

## Introduction

What is **Thermalize Juneau**?

- Clean-energy campaign launched in 2021 for a cohort of approximately 150 homeowners in Juneau, Alaska
- Provides heat pump assessments, energy audits, bulk-buy pricing discounts, and educational materials for installation of single-head ductless air source heat pumps and/or energy efficiency improvements energy audits.

Developed by **Alaska Heat Smart, Renewable Juneau, and AEL&P** and the first of its kind in Alaska, the **THERMALIZE JUNEAU** pilot program seeks to:

**INSTALL** ductless heat pumps in participating Juneau homes and businesses

**IMPROVE** energy efficiency of participating Juneau homes and businesses

**GROW** and support local clean energy jobs

**PIONEER** a repeatable framework for other communities to try!

What is an **air source heat pump (ASHP)**?

- In heating mode, transfers heat energy from outdoors to indoors, like an air conditioner in reverse.
- Electricity-based and highly efficient, especially in warmer temperatures
- Juneau's electricity comes from renewable hydropower, so switching to an ASHP reduces home's carbon footprint.

What is the Alaska Heat Smart (AHS) **heat pump assessment calculator**?

- Helps homeowners decide whether installing a heat pump is a beneficial economic choice for them based on their house characteristics and energy usage.
- Calculates changes in heating Energy Use Intensity (EUI), where:

$$EUI = \frac{\text{total energy (for heating) consumed by the building in one year}}{\text{floor area of the house}}$$

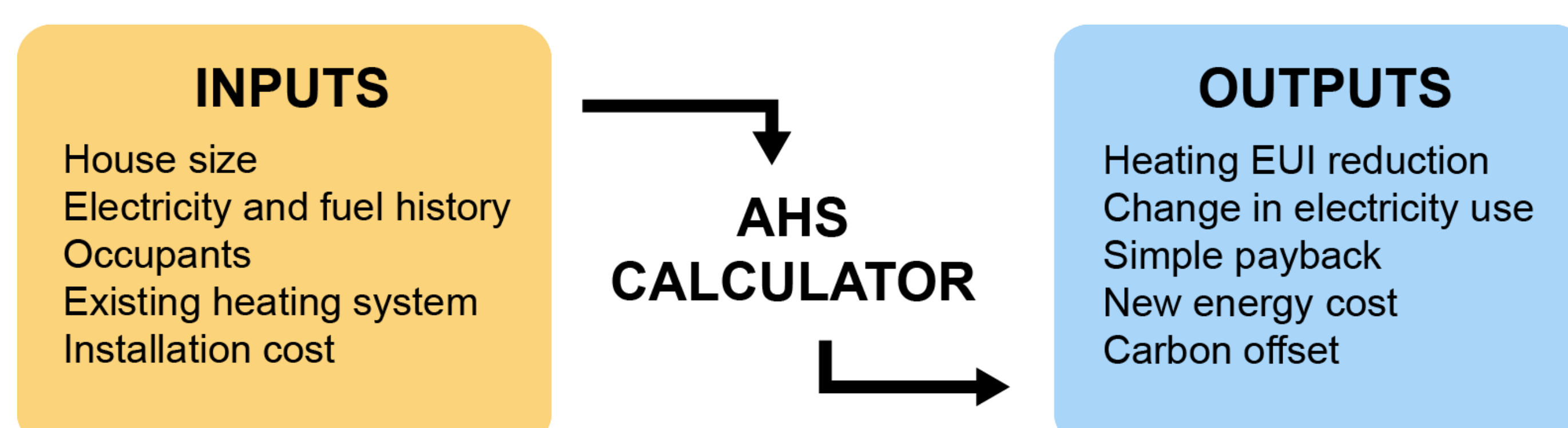


Figure 1: AHS assessment calculator inputs and outputs

## Project Goals

1. Characterize the median Thermalize participant household using the Alaska Heat Smart calculator data from Thermalize participants
2. Compare Thermalize assessment results to results from corresponding energy audits

## Process

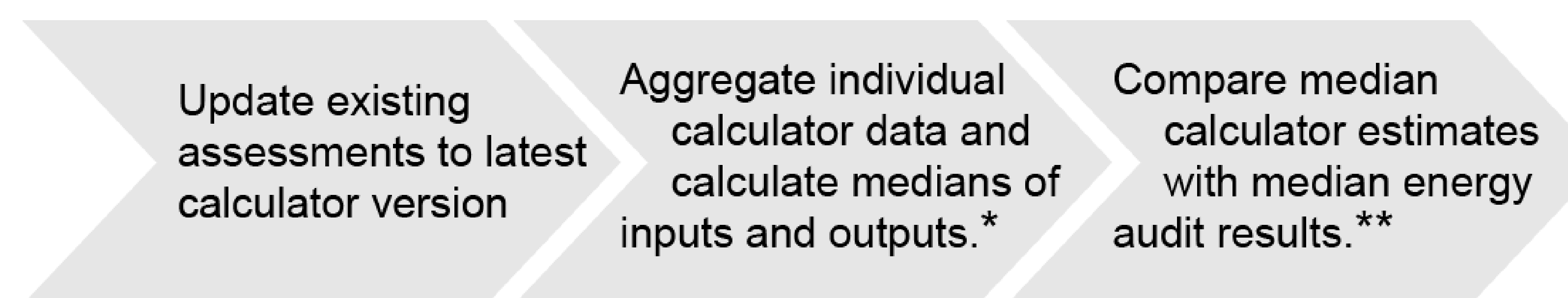


Figure 2: Process for collecting and analyzing AHS calculator data

\* Inputs and outputs aggregated and calculations run in Excel

\*\* Compared subset of households with assessment who also had corresponding AkWarm energy audit

