The “How” and “Why” of Heat Pumps

EnergyTrust of Oregon

Agenda

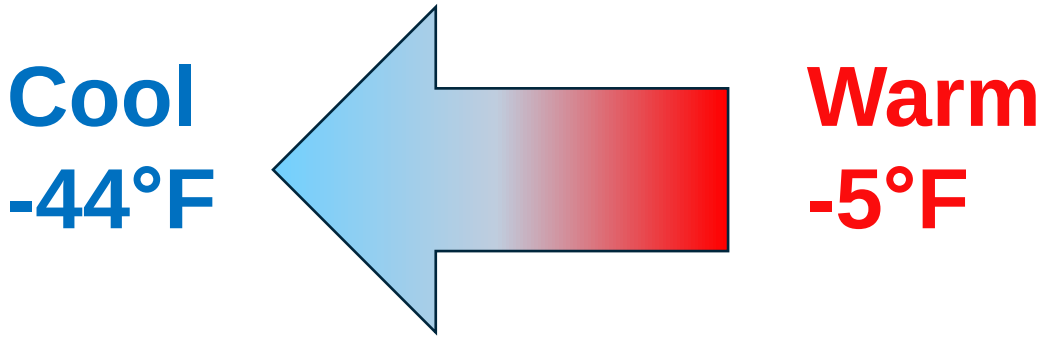
- Part 1: How Does a Heat Pump Work?
- Part 2: Heat Pumps through the eyes of State and Federal programs
- Part 3: How do Heat Pumps fit today and into the future of the Energy Trust residential program?

Part 1: How Does a Heat Pump Work?

The Basics: States of Matter

Starting with the basics

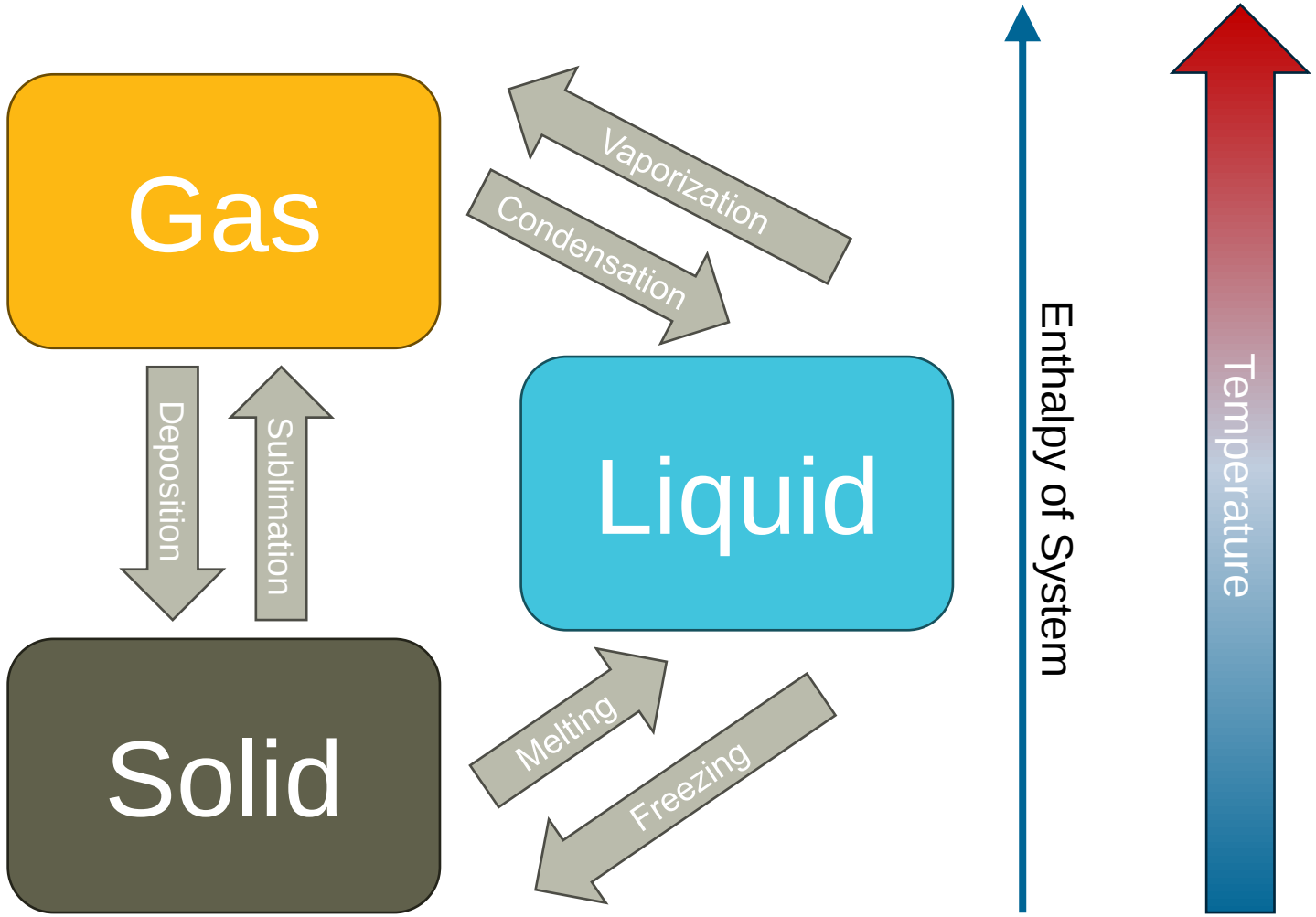
- Heat moves from high to low
- “Warm” and “Cool” are relative



