



Promote, incentivize, and/or subsidize heat pumps

Target	100% of buildings that are covered have a heat pump installed by 2035
Building types	New and existing residential and commercial buildings

Impact on GHG Emissions Relative to All Building Policies Analysed



Indicators

1. GHG emissions	↓ Decreases emissions	-3,600,000 metric ton CO ₂ e average annual GHG emissions avoided emissions (2022-2050)
2. Economic impact-lifecycle abatement cost	↓ Saves money per ton of emissions reduced	-\$100 net present value of a metric ton of avoided GHG emissions with a 3% discount rate
3. Energy efficiency	↓ Decreases energy consumption	-69,000,000 MMBTU average annual avoided energy consumption (2022-2050)
4. Resiliency	- no change	0 homes with retrofits that increase resiliency against heat, cold and severe weather events
5. Public health and air quality	↓ Decreases health costs	-\$217 million average annual avoided public health costs (2022-2050)

6. Household expenditures	 Decreases household energy costs	-36.90% change household energy expenditures between 2022 and 2050
7. Economic impact-employment	 Employment	3,368 average annual person years of employment created (2022-2050)
8. Social cost of carbon	 Decreases the social cost of carbon	-\$267.3 million average annual avoided damage from climate change globally (2022-2050)

Background

1. GHG Emissions

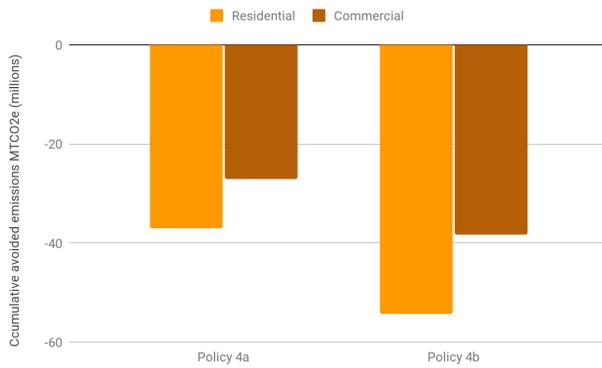


Figure 1: Heat Pumps Policy scenarios, cumulative GHG emissions reduction by sector, 2022-2050

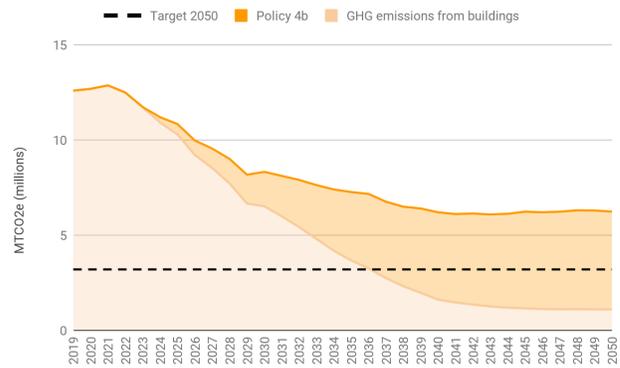


Figure 2: Heat Pumps Policy scenario 4b, annual GHG emissions reductions resulting from scenario 4b relative to total projected GHG emissions from buildings in Oregon

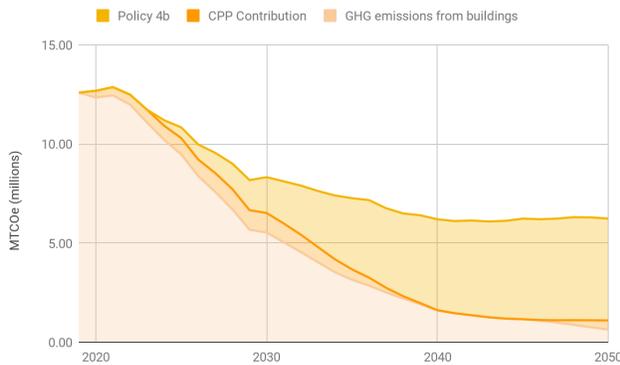


Figure 3: Heat Pumps Policy scenario 4b, annual GHG emissions reductions resulting from scenario 4b relative to total projected GHG emissions from buildings in Oregon, with reductions from CPP

