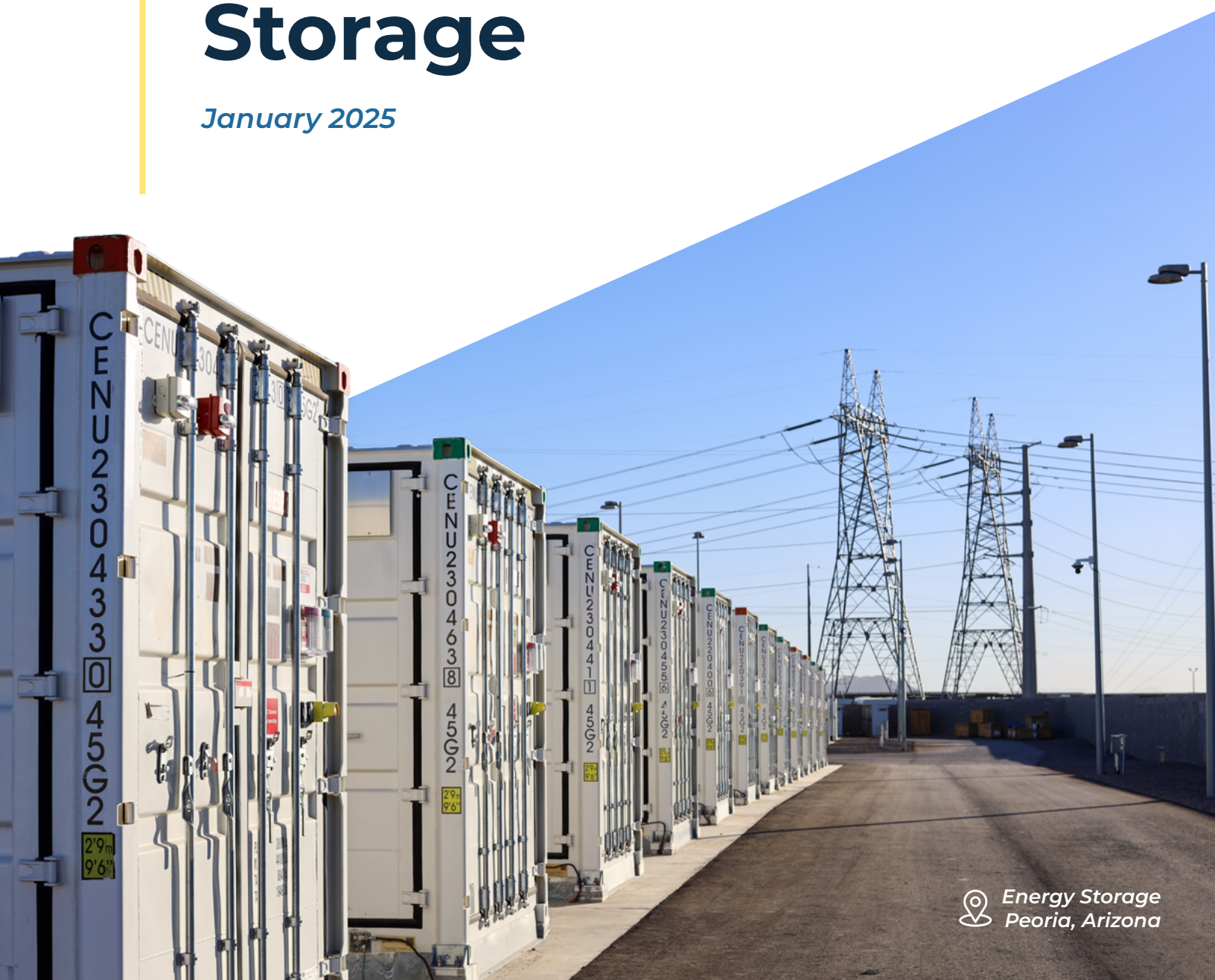
SEIA Solar Energy Industries Association®

SEIA's Vision for **American Energy Storage**

January 2025



Introduction

Solar and storage are a dynamic pair, and together are forming the backbone of a clean, resilient, and reliable electricity system.

