



**Hawaiian
Electric**

Battery Energy Storage Systems Frequently Asked Questions

What is BESS? BESS, or Battery Energy Storage System, is a system that stores energy for use at a later time using a battery technology. Hawaiian Electric's proposed BESS projects will employ state-of-the-art, grid-tied energy storage battery units. Each battery unit consists of lithium-ion batteries, a circuit breaker panel, inverter, and an internal temperature-control system packaged together as a single unit. Groups of battery units work together to operate as a single large battery system.

BESS can provide multiple grid benefits including load-shifting and contingency support.

Load-shifting – stores energy during periods of low customer demand, for use during early morning hours and at night when electricity demand is at its highest. This type of BESS enables the electric grid to accommodate more renewable sources, such as solar and wind, while it displaces thermal generation and helps lower emissions.

Contingency – allows stored energy to be sent to the grid as a quick response to an unexpected event such as a sudden drop in energy production from wind, solar, or a thermal power plant. This quick response capability improves grid reliability and reduces the likelihood of customer outages.

Why is it necessary to build these BESS? Energy storage is an important component of a clean, sustainable energy future. By storing energy when customer demand is low and then delivering it during peak demand hours, the electric grid is able to accommodate more renewable energy sources (such as solar and wind) and reduce fossil-fueled generation. At the same time, these storage systems help even out the fluctuations of wind or solar energy sources, thus increasing system reliability.

Please explain how a grid-tied BESS is different from a PV- or wind-connected battery storage? Grid-tied means the BESS will be charged by power from the grid. A grid-tied BESS offers an advantage over PV- or wind-connected BESS during days of higher loads and prolonged overcast conditions (lower levels of solar irradiance) or low wind production, when the ability for PV- or wind-connected energy storage to charge will be limited.

Please explain why Hawaiian Electric bid on its own RFP? Under the rules of the Competitive Bidding Framework issued by the Public Utilities Commission (PUC), Hawaiian Electric can propose “self-build” projects to meet the generation and/or capacity needs issued in the RFP, as long as the Company complies with a strict Code of Conduct approved by the PUC. The PUC has chosen an Independent Observer to ensure that the Code of Conduct is followed, and that all proposals are treated fairly and equitably.

What measures are being taken to prevent leaks of any hazardous materials into the soil? The BESS units that the Company has selected are self-contained units that

will be placed on concrete pads. They are designed for outdoor use in harsh environments such as high humidity, salt spray, dust and rain. The BESS units include small closed-loop cooling systems that contain refrigerant and liquid cooling agents, which are enclosed within the BESS cabinets. The system does not contain any fuel, lead, mercury, cadmium, chromium, or other heavy metals.

What measures are being taken to prevent a fire within the BESS? The BESS system has a modular design, which compartmentalizes the battery into small modules. Each module has an internal temperature control system that keeps the batteries at optimal working temperatures, as well as electrical safety systems which shut down and disconnect the module in the event of a fault. The BESS design complies with industry fire and safety standards, and rigorous fire safety testing has been conducted. In the unlikely event that the inherent safety measures are unable to prevent a fire, the compartmentalized design prevents the spread to adjacent units. As an added protective measure, Hawaiian Electric will maintain the areas around the battery units clear of vegetation.

Is Hawaiian Electric or the PUC considering the deferral some of the milestone dates especially in light of the current health crisis? The decision to defer the milestone dates for any of the self-build projects is a question for the Hawaiian Electric RFP team. Developers, including the Hawaiian Electric self-build team, must follow the requirements of the RFP and we cannot speculate on the timeline. Please contact the RFP team via email mauivariablelrfp@hawaiianelectric.com for the Maui project, and hawaiivariablelrfp@hawaiianelectric.com for the Hawai'i Island project.

Who selected the winning bidders? The selection process was handled by the Hawaiian Electric RFP team, overseen by an independent observer, and with the approval of the PUC. A total of 16 projects were selected on May 11, 2020 to the final award group, including Hawaiian Electric's proposed projects on Maui and Hawai'i Island at Keāhole Power Plant.

Who is on the selection committee? Do you know how many bidders there were? Is there an overlap between the Self-Build and RFP teams? The PUC-approved code of conduct established an internal "firewall" between the Hawaiian Electric Self-Build team and the RFP team, so the self-build team does not know who is on the selection committee or how many bidders responded to the RFP. There is no overlap between the self-build and RFP teams, and they are not allowed to communicate on matters related to the RFP except through methods that all developers can use such as the RFP email addresses (see above) and the Power Advocate online bid submittal system.

Why were these sites selected? Were other sites evaluated? The selected sites were chosen because of their size, terrain, and proximity to existing substations on land that is already zoned for industrial purposes. This will help minimize interconnection power lines, site preparations, and permitting costs, and tie the BESS directly to the substations that feed major transmission lines as required by the RFP. Hawaiian

Electric's self-build team also pursued other sites but they were either too small, too far, or would prohibit the project from meeting the RFP requirements.

