



AES' Alamos Battery Energy Storage System paves the way for global energy storage adoption

As 2020 came to a close, AES began operating the Alamos Battery Energy Storage System (BESS) in Long Beach, California, making history as the world's first stand-alone energy storage project for local capacity, the first time an energy storage system was specifically procured instead of a new natural gas peaking plant in the U.S. and the world's first grid-scale energy storage system to receive a long-term power purchase agreement (PPA). Through these unprecedented achievements, the Alamos BESS, a 100 MW, 400 MWh system and one of the world's largest energy storage systems in operation today, ushered in the widespread domestic and global adoption of energy storage and demonstrated energy storage as a critical component of the world's energy future.

For the first time in history, AES together with Southern California Edison (SCE) and Fluence demonstrated that battery energy storage systems can meet large-scale local capacity needs.

Many of the large, baseload natural gas generation facilities were retired in the Los Angeles area over the last decade, which created a strong demand for replacement energy and capacity in the region. The new capacity resources needed to be flexible enough to meet the demands of a modern, evolving grid. The unexpected shutdown of California's San Onofre nuclear plant combined with the planned retirement of numerous natural gas facilities along the coast ushered in new procurement needs for SCE to add reliable local replacement capacity that could support local reliability of supply while meeting the dynamic, evolving requirements of California's grid as the state continued to transition away from conventional generation to renewable and zero carbon electric resources. As new, clean variable energy, such as solar and wind, come online, complementary energy storage installations are critical to meet the needs of the state's new electric system.

In 2012, SCE issued an all source request for proposal for local replacement peaking capacity in the Los Angeles basin area. Between 2013 and 2014, SCE evaluated more than 1,000 responses and a variety of technologies, including large-scale combined cycle, simple cycle gas turbines, demand response and energy storage.

Competing directly against natural gas-fired peaker plants, AES proposed the largest grid-scale energy storage project

in the industry as an option to meet SCE's needs. SCE took the extraordinary and bold step to recognize the emerging capabilities of grid-scale energy storage as peaking capacity and awarded AES a 20-year power purchase agreement (PPA) to provide 100 MW, 400 megawatt-hours of interconnected energy storage. This represented the first time in U.S. history a standalone energy storage facility was specifically procured versus the option to build a new natural gas plant.

The decision to implement an energy storage solution in such a competitive environment affirmed the long-term cost efficiency of energy storage. SCE's procurement of energy storage came in far ahead of the timeline set by the California Public Utilities Commission, making it clear that the economic benefits, even more than the regulatory requirements, are the driving factor for implementing grid-scale storage.

This historic step that recognized energy storage as a viable replacement for traditional generation came with an unprecedented challenge. Because the Alamos BESS was a first-of-its-kind project, there wasn't a ready-made PPA for long-term energy storage available. AES and SCE worked closely together to restructure a natural gas PPA for energy storage, creating a framework that has since helped to accelerate the development and deployment of future similar projects.



“This type of solicitation marks an emerging trend in utility procurement, where utilities move away from technology-specific and RPS-led procurement to a more unified approach in which solar PV, demand response, energy efficiency, and natural gas peakers compete in blended solicitations that are part of long-term procurement plans or integrated resource plans.” – Cory Honeyman, Research Analyst.

“No utility has made such a big investment in customer-owned, distributed energy storage assets of this type before, making this a step into the unknown on the part of SCE.”

[Source:](#) Greentech Media, “The World’s Biggest Battery Is Being Built For Southern California’s Grid.” November 2014.

For the first time, **energy storage** is demonstrated as a viable solution to **replace traditional energy** sources and create a **more sustainable, modernized grid**.

AES’ Alamos BESS was procured specifically to provide power at times of peak demand, but it is also supporting grid modernization, increasing the integration of renewable energy, lowering costs and greenhouse gas emissions and accelerating California in its ambitious goal to power 100% of its electricity needs with carbon-free energy by 2045.

Using Advancion 5 lithium-ion battery storage technology from [Fluence](#), the grid-connected 100 MW, 400 MWh Alamos BESS is extraordinarily flexible and responsive to enable the increasing penetration of intermittent renewables into the grid operated by California Independent System Operation (CAISO), one of the world’s largest transmission organizations that manages the electric grid and wholesale power markets for 30 million Californians. The BESS will store excess renewable energy on the grid when the sun is shining or the wind is blowing and then quickly ramps up to serve load when the sun sets or winds calm. This capability frees up nearby regional power plants to operate closer to full capacity and at more efficient output rates, rather than keeping capacity in reserve for regulation. The Alamos BESS can support the grid, just as gas peaking plants do today, but without the associated CO₂ emissions. The plant can provide enough energy during a 4-hour peak period to keep the lights on for more than 60,000 local homes.

The project increases grid reliability and resilience while minimizing power disruptions. During the summer of 2020, driven by record-breaking heat, California experienced its first rolling power outages in nearly 20 years. The outages

shut down power to hundreds of thousands of homes and businesses over a two-day period. Climate change in California has resulted in higher-than-average temperatures, and experts warn that extended heat waves will become more common in Southern California. The commissioning of the Alamos BESS comes at an important time to help support a resilient power grid during times of extreme weather as the state aggressively works towards achieving carbon neutrality.

