



Battery Energy Storage Systems

Battery Energy Storage Systems (BESS) are facilities that store electricity for later use. Energy can be stored via mechanical, chemical, and thermal storage mechanisms. BESS are an example of storage via a chemical (electrochemical) reaction mechanism. As such, they generate heat upon use, which needs to be closely monitored.

Components

Typical Characteristics

- Prefabricated and housed in enclosures or containers
- Units include thermal management systems (such as HVAC systems), fire detection and suppression systems
- Projects typically include control systems, fencing, access roads, stormwater controls, and supporting electrical interconnection facilities
- Supporting electrical interconnection can include power conversion equipment, transformers, inverters, switchgear or substation.

Battery Types

Lithium-ion batteries are the most common utility-scale storage technology, but damage or battery management system failures can cause overheating and create a thermal runaway risk. Flow and zinc-hybrid batteries are less common on utility scale but generally have lower fire risk and longer lifespans, typically lasting 10 to 20 years compared with approximately 5 to 15 years for lithium-ion batteries.

Enclosures

The self-contained enclosures may be located on a concrete pad or concrete pile over gravel, or the facility may be within a warehouse-type enclosure. Containers for BESS may be around 40 feet by 8 feet by 8.5 feet; however exact dimensions can vary by manufacturer and project specifics.

Example of a BESS exterior



Example of a BESS interior



Photographs from Puget Sound Energy Glacier Battery Storage Innovation Pilot Project



Facility Siting

Favorable locations for siting BESS include:

- Near end users, substations, transmission lines, and distribution infrastructure, depending on the project's scale and intended function
- Available interconnection capacity and identified utility needs
- Adequate space for fire response and defensible buffering
- Elevated, dry sites outside of flood risk areas
- All-weather access for construction, operations and maintenance, and emergency response
- Adequate setbacks from sensitive receptors to minimize visual and noise impacts.

Construction phase haul routes may be needed for delivery of battery containers, transformers, and other heavy electrical equipment. Depending on equipment dimensions, weight, and delivery routes, projects may require oversized/overweight load permits, access permits, and road use agreements.

The modular, scalable, and ability of prefabrication for BESS allows relatively flexible siting considerations.



Constable, a PGE-owned facility located in Hillsboro, Oregon. Source: PGE



Samish Island Fire Station BESS. Source: PSE