Just a few years ago, energy storage was a small part of our electric grid. Now, with domestic manufacturing and installations at all-time highs, energy storage has taken a more central role in grid operations. By increasing reliability and lowering costs, energy storage is demonstrating its value for customers, utilities and grid operators.

What's Next:

Energy storage is critical to America's energy security, abundance and dominance in 2025 and beyond. The steadily rising need for electricity is driven by overall economic growth, AI development and new data centers, aging infrastructure and weather-related grid disruptions. Energy storage also plays a key role in enhancing and supporting solar as it is rapidly adopted by consumers and utilities.

To support our vision for a reliable and abundant energy system, the Solar Energy Industries Association (SEIA) is establishing goals for battery storage adoption in the United States and outlining a policy blueprint to facilitate that growth.

By 2030, we aim to reach 10 million distributed installations, with a larger goal of 700 gigawatt-hours (GWh) total of installed battery capacity across all market segments. To continue to strengthen the power system and meet customer needs, more electricity will come from renewable sources. To match power supply to demand and realize the full range of grid benefits will require accelerating deployment of energy storage and optimization of clean energy assets. Studies show that with about 700 GWhs of storage, utilities and grid operators will be able to integrate this new renewable energy.

SEIA is also setting sub-targets for residential, community, and grid scale storage adoption. By 2030, we aim for 20% of all storage installations to occur in the residential, commercial, and community segments and 80% of storage installations to occur in the transmission-connected segment. The distributed storage targets equate to around 10 million installations, or 140 GWh. The bulk of our target will likely be met by grid scale storage, at 560 GWh by 2030.

If we reach our target, renewables and energy storage will work seamlessly together to meet the daily ebbs and flows of electricity usage. Solar produced in the middle of the day when demand is lower will be used to recharge energy storage systems. As load increases throughout the day, and the batteries have been charged, solar energy will power the grid into the late afternoon and evening when total demand peaks. Then, as the sun begins to set, grid operators will dispatch their batteries to ease the transition from day to night and keep the grid reliable and clean.

Energy storage can smooth electricity prices, lower the risk of service disruptions, provide the capability to re-start power quickly after a major outage, provide backup power, ease congestion on the transmission network, and create the opportunity to maximize asset value by participating in wholesale energy markets.

For consumers, energy storage provides backup power during outages, lowers energy bills by storing excess solar power for use when solar panels aren't generating, and increases energy independence by reducing reliance on the grid.

To fully utilize the thousands of gigawatts of renewable energy that will connect to the grid, and to enhance reliability and resilience, the U.S. needs more storage than is currently planned. Increasing deployment to 700 GWh by 2030 is a better match for the pace of forecasted load growth and renewable deployment that is being unleashed. Having a robust level of storage ready to deploy will allow grid operators to fully use midday excess solar energy to power the grid during nighttime hours.

With support from policymakers and regulators, energy storage can help America keep the lights on and the economy growing.

Key actions that will enable the U.S. to reach **700 GWh by 2030**

Industry forecasts show that storage is set to reach roughly 450 gigawatt hours by 2030 under a baseline scenario[1], but more is needed..

To reach this more ambitious, but critical target, SEIA is calling on states, regional transmission organizations, and the federal government to act to enable further growth in energy storage to secure a clean and reliable energy future.

To expand energy storage adoption, policymakers should focus on actions and policies that:

- Level the playing field by ensuring equal access to the grid and providing fair compensation for energy storage and the grid services it can provide
- Maintain and build financial support for energy storage projects
- Promote storage adoption incentives for communities in need or those disproportionately impacted by extreme weather events

[1] *Projections based on Wood Mackenzie's Energy Storage Monitor*

Energy storage is critical to the future of American energy security

We need energy storage to improve grid reliability

Creating a more reliable grid will require a significant increase in energy storage, so that affordable renewable energy can be used around the clock. Nearly every major study shows that to create a more reliable and resilient electric sector, we need to develop the capacity to store affordable and abundant solar energy for use when we need it.

