PUBLIC WORKS COMMITTEE
MEETING AGENDA

Online via Zoom and In Person at Tumwater City Hall, Council Conference Room, 555 Israel Rd. SW, Tumwater, WA 98501

Thursday, July 17, 2025
8:00 AM

1. Call to Order
2. Roll Call
3. Approval of Minutes: Public Works Committee, May 22, 2025 & June 5, 2025
4. Interagency Agreement with Washington Department of Commerce for Washington Electric Vehicle Charging Program Closeout Update (Water Resources & Sustainability Department)
5. Fire Stations Solar and Battery Storage Feasibility Assessments Closeout Update (Water Resources & Sustainability Department)
6. Additional Items
7. Adjourn

Meeting Information
All committee members will be attending remotely. The public are welcome to attend in person, by telephone or online via Zoom.

Watch Online
https://us02web.zoom.us/j/83301506447?pwd=BmhqdPEilwH0vBUdFF8NzH1mA8xaR.1

Listen by Telephone
Call (253) 215-8782, listen for the prompts and enter the Webinar ID 833 0150 6447 and Passcode 503889.

Public Comment
The public may submit comments by sending an email to council@ci.tumwater.wa.us, no later than 5:00 p.m. the day before the meeting. Comments are submitted directly to the Committee members and will not be read individually into the record of the meeting.

Post Meeting
Video of this meeting will be recorded and posted on our City Meeting page: https://tumwater-wa.municodemeetings.com.

Accommodations
The City of Tumwater takes pride in ensuring that people with disabilities are able to take part in, and benefit from, the range of public programs, services, and activities offered by the City. To request an

accommodation or alternate format of communication, please contact the City's ADA Coordinator directly, call (360) 754-4129 or email ADACoordinator@ci.tumwater.wa.us. For vision or hearing impaired services, please contact the Washington State Relay Services at 7-1-1 or 1-(800)-833-6384.

TUMWATER PUBLIC WORKS COMMITTEE
MINUTES OF VIRTUAL MEETING
MAY 22, 2025 Page 1

CONVENE: 8:00 a.m.

PRESENT: Chair Eileen Swarthout and Councilmember Michael Althauser.

Excused: Councilmember Angela Jefferson.

Staff: City Administrator Lisa Parks, City Attorney Karen Kirkpatrick, Assistant City Administrator Kelly Adams, Finance Department Director Troy Niemeyer, Transportation and Engineering Department Director Brandon Hicks, Water Resources & Sustainability Department Director Dan Smith, City Engineer Bill Lindauer, Engineer III Ryan Blaser, Engineer II Jared Crews, Engineer II Colby Fletcher, Community Engagement Specialist Marnie McGrath, Water Resources Specialist Grant Gilmore and Water Resources Specialist David Kangiser, and Administrative Assistant Kelly Quiroz.

SERVICE PROVIDER AGREEMENT WITH HERRERA FOR THE NUTRIENT REDUCTION ENHANCED MAINTENANCE PLAN REVISION:

Specialist Kangiser presented the proposal for a Service Provider Agreement with Herrera for the Nutrient Reduction Enhanced Maintenance Plan. Since the last briefing, Herrera requested some revisions to the agreement.

The project involves analyzing the current maintenance program and practices of the stormwater team to help address Budd Inlet's dissolved oxygen TMDL (Total Maximum Daily Load) calculation assigned to the City. The project is intended to reduce nutrients discharged from the City's stormwater system into receiving waters. A spatial analysis will be completed for nutrient loading, as well as addressing street sweeping requirements that were recently added to the City's NPDES (National Pollutant Discharge Elimination System) permit requirements. The project will identify maintenance activities needed for the TMDL and NPDES permit, identify required resources to meet the requirements, and identify any data gaps. Existing spatial analysis will assist in identifying some of the troublesome areas for pollution. Spatial analysis will include land use as well as current stormwater best management practices in place to treat stormwater.

Staff selected Herrera following two rounds of Request for Qualifications (RFQs) because the company has familiarity with the City's project management team and experience working on other City projects. Herrera is also performing the same work for the cities of Bellingham and Tukwila.

The grant agreement was executed last month for $200,000. The

Herrera Service Provider Agreement is for an estimated amount of $190,000 with project completion scheduled in 2026.

The recommended action is to place the Service Provider Agreement with Herrera for the Nutrient Reduction Enhanced Maintenance Plan – Revised, on the June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign.

Chair Swarthout questioned an addition of a provision within the agreement. City Attorney Kirkpatrick advised that the provision is required by state statute. The provision is not included in the City's standard template for service provider agreements. Depending on the type of service to be performed, the language is required by statute.

MOTION: **Councilmember Althauser moved, seconded by Chair Swarthout, to place the Service Provider Agreement with Herrera for the Nutrient Reduction Enhanced Maintenance Plan – Revised, on the June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign. A voice vote approved the motion.**

GRANT AGREEMENT WITH THE DEPARTMENT OF ECOLOGY FOR THE PIONEER PARK RESTORATION PROJECT PHASE 2:

Specialist Gilmore presented the proposal for the Pioneer Park riparian restoration project. Staff is recommending two actions by the committee. The first action is to approve the Department of Ecology Water Quality Financial Assistance Agreement. The second action is to recommend approval of Amendment 3 for Stantec to proceed with Phase 2 design of the project.

The project is comprised of streambank stabilization and buffer restoration. The Deschutes River watershed encompasses 143 streams totaling 256,000 linear miles. The project section of the river has an attached TMDL requirement that was identified in 2015 and updated in 2018. The TMDL requires reduction of fine sediment loading by 46% and an increase in shading cover by over 50%.

The grant award is for $500,000 to assist the City in completing Phase 2 design, permitting, and construction of the project. The project is funded by the Stormwater Utility and is included in the Capital Facilities Plan. The project includes two phases funded by two grants. Phase 1 totaled $338,000 with a match requirement by the City of 25% for a project total of $450,781.50. Phase 2 will add an additional $500,000 with no match requirement. The total project will cost $950,781.50.

Specialist Gilmore reviewed the recommended action to place the grant agreement with the Department of Ecology for the Pioneer Park Restoration Project Phase 2 on the June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign.

SERVICE PROVIDER AGREEMENT WITH STANTEC FOR THE PIONEER PARK RESTORATION PROJECT - PHASE 2 AMENDMENT 3:

Specialist Gilmore reported the project is currently in Phase 1 with 90% project design completed. With the approval of Amendment 3, project tasks can move forward to complete an engineered design for final plan specifications and estimates to enable submittal of Phase 1 design documents for permit approval. Phase 1 work specifically addresses the riparian zone with no in-water work, which will expedite the permitting process to move quicker to construction in 2025/2026. The intent is to release a Request for Proposal (RFP) in September/October 2025 to select a contractor to construct the project. The agreement also includes Phase 2 design, engineering, and permitting with construction estimated to occur in 2027/2028.

The proposed amendment increases the project budget for Stantec to complete Phase 2 design and permitting to $190,285.

Staff recommends placing the Service Provider Agreement with Stantec for the Pioneer Park Restoration Project Phase 2, Amendment 3 on June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign.

Specialist Gilmore addressed questions about the potential of the project cost increasing because construction is not scheduled to begin until February 2027. Excellent modeling was completed by Stantec providing a predictable rate of erosion. The engineering design is predicated on that rate although it is recognized that the river is a constant moving target. Staff is confident that all data have been identified to implement an effective design and construct the project.

MOTION: **Councilmember Althauser moved, seconded by Chair Swarthout, to place the grant agreement with the Department of Ecology for the Pioneer Park Restoration Project Phase 2 on the June 3, 2025 Council consent calendar with a recommendation to approve and authorize the Mayor to sign. A voice vote approved the motion.**

MOTION: **Councilmember Althauser moved, seconded by Chair Swarthout, to place the Service Provider Agreement with Stantec for the Pioneer Park Restoration Project Phase 2, Amendment 3 on June 3, 2025 Council consent calendar with a recommendation to**

approve and authorize the Mayor to sign. A voice vote approved the motion.

YORKSHIRE RIGHT OF WAY VACATION DISCUSSION:

Engineer Crews briefed the committee on a potential right-of-way vacation for a private development project. The Yorkshire project is an approved mixed-use development comprised of apartment units and commercial space and storage. The project site is located west of I-5 between Israel Road and Tumwater Boulevard. The project proponent submitted a petition signed by adjacent property owners in compliance with Tumwater Municipal Code to vacate a portion of unopened right-of-way known as Robison Road located north of Tumwater Boulevard. Robison Road is an old fragment of right-of-way remaining from the original platting of the City that was never developed. The City has no current plans to develop the right-of-way. The right-of-way includes low vegetation, shrubs, and trees. If vacated, the right-of-way would be returned as private property to the adjacent property owners for potential actions within current permitting and zoning regulations. The City has not identified the right-of-way for any future City use. Engineer Crews identified the right-of-way on an aerial map for the benefit of the committee.

The Transportation & Engineering Department plans to present a petition for vacation of unopened Robison Road to the Public Works Committee for review and feedback on pursuing a vacation. If the committee supports the proposal, the next step is scheduling a public hearing to receive testimony on the proposed vacation. If the vacation is not supported, the right-of-way would remain in City ownership.

City Attorney Kirkpatrick described the steps necessary to approve a right-of-way vacation. The first step is adopting a resolution to enable scheduling of the public hearing. The resolution establishes the date and time of the public hearing.

Engineer Crews provided additional information on the right-of-way. Within the original platting of Tumwater, Thurston County, and the greater Washington area, platting was completed by blocks with standard parcels and lots and right-of-way located throughout those blocks. The existing right-of-way is a fragment of the original platting of the City. As the City developed and added roadways to include Tumwater Boulevard and Interstate 5, the need for that right-of-way was not required and remained vacant.

Chair Swarthout asked how the proposal might affect the future

connection of Tyee Drive to Tumwater Boulevard. Engineer Crews affirmed the plan to connect Tyee Drive to Tumwater Boulevard; however, the existing plan routes Tyee Drive to the south of the Israel Road/Tyee Drive roundabout to the south/southwest connecting to Tumwater Boulevard. The new connection of Tyee Drive to Tumwater Boulevard will not be impacted by the right-of-way vacation. Based on future improvements to Tumwater Boulevard and I-5, future private development on the vacated right-of-way could occur as long as it meets all City codes. The property includes frontage along Tumwater Boulevard and could include access; however, it would be heavily restricted if developed to ensure adequate space between the future intersection of Tyee Drive and Tumwater Boulevard, as well as setback from the Washington State Department of Transportation (WSDOT)/I-5 interchange project.

Chair Swarthout questioned the possibility of the City requiring the right-of-way to accommodate the extension of Tyee Drive to Tumwater Boulevard. Engineer Crews displayed a preliminary approved site plan for the Yorkshire project reflecting the route of the Tyee Drive extension project. He identified how the extension project would not be impacted by the subject right-of-way. Potentially, the City may need to secure additional right-of-way through dedication if any of the Tumwater Boulevard improvements are outside of the prescribed right-of-way that has been identified.

Discussion ensued on the timing of the proposal and completion of the vacation. Engineer Crews advised that the proposal is not encompassed with a specific timeline as the property is owned by the City and can be considered based on resources. However, the City is required to respond timely to the applicant as it may affect plans for the applicant's project. City Attorney Kirkpatrick added that following adoption of the resolution, timelines are required for specific actions.

In response to questions surrounding the impact of the proposal on existing workloads and current projects, City Administrator Parks advised that the City is responsible to respond to an application. The City continues to monitor and adjust City priorities and schedules daily.

Director Brandon affirmed the ability of staff to manage the proposal at this time because of the ability of staff to manage priorities and because the City is obligated to consider and respond to the applicant.

The committee agreed to move forward to the next step of preparing the resolution for scheduling a public hearing.

LOCAL AGENCY AGREEMENT AND PROJECT PROSPECTUS WITH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION FOR THE 2ND AVENUE BICYCLE & PEDESTRIAN IMPROVEMENTS:

Engineer Blaser reported the project is located between Linwood Avenue and B Street. The Safe Routes to School project is a non-circular roundabout (double mini-roundabout) at the Linwood Avenue and 2nd Avenue intersection. From the intersection to B Street, other roadway, pedestrian, and bicycle improvements are included. Construction is anticipated to begin in late 2025 or in spring 2026.

The proposal is to initiate the construction phase of the project and the agreement between the City and WSDOT to enable the City to utilize $2.1 million in state funding from the Safe Routes to School Fund.

Chair Swarthout reviewed the requested action.

MOTION: **Councilmember Althauser moved, seconded by Chair Swarthout, to place the Local Agency Agreement and Project Prospectus with the Washington State Department of Transportation for the 2nd Avenue Bicycle & Pedestrian Improvements on the June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign the Prospectus; and the Transportation and Engineering Director to sign the Local Agency Agreement. A voice vote approved the motion.**

LOCAL AGENCY AGREEMENT AND PROJECT PROSPECTUS WITH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION FOR THE SOMERSET HILL FISH PASSAGE BARRIER REMOVAL:

Engineer Blaser reported the proposal is an agreement between the City and WSDOT for the engineering phase of the project. The project is located at Somerset Hill Drive SW along Percival Creek to correct a fish barrier with the intent to return the stream to more natural conditions, stabilize banks from further erosion, and protect existing utility infrastructure located adjacent to the stream. Construction is anticipated to begin in 2027. The proposal moves the project to the preliminary engineering phase to enable the City to utilize $600,000 in federal funding. Project funds include $4 million in federal funding from the PROTECT (Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program) Fund. Approximately $3.4 million has been secured for construction after completion of the engineering phase.

Chair Swarthout reviewed the requested action.

MOTION: **Councilmember Althauser moved, seconded by Chair Swarthout, to place the Local Agency Agreement and Project Prospectus with the Washington State Department of Transportation for the**

Somerset Hill Fish Passage Barrier Removal on the June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign the Prospectus; and the Transportation and Engineering Director to sign the Local Agency Agreement. A voice vote approved the motion.

LOCAL AGENCY AGREEMENT AND PROJECT PROSPECTUS WITH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION FOR THE PERCIVAL CREEK FISH PASSAGE BARRIER REMOVAL:

Engineer Blaser reported the proposal is removal of a fish passage barrier along Sapp Road. The proposed action moves the project forward to the construction phase. The project entails replacement of a fish culvert and installing a new culver to return Percival Creek to a more natural condition in addition to roadway improvements. Construction is scheduled to begin in 2026 with the release of the RFP for construction within the next several months. Following approval of the agreement, the City could utilize $2.3 million in federal and state funding with $2 million from PROTECT Fund and $257,000 from the Salmon Funding Recovery Board fund from the state.

Chair Swarthout asked whether the project would include installation of a new bridge. Engineer Blaser advised that the project includes removing an existing culvert and replacing it with a large concrete box culvert. The Somerset Hill project will likely include a larger structure that could possibly be a bridge.

Chair Swarthout reviewed the requested action.

MOTION:

Councilmember Althauser moved, seconded by Chair Swarthout, to place the Local Agency Agreement and Project Prospectus with the Washington State Department of Transportation for the Percival Creek Fish Passage Barrier Removal on the June 3, 2025 Council Consent Calendar with a recommendation to approve and authorize the Mayor to sign the Prospectus; and the Transportation and Engineering Director to sign the Local Agency Agreement. A voice vote approved the motion.

R2025-010 SIX YEAR TRANSPORTATION IMPROVEMENT PROGRAM:

Director Hicks presented the proposed 2025-2031 Transportation Improvement Program (TIP). The briefing focused on projects removed or added to the TIP. A public hearing on the proposed TIP is scheduled during the June 3, 2025 City Council meeting.

Adoption of the TIP each year is a requirement of RCW 35.77.010 to adopt an annual TIP by June 30 each year. The program must include transportation projects that are expected to be initiated within the next six years. The emphasis is on regional significant projects or projects the City anticipates will receive federal or state funds. The program

demonstrates that the City has advanced plans for a coordinated transportation system. The TIP is utilized to communicate with members of the community, neighboring communities, the state, and grant agencies to pursue funding opportunities. The City's TIP is incorporated within the Regional TIP administered through Thurston Regional Planning Council in coordination with other jurisdictions in Thurston County. The Regional TIP is forwarded to the state for inclusion in the State TIP.

Projects proposed for inclusion in the TIP are separated into general project types of capacity, preservation, maintenance, and enhancement, and multimodal. A map of projects does not include all multimodal projects included on the TIP, which will be revised prior to the public hearing.

Director Hicks reviewed new capacity and multimodal projects.

Capacity:

- Tumwater Boulevard and Henderson Boulevard Roundabout - Design for a roundabout at the intersection of Tumwater Boulevard and Henderson Boulevard.

Multimodal:

- 93rd Ave, Tigerlilly Street to City Limits - Reconstruction of 93rd Avenue to accommodate bike lanes and sidewalk in addition to lowering the roadway at a large hill to improve site distance for safety. Funding assumes a development agreement with expected development on abutting properties.
- 2nd Avenue Pedestrian and Bicycle Improvements - Construction of a roundabout (non-circular) at the intersection of 2nd Avenue and Linwood Avenue and multimodal improvements on 2nd Avenue from B Street to Linwood Avenue.

Director Hicks reviewed projects removed from the TIP:

- Deschutes Valley Trail Segments A2, B, C, D - Individual segments were removed and replaced as one project with different segments to align with one overall design project.
- Tumwater Boulevard Interchange - The large project will be combined into two separate phases with the focus on the northbound on/off ramp first followed by the southbound on/off ramp in the next six years. Staff is proposing to modify the lane configuration on the bridge to accommodate multimodal facilities.

- Old Highway 99 Corridor - 73rd Avenue to 79th Avenue is a similar project to the Tumwater Boulevard Interchange project by splitting a large project into different phases. The TIP includes the 79th Avenue Roundabout and the Henderson Boulevard Roundabout projects.
- Brewery District Plan - Streetscape Improvements are proposed for removal because they are not considered regionally significant. Staff also does not anticipate acquiring any grant funding. Improvements proposed in the project would be incorporated into other larger roundabout and street projects.
- Rural Road - The project consists of shoulder widening to afford space for pedestrians and bicyclists. The project is not regionally significant and poses substantial environmental implications. The project will likely be transferred as a multimodal project in the TIP. It is also unlikely the project would be constructed within the next six years because of permitting and potential endangered species implications.
- Traffic Signal Controller and Detection Upgrade - The project should be completed in 2025.

Staff requests placing the R2025-010 Six Year Transportation Improvement Program (TIP) update for 2026 - 2031 on the June 3, 2025, Council meeting agenda under Council Considerations for a public hearing and consideration with a recommendation to adopt.

Councilmember Althauser questioned the removal of the trail segments because he understood each segment was included to ensure the segments were competitive for grants. Director Hicks explained that when the City pursues grant funding for a larger corridor project, it is possible to pursue grants for single components of the larger project. The intent to consolidate all segments is to align with design as the City received $5.8 million from the state with $1 million obligated for design of the entire trail as one project. It may be possible to pursue additional funding required for the entire trail within the next six years as a single project.

Director Hicks added that the Safe Routes to School program is included on the TIP as a placeholder to enable the City to pursue funding for other projects.

Chair Swarthout asked whether the replacement of the Henderson Boulevard bridge was previously included in the TIP. Director Hicks said the project is included as a capacity project and renamed as the

Henderson Boulevard - 58th Avenue to Bridge project. The prior project name was changed as the project included widening the bridge; however, it is possible to install a stand-alone shared use path bridge because the existing bridge is structurally sound. The pathway would be installed on the park side of the river. Another addition to the project is a proposed roundabout at the entrance to Pioneer Park because of the high traffic use at the entrance to the park.

MOTION: **Councilmember Althauser moved, seconded by Chair Swarthout, to place the R2025-010 Six Year Transportation Improvement Program (TIP) update for 2026 - 2031 on the June 3, 2025, City Council meeting under Council Considerations for a public hearing and consideration with a recommendation for adoption.**

ADDITIONAL ITEMS: Chair Swarthout reminded everyone of the planned Public Works picnic at Tumwater Historical Park to celebrate Public Works Week. Director Smith said the catered lunch will also feature an assortment of games. Mayor Sullivan is scheduled to welcome everyone at noon later in the day.

ADJOURNMENT: **With there being no further business, Chair Swarthout adjourned the meeting at 9:17 a.m.**

Prepared by Valerie L. Gow, Recording Secretary/President
Puget Sound Meeting Services, psmsoly@earthlink.net

TUMWATER PUBLIC WORKS COMMITTEE
MINUTES OF VIRTUAL MEETING
JUNE 5, 2025 Page 1

CONVENE: 8:00 a.m.

PRESENT: Chair Eileen Swarthout and Councilmembers Michael Althauser and Angela Jefferson.

Staff: City Administrator Lisa Parks, City Attorney Karen Kirkpatrick, Finance Department Director Troy Niemeyer, Transportation and Engineering Department Director Brandon Hicks, Water Resources & Sustainability Department Director Dan Smith, GIS Manager Jennifer Radcliff, City Engineer Bill Lindauer, Capital Project Manager Jared VerHey, Senior Engineer Joseph Norman, and Community Engagement Specialist Marnie McGrath.

APPROVAL OF MINUTES: PUBLIC WORKS COMMITTEE MAY 8, 2025:

MOTION: **Councilmember Jefferson moved, seconded by Councilmember Althauser, to approve the May 8, minutes as presented. A voice vote approved the motion.**

ORDINANCE NO. O2025-002 RENEWING PUGET SOUND ENERGY FRANCHISE AGREEMENT: Manager Radcliff presented the proposal to renew a franchise agreement with Puget Sound Energy for operations within the City's right-of-way to provide energy services to residents and businesses. The current agreement is effective for 10 years with an option to renew for two, five-year terms upon written request. The agreement is at the end of the first ten-year period. PSE submitted written notice requesting an extension of the agreement for five years.

Staff requests the committee place the ordinance on the July 1, 2025 City Council agenda under *Council Considerations* for first reading.

Councilmember Jefferson inquired about the status of agreement after the expiration of the second, five-year agreement. Manager Radcliff replied that a new agreement would be negotiated after the second five-year agreement expires. She noted that no provisions in the existing agreement have changed with the new extension other than updating some legal language.

MOTION: **Councilmember Althauser moved, seconded by Councilmember Jefferson, to place the Energy (PSE) Franchise Agreement on the**

July 1, 2025, City Council consideration calendar for first reading. A voice vote approved the motion unanimously.

SUPPLEMENTAL AGREEMENT NO. 2 WITH TIERRA ROW FOR X STREET ROUNDABOUT PROJECT:

Engineer Norman reported on the request to execute a supplemental agreement with Tierra ROW for work on the X Street Roundabout project.

The new roundabout would be located at the intersection of X Street and Capitol Boulevard. The project is federally funded. Because of the size and shape of the roundabout, acquisition of more right-of-way is required necessitating the need for assistance by Tierra to satisfy federally required mandates for the project. The supplemental agreement increases the maximum payable from $150,000 to $184,220 and adjusts billing rates to 2025 rates. The benefit to the City is receiving a higher level of service than originally contracted. The original agreement was executed in 2023 when the City's Deputy Director was available to assist with management oversight of the project. The funds are covered under the local agency agreement of $200,000 for consultant services the City received in July 2020.

Councilmember Jefferson asked for additional clarification as to the requirement for additional right-of-way. Engineer Norman responded that additional property is required for the project to construct the roundabout. The geometry of the roundabout extends into private property requiring the acquisition of additional property from the property owners to extend the City's project footprint.

Chair Swarthout reviewed the requested action.

MOTION;

Councilmember Jefferson moved, seconded by Councilmember Althauser, to place the Supplemental Agreement No. 2 with Tierra Right of Way Services for the X Street Roundabout project on the June 17, 2025 City Council Consent Calendar with a

recommendation to approve and authorize the Mayor to sign. A voice vote approved the motion unanimously.

REAL ESTATE CONTRACT WITH LOTT FOR PURCHASE OF DESCHUTES VALLEY PROPERTIES:

Director Smith reviewed the proposed purchase of LOTT Clean Water Alliance properties.

The properties are located in the Deschutes Valley and were previously owned by the former brewery. In 2011, LOTT Clean Water Alliance acquired the three parcels for reclaimed water production. At that time, LOTT's capital planning called for satellite plants located in each jurisdiction. The properties were intended to serve the City of Tumwater for reclaimed water production. Subsequent plant updates at the Budd Inlet in downtown Olympia altered planning and construction needs. In 2023, following updated capital planning, LOTT determined that a treatment plant was no longer required in Tumwater as the downtown plant could continue to produce reclaimed water to serve anticipated needs with delivery to the City through existing transmission mains. Subsequently, LOTT declared the properties surplus in 2023 and contacted the City about any interest in acquiring the properties.

The City and LOTT executed a Memorandum of Understanding (MOU) with provisions including a timeline for the potential acquisition of the properties by the City. The first step required a feasibility study by the City to determine whether the properties provide good public value. The study was completed in 2024 with assistance by SCJ Alliance. The study identified how the properties could serve a number of different goals pertaining to economic development consistent with the Comprehensive Plan and the Brewery District Plan. Some of those goals included supporting transportation needs as part of the E Street Connection project from Cleveland Avenue to Capitol Boulevard, providing habitat enhancement along the Deschutes River riparian corridor, adding trails and other outdoor recreation, and providing parking space for City events.

Following completion of the study, information was provided to LOTT affirming public value of the properties for the City and interest in moving forward with acquisition of the properties as outlined in the original MOU. Additional discussions identified the need to complete a new phase 1 study with Pioneer Technologies. In November 2024, the phase 1 study was completed. Since then, City and LOTT staff members have been meeting to develop a purchase and sale agreement that addresses the liabilities and assets of the properties.

The three properties totaling approximate 45 acres were appraised at $3.9 million, which is less than the purchase price paid by LOTT in 2011. The properties are zoned Light Industrial. Potential land uses for the properties were identified by staff based on physical and environmental characteristics of the parcels. Staff examined technical and constructability issues as the properties are located within a floodplain, reducing market demand for the properties because of potential flooding impacts to the properties. All those elements were examined in terms of how they might affect the purchase price of the properties. Staff also identified property liabilities and existing buildings.

Director Smith reviewed a conceptual drawing of how the City might utilize the parcels. Options identified included habitat restoration and replacement, compensatory mitigation for various City projects, such as stormwater outfalls, wetland enhancements for takings by other projects, floodplain storage mitigation, and up to 1,500 parking stalls. The property continues to be restrained by the railroad tracks, which prohibits public traffic but enables intermittent access for the City's July 4 holiday events. The proposed purchase and sale agreement would not be effective until September 1, 2025 providing the City with the ability to continue to sponsor the 4th of July event and satisfy parking needs under the existing agreement with LOTT. Staff would then begin negotiations with the railroad to develop a similar agreement.

Director Smith said the phase 1 assessment includes a refreshed environmental assessment for the properties since LOTT acquired the properties. The sale would include acquisition of the storage warehouse, hops storage warehouse, and the can warehouse. Unlike other brewery structures on other brewery properties, the structures do not present the same security concerns. LOTT has indicated the structures have not been major targets for vandalism. One of the structures is used by a community group for storage needs. Ongoing uses would be evaluated by staff in terms of future potential utilization of the facilities. On the west side of the railroad tracks, structures include several smaller storage and outbuildings, which would likely be removed by the City to reduce liability risks. During negotiations with LOTT, removal costs of some structures have been deducted from the purchase cost.

Councilmember Althauser asked whether the agreement addresses the responsible party in the event contamination is discovered below ground. Director Smith said the proposed installment agreement with LOTT extends to 2030 with the City paying for the properties over time.

A $300,000 environmental mitigation fund addresses any subsurface contamination that could be discovered. Additionally, the recent phase 1 assessment did not identify any significant underground contamination present on the properties. LOTT is providing a mitigation fund to reduce risks the City could encounter in addition to a $225,000 building mitigation fund. The boiler house would incur some variable costs for removal because of some unknown materials existing within the building. Should costs be higher than anticipated, discussions with LOTT for establishing an additional fund could be an option to reduce risks to the City.

Councilmember Althauser asked whether staff believes $300,000 for environmental mitigation is sufficient based on no indications of serious contamination. Director Smith affirmed the amount would be sufficient.

Director Smith reported another provision in the agreement is an easement to enable LOTT to maintain its facilities to enable service continuity to Tumwater customers. The easement across the properties is at no cost; however, any additional administration, engineering, or designing would be the monetary responsibility of LOTT.

The proposed purchase price is $3,192,670.00. Because of multiple uses of the properties, the cost is split between the general fund and the storm utility fund. LOTT will hold the installment contract payable over six years from 2025 through 2030. Each annual payment totals $572,192.11 at an interest rate of 3%.