## Results

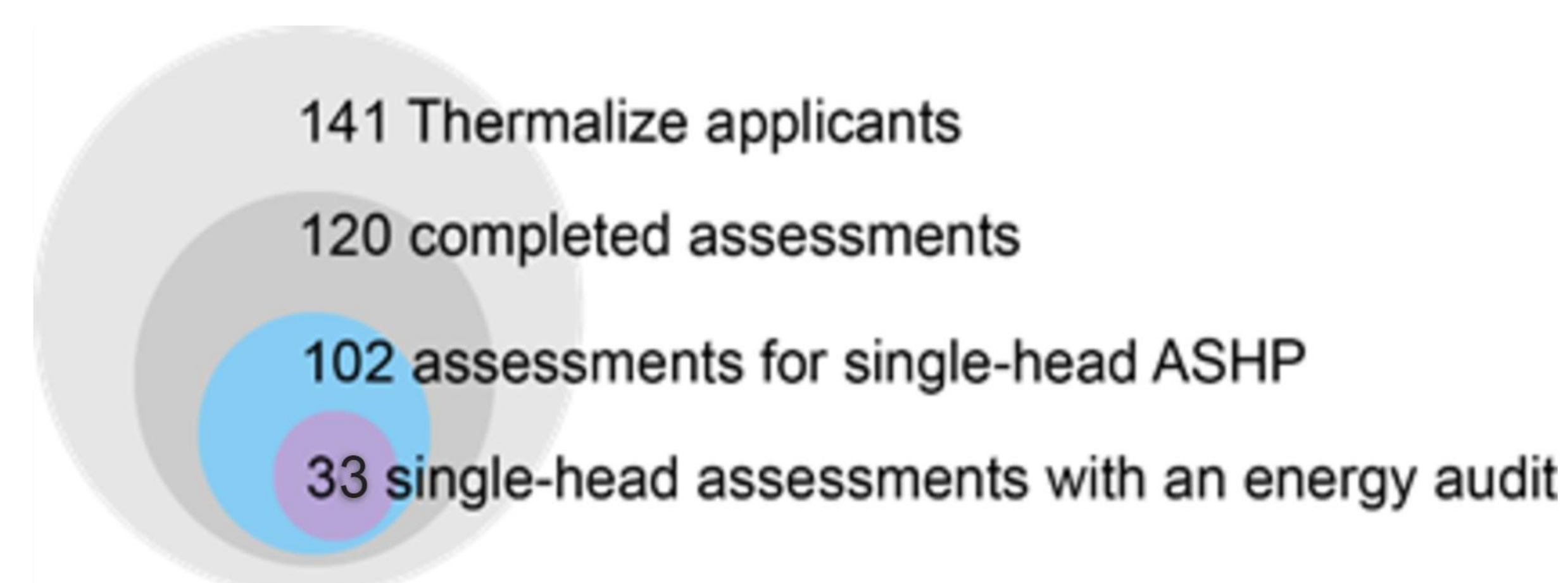


Figure 2: Bubble diagram of Thermalize participant subgroup breakdown

Table 1: Selected median values from Thermalize participant assessments for a single-head heat pump.

Median Values	Completed Assessments for single-head ASHP (102 houses)
Living floor area (ft <sup>2</sup> )	1,500
Predicted heating EUI % reduction	55.8%
Oil usage before ASHP installation (gal)	439
Yearly avoided CO <sub>2</sub> (lbs)	8,700
Simple Payback (years)	7.7
Total energy cost % reduction	28.6%

Table 2: Selected median values from Thermalize participant assessments for a single-head ASHP with corresponding energy audit (purple), Selected median values from energy audit calculations for Thermalize participants (green)

Median Values	Assessments w/ Audit (33 houses)	Energy Audit Results (33 houses)
Living floor area (ft <sup>2</sup> )	1,610	1,460
Predicted heating EUI % reduction	56.0%	66.1%
Oil usage (gal)	547	501
Yearly avoided CO <sub>2</sub> (lbs)	11,190	11,000

## Discussion

I found the median house area as calculated AHS assessments for Thermalize participants to be 1,500 ft<sup>2</sup>

- The median house area in Juneau is 1,995 ft<sup>2</sup>, the median Thermalize house is 24.8% smaller than the median Juneau house.
- This could be because a single-head ASHP might not be well-suited to the energy needs of a larger house

The median predicted avoided CO<sub>2</sub> per year per house is 8,700 lbs. If all 99 Thermalize participants install a single-head heat pump, the overall total yearly carbon offset would be 875,000 lbs, equal to taking 86 cars off the road each year.

These calculations estimate that the median household will reduce their heating EUI by half (55.8%)

- The Thermalize campaign has a target of achieving at least a 50% EUI reduction across all Thermalize participants, so these calculations predict they will achieve that goal.

I compared assessment calculations against energy audit calculations for subgroup of Thermalize assessments with corresponding energy audits. Assessments estimate a slightly smaller EUI reduction (56.0%) than the Audit results estimate (66.1%). This might be due to:

- Energy audit software has different way of accounting for parameters in calculating these estimates.
- Differences in input parameters from auditors



## Conclusions

From these estimates, it is predicted that ASHPs will provide Thermalize participants with immediate and long term economic and environmental savings.

The campaign will analyze the real outcomes against these estimates to help calibrate subsequent savings calculators. This research will help create a resource toolkit to inform future Thermalize campaigns in Alaska and elsewhere.

## Acknowledgements

I would like to thank Vanessa Stevens, Tom Marsik, Dana Truffer-Moudra and Nathan Wiltse for their mentorship, and Robert Deering for developing the AHS calculator. Thank you to fellow SULI intern Rachel Dodd for her work on the Thermalize energy audit calculations.