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CLEAN ENERGY TECHNOLOGY

Capitalizing on the growth of battery energy storage in North America

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Introduction

Battery energy storage presents a USD 24 billion investment opportunity in the United States and Canada through 2025. More than half of US states have adopted renewable energy goals, such as California’s target of 100% clean energy by 2045.

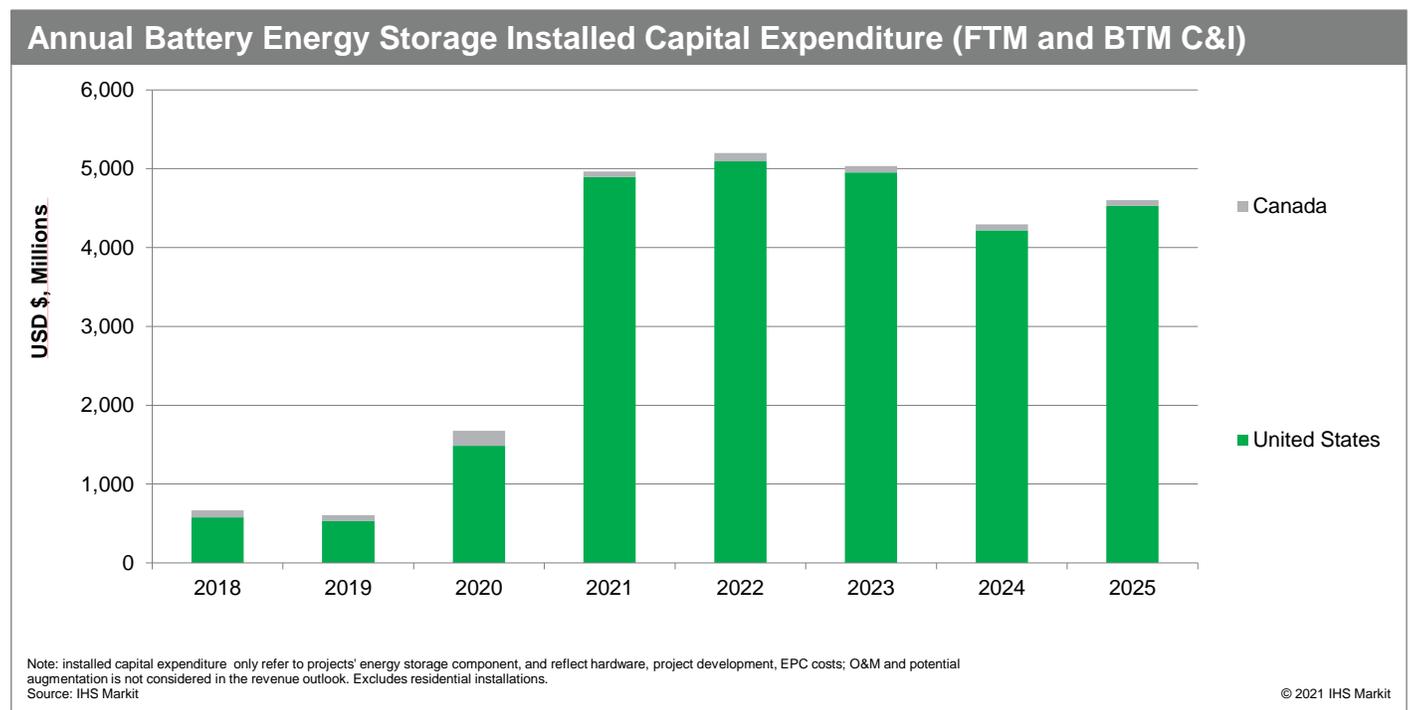
As a critical component of the energy transition, energy storage systems are needed to help balance renewable intermittency, provide a cost-effective and low-emission source of critical capacity, and empower customers to manage their energy demand.

This whitepaper reflects on available opportunities across the battery energy storage industry focusing on the market development in the United States and Canada. Highlighting throughout the importance this holds for investors, developers, and suppliers. As energy storage is pivotal in enabling the energy transition across sectors, working effectively across stakeholder groups to help realize the full potential battery energy storage technology offers, will unlock significant growth not just in the next few years but lay the foundation for a long-term acceleration in deployment.