Energy storage is also key to maintaining power quality and resource adequacy as we add more renewable energy to the system. Energy storage provides balance to the grid, can support voltage, and smooth out power delivery in high-renewable scenarios.

Energy storage provides reliability and resilience during power outages

When the grid is down, energy storage can provide critical back up power to emergency shelters, hospitals, homes, businesses and even neighborhoods. When paired with solar, the power of energy storage to keep the lights on is enhanced because the batteries can recharge using solar even if the power outage lasts several days.

Energy storage can help manage bills and keep electric rates low

In many cases, energy storage can be used instead of costly investments in grid infrastructure. Utilities can use storage to increase capacity for new clean energy deployment, which can open the benefits of clean energy to more customers. In states where net-metered electricity is billed based on “time-of-use” rates, like California and Hawaii, storage can help customers maximize the value of their solar system while providing valuable back-up power. Small resources, like home batteries, can be coordinated with grid needs to form “virtual power plants” (VPPs) that lower electric rates for everyone. Larger commercial and industrial customers can also form VPPs by opting in to utility Demand Response (DR) programs to lower their bills by reducing their electricity use when the grid is under stress. Small businesses and industrial customers who pay high demand charges can use energy storage to save money on their electricity bills by using batteries to shift their loads away from peak times.

Energy Storage
Peoria, Arizona

Market Overview

To chart the path to 700 GWh, it is important to explain where the energy storage market stands today. Wood Mackenzie's Energy Storage Monitor (ESM) shows that since 2020, 80.3 GWh of energy storage have been added to the grid, which accounts for 96.2% of all energy storage deployment across all market segments. This includes utility-scale storage as well as residential, commercial, and community storage adoption.

Deployments have generally increased year-over-year, with residential outpacing commercial and community storage due to large demand and supportive policies in that sector (Figure 1).

Grid scale makes up the lion's share of total deployments. In 2023 alone, 24 GWh of grid scale storage were deployed which is over 40% of America's total battery storage. While much of the residential, commercial, and community storage is co-located with rooftop solar, grid scale is more varied because it can be connected to grid scale solar or wind projects and as a standalone resource. Many large battery projects are placed at retired coal plants due to their already established connection to the grid.

Despite the positive direction, much more is needed to reach SEIA's 700 GWh goal.