Councilmember Jefferson asked about any potential plans to lease or sell the properties in the future. Director Smith responded that at this time, there are no plans for leasing or selling the property after the City acquires the property. Development potential is minimal because the properties are significantly impacted by the floodplain. Overall mitigation by a private developer for a project could cost between $2 million to $8 million. The property has limited commercial marketability.

City Administrator Parks noted that the City's planned action EIS will enable the City to evaluate all brewery properties to identify potential uses. The timing enables the City to include the properties within that analysis. During that process, it will be possible to identify alternatives or City intended uses for the property, as well as the impacts of those uses on the built and natural environment and mitigation measures necessary for any development to move forward. Additionally, the City

would control the property, which will be of significant importance with respect to negotiating with the railroad for easements.

Chair Swarthout inquired as to whether the City would be responsible for the security of the properties as the new property owner. Director Smith said security of the properties is an element under negotiation; however, LOTT might be receptive to continue providing security.

City Administrator Parks added that City directors are planning to meet to discuss the interim management plan for the properties once the City assumes ownership. Site security will be a topic of the discussion. Staff has been in discussions with the property owner of the historic brewtower about the importance of more proactive security measures for the other brewery properties.

Director Smith described next steps after execution of the agreement in terms of identifying the work, identifying responsibilities by different departments, working with adjoining property owners, defining roles and responsibilities, and seeking funding options for the work moving forward. The City has until September 1, 2030 to apply for the mitigation funds from LOTT.

Staff recommends placing the Real Estate Contract with the LOTT Clean Water Alliance (LOTT) for the purchase of Deschutes Valley Properties on the August 19, 2025 City Council agenda for consideration with a recommendation to approve and authorize the Mayor to sign.

MOTION: **Councilmember Althauser moved, seconded by Councilmember Jefferson, to place the Real Estate Contract with the LOTT Clean Water Alliance (LOTT) for the purchase of Deschutes Valley Properties on the August 19, 2025 City Council agenda for consideration with a recommendation to approve and authorize the Mayor to sign. A voice vote approved the motion unanimously.**

ADJOURNMENT: **With there being no further business, Chair Swarthout adjourned the meeting at 8:43 a.m.**

Prepared by Valerie L. Gow, Recording Secretary/President
Puget Sound Meeting Services, psmsoly@earthlink.net

TO: Public Works Committee

FROM: Alyssa Jones Wood, Sustainability Manager

DATE: July 17, 2025

SUBJECT: Interagency Agreement with Washington Department of Commerce for Washington Electric Vehicle Charging Program Closeout Update

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1) Recommended Action:

This briefing is informational only.

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2) Background:

The Thurston Climate Mitigation Plan (TCMP) was accepted by the City Council on January 19, 2021, by Resolution No. 2021-001. Strategy T3 of the TCMP is to increase the adoption of EVs, including zero emission fleets. This project installed eight new Level 2 EV charging ports and "stubbed-out" an additional three for the City fleet vehicles, supporting the next two years of EV vehicle purchases and their charging needs across four facilities.

This project is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

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3) Policy Support:

City Council Strategic Priorities and Goals 2025-2026

Be a Leader in Environmental Health and Sustainability.

- Sufficiently resource programs identified in the Thurston Climate Mitigation Plan and Urban Forestry Management Plans and prioritize implementation.

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4) Alternatives:

❑ No action is being requested.

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5) Fiscal Notes:

The total cost of this project was $139,505, $63,000 of which was funded by grants. The remaining $76,505 was funded by WRS Sustainability, General Fund. The City will pursue Inflation Reduction Act Direct Pay tax credits to help recover some of the cost; however, the status of that federal program is questionable. Routine maintenance and replacement costs are funded through the Equipment Repair and Replacement Fund.

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6) Attachments:

N/A

TO: Public Works Committee

FROM: Alyssa Jones Wood, Sustainability Manager

DATE: July 17, 2025

SUBJECT: Fire Stations Solar and Battery Storage Feasibility Assessments Closeout Update

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1) Recommended Action:

This briefing is informational only.

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2) Background:

The Thurston Climate Mitigation Plan (TCMP) was accepted by the City Council on January 19, 2021, by Resolution No. 2021-001. Action B5.3 in the TCMP is public building solar: install solar on all available and feasible municipal sites. These feasibility assessments are the third and fourth completed thus far for City properties' feasibility for solar and battery storage. Additional solar and battery storage assessments were completed in 2024 for City Hall and the Tumwater Timberland Library.

This project is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

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3) Policy Support:

City Council Strategic Priorities and Goals 2025-2026

B. Be a Leader in Environmental Health and Sustainability.

- Decarbonize new and existing City buildings wherever practicable.
- Sufficiently resource programs identified in the Thurston Climate Mitigation Plan and Urban Forestry Management Plans and prioritize implementation.

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4) Alternatives:

- ❑ No alternative suggested.

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5) Fiscal Notes:

The cost of the two feasibility assessments was fully paid for by a $50,000 grant from the Washington Department of Commerce. Staff will seek grant funding to move the projects into construction. These projects will be included in the 2026-2031 Capital Facilities Plan.

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6) Attachments:

A. Main Fire Station Solar + Storage Feasibility Assessment
B. North End Fire Station Solar + Storage Feasibility Assessment

Tumwater Fire Department Headquarters

Solar Plus Storage Feasibility Study

311 Israel Rd SW, Tumwater, WA 98501

Parcel #82700100100

Prepared by Cascadia Renewables for the City of Tumwater

info@cascadiarenewables.com

Published May 7, 2025

CASCADIA RENEWABLES

About Cascadia Renewables

Cascadia Renewables is a technical consultant based in Washington state, specializing in designing and deploying solar and storage assets. We leverage our combined decades of industry experience to support public and private entities as they pursue their clean energy goals. Our team has led regional clean energy policy initiatives focused on equality, transparency, and affordability.

Authors

- Markus Virta – *Managing Partner*
- Callum McSherry – *Managing Partner*
- Joshua Miller – *Sr PV/ESS Design & Project Manager*
- Dana Hickenbottom – *Sr PV/ESS Design & Project Manager*
- Rose Kirby – *Information Designer & Project Coordinator*
- Emily Coulter – *Content Writer & Administrative Assistant*

Acknowledgments

Community Stakeholders and Representatives:

- Brian Hurley – *Fire Chief* – Tumwater Fire Department
- Shawn Crimmins – *Assistant Fire Chief* – Tumwater Fire Department
- Mason Rolph – *Executive Director* – Olympia Community Solar
- Chris Graham – *Facilities Manager* – City of Tumwater
- Alyssa Jones Wood – *Sustainability Manager* – City of Tumwater
- Paddy Fowler – *Program Manager, Distributed Renewables* – Puget Sound Energy
- Sara Wattenberg – *Municipal Liaison* – Puget Sound Energy
- Kristine Rompa – *Government Liaison* – Puget Sound Energy
- Rian Winter – *Paramedic Lieutenant and Union Representative* – City of Tumwater
- Travis Leyva – *Firefighter and Union Representative* – City of Tumwater

Washington State Department of Commerce:

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- Aidan Garrity – *Solar Program Manager*
- David Hecker – *Solar Program Manager*
- Sean Mertens – *Solar Program Manager*
- Nora Hawkins – *Senior Energy Policy Specialist*
- Eli King – *Energy Emergency Management Director*
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- Kate Pedersen – *Energy Resilience Specialist*

Clean Energy Group:

- Todd Olinsky-Paul – *Senior Project Director*

Table of Contents

Letter From the Field

Dear Brian Hurley,

We are pleased to present the City of Tumwater with this study, which examines the feasibility of constructing a solar plus storage system to enhance resiliency at the Tumwater Fire Department Headquarters.

The purpose of this study is to convey a clear, detailed, and accurate description of the design for a potential solar plus storage system to enhance community resilience, taking into account geographical, infrastructural, economic, environmental, and social context. This report is the culmination of an extensive design project, the goals of which include:

- Understanding community needs
- Assessing trends in energy usage and conditions of the site
- Determining the optimal system size and architecture
- Assessing the benefits, challenges, and risks of proceeding with the proposed system
- Identifying next steps

This report is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

We intend this document to concicely convey the technical aspects of the design to those with experience reading such information. It is separated into three levels of detail:

1. A high-level summary of our findings and recommended design *(found on page 5)*
2. Detailed specifications of our design and design process *(pages <?>–46)*
3. An appendix of calculations and ancillary documents for cross-referencing, as well as the findings and photos from our original site visit *(found in separate PDFs)*

To determine the feasibility of a solar plus storage system, it is necessary to specify equipment, equipment locations, system design, and hourly labor/services estimates. Though we provide this high level of fidelity, please note that this feasibility study is conceptual– it is not intended for construction purposes. It supports stakeholder decision-making, fundraising efforts, and future designs. To determine the final product specifications, equipment locations, system design, and hourly cost/estimates, Cascadia Renewables recommends a thorough 3+ bid RFP process.

Please direct yourself to any sections appropriate and relevant to your needs. If you have questions about this report, please contact us at info@cascadiarenewables.com.

Sincerely,

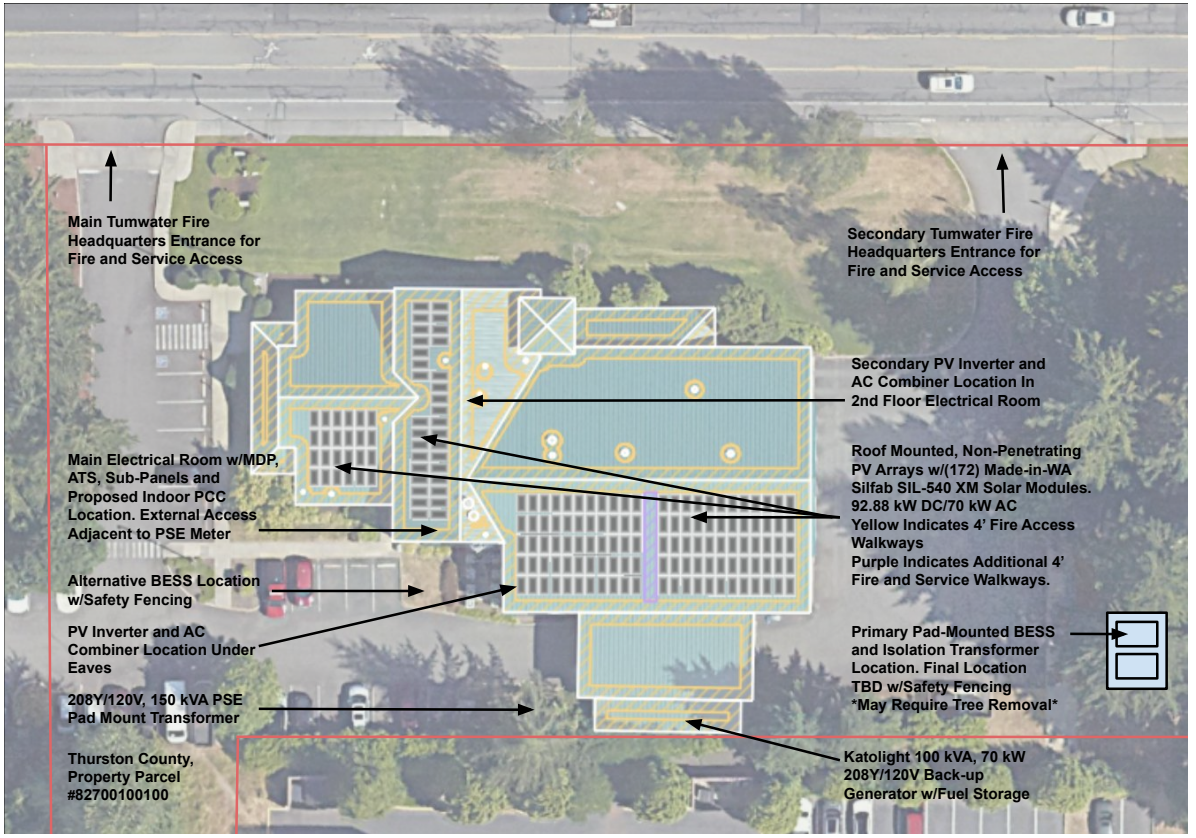
Cascadia Renewables

Design Abstract

The solar plus storage system conceptualized for the Fire Headquarters has a dual purpose. Primarily, it serves as a resilient backup power source during emergencies, allowing the facility to operate as an Emergency Operations Center during seasonal outages or natural disasters. This functionality increases the building's autonomy and reduces the reliance on diesel fuel. Secondarily, the system realizes financial savings over its lifetime. Offsetting utility energy costs with photovoltaic (PV) productions and lower building demand charges with the strategic dispatch of the battery energy storage system (BESS) during high building demand periods.

The solar system is designed to be mounted on the building's shade-free standing seam metal roofs. This choice was influenced by the minimal shading risks involved, optimizing the system's performance. The system attaches to the structure without penetrating the roofing, maintaining its warranty.

Overall, the project's feasibility is high. The community, which has a population of around 27,000 people, would be afforded resilient fire prevention and emergency medical services by constructing this system. Steps have been planned to ensure compliance with construction standards, fire codes, and permitting requirements.



PV System Size	92.88 kW DC/70.00 kW AC
BESS Size	125 kW/516 kWh
Estimated Annual Electric Production	91,643 kWh
Estimated Percentage of Annual Consumption Offset	69.86%
First Year Bill Savings	$10,455.00
Period of Autonomy	**June:** 100% Demand - Continuous 150% Demand - 53 hrs 200% Demand - 35 hrs **January:** 100% Demand - 18 hrs 150% Demand - 8.5 hrs 200% Demand - 6 hrs

Design Specifications and Process

Introduction to the Site

Type of Building: Two-story building with garage bays for the fire apparatus, and an attached administrative wing that houses the Emergency Operations Center.

Surrounding Conditions: Centrally located in the City of Tumwater, with multiple access locations for easy access by the public and fire personnel during an extended emergency.

Typical Purpose of Site: Fire station and Emergency Operation Center for the Fire Department.

The site typically has 13 people at the station during normal business hours, and never have less than 6. The site also has both city staff and community groups that utilize the training room. During extreme events or disasters, it could potentially hold 20+ people.

Emergency Function: In addition to its standard function as the Fire Department Headquarters, the facility operates as the primary Emergency Operations Center.

Project Goals

In conversation with stakeholders, the community had the following goals:

- To continue providing emergency fire services for the City of Tumwater throughout an ongoing emergency event where grid power may not be available and generator fuel supplies are limited or unavailable.

In service of those goals, the system was designed with the following priorities:

1. Provide backup power, enabling the building to remain operational during short, seasonal power outages
2. Provide long-term back up power, enabling the building to remain operational during extended emergencies
3. Increase redundancy of existing backup generator system, reducing generator runtime and fuel use
4. Reduce the station's operational costs through the reduction or elimination of monthly electrical bills, allowing internal funds to be realocated

Stakeholder Engagement

Key stakeholders included:

- Brian Hurley – *Fire Chief* – Tumwater Fire Department
- Shawn Crimmins – *Assistant Fire Chief* – Tumwater Fire Department

- Mason Rolph – *Executive Director* – Olympia Community Solar
- Chris Graham – *Facilities Manager* – City of Tumwater
- Alyssa Jones Wood – *Sustainability Manager* – City of Tumwater

Differing needs of stakeholders were voiced through the following interactions, summarized below.

Engagement Activities and Objectives:

December 23, 2024: Members of Cascadia Renewables conducted a comprehensive site assessment with personnel from the department.

February 24, 2024: A kickoff meeting was conducted between Cascadia Renewables and representatives of fire department, the City of Tumwater, and Olympia Community Solar. The goal of the meeting was to inform the stakeholders about the upcoming process, to make plans to aquire the necessary information to perfom a site analysis, and to get an impression of the goals of the stakeholders.

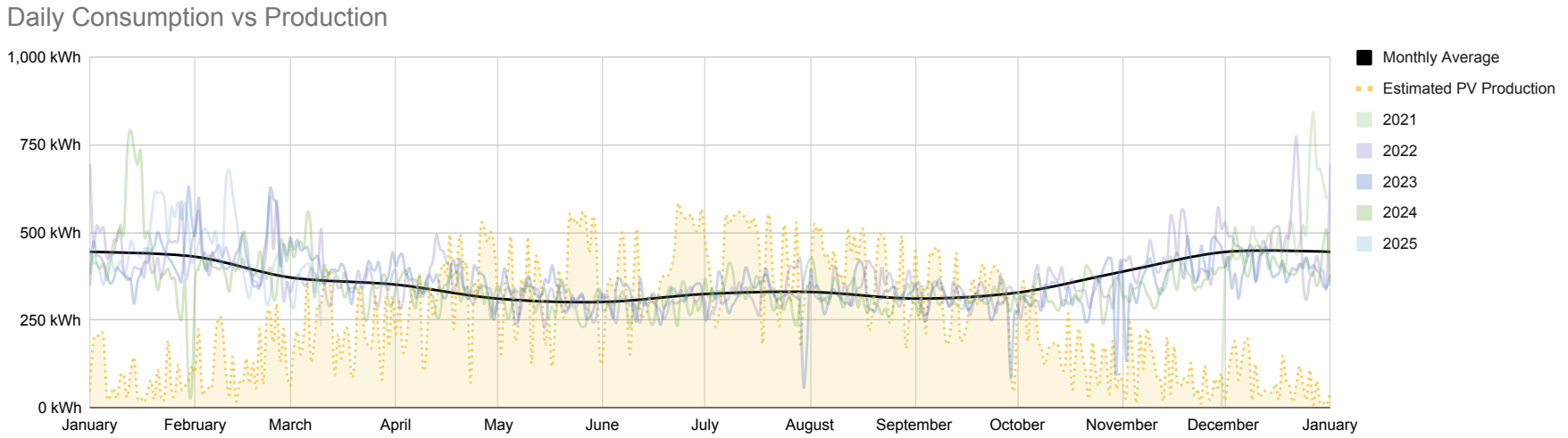
April 17, 2025: Cascadia Renewables held a design review meeting with members of the fire department, the City of Tumwater, and Olympia Community Solar to present the in-progress conceptual design. We received feedback on the design, and responded to the concerns of the organizations.

Preliminary Electrical Usage Analysis

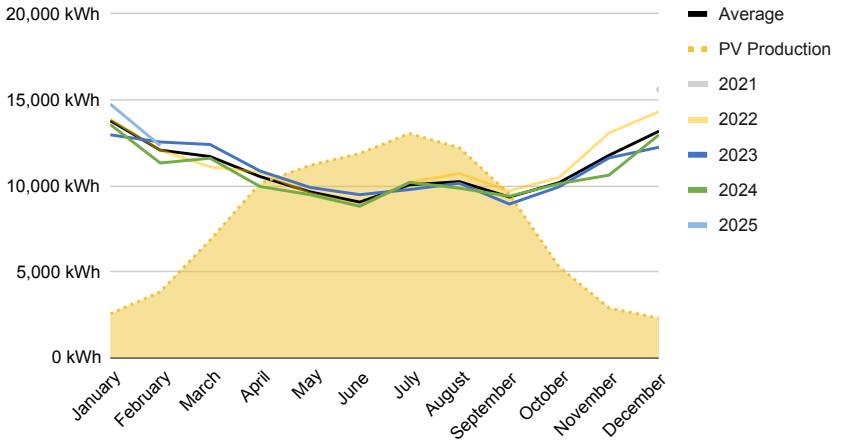
The electrical usage analysis determines the optimal solar and battery system sizes for meeting the needs of the site. We consider this electrical analysis in tandem with information collected on site to inform the conceptual design and verify the installability of the project if it is funded.

This analysis covers electricity consumption from December 2021 to March 2025. The data from this period was used to model the site's electricity usage. The data demonstrates slight seasonal fluctuations, with peak usage occurring in the winter and minor peaks at 8:00 AM and during dinner time. Electrical consumption sees minimal hourly changes, despite these small peaks. There are some planned electrical infrastructure changes, such as upgrading the elevator, which may impact the building's future consumption or demand patterns.

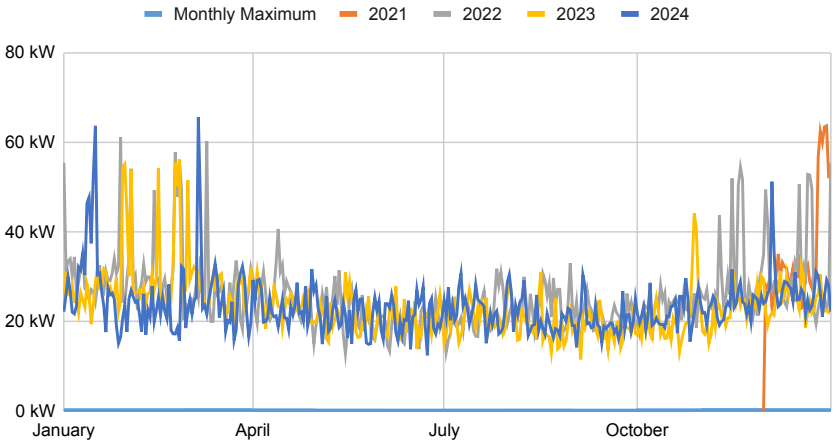
Estimated Annual Electric Consumption	131,172 kWh
Seasonal Fluctuation	52.39% fluctuation between minimum consumption in June and maximum consumption in January
Estimated Maximum Peak Demand	66 kW
98-Percentile of Consumption During a Single Day	579 kWh



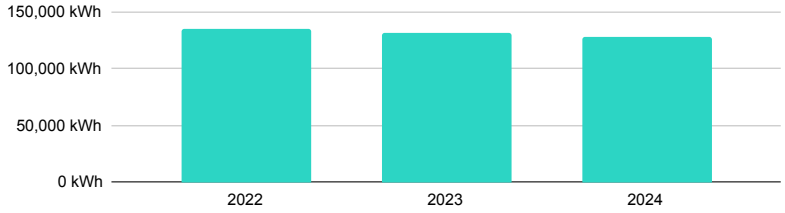
Monthly Consumption vs. PV



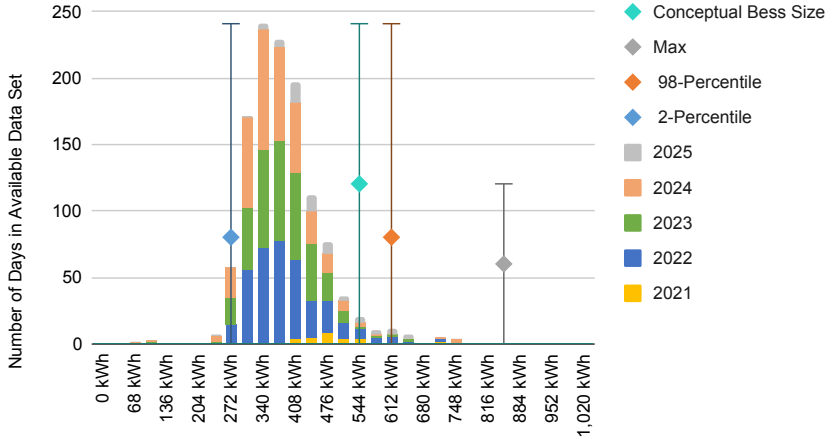
Monthly and Daily Peak Demands



Total Consumption by Year



Frequency of Consumption Occurrence



Comprehensive Site Visit

Following the preliminary electrical analysis and an initial review of the available building plans and satellite imagery, members of the Cascadia Renewables' design team assess the real-world conditions through a comprehensive site visit.

Roof:

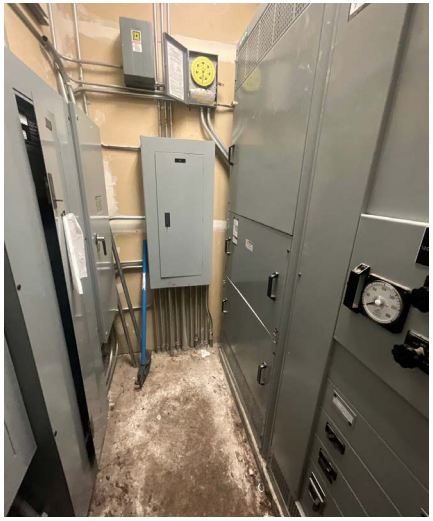
Condition of the roof

Roof Quality	The standing seam metal roof is in excellent condition, and is ideal for the installation of a non-penetrating mounting system. However, there is a reported history of leakage issues that will require caution in the system design and installation.
Roof Type	Standing Seam Metal
Roof Angle	Roof 1: 14 degrees (3:12), Roof 2: 22 degrees (5:12), Roof 3: 22 degrees (5:12)
Roof Age	25 years
Date After Which Roof Should Be Replaced	2040+

Structure:

Structure Type	The building is a two-story facility consisting of primarily a steel framed structure from Star Building Systems, with limited wood-frame construction.
Assessment of Structure Quality	The structure appears to meet all building requirements to support a flush-mounted PV system on the standing seam metal roofs.
Availability of Plans	Both structural and electrical plan sets were available onsite.
Soil Conditions	The Fire Headquarters is surrounded by concrete sidewalks and paved parking and access roads, with landscaping adjacent to the building.

Meter



MDP and Subpanels

Electrical:

Service Utility	Puget Sound Energy (PSE)
Main Service Type	208Y/120V, 3-Phase

Electrical Topology	The Fire Headquarter's electrical infrastructure is primarily located in a main electrical room that is located on the south central interior of the building, with access from a south-facing exterior door. The infrastructure includes a 1200 A Main Distribution Panel that feeds six sub-panels and a dedicated elevator disconnect. Three of the Sub-panels are backed up a 100 kVA Katolight Power System Solutions automatic generator, that is not designated as an emergency power system for permitting purposes.
Line Side Infrastructure	The Fire Headquarter's 3-Phase 208V power is fed from a pad-mounted 150 kVA PSE transformer located centrally on the south property border, across the rear driveway from the main electrical room.
Electric Utility Hosting Capacity	Generation Hosting Capacity of 1.21 MW

Location of Main Electrical Service	The main electrical room is located just behind the PSE meter, which is centrally located on the south exterior.
Locations of Current Infrastructure	The PSE transformer and back-up generator are located along the south property border, with the PSE meter mounted on the south exterior, directly outside of the main electrical room that houses the main distribution panel, ATS and sub-panels.
Main Transformer Rating, Voltage, and Phase	150 kVA, 208Y/120V, 3-Phase, pad-mounted PSE transformer
Main Service Bus Capacity	1200 A
Main Service Bus Voltage	208Y/120V
Main OCPD Rating	1200 A
Main Distribution Center Type	Switchboard
Amps Available for PV Interconnection Under 120% Rule	240 A

Generator:

Generator Brand	Katolight Power System Solutions
Generator Size	100 kVA, 70 kW, 208Y/120V, 3-Phase
Generator Fuel Type	Diesel with 140 gallons of onsite storage
Generator Interconnection Method	The generator is connected to the Main Distribution Panel, via a 400 A ASCO Automatic Transfer Switch.
Generator Backup Configuration	Partial Building

Other:

Description of Accessibility: The Fire Headquarters is centrally located in the City of Tumwater with easy access from multiple surrounding public streets and site access points. The roofs are accessible from a single-story ladder on the south, west and north sides, and a two-story ladder or manlift on to the primary upper south-facing array location.

Description of Shading: The primary roofs are shade-free, with significant shading from trees along the south edge of the property limited to the lower south-facing roof section above the covered south entrance, that is not being considered for a PV installation location as part of this feasibility study.

Photovoltaic (PV) System Design

Overview:

The conceptual 92.88 kW DC PV array would be installed on the upper standing seam metal roofs. The system was designed using a max fit methodology, meaning it aims to maximize the use of available roof space to increase energy production. The PV layout was designed to increase annual system output by avoiding areas of shading from trees along the south edge of the property and rooftop vents. The panels are installed on the lower south-facing roof, the upper primary south-facing roof, and the upper west-facing roof sections.

The PV system production was modeled using Aurora, a software that uses irradiance data, LIDAR data, and 3D models of buildings to determine PV output over the course of the day and the year.

In this report, specific products names are used. These recommendations are to be considered typical–comparable equipment may be substituted. When making substitutions, pay attention to all technical specifications, as some products that initially appear comparable may be different in key ways.

Specifications:

PV System Size	92.88 kW DC, 70.00 kW AC
PV Module	Silfab SIL-540 XM, 540 Watt Module
Number of Modules	172

Solar irradiance visualized across the array

Estimated Annual Electric Production	91,643 kWh
Estimated Percentage of Annual Consumption Offset	69.86%
Total Solar Efficiency	85.0% TSRF
Number and Models of Inverters	(2) SolarEdge SE 10K-US, (1) SolarEdge SE 50K-US, 208V Commercial 3-Phase Inverters

Location of Inverters	The PV inverters may be installed under the covered walkway to the east of the ground-mounted location of the Headquarters HVAC units.

