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Electrifying Building Heating with Heat Pumps in Institutional Facilities

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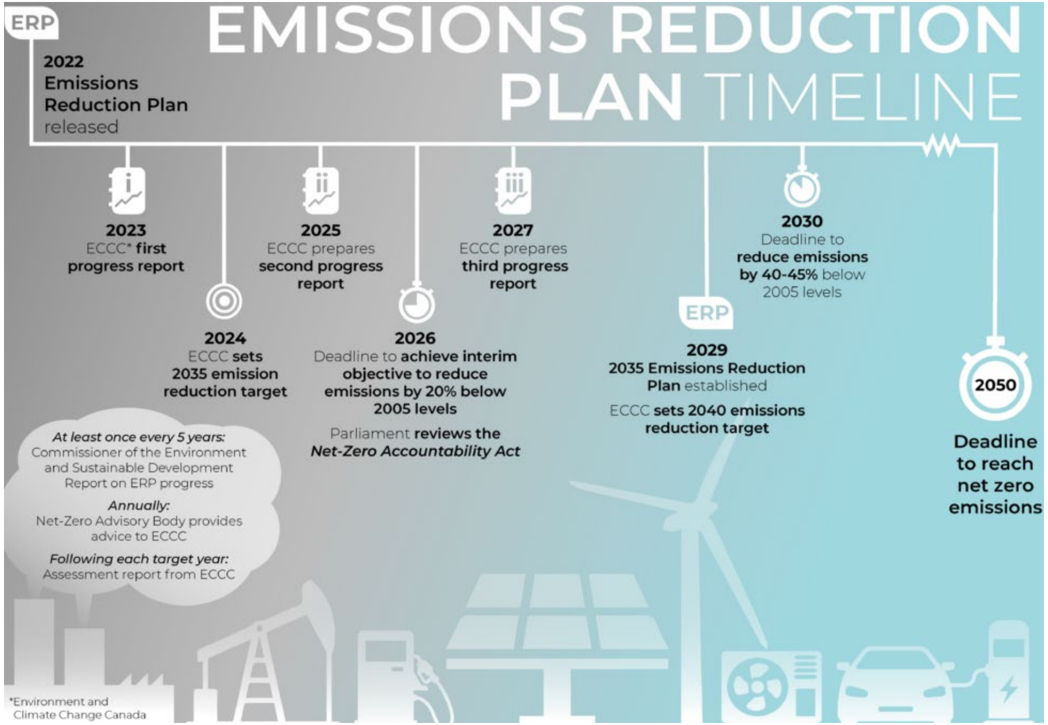
Agenda

- An overview of heat pump technology and its application in the Ontario market
- Typical retrofit opportunities for public sector buildings including offices, social housing, schools, service facilities such as terminals and airports
- Full fuel switch versus hybrid solutions
- Overview of the business case - what variables to factor in life cycle cost analysis using capital repair plans and building condition assessments for planning
- Tips on finding and working with contractors

Energy and greenhouse gas (GHG) emissions in Ontario's buildings sector

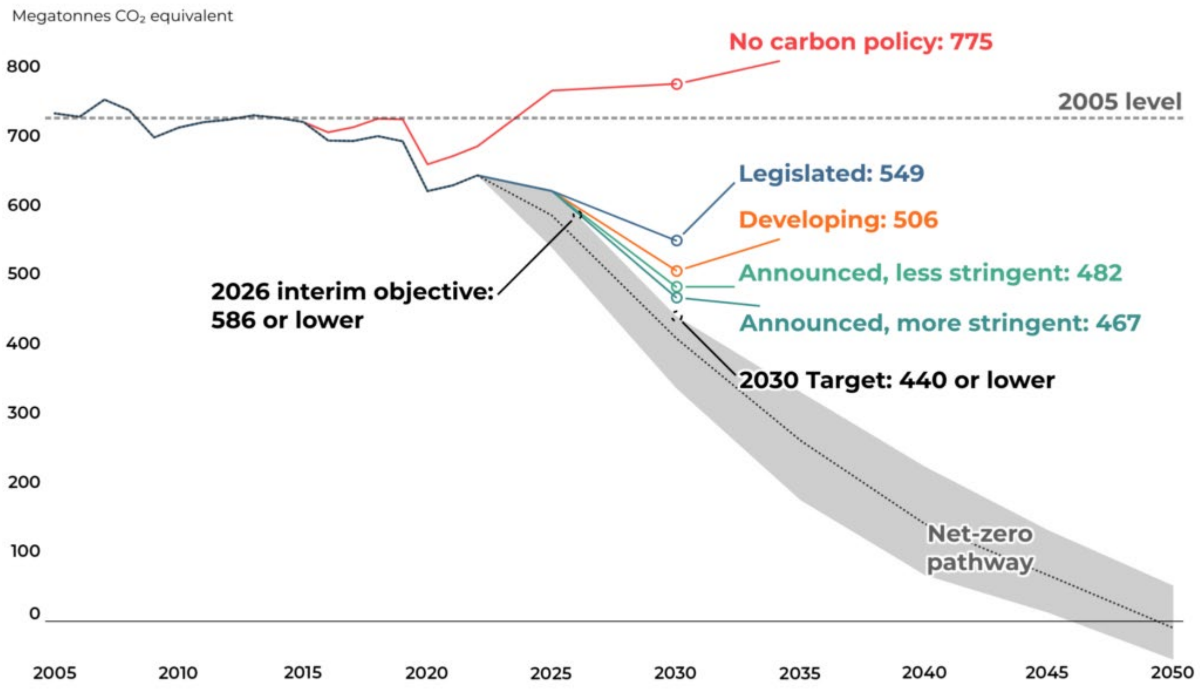
Sources : Canada Energy Regulator, Provincial and Territorial Energy Profiles (2019)

