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Utah Law Expands Energy Storage Markets to Meet Growth of Renewables

Renewable Tax Credits, Federal Investments, and Favorable Regulation Will Foster Future Growth

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Policy Brief

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Key Takeaways:

- Utah's SB 115 which establishes utility investments in several clean energy programs, including battery storage, is the latest link in a chain of state-level efforts to promote energy storage
- FERC's Orders 784 and 792, and the Energy Storage Promotion and Deployment Act of 2015 value storage for grid stability and cost-efficiency over conventional resources
- Growing levels of renewable energy installations support concurrent energy storage investments to maximize system efficiency

Entities Mentioned:

- California Public Utilities Commission
- Department of Energy
- Energy Information Administration
- Federal Energy Regulatory Commission
- Hawaii Public Utilities Commission
- Internal Revenue Service
- New York State Public Service Commission
- Oregon Public Utility Commission
- Utah Public Service Commission

Related Research

California Tariff Proposal Opens Wholesale Market to Small Distributed Energy Resources

State Commission Findings Influence Ongoing Net Energy Metering Valuation Debate

Insight for Industry – New Policies Supporting Energy Storage Linked to Expansion of Renewables and Technology Improvements

On March 29, 2016, Utah signed into law the Sustainable Transportation and Energy Plan Act (SB 115), which establishes utility investments in battery storage, electric vehicle infrastructure, and several clean energy programs. The new law seeks to boost energy storage solutions to improve the reliability and cost-efficiency of the electric grid, and joins a list of state legislatures and utility commissions enacting similar measures, including California, New York, and Texas. These new policies are expanding market opportunities for storage technology as increased generation from intermittent renewable supplies also spurs growth in front-of-the-meter, utility-side storage to manage daily load curves. At the same time, utility ratepayers are increasingly recognizing behind the meter, customer-side storage as a means to lower energy bills and ensure reliability by depending less on the grid.

New policies are expanding market opportunities for storage technology as increased generation from intermittent renewable supplies also spurs growth in front-of-the-meter, utility-side storage to manage daily load curves

At the state level, California has created a robust storage market spurred by its mandate for electric utilities to procure five percent of peak-load capacity worth of energy storage by 2020. Oregon became the second state to enact an energy storage mandate in June 2015. Similarly, in 2016, New York introduced its Grid Modernization Act with provisions to deploy storage and peak-shaving technologies, while Hawaii introduced a bill allowing energy storage tax credit, with property criteria for qualification.

In addition, the Federal Energy Regulatory Commission (FERC) has implemented regulations to increase opportunities for energy storage projects in the ancillary services market. Notably, FERC Order 755, which requires wholesale markets to implement a pay-for-performance formula for frequency regulation, has been a major stimulus for progress in the energy storage market. The recent extension of federal renewable tax credits will also boost energy storage in relation with growth in renewables. The Department of the Treasury and Internal Revenue Service (IRS) are considering regulations to address the extent to which energy storage may qualify for the investment tax credit (ITC). The IRS is considering whether only electricity-producing property is considered energy property or whether property such as storage devices and power conditioning equipment may also qualify; and whether dual-use property -- such as property that stores electricity from a solar installation as well as from the grid -- should qualify for the credit. Under current regulations, storage must be integrated with a renewable generating facility that qualifies for the ITC; and storage property qualifies as energy property only if at least 75 percent of the energy comes from the solar or wind project.

Moving forward, new regulatory policies – particularly at the state level – will expand opportunities for new storage technologies. Currently, established energy storage technologies, such as thermal storage, pumped hydropower, and compressed air energy storage have a greater share in the energy storage market. However, regulatory changes are opening markets for newer technologies, such as lithium-ion batteries, flywheels, and sodium-sulfur battery systems, which are emerging to provide better operational flexibility and faster response.

Utah Joins a Group of States Supporting Energy Storage, with California in the Forefront with Statewide Mandate

Passed on March 29, 2016, Utah's SB 115 – Sustainable Transportation and Energy Plan (STEP) Act – provides the Utah Public Service Commission (UT PSC) with discretionary authority to approve up to $3.4 million annual investment in battery storage and solar incentives. The law establishes a five-year pilot program, under which UT PSC will authorize Rocky Mountain Power, the state's major utility, to invest up to $2 million per year in electric-vehicle infrastructure and an average of $1 million per year on clean coal technology. With this bill, Utah has added itself to a growing list of states that have boosted storage through local legislation.