The Basics: States of Matter

States of Matter

- A change of state is **always** accompanied by a gain or loss of heat



The Basics: States of Matter

Some heat energy can’t be measured with a thermometer

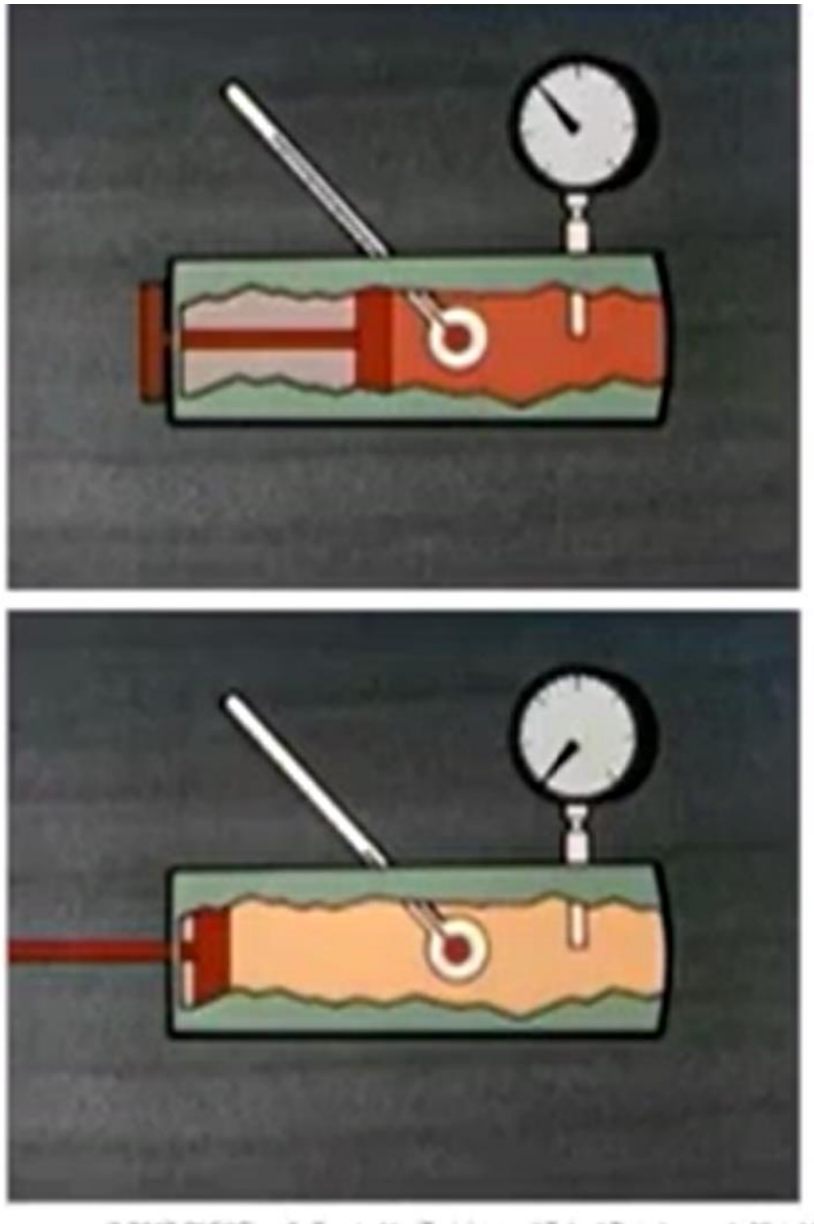
The Basics: States of Matter

Gas		**Liquid**	**Gives up heat (loss)**
Liquid		**Gas**	**Absorbs heat (gain)**

- A change of state is **always** accompanied by a gain or loss of heat.

The Basics: States of Matter

- When gas is compressed:
  - Temperature goes up
  - Pressure goes up
- When gas expands:
  - Temperature goes down
  - Pressure goes down