Canada Emissions Reduction Plan



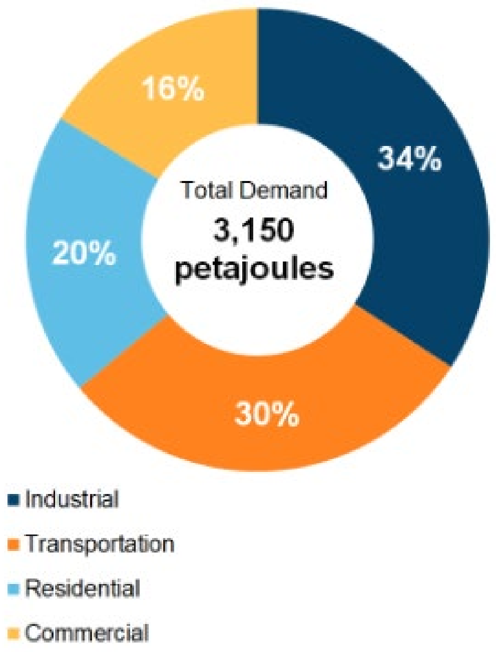
Source: Canada Climate Institute

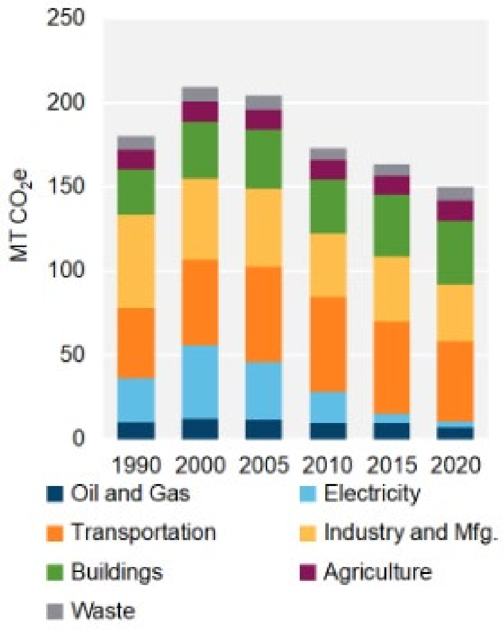
Canada's Emissions Pathway



Sources: Canada Climate Institute

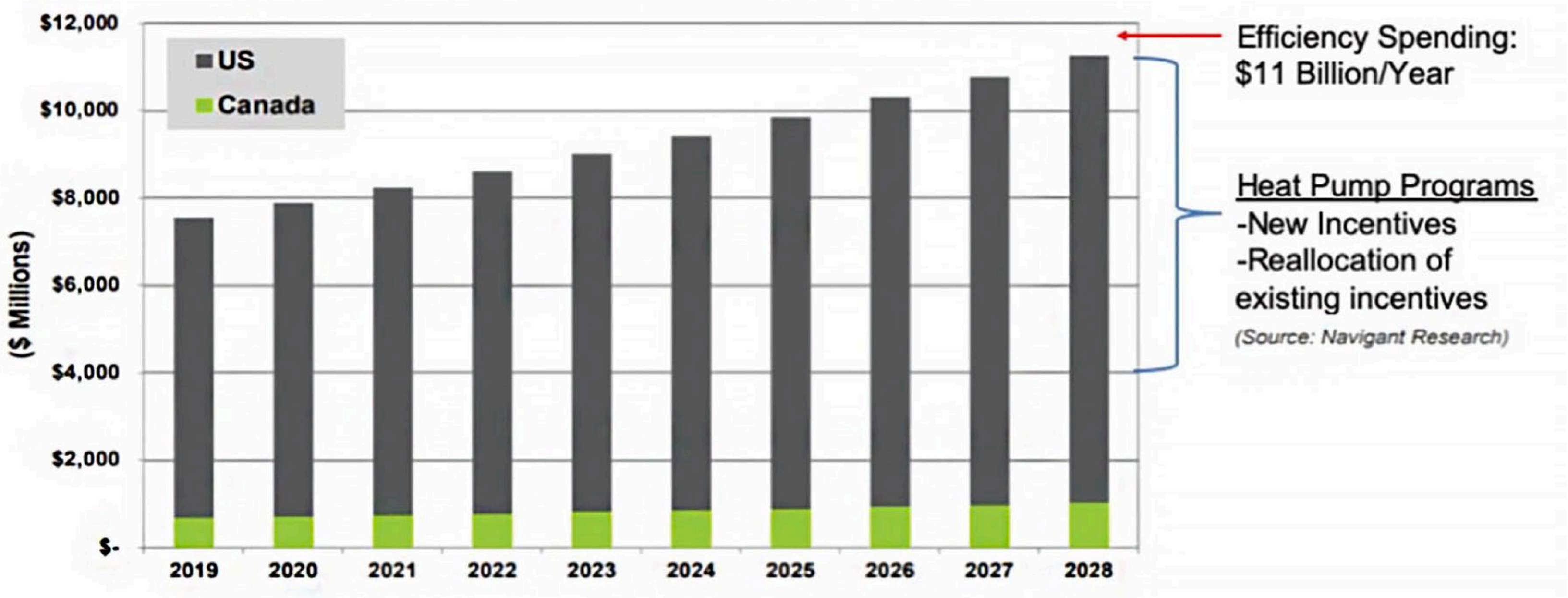
End-use demand & GHG emissions by sector in Ontario





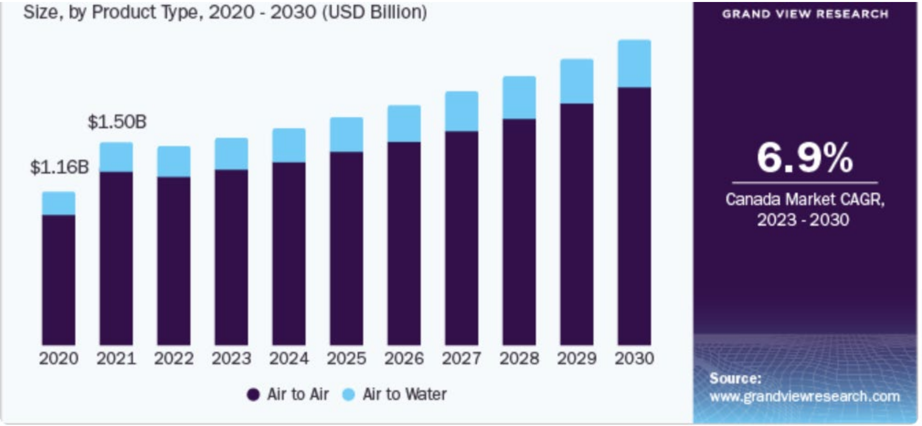
Source: Canada Energy Regulator, Provincial and Territorial Energy Profiles – Ontario

