BEACON HILL COMMUNITY COOLING AND RESILIENCY CENTERS

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Co-Design Goals

This project, led by the **Beacon Hill Clean Energy & Climate Resiliency Task Force**, aims to **boost community resilience** and **reduce climate impacts** through partnerships across Beacon Hill.

Co-design goals include:

- **Lowering energy burden** via **utility bill savings**
- **Improving heating and cooling** for **vulnerable populations** during **extreme weather** and **wildfire smoke**
- **Exploring battery storage** to maintain power during **outages**, supporting **BUMC's emergency response role**

The report is designed to **support community decisions** and **capital grant applications**

Methodology

Tailored **building data, operations, and use scenarios** specific to the **community**.

- Held **weekly meetings** with a **community liaison** and conducted a **site visit** with key stakeholders.
- Accessed and analyzed **advanced meter data** to build **performance models**.
- Explored multiple **building**, **HVAC**, **solar**, and **storage system** scenarios.
- Evaluated **resilience requirements** for **24-hour power outages** (**BUMC-specific**).

Used a **custom Python script**, **PVWatts**, and **REopt** for **technical and cost analysis** of system variations involving **retrofits**, **heat pumps**, and **solar panels**.

Financial analysis assumes **grant-funded capital costs** and shows **10-year NPV savings** under different cost scenarios.

Outcomes for BUMC

- The current energy cost can be reduced by up to 85% through leveraging **net-metering benefits**, **building retrofits**, installing **heat pumps** and **solar panels** while adding resilience to extreme weather.
- This analysis supports the **community's ability** to make **informed decisions** for **grant applications**..
- A **200 kWh battery** enables **normal BUMC operations** during a **24-hour outage** with **over 96% reliability**.
- **Next steps**: Collaborate with **BUMC facility partners** to refine the analysis for **grant writing**

Outcomes for ECC

- Analyzed **energy use** at the **Eritrean Community Center (ECC)** to identify **affordable options** for **heating**, **cooling**, and **building upgrades**.
- With **solar**, **heat pumps**, and **minor retrofits**, ECC could save up to **$69,292 over 10 years** while improving **comfort** and **resilience**.
- This analysis helps ECC plan for **long-term space use** and supports **grant applications** for energy upgrades.
- **Next steps**: Collaborate with **ECC facility partners** to refine the analysis for **grant writing**.

Beacon United Methodist Church Design Process

1. **Community Liaising: Weekly Meetings and Site Visit on 2/8/25**
   - Intended to understand the space and how it is used
   - Understanding community goals and presenting weekly progress to liaison
2. **Analyze Meter Data & Model Alternative Energy Loads:**

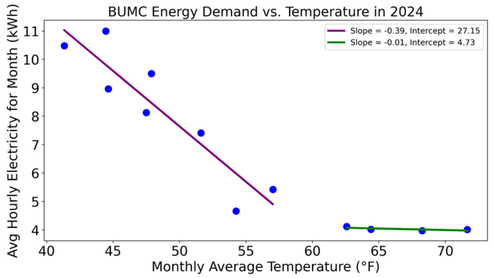


Figure 1

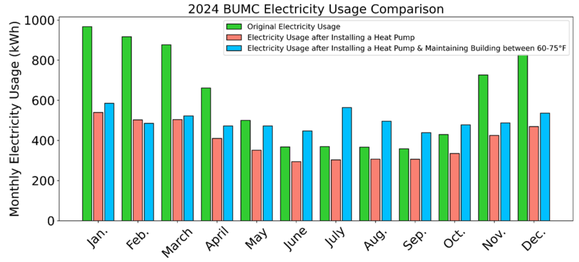


Figure 2

Figure 1. A building performance model was created for this all-electric building using 15-minute electricity meter data, aggregating it and plotting against outside temperature to assess energy used for heating vs. lighting and plug loads in the base-building.

Figure 2 shows actual monthly energy usage for current building, and modeled energy usage from adding a heat pump and cooling parameters typical in the Seattle climate zone.

3. **Implementation of Rooftop Solar at BUMC**

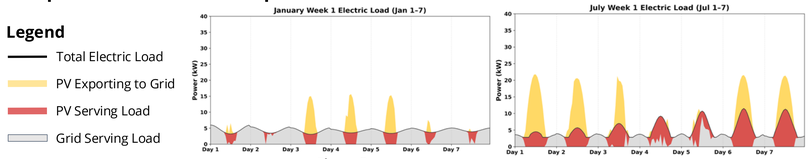


Figure 3

Figure 4

4. **Economic Analysis over 10-Year Project Lifespan (Basis Year 2024)**

- System capital cost is the sum of solar and heat pump equipment, not the cost of a retrofit
- Energy system upgrades that lead to energy cost savings are the building retrofit, heat pump, and solar panels.

