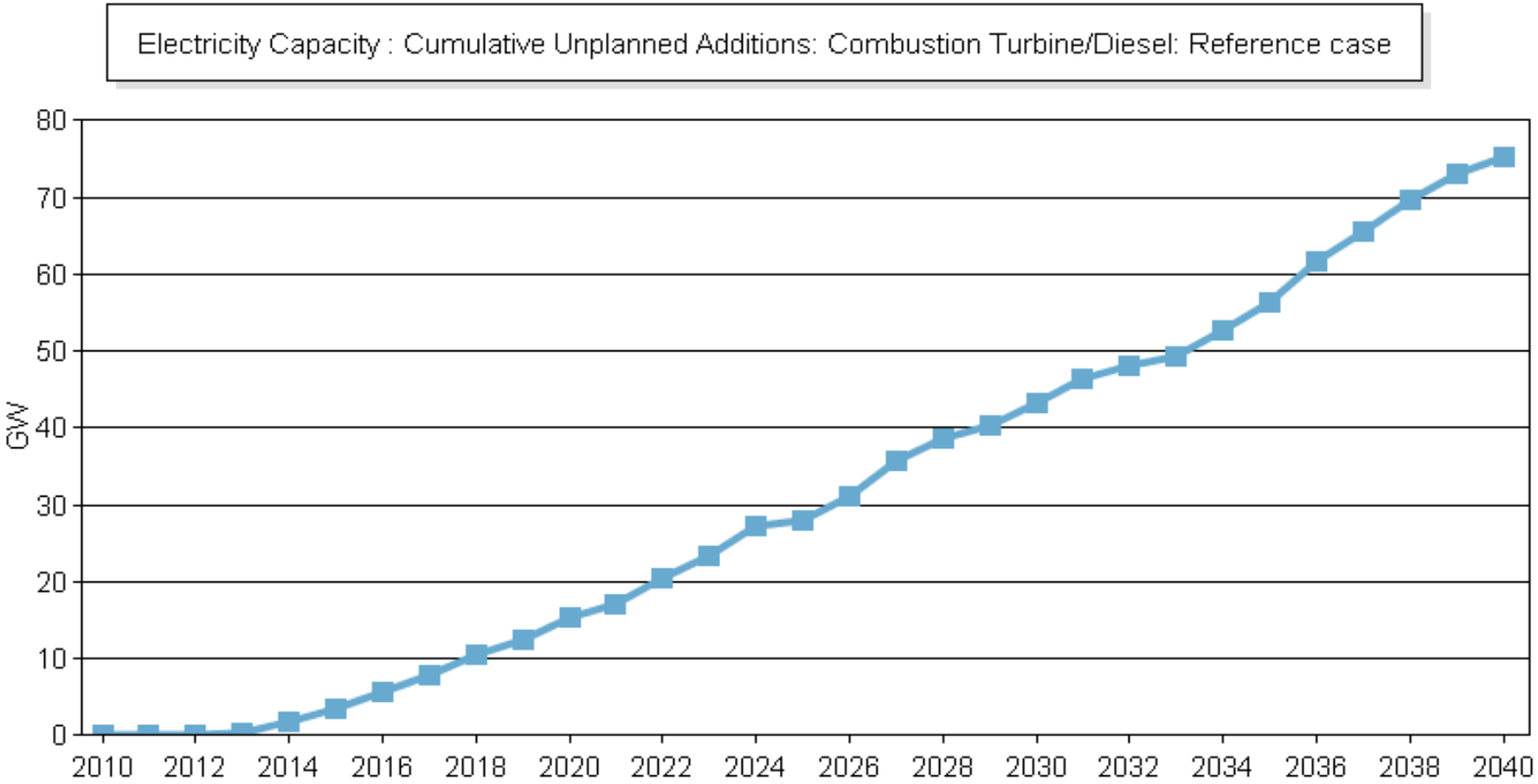
Challenge: 40 GW peak generation needed in next 15 years