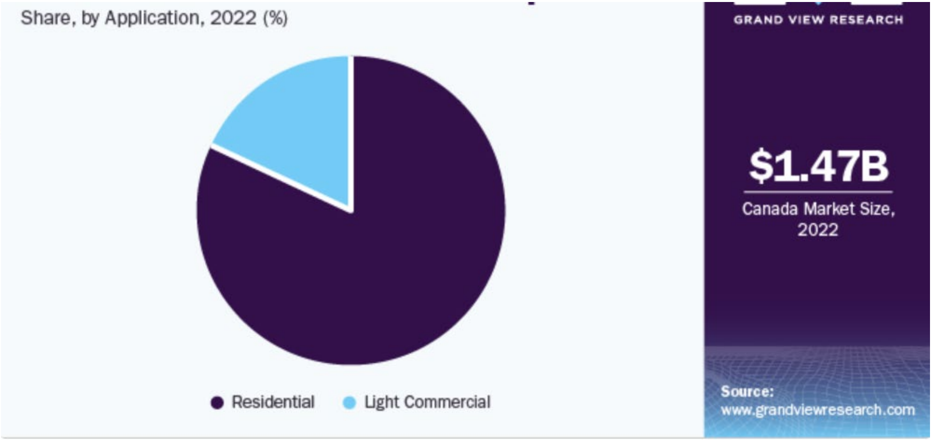
Heat pump spending in North America: 2019-2028



Source: MITSUBISHI, Strategic electrification: satisfy the demand with VRF technology

Canada air source heat pump (ASHP) market





Source: Grandview Research, Canada Outdoor Air Source Heat Pump Market Size, Share & Trends Analysis, 2023

Selling the benefits of heat pumps

Heat pumps offer several advantages over other traditional heating and cooling systems; both energy and non-energy benefits.

- Energy efficiency
- Versatility
- Environmental benefits
- Improved safety
- Improved comfort
- Longer Lifespan
- Zone control

Benefits of moving to heat pumps

Reduced overall energy costs

Reduced greenhouse gas emissions

Improved comfort for occupant

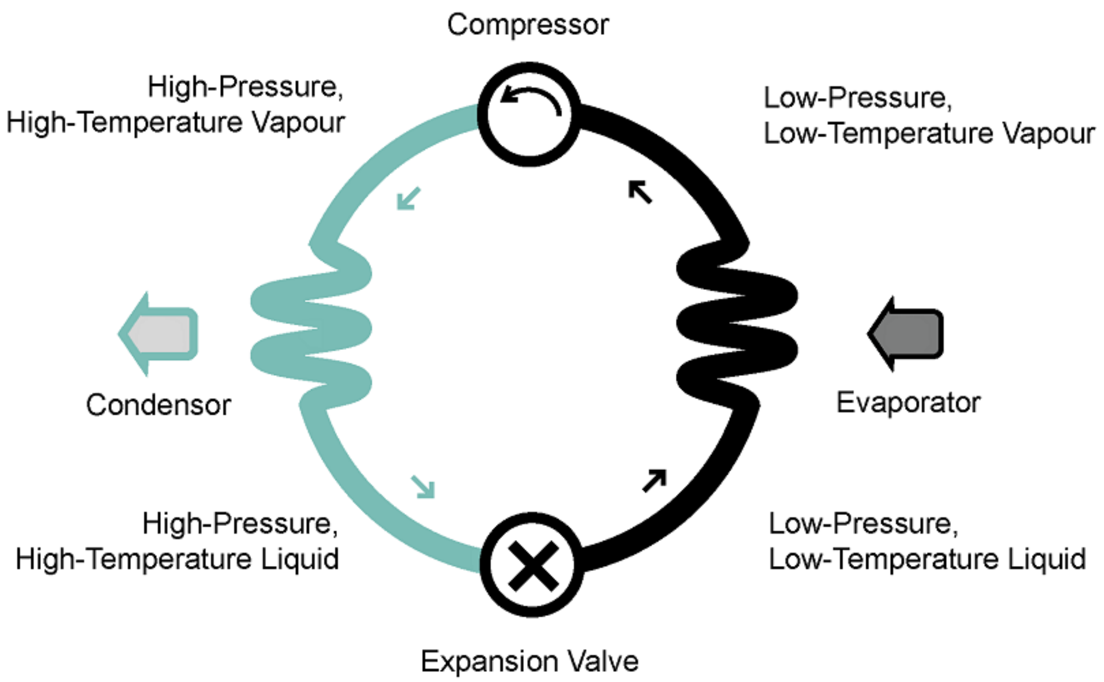
Longer lifespan

Advantages and disadvantages of heat pumps

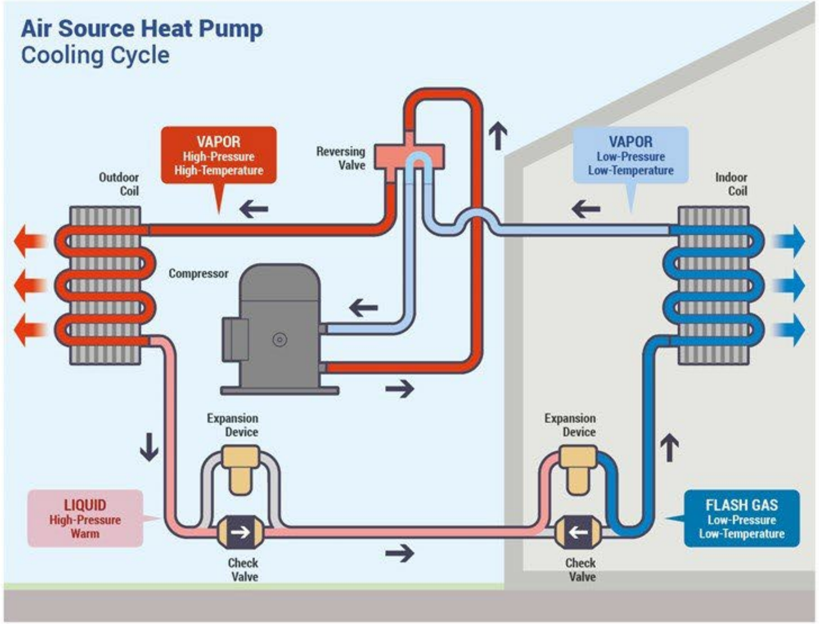
Advantages	Disadvantages
Highest HVAC efficiency	Can be noisy
Increase zone flexibility & control	Low-temperature supply limits
Low operating costs	Lower Output/efficiency at low temperature
Less complex than central plants	Retrofit scenarios are highly variable
Natural gas savings	Electrical service can be limiting