2. Economic Impact, Costs and Savings

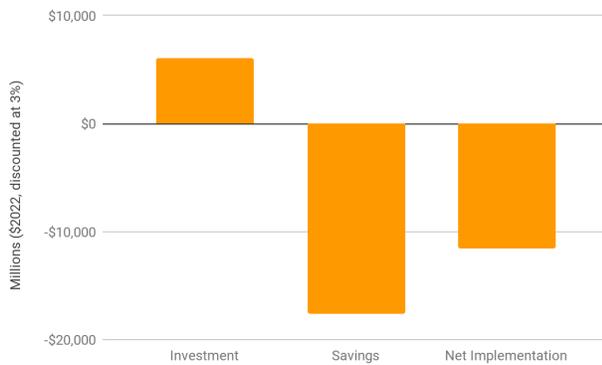


Figure 4: Heat Pumps Policy scenario 4b, NPV over the study period

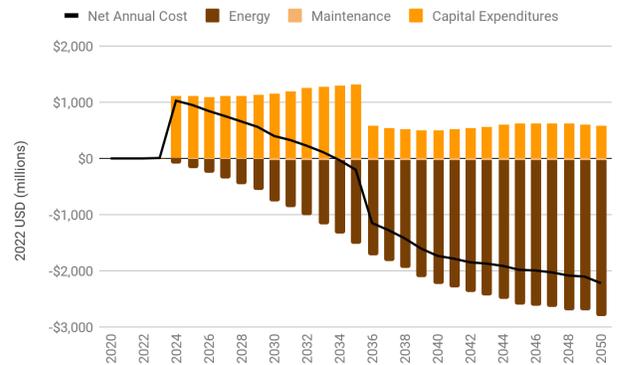


Figure 5: Heat Pumps Policy scenario 4b, net annual costs or savings

3. Energy Efficiency

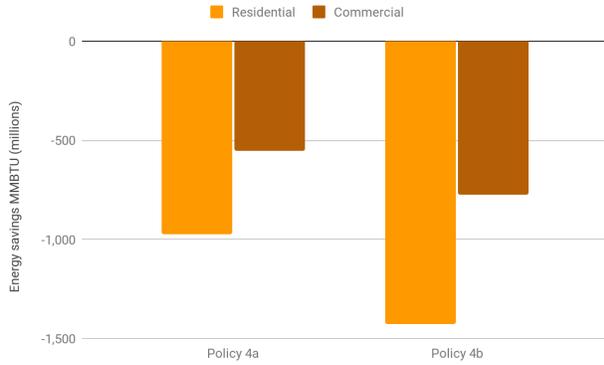


Figure 6: Heat Pumps Policy scenarios, cumulative energy savings by sector, relative to the reference scenario

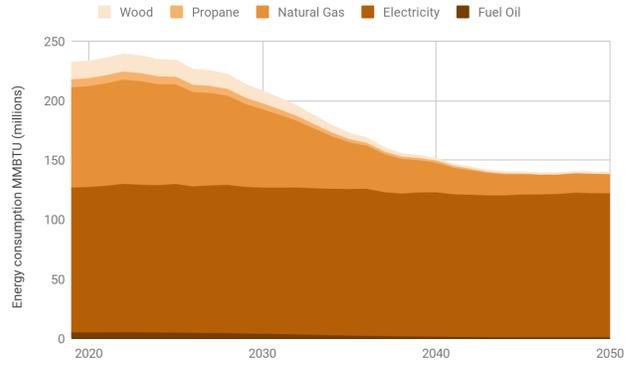


Figure 7: Heat Pumps Policy scenario 4b, energy consumption by energy source

4. Resiliency

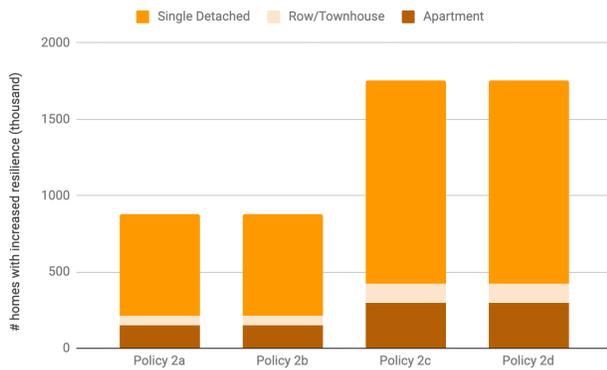


Figure 8: Heat Pumps Policy scenarios, # of homes with increased resilience by 2050