Design Considerations:

Trenching, Cutting, and Wall Penetrations Trenching and pavement cutting will be required to connect the requested BESS location along the south edge of the property, across the asphalt driveway and concrete curbs, to the main electrical room located on the southwest corner of the Headquarters. There will be a limited number of wall penetrations to allow for the integration of the PCC into the existing electrical infrastructure in the main electrical room.

Maintenance and Fire Access 4’ commercial fire setbacks will be provided on all roof locations to allow for easy maintenance and fire access. An additional fire access walkway has been included along the center path of the primary south facing PV installation location.

Wire Run The externally mounted DC PV wire runs will vary from 30’ from the primary PV array location above the PV inverter location, to 80’ from the westernmost south facing PV array.

Roof Shading The trees along the south edge of the property provide substantial hard shading that could affect the annual system performance. The conceptual PV array layout avoids the lower south facing roof in order to minimize these shading effects.

Required Upgrades Prior to PV Installation None

Interconnection Method for PV The SolarEdge inverters will have their 208Y/120V output combined in a PV combiner panel, that will feed the PV input in the Point of Common Coupling (PCC) panel that will be installed nearby with the BESS system.

Roof Loading and Mounting:

The following assessment is intended to suggest whether the structure will support the load of the PV system. Before installation, final engineering should be conducted to guarantee structural sufficiency.

PV SYSTEM DETAILS

GENERAL INFORMATION
Facility: Meter #1
Address: 311 Israel Rd SW Tumwater WA 98501

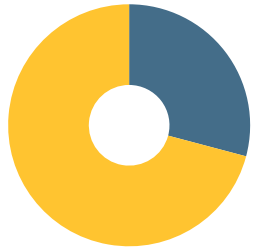
SOLAR PV EQUIPMENT DESCRIPTION
Solar Panels: 92.9 kW-DC Standard Modules

SOLAR PV EQUIPMENT TYPICAL LIFESPAN
Solar Panels: Greater than 30 Years
Inverters: 15 Years

Solar PV System Cost and Incentives	
Solar PV System Cost	$292,000
Grant Amount	-$292,000
Net Solar PV System Cost	**$0**

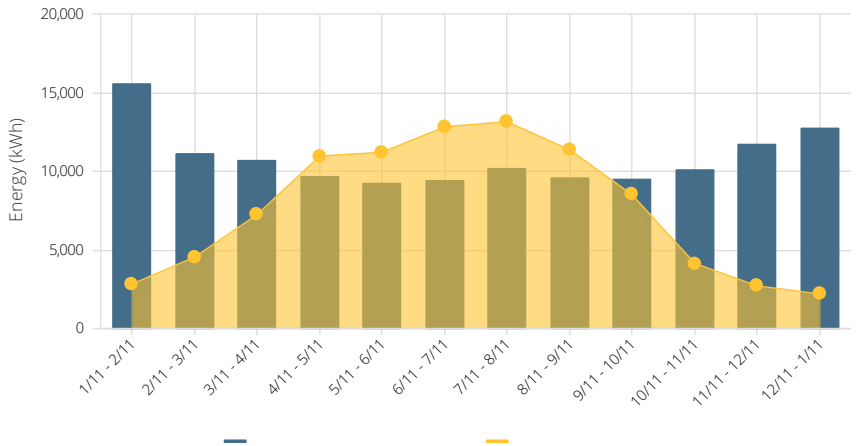
SOLAR PV SYSTEM RATING
Power Rating: 92,880 W-DC

ENERGY CONSUMPTION MIX
Annual Energy Use: 129,306 kWh



Utility 37,664 kWh (29.13%)
Solar PV 91,642 kWh (70.87%)

MONTHLY ENERGY USE VS SOLAR GENERATION



Mount Location	The PV modules will be installed on the lower south-facing roof, the upper primary south-facing roof, and the upper west facing roof sections.
PV Racking System	IronRidge Aire Rail System
PV Mounting System	Flush-mounted
Roof Penetrations	The system will be installed using a metal standing seam compatible, non-penetrating S-5-T clamping system.
Roof Loading Capacity	25.0 psf
Additional Available Roof Loading	5.0 psf
Estimated PV System Roof Loading	2.4 psf
Assessment of Whether the Roof Will Support the System	Yes

Battery Energy Storage System (BESS) Design

Specifications:

BESS Size	125 kW/516 kWh
Peak Demand for Modeling Purposes	66 kW
Source of Peak Demand	Observed
% of Building Demand used in Modeling	100%, 150%, 200%

Overview:

The conceptual 125 kW/516 kWh BESS will be installed on a concrete pad, approximately 8’ x 12’, located on the south-east corner of the property. This location was chosen to meet fire code requirements for setbacks and to provide access for maintenance while considering environmental impacts. The system is designed with a 125 kW inverter, allowing it to handle both the building’s peak demand and any future increases, such as from electric vehicle chargers. To model the BESS’s effectiveness, various scenarios were considered, including conditions with different levels of energy demand and solar availability. These scenarios help demonstrate how the BESS can continue powering the facility during outages, contributing to community goals of increasing resilience and ensuring uninterrupted essential services.

Potential BESS Location

Example of a Containerized BESS Unit

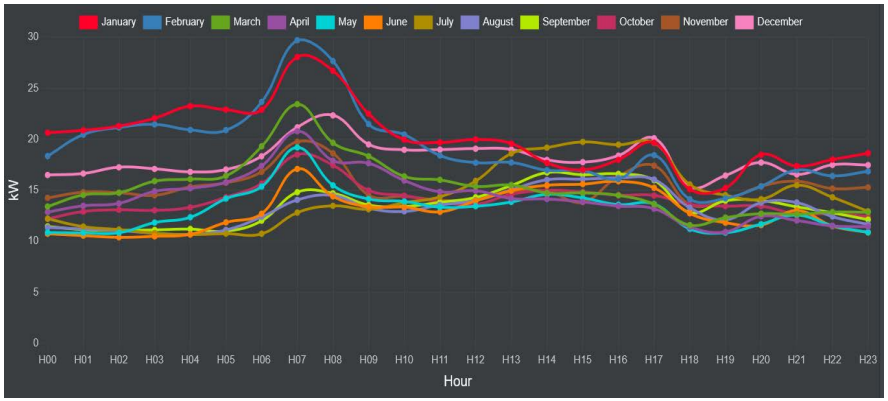
The BESS will backup entire facility and serve as the primary backup power source, allowing the building to ride through seasonal outages and medium duration outages without the need for the generator. If, during island/off-grid operation, the BESS reaches a low state of charge it will cease to supply backup power to the building and the existing standby generator turn on and provide backup power to the existing essential loads. If the BESS and PV systems can be isolated from the rest of the building loads, the PV system can remain operational and recharge the BESS. Once the BESS is recharged, it can be utilized once again to provide whole building backup power and the standby generator will turn off.

BESS dispatch performance is modeled in a program called Xendee, which considers many sources of data, including PV production, estimated site consumption, and grid energy pricing, to optimize a BESS for a variety of desired characteristics, including resiliency and financial benefit.

Demand Modeling:

For the BESS modeling, we utilized the interval data from March 9, 2024 to March 9, 2025 to create a daily building load profile in our system modeling software. This is representative of the actual historical daily load profile throughout the year and provides the most accurate basis for our system performance modeling.

Before constructing a system, we recommend conducting a month long meter study, collecting 1-minute interval data to identify transient peaks in demand.



Building Load Profile based on 15-min Utility Interval Data

BESS Design Considerations:

Although utility data showed a building peak demand of 66 kW, we specified a 125 kW BESS inverter to ensure that the system can meet building demand and transient demand surges during an outage. This also allows for future load growth at the facility if new electrical loads like EV Chargers are added or the building demand increases when utilized as the Emergency Operations Center. We also designed the system to facilitate integration of a larger whole building standby generator if desired in the future. A larger standby generator available for whole building backup and BESS recharging would help to increase the resiliency and backup power redundancy of the microgrid system.

The BESS will need to be installed on an concrete pad approximately 8’ x 12’ and, per discussions with fire and permitting officials, a security fence will be required around the BESS since it is in a visible, high traffic area. This will increase the area required for the BESS to approximately 14’ x 18’. The proposed BESS location in the SE corner of the property in the grassy area with nearby trees will need

to adhere to Washington State Fire Code requirements for setbacks. If a 10' vegetation free perimeter around the BESS cannot be established then trees/vegetation removal will be necessary (WA Fire Code 1207.5.7). The client communicated that should any trees need to be removed, the preference is for the removal of deciduous trees in that area. The Washington State Fire Code also requires that the BESS has a 10' setback from exposures (1207.8.3) including public ways and lot lines, so this will need to be considered when siting the pad mounted BESS near sidewalks and any adjacent property lines. Setback exemptions can be pursued through a fire official and AHJ review if necessary. It is important to note that the required clearances are from the BESS enclosures only (5' x 8.5') and not measured from the outer dimensions of the concrete pad or fence perimeter.

Generator Supplementation:

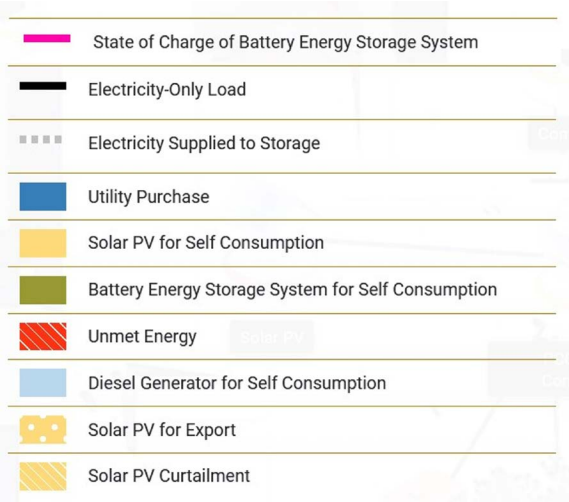
Though not part of a solar plus storage system, a standby generator can be a hugely beneficial complement to a BESS as it will allow a site to maintain extended autonomous operation in the winter. Additionally, a BESS complements a generator by allowing it to run less often and more efficiently than if the generator was installed alone. The existing 70 kW generator is undersized to be reconfigured to provide whole building backup and recharge the BESS. The conceptual system keeps the existing generator in it's currently configuration, providing backup power to the essential loads and isolated from the solar plus storage system.

Generator Recommendation	Upgrade Existing Generator (if funding can be secured)
Upgraded Generator Size	100 kVA, 70 kW, 208Y/120V, 3-Phase
Upgraded Generator Fuel Type	Diesel with build-in fuel storage compartment
Proposed Generator Interconnection Method	Into the new PCC via a motorized breaker and SEL751 relay
Proposed Upgrade Generator Backup Configuration	Whole Building Backup and BESS Recharging Capabilities

Low-PV Outage Simulation:

The BESS design was based on 100% of historical energy demand. Additional modeling was performed at 150% and 200% of historical energy demand in order to illustrate system performance in the event that building usage increases during an emergency. Modeling was also performed showing how a larger 125kW generator could be utilitized within the microgrid system and the resulting average hours of generator runtime during a longer duration outage.

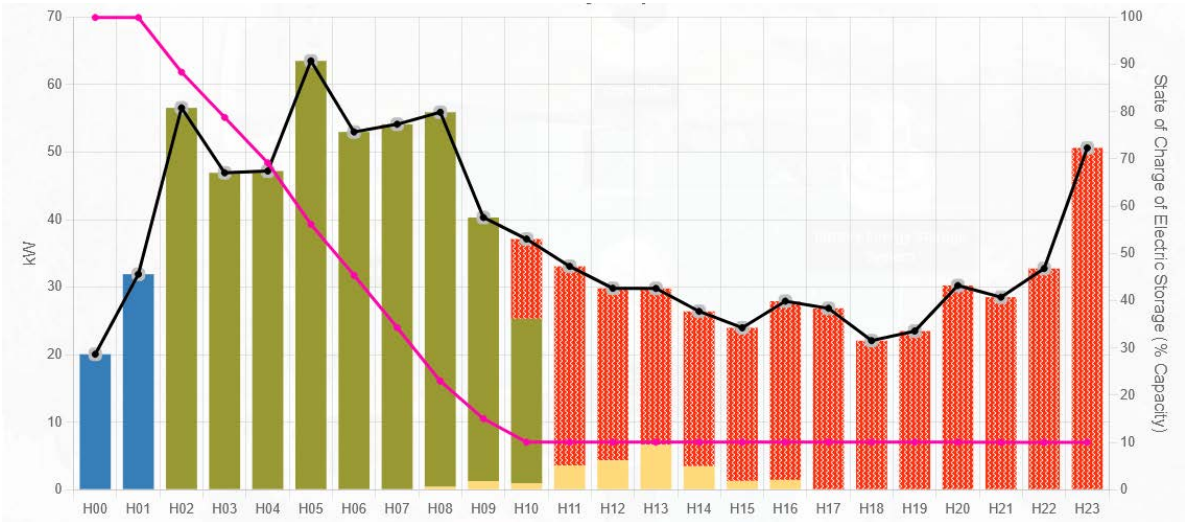
In operation, the period of autonomy of the microgrid system will depend on numerous factors, including available solar resources, BESS state of charge,



Dispatch Graph Key

January Outage Scenario Electricity Dispatch – 100% Demand

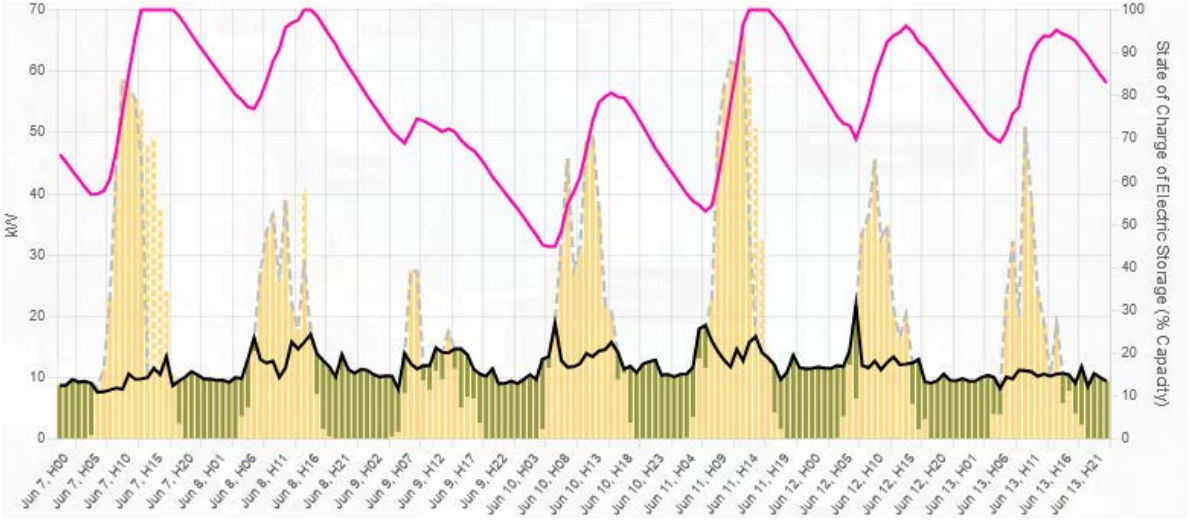
January Outage Scenario Electricity Dispatch – 150% Demand



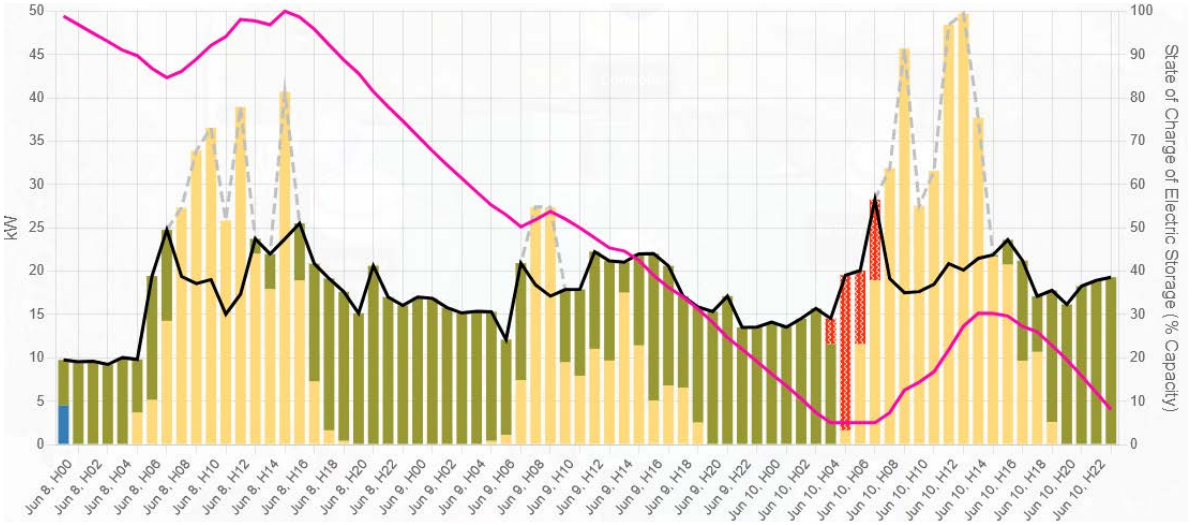
and building loads during an outage. A change in any of these factors will impact these estimates.

January Period of Autonomy	100% Demand = 18 hrs 150% Demand = 8.5 hrs 200% Demand = 6 hrs
Daily Generator Runtime Required for Continuous Site Uptime in January	125kW Generator Upgrade: 100% Demand = 30 hrs/week 150% Demand = 47 hrs/week 200% Demand = 67 hrs/week

June Outage Scenario Electricity Dispatch – 100% Demand



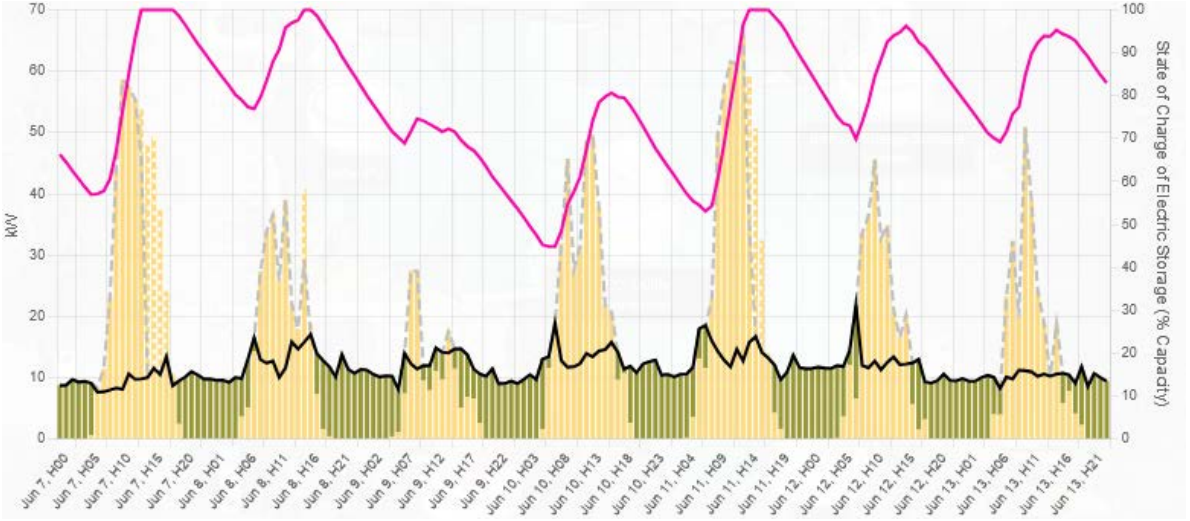
June Outage Scenario Electricity Dispatch – 150% Demand



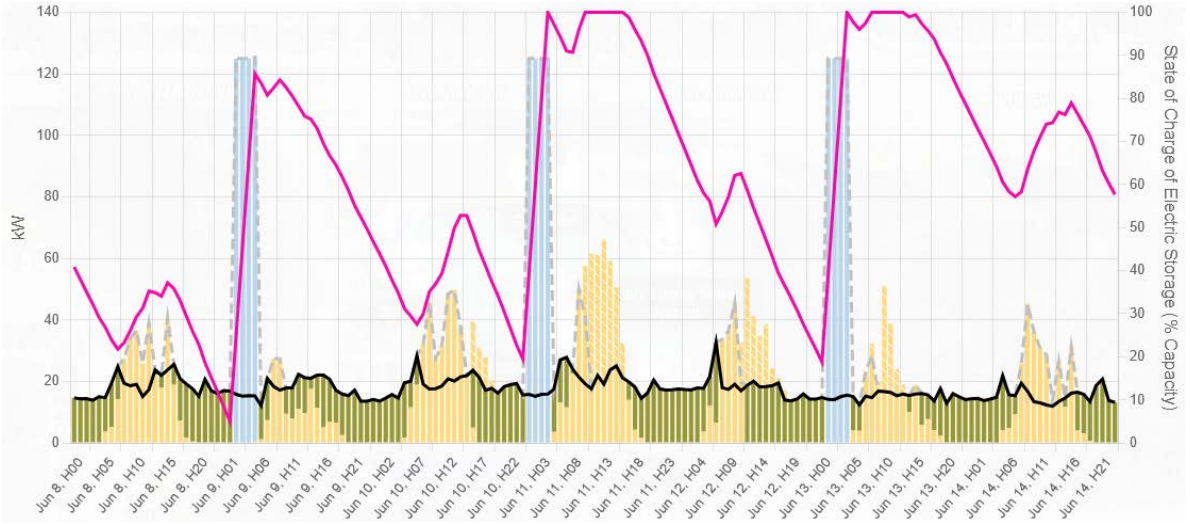
High-PV Outage Simulation:

June Period of Autonomy	100% Demand = Continuous 150% Demand = 53 hrs 200% Demand = 35 hrs
Daily Generator Runtime Required for Continuous Site Uptime in June	125kW Generator Upgrade: 100% Demand = 0 hrs/week 150% Demand = 12 hrs/week 200% Demand = 20 hrs/week

June Outage Scenario Electricity Dispatch – 100% Demand, 125 kW Generator



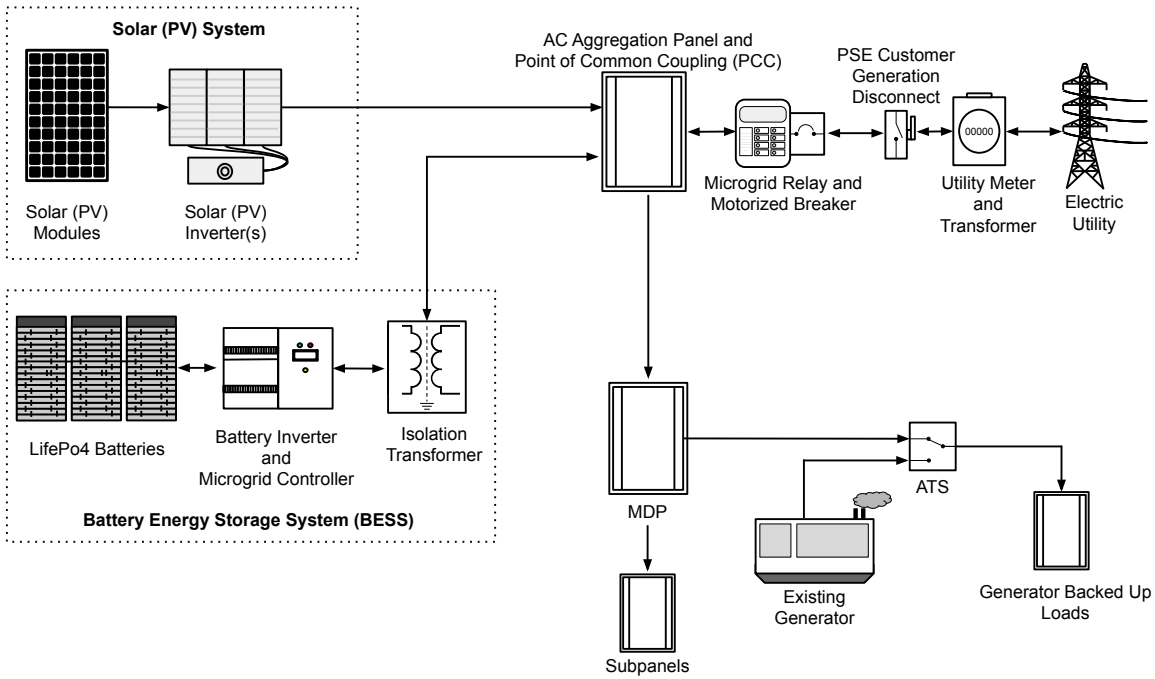
June Outage Scenario Electricity Dispatch – 150% Demand, 125 kW Generator



Interconnection

Topology:

The Tumwater Fire District Headquarters' power supply consists of an 1200A, 208Y/120V incoming service from a 150kVA PSE pad-mounted transformer on the south side of the property. The existing 1200A-rated main distribution panel (MDP) is not suitable for the point-of-common coupling (PCC) of the microgrid system due to limited available space in the electrical room. Our conceptual design utilizes a new 1200A AC Aggregation Panel that would be pad mounted on a pedestal in the landscaped area adjacent to the exterior HVAC units on the south side of the building and would serve as the PCC. The existing buried primary conductors running from the utility transformer to the main distribution panel would need to be excavated and re-routed to the new PCC equipment pedestal. Included on this pedestal would be a new CT enclosure and meter, a 1200A fused utility knifeblade disconnect (required for distributed generation systems), and finally the PCC. The PCC combines the incoming utility feed, BESS, PV, and feeds the existing MDP in the electrical room. Additional provisions can be added to the PCC to accommodate a future whole building generator system at a later date. The PCC also includes a microgrid interconnect device (MID), which consists of an 1200A rated motor controlled breaker and a SEL751 relay. The MID device automatically isolates the PCC from the utility during an outage, allowing the PV system and BESS to operate as a microgrid and supply power to the facility. The existing standby generator would be not be reconfigured and would remain in place as a redundant backup power supply for the existing essential loads at the facility. This microgrid system utilizes an Energy Management System to ensure that the distributed energy resources are dispatched efficiently



PCC Location

and that the capacity of the electrical equipment bussing is never exceeded.

Given the substantial amount of electrical reconfiguration required for this system, including the excavation of the buried primary service feeders from the utility, additional costs were factored into the system pricing. At this phase of the project, utility locates were not performed so this interconnection strategy is based on the assumption that the service conductors can be located and rerouted to the PCC. If this is deemed infeasible at a later date than an alternate interconnection plan and system configuration will need to be determined.

This configuration meets the goal of powering the entire building during seasonal outages as well as increasing the period of autonomy to allow the facility to be used as an Emergency Operations Center during a long term outage or natural disaster. This system also helps to reduce the runtime of the existing standby generator, conserving fuel reserves and increasing the building resiliency. The interconnection is a crucial element that affects the project's feasibility, budget, and timeline. Cascadia Renewables recommends that an electrical engineer verify the final system design before implementation.

Locations of New Infrastructure:

The conceptual design envisions the following locations for the new electrical equipment associated with this system:

PV Inverters - Exterior wall, under covered area to the east of HVAC units

BESS and Isolation Transformer - Pad mounted on SE corner of property, in grassy area adjacent to trees.

AC Aggregation Panel/PCC - Installed on pedestal in landscaped area to the west of HVAC units and near existing meter location.

New CT Meter - Installed on pedestal with new AC Aggregation Panel/PCC

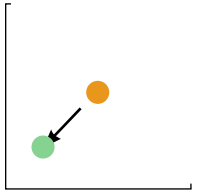
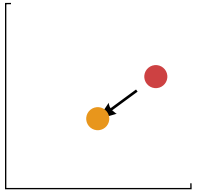
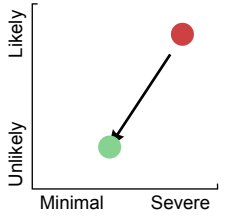
Utility Customer Generation Disconnect - Installed on pedestal, between meter and new aggregation panel.

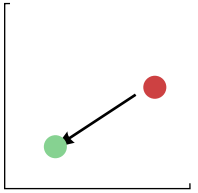
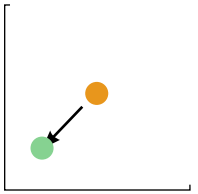
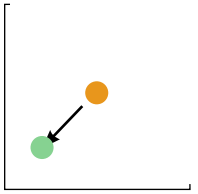
Microgrid Interconnect Device (SEL 751 Relay and Motorized Breaker) - Integrated into the new AC Aggregation Panel/PCC.

PCC Location

Project Risks

Developing a solar plus storage system comes with uncertainties, from incomplete information and market fluctuation. This feasibility study aims to mitigate some risks while identifying how others might be addressed. Risks have varying levels of severity and likelihood, which can be reduced by varying degrees through the proposed mitigation strategies.

