



U.S. ENERGY STORAGE: 2018 Year in Review



Energy
Storage
Association

THE U.S. MARKET NEARLY DOUBLED IN 2018. DRAMATIC DECREASES IN PRICING, ADVANCES IN TECHNOLOGY, AND INFRASTRUCTURE RESILIENCE NEEDS DROVE HISTORIC EXPONENTIAL GROWTH FOR ENERGY STORAGE.

THE ESA VISION

35
GIGAWATTS

OF NEW ENERGY STORAGE
INSTALLED BY 2025

\$4
BILLION

IN OPERATIONAL
GRID SAVINGS

167+
THOUSAND

NEW JOBS
CREATED

3.67 MILLION METRIC TONS OF CO₂,
AND **1000** METRIC TONS CO₂ EQUIVALENTS
(NO_x, SO_x, PM) **REDUCED**

Moving the U.S. toward a
disruption-proof grid

MARKET GROWTH

Cumulatively, **23 GW of total energy storage is now installed**, including pumped hydropower, on the U.S. electric grid. Of that total, **1 GW of batteries are installed on the U.S. electric grid**. This is divided in approximately half by standalone and co-location with renewables.

Total deployments:
80% growth over 2017

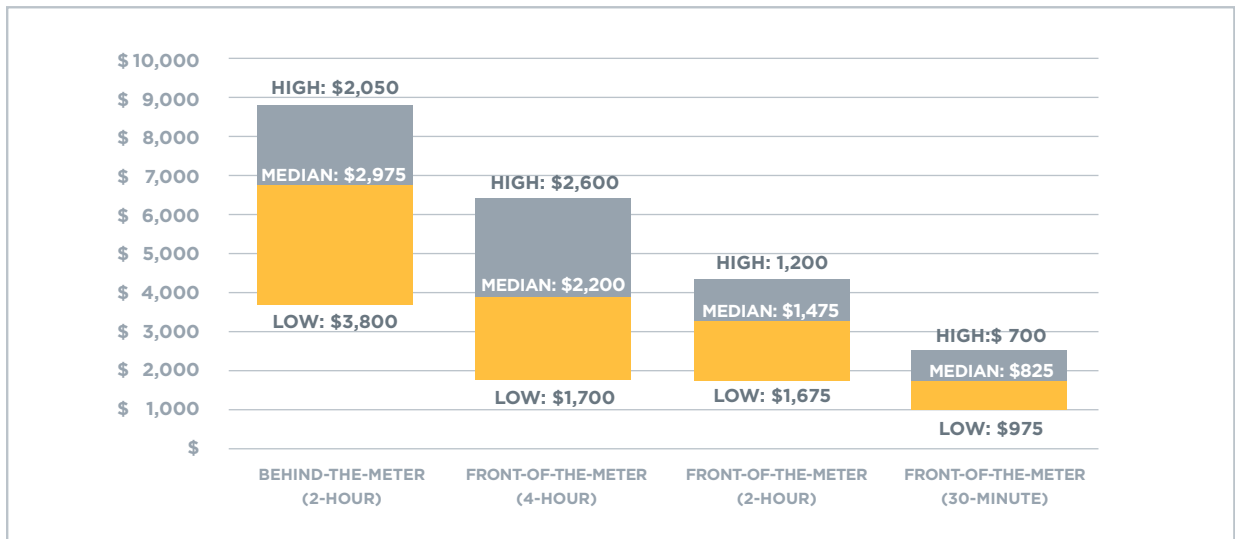
Residential:
350% growth

Non-residential:
53% growth



53% of BTM deployed in 2018

Fully-installed Li-ion system price trends, Q4 2018, \$/kW



Data: Wood Mackenzie Power & Renewables / ESA U.S. Energy Storage Monitor Q4 2018

33 GW proposed pipeline in 2018

2018 INSTALLATIONS

311
MEGAWATTS

77
MEGAWATT
-HOURS

\$486
MILLION

*Wood Mackenzie / ESA Energy Storage Monitor, 2018 Year in Review

JOB CREATION IN 2018

ESA partnered with the Energy Futures Initiative (EFI) and BW Research to include energy storage in the 2019 U.S. Energy and Employment Report, detailing jobs in the energy storage field by geography to county-level, technology, industry, or value-chain activity.