Battery energy storage – a fast growing investment opportunity

Cumulative battery energy storage system (BESS) capital expenditure (CAPEX) for front-of-the-meter (FTM) and behind-the-meter (BTM) commercial and industrial (C&I) in the United States and Canada will total more than USD 24 billion between 2021 and 2025. This explosive growth follows a doubling of CAPEX expenditure from 2019 to 2020, as almost 1.5 gigawatt (GW) of BESS was deployed.

Near-term growth in the solar-plus-storage market segment will track the federal investment tax credit (ITC) schedule. Meanwhile, the long-term trajectory, beyond some of the current incentives, remains very positive with installations growing strongly from 2026 onwards based on economic competitiveness with conventional resources.



Several crucial drivers are supporting this rapid growth in the BESS market:

- Regulatory reforms enacted in recent years are enabling better access to wholesale markets for both FTM and BTM storage systems
- States are supporting BESS installations by providing guidance in utility procurement processes and legislating energy storage targets, mandates, and incentives
- The federal ITC significantly improves solar-plus-storage system economics. Changing political priorities in the United States create more opportunities for increased public investment in and incentives for clean energy technologies
- Continued Lithium-ion battery cost declines are making BESS competitive with conventional generation resources for capacity applications and ancillary services
- Advancing project design, scale, and contracting, combined with an increased diversity of buyers and access to financing, highlights the maturing of the industry

For corporate and financial investors, these growth factors create a wealth of opportunities. In the past year alone, project portfolio acquisitions, private equity financing for developers and suppliers, and public offerings highlighted investor appetite to capitalize on the growth of this market.

Increasing acquisitions of planned and operational projects is a sign of a healthy and growing industry. Investors are seeing improving business cases for assets in the coming years but are also becoming more accepting of greater merchant exposure. This is particularly reflected in the growing number of energy storage project acquisitions by institutional infrastructure funds, which previously saw the revenue profile of storage assets as insecure. Companies operating solely in the BESS market, as well as stakeholders across clean tech and renewable markets, are also increasingly attracting private investment. Private equity investors and venture capital funds are pouring significant capital into the energy storage sector looking to finance growth and new technologies. This shift is strengthened by the pivoting of capital away from traditional, carbon-intensive energy investments. Finally, in recent months, the use of special purpose acquisition companies (SPACs) as a route to becoming publicly listed has increased dramatically in the clean technology space, as companies choose this pathway for the high cash benefits and greater public profile.

Investors are not only aiming to take advantage of the explosive growth expected in the short-term, but also the long-term drivers and accelerators that will likely sustain growth and outperform many other segments across energy markets.

Specifically, a more conducive policy environment under the new administration could create further tailwinds for the burgeoning United States battery energy storage industry. This follows the extension of the ITC as part of the December 2020 spending bill, which further energized the already surging market for solar-plus-storage projects.

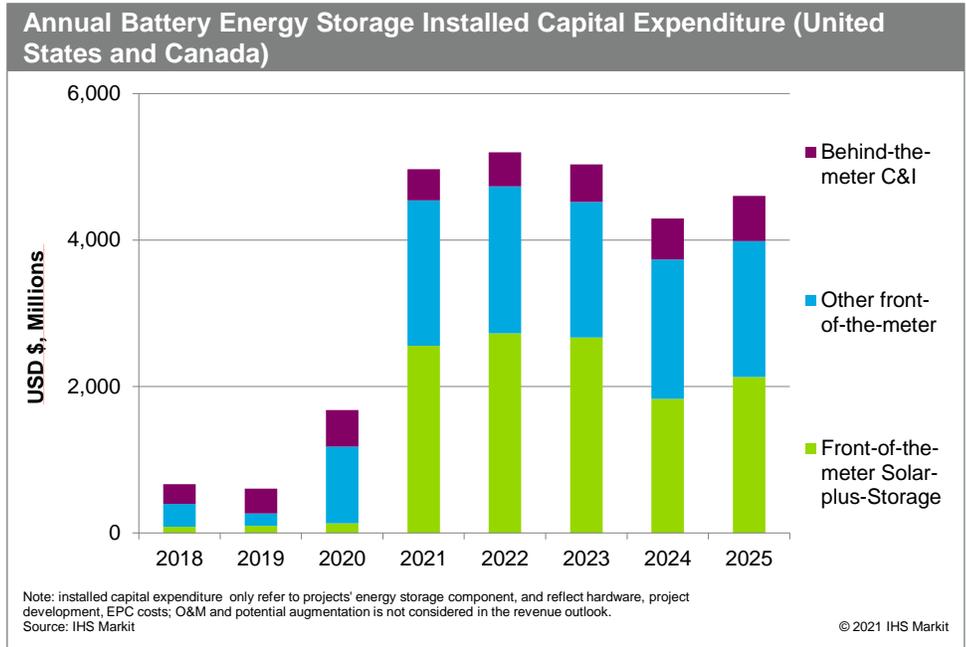
Total project costs for utility-scale BESS are expected to fall by another 16% between 2021 and 2025. These battery cost reductions will be driven by increasing battery demand from the automotive industry, supplier diversification, and product standardization – making BESS applicable across a greater number of regions and applications across North America. Finally, as a cornerstone of the energy transition, energy storage is a key enabling technology that will play a pivotal role not only in integrating large scale renewables and providing critical system resiliency, but also by facilitating the roll out of e-Mobility infrastructure and allowing end-customers to manage their energy costs.