California

California's 2010 Energy Storage Law (AB 2514) is the first state law that called for a statewide energy storage mandate to facilitate market transformation of emerging technologies. It requires state-regulated utilities to procure storage systems or services having 2.25 percent peak load capacity by 2014-2015, and 5 percent by 2020. In October 2013, CPUC finalized a decision (D.13-10-040) establishing policies and mechanisms for its energy storage procurement framework requiring the state's three major investor-owned utilities (IOUs) to collectively procure 1,325 MW of energy storage by 2024. In September 2015, the California State Legislature approved the Clean Energy and Pollution Reduction Act of 2015 (SB 350) which increased the state's Renewable Portfolio Standard (RPS) to 50 percent by 2030 from the previous goal of 33 percent by 2020.

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The CPUC's Self-Generation Incentive Program (SGIP) provides incentives to support existing, new, and emerging distributed energy resources. The SGIP provides rebates for qualifying distributed energy systems installed on the customer's side of the utility meter, including advanced energy storage systems. In a February 2016 decision, the California Public Utilities Commission (CA PUC) approved the NEM successor tariff (D. 16-01-044), keeping the current retail rate in place through 2019, with a shift to time-of-use (TOU) rates under which tariff rates change according to the time of the day.

Hawaii

In 2015, Hawaii Public Utilities Commission unveiled a Customer Self Supply program (CSS), an option created through a decision (D. 2014-0192) that ended net energy metering due to high-distributed generation penetration. The CSS is designed for solar PV installations that do not export electricity to the grid. Customers use batteries linked with their PV system to store excess energy. Under a second option – Customer Grid Supply (CGS) – customers receive a credit for electricity sent to the grid and are billed at the retail rate for electricity they use from the grid.

New York

The New York State Public Service Commission has approved demonstration projects under the Reforming the Energy Vision (REV) docket (14-M-0101),

which envisions utilities to serve as distribution grid operators to advance distributed energy resources, storage batteries, microgrids, and midsized wind farms. Among the demonstrations, ConEd's Virtual Power Plant project integrates behind-the-meter solar and storage resources into the distribution grid by aggregating residential installations to form a fleet of solar-plus-battery-storage assets. This aggregation of solar-plus-storage into a virtual power plant creates the opportunity for Con Edison to harness an intermittent power source, and control it to provide distribution and transmission benefits. The demonstration will test the ability to utilize the on-site storage resources to serve multiple purposes, maximizing their value.

Texas

In Texas, ERCOT has established the Distributed Resource Energy and Ancillaries Market (DREAM) Task Force to provide a forum for stakeholders and staff to develop DER-related market rules. The DREAM Task Force is considering and recommending a potential market framework that would allow DERs to participate more substantially in the ERCOT wholesale market. The ERCOT approach seeks to augment existing market products to increase accessibility to market participants. It would facilitate the registration of DERs through market changes, including aggregations of solar and storage. Texas Senate Bill 943, implemented in September 2011, allows interconnection of energy storage projects to the grid and sale of energy or ancillary services to the competitive wholesale market.

Oregon

In June 2015, Oregon enacted House Bill 2193, which requires PGE and PacifiCorp, Oregon's major electricity providers, to have a minimum of 5 MWh of energy storage in service by January 1, 2020. The Oregon Department of Energy (ODOE) is partnering with the Department of Energy (DOE) to offer funds for an energy storage demonstration project in Oregon. The demonstration is an outcome of a March 2014 energy storage workshop of ODOE and the Oregon Public Utility Commission (OR PUC).

In June 2015, Oregon became the second state to enact an energy storage mandate for the state's major electricity providers

In addition, several state legislatures are engaged in efforts to harness energy storage solutions (Table 1).