- 2018 saw more than **14% increase in employment** in the energy storage industry over 2017—the **greatest rate of increase of any energy technology** in the United States, according to Energy Futures Initiative—and growing further.
- Nearly **75,000 Americans are working in energy storage** jobs to help manufacture, construct, repair, and operate energy storage projects, in almost every state in the Union, including fast-growing areas of Arizona, California, Florida, Hawaii, Massachusetts, Nevada and Texas.
- **Battery storage added over 9,500 new jobs** for an 18% growth rate in 2018.



Notable 2018 Project Milestones

176 MW and 36 MW installed in California and Hawaii

Biggest project contracted in 2018: 300 MW/1200 MWh Vistra Moss Landing Energy Storage plant, for PG&E

New use of residential storage for grid services at Green Mountain Power in Vermont and Liberty Utilities in New Hampshire

545 MW of microgrids installed, led by the Southeastern U.S. in deployments

Hurricane disaster recovery efforts spur solar + storage microgrid resilience projects in Puerto Rico and other areas of the U.S.

Unprecedented billion-dollar California wildfires pushed new central station and customer-sited storage responses, driving new microgrid resilience planning.

ACCELERATING MARKETS IN 2018

ESA helped pass landmark bipartisan federal, regional, and state policies to expand members' access to a \$1 billion annual investment market in 2018.

To open markets and promote the widespread adoption of competitive and reliable energy storage systems in the U.S., ESA focuses on three goals: (1) Increasing revenues available to storage; (2) Increasing competitiveness of storage; and (3) Increasing grid and market access for storage.

FEDERAL LEGISLATIVE

- Senate leadership supports, and Democratic leadership prioritize, an energy storage **Federal Investment Tax Credit for standalone energy storage**; a broad coalition of 17 trade groups sign on.
- **Advancing Grid Storage Act, LIFT Act, and Rebuilding Resilient Energy Systems Act** were introduced to advance storage in energy, infrastructure, and resilience, respectively, with bipartisan support. Storage is the focus of seven bills overall and is included in proposed omnibus energy legislation. Appropriations for federal investment in battery storage R&D increased from \$41 million to \$46 million.
- **2018 Farm Bill amendments** pass, allowing energy storage in USDA energy programs.
- **The House of Representatives Energy & Commerce Committee held a Committee hearing on energy storage** with ESA member companies as witnesses.

FEDERAL AND REGIONAL REGULATORY

- The Federal Energy Regulatory Commission unanimously issues the landmark, bipartisan **FERC Order 841** directing regional grid operators to establish rules that open capacity, energy, and ancillary services markets to energy storage. RTO/ISO implementation plans have shown compliance progress, including a four-hour resource adequacy/capacity standard in MISO and SPP. Former FERC Commissioner Robert Powelson recognized ESA's key role in driving development of the Order from the start. ESA continues advocacy on several RTO compliance plans to ensure comprehensive market access for storage and new remunerated services.
- **FERC Order 845** is finalized, facilitating storage retrofits to existing generators and tailored interconnection requests.
- **NARUC passes a resolution** calling for inclusion of energy storage and modeling flexibility needs in utility long-term resource planning.
- **NFPA 855** draft sets new unified national fire and safety standard for energy storage that avoid some onerous compliance burdens on industry.