The Basics: States of Matter

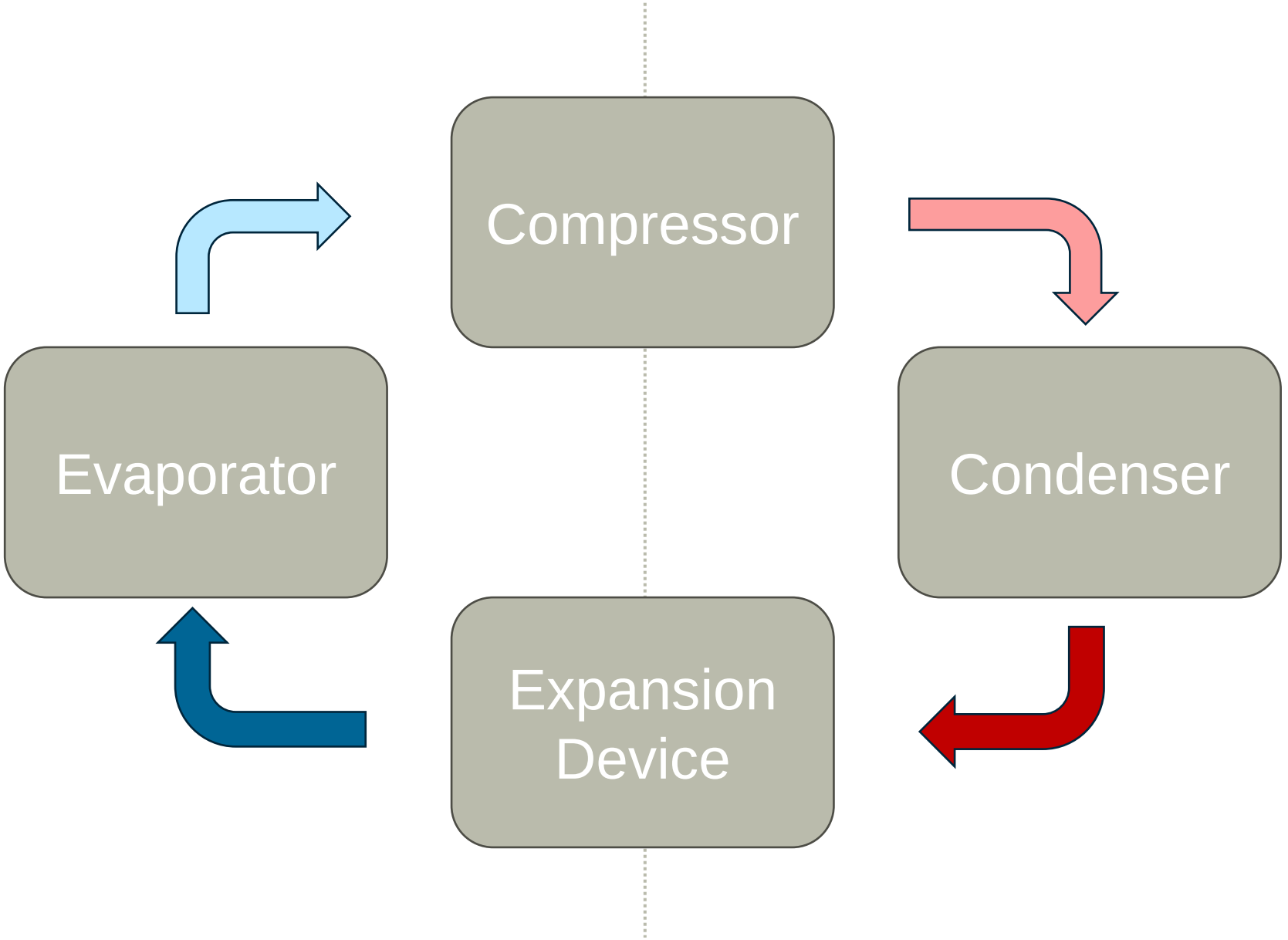
1. **“Warm” and “Cool” are relative**

2. **A change of state is <u>always</u> accompanied by a gain or loss of heat**

3. **Gas**
   - **When compressed, temperature + pressure go up**
   - **When expands, temperature + pressure go down**

How Does a Heat Pump Work?