The Alamos BESS shows how energy storage can both meet the demands of the electrical system and modernize it.

What’s the difference between standalone storage vs hybrid storage?

The difference lies in the interconnection with the grid. Standalone storage systems have their own interconnection agreement. Hybrid storage systems, where a battery system is paired with another power facility, often a solar or wind farm, typically shares an interconnection with the associated generation asset.

It may not look that different on the surface, but standalone systems, like the Alamos BESS, have more flexibility to meet more of the needs of the grid on a second-by-second basis to support reliability and resiliency, and can provide their full output to meet local energy needs. Local capacity is important for areas with grid constraints and high load, like the Los Angeles metro area, where transmission constraints can limit the ability to deliver energy from the desert into the Los Angeles basin.

Accelerating the future of energy storage in California

The success of the Alamos BESS in demonstrating that battery energy storage systems can meet large local capacity needs cost-effectively and more efficiently than traditional generation sources helped spur energy storage deployment and redefined the electricity and storage markets in California and beyond. California created the nation's first energy storage mandate in 2010, and partly due to Alamos' success, moved to expand its storage program. The flexible and responsive capacity provided by the Alamos BESS, along with the additional battery energy storage systems which are being installed to follow its lead, will play a critical role in ensuring grid reliability and resilience as we transition to a 100% carbon-free energy future.

Today, over 4 GW of energy storage is expected to be contracted and brought online by 2023. Fluence is helping customers bring nearly 1 GW of energy storage onto the California grid in 2021 alone.

California has been the U.S.' most prolific installer and deployer of battery energy storage, and energy storage will continue to play a critical role in the state's energy transition as it works to meet its goal of 100% carbon-free energy by 2045.

According to a [recent study](#) by the California Energy Storage Alliance (CESA), the state will need to deploy between 45 GW and 55 GW of long-duration energy storage by 2045 and 2-11 GW of long-duration energy storage to meet its interim goal of 60% renewables by 2030. "Deploying those larger amounts of long-duration storage could provide numerous benefits to California's grid...including enabling the retirement of 10 GW of fossil fuel generation, reducing the costs of system capacity by \$1.5 billion per year between 2031 and 2045 and increasing the utilization of renewable energy by 17%."

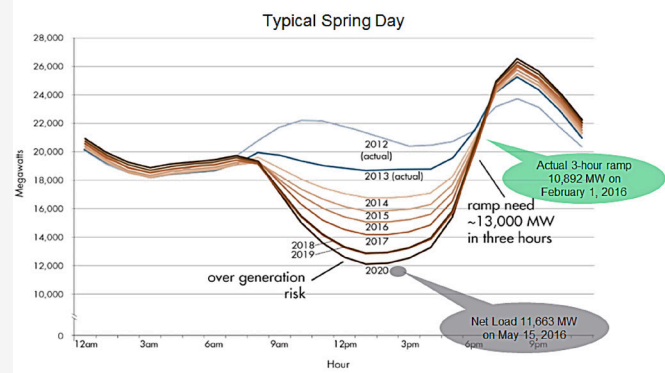
Innovating the Alamos BESS to meet California's most pressing energy challenges



California was the first state in the nation to establish an energy storage target in 2010 and was among the first states to set a 100% clean energy goal, committing to reach 100% carbon-free electricity by 2045. Making these targets all the more challenging to achieve, California was also facing an increasing challenge with solar curtailment. In order to balance load and generation on a second by second basis which is necessary to ensure reliability, CAISO had to curtail renewables while keeping traditional thermal generators online to meet the evening ramp and reliably serve load when the sun went down.

The Alamos BESS helps California meet its ambitious targets and address its rapidly changing net load profile that requires clean, fast-ramping peak power solutions that solve for the challenges of the "duck curve" and maximize the use of renewable energy.

Figure 2: The duck curve shows steep ramping needs and overgeneration risk



Source: CAISO

In 2013, the California Independent System Operator (CAISO) attempted to predict how the influx of renewables, particularly solar energy, would impact the grid overall. The graph indicates that as solar resources are added to the grid, there is a risk of generating too much power during the daylight hours while not having enough power to meet peak demand in the evening hours. In 2013, CAISO estimated that by 2020, the grid would need to ramp 13,000 MW in three hours.

Source: Fluence. "Want sustained solar growth? Just add energy storage." March 2018.

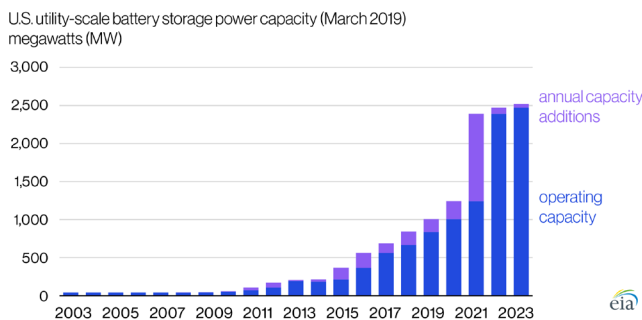


“Economical grid-scale and distributed storage has the potential of completely transforming the electric industry. Planning processes, operations, markets and the role of utilities will all be impacted by large-scale deployment of storage.” - Steve Berberich, CAISO President and CEO, 2005-2020.