Many investors – private, institutional, and corporate – have spotted this opportunity with the influx of capital further fueling industry growth, enabling the scaling of technology and capabilities. Falling on fertile ground this will make the North American energy storage market the largest market in the world accounting for a third of global energy storage installations (in MW) between 2021 and 2030.

Cost-competitiveness and a conducive policy environment drive growth

Soaring project development pipelines underpin a strong near-term outlook for energy storage markets in the United States, and to a lesser extent Canada. As the battery energy storage industry gathers momentum, state targets, tax credits, and other incentives enable BESS to become competitive over a wider range of applications. As costs continue to fall and utilities become more comfortable with the technology, BESS will be increasingly competitive as a source of new capacity—replacing traditional gas peakers. Joint procurement with renewables, as part of clean portfolios, will allow utilities to meet demand for new energy and capacity without compromising reliability. In the long-term, rising penetrations of intermittent renewables will be the biggest driver for BESS. Intraday fluctuations in net load caused by wind and solar variability will increase the value of flexibility, while the retirement of conventional thermal plants will spur the need for emissions-free resources capable of meeting peak demand—both roles that BESS excel at.

CAPEX investment in the United States FTM and C&I BESS markets alone is poised to be a cumulative USD 23.6 billion until 2025. Adding more than 25 GW in the same timeframe and 55 GW across the whole energy storage industry through 2030. Most capacity additions will be in the FTM segment, driven by utility procurement of large, centralized plants that can achieve economies of scale. Canada—a much smaller market—will add less than half a GW until 2025, with BTM in Ontario underpinning short-term growth, before changing regulatory framework across provinces enable wider uptake.

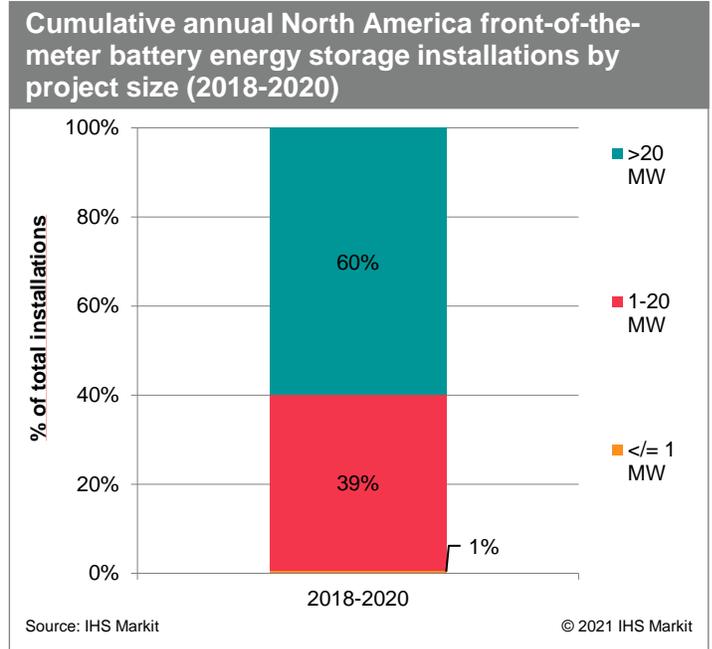


FTM sited energy storage will drive growth

While state targets and the federal ITC provide valuable incentives, the most impactful US regulatory action supporting the energy storage industry was Federal Energy Regulatory Commission (FERC) Order 841, which allows energy storage assets to fully participate in wholesale markets. This continues to create strong short-term momentum, strong advances in project design, scale, and contracting, combined with an increased diversity of buyers, reflect an evolving industry.