Risk	Impact	Mitigation	Risk Before and After Mitigation
Construction projects often encounter unforeseen challenges, including site-specific conditions, environmental constraints, and permitting issues.	Delays in project timelines, increased costs, potential legal disputes, and strained relationships with stakeholders.	Regular site assessments, proactive stakeholder engagement, and a robust project management approach can help identify and address potential hurdles early. Engage in thorough due diligence before finalizing a contractor to ensure they are sufficiently qualified and experienced to take on a complex solar plus storage project. Ensure that contracts have clear clauses regarding delays, with penalties or incentives for timely completion.	
Geopolitical events can impact supply chains, project financing, and overall project feasibility.	Disruption in material or equipment delivery, increased costs, potential project cancellation, or delays due to financing issues.	Diversifying supply chains, monitoring global events closely, and having contingency plans in place can help navigate these challenges. Consider insurance or hedging options that protect against geopolitical risks.	
The industry can experience shortages in critical equipment due to high demand or manufacturing constraints.	Project delays, the potential need for equipment substitutions leading to design modifications, and increased costs.	Seek contractors with established relationships with multiple suppliers, who maintain a strategic inventory and who monitor industry trends to anticipate shortages. Consider contracts allowing equipment substitution or alternative solutions in case of shortages.	

Risk	Impact	Mitigation	Risk Before and After Mitigation
The availability and cost of skilled labor can fluctuate based on market conditions.	Delays in project timelines, potential compromise in work quality, and increased labor costs.	Consider prioritizing contractors with a strong track record of workforce management and training or with established partnerships with local training institutions. Ensure contracts have provisions for labor continuity and quality assurance. Consider the timeline of construction and allowance for longer construction periods or delaying construction until more workforce development for the large-scale solar plus storage industry has occurred.	
Detailed engineering and site-specific surveys may reveal conditions or requirements that impact cost and timeline.	Potential redesign requirements, increased costs, and project delays.	Engage experienced engineering firms, conduct thorough preliminary surveys, and allocate resources for potential additional studies. Consider engaging independent third-party reviewers for critical project milestones. Allocate a portion of the budget for potential additional studies or modifications.	
Prices for materials, equipment, and services can be subject to market volatility.	Unpredictable project costs, potential financial strain, and challenges in budgeting and forecasting.	Negotiate fixed-price or capped-price contracts where possible. Maintain a contingency budget for unexpected price fluctuations and ensure transparency in cost adjustments.	

Logistical and Financial Analysis

Hurdles Presented by Existing Conditions

Below are construction challenges and setbacks that could arise while implementing this conceptual design and potential mitigation strategies for them. Overcoming certain hurdles may create additional expenses, while other hurdles necessitate further validation of the final design before incurring significant costs.

BESS installation location will be in close proximity to areas that are accessible and/or visible

For safety reasons, the BESS system will need to be housed in a substantial outdoor metal enclosure at the location shown on the feasibility study's site plan. This is in a highly visible, high usage zone, and may impact the aesthetics or assesibility of this area.

Mitigation Strategy 1: An alternative location may be available and coordinated with the installing contractor at the time of final design. Additional costs may arise from this change.

Mitigation Strategy 2: Additional fencing may be installed to mitigate visibility and access to the BESS system. Electrical and property setbacks must be followed.

Utility locates may alter the trenching route

Underground utilities could require altering the conceptual trench route, requiring additional labor and potential concrete cutting and repair. This could increase system costs.

Mitigation Strategy 1: Locate utilities ahead of bid solicitation and document this for potential contractors to design around.

Mitigation Strategy 2: Require itemized costs for trenching and concrete cutting per foot and NTE clauses on bids to ensure that construction costs are understood and cannot balloon beyond established contingencies.

Fire Control Systems may activate during a power outage

Reviews of installed BESS systems show that some building Fire Control Systems may activate temporarily when the power goes out and the change from grid to battery power is occuring due to the millisecond delay.

Mitigation Strategy: On-site personnel must be trained as to the proper operation and required steps for building and BESS operation during and extended emergency.

The standing seam metal roof has reported leakage issues in past years

Chief Hurley informed CR staff that there have been past issues with leakage and water intrusion that will require careful planning, system layout, and installation methods.

Mitigation Strategy 1: A pre-contracting roof review should be completed by the installing solar contractor in conjunction with the original roofing

installer to locate potential leaks and verify the installation methods required to maintain the current roof warranties.

Mitigation Strategy 2: If it is determined that the solar project cannot be installed with the roof in its current condition, the Fire Department will need to conduct repairs and/or replacement of roof sections at their expense in order to ensure the integrity fo the roof surface.

Mitigation Strategy 3: The solar contractors warranties should be reviewed and approved prior to awarding an installation contract.

Limited available space for BESS given Fire Code Setback Requirements

The 2021 Washington State Fire Code requires the BESS to have a 10’ clearance from exposures including buildings, lot lines, public ways and hazardous materials. In addition, areas within 10’ of a BESS much be cleared of combustible vegetation. These clearance requirements limit the available locations that a BESS can be located on the property.

Mitigation Strategy 1: Seek an exposure clearance exemption from the fire code official based on the BESS large scale fire testing results and Hazard Mitigation Analysis report to open up more potential BESS installation areas.

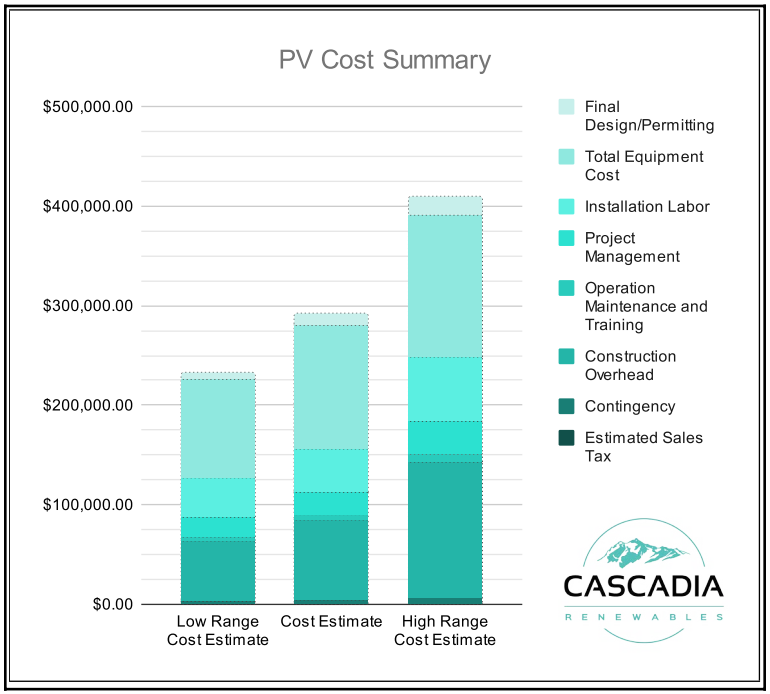
Mitigation Strategy 2: If a location cannot be found with the required 10’ vegetation perimeter, then tree/vegetation removal may be required. Based on client feedback the preference would be to remove deciduous trees if necessary and then replant elsewhere.

System Budget

Cascadia Renewables included current Davis Bacon prevailing wage rates, contractor direct pricing, permitting, and consulting/engineering fees to determine the conceptual system pricing. The labor rates and equipment pricing used in the provided budgetary information are relevant to and compliant with local, regional, and federal grant programs to give the applicant access to an array of funding opportunities. The estimated installation cost excludes any required architectural or structural improvements, the internal organizational cost of procurement, and administration. This cost estimate also excludes future storytelling and community engagement efforts.

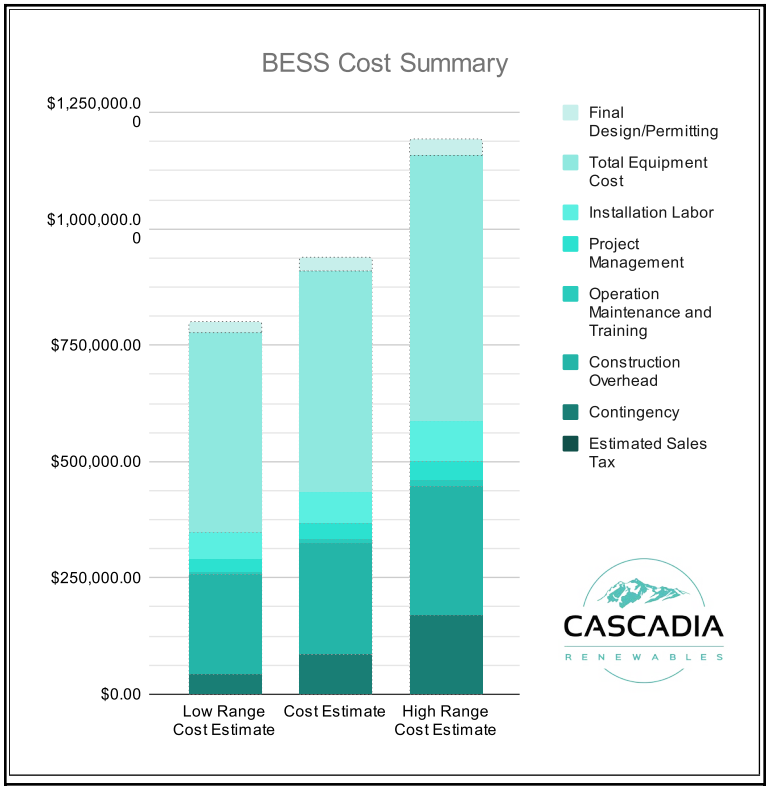
We advise applicants to consider these budget items separately and designate suitable resources for each. The cost estimate provided is based on market conditions, availability of labor, and equipment costs at the time of writing.

Since it is a well-established and competitive market, there is limited opportunity to reduce these costs further. The projected increase in the demand for BESS projects over the coming years may outpace the current supply. This may inflate equipment costs in the short term, which we reflect in our estimated budget. Final pricing may vary based on the chosen installation partner, final engineered solution, on-site soil, and geotech studies, which are not available within the scope of this feasibility study. We recommend establishing a comprehensive 3+ bid RFP process that encourages contractor participation, value engineering, and competitive pricing. We recommend periodic system price updates during the project development and construction.



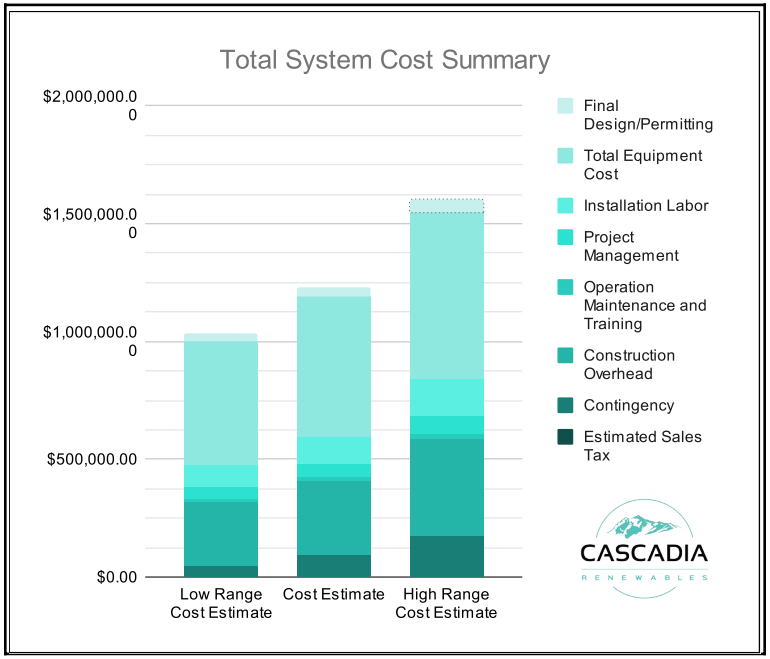
PV - COST SUMMARY

Total Costs	Low Range Cost Estimate	Cost Estimate	High Range Cost Estimate
Final Design/Permitting	$5,900.00	**$11,800.00**	$17,700.00
Total Equipment Cost	$99,360.00	**$124,200.00**	$142,830.00
Installation Labor	$38,880.00	**$43,200.00**	$64,800.00
Project Management	$20,160.00	**$22,400.00**	$33,600.00
Community Outreach	TBD By Applicant	**TBD By Applicant**	TBD By Applicant
Operation Maintenance and Training	$4,250.00	**$5,000.00**	$7,000.00
Construction Overhead	$60,300.00	**$80,400.00**	$136,680.00
Contingency	$3,500.00	**$5,000.00**	$7,000.00
Estimated Sales Tax	$0.00	**$0.00**	$0.00
Total PV System Cost Estimate	**$232,350.00**	**$292,000.00**	**$409,610.00**
Cost/Watt ($/w)	**$2.50**	**$3.14**	**$4.41**



BESS - COST SUMMARY

Total Costs	Low Range Cost Estimate	Cost Estimate	High Range Cost Estimate
Final Design/Permitting	$25,075.00	**$29,500.00**	$33,925.00
Total Equipment Cost	$427,230.00	**$474,700.00**	$569,640.00
Installation Labor	$57,120.00	**$67,200.00**	$87,360.00
Project Management	$26,880.00	**$33,600.00**	$40,320.00
Community Outreach	TBD By Applicant	**TBD By Applicant**	TBD By Applicant
Operation Maintenance and Training	$7,000.00	**$10,000.00**	$14,000.00
Construction Overhead	$215,280.00	**$239,200.00**	$275,080.00
Contingency	$42,750.00	**$85,500.00**	$171,000.00
Estimated Sales Tax	$0.00	**$0.00**	$0.00
Total BESS System Cost Estimate	**$801,335.00**	**$939,700.00**	**$1,191,325.00**
Cost/Kilowatt Hour ($/kWh)	**$1,552.97**	**$1,821.12**	**$2,308.77**



Total System - COST SUMMARY

Total Costs	Low Range Cost Estimate	Cost Estimate	High Range Cost Estimate
Final Design/Permitting	$30,975.00	**$41,300.00**	$51,625.00
Total Equipment Cost	$526,590.00	**$598,900.00**	$712,470.00
Installation Labor	$96,000.00	**$110,400.00**	$152,160.00
Project Management	$47,040.00	**$56,000.00**	$73,920.00
Community Outreach	TBD By Applicant	**TBD By Applicant**	TBD By Applicant
Operation Maintenance and Training	$11,250.00	**$15,000.00**	$21,000.00
Construction Overhead	$275,580.00	**$319,600.00**	$411,760.00
Contingency	$46,250.00	**$90,500.00**	$178,000.00
Estimated Sales Tax	$0.00	**$0.00**	$0.00
Total System Cost Estimate	**$1,033,685.00**	**$1,231,700.00**	**$1,600,935.00**

Economic Benefit

This is a detailed breakdown of the cash flow of the system. Please note that this breakdown does not include the cost of operations and maintenance, as that cost is challenging to predict. Cascadia Renewables does not want to offset the confidence we otherwise have in these financial estimates by overshadowing our conclusions with less reliable data. To that effect, Cascadia Renewables recommends requesting an estimate for annual operations and maintenance as part of the contractor selection RFP.

Assumptions and Key Financial Metrics

Discount Rate	5.0%	Federal Tax Rate	0.0%	State Tax Rate	0.0%
Average Annual Utility Escalation	3.0%	PV Generation (kWh/kW-DC)	987 kWh/kW-DC	Average PV Degradation Rate	0.56%
Average ESS Degradation Rate	5.00%				

Years	Project Costs	Electric Bill Savings	Grant Amount	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	-$1,231,700	-	-	-	-$1,231,700	-$1,231,700
1	-	$10,455	$1,231,700	91,643	$1,242,155	$10,455
2	-	$10,750	-	91,130	$10,750	$21,205
3	-	$11,052	-	90,616	$11,052	$32,257
4	-	$11,363	-	90,103	$11,363	$43,620
5	-	$11,683	-	89,590	$11,683	$55,304
6	-	$12,012	-	89,077	$12,012	$67,316
7	-	$12,350	-	88,564	$12,350	$79,666
8	-	$12,698	-	88,050	$12,698	$92,363
9	-	$13,055	-	87,537	$13,055	$105,418
10	-	$13,422	-	87,024	$13,422	$118,840
11	-	$13,800	-	86,511	$13,800	$132,639
12	-	$14,188	-	85,998	$14,188	$146,827
13	-	$14,587	-	85,484	$14,587	$161,414
14	-	$14,997	-	84,971	$14,997	$176,410
15	-	$15,418	-	84,458	$15,418	$191,829
16	-	$16,201	-	83,945	$16,201	$208,030
17	-	$16,585	-	83,432	$16,585	$224,615
18	-	$16,978	-	82,918	$16,978	$241,593
19	-	$17,379	-	82,405	$17,379	$258,972
20	-	$17,789	-	81,892	$17,789	$276,760
Totals:	-$1,231,700	$276,760	$1,231,700	1,735,350	$276,760	-

Maintenance Considerations

An operations and maintenance plan should be enacted by internal personell or an external contractor. When designing this plan, consider the following:

- The PV system will require regular annual or bi-annual PV module cleaning to remove any built-up debris in order to maintain the peak system performance and maximum BESS charging capabilities. The maintenance schedule will vary depending upon the site conditions, frequency of rain events, and build up of season debris such as fall leaves or needles.
- The BESS will require regular maintenance to maintain it's equipment warranty and ensure proper system functionality. The required maintenance steps and frequency will be defined by the equipment manufacturer but typically include servicing the BESS HVAC and fire protection systems, internal/external visual inspections, loose connections check, and a functional battery test on an annual basis.

Community Benefit

The Tumwater Fire Department Headquarters plays a crucial role in serving the City of Tumwater. This facility operates as both a fire station and an emergency coordination hub. It supports daily Fire Department operations and serves as the primary Emergency Operations Center during major events or disasters. The site ensures that emergency services remain available during power outages, providing backup power to maintain operations and support the community's safety needs.

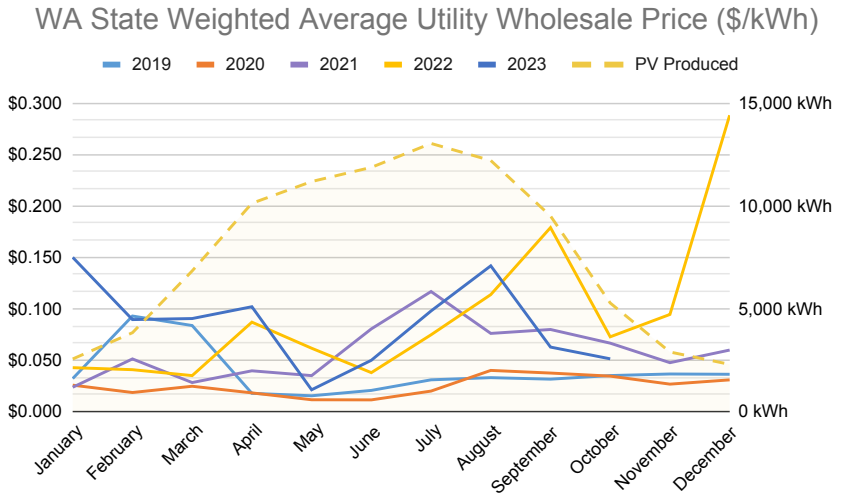
Approximately 27,000 people live in the range of the fire district. The City of Tumwater has only two fire stations: its headquarters and the North End station. If one or both of these stations were to become inoperable, the effect on the city's emergency response capacity would be immediate and severe.

By specifying local contractors and utilizing union labor and apprenticeship programs, the workforce local to the area can be trained. This increases the local capacity to develop future resiliency projects.

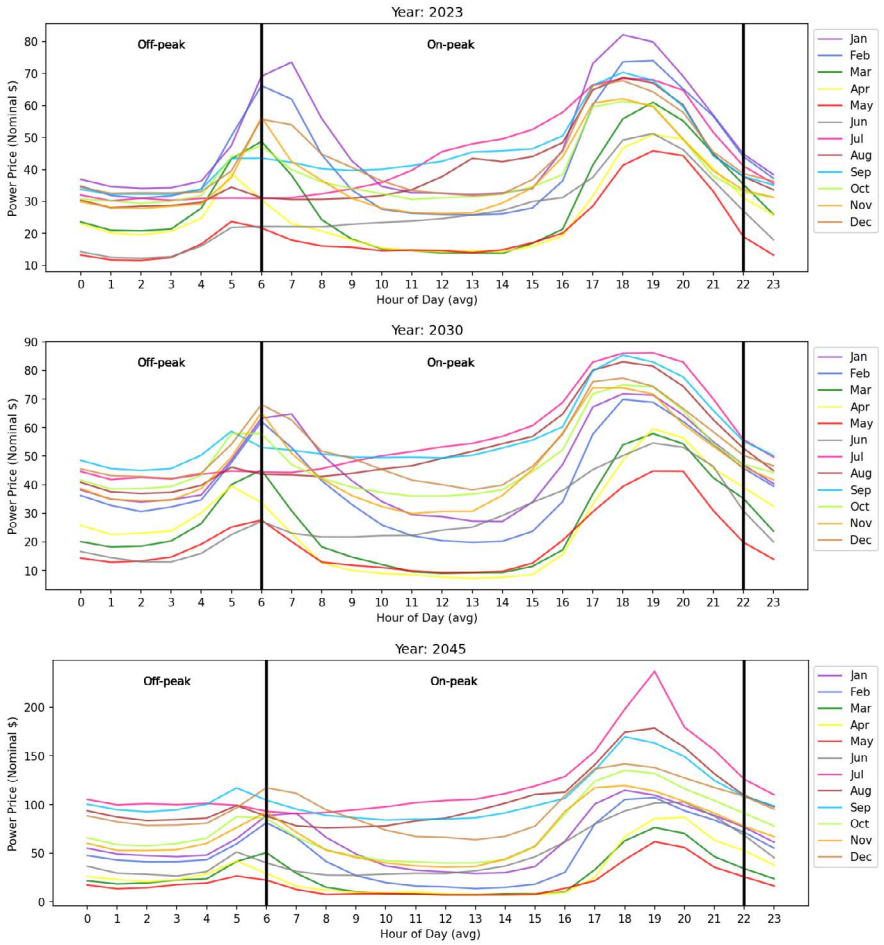
Over the warrantied lifetime of the PV array, the system will offset 1,436 tons of carbon, equivalent to planting 21,536 trees.

Grid Benefit

At a national level, the US electric grid is one of the world's largest and most complex machines, with aging infrastructure facing increased demand due to the electrification of transportation and buildings, population growth, and migration. Distributed Energy Resources (DERs) play a crucial role in strengthening existing grid infrastructure and moving toward a more equitable and sustainable electric grid. Washington State has historically relied on hydroelectric power to balance energy demand. However, climate change is reducing snowpack and our available hydro resources, making it necessary to explore alternative options. Regional electricity prices, represented in the middle Columbia WA State Weighted Average Wholesale Price graph below, have been increasingly volatile during late summer afternoons. The largest investor-owned utility (IOU) in WA, PSE, anticipates that this price volatility will increase in coming years (see graph below). In Washington State, solar generation can help address the energy shortfall during summers, and energy storage can provide balancing services and further reduce demand during peak periods.



Monthly production of the system vs average wholesale energy pricing. Coincidence of high production to high pricing is financially beneficial.



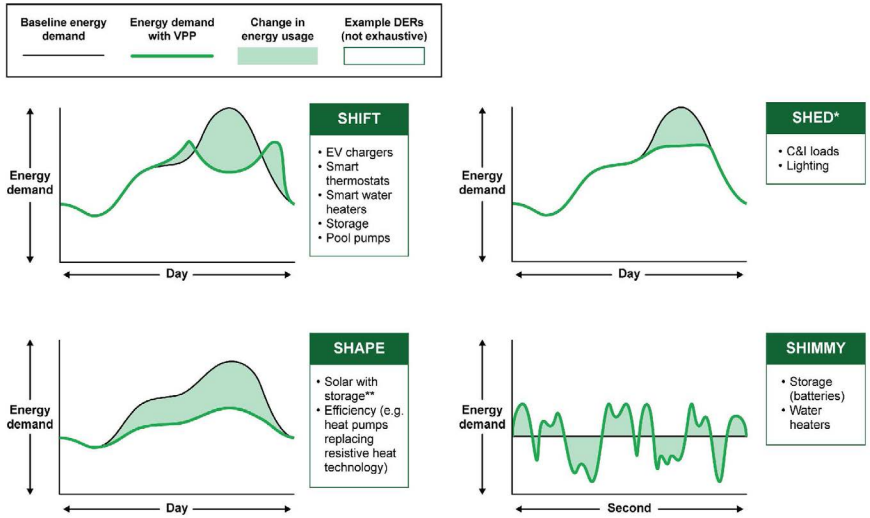
Daily price volatility by month for the years 2023, 2030, and 2045.

The US Department of Energy's September 2023 report titled "The Pathway To Commercial Liftoff: Virtual Power Plants" suggests integrating solar panels, battery storage, and micro-grid projects to optimize energy resource usage and manage grid stability. Virtual Power Plants (VPPs) and networked energy storage solutions are cost-effective alternatives to natural gas peaker plants, offering substantial benefits and low costs. The report highlights the importance of adopting innovative technologies to meet the growing energy demand sustainably and cost-effectively. Ultimately, strengthening the grid benefits the entire community. This project can play a part in improving regional energy infrastructure by reducing energy demand and providing grid-balancing services.

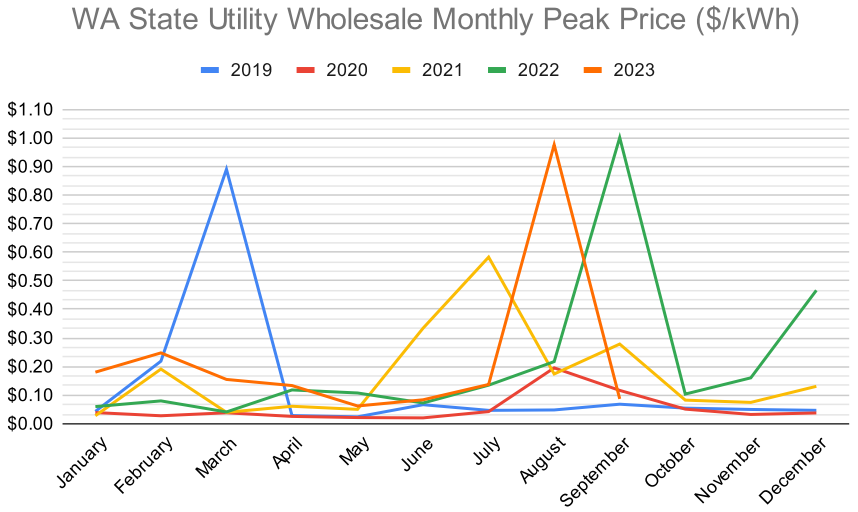
Energy pricing can serve as an effective method for utilities to encourage efficient energy dispatch from flexible resources such as solar and storage. A well-optimized system can use stored energy during high-demand periods, contributing to grid stability and economic efficiency. By implementing an appropriate demand response program, unused BESS capacity can be deployed to reduce peak demand across the service territory on a grid scale. This section aims to evaluate the potential benefits of the conceptual system in terms of reducing demand, exporting energy, and providing grid-balancing services.

PSE does not currently have a demand response program, so we have conducted optimizations to showcase the maximum demand reduction on-site while ensuring battery cell longevity.

To illustrate the effects that the conceptual system could have on the site's demand, we have simulated the conceptual system with a model of predicted consumption patterns. These charts depict the days on which the peak demand for January is predicted to occur, according to our simulation



Illustrations of the various ways DERs can influence demand. "Shape" (bottom left) is the most likely result of a solar plus storage system. Graphs by the US Department of Energy.