STATE LEGISLATIVE

- New York, New Jersey, and Massachusetts set world-leading **energy storage targets** of 3 GW, 2 GW, and 1 GWh, respectively.
- California, New York, and Massachusetts approve over **\$1.2 billion in incentives** for customer-sited and community- sized storage projects to assist climate and grid plans.
- Massachusetts passes legislation to create a first-of-a-kind **Clean Peak Standard** that would require energy storage to manage peak needs and expands the state energy storage target.

STATE REGULATORY

- Massachusetts establishes capacity rights for behind-the-meter storage, enabling owners to bid into the ISO-NE forward capacity market.
- Hawaii PUC and Hawaiian Electric initiate landmark solicitation for **grid services from customer-sited aggregated storage** and other resources.
- Nevada determines storage targets are in the public interest and commissions a study which concludes a **1 GW storage deployment target** is cost-effective.
- Colorado and Arizona pass new regulations **reforming utility planning** to include storage.
- ESA drives Maryland's energy storage working group proposal to **pilot new multiple-use and hybrid models** for storage.
- California PUC cancels or delays 4 new gas peaking plants, **redirecting bids toward energy storage** and associated renewable or efficiency replacement resources.

MARKET ADOPTION IN 2018...

- More than **17 utilities file IRPs** with energy storage investments or issued Request for Offers.
- Community **aggregators, municipal utilities, and coops** increasingly solicit storage resources, paralleled by state initiatives for disadvantaged communities, as in California.
- Fast-charging **electric transportation begins adding stationary storage** for grid benefits, as a dramatic new climate solution opportunity.
- **Alert: Federal Administration proposes new tariffs on Chinese imports** of inverters, lead batteries, "other" batteries and containers. "Other" batteries and containers were subsequently removed from the list.

CONNECTING MEMBERS IN 2018



In 2018, ESA helped to facilitate business and enhance members' brands:

FEBRUARY

ESA's Energy Storage Policy Forum in Washington, DC featured FERC Commissioner Robert Powelson and California Public Utilities Commissioner Carla Peterman on important market changes.

APRIL

ESA Annual Conference and Expo "Proven. Ready for Business" in Boston, Massachusetts was the association's largest conference to date, fielding a 13% increase and attendance from 26 countries.

- Keynote speakers included Massachusetts Governor Charlie Baker, U.S. Department of Energy Assistant Secretary Bruce Walker, Massachusetts Department of Energy Resources Commissioner Judith Judson, New York Power Authority President Gil Quinones, Puerto Rico Revitalization Coordinator Noel Zamot and Fluence CEO Steven Coughlin
- New: Microgrid Exchange and the ESA News Desk amid 14 hours of deal-making and networking.
- 68% of attendees reported making final purchasing decisions at the show.

OCTOBER

The biggest ESA STUDIO Conference ever brought together approximately 200 energy services companies, project developers, and other stakeholders for expert technical education and peer-to-peer idea exchange. Co-sponsored with the Electric Power Research Institute, STUDIO is now the ESA Storage Exchange and will be held in Bellevue, Washington in October 2019.

EDUCATING STAKEHOLDERS IN 2018



ESA is the central source on energy storage in all its forms—keeping members apprised of the latest in policy, technology and markets.

- **ESA Annual Conference and Expo** is the premier energy storage event in North America, and the only national conference and expo event sponsored by the energy storage industry, for the energy industry. The Annual Conference hosts industry professionals and policymakers for engaging dialogue and business development opportunities. Members receive generous discounts on registration and exhibit space pricing.
- Annual ESA-Wood Mackenzie Power & Renewables **Energy Storage Monitor** and quarterly data deep-dives
- **White papers** focused on: policy design best practices for storage in integrated resource planning and distribution interconnection of storage; rate design recommendations for commercial and industrial users; ownership and competition principles; investment frameworks for distributed energy resources; and more
- **20 newsletters and blogs** highlighting RFPs and business opportunities in 2018
- **18 webinars** attracting 2,765 participants in 2018
- **More than 600 calls/email inquiries fielded per month**
- **Website portal** of exclusive storage-related data for members
- Members drive state and federal positions through subject-specific **Policy Working Groups**. In 2018, the Working Groups focused on Commercial & Industrial Rate Design and Ownership and Competition. In 2019, the topics are Multiple-Use Storage and Storage-as-Transmission.

