

# Energy Storage: A Critical Flexible Resource for Reducing Greenhouse Gas Emissions

*Energy storage systems offer our electricity grid the flexibility it needs to operate more efficiently and accommodate growing deployment of low-carbon energy sources, enabling a cleaner energy system.*



As costs continue to decline and capabilities expand, grid energy storage will be well placed to maximize the capabilities of clean energy generation like wind or solar while solving some of the challenges such resources pose for the operation of a reliable and resilient electricity grid. Storage can also be deployed to make other elements of the energy network more efficient, from the operation of fossil generators to transmission and distribution systems, to customers' own energy needs.

In addition to environmental benefits, energy storage offers an attractive value proposition in many scenarios, offering costs savings from more efficient operation of generation or grid operation, as well as improved resilience for the electric power system.

## Energy storage fixes renewables' intermittency challenge

Generation from wind, solar, waves, and tides doesn't naturally follow the precise needs of energy users the way that powering a fossil fuel plant up or down can. But energy storage systems are ideally suited to match the generation from renewable sources to users' energy demand: storage systems can absorb surplus energy when generation exceeds demand and release it when generation drops below what is needed to serve energy users. And storage's greenhouse gas benefits increase the more renewables are in a region – for example studies have shown that **600 MW of storage deployed in Massachusetts would produce CO<sub>2</sub> reductions equivalent to taking 73,000 cars off the road, with reductions deepening as the state's grid mix becomes cleaner.**

## Energy storage helps make the grid more efficient

Energy storage can also improve the efficient operation of the grid, reducing peak period congestion on the grid which causes inefficient operation and can also prevent distant renewable energy getting to end users. Simply not having to build additional power plants to meet rare peak demand situations provides significant environmental and financial savings. Directly replacing fossil fuel generation – particularly expensive natural gas peaker plants – can also reduce emissions; **the National Renewable Energy Laboratory estimates 28,000 MW of potential storage-for-gas replacements exists with current grid conditions.**

## Energy storage can make traditional generation more efficient

Most conventional fuel-based generation operates most efficiently within relatively narrow output ranges; operating below or beyond that output, they aren't as efficient and may experience greater wear and tear. Similarly, rapid start-ups or output increases can cause inefficiencies and greater emissions. Energy storage can smooth demand peaks or supply short-term power to allow a generator to more gradually ramp up, allow more efficient operation, lower fuel consumption, and reduce emissions. **GE estimates a 10MW battery coupled to an existing 50MW gas peaker plant can save up to 30,000 metric tons of CO<sub>2</sub> annually.**

## Energy storage enables electric vehicles

Electrifying vehicles removes gasoline or diesel fuel from the roads, rails, skies, and seas; electric vehicles produce about a third of the CO<sub>2</sub> emissions of a gasoline car on average in the US according to the Union of Concerned Scientists – but stationary energy storage can also solve challenges EV charging might create. Increasingly highly-powered chargers may strain local electricity networks and incur electric bill fees for charging station owners. Coupling energy storage systems with EV charging infrastructure can spread out the loads they can place on a distribution grid, **reducing the need for costly upgrades to lines and charges that would raise costs and hamper deployment of electric vehicle charging infrastructure.**

## Conclusion: Flexibility is the core benefit of energy storage

Energy storage's flexibility can make low-carbon generation more effective and solve the challenges it presents to grid operation while also making energy use more efficient in several applications. As capabilities increase and costs decline, energy storage is poised to play an increasingly central part of the decarbonization of energy.