

# The Energy Storage Conundrum

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December 4, 2022

## Executive Summary

Wind and solar facilities for generating electricity can never be the sole power sources for an electrical grid, where supply must match demand minute by minute. Due to the intermittency of wind and solar, and the fact that generation from both can go to zero at any time (e.g., a calm night), full backup is necessary, either in the form of some dispatchable electricity source, or alternatively energy storage.

However, many jurisdictions plan to phase out essentially all dispatchable sources, particularly fossil fuels but also nuclear, leaving energy storage as the sole remaining source of backup.

But the amount and cost of energy storage necessary for full grid backup are so huge that they make any program to provide backup in this way completely unaffordable and impracticable.

This Report reviews realistic calculations from several authors of the amount and cost of energy storage that would be needed to fully back up a grid powered entirely by wind and solar sources. Calculations based on actual levels of consumer demand and actual production from existing wind and solar sources show that, to get through a full year without blackout, storage in the range of some 24 to 40 days of average usage would be required.

The cost of such storage, in the form of the best available current technology and with optimistic assumptions of decreasing prices, would range from some 10 to 15 or more times a country's entire gross domestic product (GDP).

Multiple states and countries (e.g., California, New York, Germany) have announced plans to move toward primarily wind/solar/storage electricity systems. However, in every case, the people in charge have their heads in the sand as to the amount of storage required.

This Report calculates, for example, that California's and New York's plans for energy storage capacity by the 2030s, although costing tens of billions of dollars and sounding huge in terms of gigawatt-hours (GWh), nevertheless would provide only about 0.1% to 0.2% of the amount of storage that would actually be needed to back up a primarily wind/solar-powered grid that they supposedly envision.

The Report emphasizes that there is no such thing in the world as a demonstration project to show how a fully wind/solar/storage electricity system would work and how much it would cost.

The closest thing to a demonstration project – the Gorona del Viento system on the island of El Hierro in Spain – has only served to show that such a project cannot work at any conceivably affordable cost. Now almost nine years after its launch in 2014, Gorona del Viento struggles to provide 50% of the electricity to El Hierro over the course of the year, and requires full backup from a diesel generator.

It is imperative that any state or country seeking to implement a primarily wind/solar/storage system have a fully functioning and costed demonstration project before making the citizenry guinea pigs for plans that almost certainly will not work and will need to be abandoned.