Table 1 - State Legislation on Energy Storage

State	Bill Number	Date of Last Action/Status	Description
2015 Enacted Legislation			
Arizona	SB 1465	Enacted Mar 30, 2015	Clarifies disclosure requirements on agreements governing financing, sale, or lease of distributed energy generation systems, including energy storage
California	SB 350	Enacted Oct 7, 2015	Increases the state's Renewable Portfolio Standard (RPS) to 50 percent by 2030 and specifies storage as a means to help achieve the state's goals
Minnesota	HF 3	Enacted Jun 13, 2015	Includes a provision that utilities shall identify grid modernization investments, such as energy storage and microgrids, and technologies that enable demand response

State	Bill Number	Date of Last Action/Status	Description
New Jersey	S 2016	Enacted Jun 26, 2015	Provides funding for grants to state departments, agencies, authorities, and public colleges and universities for renewable and energy efficiency projects, which includes energy storage as one of the eligible technologies
Oregon	HB 2193	Enacted Jun 10, 2015	Directs the state's electric companies to procure one or more energy storage systems that have the capacity to store a specified amount of energy
Pending Legislation			
Minnesota	SF 3473	April 6, 2016 Introduced	Would provide a credit for purchase and installation of energy storage systems
Oklahoma	HB 2748	March 21, 2016 Passed One Chamber	Would create the Oklahoma Energy Initiative to advance new and existing energy research including energy storage
Hawaii	SB 2739	February 17, 2016 Introduced	Would create an energy storage compliance mandate; Requires electric utilities and electricity cooperatives to comply with certain priority preferences in planning energy storage system changes and to submit deployment plans to the PUC for approval
	HB 2236	February 4, 2016 Introduced	Would replace the current renewable energy technology systems tax credit with tax credits for solar energy property, wind energy property, and energy storage property; apply to taxable years beginning after 12/31/2016
	SB 1172	January 21, 2016 Introduced	Would allow energy storage tax credit for energy storage property and defines criteria for such property to qualify
Maryland	HB 787	March 14, 2016 Introduced	Would require the public Service Commission to open a proceeding to 4determine certain appropriate targets and policies for certain electric companies to 5procure certain energy storage systems by certain dates
Washington	HB 2966	March 10, 2016 Introduced	Would encourage programs for electrification of transportation recognizing its potential to allow utilities to optimize the use of electric grid infrastructure and manage loads, integration of renewables and storage
	SB 5096	January 11, 2016 Introduced	Would facilitate grants to fund projects that demonstrate integration of renewable through energy storage, dispatch of energy storage resources from utility control rooms, use of thermal energy systems to store energy or improve reliability and reduce costs of distributed energy
California	AB 33	January 28, 2016 Passed One Chamber	Would require CA PUC to determine the role of large scale energy storage as part of the state's overall strategy to procure a diverse portfolio of resources
West Virginia	SB 124	January 13, 2016 Introduced	Would define pumped storage hydroelectric project as alternative energy resource, among other provisions
New Jersey	S 684	January 12, 2016 Introduced	Would establish Clean Energy Technology enter and Alternative and Clean Energy Investment Trust Fund; include energy storage for automotive and power grid applications under clean energy research
New York	A 2371	January 6, 2016 Introduced	Would enact the New York Grid Modernization Act including provisions to deploy and integrate advanced electricity storage and peak-shaving technologies that include plug-in electric and hybrid electric vehicles, thermal storage air conditioning and renewable generation

Source: EnerKnol

Most states have RPS policies that require a specific portion of generation to be produced from renewable energy and have contributed to growth in the solar and energy storage markets. Table 2 summarizes state utility commission proceedings on energy storage and grid modernization.

Table 2 - State Utility Commission Dockets on Energy Storage

State	Docket/Case Number	Date Instituted	Description
California	R.16-02-007	February 2016	Develops an electricity integrated resource planning framework and to coordinate and refine long-term procurement planning requirements
	R.15-03-01	March 2015	Considers policy and implementation refinements to the Energy Storage Procurement Framework and Design Program (D.13-10-040, D.14-10-045) and related Action Plan of the California Energy Storage Roadmap
Oregon	UM 1751	September 2015	Implements Energy Storage Program guidelines pursuant to HB 2193
New York	14-M-0101	April 2014	Implements the REV initiative that seeks to reform state's utility regulatory structure by creating distributed service platform (DSP) providers for greater DER integration and better energy management options for consumers
Hawaii	2014-0192	August 2014	Investigates DER policies of the islands' utilities: Hawaiian Electric Company, Hawaii Electric Light Company, Maui Electric Company, (the HECO Companies), and the Kauai Island Utility Cooperative; and modernization-related issues