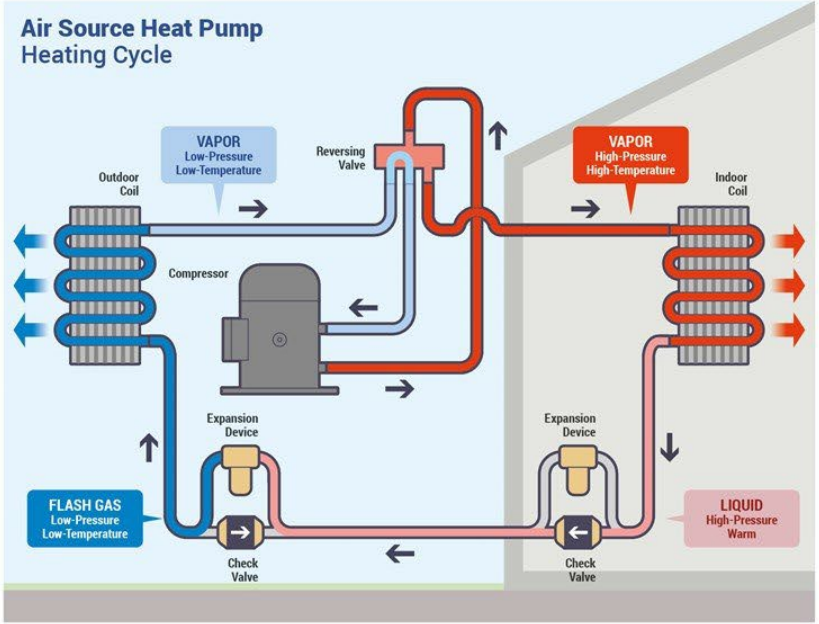
HVAC: Heating, Ventilation, and Air Conditioning

Heat pump components



The refrigeration cycle





Heat pump selection - considerations

- Heat Source: Air or Ground
- Distribution: Air, Water or Refrigerant
- Sizing: Heating and Cooling Load
  - Supplementary Heat Sources
- Efficiency (HSPF)
- Defrost
- Installation
- Maintenance

Common heat pump system applications

Single-split systems

Multi-split systems

Packaged rooftop terminal units (RTUs)

Variable refrigerant flow (VRF)

Hybrid heat pump systems

Single split

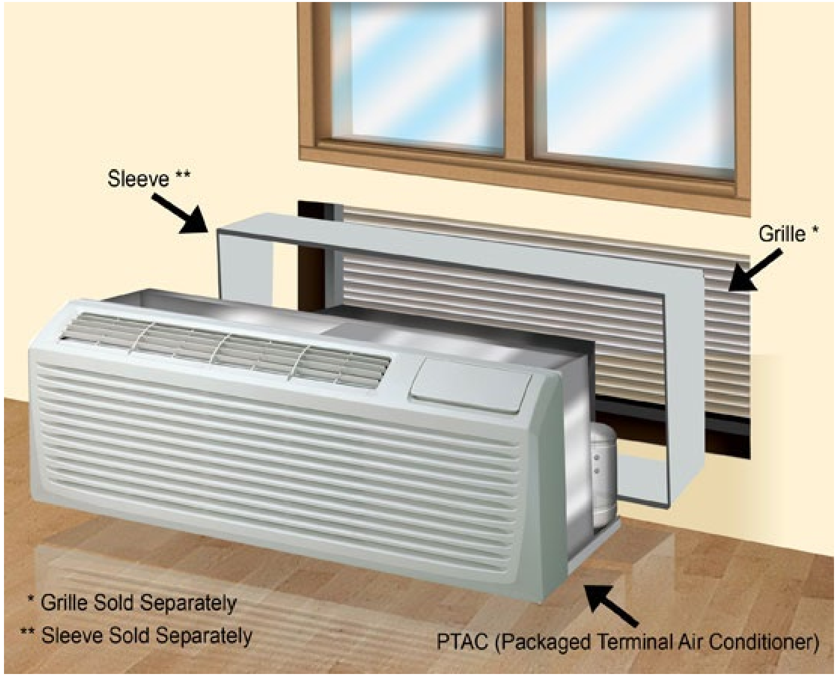
- The single-split systems work perfectly for buildings that contain many small spaces or facilities.
- Most small institutional buildings prefer it due to its affordability and suitability

Multi-split

- Multi-split systems take up less outdoor space and allows for better management over indoor units.
- These systems can connect multiple indoor units to one outdoor unit.

Packaged terminal heat pumps

- Packaged terminal heat pumps are self-contained, through-the-wall units of the kind commonly used in some residential or lodging buildings.

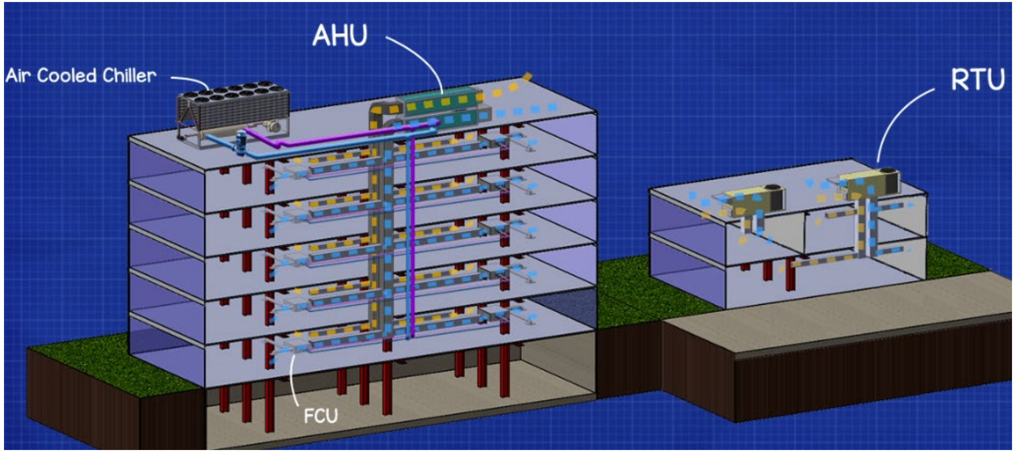


Rooftop units

- A rooftop unit (RTU) used in a variety of building types. RTUs are usually located on the roof of a building, and they work to provide heating, cooling, and ventilation for the interior spaces.

Rooftop units cont'd

- "All-in-one" mechanical unit where heating, cooling, return/exhaust, outside air control, humidification, energy recovery and filtration occur
- Heating sources: hydronic, steam, heat pump, electric, fossil fuels
- Cooling sources: hydronic, electric-direct expansion (DX), electric-heat pump (HP)
- Range from 1.5-100 tons
- Constant air volume (CAV) or
- variable air volume (VAV)

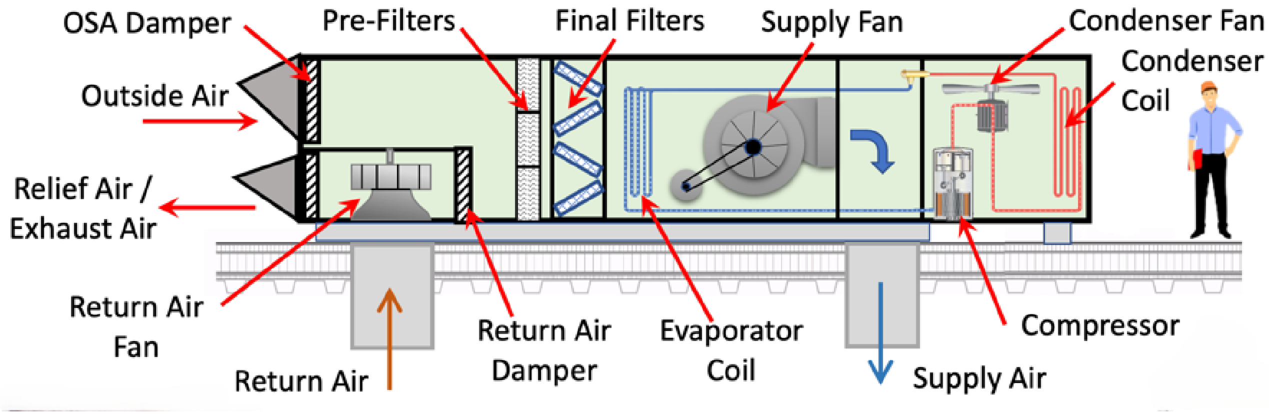


AHU: Air Handling Unit
RTU: Rooftop Unit
FCU: Fan Coil Unit

Rooftop units with heat pump

CAV with constant airflow (CFM):

- Simple control
- Higher operational costs
- Unit cycles frequently
- Usually single zone units



Source: MEPAcademy.com

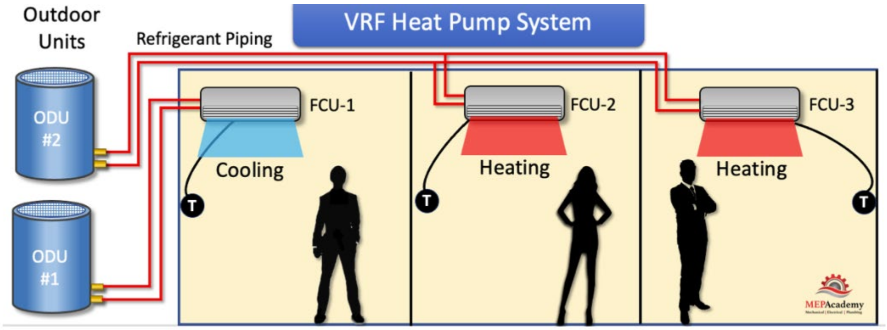
Variable refrigerant flow (VRF) heat pump

- Variable refrigerant flow (VRF) zoning systems
- Most popular technology for decarbonizing heating and cooling
- Lower carbon footprints
- Benefit: strategic electrification
- Reducing overall costs for building owners
- VRF heat pump systems are used for single zone applications or multi-zone applications where each zone has the same thermal profile.

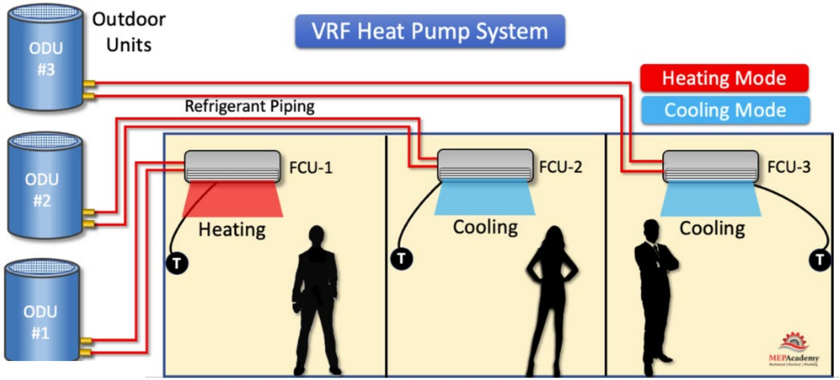
REDUCED GHG EMISSIONS WITH VRF SYSTEMS

Source: Northeast Energy Efficiency Partnerships Variable Refrigerant Flow (VRF) Market Strategies Report (September 2019)

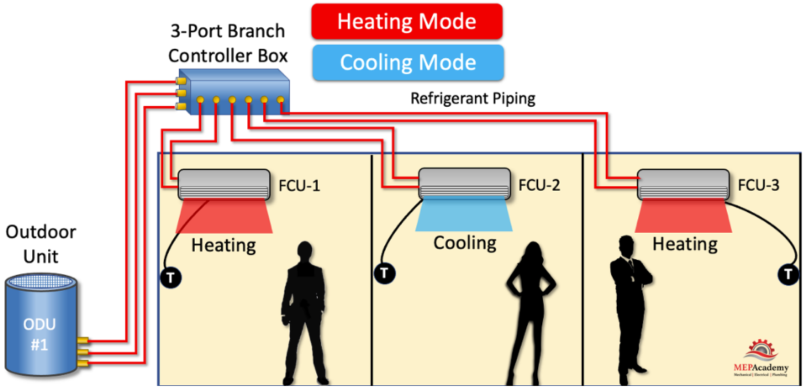
VRF Heat Recovery vs VRF Heat Pump



VRF Heat Pumps with Consolidated Zon



ndividual Zones



Source: MEPAcademy

VRF Heat Recovery vs VRF Heat Pump (Heat Recovery System with 3-Port Branch Controller)

Hydronic Heat Pump

Hydronic systems use water or water-based solutions to move thermal energy from where it is produced to where it is needed.

Comparing heat pump systems

Single mini- split	Multi split	Rooftop unit (RTU)	Variable refrigerant flow (VRF)	Hybrid heat pump
Single connection: one indoor unit connected to one outdoor unit.	Customized temperature zones	Centralized and suitable for medium to large commercial spaces.	Simultaneously	Suitable for boiler and chiller retrofits
Energy-efficient for individual rooms.	Takes up less outdoor space	Accessibility of the roof simplifies maintenance and repairs.	Adjust to the actual heating or cooling needs of different zones Improving energy efficiency due to individual zone control	Combines the efficiency of a heat pump with existing hydronic distribution systems and auxiliary equipment such as fan coil units.

Operating parameters

Work done by a heat pump requires that:

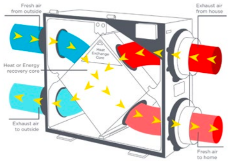
- The indoor coil must be larger
- Indoor air volume (cfm) will typically be greater
- Greater care must be taken to manage flood back
- Defrost controls are used for the heating cycle
- Supplemental heat may be required

Energy Efficiency Regulations

Product Type	Size	Minimum efficiency requirement
Single package vertical heat pump (SPVHP)	< 19 kW	EER = ≥ 11.0 and COP = ≥ 3.3
	≥ 19 kW and < 39.5 kW	EER = ≥ 10.0 and COP = ≥ 3.0
	≥ 39.5 kW and < 70 kW	EER = ≥ 10.0 and COP = ≥ 3.0
Large heat pumps	cooling capacity of ≥ 40 kW and < 70 kW	EER ≥ 10.6 and COP ≥ 2.05 (at -8.3°C)
	cooling capacity of ≥ 70 kW and < 223 kW	EER ≥ 9.5 and COP ≥ 2.05 (at -8.3°C)
Single phase single package central heat pumps	Not space constrained	SEER 2 ≥ 13.4 and HSPF 2 (Region V) ≥ 5.4
Three-phase single package central heat pumps	Not space constrained	SEER ≥ 12.0 HSPF (Region V) ≥ 6.4

Source: ASHRAE Handbook

Energy hierarchy



Study: Audit and Analysis

Avoid and Reduce Waste: Energy Conservation

Reuse/Recover Waste Energy

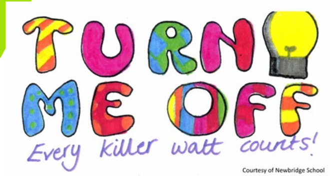
Improve:

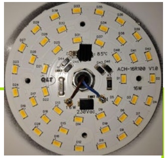
- Energy Efficiency
- Energy Management
- Demand Management

Onsite Switch:

- Renewable Energy Sources
- Low Emission Energy Sources

Offset





Motivations and barriers for building owners

Motivations

1. Energy efficiency
2. Environmental sustainability
3. Government incentives
4. Cost savings
5. Energy independence
6. Long-term investment
7. Reduced maintenance
8. Increased asset values

Barriers

1. High initial costs
2. Lack of awareness
3. Perceived reliability issues
4. Technical challenges
5. Space requirements
6. Access to financing
7. Split incentives

Heat pump sizing

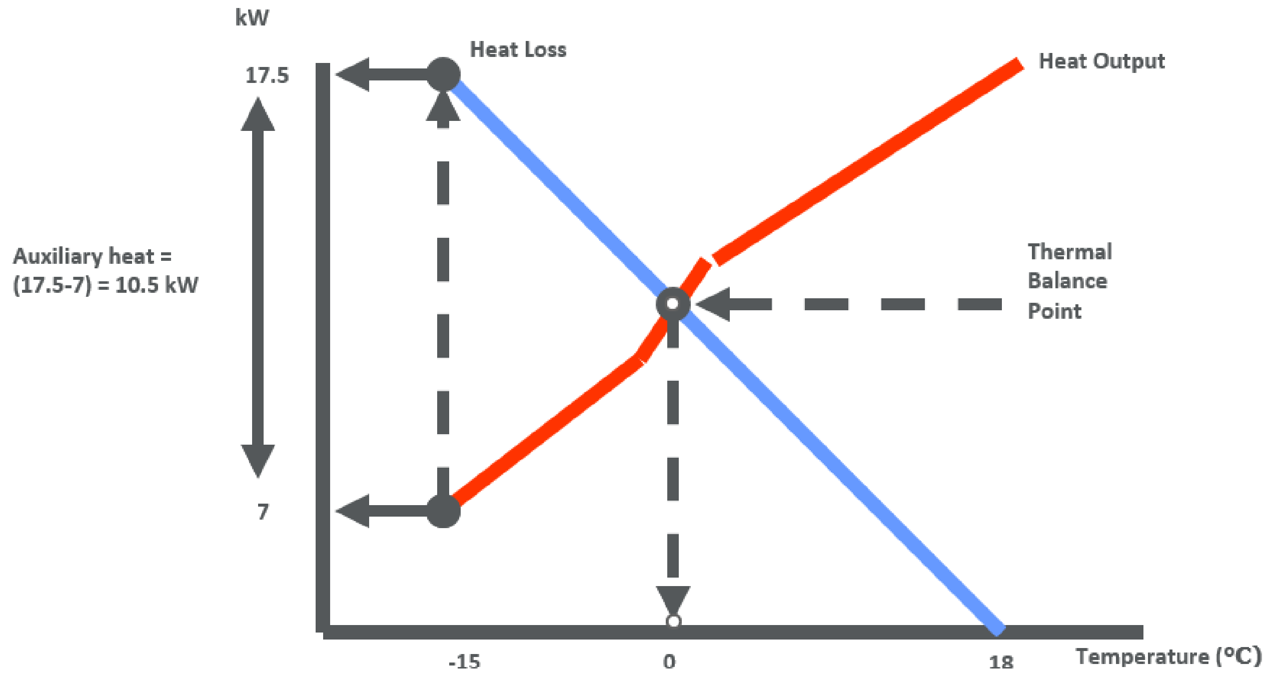
When it comes to sizing a heat pump, one of the most critical concepts is that of the **thermal balance point**.

Thermal balance point is that condition where the heating output of the heat pump is equal to the heat loss rate of the home.

The thermal balance point can be plotted on a graph.

Supplemental heat is needed for periods when the outdoor air temperature is below the thermal balance point.

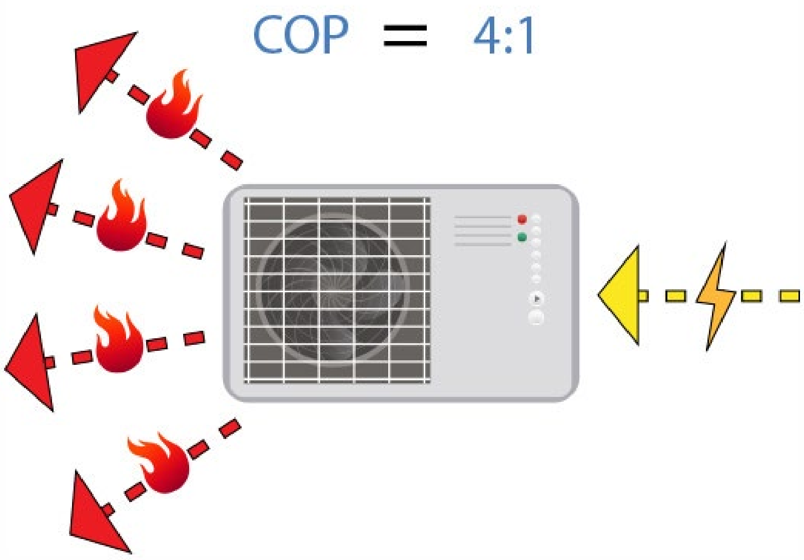
Plotting the Balance Point



Coefficient of performance (COP)

$$COP = \frac{heat\ transferred\ by\ the\ heat\ pump\ (kWh\ or\ kW)}{energy\ supplied\ to\ the\ heat\ pump\ (kWh\ or\ kW)}$$

Coefficient of performance is the ratio of the heat delivered by the heat pump to the energy input to the heat pump.
COP is published by Air Conditioning, Heating, and Refrigeration Institute (AHRI).

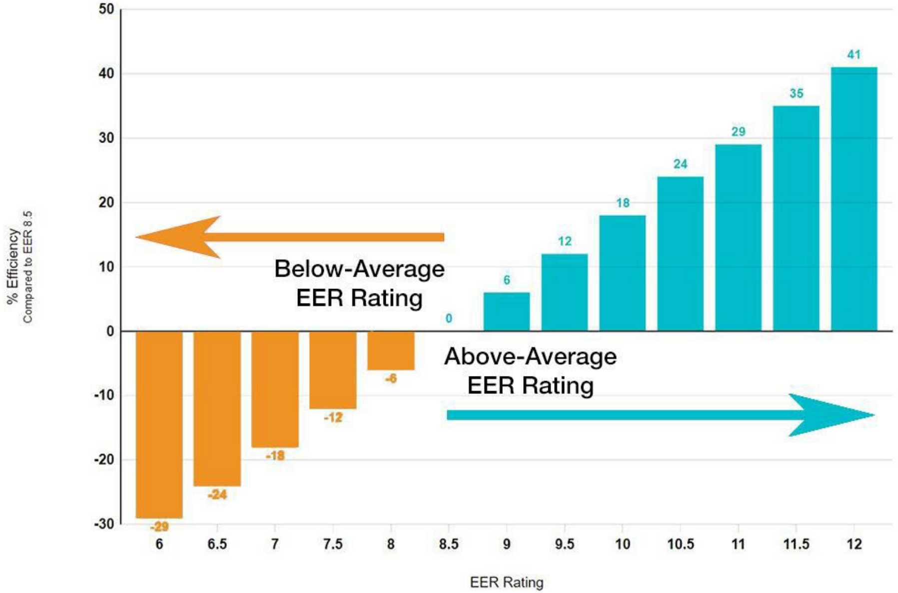


Energy efficiency ratio (EER)

$$\text{EER} = \frac{\text{Cooling Capacity (Btu)}}{\text{Electrical Input (W)}}$$

The **EER** of a system is a ratio of the cooling output over the electrical power input.

Like COP, also a steady state measurement at a fixed operating condition.

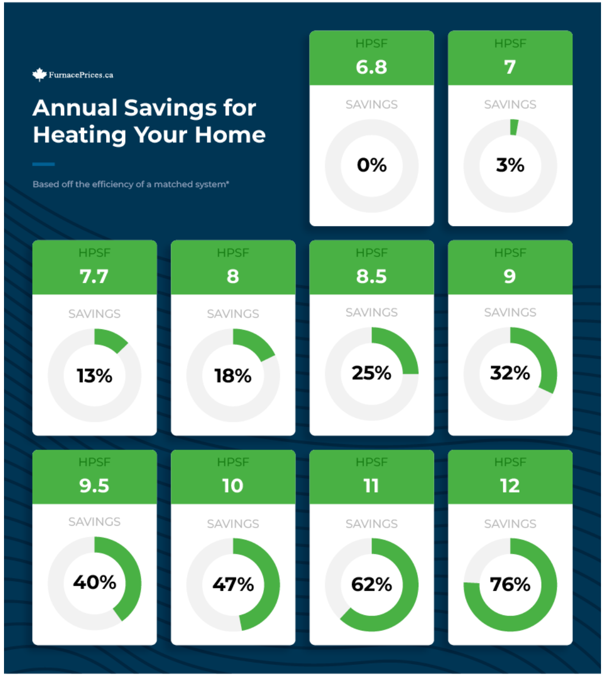


Heating seasonal performance factor (HSPF)

$$\text{HSPF} = \frac{\text{Total Heating Output (Btu)}}{\text{Total Electrical Input (Wh)}}$$

The **HSPF** measures a heat pump's heating efficiency over an entire heating season.

HSPF is calculated by dividing the total heating output over the season by the total energy input for the same period.

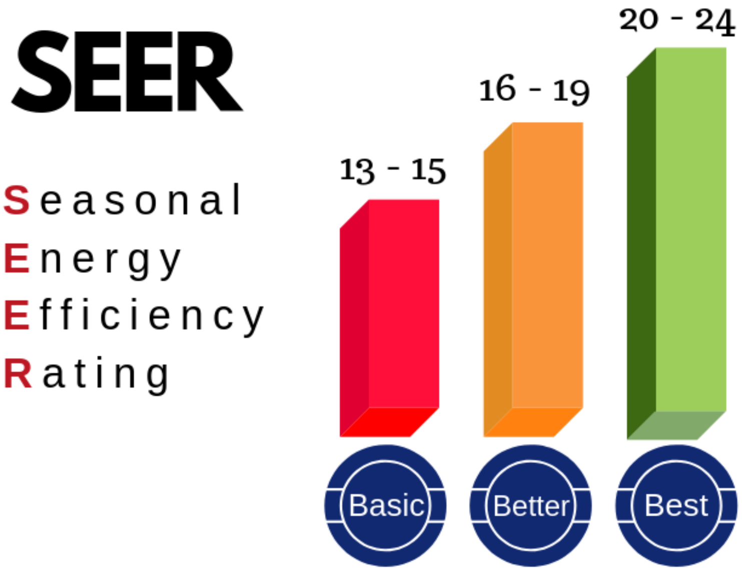


Seasonal Energy Efficiency Rating (SEER)

$$\textbf{SEER} = \frac{\textbf{Total Cooling Output (Btu)}}{\textbf{Total Electrical Input (Wh)}}$$

The **SEER** measures a heat pump's cooling efficiency over an entire cooling season.

