CLEAN GRID ALLIANCE

FACT SHEET

# Storage and Renewables

## Energy Storage: A Necessary Resource

As the amount of clean energy increases on our grid, so does the need for energy storage. Renewable energy resources like wind and solar are available all year, but the amount of electricity they can produce varies from day to day and throughout the day.

We all know that solar electric resources produce power when the sun is shining, but wind resources often produce more electricity at night or in the morning and early evening when the sun is rising and setting. Wind and solar energy are complementary, but how can we rely on these clean resources when the sun or wind are not available? In comes an emerging new technology – energy storage.

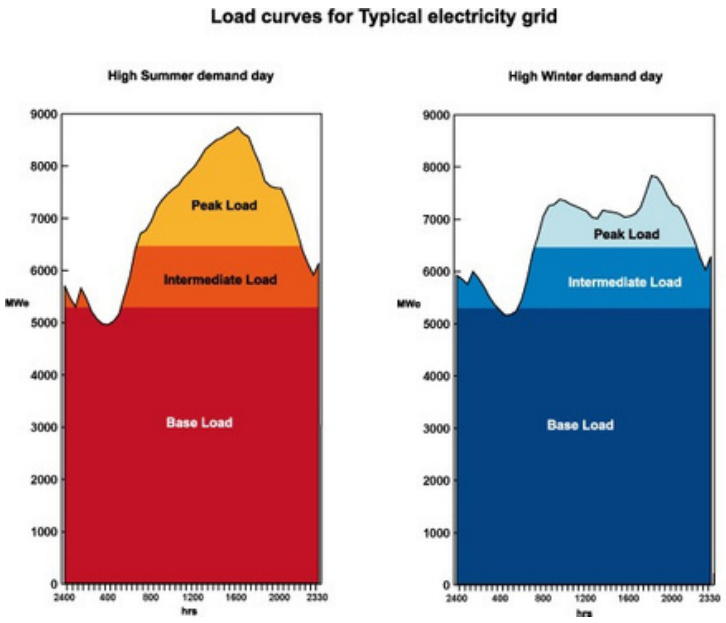
Energy storage, whether used as a stand-alone resource or coupled with renewables, can provide key benefits to the grid and allow us to use clean electricity even when the sun or wind are not available.[1] Together, these resources can provide a reliable, carbon-free alternative to new natural gas plants. Utilities such as Xcel Energy, DTE and Consumers Energy in Michigan, and all the utilities in Indiana are looking at batteries along with new renewables because they know the capabilities batteries provide to the grid will be necessary as renewable resources increase.

## Enhancing Grid Efficiency

Energy needs fluctuate throughout the day and over the course of the year, and the goal of electric utilities is to match consumer demand with energy production from their fleet of resources.

Energy storage allows us to access more clean power when we need it, without having to construct backup generation sources on the grid to meet peak electricity demand.[2]

Storage resources can capture and store electricity produced by solar and wind resources when they are operating at their peak output, and then deliver that electricity back to the grid and consumers when our renewable resources are producing less.




Source: NREL Load Curves

For example, storage resources can store solar energy in the middle of the day when the sun is at its peak, and then deliver that energy back to the grid in the evening when the sun goes down but consumers are coming home and turning on their heat and appliances.

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1. "Energy Storage." Energy.gov, U.S. Department of Energy: Office of Electricity, https://www.energy.gov/oe/energy-storage.
2. Calma, Justine. "Battery Power Capacity in the US Grew Big Time in 2020." The Verge, 19 Aug. 2021, https://www.theverge.com/2021/8/19/22632172/large-battery-pow- er-capacity-us-grew-2020.

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## Responsiveness and Flexibility

Storage can also smooth the delivery of wind and solar energy to the grid, balancing out the minute-to-minute variability of these resources as clouds obscure the sun or the wind lulls or picks up. This helps operators of the grid maintain a balance between supply and demand on the system at any point in time.

Storage can also step in quickly to make up for lost energy from a resource, renewable, gas, or coal, that has been knocked off-line due to extreme weather events.

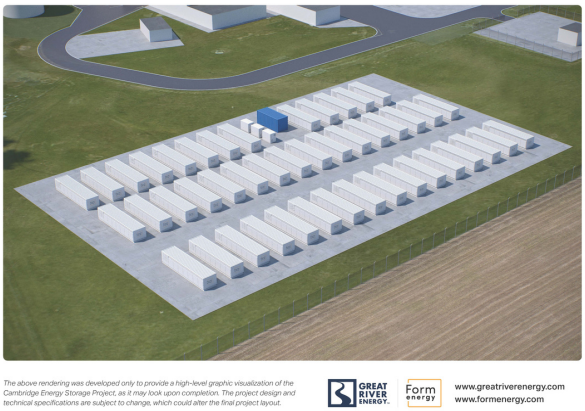
As energy needs and resource availability ebb and flow, the grid must respond fast enough to avoid power outages. Energy storage is quick and flexible and enhances the responsiveness of the grid, allowing us to rapidly meet unexpected fluctuations in electricity production and demand.[3]

## A Growing Investment

Battery storage capacity in the United States continues to grow, with 2,599 MW installed in 2021, 196% higher than 2020 volumes.[4] This capacity comes from more than 241 operating battery storage projects, including the two largest energy storage systems in operation, both in California.[5]

The Midwest also hosts battery storage systems, including the coming Cambridge Energy Storage Project, a 1-megawatt storage system capable of continuously delivering power for 150 hours beginning in 2030.[6]

Cambridge Energy Storage Project




A rendering of what the 1 MW Cambridge Energy Storage Project will look like in 2030 once constructed and in operation. (Great River Energy)

Across the globe, international battery storage capacity additions in 2020 rose to a record high 5 GW, demonstrating an increasing effort to enhance the flexibility of the grid.[7]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3 La`porte, Amaury. "Fact Sheet: Energy Storage (2019)." Environmental and Energy Study Institute (EESI), 2019, https://www.eesi.org/papers/view/energy-storage-2019.
4 American Clean Power Association, 2022, Clean Power Quarterly Report Q4 2021, https://cleanpower.org/resources/clean-power-quarterly-report-q4-2021/.
5 American Clean Power Association, 2021, Clean Power Annual 2020 Report, https://cleanpower.org/resources/clean-power-annual-report-2020/.
6 "Battery Project Includes Minnesota Flair." Great River Energy, 15 Sept. 2021, https://greatriverenergy.com/battery-project-includes-minnesota-flair/#:~:text=The%20ener- gy%20storage%20project%20is,multi%2Dday%20energy%20storage%20technology.
7 IEA. "Energy Storage - Analysis." International Energy Agency (IEA), 1 Nov. 2021, https://www.iea.org/reports/energy-storage.

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## Creating Rules to Meet Our Needs

One change we need in order for storage resources to provide their full set of capabilities to the grid are new market rules. All generation resources need rules of the road to provide energy and other reliability services to the grid, but different resource types need different market rules.

The market rules have already been adapted for wind and solar resources, but stand-alone storage resources and hybrid resources that combine storage with renewables do not yet have effective market rules.

The Federal Energy Regulatory Commission (FERC) has ordered all grid operators to provide market rules for stand-alone storage, but most regions of the country are still working to develop and implement them. Hybrid resource market rules have even farther to go, and more coordination is needed to see this technology to fruition.

## Finally....

Although storage has grown exponentially over the last few years, the rules under which storage will be integrated into the Midwest energy market and operated are still under development. The exact role storage will play in maintaining a reliable supply of electricity, integrating renewables and providing the attributes that traditional generation has contributed to the grid is a work in progress.

Clean Grid Alliance will be an active participant in the conversation with utilities in Integrated Resource Plans and in the MISO stakeholder process to help create more opportunities for storage and hybrid resources as we move towards greater decarbonization of the grid.


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