Energize! Heat Pump Program: Addressing Barriers Regarding Renewable Energy

Mollie Hetlage*, Program on the Environment, University of Washington
Site Supervisor: Nicole Sanders, King County
Faculty Advisor: Christine Bae, Urban Design & Planning, University of Washington

Background

- Decarbonizing buildings is an important piece in the fight to combat climate change.
- In 2022, King County is launching a pilot program to retrofit 150 homes with electric heat pumps.
- The program will focus on low- and moderate-income and English-Second-Language households.
- Many of the 121 people in Washington who lost their lives in the heat wave were elderly or low-income
- Heat pumps can be expensive so programs that provide vulnerable populations with this technology are extremely important.

Image 1 This image shows a typical ductless heat pump, which is one possible way to decarbonize buildings.

Research Questions

What barriers could the Energize! Heat Pump Program face? And what are the greenhouse gas & cost savings from switching to low/zero-carbon heat pumps?

Internship & Methods

- 8 subjects were asked a series of questions through interviews in order to identify 17 barriers.
- A survey was then sent to the same 8 subjects and listed the 17 barriers and asked how impactful they would be on a scale from 1-5
- To gain information regarding cost and greenhouse gas saving of heat pumps we reviewed scholarly sources and data tools (such as the EIA REC's data tool).

Results (Barriers)

- The scores from each subject for each barrier were added together to get the total score.
- From the data collected, the most impactful barrier was, "equipment and supply delays due to supply chain issues," which has a score of 32. The second-most impactful barrier was "cost of upgrades to panels and other infrastructure" with a score of 31. Three barriers had an equal score of 30.

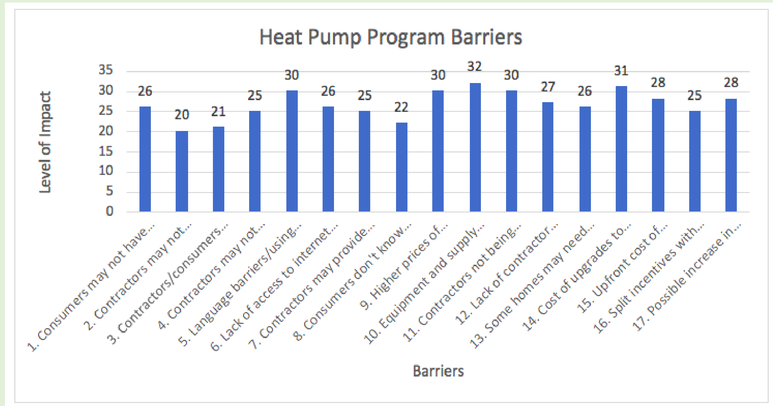

Figure 1 This first graph shows how the eight subjects rated each barrier on the 1-5 scale. The barrier with the highest score of 32 was "equipment and supply delays due to supply chain issues".

Results (GHG Savings)

- When switching from any fuel type, it is shown that there would be a reduction in GHGs; the highest GHG reductions are from fuel oil at 78%, and the lowest reductions are from electric resistance at 56%.

Table 1. Greenhouse Gas Emission Impacts from Heat Source Fuel Conversions

Technology	Fuel to Convert From	Lifetime GHG Impact[4] (MTCO2e)	
		GHG Reduction (metric tons of Co2e)	GHG % Reduction
Air Source Heat Pump (Space Heating/ Cooling)	Natural Gas	14.7	69%
	Electric Resistance	5.7	56%
	Fuel Oil	24.5	78%
	Propane	18.2	74%

Table 1. Emissions factors for natural gas, propane, and fuel oil are sourced from the US EIA. Emissions factors for the electricity grid are sourced from the NREL's Cambium long-run-marginal-emissions dataset

Results (Cost Savings)

- Homes using natural gas systems could potentially see bill increases when switching to a heat pump
- Although natural gas systems could see bill increases of 1%, the other three types of fuel systems (electric resistance, fuel oil and propane) would all see bill savings of between 37% to 53%.

Table 2. Monthly Bill Impacts from Heat Source Fuel Conversions

Technology	Fuel to Convert From	Typical Monthly Bill Impact[3]	
		Bill Savings	Bill % Reduction
Air Source Heat Pump[1] (Space Heating/ Cooling)	Natural Gas	$0	-1%
	Electric Resistance	$24	53%
	Fuel Oil	$19	37%
	Propane	$22	43%

Table 2. Results reflect appliances in a typical single-family home. Results assume each appliance is replaced in 2022 at the end of a 15-year lifecycle. Current end use energy usage is based on sub-regional 2015 EIA RECs data. All costs are adjusted for inflation.

Significance

- Since King County is specifically installing heat pumps in ESL households, it is important to make sure that the outreach tools are translated into the primary, non-English languages spoken in the program areas.
- Heat pump programs are a way to provide low-income households and ESL households with efficient energy.
- Programs like the Energize Heat Pump Program play an important role in supplying vulnerable populations with forms of climate resilience, like heat pumps.

Acknowledgements

I would like to thank my site supervisor Nicole Sanders, my faculty advisor Christine Bae, my cohort, my friends and family. You've all been incredibly supportive!