Source: EnerKnol

Federal Regulation Recognizes Energy Storage as a Key Source for Grid Balance

In addition to efforts at the state level, storage has enjoyed recent support on the federal level. Among the most important drivers is the recent extension of federal renewable tax credits, which is expected to boost energy storage along with renewables. The production tax credit (PTC) for wind energy will remain in place through 2016, followed by incremental reductions for 2017, 2018, and 2019 before expiring in January 2020. The ITC for solar will continue at 30 percent levels for commercial and residential systems for the next three years, and then decrease incrementally each year to settle at 10 percent in 2022. Further, the Department of the Treasury and the Internal Revenue Service are considering the extent to which storage may qualify for tax credits, indicating an upside for projected deployment. At the federal level, the Energy Storage Promotion and Deployment Act of 2015 (S.1434), introduced in June 2015, would establish a national energy storage portfolio standard.

FERC regulations ensure that fast-responding storage resources, such as batteries and flywheels, receive higher payments than slower fossil-fuel-centered resources in the ancillary services market:

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- FERC Order 755, issued in 2011, finalized the "Frequency Regulation Compensation in the Organized Wholesale Power Markets," requiring independent system operators and regional transmission organizations (ISOs/RTOs) to implement a performance-based model to compensate frequency regulation resources.
- FERC Order 784, issued in 2013, augments FERC Order 755 pay-for-performance requirements by including two additional attributes – speed and accuracy – for assessment while compensating fast-ramping energy storage systems for frequency regulation.
- FERC Order 792, announced in November 2013, adds energy storage to the category of resources eligible for grid interconnection under the Small Generator Interconnection Procedures (SGIP), and allows storage projects to participate in the accelerated interconnection process known as Fast Track. The order reduces the time, cost, and regulatory burden associated with interconnection of energy storage projects.

In addition to regulation, the federal government has directly ventured into developing storage technologies through investments. Under the American Recovery and Reinvestment Act of 2009, the Department of Energy (DOE) and the electricity industry have invested more than $1.5 billion in 32 cost-shared Smart Grid Demonstration Program projects to modernize the electric grid. The program includes 16 energy storage demonstrations focused on grid-scale storage application of several technologies including advanced batteries, flywheels, and underground compressed air systems. These technologies are evaluated for technical and economic performance load shifting, ramping control, frequency regulation services, voltage smoothing, distributed energy, and grid integration of renewable resources.

The Advanced Research Projects Agency – Energy's (ARPA-E) Grid Scale Rampable Intermittent Dispatchable Storage (GRIDS) program is focused on developing new grid-scale energy storage technologies to balance short-duration variability in renewable generation. ARPA-E recognizes that dispatchable and cost-effective grid-scale energy storage technologies are critical for accelerating adoption of renewable generation and reducing emissions from electricity generation.

ARPA-E's High Energy Advanced Thermal Storage (HEATS) aims to support the development of novel, advanced thermal energy storage technologies to enable large scale, high temperature systems for high efficiency, non-intermittent CSP and zero-emission peaking power from nuclear energy; thermochemical fuel production from sunlight, and small scale, high-density thermal storage based HVAC systems for electric vehicles.

Expansion of Renewables Drives Utility Demand for Energy Storage

The prospect of low-cost batteries powering vehicles, buildings, and expanding the reach of renewables has spurred investment in energy storage projects. In particular, solar photovoltaic (PV) systems, ranging from smaller residential systems to large utility-scale projects, have been a major driver for storage. The Energy Information Administration data shows that solar accounted for 26 percent of new electric generation in 2015 with distributed solar photovoltaic (PV) capacity showing a record installation level of 2,158 MW. Notably, Tesla's 2015 announcement of its residential and grid scale batteries, together with its planned Nevada Gigafactory signaling a dramatic reduction in energy storage costs across a broad range of applications, has sparked new interest in energy storage.