States and territories continue to support BESS through targets, incentives, and guidance in utility procurement processes. 10 states and territories have now announced energy storage targets, with Puerto Rico becoming the latest addition to this growing list. This brings the total state and territory targets to 13.64 GW by 2035. A growing number of utilities are also adopting integrated resource plans (IRPs) that included BESS.

Half of FTM capacity additions will be colocated with a source of generation—primarily solar photovoltaics (PV)—to capture cost savings, tax credits, and operational synergies. Projects in the development pipeline are becoming larger as developers scale up to capture economies of scale in system costs. The extension of the federal solar ITC improves solar-plus-storage system economics, providing a major tailwind to deployment in 2024-25—although the step-down schedule does impact deployments in the mid-2020s. This is also reflected in conventional power purchase agreements (PPAs) being modified to accommodate hybrid solar-plus-storage plants, with many incorporating time-varying rates or fixed capacity payments to reward on-peak output. While wholesale market economics remain generally challenging, attractive revenue streams are emerging in the California Independent System Operator (CAISO) and the Electric Reliability Council of Texas (ERCOT).

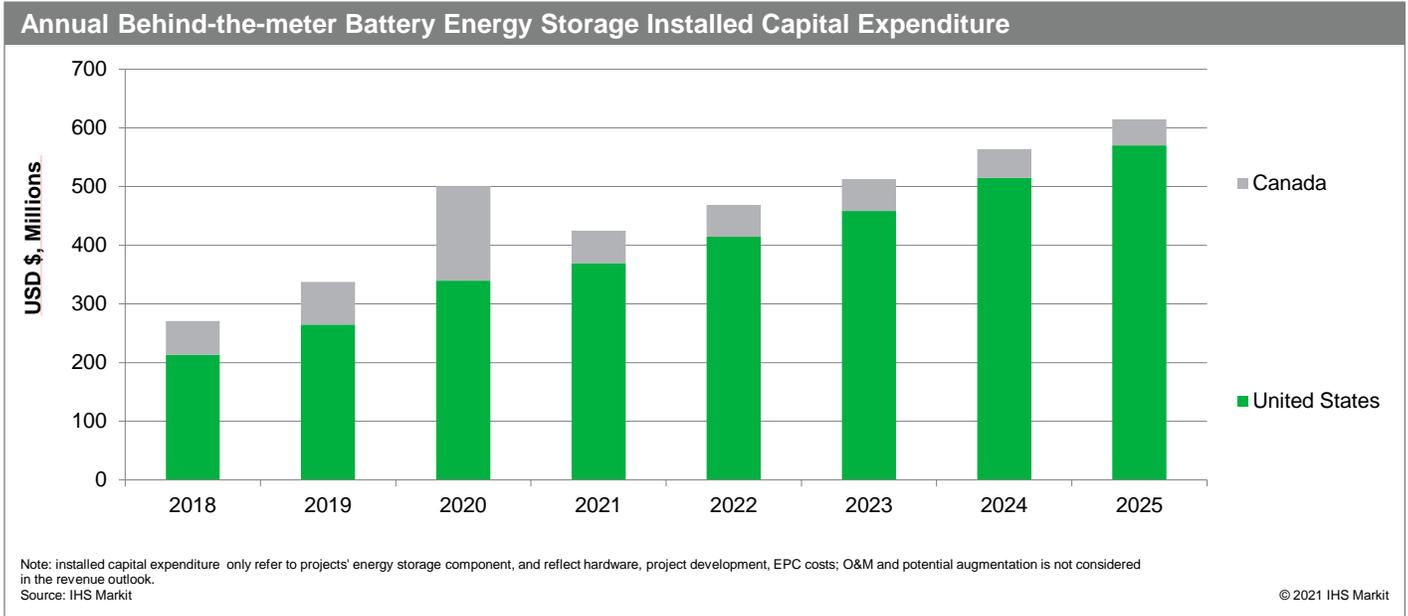


The trend toward larger project size reflects increasing investor confidence in the technology as well as cost savings from scale. Average project size has been steadily increasing with projects above 20 MW accounting for 60% of total installations in the last 3 years. At the same time, the FTM segment is seeing a bifurcation in durations, where BESS are targeting both ancillary services and wholesale arbitrage with shorter-duration systems, as well as providing critical capacity with four-hour project durations.