- Evaporator takes up heat
- Condenser gives up heat



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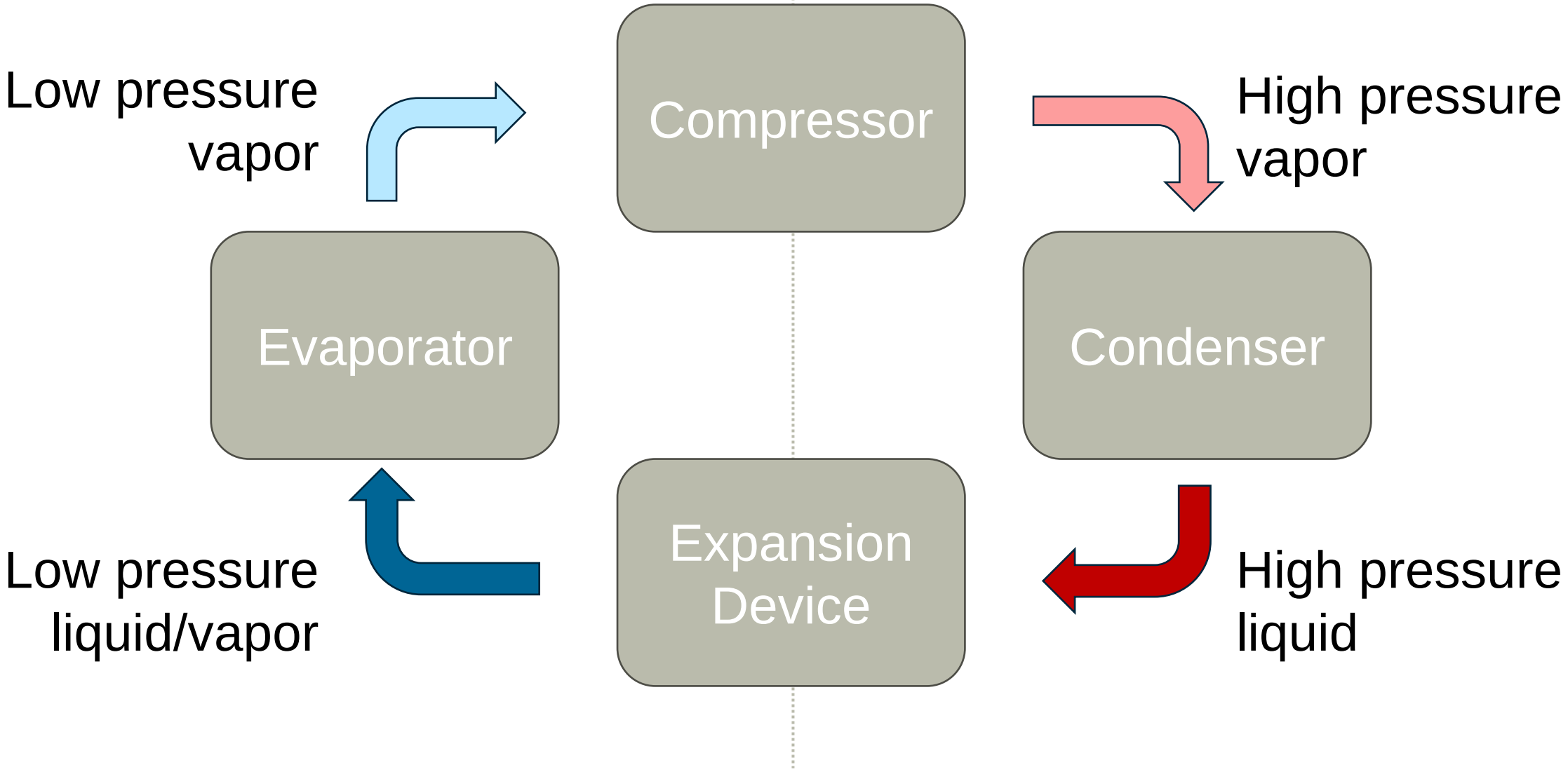

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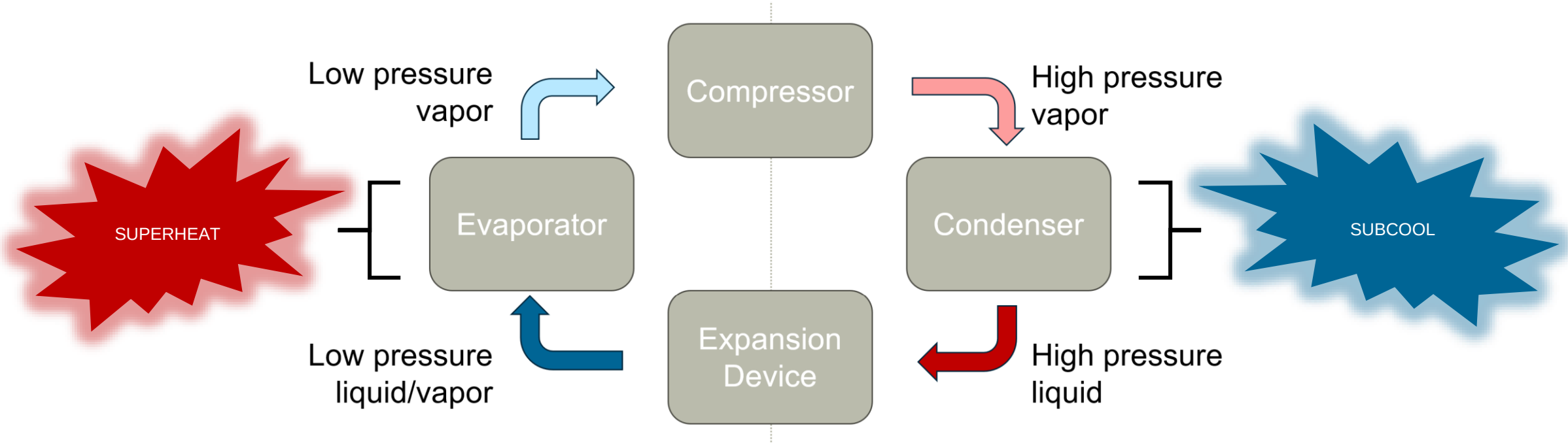

