The Heat Is On! Understanding the Savings Potential of Heat Pumps

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EVERGREEN ECONOMICS

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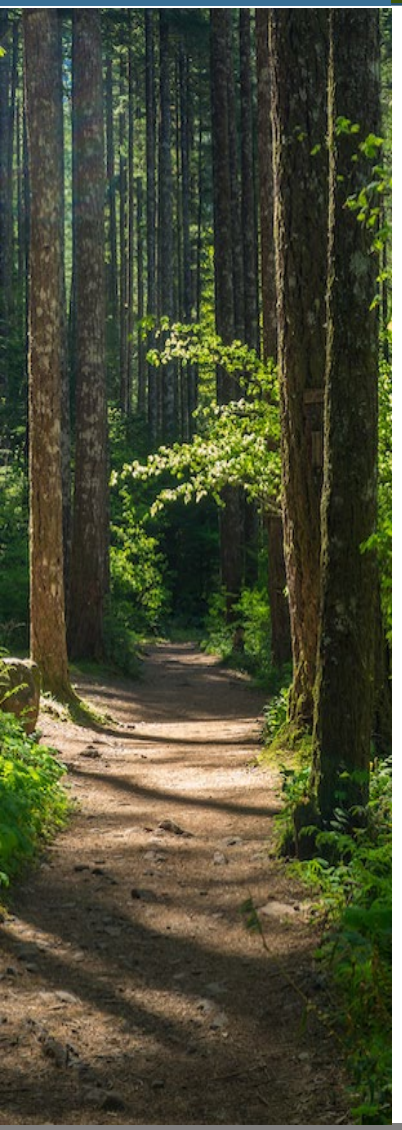


Background

Study Region

- Heat pumps = key energy savings strategy
- Study builds on prior Bonneville Power Administration (BPA) research
- Results inform Regional Technical Forum (RTF) savings

Background

Goal: Help move savings for Regional Technical Forum measures from "planning" to "proven"

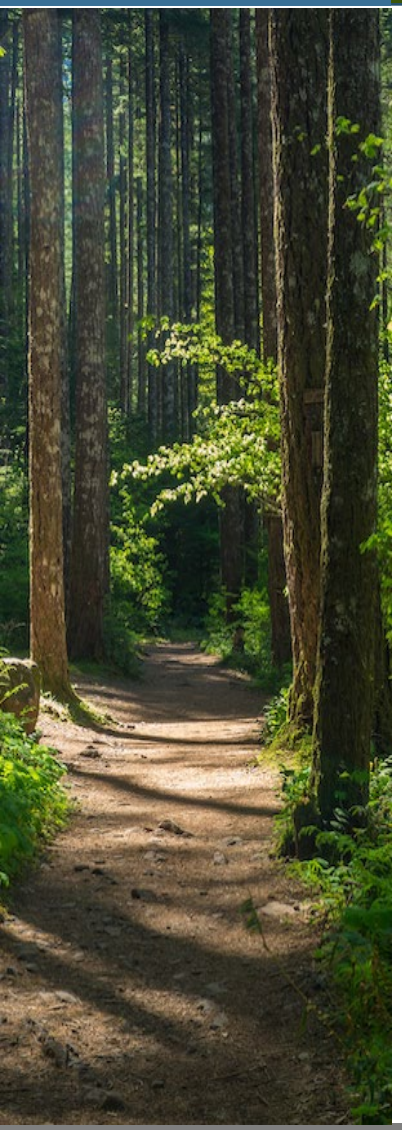
Measure	Home Type	Heating Zone 1	Heating Zones 2/3
Air Source Heat Pump (ASHP)	Single Family (SF)	Proven	Planning
	Manufactured Home (MH)	Proven	Planning
Variable Speed Heat Pump (VSHP)	Single Family (SF)	Planning	Planning
	Manufactured Home (MH)	Planning	Planning

Focus: Electric resistance conversions to heat pumps

Research Objectives

1. Estimate energy savings of ASHP and VSHP conversions

2. Identify drivers of savings



Methodology

Comparison Group Development

Isolate effect of heat pumps

Methodology

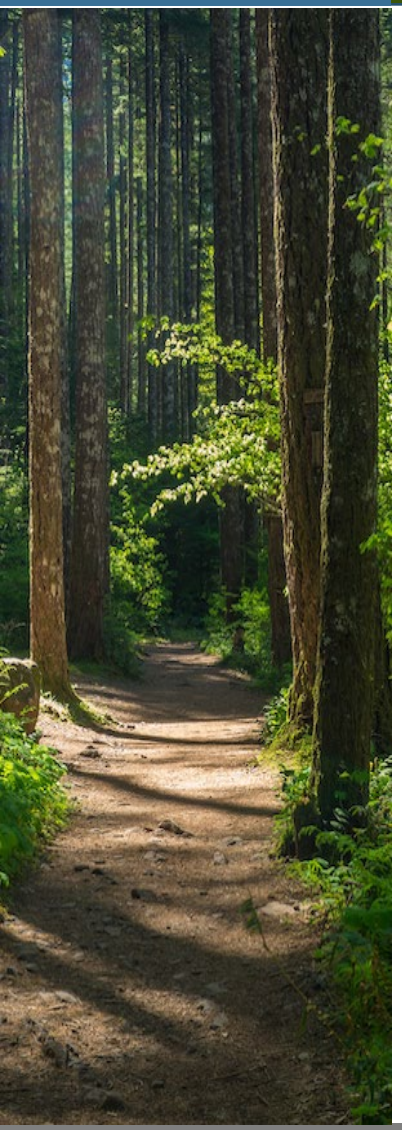
Post-Only with Comparison Group → Estimate savings

