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Clean Energy Options for the Suquamish Tribal Museum and House of Awakened Culture

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Community Partner

Suquamish Tribe
Community Liaison: Hannah Ljunggren
Special Thanks: Joe Bethea, Annie Smaus, Todd Stroud, Aaron Wheeler

Co-Design Goals

Explore energy system designs that can reduce energy bills, lower carbon pollution, and increase outage resiliency. Capital costs and operating savings were estimated for the:

- **All-electric Museum**, where solar energy and battery storage were evaluated for impact on costs, carbon, and extending the back-up duration for the generator.
- **Propane-heated House of Awakened Culture (HOAC)**, where adding a heat pump, solar, and battery storage were evaluated for impact on costs, CO_2, and outage resilience.

Methodology

- **Project scope** was established through weekly meetings with community liaison, a site visit, meter and propane bills, as well as detailed building-use data.
- **Building performance analysis** aligned energy use patterns to average temperatures and operational schedules to create customized models for the HOAC and Museum.
- **Hourly loads for a year** were synthesized from the building and use-case models.
- **Energy design and financial analysis** utilized engineering software tools REOpt and PVWatts, supplemented by spreadsheet calculations, with results reported in a manner that recognizes capital costs will be raised largely through state and federal grants.

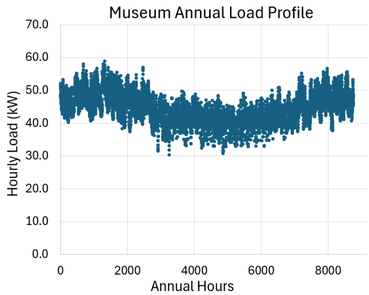
Outcomes

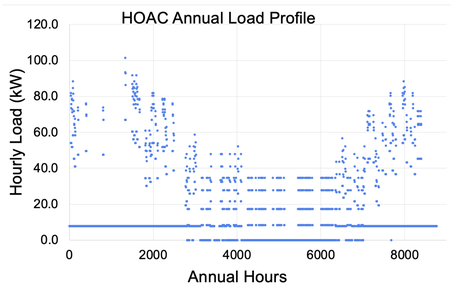
- **Museum ten-year net present value savings** increase linearly with PV sizes, up to the net-metering limit of 100 kW, but adding a battery has less benefit on NPV. We estimate 100 kW of PV with a 90kWh battery would save over $50,000 NPV, while requiring about 90% of the capital grant-financed by or direct-pay credit for break-even in a decade.
- **The HOAC's ten-year net present value** assumed replacement of the propane boiler with a heat pump. The HOAC is more sensitive to battery size than the Museum, owing to higher simulated demand charges. A 100kW PV array with 200kWh battery would generate over $130,000 NPV savings, requiring at least 80% grant-financing of capital.
- **About 42 tones of annual carbon pollution reduction** results from eliminating the HOAC propane fired boiler. State regulations require net-zero PSE electricity by 2035.
- **Outage resiliency in the museum** currently relies on a diesel generator capable of sustaining full operations for 80 hours. Adding solar+storage can roughly double the Museum's summer ride-through time. HOAC's outage ride-through time is fairly complex, since it is entirely dependent on the solar+storage system (no generator is assumed).

Design Process

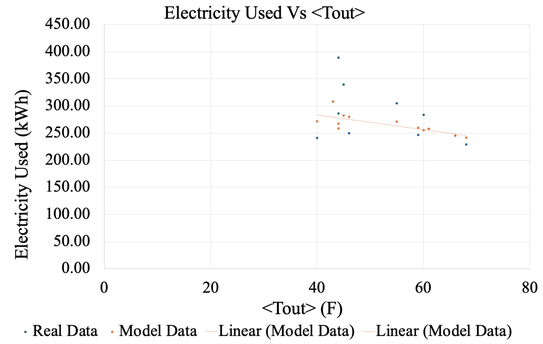
Project scope: February 2024
Evaluated equipment at both buildings and discussed daily operation with building associate

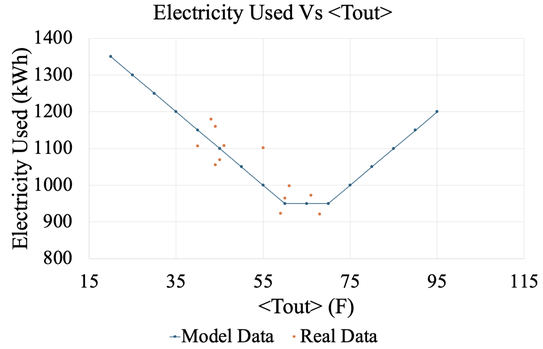
Hourly load profiles: April 2024



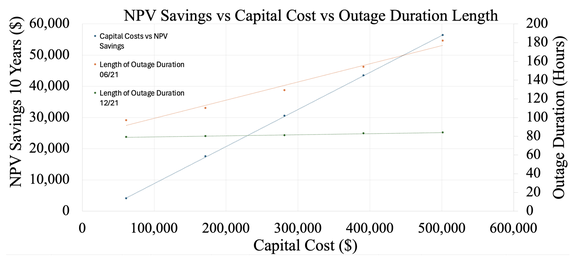


Analysis: Feb–March 2024
Created customized models for the HOAC and Museum





Museum resiliency: May 2024



Energy design and financial analysis: May 2024