

## **GENERAL ABSTRACT**

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The DOE Office of Energy Efficiency and Renewable Energy plans to transition America to net-zero greenhouse gas emissions by 2050. Due to their high heating load, cold climate residences have difficulty finding renewable energy heating methods. The National Renewable Energy Laboratory (NREL) researchers at Cold Climate Housing Research Center (CCHRC) are finding ways to effectively provide heat in cold climate housing conditions, in hopes to lower energy costs and greenhouse gas emissions.

CCHRC launched Alaska's first thermalize campaign, having over 160 participants. This Juneau, Alaska campaign centers around the use of air source heat pumps (ASHP). ASHP are partially renewable heating appliances that gather heat from outdoor air and use a refrigeration cycle to step it up to a temperature usable for indoor heating. Questions arose about the efficiency of ASHP at extremely low temperatures and their capability to produce real-world energy savings in colder climates.

For my Science Undergraduate Laboratory Internship (SULI), I collected data in a controlled laboratory climate chamber to calculate the efficiency of the Thermalize Juneau 2021 heat pump model. I programmed using Python on Google Collaboratory to clean and arrange baseline electrical data from Thermalize Juneau buildings. Future research includes testing additional heat pump models and evaluating the energy savings and suitability of ASHP technology using post-retrofit data. These results will accelerate research, development and deployment of renewable energy technologies that help communities such as Juneau, Alaska transition to lower greenhouse gas emissions.

NREL's SULI program provided me with many opportunities and resources for professional growth. I gained skills on effective scientific communication and research report writing from professional development workshops. Through my mentorships, I learned laboratory safety protocols, acquired hands-on research experience using a climate chamber, and expanded my data analysis skill set through standardizing real-world energy data. This experience heightened my passion for research in renewable energy technologies and my desire to pursue graduate studies within it.