“Southern California Edison sees a growing role for battery storage as California transitions to 100% clean renewable energy. Battery storage will help integrate wind and solar resources into our grid and improve reliability.” – William Walsh, SCE Vice President of Energy Procurement and Management.

Accelerating the adoption of energy storage in the U.S. and beyond

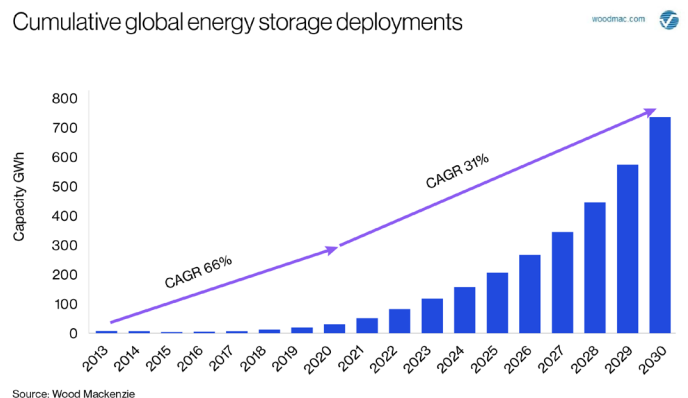
In the U.S., we saw a stark increase in battery storage installations after the successful procurement of the Alamos BESS. In 2019, the U.S. Energy Information Administration (EIA) recognized utility-scale battery storage systems as a newer power source with ever increasing rates of adoption. Over the course of five years, operating utility-scale battery storage power capacity more than quadrupled from 214 MW at the end of 2014 to 899 MW by March 2019.



Source: EIA “U.S. utility-scale battery storage power capacity to grow substantially by 2023.” July 2019.

Energy storage is shaping the future of the global power grid

The procurement, and the subsequent construction and operations, of the Alamos BESS spurred conversations and actions that made energy storage part of the global power supply. In its decades-long history, energy storage transformed from being viewed as a potentially risky technology to shaping the infrastructure of the grid and power supply as we know it. Battery energy storage is now being recognized as the solution to how we deploy renewables at scale and transform them from a clean energy resource into a clean capacity resource that’s available at any time of the day, and even more importantly, at night.



Source: Wood Mackenzie

Since the Alamos BESS was procured in 2014, global energy storage deployments have skyrocketed.

Source: Wood Mackenzie, “Global energy storage capacity to grow at CAGR of 31% to 2030.” September 2020.



We're already seeing how in other parts of the world, procurements of flexible clean power in the form of renewables and storage are displacing natural gas – and its emissions – for providing peak power, and the energy storage market will only continue to grow.

According to [Wood Mackenzie](#), 2020 is just the start of a tidal wave of storage set to come in the near future. "By 2025, the market is set to grow to nearly 7.5 GW in 2025, representing

sixfold growth over the projected 1.2 GW set to be installed by the end of 2020. Alongside this capacity growth, the market is also expected to be a \$7.3 billion annual market in 2025, after crossing the \$1 billion mark in 2020."

[Bloomberg New Finance](#) further projects that energy storage installations will multiply exponentially, growing to 1,095 GW by 2040.

Shaping the energy storage industry as we know it today

Together with SCE and Fluence, AES' Alamos Battery Energy Storage project turbocharged the energy industry through innovative storage solutions for capacity and grid reliability and developed commercial customer and supplier frameworks that enabled successful large-scale and long-term energy storage integration. As the world's first standalone energy storage project specifically procured to perform the local capacity functions of a natural gas peaking plant and receive a long-term PPA, the Alamos BESS paved the way for long-term, large-scale the deployment of energy storage on a state, national and global scale.

The Alamos BESS showed the world that cost-effective, large-scale battery energy storage is achievable and is now one of the most important technologies to meet the changing needs of the electrical system that requires modern and flexible generating technology to respond the integration of more intermittent renewable energy to reliably meet our carbon-free energy goals. As shown by the Alamos BESS, energy storage can deliver.

The project's groundbreaking accomplishments changed how the industry views energy storage: energy storage is no longer considered an option; it's now recognized as the critical component that will enable us to fulfill the promise of a 100% carbon-free future.

We mean it when we say that when we **work together**, we **change the world**.



We work together to turn "impossible" visions into a reality to accelerate clean energy transitions. Just like we did with Southern California Edison, sometimes this means creating the next big thing in clean energy. Find out how we can partner together to achieve your goals and make your unique impact to a greener climate future at www.aes.com.



AES was the first to pioneer the use of grid scale lithium-ion batteries for energy storage over a decade ago. Today, Fluence, AES' joint venture with Siemens, is the energy storage global market leader with a presence in 24 countries. Learn more at www.fluenceenergy.com.