	Current Building	Retrofit Building*	Current Building + Heat Pump (no cooling)	Current Building + Heat Pump (heating/cooling)	**Retrofit Building* + Heat Pump (heating/cooling)**
Cumulative 10 Year Cost without Solar	$60,986	$38,224	$28,535	$49,888	**$35,484**
O&M + Utility 10 Year Cost with Solar **	$9,303 (56 kW)	$6,849 (39 kW)	$5,225 (25 kW)	$7,911 (45 kW)	**$6,100 (32 kW)**
10 Year Savings with Solar	$51,683	$31,374	$23,309	$41,977	**$29,384**
System Capital Cost for Solar and Heat Pump (One-time)	$113,240	$82,810	$57,750	$93,550	**$70,280**

*Retrofit assumes 30% energy savings. **QUOTES REQUIRED-WA solar generally exceeds national average & new tariffs add price uncertainty .

5. **Implementation of Battery - No energy cost savings, but adds resilience to outages**
   - **Optimized building:** Retrofit building + heat pump (heating/cooling)
   - **Battery size impact** - probability of surviving 24 hours: 100 kWh - 86%, 200 kWh - 96.36%

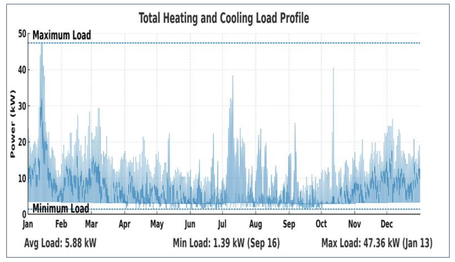
*National average Battery+Installation cost is $455 per kWh. GET A QUOTE: new tariffs and Washington State specific factors are likely to raise the total battery cost significantly.

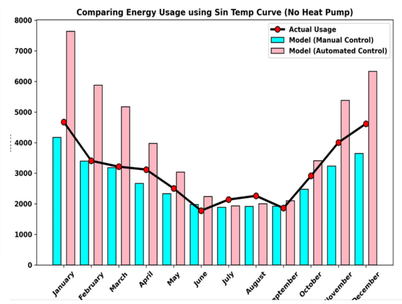
Eritrean Community Center Design Process

1. **Site visit**

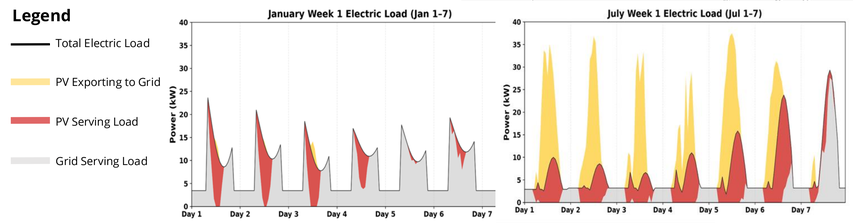
Conducted a site visit to document building layout, equipment, and usage patterns. Insights informed load modeling and retrofit recommendations

2. **Analyze meter data & model alternative energy loads:**
   - Utility data from: Seattle City Light (electric) & Puget Sound Energy (gas)
   - Used REopt and PVWatts to simulate energy use and evaluate solar + heat pump systems

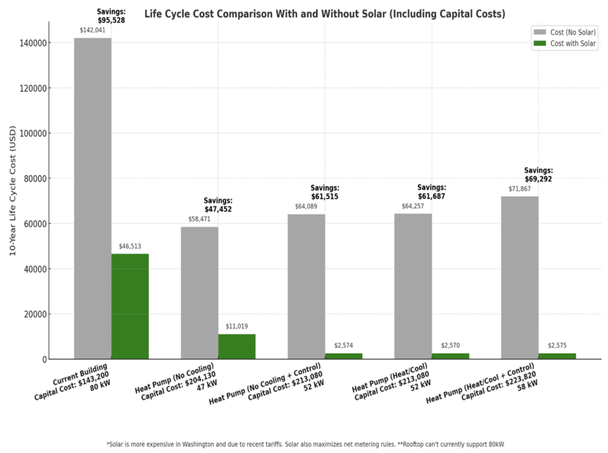




3. **Implementation of Solar**



4. **Economic Analysis**



*Solar is more expensive in Washington and due to recent tariffs. Solar also maximizes net metering rules. **Rooftop can't currently support 80kW

Maintaining the current building is projected to cost over $98,000 over 10 years. Simply adding solar reduces that cost to $2,594, which results in savings of more than $95,000.

A full upgrade with a heat pump costs about $72,000 without solar. When solar is included, that cost drops to just $2,575, creating an additional savings of over $69,000.

These options offer ECC flexible, cost-effective paths to improve comfort, resilience, and long-term affordability.

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