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More recent market developments point to the critical role of energy storage in expanding renewable integration while improving grid-operating capabilities:

- On March 31, 2016, San Diego Gas & Electric (SDG&E) announced energy storage and efficiency investments aimed to support the company's efforts to deliver more renewable energy, bring other sustainable practices into the community, and lower the region's carbon footprint. SDG&E expects the battery project to bring its total completed or ongoing energy storage projects to 79 MW, placing the company well ahead of schedule in meeting California's storage goals. The 20-MW lithium ion battery project, the largest of its kind in the San Diego region, would be owned by Hecate Energy Bancroft and supply energy under a 20-year power purchase agreement to SDG&E. The storage facility, expected to be completed by 2019, would be capable of storing supplies of solar, wind, and other clean traditional resources when they are abundant and inexpensive, and release the stored energy during peak hours when customer demand is high.

- On March 31, Ormat Technologies announced an agreement with Alevo Group, a leading energy storage provider, to jointly build the 10-MW Rabbit Hill Energy Storage Project in Georgetown, Texas. Alevo will provide its GridBank inorganic lithium ion energy storage system, which will also provide fast responding regulation services as an open market participant in the Electric Reliability Council of Texas (ERCOT). The project would contribute significantly to the evolving Texas market, which has more installed wind capacity than any other state and an expanding base of installed solar energy projects. It can modulate the intermittency of wind and solar generation while providing regulation services to the ERCOT wholesale market.

- On March 17, Alevo Group announced its deployment of an 8MW/4 MWh energy storage system in Lewes, Delaware to sell ancillary

services into the PJM regulation market, bringing enhanced power quality, a more reliable grid system, and the ability to shave peak demand for PJM's customers. Alevo said that the project demonstrates commercial viability of energy storage by stacking of multiple value streams and power grid benefits to enhance project economics.

- On February 22, Solarreserve announced that Crescent Dunes Solar Energy, a 110 MW concentrating solar power (CSP) electricity plant, began full operation. Crescent Dunes uses an energy storage system that developers expect will be able to store enough thermal energy to generate electricity for up to 10 hours after sunset or when direct sunlight is unavailable.

- On February 24, SolarCity introduced a Smart Energy Home product to new Hawaiian residential customers, offering solar PV, Tesla battery storage, smart electric water heaters and the Nest Learning Thermostat coordinated by a home gateway that controls the battery, water heater, and inverter to maximize solar PV generation and self-consumption. The product aims at Hawaii's new post-net energy metering (NEM) "self-supply" option intended for customers who generate energy for onsite consumption. Under this alternative, owners of rooftop solar receive no benefit for exporting their electricity to the grid. Accordingly, SolarCity's product would allow customers to use most of their electricity onsite.

- On February 2, California-based Ice Energy announced a residential version of its thermal energy storage product, which stores cooling energy by freezing water in an insulated tank while providing cooling to the home during off-peak hours, delivers up to 4 hours of cooling, using only 5 percent of the power that is usually required during peak hours. The company has contracts with Southern California Edison and Riverside Public Utilities to help manage peak energy demand, and increase energy efficiency.

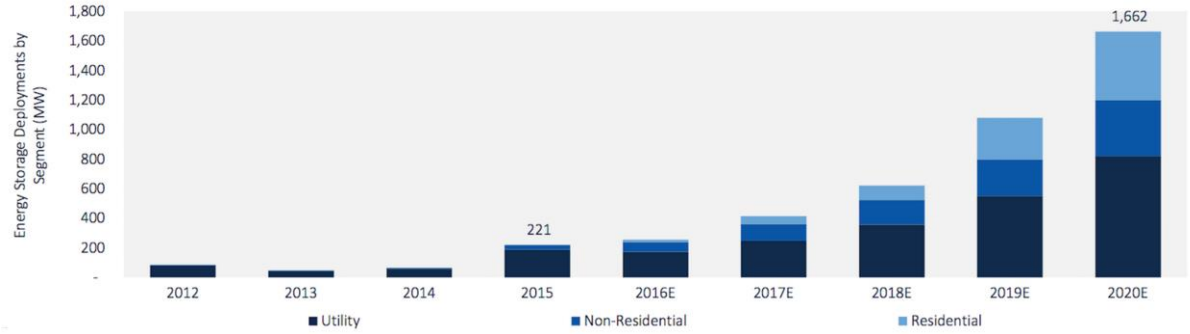
- In December 2015, Green Mountain Power announced a plan to offer the Tesla Powerwall Home Battery option to customers. The company expects the first-of-its kind plan to help leverage solar with cost savings, while empowering customers to generate, store and use energy closer to the home.