5. Public Health and Air Quality

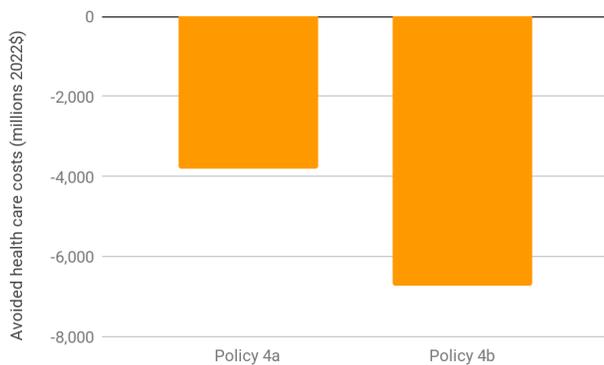


Figure 9: Heat Pumps Policy scenarios, avoided cumulative health costs

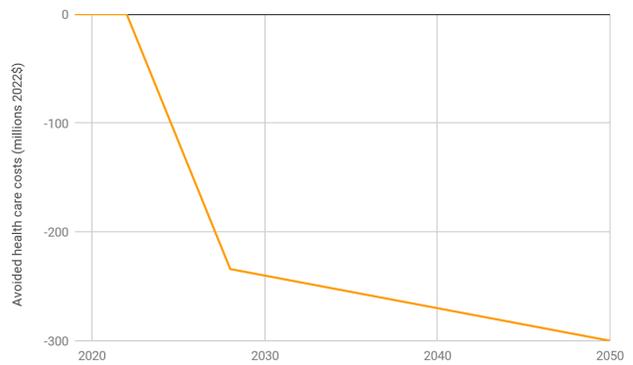


Figure 10: Heat Pumps Policy scenario 4b, avoided annual health costs

6. Household Expenditures

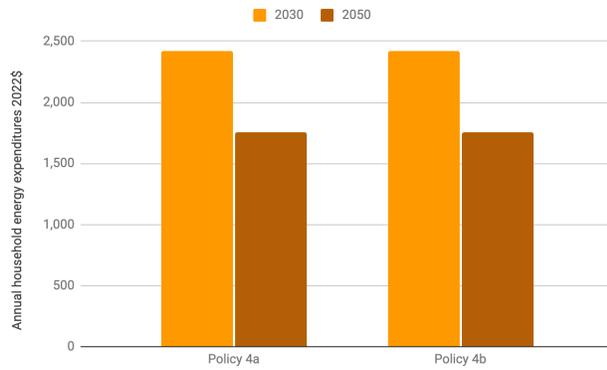


Figure 11: Heat Pumps Policy scenarios, annual household energy expenditures

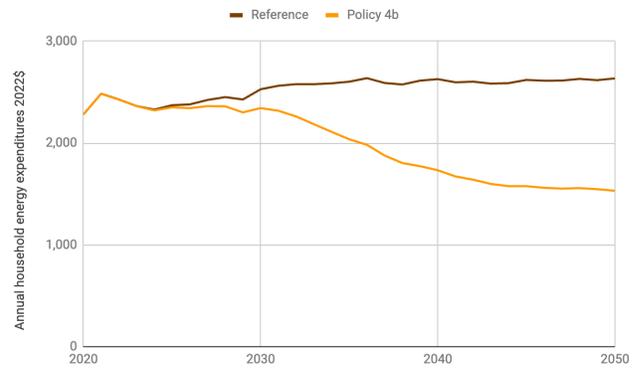


Figure 12: Heat Pumps Policy scenario 4b, annual household energy expenditures relative to the reference scenario