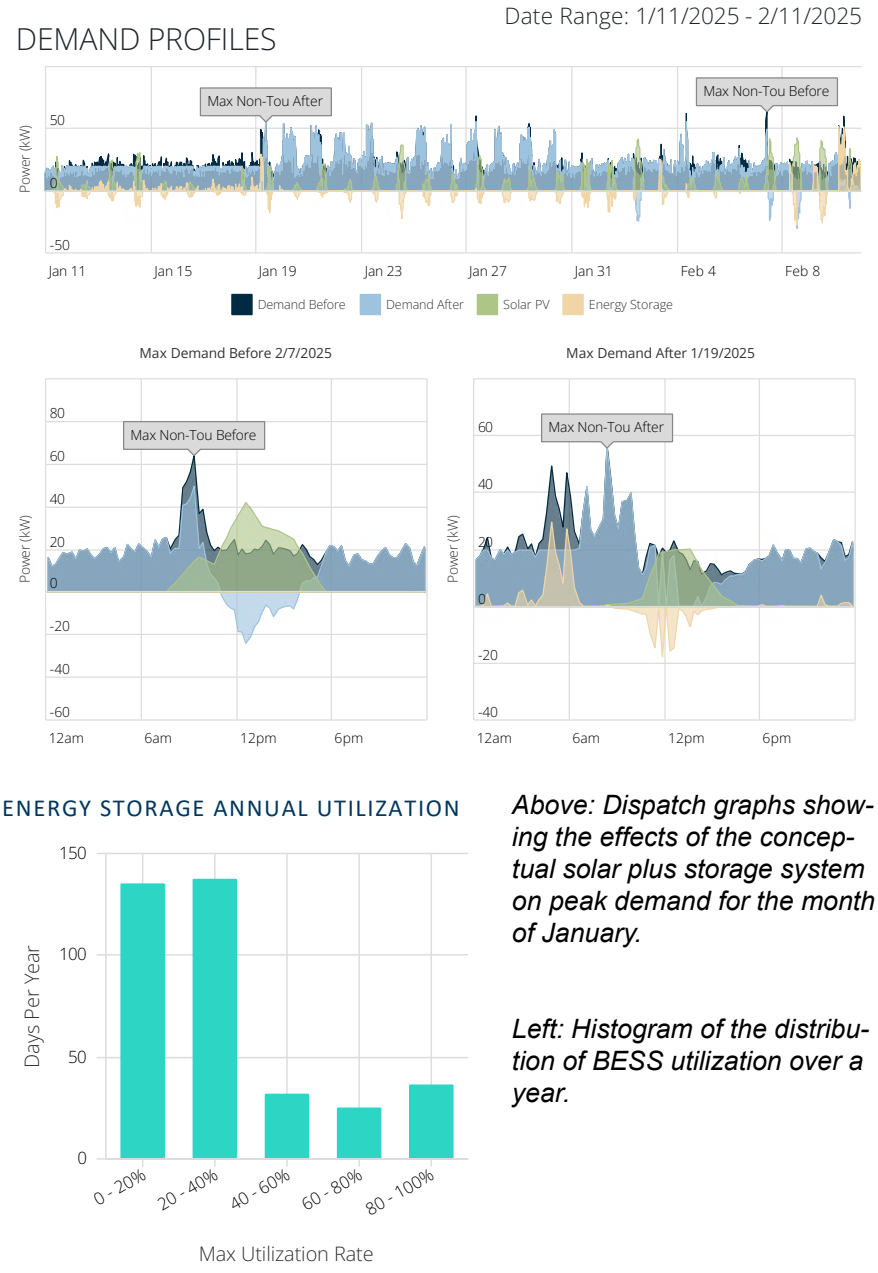


The highest wholesale costs can be mitigated by dispatching unused BESS capacity, given appropriate programs.

of the conceptual system. The demand of the site before accounting for the system is shown in dark blue, while the demand that would result from its implementation is shown in light blue. The difference between the demand before and the demand after is the sum of the PV generation (shown in green) and the BESS's flow (shown in yellow). The chart on the left displays the day of maximum historical demand, while the chart on the right displays the day of maximum simulated demand accounting for the effects of the conceptual system. The appendix provides the same series of charts relevant to each month throughout the year. Note that any smoothing or demand reduction on site represents a reduced burden on the local grid.

To promote system health and longetivity, the BESS should be configured to partially discharge each day. This discharge can be coordinated with times of peak building demand, which will reduce and flatten the demand profile of the building. Based on utility bills this facilitity is subject to monthly peak demand charges so the BESS could be strategically dispatched during times of peak building demand to lower monthly demand charges, providing additional economic benefits from the system.

The bar chart shows how many days each quintile of the BESS is used for on-site demand management throughout the year. It is worth noting that increased utilization of the BESS could result in a faster degradation rate.



Above: Dispatch graphs showing the effects of the conceptual solar plus storage system on peak demand for the month of January.

Left: Histogram of the distribution of BESS utilization over a year.

Permitting and Utility Agreements

If this project proceeds to installation, it will be the responsibility of the installer to verify the relevant authorities having jurisdiction (AHJs) and ensure all necessary permits and agreements are in place. As it pertains to this conceptual design, Cascadia Renewables has identified the following AHJs and has documented our interactions to date.

Laobr & Industries - Electrical Permitting:

The conceptual PV system and BESS design will require electrical permitting and a possible plan review from the Washington Department of Labor & Industries to verify that they meet all current WAC and NEC code reviews. Code revisions may occur in the NEC and WAC and will need to be verified during the final system design.

Puget Sound Energy - Interconnection:

The conceptual PV system is designed to align with Puget Sound Energy's standard interconnection rules, with a capacity of 100kW AC or less per customer meter. This classification ensures the system adheres to the established approval procedures for Net Metering. To proceed, a Schedule 150 Application and Agreement for Interconnection, Net Metering, and Production must be submitted.

Department of Archeology and Historic Preservation:

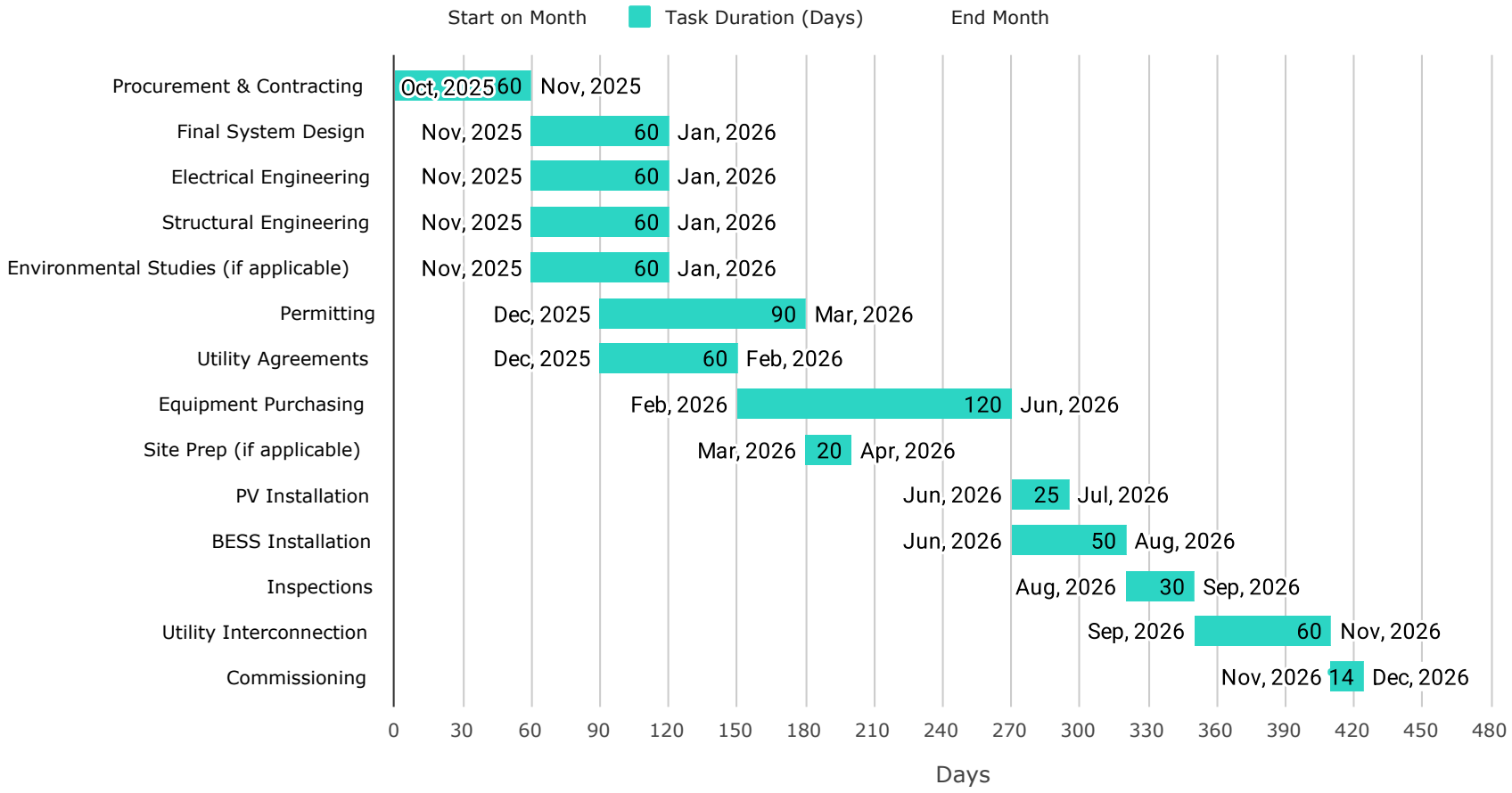
This permit is required any time there is soil disturbance. DAHP does not charge a fee to process or issue a permit; however, there are penalties for failing to obtain or comply with a permit.

Solar, BESS, Building, and Fire Review/Permitting:

The City of Tumwater Community Development Department will provide single point review and permitting for the rooftop solar arrays, the BESS installation location, BESS pad and fire code compliance. Al Christensen, the Building and Fire Safety Official at the Department provided an initial review of the project on 3/25/2025 to determine permitting requirements. The rooftop solar array will require a standard Building Permit Application that includes a site plan, rooftop array layout drawing, stamped engineering letter or plans showing compliance to snow/wind loading requirements, and equipment specification sheets.

The BESS installation can be included in this single permit application, with additional documentation showing compliance to NFPA/NEC required setbacks and fire safety requirements. Planning will require that the BESS be shielded from public view by a solid wall or fence and that a Foundation Plan be submitted. Chainlink fences are not acceptable as shielding. The initial review indicated that no land use, or additional special use permits will be required. All fire reviews for the BESS and PV system will be included in the Building Permit review, with no additional permit applications required. Please note that the Department indicated that the "rules may change by the time of installation. The Department is currently reviewing other ongoing installations in the County and may be updating permitting requirements or BESS installation policies."

Schedule


Start on Month
Task Duration (Days)
End Month
Procurement & Contracting
Oct, 2025 60 Nov, 2025
Final System Design
Nov, 2025 60 Jan, 2026
Electrical Engineering
Nov, 2025 60 Jan, 2026
Structural Engineering
Nov, 2025 60 Jan, 2026
Environmental Studies (if applicable)
Nov, 2025 60 Jan, 2026
Permitting
Dec, 2025 90 Mar, 2026
Utility Agreements
Dec, 2025 60 Feb, 2026
Equipment Purchasing
Feb, 2026 120 Jun, 2026
Site Prep (if applicable)
Mar, 2026 20 Apr, 2026
PV Installation
Jun, 2026 25 Jul, 2026
BESS Installation
Jun, 2026 50 Aug, 2026
Inspections
Aug, 2026 30 Sep, 2026
Utility Interconnection
Sep, 2026 60 Nov, 2026
Commissioning
Nov, 2026 14 Dec, 2026
0 30 60 90 120 150 180 210 240 270 300 330 360 390 420 450 480
Days

Summary of Feasibility and Next Steps

A solar plus storage system at the Fire District headquarters offers resiliency benefits by ensuring power availability during outages. Designed to support an entire facility, the system provides backup power for periods ranging from medium-duration outages to extended ones. During winter months, when solar power generation may be reduced due to weather conditions, the solar + storage system offers a shorter duration period of autonomy without an additional distributed generation resource, such as a larger whole building backup generator. The integration of a larger 125kW whole building generator would increase the systems resiliency benefits and would ensure that essential operations continue smoothly and uninterrupted, even in less favorable conditions.

This site does pose some additional challenges when considering adding a solar plus storage microgrid system. These include complex electrical work to install the new equipment required for the microgrid integration into the existing electrical system, limited available space for the BESS according to fire code requirements, and the lack of an adequately sized generator to recharge the BESS during long term outages. However, these hurdles have been identified and included in the system cost estimates. It would still be feasible to integrate a solar plus storage microgrid system at this facility.

Next Steps:

- Evaluate the available space and proposed locations for the pad-mounted BESS.
- Explore possible alternative funding opportunities for a whole building generator upgrade.
- Consider funding pathways and potential grant writing efforts.
- If successful in grant requests and negotiations, construct project.

Additional Reference Information

General Site Information

Managing Organization	City of Tumwater
Site Address	311 Israel Rd SW, Tumwater, WA 98501
Parcel Number	82700100100
Organization Contact	Brian Hurley, Fire Chief
Organization Contact Phone Number	(360) 754-4170
Organization Contact Email	BHurley@ci.tumwater.wa.us

Utility Information

Service Electric Utility	Puget Sound Energy (PSE)
Electric Utility Meter Number	P166329611
Electric Utility Tariff Structure	Commercial 25
Electric Utility Hosting Capacity	Generation Hosting Capacity of 1.21 MW

Minimum Equipment Recommendations

The conceptual system has been designed assuming specific named products. These choices are based on the current market, and the named equipment may not be the best choice for the project or may not be available at the time of hypothetical construction. When evaluating bids, we recommend considering the following criteria to be the acceptable minimums.

PV Modules:

Warranty: Minimum of 12 years for the product, extending to 25 years, covering parts and labor.

Performance Guarantee: A linear performance warranty that guarantees at least 86% of nominal power rating after 25 years.

Manufacturing Standards: Modules should be Tier 1 qualified, preferably assembled in the USA.

Cell Type: Monocrystalline cells.

Frame and Weight: Anodized aluminum frame with an average system weight not exceeding 2.6 pounds per square foot (psf).

Certifications: Compliance with UL 1703/UL 61730; PID Resistance (IEC 62804); Salt Mist (IEC 61730) when PV system is within 2 kilometers of shoreline; and Fire Classification matching that of the existing roof.

PV Inverters:

Efficiency and Warranty: Minimum efficiency of 96%, with a 10-year limited warranty, extendable up to 5-15 years.

Compliance and Compatibility: Must comply with IEEE 1547/ UL1741SB standards; suitable for output voltages of 120/240V Single-Phase, 120/208V 3-Phase, or 277/480V 3-Phase as dictated by the BESS design and existing electrical infrastructure; FCC Part 15 Class A; SunSpec Modbus Compliant.

Safety Features: UL1699B; NEC 2020 Rapid Shutdown Compliant; Ground Fault Detection and Interruption, AC and DC Surge Protection

PV Monitoring:

Monitoring Level: Module-level monitoring

Connectivity: Connection options should include hard-wired Ethernet, Wi-Fi, or a cellular connection.

User Interface: A web-based portal accessible to customers, displaying real-time and historical data on PV power, energy production, system alerts, and module status.

Mounting System:

Warranty and Design: A minimum of a 25-year manufacturer warranty. The mounting system design should be suitable for the specific roof type and capable of withstanding local wind, seismic, and snow loading requirements.

Compatibility with Roof Materials: For standing seam metal roofs, use non-penetrating clamps. The mounting system must comply with UL2703 and local building codes, as well as maintain the roof's warranty and fire classification.

Examples of Mounting Systems for Standing Seam Metal Roofs.

BESS Specifications:

Warranty: Minimum 5-year manufacturer's warranty with 5-10-year warranty extension options.

Standards Compliance: Must comply with UL 9540 and UL 9540A for safety. Must adhere to NFPA 855 standards for installation and safety.

Battery Chemistry: Lithium Iron Phosphate (LFP/LiFePO4) is preferred for its stability, safety, and longevity.

Compatibility: Should be compatible with a range of third-party inverters and microgrid control systems. Should include generator compatibility and black start capability.

Enclosure Rating: A minimum NEMA 3R rating is required for outdoor installations to ensure protection against weather elements. If the system is to be installed near salt water, the enclosure must be suitable for the environment, and warranties must not be voided.

Fire Suppression: Active chemical fire suppression and exterior ventilation is recommended for all indoor and outdoor installations.

Battery Heating/ Cooling Equipment: Integrated HVAC or alternate active temperature control system to maintain ideal battery operating conditions and temperature.

Country of Origin: Must meet any specific country of origin requirements as per the funding source's guidelines.

Energy Capacity and Power Output: Specified based on the project's energy storage needs, considering peak demand shaving, load leveling, and backup power requirements.

Multimodal BESS Inverter: Should have the following listings and certifications, including but not limited to: UL 1741SB, IEEE 1547, IEEE 519, NEMA 3R Enclosure, Minimum efficiency of 95% with a minimum 10-year limited warranty, extendable up to 5-15 years

Efficiency and Performance: High round-trip efficiency and low degradation rate over the system's operational life.

Safety Features: Advanced Battery Management System (BMS) for monitoring cell voltage, temperature, state of charge, and overall system health. Overcharge, deep discharge, overcurrent, and short-circuit protection.

Scalability: Ability to scale up the system with additional energy storage modules or integrate with existing renewable energy systems.

Installation Flexibility: Suitable for various installation environments, including ground mount, rooftop, or integrated within existing infrastructure.

Maintenance: Low maintenance requirements, with remote monitoring and diagnostics capabilities.

Microgrid Controller:

Functionality: Highly recommended to include a microgrid controller for advanced management capabilities.

Integration: Should offer interoperability with third-party Virtual Power Plant (VPP) providers.

Features: Capable of real-time monitoring, demand response, load management, and predictive analytics.

User Interface: Intuitive, user-friendly interface for system management and data visualization.

Grid Support: Ability to monitor grid voltage and frequency to initiate power quality correction measures using distributed energy assets when needed.

North End Fire Station

Solar Plus Storage Feasibility Study

405 Linwood Avenue SW

Tumwater, WA 98512

Parcel #09080004002

Prepared by Cascadia Renewables for the City of Tumwater

info@cascadiarenewables.com

Published May 7, 2025

CASCADIA RENEWABLES

About Cascadia Renewables

Cascadia Renewables is a technical consultant based in Washington state, specializing in designing and deploying solar and storage assets. We leverage our combined decades of industry experience to support public and private entities as they pursue their clean energy goals. Our team has led regional clean energy policy initiatives focused on equality, transparency, and affordability.

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Acknowledgments

Community Stakeholders and Representatives:

- Brian Hurley – *Fire Chief* – Tumwater Fire Department
- Shawn Crimmins – *Assistant Fire Chief* – Tumwater Fire Department
- Mason Rolph – *Executive Director* – Olympia Community Solar
- Chris Graham – *Facilities Manager* – City of Tumwater
- Alyssa Jones Wood – *Sustainability Manager* – City of Tumwater
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- Kristine Rompa – *Government Liaison* – Puget Sound Energy
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- Todd Olinsky-Paul – *Senior Project Director*

Table of Contents

Letter From the Field

Dear Brian Hurley,

We are pleased to present the City of Tumwater with this study, which examines the feasibility of constructing a solar plus storage system to enhance resiliency at the North End Fire Station.

The purpose of this study is to convey a clear, detailed, and accurate description of the design for a potential solar plus storage system to enhance community resilience, taking into account geographical, infrastructural, economic, environmental, and social context. This report is the culmination of an extensive design project, the goals of which include:

- Understanding community needs
- Assessing trends in energy usage and conditions of the site
- Determining the optimal system size and architecture
- Assessing the benefits, challenges, and risks of proceeding with the proposed system
- Identifying next steps

This report is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

We intend this document to concicely convey the technical aspects of the design to those with experience reading such information. It is separated into three levels of detail:

1. A high-level summary of our findings and recommended design *(found on page 5)*
2. Detailed specifications of our design and design process *(pages 6–46)*
3. An appendix of calculations and ancillary documents for cross-referencing, as well as the findings and photos from our original site visit *(found in separate PDFs)*

To determine the feasibility of a solar plus storage system, it is necessary to specify equipment, equipment locations, system design, and hourly labor/services estimates. Though we provide this high level of fidelity, please note that this feasibility study is conceptual– it is not intended for construction purposes. It supports stakeholder decision-making, fundraising efforts, and future designs. To determine the final product specifications, equipment locations, system design, and hourly cost/estimates, Cascadia Renewables recommends a thorough 3+ bid RFP process.

Please direct yourself to any sections appropriate and relevant to your needs. If you have questions about this report, please contact us at info@cascadiarenewables.com.

Sincerely,

Cascadia Renewables

Design Abstract

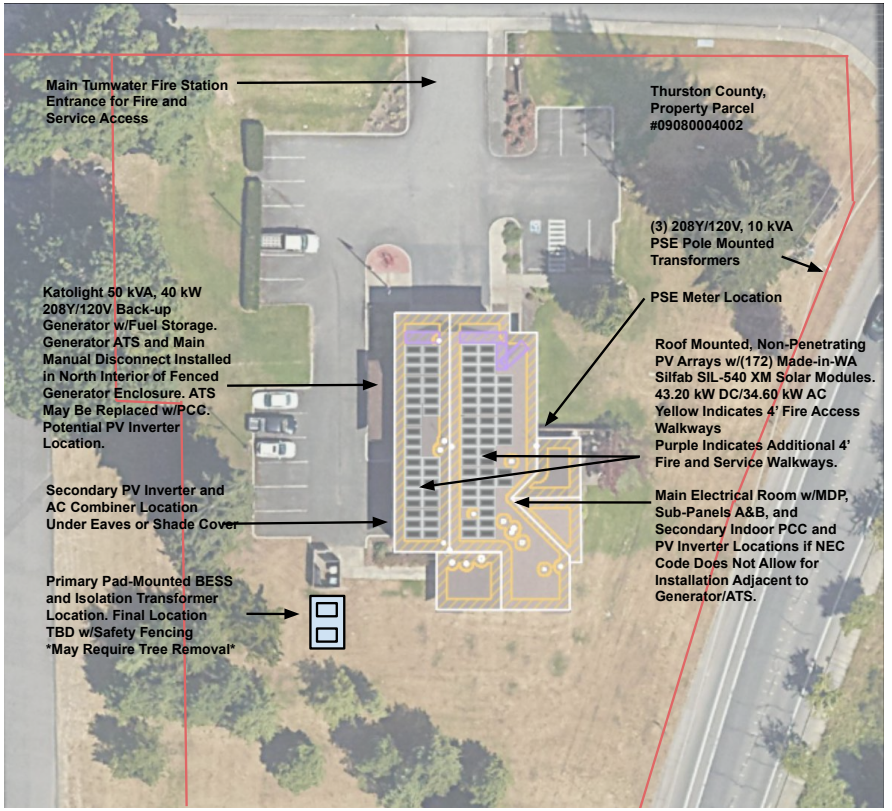
The conceptual solar plus storage system for the Tumwater Fire District North Station aims to improve the site's resilience by enabling the facility to function autonomously during power outages. This will allow it to serve as an Emergency Operations Center during extended outages or natural disasters. Financially, the system offers benefits by offsetting utility energy purchases with photovoltaic (PV) solar production as well as reducing monthly peak demand charges through the strategic use of the battery energy storage system (BESS) during high-demand periods.

With the installation of PV modules on the upper east and west-facing roof sections, the system is designed to maximize annual energy output while avoiding shading from nearby trees and rooftop structures. Excluding modules along the south edge accommodates future building expansions.

The primary purpose of the BESS is resilience, ensuring a continuous power supply during outages and reducing the runtime of the standby generator, which results in fuel conservation.

The project's feasibility is supported by its alignment with community goals, which includes serving 27,000 residents and supporting citywide emergency preparedness. The system is designed to offset 109.76% of annual energy consumption, contributing to ongoing sustainability efforts. The PV system's racking and roof mounting solutions ensure straightforward installation.

Given these considerations, the system is technically feasible and aligns with the project goals of enhancing the site's energy independence and resilience while also delivering economic benefits.



PV System Size	43.20 kW DC/34.60 kW AC
BESS Size	35 kW/143 kWh
Estimated Annual Electric Production	38,203 kWh
Estimated Percentage of Annual Consumption Offset	109.76%
First Year Bill Savings	$4,261.00
Period of Autonomy	**December:** 100% Demand - 39 hrs 150% Demand - 24 hrs 200% Demand - 17 hrs **July:** 100% Demand - Continuous 150% Demand - 37 hrs 200% Demand - 31 hrs

Design Specifications and Process

Introduction to the Site

Type of Building: The Fire Station is a modern stick-built wood construction, two-story building with garage bays for the fire apparatus, with internal offices and conference rooms that may be used as the primary alternate Emergency Operations Center.

Surrounding Conditions: The North End Station is one of only two fire stations in the city of Tumwater, with multiple access locations for easy access by the public and fire personnel during an extended emergency.

Typical Purpose of Site: Fire Station serving the north end of the City of Tumwater.

Emergency Function: The station serves as the regional fire station primarily for the City of Tumwater's north side and urban growth areas, and as the back-up Emergency Operations Center for large-scale emergency management, providing leadership and coordination during disasters. Additionally, it supports daily fire and emergency response activities critical to community safety.

Project Goals

In conversation with stakeholders, the community had the following goals:

- To continue providing emergency services for the City of Tumwater through increasingly challenging environmental conditions.
- To continue providing emergency fire services for the City of Tumwater throughout an ongoing emergency event where grid power may not be available and generator fuel supplies are limited or unavailable.

In service of those goals, the system was designed with the following priorities:

1. Provide backup power, enabling the building to remain operational during short, seasonal power outages.
2. Provide long-term back up power, enabling the building to remain operational during extended emergencies.
3. Increase redundancy of existing backup generator system, reducing generator runtime and fuel use.
4. Reduce the station's operational costs through the reduction or elimination of monthly electical bills, allowing internal funds to be reallocated.

Stakeholder Engagement

Key stakeholders included:

- Brian Hurley – *Fire Chief* – Tumwater Fire Department
- Shawn Crimmins – *Assistant Fire Chief* – Tumwater Fire Department
- Mason Rolph – *Executive Director* – Olympia Community Solar
- Chris Graham – *Facilities Manager* – City of Tumwater
- Alyssa Jones Wood – *Sustainability Manager* – City of Tumwater

Differing needs of stakeholders were voiced through the following interactions, summarized below.

Engagement Activities and Objectives:

December 23, 2024: Members of Cascadia Renewables conducted a comprehensive site assessment with personnel from the department.

February 24, 2024: A kickoff meeting was conducted between Cascadia Renewables and representatives of fire department, the City of Tumwater, and Olympia Community Solar. The goal of the meeting was to inform the stakeholders about the upcoming process, to make plans to aquire the necessary information to perfom a site analysis, and to get an impression of the goals of the stakeholders.

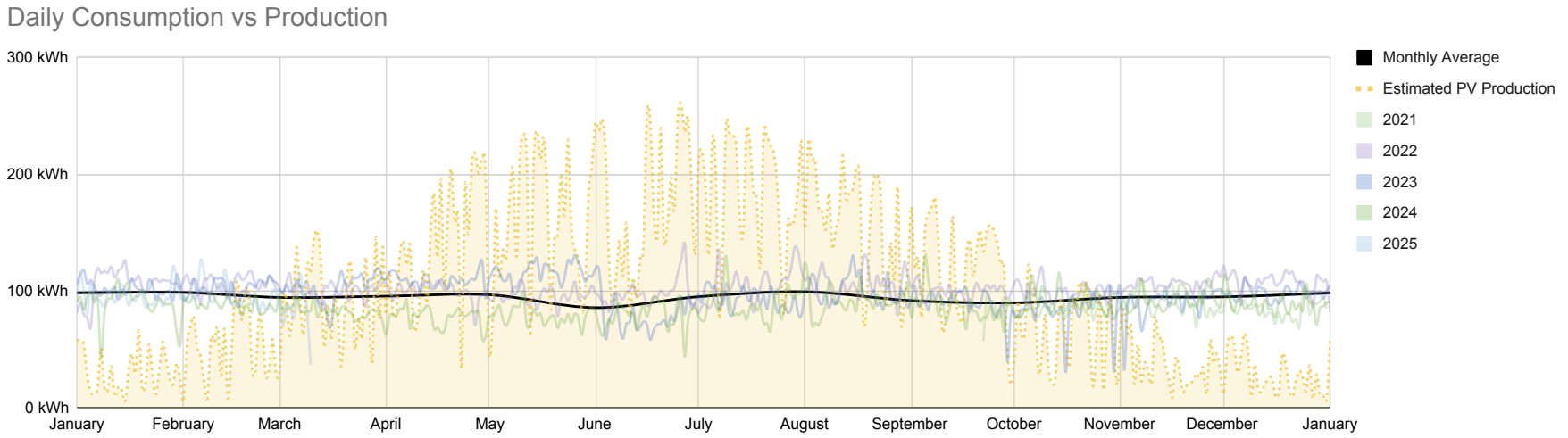
April 17, 2025: Cascadia Renewables held a design review meeting with members of the fire department, the City of Tumwater, and Olympia Community Solar to present the in-progress conceptual design. We received feedback on the design, responded to the concerns of the organizations, and made a plan to spread the word about the project's plans to the broader community.