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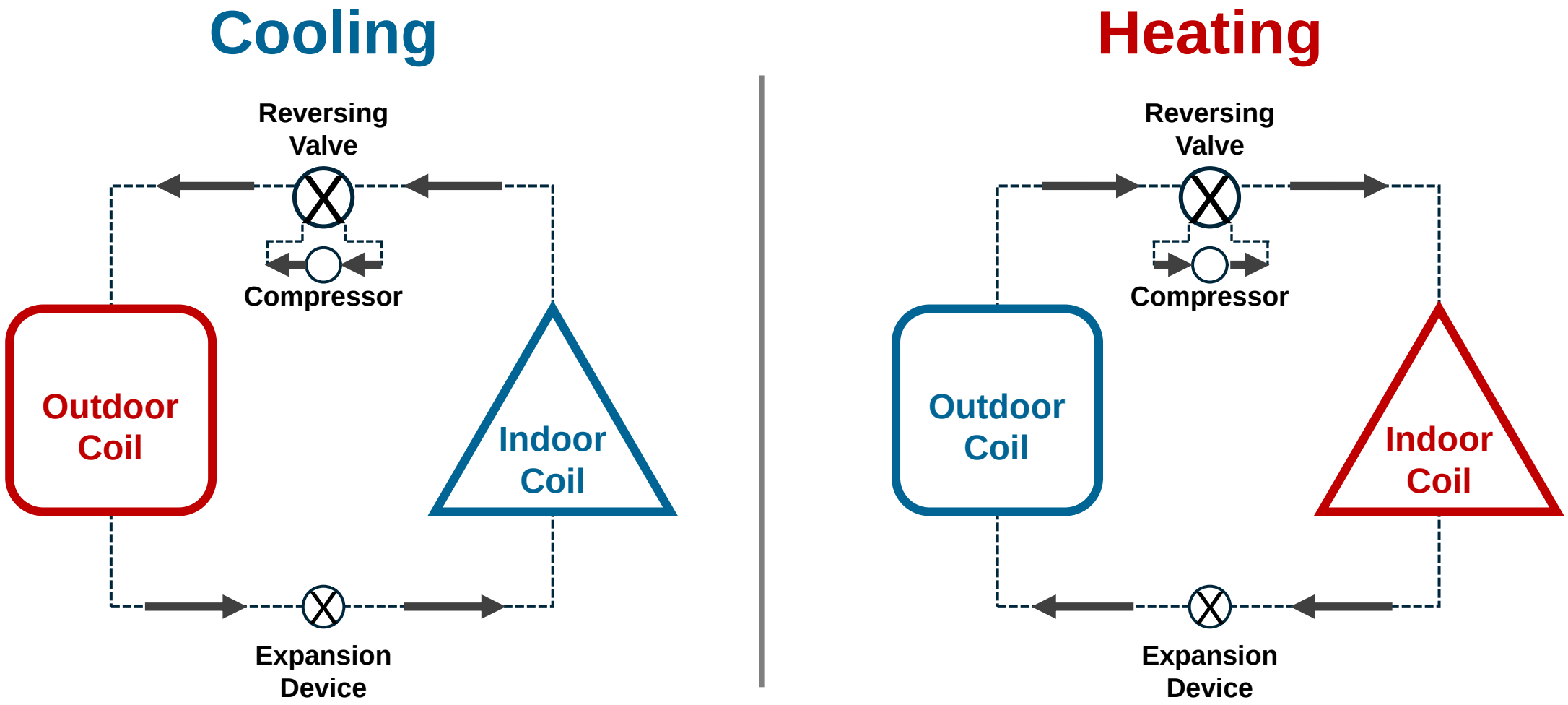

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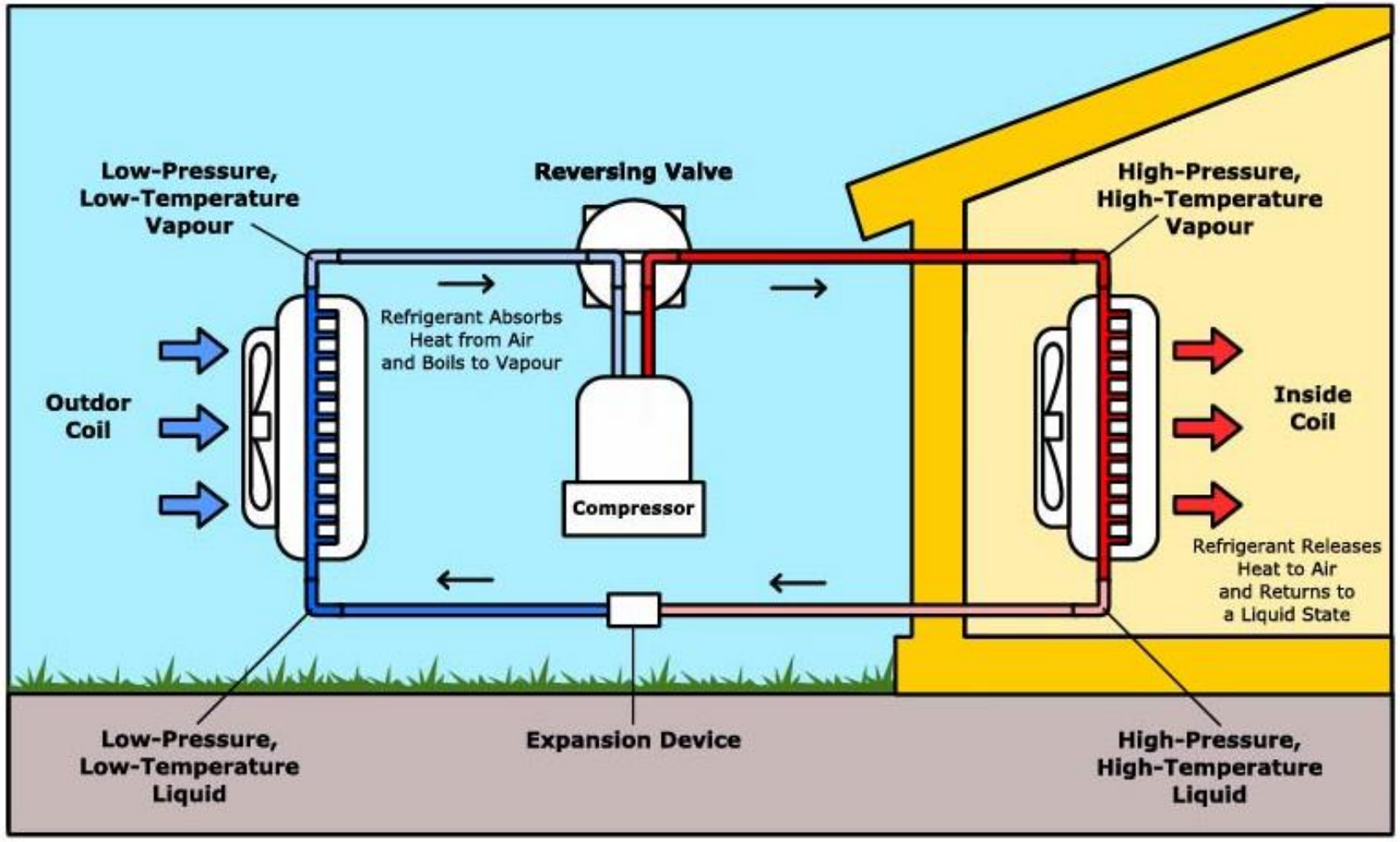