7. Economic Impact, Employment

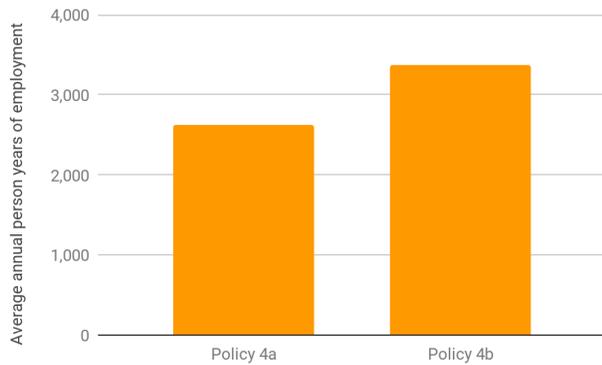


Figure 13: Heat Pumps Policy scenarios, cumulative person years of employment

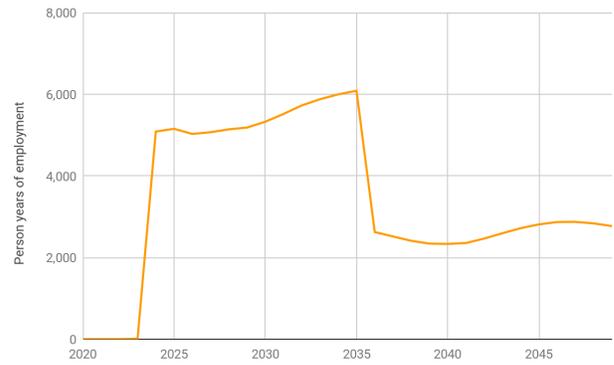


Figure 14: Heat Pumps Policy scenario 4b, annual person years of employment

8. Social Cost of Carbon

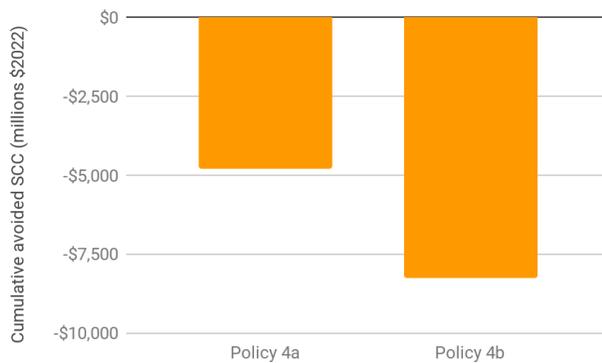


Figure 15: Heat Pumps Policy scenarios, cumulative avoided social cost of carbon

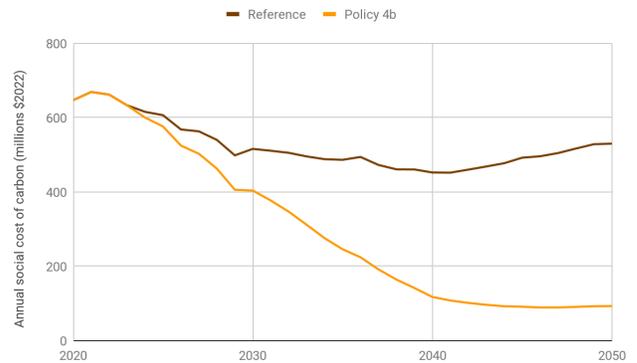


Figure 16: Heat Pumps Policy scenario 4b, annual avoided social cost of carbon relative to the reference scenario

Key

Term/Acronym	Definition	Additional information
CPP	Climate Protection Program	The Climate Protection Program sets a declining limit, or cap, on greenhouse gas emissions from fossil fuels used throughout Oregon, including diesel, gasoline, natural gas and propane, used in transportation, residential, commercial and industrial settings. The rate of reduction is applied to covered fuels in the residential and commercial sectors.
Cumulative		The sum of the annual costs or savings over the period. For example, if there were \$40 of savings in 2022, \$60 of savings in 2023 and \$120 of costs in 2024, the cumulative value would be $-\$40 + -\$60 + \$120 = \20 .
GHG	Greenhouse gases	The three primary GHGs are carbon dioxide (CO ₂), methane (CH ₄), nitrous oxides (NO _x).
Household energy expenditures		Cost of energy used in a house, calculated by summing total expenditures on energy in houses in Oregon divided by number of houses.
MMBtu	Million british thermal units	A measure of energy. 1 kWh of electricity is equivalent to 3,400 Btu 1 gallon of gasoline is equivalent to 120,000 Btu
MtCO ₂ e	Metric tons of carbon dioxide equivalent	A measure that combines CO ₂ , CH ₄ , NO _x into one measure. For example, 1 unit of CH ₄ is equivalent to 28 units of CO ₂ over 100 years. In other words, 1 unit of CH ₄ causes 28 times more warming than 1 unit of CO ₂ over 100 years, where the 28 is described as the Global Warming Potential (GWP). If a policy results in 2 Mt of CO ₂ and 2 Mt of CH ₄ , the total would be $2 + (2 \times 28) = 58$ MtCO ₂ e.
NPV	Net present value	A method used to determine the current value of all future cash flows generated by a project, including the initial capital investment. Based on the idea that a future dollar is worth less than a current dollar, future costs and savings are discounted back to current dollars. The net present value is sensitive to the discounting rate.
Person years of employment		One person working full time for a year. For example, a job which lasts 10 years is equivalent to 10 person years of employment.
Reference		The reference scenario includes: <ul style="list-style-type: none"> ● Population growth ● Employment growth ● Heating and cooling degree days projections ● Community Renewable Energy Program ● Energy efficiency standards for appliances ● HB2021 ● Heat Pump Rebate Program ● Implement Healthy Homes Repair Fund ● Manufactured home replacement ● Solar + Storage Rebate Program

Resilience		Residential building retrofits are assumed to increase the resilience of the home. By increasing the thermal performance of the home, the retrofit increases its passive survivability, the ability of a building to maintain critical life-support conditions for its occupants if services such as power, heating fuel are lost for an extended period.
SCC	Social cost of carbon	The SCC is a comprehensive estimate of climate change damages and includes changes in net agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning.