

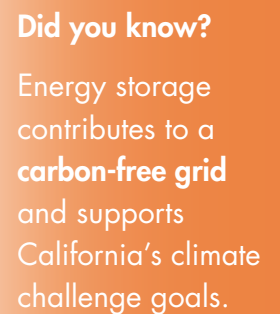
ISO Storage Pilot Projects: Advancing a smarter grid

As part of its continuing effort to support a greener grid and climate sustainability goals, the California Independent System Operator Corporation (ISO) is working with state agencies, utilities, military installations and universities to advance the use of smart grid technologies such as storage devices.

Storing energy in batteries promises to help the ISO keep the grid in balance as electricity needs fluctuate in real time. The unique characteristics of storage technologies allow power to be captured when demand is low and then released back to the grid when needs are high. As a grid resource, storage has the potential to respond quickly to signals to inject or withdraw energy — an essential resource to counter fluctuations in the output of renewable power such as wind and solar that are impacted by weather conditions.

Last year, the California Public Utilities Commission (CPUC) recognized the need to expand the role of energy storage in support of a carbon-free grid by establishing an energy storage procurement target of 1,325 megawatts for load serving entities. The investor-owned utilities, Pacific Gas and Electric Company, Southern California Edison and San Diego Gas & Electric, as well as energy service providers operating in California must procure storage resources by 2020 with installations completed by the end of 2024.

The ISO supports the CPUC's goals of creating a greener grid through grid optimization, integration of renewable energy resources and reduction of greenhouse gas emissions.



Did you know?
Energy storage contributes to a **carbon-free grid** and supports California's climate challenge goals.

The resource changes occurring in the electric power industry today include a clearly visible trend toward increasing numbers of distribution-connected resources. From the ISO perspective, this trend brings certain operational uncertainties, which include the magnitude, type, timing, forecasting, and geographic distribution of distributed energy resources. Saying this, the ISO believes that these challenges can be overcome without compromising reliability by setting clear goals and enabling collaboration, coordination and cooperation among key policy makers, state agencies, and market participants.

Large-Scale Energy Storage Pilots

The ISO set the stage for using energy storage as a grid management tool with a federally approved change in its regulation energy management rules in 2010. That change revised or removed certain restrictions preventing storage from fully participating in the ISO's ancillary services, or reserves, market — an essential market to keeping the grid in balance in real time. In 2013, non-generator resources began participating in the market based on their ability to be dispatched as a single resource

to any operating level within their entire capacity range of load and generation. Non-generator resources include batteries, flywheels, and other energy limited devices. Supported by ISO resource modeling and management, these flexible resources could stand ready to operate around the clock.

Several storage efforts are now underway across the state. This includes multi-megawatt battery installations by the investor-owned utilities, as well as, smaller scale efforts utilizing aggregations of electric vehicles and smaller stationary batteries located within a microgrid design. These projects are providing the ISO and storage resource owners with invaluable information on the nature of bi-directional energy management, paving the way for utilizing storage in ISO markets and grid operations.



Benefits

Through innovative technology, stored energy offers significant flexibility in balancing the grid under a variety of conditions. The potential operational benefits include the following:

- flexible energy management – dispatching and operating seamlessly across generation and load
- voltage support – devices such as batteries and flywheels could help maintain local grid voltage, which supports grid stability by providing a steady push of electrons across long-distance power lines
- regulation and reserves – unique bi-directional and fast-acting characteristics allow storage to help with regulation energy and spin/non-spin replacement reserves, which is electricity called upon when the grid needs balancing or is under stress
- demand response and load management – potentially flatten spikes in high consumer energy use, which in turn helps bring down wholesale energy prices during peak periods, while increasing consumption during times of abundant generation
- reliability – frequent and fast start/stop capabilities can offset the variability of preferred resources such as wind and solar power.



Next Steps

The ISO will continue to test and learn how these storage technologies align to the operational needs of the grid as well as identify any unique challenges associated with storage resources participating in the ISO markets. The ISO non-generator resources market model provides an excellent foundation for storage resources from which future market enhancements can evolve.

[Click here](#) to see the large scale energy storage pilots currently underway.