Preliminary Electrical Usage Analysis

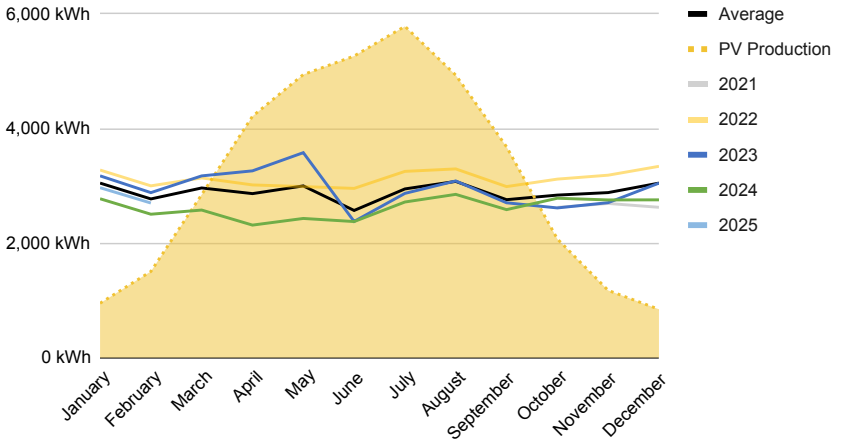
The electrical usage analysis determines the optimal solar and battery system sizes for meeting the needs of the site. We consider this electrical analysis in tandem with information collected onsite to inform the conceptual design and verify the installability of the project if it is funded.

This analysis of the community's electricity consumption uses data from March 2024 to March 2025, providing a full year for accurate modeling. The data shows minor seasonal variations, with July seeing the highest demand due to increased air conditioning. Consumption is typically higher on weekdays due to typical business use. There are no expected changes to the electrical infrastructure that would affect current demand or consumption trends. This analysis offers insights to guide more efficient and sustainable energy management.

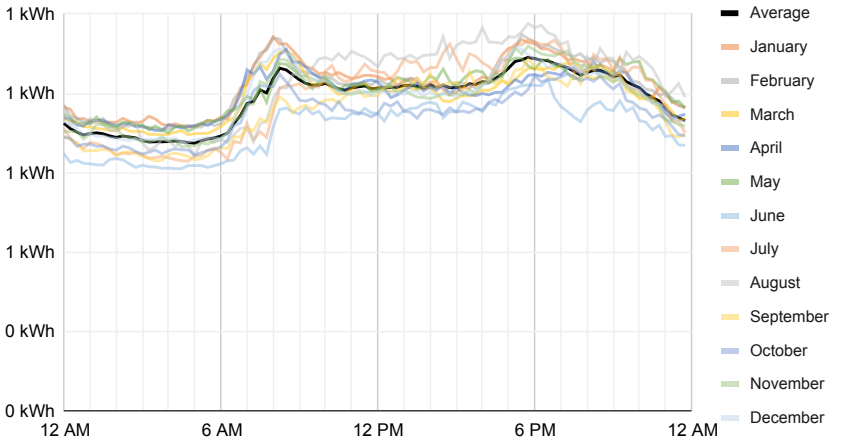
Estimated Annual Electric Consumption	34,805 kWh
Seasonal Fluctuation	19.75% fluctuation between minimum consumption in June and maximum consumption in August
Estimated Maximum Peak Demand	10 kW
98-Percentile of Consumption During a Single Day	122 kWh



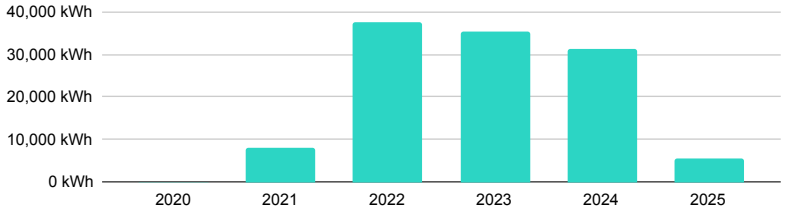
Monthly Consumption vs PV



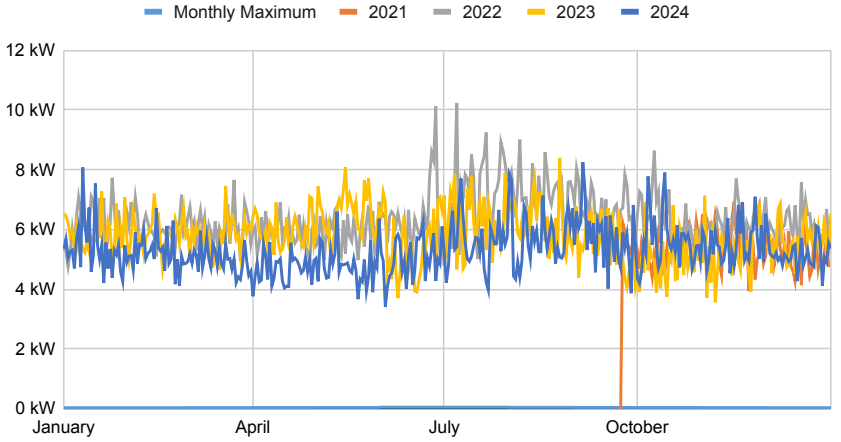
Average Consumption per 15-Minutes by Month



Total Consumption by Year



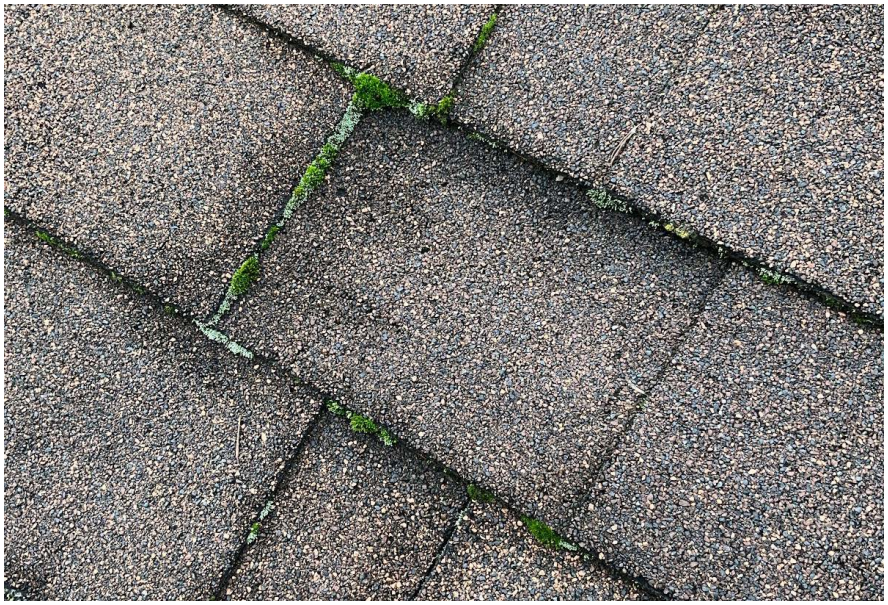
Monthly and Daily Peak Demands



Comprehensive Site Visit

Following the preliminary electrical analysis and an initial review of the available building plans and satellite imagery, members of the Cascadia Renewables' design team assessed the real-world conditions through a comprehensive site visit.

Roof:



Condition of the roof

Roof Quality	Fair condition with moss growth
Roof Type	Composition
Roof Angle	Roof 1: 22 degrees (5:12), Roof 2: 22 degrees (5:12)
Roof Age	Unknown - Less than 10 years of remaining useful life
Date After Which Roof Should Be Replaced	The composition shingle roof should be replaced prior to installing the PV system.

Structure:

Structure Type	The Fire Station is a modern stick-built wood construction, two-story building.
Assessment of Structure Quality	The structure appears to meet all building requirements to support a flush-mounted PV system on the plywood and composition shingle roofs.
Availability of Plans	Both structural and electrical plan sets were available onsite.
Soil Conditions	The Fire Station is surrounded by asphalt parking and driveways on the north and west side, with grass landscaping on the south and east sides.

Meter photo

MDP and Sub-Panels A & B

Electrical:

Service Utility	Puget Sound Energy (PSE)
Main Service Type	208Y/120V, 3-Phase
Electrical Topology	The Fire Station's electrical infrastructure is primarily located on the east wall in the main central interior living and workout area, with multiple access locations. The infrastructure includes a 225 A Main Distribution Panel, with two adjacent 225 A Sub-Panels.

Line Side Infrastructure	The Fire Station's 3-Phase 208 V power is fed to the externally mounted PSE meter from (3) pole-mounted 10 kVA PSE transformers located on the northeast edge of the property.
Electric Utility Hosting Capacity	Generation Hosting Capacity of 4.45 MWs
Location of Main Electrical Service	The main electrical service is located on the east wall in the main central interior living and work-out area of the Fire Station
Locations of Current Infrastructure	The PSE transformers are located on the northeast edge of the property, with the PSE Meter located centrally on the east exterior wall. The Generator and ATS are located centrally on the west exterior of the Fire Station. The Main Distribution Panel and Sub-Panel A &B are located on the east wall in the main central interior living and work-out area.
Main Transformer Rating, Voltage, and Phase	(3) Pole-Mounted 10 kVA, 208Y/120V, 3-Phase Transformers

Main Service Bus Capacity	225 A
Main Service Bus Voltage	208Y/120V, 3-Phase
Main OCPD Rating	225 A
Main Distribution Center Type	Panelboard
Amps Available for PV Interconnection Under 120% Rule	45 A

Generator:

Generator Brand	Katolight Power System Solutions
Generator Size	50 kVA, 40 kW, 208Y/120V, 3-Phase
Generator Fuel Type	Diesel - Could not verify fuel storage capacity during site visit

Generator Interconnection Method	The generator interconnects to the Fire Station through an Automatic Transfer Switch (ATS) that is located adjacent to the generator. The ATS feeds the main distribution panel allowing the generator to provide whole building backup power.
Generator Backup Configuration	Whole Building

Other:

Description of Accessibility: The Fire Station is located on the north edge of the City of Tumwater, halfway between the Tumwater Fire Headquarters and the City of Olympia, with easy access from multiple surrounding streets, including nearby I-5. The roofs are accessible from a single-story ladder on the southwest corner and lower east roofs, and a two-story ladder or man-lift onto the PV installation locations from the parking/driveways to the north and west.

Description of Shading: The primary east and west roofs are mostly shade-free, with limited shading along the lower northeast edge from adjacent trees, and small localized shading from rooftop vents and antennas.

Photovoltaic (PV) System Design

Overview:

The conceptual 43.20 kW DC PV array would be installed on the upper composition shingle roof. The system was designed using a max fit methodology, meaning it aims to fully offset the building's annual energy consumption by efficiently utilizing available roof space. The PV layout places the panels on the east and west-facing sections of the roof while avoiding areas that might experience shading from nearby trees or rooftop structures. This design ensures optimal energy production while facilitating easy installation and maintenance.

The PV system production was modeled using Aurora, a software that uses irradiance data, LIDAR data, and 3D models of buildings to determine PV output over the course of the day and the year.

In this report, specific products names are used. These recommendations are to be considered typical–comparable equipment may be substituted. When making substitutions, pay attention to all technical specifications, as some products that initially appear comparable may be different in key ways.

Solar irradiance visualized across the array

Specifications:

PV System Size	43.20 kW DC, 34.60 kW AC
PV Module	Silfab SIL-540 XM, 540 Watt Module
Number of Modules	80

Estimated Annual Electric Production	38,203 kWh
Estimated Percentage of Annual Consumption Offset	109.76%
Total Solar Efficiency	77.0% TSRF

Number and Models of Inverters	(2) SolarEdge SE 17.3K-US, 208V Commercial 3-Phase Inverters
Location of Inverters	The (2) PV inverters may be installed on the southwest wall of the Fire Station, but heat issues could arise if a shade cover is not included. CR recommends installing in fenced area adjacent to the generator and new PCC or indoors as space and code allows.

Design Considerations:

Trenching, Cutting, and Wall Penetrations Trenching and pavement cutting will be required to connect the requested BESS location along the southwest edge of the property, across the asphalt driveway and concrete curbs, to the genarator/ATS location on the west side where the PCC will be installed. There may be a limited number of wall penetrations to allow for the integration of the PCC into the existing electrical infrastructure in the central living and work-out area.

Maintenance and Fire Access 4’ commercial fire setbacks will be provided on all roof locations to allow for easy maintenance and fire access.

Wire Run The externally mounted DC PV wire runs will vary from 30’ from the primary west-facing PV array location above the PV inverter location, to 80’ from the east-facing PV array.

Roof Shading The primary east and west roofs are mostly shade-free, with limited shading along the lower northeast edge from adjacent trees, and small localized shading from rooftop vents and antennas.

Required Upgrades Prior to PV Installation None

Interconnection Method for PV The (2) SolarEdge SE17.3K inverters will have their 208Y/120V output combined in a PV combiner panel, that will feed the PV input in the Point of Common Coupling (PCC) panel that will/may be installed in place of the existing generator ATS on the west exterior.

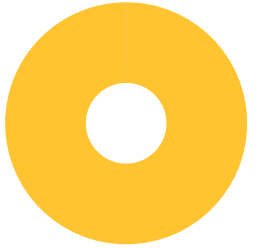
PV SYSTEM DETAILS

GENERAL INFORMATION
Facility: Meter #1
Address: 405 Linwood Ave SW Tumwater WA 98512

SOLAR PV SYSTEM RATING
Power Rating: 43,200 W-DC

SOLAR PV EQUIPMENT DESCRIPTION
Solar Panels: 43.2 kW-DC Standard Modules

ENERGY CONSUMPTION MIX
Annual Energy Use: 31,814 kWh

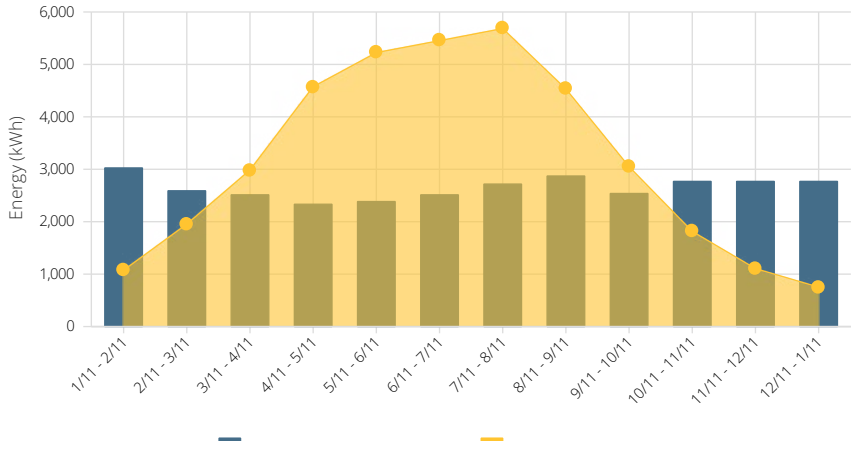


Utility -6,390 kWh (0.00%)
Solar PV 38,204 kWh (100.00%)

SOLAR PV EQUIPMENT TYPICAL LIFESPAN
Solar Panels: Greater than 30 Years
Inverters: 15 Years

Solar PV System Cost and Incentives	
Solar PV System Cost	$185,900
Grant Amount	-$185,900
Net Solar PV System Cost	**$0**

MONTHLY ENERGY USE VS SOLAR GENERATION



Roof Loading and Mounting:

Mount Location	The PV modules will be installed on the upper east and west-facing roof sections.
PV Racking System	IronRidge Aire Rail System
PV Mounting System	Flush-mounted
Roof Penetrations	The system will be installed using IronRidge's FlashFoot 2 anodized aluminum flashing system for composition shingle roofs, with additional butyl tape to provide a weather-tight roof connection.
Roof Loading Capacity	25.0 psf
Additional Available Roof Loading	5.0 psf
Estimated PV System Roof Loading	2.5 psf
Assessment of Whether the Roof Will Support the System	Yes

Battery Energy Storage System (BESS) Design

Specifications:

BESS Size	35 kW/143 kWh
BESS Backup Configuration	The BESS is configured to backup the entire facility and serve as the primary backup power source, allowing the building to ride through seasonal and medium duration outages without the need for the generator. If, during island/off-grid operation, the BESS reaches a low state of charge, the microgrid control system will turn on the standby generator which will power the building loads and recharge the BESS. Once the BESS reaches the desired state of charge, the generator will be turned off and the BESS will continue powering the building load with support from the PV system when available.
Peak Demand for Modeling Purposes	10 kW
Source of Peak Demand	Observed

PCC Location

Example of a Containerized BESS Unit

Overview:

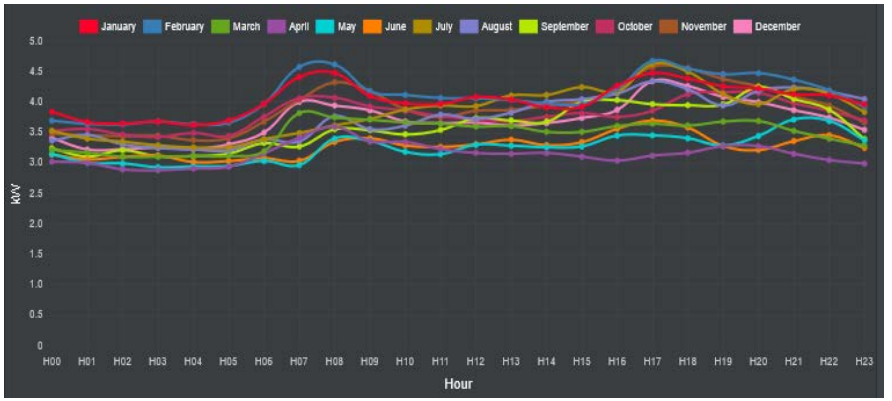
The conceptual 35kW/143 kWh BESS would be installed in the grassy area south of the parking lot, mounted on a concrete pad and enclosed by a security fence, to comply with local fire code requirements and limit its visibility from public areas. The system's design considers various scenarios, including 100%, 150%, and 200% of historical energy demand, and both full and zero PV resource availability. Such modeling assumptions ensure that the BESS effectively supports typical building operations and increased demand scenarios during emergencies and the eventual building expansion. The BESS integrates with an existing generator to offer robust backup power during extended outages, maintaining a steady power supply.

BESS dispatch performance is modeled in a program called Xendee, which considers many sources of data, including PV production, estimated site consumption, and grid energy pricing, to optimize a BESS for a variety of desired characteristics, including resiliency and financial benefit.

Demand Modeling:

For the BESS modeling, we utilized the interval data from March 9, 2024 to March 9, 2025 to create a daily building load profile in our system modeling software. This is representative of the actual historical daily load profile throughout the year and provides the most accurate basis for our system performance modeling.

Before constructing a system, we recommend conducting a month-long meter study, collecting 1-minute interval data to identify transient peaks in demand.



Load Profile based on 15-min Utility Interval Data

BESS Design Considerations:

Although utility data showed a building peak demand of 10 kW, we specified a 35 kW BESS inverter to ensure that the system can meet building demand and transient demand surges during an outage. When considering the increased building demand as a result of the planned building expansion, an additional 35kW BESS inverter may need to be added to the system to ensure the system can meet this increased demand. The BESS design features rack-mounted inverters that can easily be expanded for an estimated cost of $15,000 per 35kW inverter. We also designed the system to integrate with the existing backup generator to maximize system resilience and backup power supply redundancy.

The BESS will need to be installed on an concrete pad approximately 5' x 8' and, per discussions with fire and permitting officials, a security fence would be required around the BESS since it would be in a visible, high traffic area. This will increase the area required for the BESS to approximately 11'

x 14’. The proposed BESS location in the grassy area on the south side of the propery is clear of nearby vegetation. A 10’ setback from exposures, including public ways and lots lines (WA Fire Code 1207.8.3) will need to be maintained when determining a final BESS location after the building expansion plans are finalized. Based on the site assessment, there appears to be sufficient space to accommodate the BESS while maintaining fire code clearances.

Generator Supplementation:

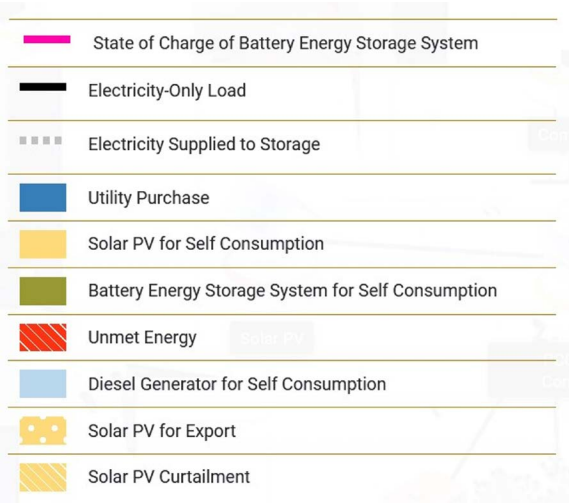
Though not part of a solar plus storage system, a standby generator can be a hugely beneficial complement to a BESS as it will allow a site to maintain extended autonomous operation in the winter. Additionally, a BESS complements a generator by allowing it to run less often and more efficiently than if the generator was installed alone.

Generator Recommendation	Keep Existing Generator
Proposed Generator Size	50 kVA, 40 kW, 208Y/120V, 3-Phase (Same as Existing)
Proposed Generator Fuel Type	Diesel - Could not verify Fuel Storage capacity during site visit. (Same as Existing)
Proposed Generator Interconnection Method	The generator interconnection would be moved from the existing ATS into a newly installed AC Aggregration Panel via a motorized breaker and SEL751 relay.
Proposed Generator Backup Configuration	Whole Building

Low-PV Outage Simulation:

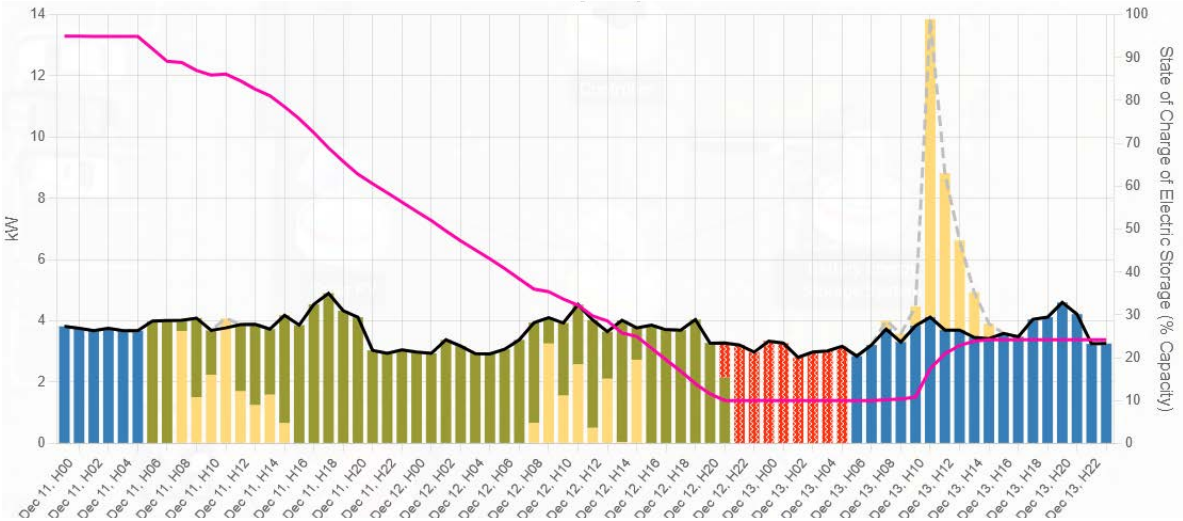
The BESS design was based on 100% of historical energy demand. Additional modeling was performed at 150% and 200% of historical energy demand in order to illustrate system performance in the event that building usage increases during an emergency. Modeling was also performed showing the generator dispatch to illustrate the reduction in generator runtime and how this redundant backup power source could be utilized during long duration outages.

In operation, the period of autonomy of the BESS and estimated daily generator runtime will depend on numerous factors, including available solar resourc-

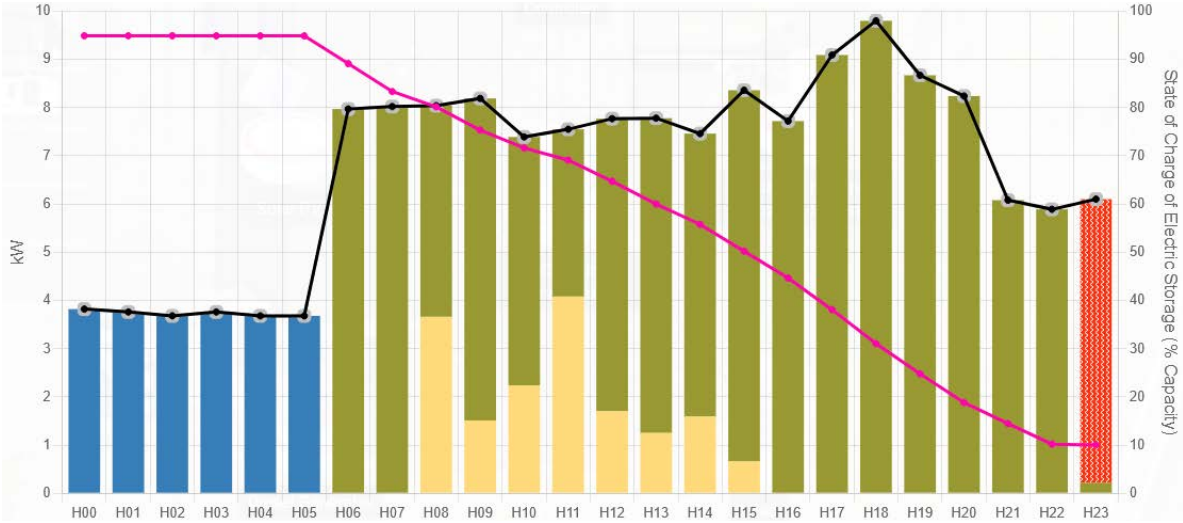


Dispatch Graph Key

December Outage Scenario Electricity Dispatch – 100% Demand



December Outage Scenario Electricity Dispatch – 200% Demand



es, BESS state of charge, and building loads during an outage. A change in any of these factors will impact these estimates.

