

## Bess response time

For a battery energy storage system to be intelligently designed, both power in megawatt (MW) or kilowatt (kW) and energy in megawatt-hour (MWh) or kilowatt-hour (kWh) ratings need to be specified. The power-to-energy ratio is normally higher in situations where a large amount of energy is required to be discharged within a short time period such as within frequency regulation applications. For pricing purposes, however, the quoted measure is usually the energy rating.

Battery storage systems have several advantages when paired with renewable energy and non-renewable forms of generation. Solar and wind can be unpredictable, so battery storage systems are a key component in steadying energy flow by providing a steady supply whenever required, irrespective of weather conditions. Additionally, BESS can protect users from potential supply interruptions that could threaten the energy supply. Here are some of the benefits of battery storage systems:

Installing a battery energy storage system powered by renewable energy generation technologies helps reduce carbon emissions from fossil fuels and contributes to the net zero pathways in combatting the effects of global warming.

BESS allows consumers to store low-cost solar energy and discharge it when the cost of electricity is expensive. In doing so, it allows businesses to avoid higher tariff charges, reduce operational costs and save on their electricity bills.

The sun is not always "on." A battery storage system works round the clock and therefore compensates for any fluctuations in solar energy supply by storing any excess energy and maximise renewable energy generation.

Battery systems can co-locate solar photovoltaic, wind turbines, and gas generation technologies. In doing so, BESS co-location can maximise land use and improve efficiency, share infrastructure expenditure, balance generation intermittency, lower costs, and maximise the national grid and capacity.

The battery energy storage system can regulate the frequency in the network by ensuring it is within an appropriate range. Discrepancies between generated and required energy can cause short-term problems, such as outages or blackouts, but BESS can quickly react and secure sub-second frequency response, stabilising the network. Additionally, it guarantees voltage stability by keeping it within established boundaries.

Rated Energy Storage Capacity is the total amount of stored energy in kilowatt-hours (KWh) or megawatt-hours (MWh). Capacity expressed in ampere-hours (100Ah@12V for example).

The amount of time or cycles a battery storage system can provide regular charging and discharge before failure or significant degradation. Cycle Life is the number of times a battery storage part can be charged and

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discharged before failure, often affected by Depth of Discharge (DoD), for example, one thousand cycles at a DoD of 80%.

Self-discharge occurs when the battery's stored charge (or energy) is reduced through internal chemical reactions or without being discharged from performing work for a customer or the grid. Self-discharge is usually expressed as a percentage of the charge lost over a certain period. It is an essential parameter in batteries intended for longer-duration applications.

Discharge Rate (C) describes the current that a battery can deliver for a period of time, as an example, C5 is the current a battery will provide over 5 hours to reach full discharge.

The state of charge is usually expressed as a percentage representing the battery's present charge level and ranges from wholly discharged to fully charged. The state of charge influences a battery's ability to provide energy or ancillary services to the network at any given time. The state of Charge expresses the amount of capacity remaining.

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