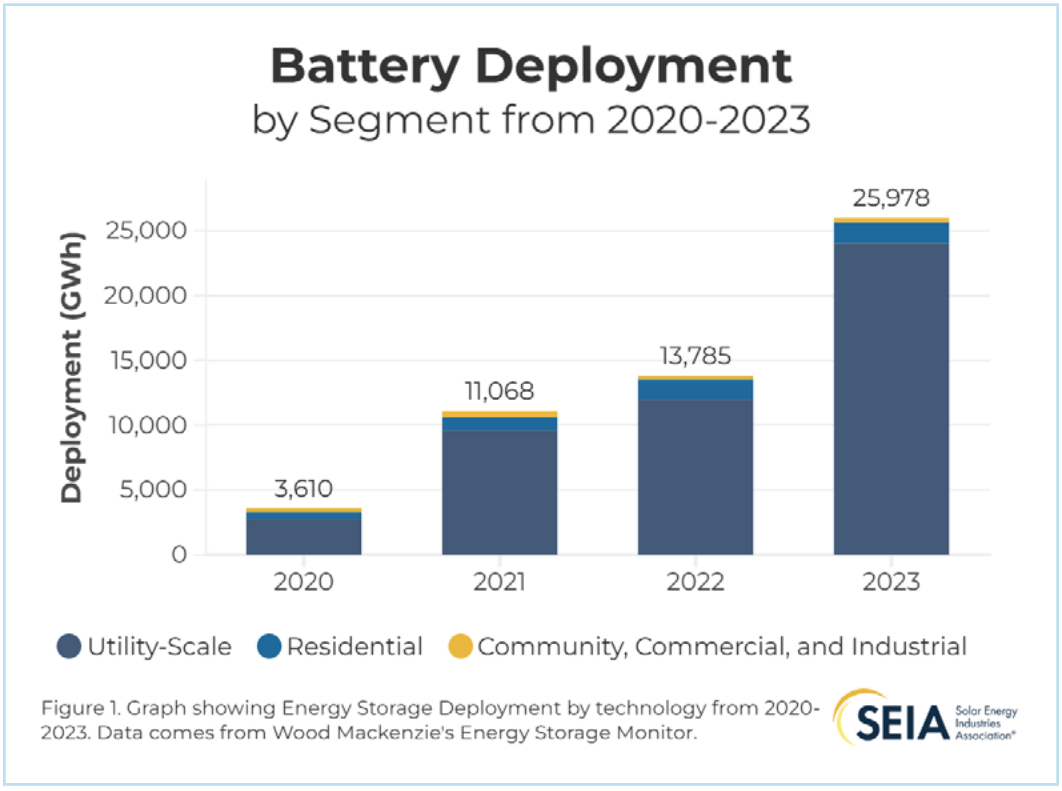


Figure 1. Graph showing Energy Storage Deployment by technology from 2020-2023. Data comes from Wood Mackenzie's Energy Storage Monitor.

Market Prices Dropping

Energy storage deployment is also increasing because installed system costs are decreasing. The median costs for both residential and 2-hour utility-scale systems fell by 7.8% and 16% respectively between Q1 2018 and Q1 2021. However, a worldwide lithium supply chain shortage caused prices to jump above 2018 numbers by mid-2022. This demonstrates that an unsecured supply chain of raw materials can derail substantial progress, reinforcing the need to maintain steady access to essential raw materials. As those supply chain issues eased, prices returned to their downward movement.

Median prices for residential systems fell below $2,000/kW for the first time at the end of 2023, and 2-hour utility-scale fell below $1,000/kW at the end of 2023. Similar trends hold true for commercial and community storage and other utility-scale batteries. In addition, the discovery of new lithium deposits in the United States, the manufacturing tax credits in the Inflation Reduction Act (IRA), and emerging battery technology will likely drive further price declines.

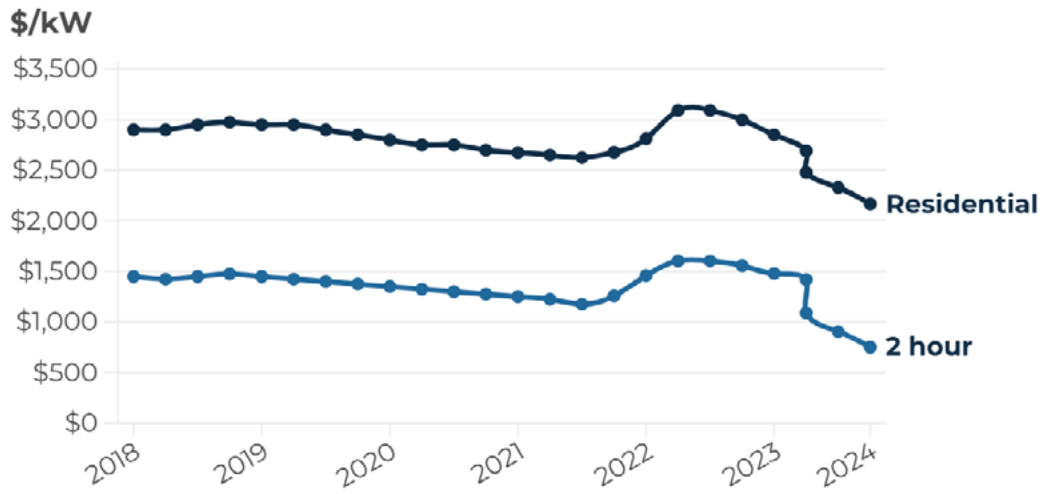


Figure 2. Graph showing Median price trends for Residential and 2-hour Utility-scale energy storage deployments. Data comes from Wood Mackenzie's Energy Storage Monitor.

Deployment on the Rise

Wood Mackenzie's Energy Storage Monitor tracks utility-scale storage adoption and expects over 300 GWh of storage to come online by 2028.