December Period of Autonomy

100% Demand: 39 hrs

150% Demand: 24 hrs

200% Demand: 17 hrs

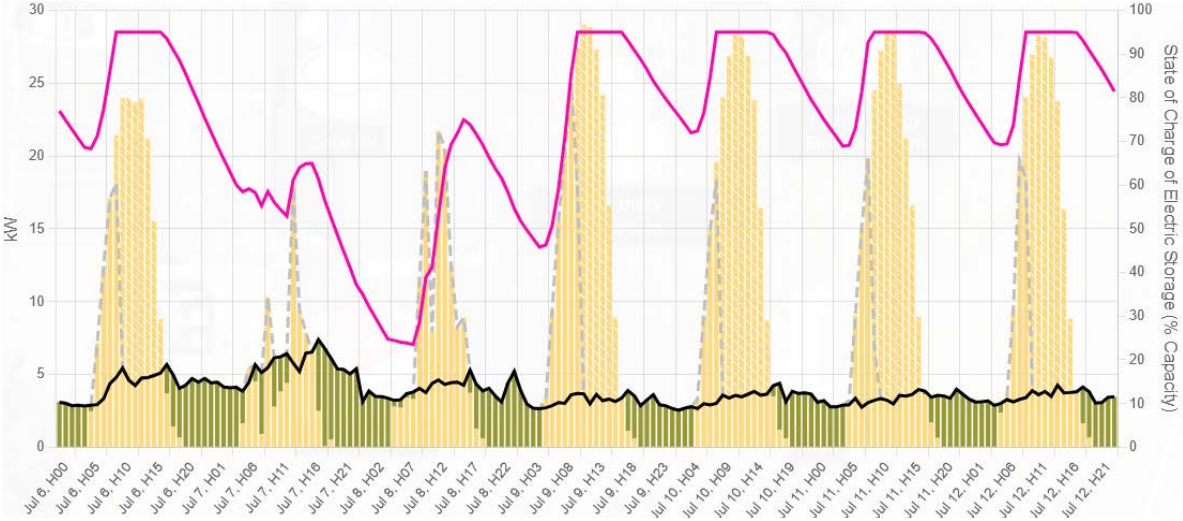
July Period of Autonomy

100% Demand: Continuous

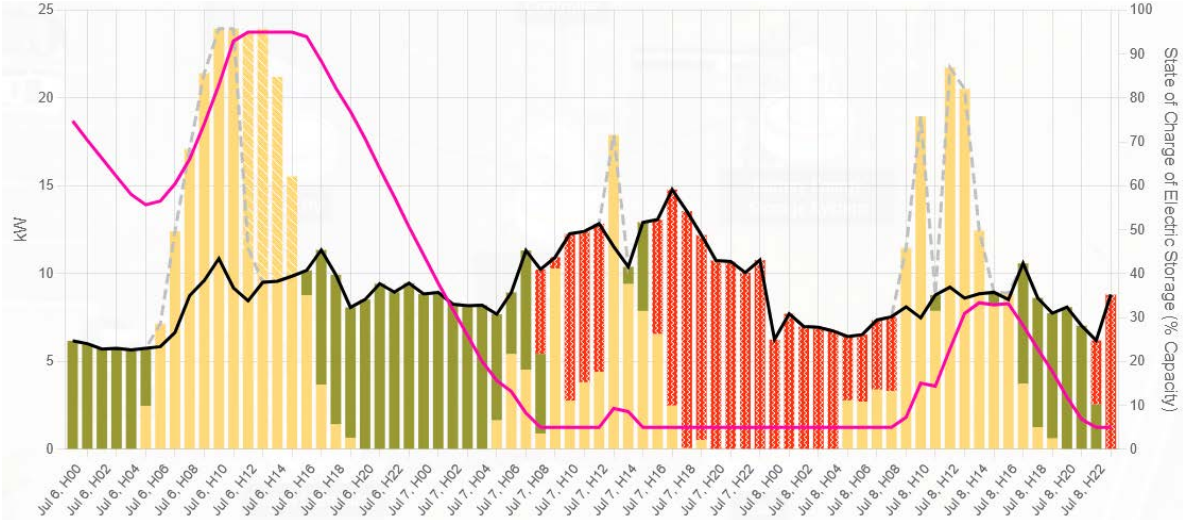
150% Demand: 37 hrs

200% Demand: 31 hrs

July Outage Scenario Electricity Dispatch – 100% Demand



July Outage Scenario Electricity Dispatch – 200% Demand



High-PV Outage Simulation:

Daily Generator Runtime Required for Continuous Site Uptime in December

100% Demand: 16 hrs/week

150% Demand: 30 hrs/week

200% Demand: 35 hrs/week

Daily Generator Runtime Required for Continuous Site Uptime in July

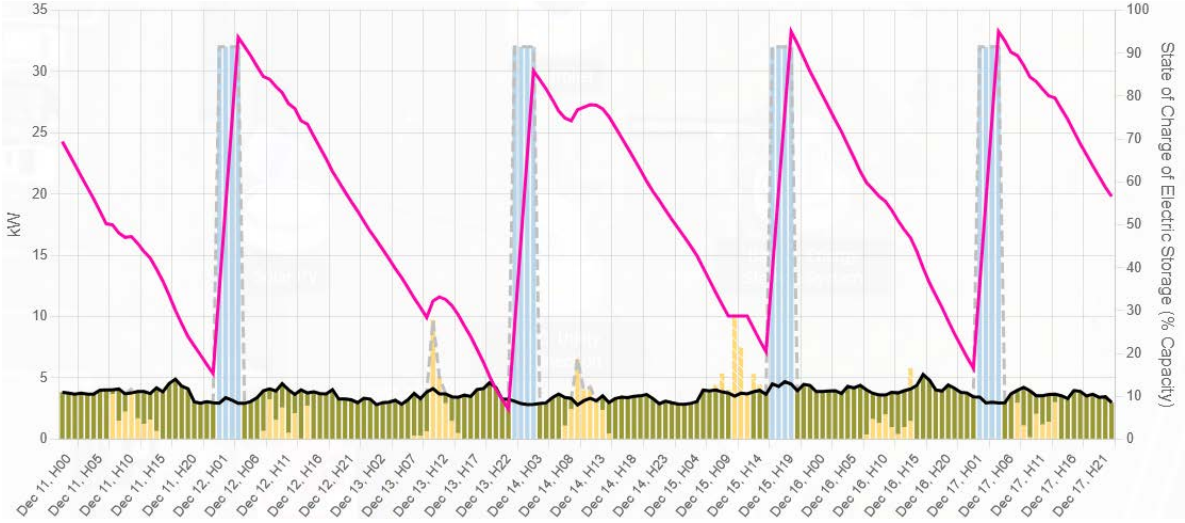
100% Demand: 0 hrs/week

150% Demand: 4 hrs/week

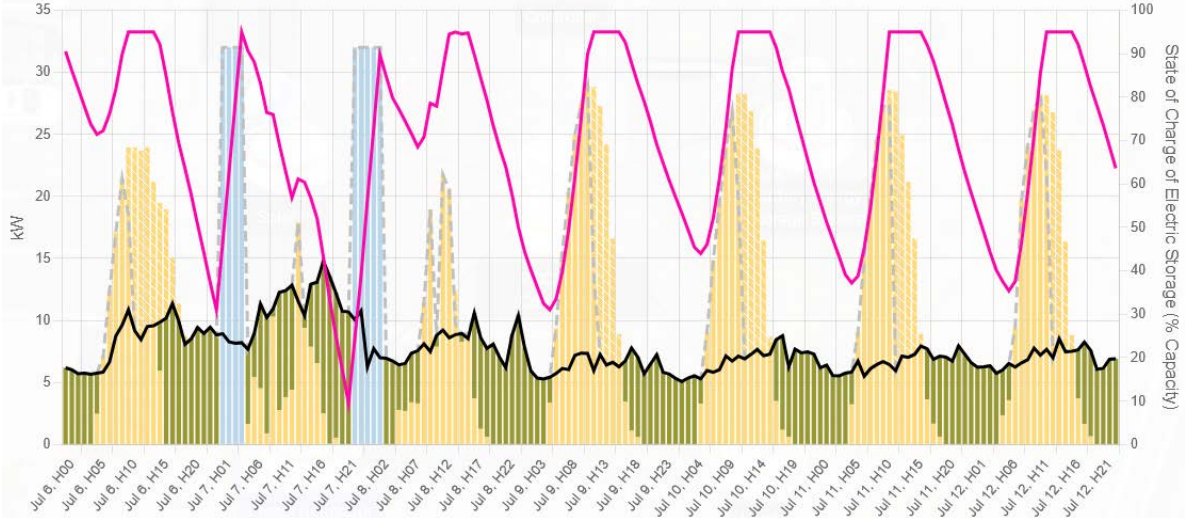
200% Demand: 9 hrs/week

In operation, the period of autonomy of the BESS and estimated daily generator runtime will depend on numerous factors, including available solar resources, BESS state of charge, and building loads during an outage. A change in any of these factors will impact these estimates.

December Outage Scenario Electricity Dispatch – 100% Demand, 40 kW Generator



July Outage Scenario Electricity Dispatch – 200% Demand, 40 kW Generator

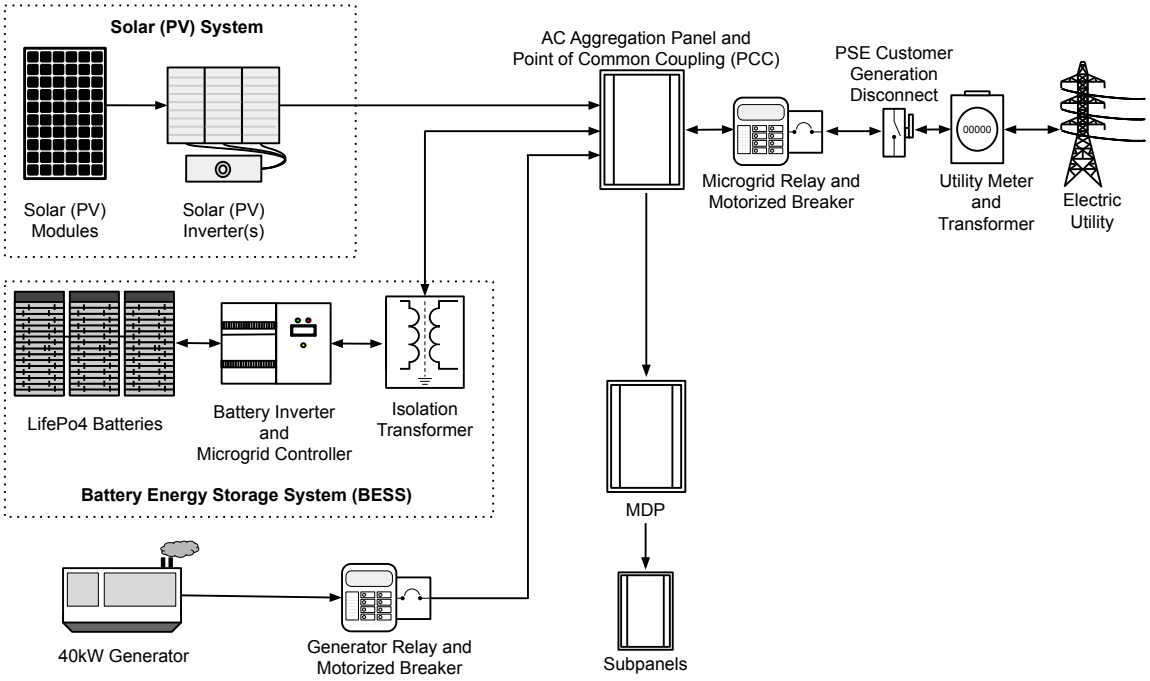


Interconnection

Topology:

The Tumwater Fire District North Station's power supply consists of a 225A, 208Y/120V incoming service from a 30kVA PSE pole-mounted transformer bank. The existing 225A-rated main distribution panel (MDP) is fed from an ATS that is connected to a 40kW standby generator. Our conceptual design replaces the existing ATS with a new 400A AC Aggregation Panel installed in the same location that would serve as the PCC. This Aggregation Panel/ PCC combines the incoming utility feed, BESS, PV, Generator, and feeds the existing MDP in the electrical room. The PCC also includes a microgrid interconnect device (MID), which consists of a 225A rated motor controlled breaker and a SEL751 relay. The MID device automatically isolates the PCC from the utility during an outage, allowing the PV system, BESS, and generator to operate as a microgrid and supply power to the facility. The standby generator would be interconnected into the PCC via a motorized breaker controlled by the microgrid control system to provide grid isolation from the generator until the system moves into island mode during a utility outage and the generator is needed to recharge the BESS and power the facility. Replacing the existing 225A service disconnect would be a new lockable, knifeblade fused disconnect that functions as both a service disconnect and a PSE required distributed generation disconnect. This microgrid system utilizes an Energy Management System to ensure that the distributed energy resources are dispatched efficiently and that the capacity of the electrical equipment bussing is never exceeded.

This configuration meets the goal of powering the entire building during seasonal outages as well as increasing the period of autonomy to allow the facility to be used as an Emergency Operations Center during a long term outage or



Simplified single line diagram of the conceptual system showing the topology of its interconnection.

natural disaster. This system also helps to reduce the runtime of the existing standby generator, conserving fuel reserves and increasing the building resiliency. The interconnection is a crucial element that affects the project's feasibility, budget, and timeline. Cascadia Renewables recommends that an electrical engineer verify the final system design before implementation.

Locations of New Infrastructure:

The conceptual design envisions the following locations for the new electrical equipment associated with this system:

PV Inverters - In the fenced area adjacent to the generator

BESS - Pad mounted in grassy area south of the parking lot

AC Aggregation Panel/PCC - Replaces existing ATS unit in fenced generator area

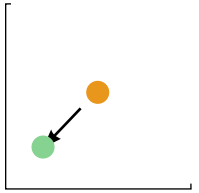
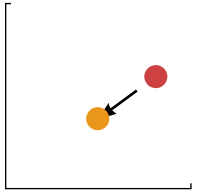
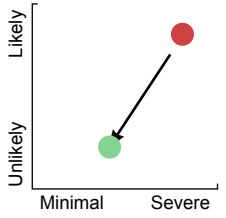
Utility Customer Generation Disconnect - Adjacent to PCC

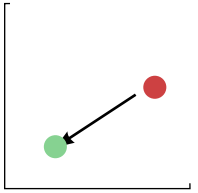
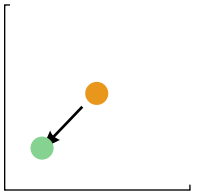
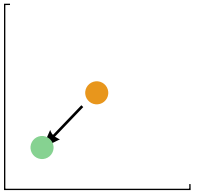
Microgrid Interconnect Device (SEL 751 Relay and Motorized Breaker) - Integrated into the new AC Aggregation Panel/PCC

PCC Location

Project Risks

Developing a solar plus storage system comes with uncertainties, from incomplete information and market fluctuation. This feasibility study aims to mitigate some risks while identifying how others might be addressed. Risks have varying levels of severity and likelihood, which can be reduced by varying degrees through the proposed mitigation strategies.

Risk	Impact	Mitigation	Risk Before and After Mitigation
Construction projects often encounter unforeseen challenges, including site-specific conditions, environmental constraints, and permitting issues.	Delays in project timelines, increased costs, potential legal disputes, and strained relationships with stakeholders.	Regular site assessments, proactive stakeholder engagement, and a robust project management approach can help identify and address potential hurdles early. Engage in thorough due diligence before finalizing a contractor to ensure they are sufficiently qualified and experienced to take on a complex solar plus storage project. Ensure that contracts have clear clauses regarding delays, with penalties or incentives for timely completion.	
Geopolitical events can impact supply chains, project financing, and overall project feasibility.	Disruption in material or equipment delivery, increased costs, potential project cancellation, or delays due to financing issues.	Diversifying supply chains, monitoring global events closely, and having contingency plans in place can help navigate these challenges. Consider insurance or hedging options that protect against geopolitical risks.	
The industry can experience shortages in critical equipment due to high demand or manufacturing constraints.	Project delays, the potential need for equipment substitutions leading to design modifications, and increased costs.	Seek contractors with established relationships with multiple suppliers, who maintain a strategic inventory and who monitor industry trends to anticipate shortages. Consider contracts allowing equipment substitution or alternative solutions in case of shortages.	

Risk	Impact	Mitigation	Risk Before and After Mitigation
The availability and cost of skilled labor can fluctuate based on market conditions.	Delays in project timelines, potential compromise in work quality, and increased labor costs.	Consider prioritizing contractors with a strong track record of workforce management and training or with established partnerships with local training institutions. Ensure contracts have provisions for labor continuity and quality assurance. Consider the timeline of construction and allowance for longer construction periods or delaying construction until more workforce development for the large-scale solar plus storage industry has occurred.	
Detailed engineering and site-specific surveys may reveal conditions or requirements that impact cost and timeline.	Potential redesign requirements, increased costs, and project delays.	Engage experienced engineering firms, conduct thorough preliminary surveys, and allocate resources for potential additional studies. Consider engaging independent third-party reviewers for critical project milestones. Allocate a portion of the budget for potential additional studies or modifications.	
Prices for materials, equipment, and services can be subject to market volatility.	Unpredictable project costs, potential financial strain, and challenges in budgeting and forecasting.	Negotiate fixed-price or capped-price contracts where possible. Maintain a contingency budget for unexpected price fluctuations and ensure transparency in cost adjustments.	

Logistical and Financial Analysis

Hurdles Presented by Existing Conditions

Below are construction challenges and setbacks that could arise while implementing this conceptual design and potential mitigation strategies for them. Overcoming certain hurdles may create additional expenses, while other hurdles necessitate further validation of the final design before incurring significant costs.

The roof should be replaced prior to the PV module installation

The roof sections designated for the PV installation appear aged to the point that they will not last the full length of the PV system's intended period of use or the PV module's warranted lifespan.

Mitigation Strategy 1: Consider the cost of re-roofing the designated roof section for the PV system before the PV module installation commences.

Mitigation Strategy 2: Prepare for the out-of-pocket costs to hire contractors to remove the PV system and mounting system, complete the re-roof, and reinstall the PV system after the initial installation. This process may cost more than the remaining value of the roof and is not covered by grant funding or tax credits.

The PV System layout and final BESS sizing and interconnection methods may change upon completion of the scheduled 2026 remodel/addition

No electrical or structural plans are available to determine the extent to which the scheduled 2026 remodel/addition will affect the current roof configuration or electrical usage/demand.

Mitigation Strategy 1: The PV roof layout should be verified with the architect to ensure that the current roofline is not affected. Additional new roofs may allow for a larger PV installation at the time of contracting/engineering.

Mitigation Strategy 2: The BESS storage capacity and peak output should be verified for compatibility with any changes to the electrical system and/or load profiles when the the scheduled 2026 remodel/addition is completed. These changes may result in the requirement for a larger BESS and PCC to accomodate additional loads that have not been accounted for at the time of this feasibility study.

BESS installation location will be in close proximity to areas that are accessible and/or visible

For safety reasons, the BESS system will need to be housed in a substantial outdoor metal enclosure at the location shown on the feasibility study's site plan. This is in a highly visible, high

usage zone, and may impact the aesthetics or assesibility of this area.

Mitigation Strategy 1: An alternative location may be available and coordinated with the installing contractor at the time of final design. Additional costs may arise from this change.

Mitigation Strategy 2: Additional fencing may be installed to mitigate visibility and access to the BESS system. Electrical and property setbacks must be followed.

Fire Control Systems may activate during a power outage

Reviews of installed BESS systems show that some building Fire Control Systems may activate temporarily when the power goes out and the change from grid to battery power is occuring due to the millisecond delay.

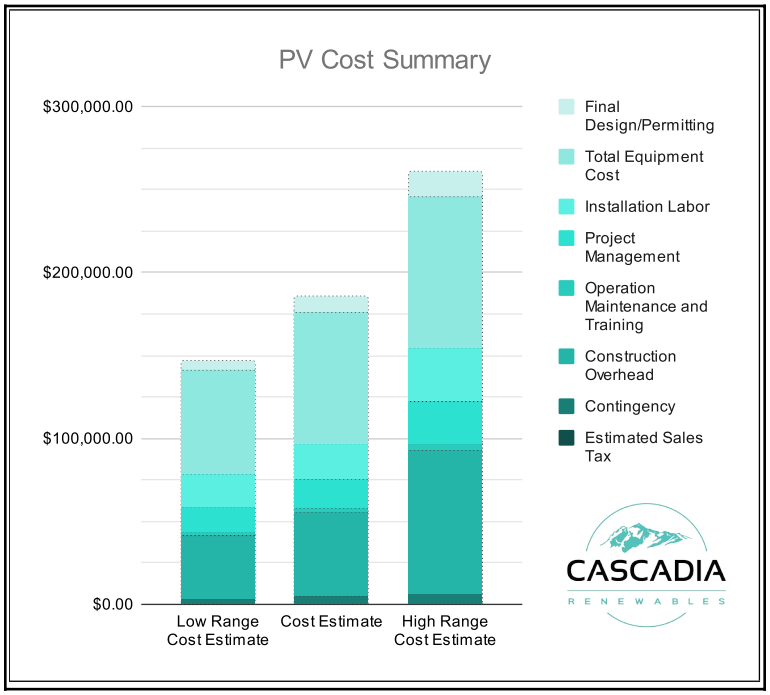
Mitigation Strategy: On-site personnel must be trained as to the proper operation and required steps for building and BESS operation during and extended emergency.

System Budget

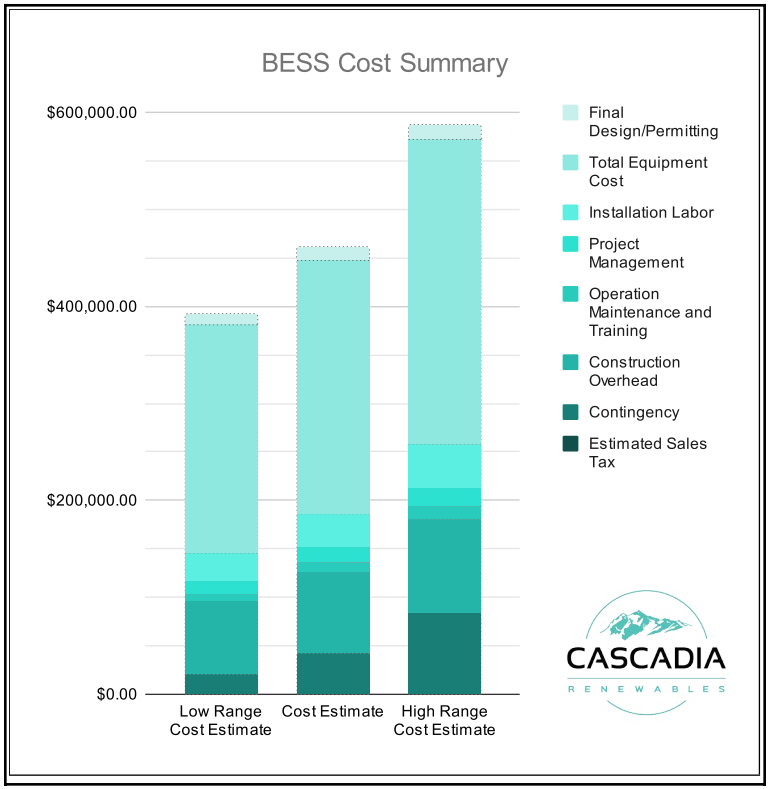
Cascadia Renewables included current Davis Bacon prevailing wage rates, contractor direct pricing, permitting, and consulting/engineering fees to determine the conceptual system pricing. The labor rates and equipment pricing used in the provided budgetary information are relevant to and compliant with local, regional, and federal grant programs to give the applicant access to an array of funding opportunities. The estimated installation cost excludes any required architectural or structural improvements, the internal organizational cost of procurement, and administration. This cost estimate also excludes future storytelling and community engagement efforts.

We advise applicants to consider these budget items separately and designate suitable resources for each. The cost estimate provided is based on market conditions, availability of labor, and equipment costs at the time of writing.

Since it is a well-established and competitive market, there is limited opportunity to reduce these costs further. The projected increase in the demand for BESS projects over the coming years may outpace the current supply. This may inflate equipment costs in the short term, which we reflect in our estimated budget. Final pricing may vary based on the chosen installation partner, final engineered solution, on-site soil, and geotech studies, which are not available within the scope of this feasibility study. We recommend establishing a comprehensive 3+ bid RFP process that encourages contractor participation, value engineering, and competitive pricing. We recommend periodic system price updates during the project development and construction.

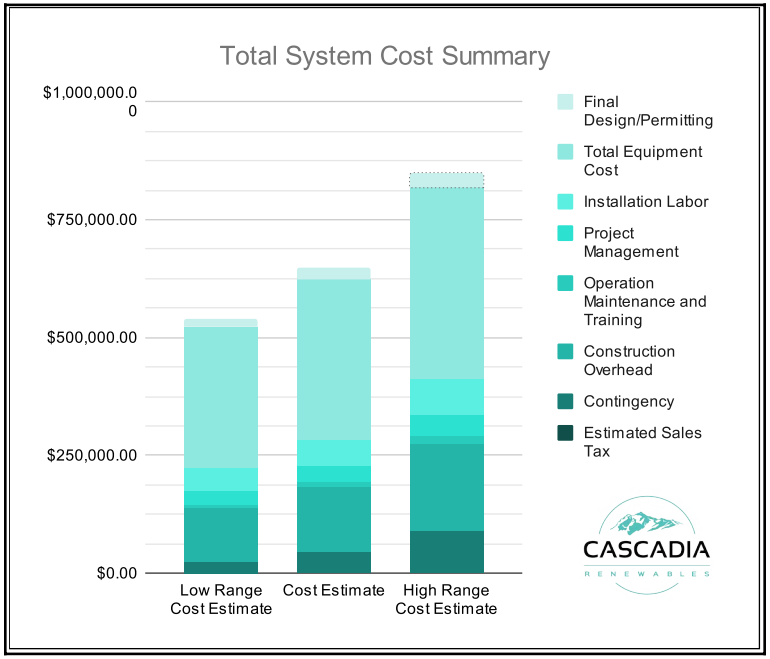


PV - COST SUMMARY			
Total Costs	**Low Range Cost Estimate**	**Cost Estimate**	**High Range Cost Estimate**
Final Design/Permitting	$5,000.00	**$10,000.00**	$15,000.00
Total Equipment Cost	$63,280.00	**$79,100.00**	$90,965.00
Installation Labor	$19,440.00	**$21,600.00**	$32,400.00
Project Management	$15,300.00	**$17,000.00**	$25,500.00
Community Outreach	TBD By Applicant	**TBD By Applicant**	TBD By Applicant
Operation Maintenance and Training	$2,125.00	**$2,500.00**	$3,500.00
Construction Overhead	$38,025.00	**$50,700.00**	$86,190.00
Contingency	$3,500.00	**$5,000.00**	$7,000.00
Estimated Sales Tax	$0.00	**$0.00**	$0.00
Total PV System Cost Estimate	**$146,670.00**	**$185,900.00**	**$260,555.00**
Cost/Watt ($/w)	**$3.40**	**$4.30**	**$6.03**



BESS - COST SUMMARY

Total Costs	Low Range Cost Estimate	Cost Estimate	High Range Cost Estimate
Final Design/Permitting	$11,475.00	**$13,500.00**	$15,525.00
Total Equipment Cost	$235,890.00	**$262,100.00**	$314,520.00
Installation Labor	$28,560.00	**$33,600.00**	$43,680.00
Project Management	$12,960.00	**$16,200.00**	$19,440.00
Community Outreach	**TBD by Applicant**	**TBD by Applicant**	**TBD by Applicant**
Operation Maintenance and Training	$7,000.00	**$10,000.00**	$14,000.00
Construction Overhead	$75,510.00	**$83,900.00**	$96,485.00
Contingency	$21,000.00	**$42,000.00**	$84,000.00
Estimated Sales Tax	$0.00	**$0.00**	$0.00
Total BESS System Cost Estimate	**$392,395.00**	**$461,300.00**	**$587,650.00**
Cost/Kilowatt Hour ($/kWh)	**$2,744.02**	**$3,225.87**	**$4,109.44**



Total System - COST SUMMARY

Total Costs	Low Range Cost Estimate	Cost Estimate	High Range Cost Estimate
Final Design/Permitting	$16,475.00	**$23,500.00**	$30,525.00
Total Equipment Cost	$299,170.00	**$341,200.00**	$405,485.00
Installation Labor	$48,000.00	**$55,200.00**	$76,080.00
Project Management	$28,260.00	**$33,200.00**	$44,940.00
Community Outreach	**TBD by Applicant**	**TBD by Applicant**	**TBD by Applicant**
Operation Maintenance and Training	$9,125.00	**$12,500.00**	$17,500.00
Construction Overhead	$113,535.00	**$134,600.00**	$182,675.00
Contingency	$24,500.00	**$47,000.00**	$91,000.00
Estimated Sales Tax	$0.00	**$0.00**	$0.00
Total System Cost Estimate	**$539,065.00**	**$647,200.00**	**$848,205.00**

Economic Benefit

This is a detailed breakdown of the cash flow of the system. Please note that this breakdown does not include the cost of operations and maintenance, as that cost is challenging to predict. Cascadia Renewables does not want to offset the confidence we otherwise have in these financial estimates by overshadowing our conclusions with less reliable data. To that effect, Cascadia Renewables recommends requesting an estimate for annual operations and maintenance as part of the contractor selection RFP.

Assumptions and Key Financial Metrics

Discount Rate	5.0%	Federal Tax Rate	0.0%	State Tax Rate	0.0%
Average Annual Utility Escalation	3.0%	PV Generation (kWh/kW-DC)	884 kWh/kW-DC	Average PV Degradation Rate	0.56%
Average ESS Degradation Rate	5.00%				

Years	Project Costs	Electric Bill Savings	Grant Amount	PV Generation (kWh)	Total Cash Flow	Cumulative Cash Flow
Upfront	-$647,200	-	-	-	-$647,200	-$647,200
1	-	$4,261	$647,200	38,204	$651,461	$4,261
2	-	$4,364	-	37,990	$4,364	$8,624
3	-	$4,469	-	37,776	$4,469	$13,094
4	-	$4,577	-	37,562	$4,577	$17,671
5	-	$4,688	-	37,348	$4,688	$22,359
6	-	$4,801	-	37,134	$4,801	$27,160
7	-	$4,916	-	36,920	$4,916	$32,076
8	-	$5,035	-	36,706	$5,035	$37,111
9	-	$5,155	-	36,492	$5,155	$42,266
10	-	$5,279	-	36,278	$5,279	$47,545
11	-	$5,405	-	36,064	$5,405	$52,951
12	-	$5,534	-	35,850	$5,534	$58,485
13	-	$5,666	-	35,636	$5,666	$64,151
14	-	$5,801	-	35,422	$5,801	$69,953
15	-	$5,939	-	35,208	$5,939	$75,892
16	-	$6,080	-	34,994	$6,080	$81,972
17	-	$6,224	-	34,780	$6,224	$88,196
18	-	$6,372	-	34,567	$6,372	$94,568
19	-	$6,522	-	34,353	$6,522	$101,090
20	-	$6,676	-	34,139	$6,676	$107,766
Totals:	-$647,200	$107,766	$647,200	723,422	$107,766	-

Maintenance Considerations

An operations and maintenance plan should be enacted by internal personell or an external contractor. When designing this plan, consider the following:

- The PV system will require regular annual or bi-annual PV module cleaning to remove any built-up debris in order to maintain the peak system performance and maximum BESS charging capabilities. The maintenance schedule will vary depending upon the site conditions, frequency of rain events, and build up of season debris such as fall leaves or needles.
- The BESS will require regular maintenance to maintain it's equipment warranty and ensure proper system functionality. The required maintenance steps and frequency will be defined by the equipment manufacturer but typically include servicing the BESS HVAC and fire protection systems, internal/external visual inspections, loose connections check, and a functional battery test on an annual basis.

