Seattle Office of Sustainability & Environment

Seattle City Light

Washington State Department of Enterprise Services

Washington State Department of Services for the Blind

An energy efficiency and electrification path to carbon neutral

Credit: Seattle OSE

Washington State Services for the Blind provides training, counseling, and support to blind and visually impaired persons of all ages, with a focus on pursuing employment, education, and independent living. Their Seattle facility in Columbia City is owned and managed by the State of Washington Department of Enterprise Services (DES).

The building's failing chiller prompted DES' Resource Conservation Manager to take a look at the entire building's performance, rather than fixing one issue at a time. DES envisioned a holistic strategy with electrification that would improve tenants' comfort, achieve carbon-neutrality, and meet Seattle's energy code requirements.

Working with UMC, DES conducted an energy audit with a 30-year life cycle cost analysis (LCCA). Looking at all costs, such as equipment replacement, maintenance, utilities, and future capital expenses, made it clear that a full building renewal, including a new electric heat pump HVAC system, was the right decision—instead of replacing the chiller and gas boiler now, and the remaining systems later.

While more expensive upfront, this approach would result in a lower total cost of ownership over a 30-year timespan. It would also preserve an important educational facility, just a 5-minute walk from the light rail, and would also result in a smaller increase on the lease rate for the tenants.

About

Address: 3411 S. Alaska St., Seattle, WA 98118

Size: 23,200 sq. ft., two-story building

Original Construction: 1962

Projected Energy Savings: Up to 70% annually

Projected Direct Emissions Reduction: 72 MT/CO2e annually

Projected Utility Cost & Operational Savings:[1] $9,600 annually

Total Project Costs: $2.7 million

Total City Light Incentives:[2] $23,186

Owner: State of Washington Department of Enterprise Services (DES)

Consultants: UMC

UMC was contracted through the DES's Energy Savings Performance Contracting Program (ESPC)

1 Based on utility costs for 2017.

2 This includes a guaranteed incentive of $16,048, plus a $7,138 performance incentive to be paid when kWh savings are validated.

Existing buildings are key to a carbon-neutral future

More than 90 percent of Seattle's building-related climate-polluting emissions comes from burning fossil fuels, like gas and oil for hot water, space heating, and appliances.[3] Since most existing buildings will still be here in 2050, electrifying them to become carbon neutral, along with constructing all-electric new buildings, is one of Seattle's key strategies to address climate change. Seattle's goal is to reduce building emissions city wide 40 percent by 2030 and be net-zero carbon emissions by 2050.

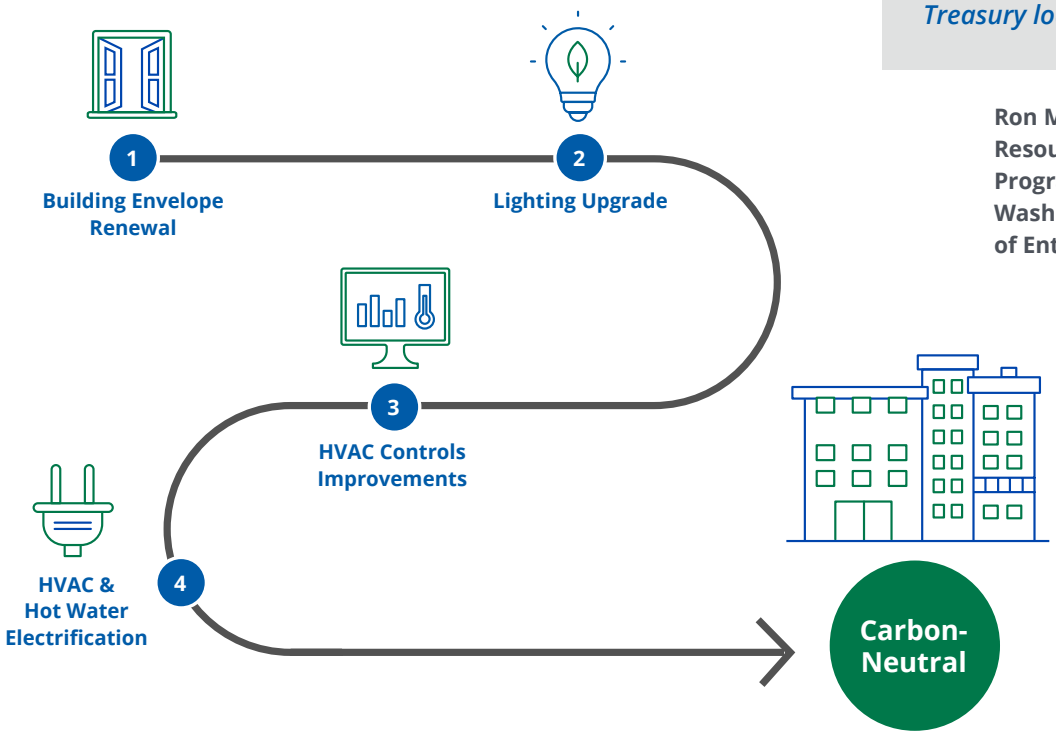
The State of Washington has statutory targets to improve energy efficiency and reduce climate-polluting emissions from its own state agency operations by 45 percent by 2030 and 95 percent by 2050.[4] Washington also passed the first state wide building energy performance standard in 2019—the Clean Buildings Act—and many other climate-forward policies.[5]

Steps to a carbon-neutral building

DES contracted with UMC to implement an integrated plan that reduced energy use by nearly 70 percent and eliminated nearly all greenhouse gas emissions (GHG) from gas power—resulting in a nearly carbon-neutral building.[6] DES' thoughtful planning enabled Washington Services for the Blind to **stay open throughout the 18-month project.** And although the building is too small to fall under the current Clean Buildings Act rules, its energy use intensity (EUI) was reduced from 81.5 to 25.0 kBtu/sq. ft./yr.— easily meeting the state's requirement.

