

OREGON HOUSING & COMMUNITY SERVICES
Multifamily Energy Program

DUCTLESS HEAT PUMPS

System Types and Controls

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Presenter: Nick Young, Association for Energy Affordability



TRC

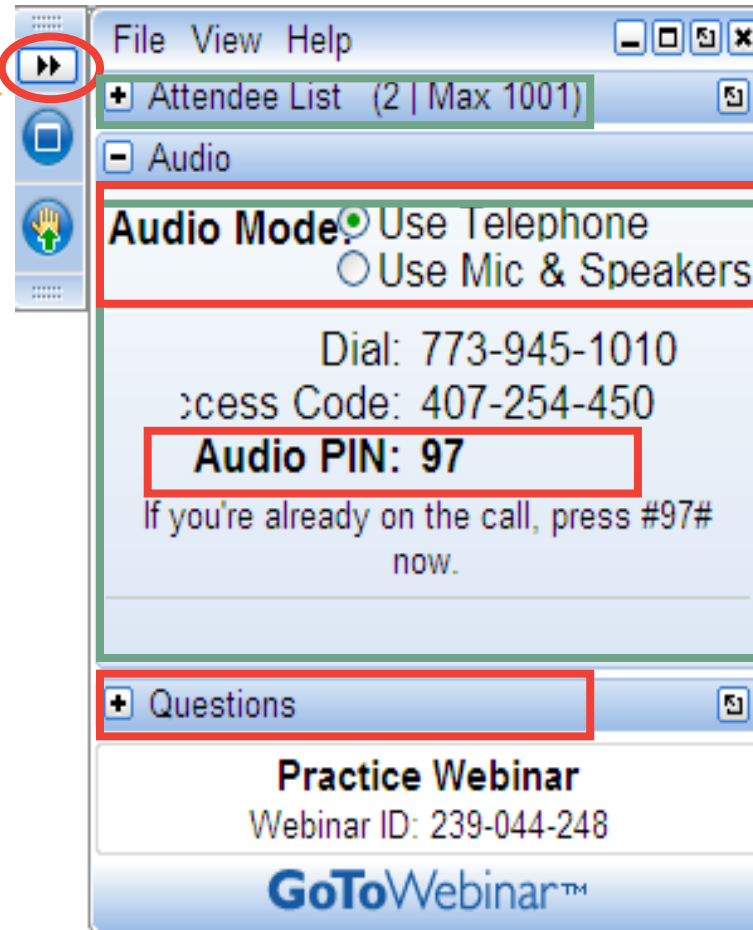


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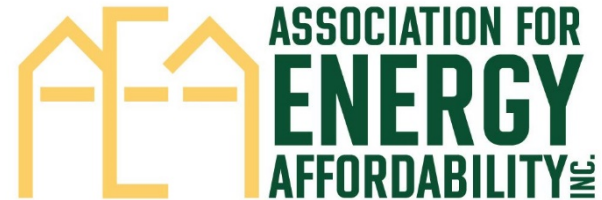
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Nick Young
Association for Energy Affordability



OR-MEP INCENTIVES

The OHCS Multifamily Energy Program (OR-MEP) provides incentives for energy efficiency measures that results in **ELECTRIC SAVINGS**

Qualifying Energy Efficiency Measures

The OHCS Multifamily Energy Program provides incentives for energy efficiency measures that results in electric savings, including the following:

HVAC

Heating
Cooling
Fans
Smart Thermostats

WATER

Water Heaters
Pumps & Controls
Showerheads
Aerators



ENVELOPE

Windows
Insulation
Air Sealing

LIGHTING & APPLIANCES

Kitchen Appliances
Outdoor Lighting
Indoor Lighting
Laundry

AGENDA

- ◆ Heat Pump Basics
- ◆ Ductless Heat Pump System Types
- ◆ Ductless Heat Pump Controls



HEAT PUMP BASICS



WHAT IS A HEAT PUMP?