Part 2: Heat Pumps through the eyes of Federal and State Programs

Heat Pumps at the Federal Level

Heat pumps are a key product for a variety of Federal objectives

1. Shift away from fossil fuels / reduce greenhouse gas emissions
2. Lower energy bills (particularly for LMI households and DACs)
3. Improve air quality
4. Bolster local economic development

Heat Pumps at the Federal Level

Inflation Reduction Act (IRA)

- Heat pump tax credit = 30% ($2,000 max)
- Home Efficiency Rebates (HOMES) – Rebate program for LMI households. Rebate based on estimated energy savings.
- Home Electrification and Appliance Rebate (HEAR) – Point-of-sale rebate for qualified electrification projects for LMI households. ($14,000 cap)

Electrical Load Service Center upgrades/Breaker box	$4,000
Electric Stove, Cooktop, Range and/or Oven	$840
Electric Wiring	$2,500
Heat Pump Clothes Dryers	$840
Heat Pump Heating/Cooling	$8,000
Heat Pump Water Heaters	$1,750
Weatherization (Insulation, Air Sealing, Ventilation)	$1,600

Heat Pumps at the Federal Level

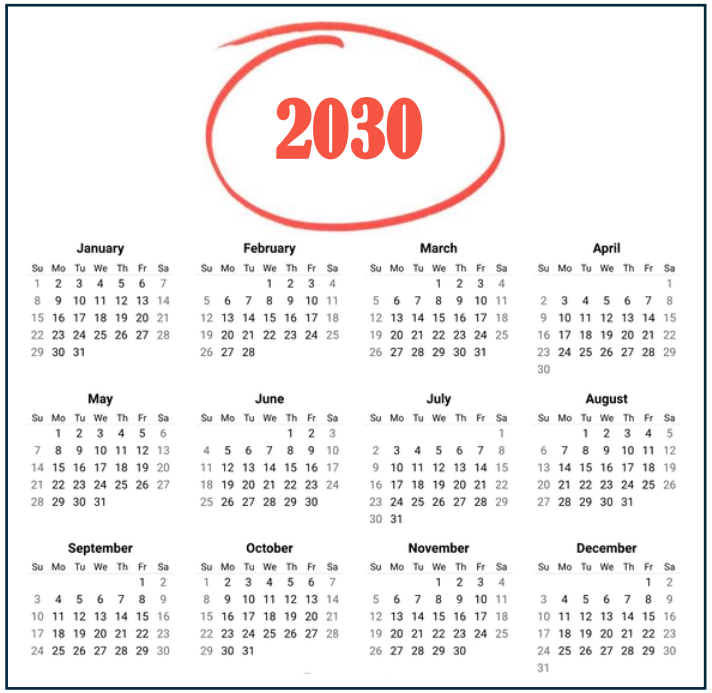
Recent & upcoming Federal regulation updates for heat pumps

2023	Performance ratings	New national minimum efficiency levels for heat pumps manufactured in 2023 and beyond.
2025	Refrigerant regulations	Technology Transitions Program expected to go into effect on 1/1/25. TTP will restrict the use of higher-GWP HFC's in new refrigeration, air conditioning, and heat pump equipment.
2030?	Performance ratings	Industry experts predict Federal performance ratings for heat pumps will move away from HSPF and focus on some version of COP.

Heat Pumps at the State Level

- **July 2023:** Oregon lawmakers passed legislation to adopt a goal for the state to have at least 500,000 new heat pumps in its residential and commercial buildings by 2030.

