

A BATTERY STORAGE SYSTEM Can be the Perfect Complement to Your New Solar PPA

HEDGING AGAINST THE DUCK CURVE

As the solar industry continues to make progress on the technology cost curve, the economic competitiveness of solar power has steadily become a reality in U.S. markets across California and the desert southwest. Solar generation is increasingly becoming a significant portion of the California and southwest regions' power supply mix, especially during daylight hours. However, "too much of a good thing" may be the best way to describe the hourly timeof-day price distortions being caused by an oversupply of cheap solar during daylight hours in California, Arizona, and Nevada, a phenomenon known as the "duck curve". For offtakers seeking to power their load in these western markets with abundant solar power, there is one consistent, carbon-free solution being implemented by prudent offtakers to help mitigate their economic exposure to low mid-day prices, and to capture some of the high-priced evening peaks: **battery storage systems**.

Battery storage technology and its cost efficiencies have progressed by leaps and bounds over the past two years and, combined with the increasing presence of the duck curve in the California and desert southwest markets during that same period, the popularity of battery storage as a technology hedge against the curve continues to surge. Not only do solar + storage facilities create a more valuable generation shape given today's duck curve, but also the addition of storage, and the conversion of an as-available solar resource to a partially dispatchable resource, creates a more comprehensive hedge to more closely follow the buyer's load shape.



Solar only vs. Solar + Storage

The chart below illustrates the difference in value between the generation shapes of a solar only and a solar + storage facility in California, where storage is 50% of solar nameplate capacity, and four-hours of discharge duration. The presence of the battery storage system will reduce the project's solar generation delivered to the grid during the low-priced, mid-day solar hours by approximately 30%, and will more than double its energy output to the grid during the highest-priced, late-day shoulder hours. Moreover, if properly designed and operated, the battery system can be partly charged using free, excess, behind-the-meter solar energy from the paired solar project. In a solar-only scenario, this free solar energy would otherwise be clipped behind-themeter and would never be delivered to the grid.1

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The Solar + Storage solution will **reduce** generation during low-priced "Solar Hours" by approximately 30% and increase generation during high-priced "Shoulder Hours" by approximately 110%.

¹ Most solar facilities are designed with a DC:AC sizing ratio > 1, which means that the DC energy that can be produced by the facility is greater than the interconnection rights, and therefore, during many months of the year the solar facility's generation is clipped.

Economical and operational benefits worth a look

Today, there are hardly any grid-scale solar projects being developed in California or the desert southwest that do not contemplate a paired battery storage component to the solar development site. The result is a more dispatchable renewable energy generation asset that can shift its daily shape to capture the highest-priced, most valuable hours. On a macro level, the prevalence of grid-scale battery storage will enable the market to effectively deal with the duck curve phenomenon, while also providing the grid with a carbon-free source of capacity and resource adequacy. If you are an offtaker contemplating solar generation to power your California or desert southwest load, it is worth taking a hard look at the economics and operational benefits of adding a paired battery storage system to the solar offering.





This piece is written by Michael Pariser, Associate Director of Origination for EDF Renewables North America.

Michael manages customer relationships for EDF Renewables wind, solar, and battery storage offerings throughout the United

States, and has successfully sourced and structured longterm Power Purchase Agreements with several Fortune 500 renewable energy buyers. From 2014-2016, Michael served as a Founding Executive Board Member of the Rocky Mountain Institute's Business Renewables Center. Michael holds a B.S. in Finance and International Business from Georgetown University and an MBA from Rice University

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15445 Innovation Drive San Diego, CA 92128 www.edf-re.com