Independent Statistics & Analysis
U.S. Energy Information Administration

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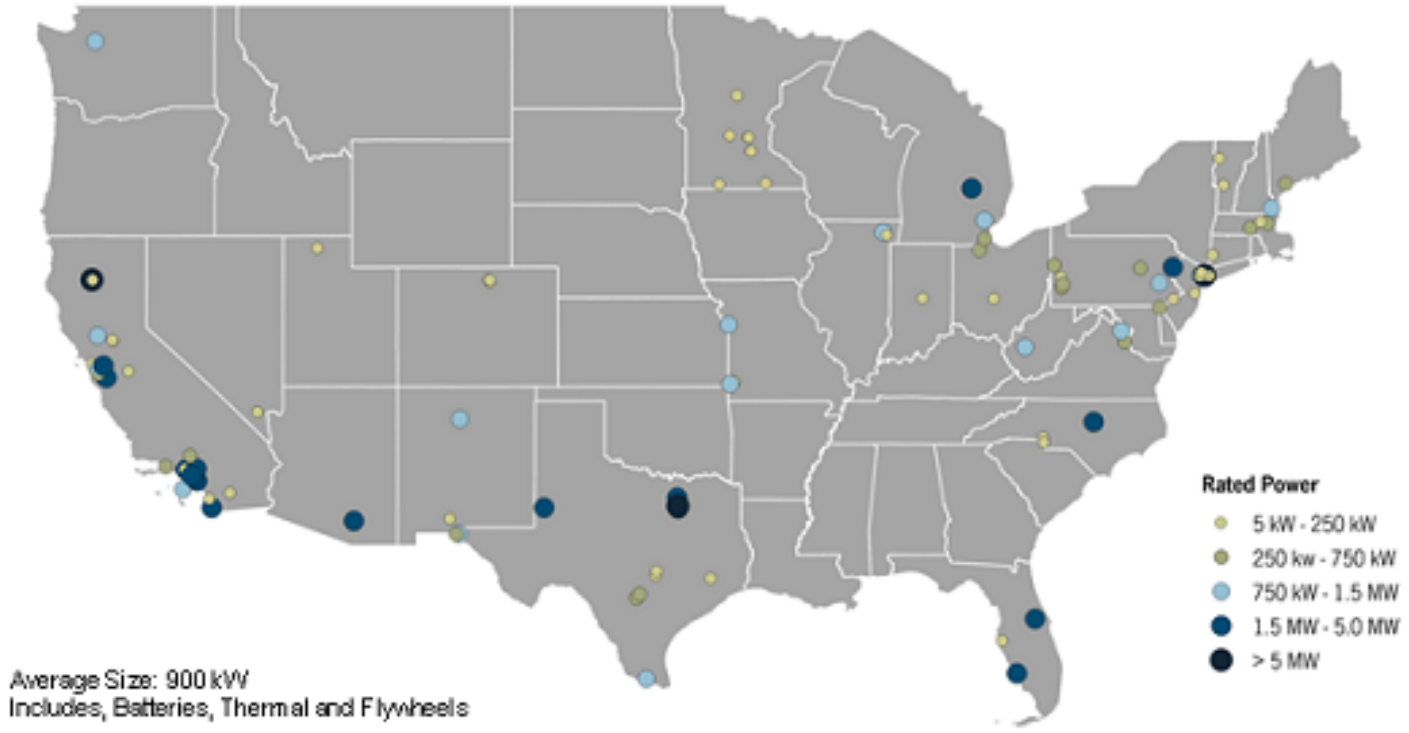
Why isn't energy storage *everywhere*?

FIGURE: Map of Distributed Storage: Operational, Announced, and Under Construction



Source: US Department of Energy, GTM Research

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Congress and the Administration

- DOE Storage Program and Funding
- EPA 111(d) specific inclusion of storage in FIP and Building Blocks
- Quadrennial Energy Review 2015 Release
- Legislation:
  - ✓ Federal Investment Tax Credit (ITC) of 20%
  - ✓ Storage Capacity Standard
  - ✓ National energy policy, associated bills
  - ✓ Resilience Bills

FERC/ISO Policies

- FERC Initiatives
  - Order 755: Pay for Performance
  - Order 784: Third Party Services and Accounting
  - Order 792: Small Generator Interconnection
  - Order 794: Frequency Response
  - Order 1000: "Non-Transmission" Alternatives
- ISO/RTO Market Products
  - Continue to remove barriers and create rules for storage to provide full suite of services; flexible capacity product

State Policies

Regulatory

✓Commissioners understanding the myriad values of storage and cost effectiveness

✓Including storage as an alternative and supplement to traditional grid assets in rate cases and planning

✓Setting rules that quantifies the values storage applications offer

Legislative

✓Offer statutory basis to regulators to be able execute on the above

✓Develop financial incentives for storage deployment

✓Create market frameworks and incentives (e.g. procurement targets, portfolio standards, environmental policies)

State Examples

California – 1.3 GW procurement requirement by 2022; SGIP $1.42 a watt for storage (2 hr min. duration); CPUC rulemaking; CAISO Storage Roadmap; 50% RPS by 2030 and need for GWs of capacity; EV deployment

Hawaii – Up to 200 MW of storage from 2014 RFP; 100% RPS by 2045; overhaul of net metering and distribution system regulations after rejection of HECO rate case

Oregon – New ~$300,000 pilot project funding opportunity; pending bill in Legislature to require Commission to define value of storage on OR grid, and require public utilities in the state to submit rate recoverable storage deployment plans by 2018, with minimum of 5MW procurement on each system

New Jersey – Issued grants for over 9 MW of behind the meter storage facilities to improve grid resilience in 2015; currently seeking comment on 2016 Renewable Electric Storage Program

State Examples (Cont'd.)

New York – REV Process overhauling distribution grid; storage monetization; DSPP storage deployment on utility property; draft plans form distribution utilities on DSPP due by the end of 2015; ConEd proposal for 100 MW of load reduction including energy storage

Connecticut – State Legislator considering two storage bills – (1) to make storage eligible for low-interest loan program for migrogrids, and (2) to require the Department of Energy and Environment (Commission subordinate to DEEP) to define the value of DERs including storage and have utilities to submit demonstration project plans up to $5 million.

Mississippi – The State Commission recently approved adoption of net metering in the state and is seeking comments on implementation

Texas – ERCOT continues its process of redesigning its ancillary services market, increasing the valuation of benefits storage offers; Oncor plan continues to be debated, though no legislative action occurred around the proposal in the 2015 session.

Engaging and Collaborating with Stakeholders

- Renewable resource associations (solar, hydro)
- Clean energy/environmental organizations
- Start-up industries cross-sector
- Innovation and manufacturing groups
- Department of Defense and others with resilience/security needs
- Utilities and ISOs
- Consumer advocates
- States and regions developing SIPs


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