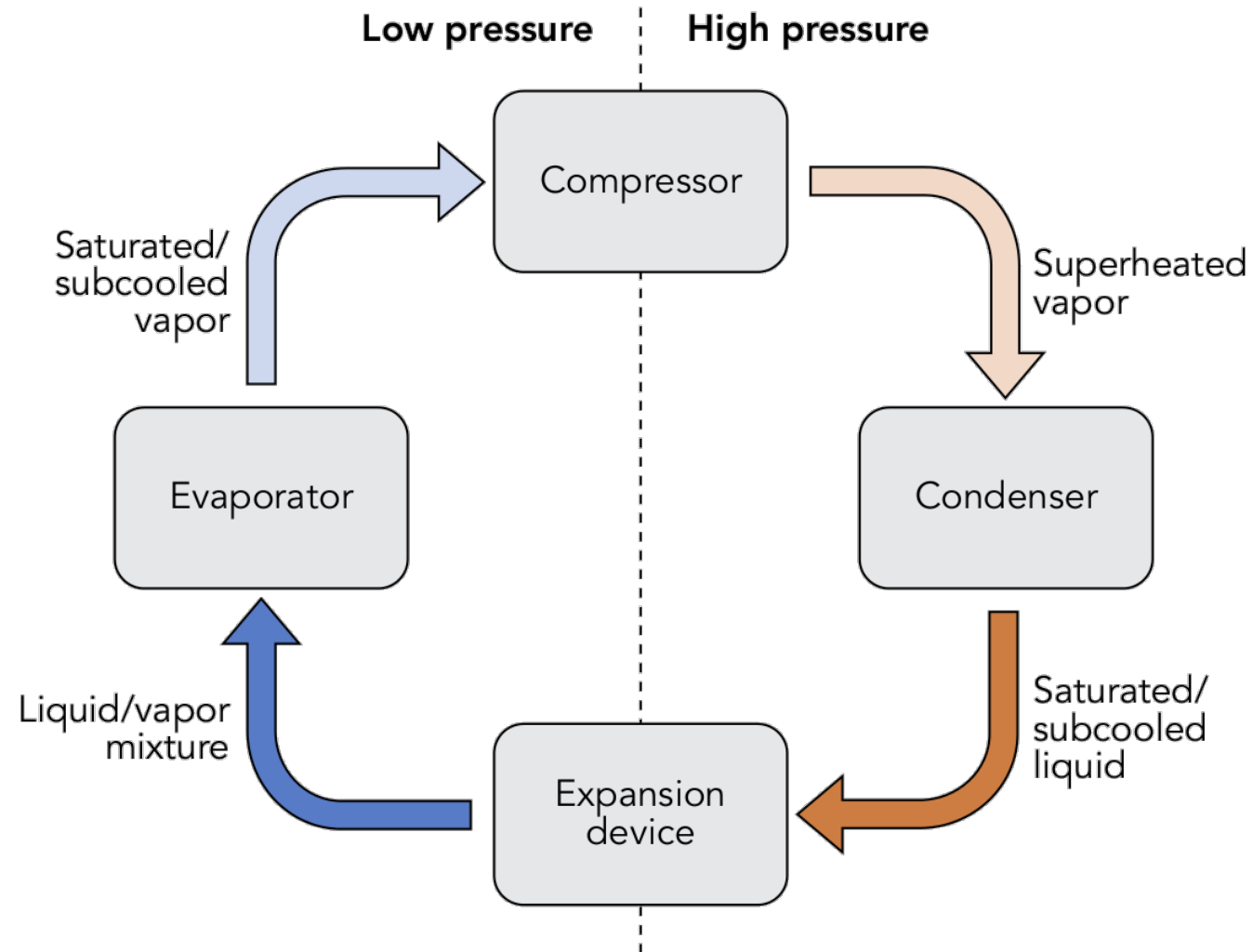


WHAT IS A HEAT PUMP?

It moves heat from one place to another using refrigerant

Just like an air conditioner or refrigerator

REFRIGERANT CYCLE



BENEFITS OF HEAT PUMPS VS ELECTRIC RESISTANCE

Much Higher Efficiency

- Heat Pumps operate at 2-5x the efficiency of electric resistance systems, significantly lowering heating costs

Provide Cooling & Dehumidification

- Heat pump systems can provide heating, cooling, and dehumidification in a single unit.

WHAT IS A DUCTLESS HEAT PUMP?

Any heat pump unit that does not use ductwork



Packaged

OR



Split

BENEFITS OF DUCTLESS HEAT PUMPS

Lower Installation Cost than Ducted HP

- No ductwork and associated installation or design costs
- No HERS duct testing required
- Refrigerant can be factory-charged, so no HERS refrigerant charge testing

High Efficiency



- Ductless heat pumps eliminate duct losses, improving system efficiency
- Inverter-driven systems can vary speed to match load

BENEFITS OF DUCTLESS HEAT PUMPS

Design & Operation Flexibility

- Ductless split systems can be located almost anywhere
- Many systems can have different setpoints per room, or only heat/cool one room at a time if desired.





QUESTION BREAK

DUCTLESS HEAT PUMP SYSTEM TYPES

- ◆ **Packaged Systems vs Split Systems**



DUCTLESS HEAT PUMP SYSTEM TYPES

Packaged Systems



Packaged Terminal
Heat Pump (PTHP)

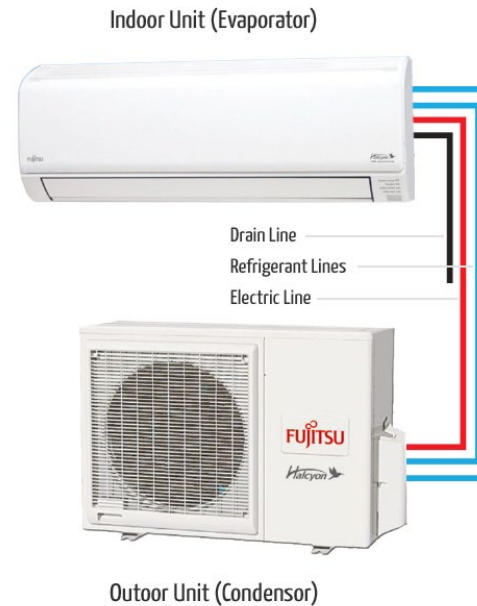


Room Heat Pump / AC

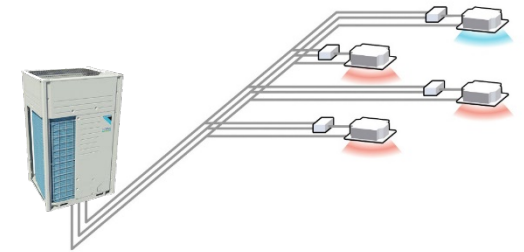


Vertical
Terminal Heat
Pump (VTAC)

Split Systems



Ductless Mini-Split



Variable Refrigerant Flow

PACKAGED SYSTEMS

- ◆ Packaged Terminal Heat Pump (PTHP)
- ◆ Vertical Terminal Heat Pump (VTAC)
- ◆ Room Heat Pump / AC

PACKAGED TERMINAL HEAT PUMP (PTHP)

Components

- ❑ Self-contained through-wall unit



Advantages

- Low first cost
- Room-by-room controls

Drawbacks

- Low efficiency
- Noisier than split systems
- Takes up interior floor space



NOTE: Always look for PTHP, not PTAC. PTACs (and even some PTHPs) may have inefficient electric resistance heat.

VERTICAL TERMINAL HEAT PUMP (VTAC)

Components

- ❑ Self-contained through-wall unit
- ❑ Short duct run

Advantages

- Low first cost
- Room-by-room controls

Drawbacks

- Low efficiency, some duct losses
- Takes up interior floor space



NOTE: Many VTAC systems with heat pump heating also have electric resistance backup heat. System should be sized based on heat pump heating capacity.

ROOM HEAT PUMP / AC

Components

- ❑ Self-contained through-wall unit

Advantages

- Low first cost
- Smaller penetrations than PTHP
- Run on 1Ph/120V power (ideal for retrofit)

Drawbacks

- Newer product to US (limited availability)
- Smaller capacity appropriate to low-load applications



SPLIT SYSTEMS

- ◆ Ductless Mini-Split
- ◆ Variable Refrigerant Flow

DUCTLESS MINI-SPLIT

Components

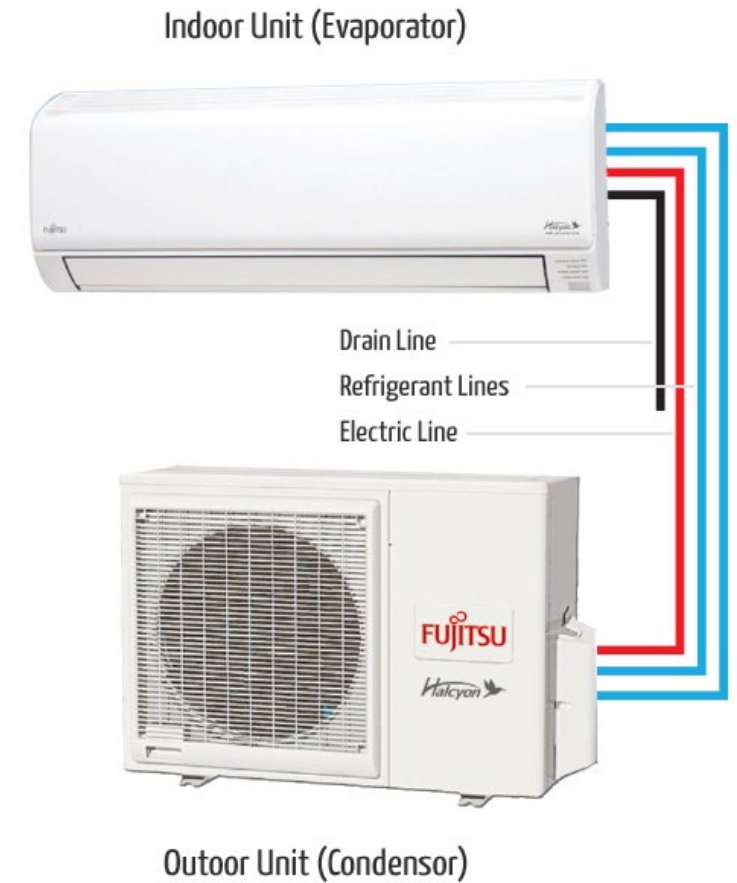
- ❑ Outdoor unit
- ❑ 1-4 indoor units
- ❑ Refrigerant lines