Canada represents a much smaller opportunity, with near term investment driven by limited uptake in Ontario and regulatory changes in Alberta to establish a framework for storage participation in energy markets. With a lack of clear market drivers, uptake will remain limited, but the development of regulatory changes and incentives across other Eastern provinces create an upside towards the middle of the decade.

BTM C&I additions grow strongly, but only account for around 5% of total additions in the United States and Canada until 2025

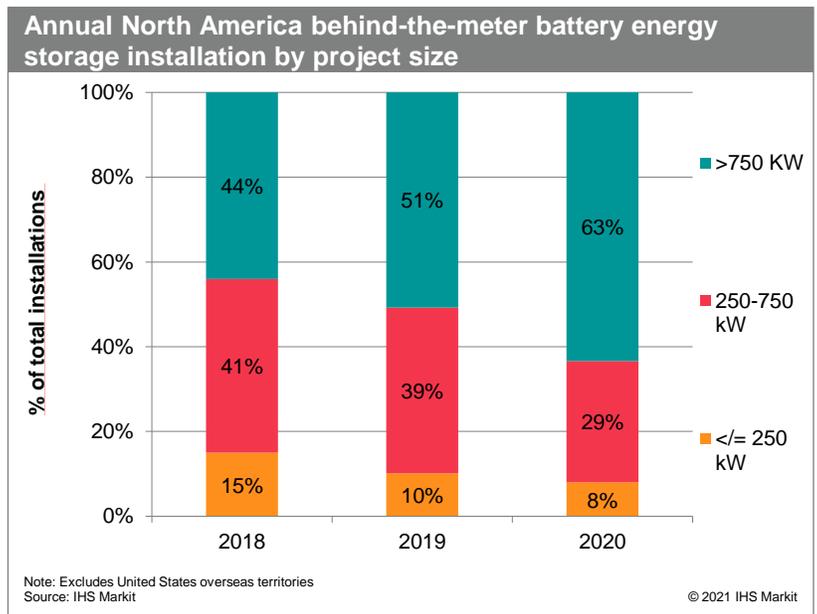
More than USD 1 billion will be invested into BTM battery energy storage projects through 2025, overcoming short-term challenges caused by supplier consolidation and the economic impact of the COVID-19 pandemic on businesses. For many commercial and industrial end-customers, managing their peak demand can create a very strong proposition for reducing energy costs. The critical challenge for BESS installed at C&I customer sites, is the variation in the economic benefits from customer to customer—depending on load profiles and electricity tariff schedule. Nonetheless, the combination of trying to reduce energy cost and increasing resiliency, coupled with low interest rates and environmental, social, and corporate governance (ESG) initiatives, is creating a strong momentum for long-term corporate investment into low-carbon energy infrastructure.



The North American C&I energy storage market has started to bounce back from the short-term delays caused by COVID-19, but the pandemic and economic challenges will stymie the market’s momentum and projected growth over the next five years.

Despite these barriers, there remain strong market drivers. California continues to lead the region in deployments, bolstered by the state’s strong incentive programs and high demand charges—IHS Markit forecasts that the state will account for more than 50% of the C&I market in 2025. Reduction of global adjustment charge payments has been a major driver for high-demand customers to install energy storage systems in Ontario, but a freeze on the charge in 2020 and market saturation will slow future growth.

In the United States FERC Order 2222 aims to open wholesale markets to BTM energy storage assets, but key issues around locational requirements, coordination among stakeholders, and metering and telemetry must be clarified first. Further driving the long-term growth is the continued growth of the commercial solar market and utilities that are increasingly implementing programs to support BTM storage systems providing demand response. The North American C&I sector has undergone rapid consolidation, as many key players have pivoted, exited the industry, or been acquired. Project developers with diversified and well-capitalized parent companies will be able to weather the pandemic’s economic fallout more easily than independent developers.



The North American C&I storage project pipeline through the first half of 2021 reflects this trend; it also indicates that the market is shifting from smaller projects at local businesses to larger contracts across multiple sites. The above graph clearly illustrates that trend over the past three years. However, the analysis is heavily skewed by larger-scale industrial projects in Ontario, Canada that are predominantly over 1 MW in size. In the United States, around 50% of projects in 2020 were larger than 750 kW.