Variable Based Degree Days and Drivers Analysis → Explore variance in savings

Sample

Regression Model Sample (n=993)

Measure	Heating Zone	Home Type	Population	Target	Sample
ASHP	HZ 2/3	SF	232	100	172
		MH	113	75	85
VSHP	HZ 1	SF	895	100	459
		MH	246	75	149
	HZ 2/3	SF	144	100	105
		MH	31	75	23



Drivers of Savings

Higher usage = greater savings

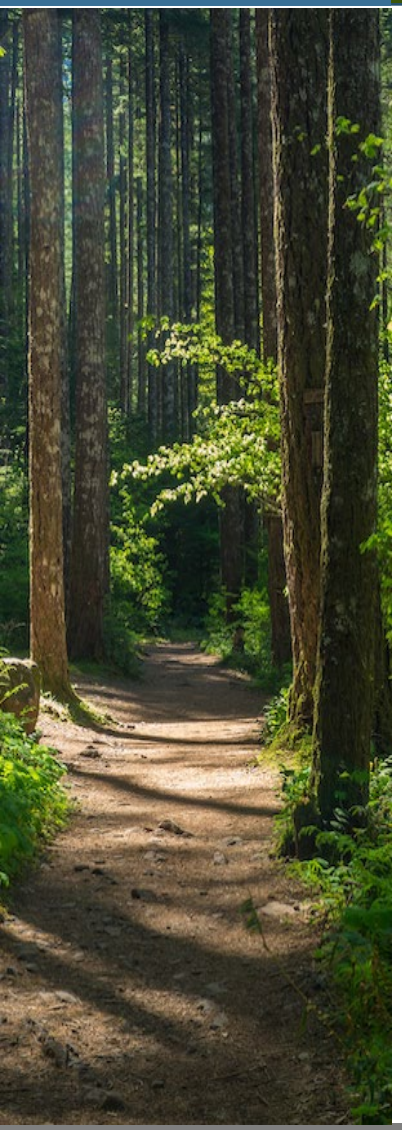
No AC = lower savings for one measure group

Manufactured homes = lower savings

Evaluation Results

Evaluated savings were similar to RTF values.

Measure	Heating Zone	Home Type	Sample	Evaluated Savings	RTF Values	Realization Rate
ASHP	HZ 2/3	SF	172	3,315	2,504	132%
		MH	85	2,256	3,451	65%
		Subtotal				**110%**
VSHP	HZ 1	SF	459	5,075	5,056	100%
		MH	149	1,711	4,796	36%
		Subtotal				**86%**
	HZ 2/3	SF	105	2,527	3,342	76%
		MH	23	3,753	4,271	88%
		Subtotal				**78%**



Reasons for Lower-than-Expected Savings

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Snapback

More efficient
→ less expensive
→ more use

Reasons for Lower-than-Expected Savings

Snapback	Added AC
More efficient → less expensive → more use	Ability to cool → more use

Reasons for Lower-than-Expected Savings

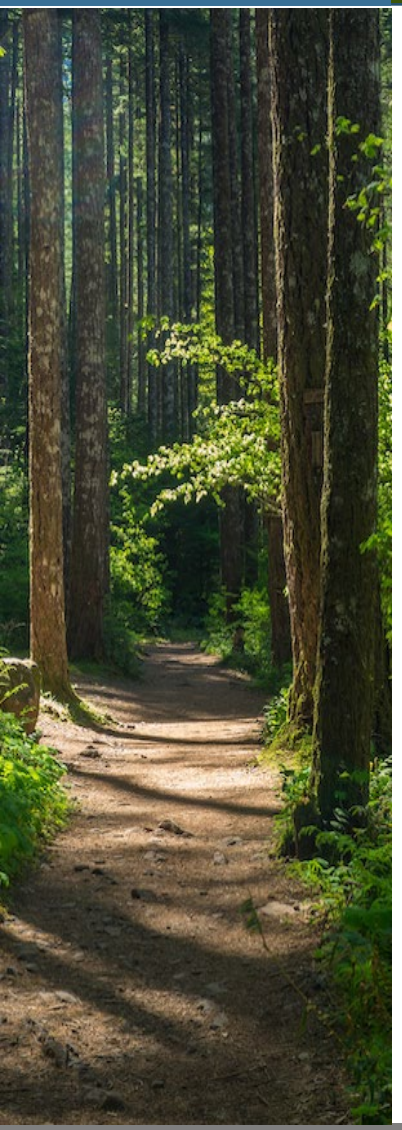
Snapback	Added AC	Contractor Choices
More efficient → less expensive → more use	Ability to cool → more use	Contractor settings → more comfort → less efficient

Reasons for Lower-than-Expected Savings

Snapback	Added AC	Contractor Choices	Bulk Fuels
More efficient → less expensive → more use	Ability to cool → more use	Contractor settings → more comfort → less efficient	Fuel displacement → less wood, propane, gas → more electricity use

Considerations for Future Research

1. Customer survey
2. Consider different baselines for homes without AC
3. Track reductions in non-electric heating



Key Takeaways

- Energy usage is the main driver of savings.
- Several factors can decrease savings.
- Consider all equipment benefits.

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