SEIA expands on this analysis and expects the business-as-usual projection for the entire storage market to reach about 450 GWh by 2030. This estimate accounts for the significant increase in annual deployment across all sectors. Even with the rosy picture, these numbers still fall well below SEIA's target of 700 GWh by 2030 and would be insufficient to support our nation's energy needs. Figure 3 shows the expansion required to reach the 2030 target. Although daunting at first, similar jumps have occurred before. Solar deployments have smashed expectations over the previous decade, and many domestic manufacturing facilities are expected to come online in the next 2-3 years. Additionally, more lithium deposits are being discovered and new technologies, such as iron air batteries, could revolutionize the energy storage industry. Through an aggressive mix of policies, programs, R&D funding and additional incentives for energy storage that we have identified below, SEIA's 700 GWh target is achievable.

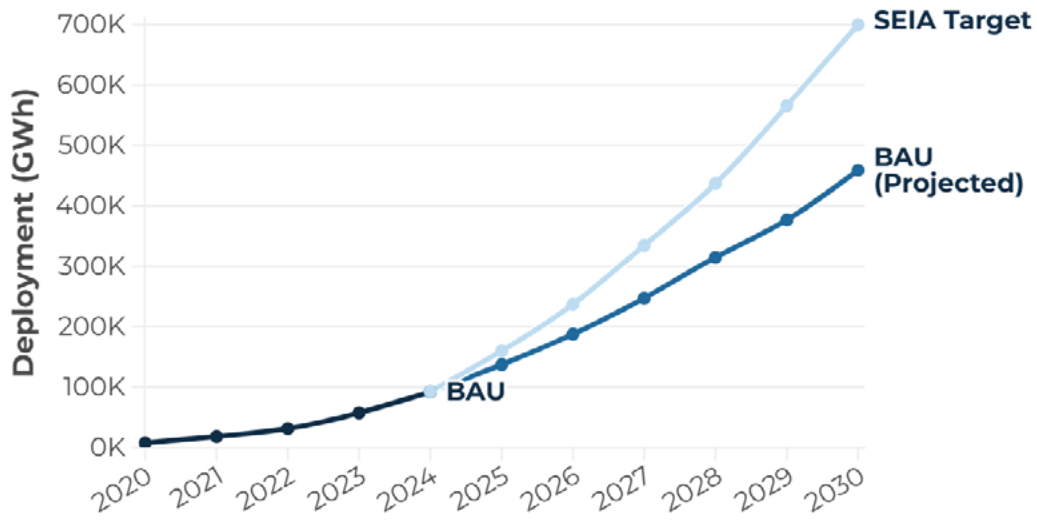


Figure 3. Energy Storage through 2030. 2020-2028 Data comes from Wood Mackenzie's Energy Storage.

Energy storage needs the support of policymakers

Storage can only thrive in a policy environment where it has equal access to the grid and where market barriers have been removed. To support the transition to a clean, reliable grid that maximizes the potential of energy storage, public policy investments must be made to support new storage projects and manufacturing facilities. Federal, regional, and state policy makers should focus on the following priorities to unleash the full potential of energy storage:

Level the playing field for storage by ensuring equal access to the grid and providing fair compensation for energy storage and the grid services it can provide

Maintain and build financial support for storage projects

Promote storage adoption incentives for vulnerable communities or those disproportionately impacted by extreme weather events

Level the Playing Field

Secure revenue streams and fair access to markets

Despite offering many valuable services to the grid, energy storage owners do not always receive fair compensation for what these services are worth. In wholesale markets, FERC has attempted to open up access to storage with Orders 841, (which requires regional markets to include participation for energy storage) and 2222 (which directs regional market operators to allow aggregated distributed energy resources to participate in wholesale markets), but implementation has left significant gaps and many regional markets won't allow storage to compete equally for several more years. Storage is also systemically undervalued on the distribution grid, where there is a mismatch between retail electric rates and compensation that electricity dispatched from storage can receive. This means projects that should pencil out on their own often don't because they don't have free and fair market access to buy and sell energy at fair wholesale rates.

