Washington
Green Transportation Program
Moving forward with Washington's public fleets

Battery Energy Storage Systems

Battery energy storage systems (BESS) are an important part of electrical grid infrastructure. They are often co-located with wind or solar projects to firm intermittent electrical production, increase capacity factors, and maximize existing transmission line capacity.

BESS charge during periods of excess energy production when energy prices are low, and discharge when needed, such as during shoulder hours for a solar generating station. BESS projects are often located near load centers, preferably within one mile of an existing utility substation.[1]

BESS power output is provided in megawatts (MW) and stored energy capability is described as megawatts per hour (MWh). A 200 MW/400 MWh BESS project could provide 200 MW of power for up to two hours when fully charged (or 100 MW for four hours).

Lithium-ion BESS

Li-ion BESS is a mature, relatively low-cost technology with a high specific energy density and a very fast response rate, making it ideal for grid balancing and firming of intermittent renewable resources.[2] These systems are often co-located with wind and solar projects, or sited adjacent to utility substations with transmission line access. Construction time is minimal. These systems have an 85% to 95% turnaround efficiency with discharge times up to eight hours.[2]

Modular design enables flexible sizing

Li-ion BESS sizes are flexible due to their modular design. Multiple Tesla Li-ion Megapacks can be installed to achieve the desired power and energy storage at a location. Megapacks have internal thermal management systems and can be located outdoors.[3] [5]

Eolian's 350 MW/1,400 MWh BESS system in Texas.

Each 28-ton Megapack contains 200,000 Li-ion cells and can provide 1.26 MW/2.53 MWh (2-hour rating) or 0.74 MW/2.96 MWh (4-hour rating).[3]

Each Megapack is factory assembled and tested, then shipped to the location in a 40-foot shipping container. Only seismic anchoring, conductor connections, and a communications cable are required before the Megapack assembly is ready for use.

Siting BESS Projects

Early BESS projects faced fewer barriers to permitting and siting as illustrated by experiences in Oregon and Washington.

Siting success in Oregon

Oregon has been busy siting and building BESS projects. Oregon's first standalone, large-scale BESS projects were permitted by city planning departments; in some cases, these projects did not even require a public hearing.[1]

Portland General Electric (PGE) is active in BESS development:
A 30 MW/120 MWh BESS project co-located with a 300 MW wind farm and a 50 MW solar facility in Morrow County,[6] began operation in 2022.

PGE is working with NextEra Energy to develop a 200 MW/400 MWh BESS project near Troutdale.[6] This facility will be the biggest BESS in the Pacific Northwest. PGE signed a 20-year Storage Capacity Agreement for this project.[6]

Eolian is building a 200 MW/400 MWh BESS system in Portland that will be owned by PGE. The project is expected to begin service in 2025.[6]

Siting barriers in Washington

In contrast, independent energy companies in Washington have encountered community pushback with several proposed BESS projects near schools, subdivisions, wetlands and salmon-bearing streams, and in rural property zoned for no more than one house per five acres.[1]

BESS opponents state that banks of tightly packed Li-ion batteries pose an unacceptable risk of catching fire. Neighbors fear such fires could send toxic smoke into the community and release toxic runoff into nearby streams when the fire is extinguished.[1]

A 200 MW BESS project proposed on a vacant lot behind a lumber mill has encountered less opposition. Another 200 MW project in a light industrial district dominated by warehouses is also moving ahead.[1]

As of September 2024, transmission planners at Puget Sound Energy had 15 to 20 requests for BESS projects in their queue for evaluation. Seattle City Light is designing a 10- to 35-MW BESS system for plug-in hybrid ferry charging.[1] The city councils in Covington, Black Diamond, and Renton along with commissions in Yakima and Benton counties passed moratoriums on processing BESS permits to give themselves time to formulate siting and safety rules.[1]

Gaining Traction Despite Siting Barriers

Project developers compare their BESS projects to self-storage facilities, stating that they are quiet and cause no commute traffic. They also note that fires are extremely rare. Success stories include:

- A 100 MW/200 MWh BESS project located near Angleton, Texas. It sits on 7.7 acres of land but the actual footprint of the project is 2.5 acres.[7]
- A 300 MW/450 MWh grid-scale BESS project used for solar and wind output firming in Victoria, Australia, covers an area smaller than a football field. It came online in 2021, only three months after approval.[8]
- Rongke Power commissioned a 100 MW/400 MWh vanadium flow battery BESS project in Dalian, China, in 2022.

As of May 2023, the total installed energy storage of flow battery projects worldwide was approximately 1,000 MWh and the global deployment of Li-ion-based BESS was 2.8 million MWh.[9] The International Energy Agency predicts that grid-scale batteries will account for most energy storage growth worldwide in the near future. The U.S. DOE states that total installed costs of intra-day electricity storage are $1,100/kW to $1,400/kW.[10]

[1] Tom Banse. "Battery Farms, the Energy Industry's New Darling, Line up to Enter Pacific NW." *Washington State Standard*. Sept. 5, 2024

[2] OnLocation. "Electricity Storage Technology Review." Prepared for the U.S. Department of Energy Office of Fossil Energy, June 30, 2020.

[3] Scott Rhode. "Homer Electric Association Deploys Tesla Batteries in Soldotna." *Alaska Business Magazine*, March 30, 2022.

[4] Tesla. "Megapack Datasheet." Standard system specifications. June 2020.

[5] Cameron Murray. "Eolian to Deploy 350 MW of 4-hour Duration BESS for CPS Energy in Texas." *Energy-Storage News*, Aug. 29, 2024.

[6] Stephen Singer. "Portland General Electric to Add 400 MW of Battery Storage at 2 Sites in Partnership with NextEra, Eolian." *Utility Dive*, May 1, 2023. See also Wheatridge Renewable Energy Facilities Fact Sheet.

[7] Maria Merano. "Tesla's 200 MWh Megapack Installation in Angleton, TX is Ready for the Next Big Freeze." Teslarati, Jan. 6, 2022.

[8] FAQS. "Victorian Big Battery—Securing Power for Victoria."

[9] Rongke Power. "Milestone Projects: The Dalian ConCurrent Energy Storage Project."

[10] U.S. Department of Energy. "Pathways to Commercial Liftoff: Long Duration Energy Storage." March 2023

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***Our Mission Statement**: Creating Energy Solutions*

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