ESA—YOUR VOICE OF ENERGY STORAGE TO ACCELERATE MARKETS, CONNECT MEMBERS AND EDUCATE STAKEHOLDERS



The U.S. Energy Storage Association (ESA) is the national trade association dedicated to realizing a more resilient, efficient, sustainable and affordable electricity grid – as is uniquely enabled by energy storage.

Entire value chain coverage

encompassing: manufacturers and suppliers; developers/IPPs; integrators; finance, legal, analysis, and other services; public and private utilities; independent system operators; public agencies, non-profits, and academics; end users; and transportation.

- 16% increase in membership since 2017, including 55% growth in corporate members
- Growing participation of municipal and cooperative electric utility members since 2016

ESA leadership represents a full value spectrum:

- Half of Board of Directors are Leadership Circle members, gaining the fastest insights on regional and state market opportunities
- ESA's Leadership Circle has increased 44% since EOY 2017, representing the full spectrum of the storage value chain
- A Technical Advisory Council guides ESA research with input from national leaders in electricity and transportation analysis
- Half of Board are women executives

Active in 21 states, the RTOs, and all major Federal venues in 2018

- ESA staff spoke at more than 80 events, including providing public testimony at federal, RTO, or state legislatures
- 41 filings, testimonies and letters of support at the state and federal regulatory levels
- Tracked 23 bills in twelve states on behalf of members
- Meetings with more than 30 Congressional offices and committees

Advised 40+ national and local non-profits and trade associations on technical, policy, safety, financial, and other elements of energy storage services and value.

Thirty-nine interviews in 2018 with international, national, and local media about energy storage, with **653 ESA media mentions** on websites with a combined circulation of **4,018,128,941** unique web visitors per month.

COMING UP IN 2019

- Utility-facing **IRP Planning Seminars** for intensive training in resource planning.
- **Broad member services include:** Corporate Responsibility and emergency preparedness resources and peer networks; Communications Council of Members and Thought Leadership Program for peer information-sharing and member media promotion; crisis communications and media toolkits; Technical Advisory Council-supported research programs; Policy Partner and Sponsorship Partner opportunities for ESA member promotion; member-to-member introductions, careers portal, and more.
- **Expanding deeper and broader reach** with software and grid support providers, transportation, consumer segments, and other expanding demands for energy storage.
- **New initiatives** in fire safety regulations; codes and standards; public power training and certification, communications support, national projects database; and the Corporate Responsibility Initiative covering operational hazards, recycling, and supply chain practices.
- **New educational webinar series**, including Storage 101 and storagePLUS series on how storage improves existing energy resources
- **2019 advocacy priorities:**
 - Storage in Federal investment tax credit, infrastructure legislation, and energy legislation
 - Wholesale Markets: FERC orders 841 and 845 compliance, rules on hybrid (storage + generation) resources and storage-as-transmission, Ensuring access to capacity markets
 - State cost-benefit studies and deployment targets, incentive programs, integrated resource planning and distribution planning, and rules that enable storage business model innovation

Visit ESA's new flagship office on 901 New York Avenue, NW, Washington, DC 20001 in the nation's capital.

ESA Vision

The U.S. Energy Storage Association is the leading national voice that advocates and advances the energy storage industry to realize its 35 GW by 2025 goal, resulting in a better world through a more resilient, efficient, sustainable, and affordable electricity grid.

ESA Mission

ESA's mission is to accelerate the widespread use of competitive and reliable energy storage systems in North America. To achieve this mission, ESA will educate stakeholders, advocate for public policies, accelerate market growth, and deliver direct member value.



Energy
Storage
Association

www.energystorage.org