Surprisingly, we determined that the lowest cost in-kind replacement would have meant needing to raise the lease rate by $15/sq.ft. Instead, this holistic electrification project, which cost more than in-kind replacements, resulted in a lower rate increase of $12/sq. ft. when accounting for the debt service on the State Treasury loan.

Ron Major,
Resource Conservation Program Manager at Washington State Department of Enterprise Services



3 https://www.seattle.gov/Documents/Departments/OSE/ClimateDocs/2018_GHG_Inventory_Dec2020.pdf
4 Per RCW 70A.45.050 using 2005 emissions as a baseline.
5 Applicable to commercial buildings greater than 50,000 SF. See https://www.commerce.wa.gov/growing-the-economy/energy/buildings/
6 The building maintains a residential style gas stove for its training facility which is necessary to train blind and visually impaired students to safely operate them in homes they own or rent. For electric service, City Light offsets its emissions to achieve carbon-neutral status as an electric utility. Building owners should, however, participate in the utility's Green Up Program to call their building net-zero at the site. Visit https://www.seattle.gov/city-light/business-solutions/renewable-energy-services.

1 Building Envelope Renewal

The 1962 era building was constructed of concrete masonry with a brick façade and single-pane, metal framed windows that were drafty and prone to winter condensation. Now, new low-e coated double-pane windows and new metal panels with integrated insulation reduce air leakage and improve tenant comfort and energy efficiency. These steps reduced the building's energy load to enable a smaller electric heat pump system.

2 Lighting Upgrade

Inside, the team replaced inefficient fluorescent lighting and occupancy controls with new LED lighting with dimming capability. Outside, they installed new LED fixtures to replace older, inefficient High Intensity Discharge (HID) lamps. This provided energy savings, better visibility, and increased safety for visitors. LED technology typically reduces maintenance costs due to its longer lifespan.

3 HVAC Controls Improvements

Done in tandem with the HVAC system electrification, this work expanded and improved the existing direct digital control (DDC) system. DDCs provide a higher level of control of the building for comfort and promote energy efficiency via precise monitoring of the HVAC systems.

4 HVAC and Hot Water Electrification

Replacing the gas-fired HVAC system was the most significant step for eliminating GHG emissions and maximizing energy efficiency.[7] The team installed three 20-ton, high-efficiency air-to-water source heat pumps to provide hot water for heating and chilled water for air conditioning. Renewing the building envelope allowed the building to run on a smaller 60-ton system (instead of 80-ton), and since the chiller was replaced, an electric service upgrade was not needed. For more efficient air distribution, the team reconfigured zones and replaced the existing radiators and multizone air handlers with new 4-pipe terminal units with high-efficiency ECM motors. The team also installed a Dedicated Outdoor Air System with an energy recovery ventilator for 100-percent outdoor air ventilation.[8] To meet hot water needs, an 80-gallon commercial heat pump water heater was a straightforward replacement for the gas unit.

Seattle City Light Incentives

Seattle City Light is dedicated to providing customers affordable, reliable, and environmentally responsible energy services. For this unique project, City Light provided a custom package of up to $23,000 of incentives for the electric savings. Whether your project is complex or more suitable for standard programs, City Light is ready to work with you. Contact an Energy Advisor at (206) 684-3800 or visit **seattle.gov/city-light/business-solutions**.

Hydronic pumps for supply and return chilled and heating water. Credit: WA DES

Heat pump water heater. Credit: WA DES

7 These changes also bring the building up to meet the 2018 Seattle Energy Code. https://www.seattle.gov/sdci/codes/changes-to-code/2018-seattle-code-adoption

8 Learn more about high-efficiency DOAS: https://betterbricks.com/case-studies/dedicated-outdoor-air-systems-doas-bring-in-fresh-air-and-energy-savings

Committed to a carbon-neutral future

Seattle City Light was fortunate to partner in this innovative retrofit with DES and UMC. Seattle City Light's mission is to provide customers with affordable, reliable, and environmentally responsible energy services. The entire project reflects City Light's vision to create a shared energy future by partnering with our customers to meet their energy needs in whatever way they choose. From the onset, DES was clear about the project's purpose—to move away from burning fossil fuels and bring the building to carbon neutrality. UMC was integral to this project's success with their technical analysis of proposed systems and providing site access so City Light could determine project incentives. **DES has proven that you can successfully electrify your building, increase tenant comfort, save money long term, and protect the planet.**

30-Year Cost Comparison

	Like-for-Like Equipment Replacement	Renewal & Electrification
Projects Starting in 2018	Gas Boiler & Chiller*	Heat Pump, HVAC Distribution, Windows, Lighting
Total Project Cost	$990,000	$2,723,000
Total Cost of Ownership (at 30 years)	$5,034,754	$3,929,970
Fund Balance Spend Down	$562,000	$430,000
Increase in Tenant Rent beginning July 2021	$15.57/sq. ft.	$12.14/sq. ft.

* With phased replacements of lighting, HVAC distribution, windows, etc. over next 20 years.

The new air source heat pump with DOAS. Credit: WA DES

Get in touch with us.

Electrifying buildings is one of the most powerful levers for reducing climate polluting emissions. Have ideas, a building you want to retrofit, or ways your organization might want to collaborate? Contact us at **cleanbuildings@seattle.gov**.