Energy storage as a critical enabler towards a lower emission and more reliable energy system

Policy makers across the world continue to pivot towards taking greater climate change action outlining plans for greenhouse gas (GHG) emission reduction. In the United States, President Joe Biden signed the “Executive Order on Tackling the Climate Crisis at Home and Abroad,” recognizing the urgency of the climate crisis and the need to put the United States on a path to achieve net-zero emissions by no later than 2050. Canada, committed to the Paris climate agreement, has set the goal of increasing the share of zero-emitting sources of electricity generation to 90 percent by 2030.

To achieve this, more than half of the states in the United States are adopting renewable energy goals, with leading examples such as California targeting 100% clean energy by 2045. The increase in intermittent renewable generation, coupled with the electrification of transport, drives emission reduction action. At the same time, it creates an ever more urgent need for critical system flexibility and “peaking” capacity. Lithium-ion batteries today provide the most cost-effective energy storage resource deployable at scale. In the long-term, finding ways to better match the supply of abundant low-cost renewable generation with demand throughout the year will require longer duration storage, including multi day and seasonal storage. If energy storage fails to be integrated across the energy system, clean energy goals will not be met.

Extreme weather events – from the extreme colds seen in Texas in 2021, wildfires in California, to hurricanes around the Caribbean – devastate infrastructure, lead to widespread outages and can even cause long-term supply challenges as seen in Puerto Rico. As climate change is increasing the frequency and strength of natural disasters, this has elevated the critical role that energy storage plays in not only providing resiliency, but also supporting the rebuilding in the aftermath of natural disasters.

Energy storage can provide resiliency at many different levels, and through proper system planning provides a holistic solution on both sides of the meter:

- At grid-scale, battery solutions are crucial to meet peak net load. Net load is electricity demand less renewable generation, which must be met with dispatchable generation such as natural gas power plants or BESS. As highlighted by rolling blackouts in California in 2020, lack of available dispatchable generation can have severe consequences for businesses and consumers. Greater build out of BESS will strengthen the resource adequacy of power systems and help avoid future blackouts.
- Transmission and distribution system operators are increasingly facing power reliability issues as renewable generation levels rise and network infrastructure continues to age. BESS can be fast to deploy, can provide multiple services, and often come at a lower lifetime cost, which has created a strong financial case for installing such assets to provide dispatchable generation and mitigate outages at network infrastructure level.
- For C&I customers, BESS can help initially securing critical facilities such as hospitals and emergency services through uninterrupted power supply (UPS) and back-up power, with on-site generation ensuring continued operation. Energy storage as part of microgrids can support the islanding of whole communities, and in the retail sector, prevent perishables goods from spoiling.

Capitalizing on the potential of energy storage

With the United States at the helm of a global battery energy storage industry, where annual installations are expected to more than triple in the next five years and grow fivefold by 2030, stakeholders need to position themselves to realize the value provided by the technology and capitalize on the opportunity.



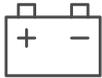
With a large influx of capital driven by the growth trajectory of the industry, investors need to ensure they understand the complexity of asset management and optimization for BESS.

It is crucial to be aware of the intricacies of the technology and revenue streams, compared to renewable generation resources, to mitigate risk.



Project developers are looking to put capital to work but should be mindful of the importance of location as it greatly impacts development timelines and project costs.

With the value of energy storage projects firmly sitting in the long-term operation of assets, developers require a clear strategy for maximizing revenue potential to create a compelling case for investors.



Hardware suppliers and system integrators need to offer more holistic solutions that include stronger software and operations offerings and superior project execution.

Product standardization will help reduce system assembly cost and drive procurement scale, while integrating upstream component expertise and downstream operations capability will help diversify revenues and stack margins.



Policy makers and regulators need to work closely with industry when developing new rules and frameworks.

Direct incentives – such as a standalone storage ITC - support the scaling of the industry and allow new technologies to develop a track record. More importantly it is pivotal that market frameworks accurately value the capabilities of energy storage assets through tariff structures rewarding flexibility, new approaches to resource planning, as well as recognition and ability to monetize the value of storage for reliability and resiliency.

Working effectively across stakeholder groups to help realize the full potential battery energy storage technology offers, will unlock significant growth not just in the next few years but lay the foundation for a long-term acceleration in deployment. Energy storage will provide system critical flexibility, capacity, support network infrastructure, and help business manage their energy demand and sustainability credentials. Despite recent explosive growth, the industry is still in a nascent stage. More conducive regulatory frameworks, new incentives, and stronger policy focus on emission reduction in the energy sector, and the influx of capital will all set the path for growth that could well outpace current predictions.

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