The annual U.S. energy storage market is expected to surpass the 1-GW mark in 2019 and become a 1.7 GW market valued at $2.5 billion by 2020

In its 2015 review, the U.S. Energy Storage Monitor highlights that front-of-meter storage accounted for 85 percent of deployments in 2015, and most of them were in the PJM market, which installed more than 160 MW of energy storage systems. The report notes that the U.S. deployed 221 MW of storage in 2015, a 243 percent increase from 2014 level of 65 MW (Figure 1). Storage deployment in Q4 2015 totaled 112 MW representing more than the combined storage deployments in 2013 and 2014. The annual U.S. energy storage market is expected to surpass the 1-GW mark in 2019 and become a

1.7 GW market valued at $2.5 billion by 2020. For utility projects to be completed in 2017, the report projects a cost 29 percent reduction in prices of installed systems for energy applications and 25 percent reduction for power applications, compared to 2015 levels.

Figure 1 - Annual U.S. Energy Storage Deployments, 2012-2020E



Source: U.S. Energy Storage Monitor

Benefits of Energy Storage Reflected both Behind and in Front of the Meter

The benefits of energy storage are already reflected on multiple fronts, including deferred investment in generation, transmission, and distribution infrastructure, reduced need for peakers -- oil- and gas-fueled power plants that only run when the electricity demand is high, ability to accelerate renewables deployment, and contribution to grid efficiency and reliability. Storage is also helping reduce price volatility, facilitating competition in electric power markets.

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Due to intermittency, renewable generation from wind and solar is not considered dispatchable by electric grid operators. In the absence of grid-scale energy storage, the power grid is regulated with fossil fuel powered spinning reserves, which run in parallel with renewable generating resources. Grid-scale storage would displace fossil fuel powered spinning reserves and also address ramps (short-term, unsupported losses or additions of power to the grid). In particular, storage could replace peaking gas turbine facilities, which are used during periods of high demand and are more expensive to run than typical power plants. As batteries become the more cost-effective option, peaker plants may no longer be necessary.

Behind-the-meter storage systems – electrochemical and thermal batteries – generate valuable services for both customers and grid. On the customer side, these storage systems:

- Lower peak demand charges through peak load shaving;
- Lower energy costs by storing inexpensive electricity at night and offsetting consumption during the day;
- Maintain critical services during outages;

- Increase the value of solar PV by smoothing fluctuation in production;
- Increase equipment of thermal batteries by decreasing the number of start/stop cycles and operating at more optimal conditions.

Electric utilities also stand to benefit from behind-the meter systems, as peak load reductions can defer major investments in transmission and distribution lines in constrained areas; reduce the need for peaker plants by providing on-demand energy storage at customer sites; help stabilize the grid, enabling safe interconnection of more intermittent resources; provide ancillary grid services such as frequency regulation and demand response; and achieve compliance with mandatory storage targets.

Accelerating Growth of Renewables Will Require Corresponding Energy Storage Solutions

Growing levels of renewable energy installations support concurrent energy storage investments to maximize system efficiency. The prolific growth of distributed solar PV has unlocked significant opportunities for the deployment of distributed energy storage. Energy storage is also valued for its rapid response in comparison with fossil fuel sources which tend to take longer to ramp up. This rapid response is important for ensuring stability of the grid when unexpected increases in demand occur. Storage is also the preferred option to replace major new transmission lines or install micro grids.

While FERC's pay-for-performance pricing structure set off the market for energy storage to make them more cost-effective on a commercial-scale, storage technologies are likely to see significant capital cost declines, driven primarily by economies of scale in manufacturing and design, engineering improvements, and increasing use of renewable energy.

Technological advancements, supportive policies, and economies of scale will continue to drive increased deployment of energy storage technologies

Moving forward, energy storage is projected to show exponential growth over the foreseeable future, with the ability to deliver more dynamic energy services, address peak demand challenges, and facilitate the expanded use of renewable generation. Technological advancements, supportive policies, and economies of scale will continue to drive increased deployment of energy storage technologies.

Disclosures Section

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Regulatory and Legislative agendas are subject to change.

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