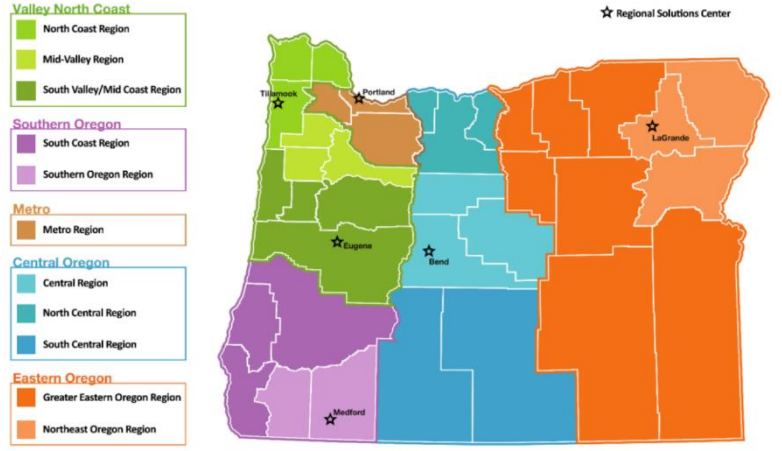
- **Sep 2023:** Oregon joined a consortium of US states and territories (US Climate Alliance) to collectively reach 20 million residential heat pump installations by 2030.



Heat Pumps at the State Level

State bill 1536 directed ODOE to:

1. Develop a $10 million heat pump deployment program, currently referred to as the **“Community Heat Pump Deployment Program”**. Designed to be led by organizations located in 11 regions across the state of Oregon.



2. Create a $15 million grant/rebate program for installation of heat pumps by landlords, currently referred to as the **“Oregon Rental Home Heat Pump Program”**. As of 9/26, 99 contractors are currently approved for this program.

ODOE has rebates available up to $7,000 for heat pump installations and up to $4,000 for related upgrades.

ODOE is now accepting rebate reservations from approved contractors and registrations for additional approved contractors.

Heat Pumps at the State Level

IRA HP Programs in Oregon

- The HOMES and HEAR rebate programs are not expected to be available to Oregon consumers before mid-2024.
- The HEAR rebates will not be available retroactively
- The HOMES rebates, Oregon will make a decision regarding retroactivity.

Per ODOE: *“We do not recommend households wait to accomplish needed home energy upgrades and we encourage you to pursue other incentive options that are available to you now.”*

Heat Pumps & the City of Portland

Portland Clean Energy Fund (PCEF)

- Sep. 2023: Portland City Council adopted the Climate Investment Plan
  - $750 million invested over 5 years
  - Focused on ensuring most-impacted residents are prepared for a changing climate
  - $140 million dedicated to clean energy improvements in single family homes

Part 3: How do Heat Pumps fit today and into the future within the Energy Trust Residential Program?

Current & Future Role of HP's within Energy Trust

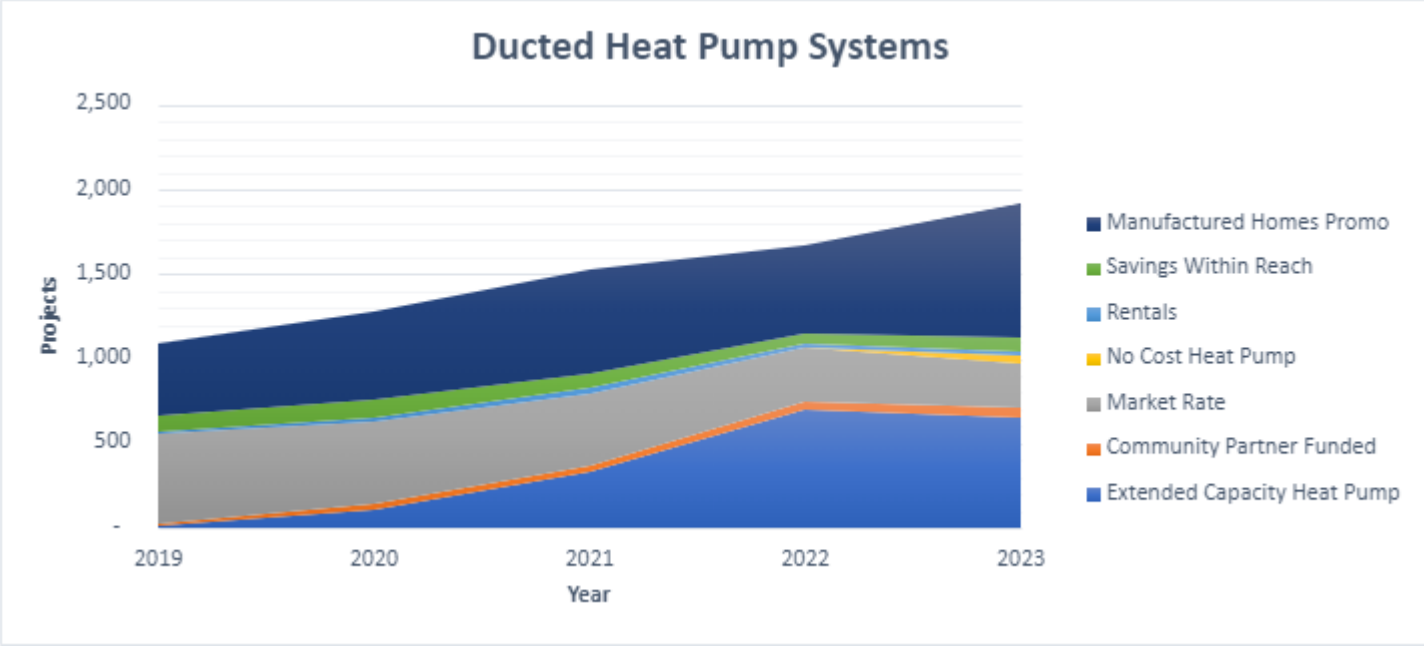
With increasing sources of energy efficiency programs & funding, Energy Trust continues to fill a unique role in the market:

- Long-term presence in Oregon/SW Washington
- Positioned to build upon multi-year partnerships with contractors and customers
- Capable of influencing installation methods and enhancing activity driven by Federal/State programs

Current Role of HP's within Energy Trust

Building to today:

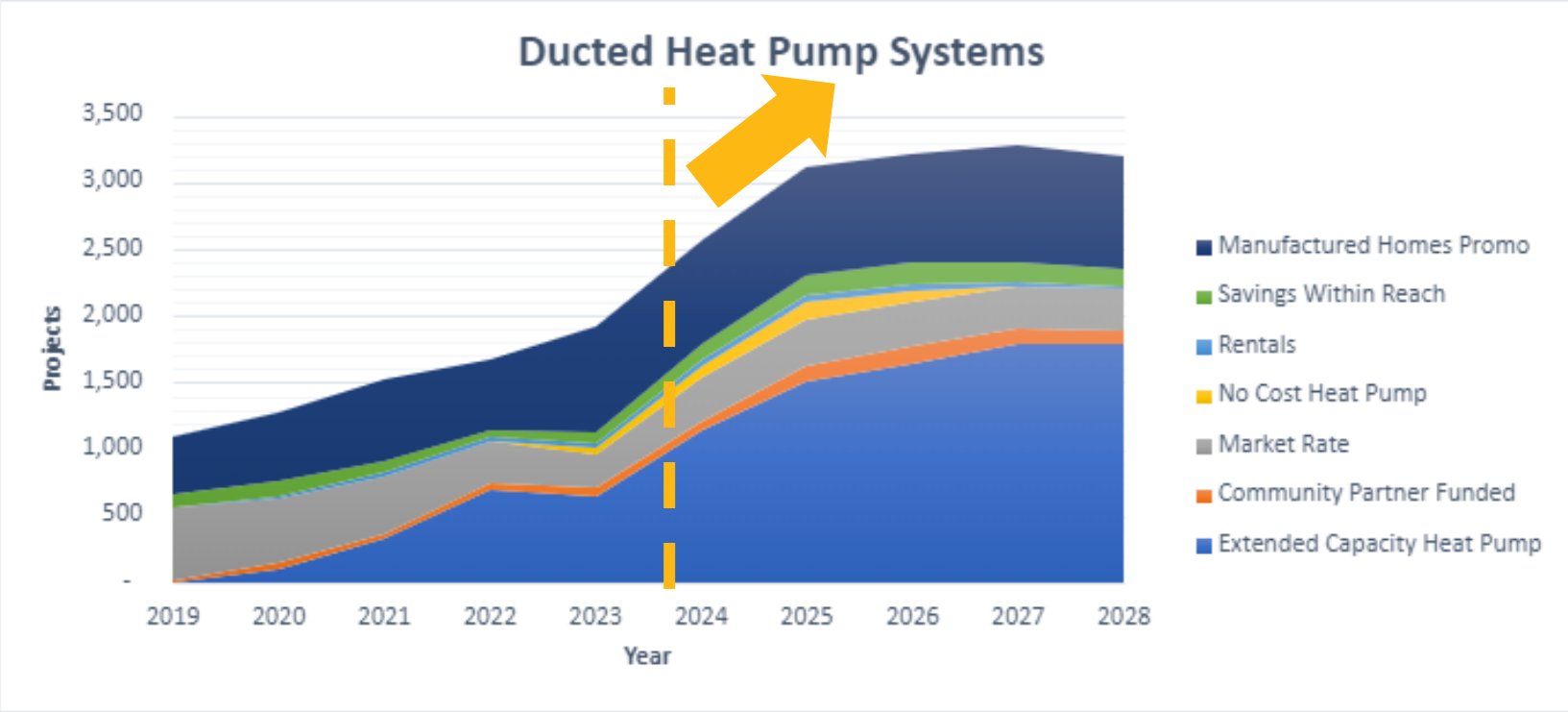
- Heat pump savings primarily based on displacing electric resistance heat
- Cost effectiveness determines incentive potential



Future Role of HP's within Energy Trust

Looking towards tomorrow:

- Finding new ways to claim benefits of heat pumps
- Custom tailor services to a site to maximize the heat pump performance



Current & Future Role of HP's within Energy Trust

Bringing benefits to historically underserved customers

- Energy Trust offers can now reach low income and energy burdened customers
- No out-of-pocket costs:
  - Ductless heat pump (current)
  - Heat pump + heat pump water heater (future)
- Providing cooling benefits for customers, impacting livability and improving health and safety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Thank you

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