How many stand-alone battery systems has Hawaiian Electric built? The Keāhole and Waena BESS projects will be the first stand-alone battery systems to be built by Hawaiian Electric. Tesla, the selected battery manufacturer, has more than 15 years experience as a leading provider of state-of-the-art energy storage systems, and they are highly qualified to deliver the best value for our customers. Their technological expertise, production capacity, and project deployment experience, along with on-island operations support and staffing, also were factors in their selection.

How will the systems be financed? All capital projects like the proposed BESS are financed through a mix of debt and equity as part of our Capital Projects program. Once the projects go into service and are useful to our customers, the cost is included in the rate base.

The cost per kilowatt hour is not included in any of the presentations. Will this information be disclosed to the public? Costs will be determined on a monthly total-cost-to-customers basis, rather than per kilowatt hour.

What are the impacts on customer electric bills?

For Keāhole BESS, the estimated bill impact for the average Hawai'i Island customer will be an additional \$0.86 per month increase.

For Waena BESS, the estimated bill impact for the average Maui customer will be an additional \$3.22 per month increase.

Please note that the above bill impacts are only for the projects, and do not take into account any fuel costs savings or other associated savings that will be realized due to the projects' integration into the respective electric grids. Additionally, if the actual project costs come in less than forecasted, the bill impacts will be reduced.

What are the total project costs and when will the BESS projects be completed?

The Keāhole BESS project is scheduled to be completed in July 2023 at a total estimated cost of \$16.9 million. This cost will cover primarily engineering, procurement, construction, and interconnection.

The Waena BESS project is scheduled to be completed in November 2023 at a total estimate cost of \$60 million. This cost will cover primarily engineering, procurement, site development and construction, permitting, system commissioning and integration, high-voltage interconnection and metering equipment, and a new 69kV bay and transmission lines.

What is the life cycle of the self-build projects? How often do you have to replace the batteries? What happens to the batteries? The projects have a 20-year life cycle. As needed, new batteries will be added when the original batteries lose their capacity. The old battery modules will be returned to the battery manufacturer on the U.S. mainland which has a robust recycling program so that the battery parts may be reused in other applications.

What is the estimated greenhouse gas (GHG) emissions reductions from these projects? As a load-shifting battery storage system, the Waena BESS project will provide significant reductions of GHG emissions over the project lifecycle and reduce the need for fossil fuel generation. Keāhole BESS is a contingency battery and will not result in overall net reduction of GHG emissions, however, it will provide grid stability in the event of sudden generation loss and reduce the likelihood of customer outages. For further details, please refer to the application filing.

Are any of the sites located in tsunami evacuation zones? No, the RFP does not allow projects to be built in tsunami evacuation zones. All Hawaiian Electric proposed projects are located outside the zones.

Are the batteries able to withstand a hurricane, tsunami, earthquake, flood, etc. How? The battery technology selected can withstand extreme environments, including Category 5 winds with gusts up to 157 mph as well as high heat and humidity, corrosive atmospheres, rain. A single battery unit resembles a shipping container and is sized at approximately 23'-5" (width) x 5'3" (depth) x 8'3" (height) and weighs between 43,430 pounds to 56,000 pounds. When deployed, it will be anchored to a concrete pad.

Have you considered vertical stacking of the batteries? Vertical stacking was not necessary for the proposed self-build BESS projects because the site sizes were adequate for the amount of storage needed on each site. For our projects, vertical stacking would have resulted in higher construction and maintenance costs, and unnecessary risk in the event of a thermal issue where heat travels from the lower batteries upward. It is technically feasible to do so, but was not necessary for the Hawaiian Electric projects since the site footprints were not an issue.

Are there any issues with noise? Does it emit anything? The proposed BESS projects are not significant noise sources (at 75 decibels, about the sound output of a vacuum cleaner at the battery enclosures) and are located on properties zoned for industrial uses, thus away from residential neighborhoods. The batteries do not use fuel and will not produce any fumes or other emissions.

How efficient are these batteries? Modern battery technology is approximately 85% efficient, which means the batteries give back to the grid about 85% of the energy that is used to charge them.

What kind of impact will the community experience as these projects are built? We anticipate there will be minimal impacts felt by the community during the

implementation of the BESS projects since these projects are away from residential areas. We will coordinate delivery of the units with the Hawai'i Department of Transportation to off peak hours as much as possible, and alert the public through traffic advisories as needed.

Will the the BESS projects have any visual impact? The height of the BESS battery unit is about 8'3". In comparison, the top of a basketball hoop is 10 feet above the ground. Generally speaking, from street level views, the BESS projects will not change the overall visual character of the locations where they are proposed, as they will be located on industrial-zoned lands within or behind existing infrastructure.

Who is on the other end of the BESS email addresses? – The self-build community relations specialists for the island-specific projects are responding to the questions, comments, and feedback received through the Hawaiian Electric BESS emails.

On Maui: Kūhea Asiu (mauibess@hawaiianelectric.com)

On Hawai'i Island: Emil Osorio (keaholebess@hawaiianelectric.com)