Community Benefit

The North End Station plays a crucial role in serving the city of Tumwater. This facility operates as both a fire station and an emergency coordination hub. It supports daily fire department operations and serves as the primary Emergency Operations Center during major events or disasters. The site ensures that emergency services remain available during power outages, providing backup power to maintain operations and support the community's safety needs.

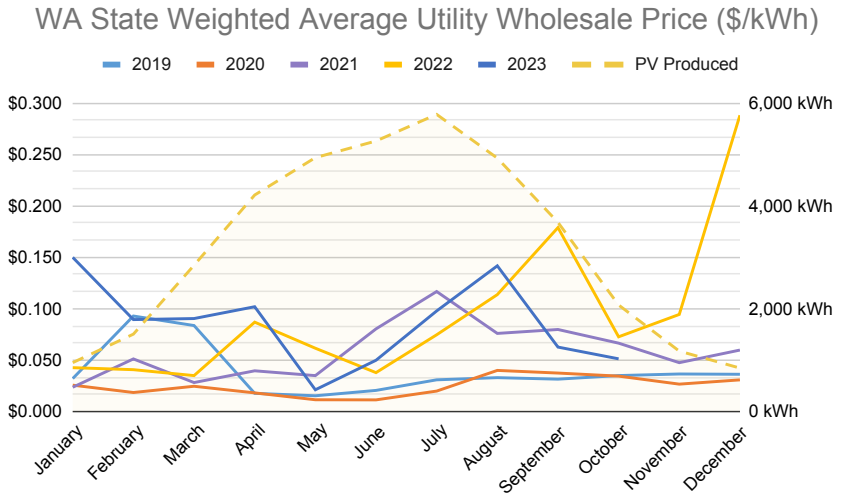
Approximately 27,000 people live in the range of the fire district. The City of Tumwater has only two fire stations: headquarters and North End station. If one or both of these stations were to become inoperable, the effect on the city's emergency response capacity would be immediate and severe.

By specifying local contractors and utilizing union labor and apprenticeship programs, the workforce local to the area can be trained. This increases the local capacity to develop future resiliency projects.

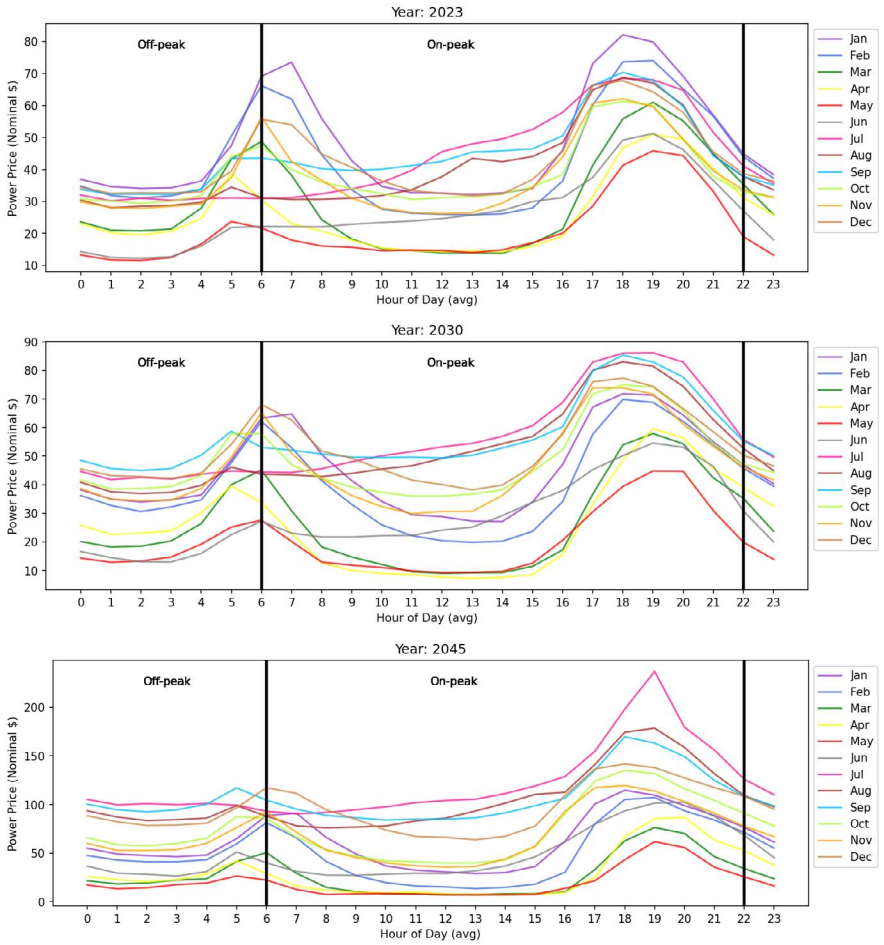
Over the warrantied lifetime of the PV array, the system will offset 599 tons of carbon, equivalent to planting 8,978 trees.

Grid Benefit

At a national level, the US electric grid is one of the world's largest and most complex machines, with aging infrastructure facing increased demand due to the electrification of transportation and buildings, population growth, and migration. Distributed Energy Resources (DERs) play a crucial role in strengthening existing grid infrastructure and moving toward a more equitable and sustainable electric grid. Washington State has historically relied on hydroelectric power to balance energy demand. However, climate change is reducing snowpack and our available hydro resources, making it necessary to explore alternative options. Regional electricity prices, represented in the middle Columbia WA State Weighted Average Wholesale Price graph below, have been increasingly volatile during late summer afternoons. The largest investor-owned utility (IOU) in WA, PSE, anticipates that this price volatility will increase in coming years (see graph below). In Washington State, solar generation can help address the energy shortfall during summers, and energy storage can provide balancing services and further reduce demand during peak periods.



Monthly production of the system vs average wholesale energy pricing. Coincidence of high production to high pricing is financially beneficial.



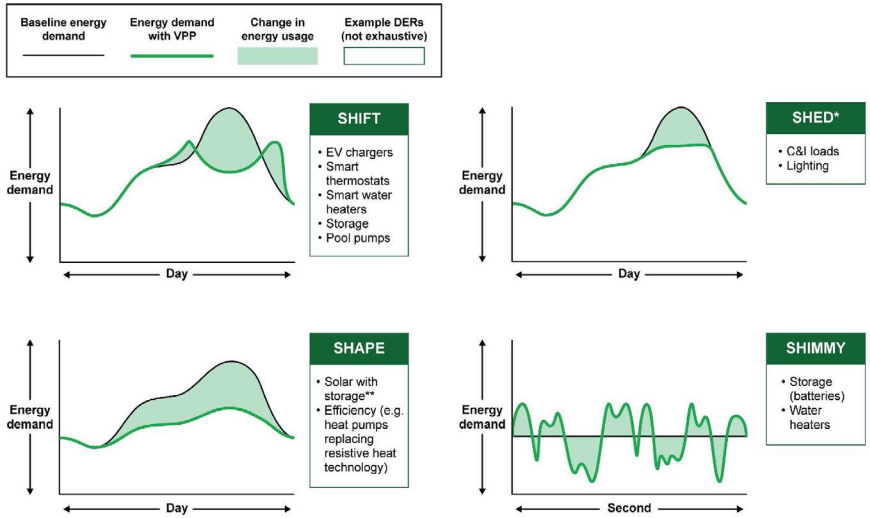
Daily price volatility by month for the years 2023, 2030, and 2045.

The US Department of Energy's September 2023 report titled "The Pathway To Commercial Liftoff: Virtual Power Plants" suggests integrating solar panels, battery storage, and micro-grid projects to optimize energy resource usage and manage grid stability. Virtual Power Plants (VPPs) and networked energy storage solutions are cost-effective alternatives to natural gas peaker plants, offering substantial benefits and low costs. The report highlights the importance of adopting innovative technologies to meet the growing energy demand sustainably and cost-effectively. Ultimately, strengthening the grid benefits the entire community. This project can play a part in improving regional energy infrastructure by reducing energy demand and providing grid-balancing services.

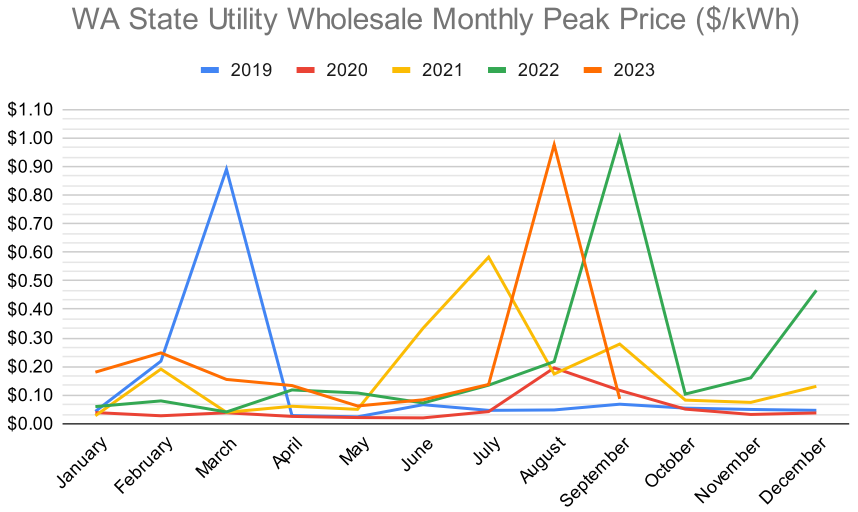
Energy pricing can serve as an effective method for utilities to encourage efficient energy dispatch from flexible resources such as solar and storage. A well-optimized system can use stored energy during high-demand periods, contributing to grid stability and economic efficiency. By implementing an appropriate demand response program, unused BESS capacity can be deployed to reduce peak demand across the service territory on a grid scale. This section aims to evaluate the potential benefits of the conceptual system in terms of reducing demand, exporting energy, and providing grid-balancing services.

PSE does not currently have a demand response program, so we have conducted optimizations to showcase the maximum demand reduction on-site while ensuring battery cell longevity.

To illustrate the effects that the conceptual system could have on the site's demand, we have simulated the conceptual system with a model of predicted consumption patterns. These charts depict the days on which the peak demand for July is predicted to occur, according to our simulation of the



Illustrations of the various ways DERs can influence demand. "Shape" (bottom left) is the most likely result of a solar plus storage system. Graphs by the US Department of Energy.

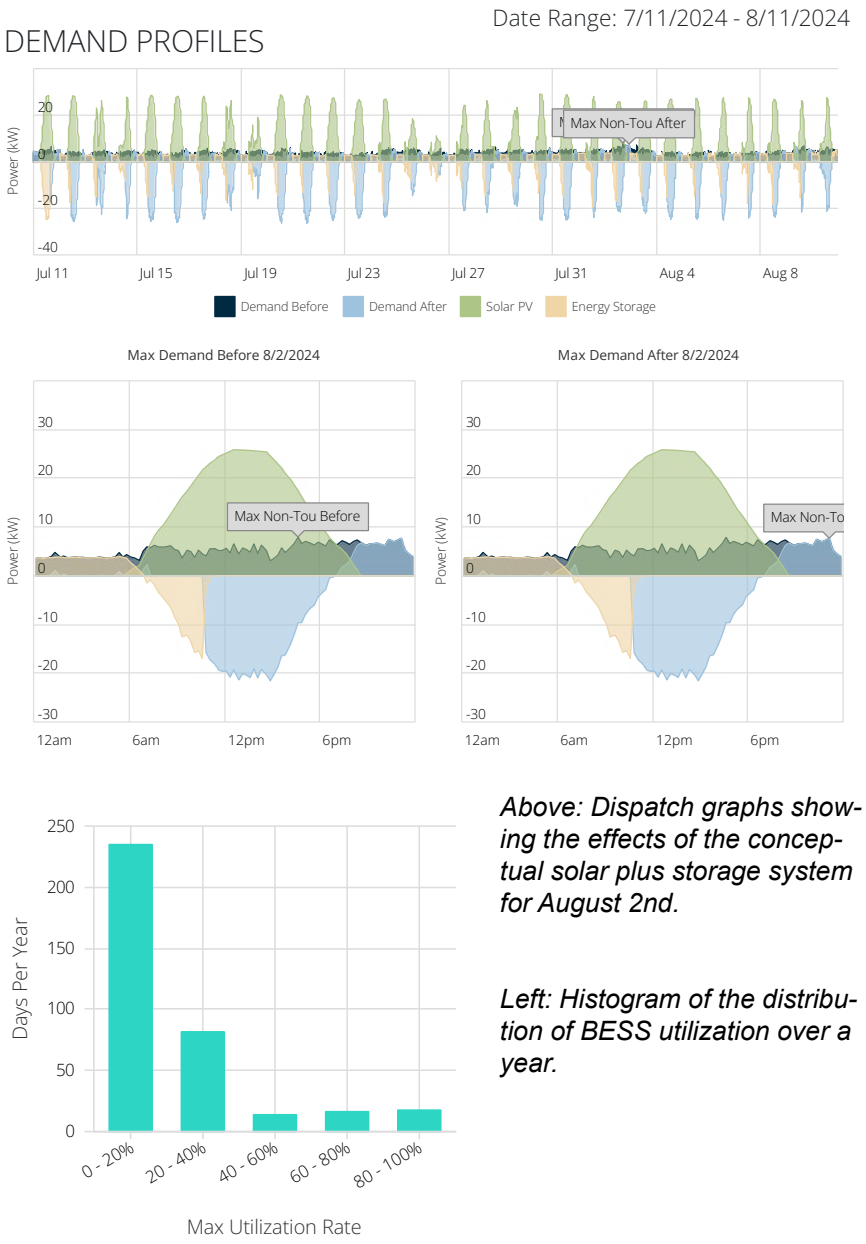


The highest wholesale costs can be mitigated by dispatching unused BESS capacity, given appropriate programs.

conceptual system. The demand of the site before accounting for the system is shown in dark blue, while the demand that would result from its implementation is shown in light blue. The difference between the demand before and the demand after is the sum of the PV generation (shown in green) and the BESS's flow (shown in yellow). The chart on the left displays the day of maximum historical demand, while the chart on the right displays the day of maximum simulated demand accounting for the effects of the conceptual system. The appendix provides the same series of charts relevant to each month throughout the year. Note that any smoothing or demand reduction on site represents a reduced burden on the local grid.

To promote system health and longetivity, the BESS should be configured to partially discharge each day. This discharge can be coordinated with times of peak building demand, which will reduce and flatten the demand profile of the building. Based on utility bills this facilitity is subject to monthly peak demand charges so the BESS could be strategically dispatched during times of peak building demand to lower monthly demand charges, providing additional economic benefits from the system.

The bar chart shows how many days each quintile of the BESS is used for on-site demand management throughout the year. It is worth noting that increased utilization of the BESS could result in a faster degradation rate.



Above: Dispatch graphs showing the effects of the conceptual solar plus storage system for August 2nd.

Left: Histogram of the distribution of BESS utilization over a year.

Permitting and Utility Agreements

If this project proceeds to installation, it will be the responsibility of the installer to verify the relevant authorities having jurisdiction (AHJs) and ensure all necessary permits and agreements are in place. As it pertains to this conceptual design, Cascadia Renewables has identified the following AHJs and has documented our interactions to date.

Labor & Industries - Electrical Permitting:

The conceptual PV system and BESS design will require electrical permitting and a possible plan review from the Washington Department of Labor & Industries to verify that they meet all current WAC and NEC code reviews. Code revisions may occur in the NEC and WAC and will need to be verified during the final system design.

Puget Sound Energy - Interconnection:

The conceptual PV system is designed to align with Puget Sound Energy's standard interconnection rules, with a capacity of 100kW AC or less per customer meter. This classification ensures the system adheres to the established approval procedures for Net Metering. To proceed, a Schedule 150 Application and Agreement for Interconnection, Net Metering, and Production must be submitted.

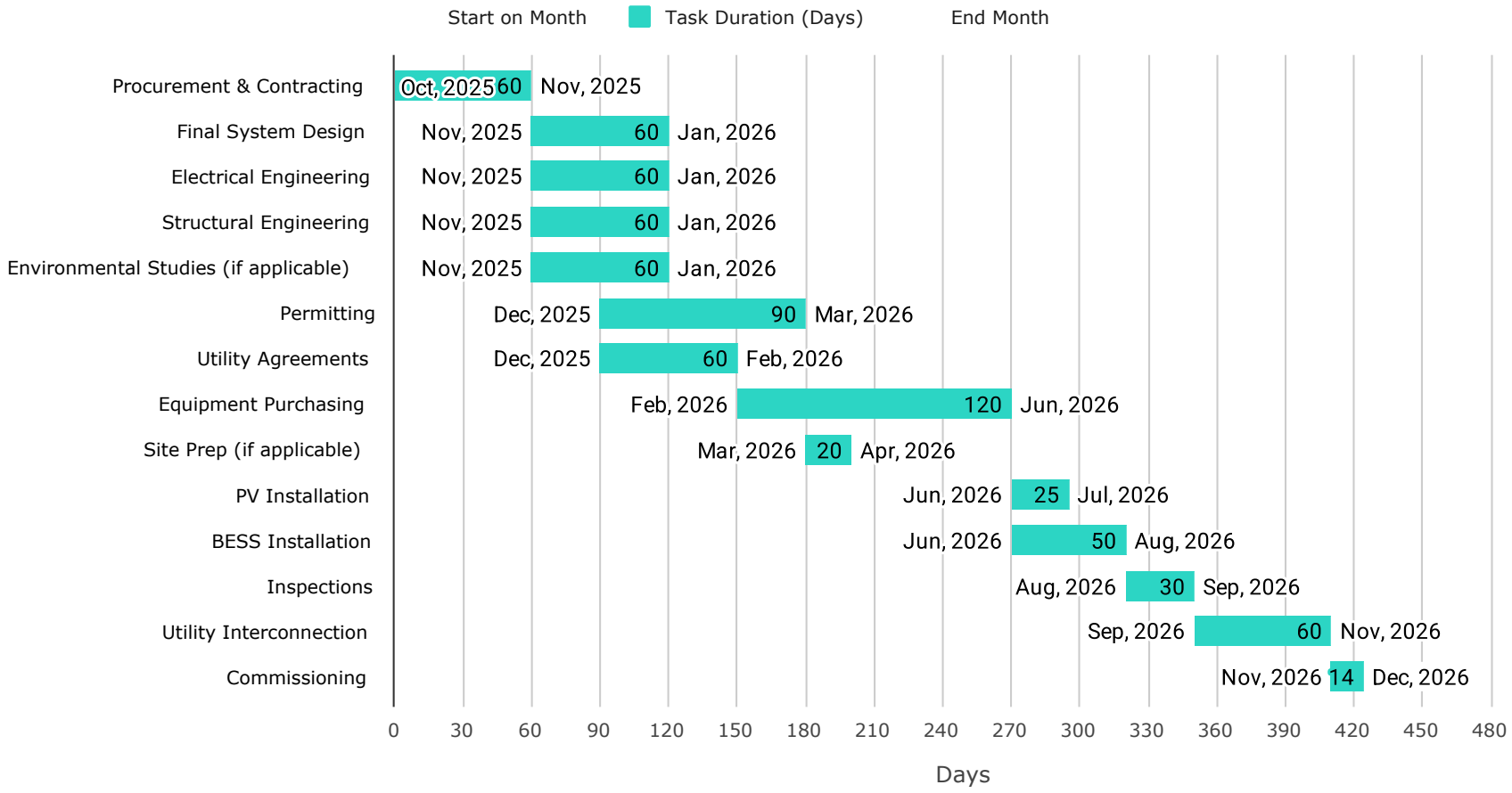
Department of Archeology and Historic Preservation:

This permit is required any time there is soil disturbance. DAHP does not charge a fee to process or issue a permit; however, there are penalties for failing to obtain or comply with a permit.

Solar, BESS, Building, and Fire Review/Permitting:

The City of Tumwater Community Development Department will provide single point review and permitting for the rooftop solar arrays, the BESS installation location, BESS pad and fire code compliance. Al Christensen, the Building and Fire Safety Official at the Department provided an initial review of the project on 3/25/2025 to determine permitting requirements. The rooftop solar array will require a standard Building Permit Application that includes a site plan, rooftop array layout drawing, stamped engineering letter or plans showing compliance to snow/wind loading requirements, and equipment specification sheets. The BESS installation can be included in this single permit application, with additional documentation showing compliance to NFPA/NEC required setbacks and fire safety requirements. Planning will require that the BESS be shielded from public view by a solid wall or fence and that a Foundation Plan be submitted. Chainlink fences are not acceptable as shielding. The initial review indicated that no land use, or additional special use permits will be required. All fire reviews for the BESS and PV system will be included in the Building Permit review, with no additional permit applications required. Please note that the Department indicated that the "rules may change by the time of installation. The Department is currently reviewing other ongoing installations in the County and may be updating permitting requirements or BESS installation policies."

Schedule


Start on Month
Task Duration (Days)
End Month
Procurement & Contracting
Oct, 2025 60 Nov, 2025
Final System Design
Nov, 2025 60 Jan, 2026
Electrical Engineering
Nov, 2025 60 Jan, 2026
Structural Engineering
Nov, 2025 60 Jan, 2026
Environmental Studies (if applicable)
Nov, 2025 60 Jan, 2026
Permitting
Dec, 2025 90 Mar, 2026
Utility Agreements
Dec, 2025 60 Feb, 2026
Equipment Purchasing
Feb, 2026 120 Jun, 2026
Site Prep (if applicable)
Mar, 2026 20 Apr, 2026
PV Installation
Jun, 2026 25 Jul, 2026
BESS Installation
Jun, 2026 50 Aug, 2026
Inspections
Aug, 2026 30 Sep, 2026
Utility Interconnection
Sep, 2026 60 Nov, 2026
Commissioning
Nov, 2026 14 Dec, 2026
0 30 60 90 120 150 180 210 240 270 300 330 360 390 420 450 480
Days

Summary of Feasibility and Next Steps

Installing a solar plus storage system, incorporating Battery Energy Storage Systems (BESS), offers a practical solution for enhancing power reliability, especially during outages. This system design ensures continuous power supply, adapting to both typical and emergency energy needs. During outages, the BESS can back up the entire facility and significantly reduce reliance on grid power. For extended periods without solar resource availability, such as in winter, a generator can be utilized to provide long-term autonomy.

In this setup, the existing 40kW standby generator will be integrated to recharge the BESS. This integration effectively extends the duration of autonomous power, providing additional resilience during prolonged grid failures. This system configuration offers a significant improvement in site energy resilience, providing numerous benefits and increased support to the community, even during disasters and long-term outages.

Next Steps:

- Once building expansion plans are finalized, evaluate the available space and proposed location for the pad-mounted BESS.
- Determine the anticipated increase in building demand after the expansion and evaluate if an additional 35kW BESS inverter will be needed.
- Consider funding pathways and potential grant writing efforts
- If successful in grant requests and negotiations, construct project.

Additional Reference Information

General Site Information

Managing Organization	City of Tumwater
Site Address	405 Linwood Avenue SW Tumwater, WA 98512
Parcel Number	09080004002
Organization Contact	Brian Hurley, Fire Chief
Organization Contact Phone Number	(360) 754-4170
Organization Contact Email	BHurley@ci.tumwater.wa.us

Utility Information

Service Electric Utility	Puget Sound Energy (PSE)
Electric Utility Meter Number	P158621671
Electric Utility Tariff Structure	Commercial 24
Electric Utility Hosting Capacity	Generation Hosting Capacity of 4.45 MWs

Minimum Equipment Recommendations

The conceptual system has been designed assuming specific named products. These choices are based on the current market, and the named equipment may not be the best choice for the project or may not be available at the time of hypothetical construction. When evaluating bids, we recommend considering the following criteria to be the acceptable minimums.

PV Modules:

Warranty: Minimum of 12 years for the product, extending to 25 years, covering parts and labor.

Performance Guarantee: A linear performance warranty that guarantees at least 86% of nominal power rating after 25 years.

Manufacturing Standards: Modules should be Tier 1 qualified, preferably assembled in the USA.

Cell Type: Monocrystalline cells.

Frame and Weight: Anodized aluminum frame with an average system weight not exceeding 2.6 pounds per square foot (psf).

Certifications: Compliance with UL 1703/UL 61730; PID Resistance (IEC 62804); Salt Mist (IEC 61730) when PV system is within 2 kilometers of shoreline; and Fire Classification matching that of the existing roof.

PV Inverters:

Efficiency and Warranty: Minimum efficiency of 96%, with a 10-year limited warranty, extendable up to 5-15 years.

Compliance and Compatibility: Must comply with IEEE 1547/ UL1741SB standards; suitable for output voltages of 120/240V Single-Phase, 120/208V 3-Phase, or 277/480V 3-Phase as dictated by the BESS design and existing electrical infrastructure; FCC Part 15 Class A; SunSpec Modbus Compliant.

Safety Features: UL1699B; NEC 2020 Rapid Shutdown Compliant; Ground Fault Detection and Interruption, AC and DC Surge Protection

PV Monitoring:

Monitoring Level: Module-level monitoring

Connectivity: Connection options should include hard-wired Ethernet, Wi-Fi, or a cellular connection.

User Interface: A web-based portal accessible to customers, displaying real-time and historical data on PV power, energy production, system alerts, and module status.

Mounting System:

Warranty and Design: A minimum of a 25-year manufacturer warranty. The mounting system design should be suitable for the specific roof type and capable of withstanding local wind, seismic, and snow loading requirements.

Compatibility with Roof Materials: For composition shingles, fully flashed mounting feet are recommended, including the usage of butyl tape and/or polyurethane caulking. The mounting system must comply with UL2703 and local building codes, as well as maintain the roof's warranty and fire classification.

Examples of Mounting Systems for Composition Roofs.

BESS Specifications:

Warranty: Minimum 5-year manufacturer's warranty with 5-10-year warranty extension options.

Standards Compliance: Must comply with UL 9540 and UL 9540A for safety. Must adhere to NFPA 855 standards for installation and safety.

Battery Chemistry: Lithium Iron Phosphate (LFP/LiFePO4) is preferred for its stability, safety, and longevity.

Compatibility: Should be compatible with a range of third-party inverters and microgrid control systems. Should include generator compatibility and black start capability.

Enclosure Rating: A minimum NEMA 3R rating is required for outdoor installations to ensure protection against weather elements. If the system is to be installed near salt water, the enclosure must be suitable for the environment, and warranties must not be voided.

Fire Suppression: Active chemical fire suppression and exterior ventilation is recommended for all indoor and outdoor installations.

Battery Heating/ Cooling Equipment: Integrated HVAC or alternate active temperature control system to maintain ideal battery operating conditions and temperature.

Country of Origin: Must meet any specific country of origin requirements as per the funding source's guidelines.

Energy Capacity and Power Output: Specified based on the project's energy storage needs, considering peak demand shaving, load leveling, and backup power requirements.

Multimodal BESS Inverter: Should have the following listings and certifications, including but not limited to: UL 1741SB, IEEE 1547, IEEE 519, NEMA 3R Enclosure, Minimum efficiency of 95% with a minimum 10-year limited warranty, extendable up to 5-15 years

Efficiency and Performance: High round-trip efficiency and low degradation rate over the system's operational life.

Safety Features: Advanced Battery Management System (BMS) for monitoring cell voltage, temperature, state of charge, and overall system health. Overcharge, deep discharge, overcurrent, and short-circuit protection.

Scalability: Ability to scale up the system with additional energy storage modules or integrate with existing renewable energy systems.

Installation Flexibility: Suitable for various installation environments, including ground mount, rooftop, or integrated within existing infrastructure.

Maintenance: Low maintenance requirements, with remote monitoring and diagnostics capabilities.

Microgrid Controller:

Functionality: Highly recommended to include a microgrid controller for advanced management capabilities.

Integration: Should offer interoperability with third-party Virtual Power Plant (VPP) providers.

Features: Capable of real-time monitoring, demand response, load management, and predictive analytics.

User Interface: Intuitive, user-friendly interface for system management and data visualization.

Grid Support: Ability to monitor grid voltage and frequency to initiate power quality correction measures using distributed energy assets when needed.