Interconnection: recognize flexibility

Before energy resources connect to the grid, they need to go through a process called interconnection. The capabilities of the grid are studied to determine if any new or upgraded infrastructure like poles, wires, or transformers are required.

In many states and RTOs, storage is not accurately represented during interconnection studies. Grid operators will study storage under a "worst case" scenario, like importing power during peak load conditions, or exporting at max power when the grid is saturated with renewable generation or is in a low-load situation. This isn't the way storage operates, and it can leave storage owners to cover a large price tag for equipment they don't really need.

Reforms to the surplus interconnection service("SIS") process at RTOs will more fairly facilitate ESS coming onto the grid. SIS provides a simpler, expedited study process that occurs outside the conventional interconnection

queue, allowing new generators that do not trigger transmission system upgrades to use an existing generator's unused interconnection capability.

SEIA advocates at state PUCs and RTOs to make sure that storage is treated fairly in the interconnection process.

Retail rates for charging should be rational and affordable

Energy storage systems can draw power directly from the grid. When they do, they pay for electricity. The rates they pay often don't reflect the value that storage brings to the system or the dynamic ability for system operators to craft retail rates based on when storage will charge. For example, many storage systems pay large demand charges even though they can be set to charge during times of low-cost energy and away from coincident system peaks. Energy storage is operated to provide benefits to the electric system, not to strain it, and rates should be created to reflect these benefits and to incentivize storage operators to manage their projects in ways that are best for the electric grid. For state commissions setting retail rates, SEIA will engage to ensure that rates paid by energy storage owners are fair and reasonable.

Manufacturing: building an American energy storage value chain

Building an American energy storage manufacturing ecosystem requires a combination of supply side support and informed trade policy. Policymakers should also encourage "friendshoring" and collaboration with free trade agreement countries. The energy storage sector needs targeted trade policy changes to support domestic battery value chain manufacturing. Targeted trade policy changes can support domestic manufacturing, create quality jobs, and diversify energy storage supply chains.

Battery Energy Storage Systems (BESS) and electric vehicle (EV) batteries share much of their supply chains. While BESS batteries are distinct from EV batteries, the combined scale will help build critical volume to support more upstream suppliers and strengthen supply chains.

Similarly, BESS manufacturers can leverage the existing infrastructure of high-quality recycling serving other industries incorporating batteries to reduce the environmental impact of energy storage systems. American manufacturers should proactively address environmental and conservation concerns by implementing community benefit agreements and engaging in environmental remediation efforts at all stages of the supply chain.

Lower barriers to siting

State and local officials should ensure that permitting for the installation of energy storage systems is as smooth and seamless as possible. Jurisdictions should consider adopting SolarAPP+, a free and easy online permitting platform, to streamline permitting of distributed resources interconnected to the grid. State governments should ensure that local codes and zoning ordinances are not overly burdensome in their requirements for setbacks, screening and aesthetics, environmental review, and noise.

Maintain and Build Financial support

State-level procurement programs with financial support

States like California and New York are already realizing the benefits of storage by providing a variety of compensation structures, grid access programs, and incentives to help projects get off the ground. These state-level programs provide incentives to storage systems to maximum the value of these assets. . As the costs of manufacturing storage decline, and as more renewables come online, the value proposition for storage will continue to improve. For sufficient resources to come onto the system in time to meet demand, policymakers should act now with long-term investments in our energy and economic future. State governments should provide a clear pathway for procurement targets to be financed, and public utility commissions should ensure that storage is fully considered in integrated resource planning – as a tool to improve the capacity rating of renewable generation, as a non-wires solution to grid constraints, and as a stand-alone asset.

Electric vehicles (EVs) offer an opportunity to gain many of the benefits of storage by taking advantage of a resource we already expect to be coming onto the grid. Electric cars use large batteries that can be aggregated and used as

an asset on the grid. Virtual power plants (VPPs) can virtually bundle all those batteries together and charge them during optimal times, like when the sun is shining, or even use them to take stress off the grid during peak times. State and utility programs should support VPPs and provide EV customers with fair compensation for these services and recognize EVs as controllable, flexible loads.