Advantages

- Inverter-driven compressor = very high efficiency
- Room-by-room controls

Drawbacks

- Need to locate outdoor unit for every apartment
- Can cost more for a 2+BR apartment



VARIABLE REFRIGERANT FLOW

Components

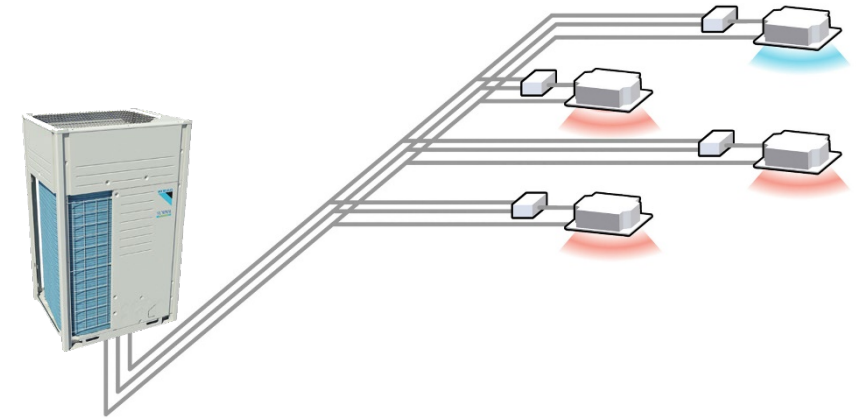
- ❑ Outdoor unit
- ❑ Many (40+) indoor units
- ❑ Refrigerant lines
- ❑ Control boxes



Advantages

- Super efficient, with simultaneous heating + cooling
- Single outdoor unit serves multiple zones

Drawbacks

- Challenging to sub-meter tenants for energy from central system
- Higher first cost







QUESTION BREAK

DHP DECISION MAKING: KEY CONSIDERATIONS

- ◆ **Size and Layout of Property**
 - When does it makes sense to go for a split system vs. packaged system?
- ◆ **System Zoning**
 - More indoor zones = more equipment = more cost?
 - What about transfer fans?
- ◆ **Retrofit vs. New Construction**
 - What systems are better options in retrofit vs new construction?
- ◆ **Maintenance**
 - What are typical maintenance needs?
- ◆ **Cost**
 - (1) first cost, (2) maintenance costs, (3) lifetime energy cost

COMPARISON OF OR-MEP'S MOST POPULAR SYSTEMS

	Electric Baseboards & Wall Heaters	Packaged Terminal Heat Pumps (PTHPs)	Ductless Mini-Split Heat Pumps
Efficiency Rating (Heating & Cooling)	POOR	GOOD	VERY GOOD
Useful Life (Yrs)	20+ yrs	15 yrs	15 yrs
Provides Cooling?	NO	YES	YES
Energy Savings	--	+	++
Install Costs	\$	\$\$	\$\$\$
Maintenance Cost	\$	\$\$	\$\$
Lifetime Energy Cost	\$\$\$	\$\$	\$



QUESTION BREAK

DUCTLESS HEAT PUMP CONTROLS



DUCTLESS HEAT PUMP CONTROLS



Manufacturer

OR



3rd Party

MANUFACTURER CONTROLS

Remote Control

- Included with most ductless mini-split systems
- Good for room-by-room control
- Need to maintain batteries
- Can get lost



Wired Thermostat

- Optional upgrade for some systems
- Can control multiple units
- No batteries to maintain
- Wall-mounted



3RD PARTY CONTROLS

- ◆ Highly customizable
- ◆ User-friendly interface
- ◆ Usually require Wi-Fi
- ◆ Most expensive option



CONTROLS: KEY CONSIDERATIONS

- ◆ **Simpler is usually better**
- ◆ **Hardwired may cost more upfront, but be easier to maintain**
- ◆ **Train residents on control operation**
- ◆ **Provide quick-reference information**

THANK YOU FOR ATTENDING

**Oregon Housing and Community Services
Multifamily Energy Program**

www.oregonmultifamilyenergy.com

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