Defending and Implementing Federal Clean Energy Policies

The Inflation Reduction Act (IRA) was an important leap forward in promoting energy storage with the first-ever tax credit for stand-alone storage. Defending and preserving these policies is a top priority for SEIA and the industry as a whole.

Rules and regulatory guidance released by federal agencies, such as energy communities', domestic content requirements, advanced manufacturing tax credit regulations, and federal funding through the Greenhouse Gas Reduction Fund, will impact the roll out of storage and whether we can meet our ambitious goals. SEIA and our members will continue to advocate for consistent IRA implementation that supports energy storage growth.

Manufacturers and developers of energy storage systems will be particularly impacted by forthcoming rules on the domestic content bonus credit and the section 45X advanced manufacturing tax credit. SEIA's advocacy will therefore be critical to provide to the Department of the Treasury and Department of Energy, as well as Congress, as they proceed with implementation of the IRA.

Support Vulnerable Communities

Vulnerable communities

Policy makers should provide extra financial support for vulnerable communities who can benefit most from the reliability that storage provides. Households with higher reliability needs, including people with disabilities, medical equipment, and the elderly, stand to benefit the most from small-scale storage because they need reliable power and because they have a more difficult time evacuating during emergencies. State programs should provide higher upfront incentives to people with disabilities, elderly people, and low- to moderate-income households.

Microgrid programs that use sola r+ storage can also be targeted to critical infrastructure and neighborhoods or multifamily housing with disproportionate outages and a weaker grid. Focusing storage and resilient energy development on community centers and other emergency hubs in underserved areas can increase their resilience and provide valuable economic benefits.

Energy storage should also be deployed strategically to allow for the retirement of fossil fuel plants that are often sited in historically overburdened communities. Energy storage, if supported by policy makers, can improve air quality and quality of life in areas that have long been negatively impacted by emissions from fossil power plants.

Fire safety and risk management

The risk of battery fires, as with all electrical infrastructure, is never zero. However, battery fires are rare, and when they do occur, there are established protocols in place to minimize any damage they may cause. State fire marshals should work with industry experts to provide training to first responders to help mitigate these risks.

Energy storage facilities utilize and comply with established OSHA safety equipment regulations and training, national, state, and/or local building, structural, electrical and fire codes, and employ strategies to ensure that risks associated with the installation and operation of the battery systems are appropriately mitigated. Compliance to nationally recognized product safety and installation standards such as NFPA 855 and UL 9540 and the accompanying test method, UL 9540A attest to the rigors undertaken to address and mitigate risks and hazards. These efforts taken by manufacturers and installers provide confidence in the safety and performance of these systems when they are installed in accordance with these standards, the adopted codes, and the manufacturers' installation instructions. Fire protection engineers, Authorities Having Jurisdiction, product safety engineers, and industry experts continually update and improve these codes and standards.

Long-duration energy storage

As we continue to add renewable energy to the grid and experience extreme weather events, storage with durations of 10 hours and longer will be needed to fully support the grid and reach our long-term net zero goals. SEIA will stay engaged as an active stakeholder in initiatives to promote long-duration storage such as the U.S. Department of Energy (DOE)'s Long-duration Storage Shot initiative. SEIA will also engage in policy efforts to support long-duration storage at the state level through integrated resource planning, procurement programs, and market design.

Conclusion

Energy storage is critical to American energy independence and abundance; however, without support and strategic policies, the U.S. will not develop sufficient energy storage to meet our goals for resilience and decarbonization. Policy makers must focus on appropriate compensation given the services and benefits energy storage can provide, evening the playing field, and safe, fair deployment to support vulnerable communities to unleash the full potential of this expansive and grid-supporting technology. SEIA is laser focused on advocating for policies and programs that support energy storage to reach our ambitious target of 700 Gigawatt hours of energy storage deployed in the U.S. by 2030.

SEIA Solar Energy Industries Association®

Leading the Transformation to a Clean Energy Economy.

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