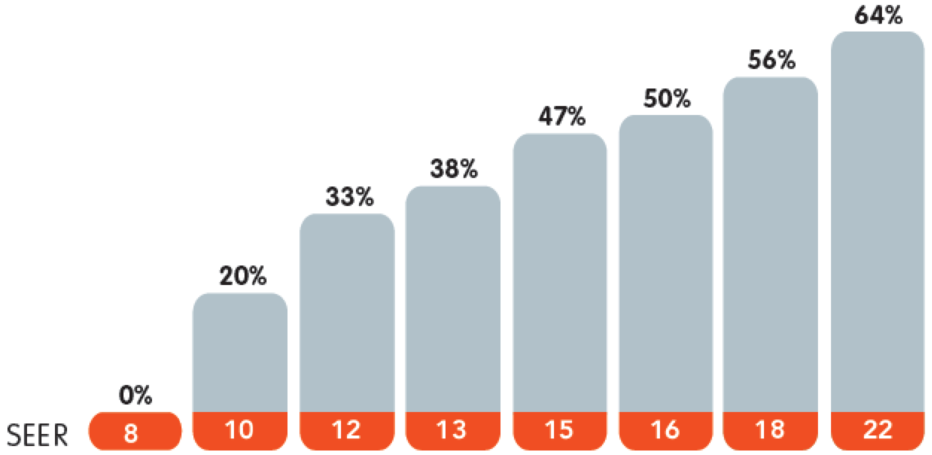
SEER is calculated by dividing the total cooling output over the season by the total energy input for the same period.



Cost Savings Based on SEER

Annual saving for cooling

Like kilometer per litre in a car, the higher the system SEER rating, the more comfort you will get from each energy dollar.



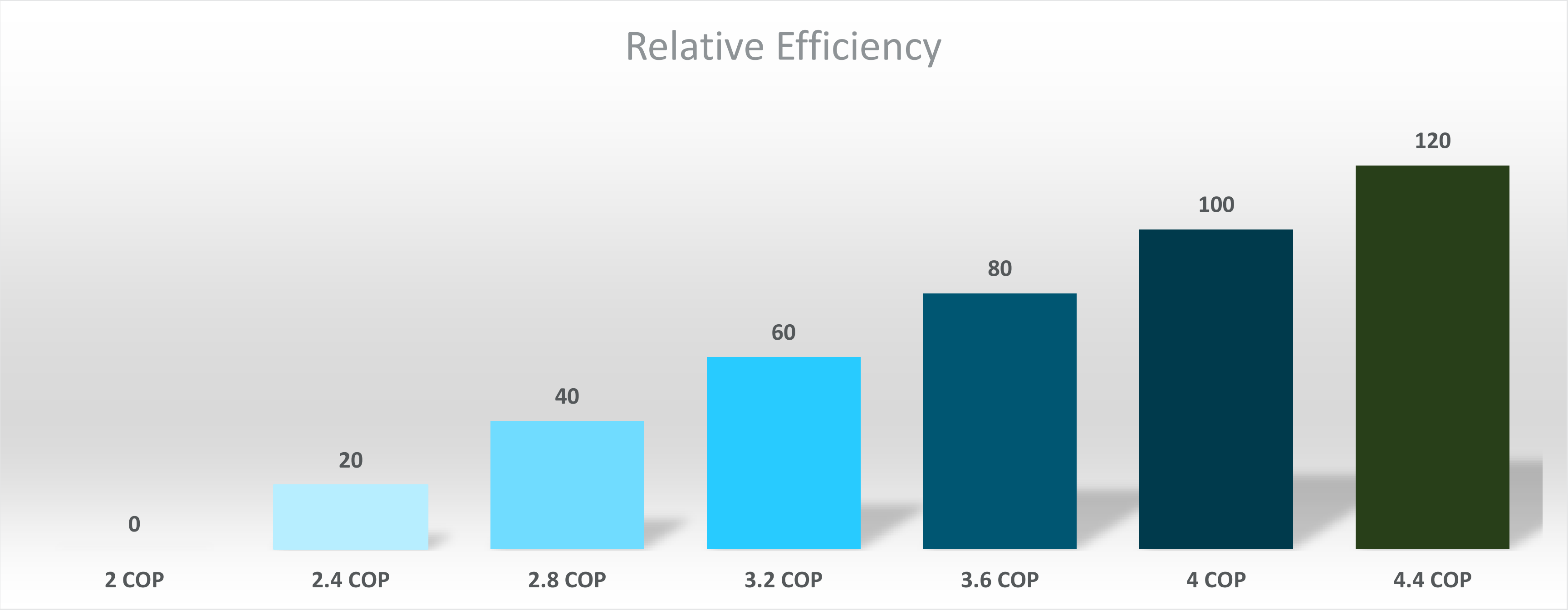
SEER and HSPF ratings in HVAC: Why they matter?

Efficiency

Comfort

Performance

How much more efficient are high COP heat pumps?



Source: https://www.ecohome.net/guides/1495/heat-pump-efficiency-explained-the-definitive-guide-to-seer-vs-hspf-vs-s-cop-heat-pump-ratings/

Selected Codes and Standards Published

Heat Pumps	Commercial Systems Overview	ACCA	ACCA Manual CS-1993
	Geothermal Heat Pump Training Certification Program	ACCA	ACCA Training Manual
	Heat Pumps Systems, Principles and Applications, 2nd ed.	ACCA	ACCA Manual H-1984
	Residential Equipment Selection, 2nd ed.	ACCA	ANSI/ACCA 3 Manual S-2014
	Industrial Ventilation: A Manual of Recommended Practice, 29th ed. (2016)	ACGIH	ACGIH
	Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment	AHRI	ANSI/AHRI 210/240-2017
	Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment	AHRI	ANSI/AHRI 340/360-2015
	Single Package Vertical Air-Conditioner and Heat Humps	AHRI	ANSI/AHRI 390-2003
	Direct Geoexchange Heat Pumps	AHRI	ANSI/AHRI 870-2016
	Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment	AHRI	ANSI/AHRI 1230-2014
	Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment	ASHRAE	ANSI/ASHRAE 37-2009
	Methods of Testing for Rating Seasonal Efficiency of Unitary Air-Conditioners and Heat Pumps	ASHRAE	ANSI/ASHRAE 116-2010
	Method of Test for Direct-Expansion Ground Source Heat Pumps	ASHRAE	ANSI/ASHRAE 194-2017
	Method of Testing for Rating of Multi-Purpose Heat Pumps for Residential Space Conditioning and Water Heating	ASHRAE	ANSI/ASHRAE 206-2013
	Performance Standard for Split-System and Single-Package Central Air Conditioners and Heat Pumps	CSA	CAN/CSA C656-14
	Installation of Air-Source Heat Pumps and Air Conditioners	CSA	CAN/CSA C273.5-11 (R2015)
	Performance of Direct-Expansion (DX) Ground-Source Heat Pumps	CSA	C748-13
	Water-Source Heat Pumps—Testing and Rating for Performance, Part 1: Water-to-Air and Brine-to-Air Heat Pumps	CSA	CAN/CSA C13256-1-01 (R2016)
	Part 2: Water-to-Water and Brine-to-Water Heat Pumps	CSA	CAN/CSA C13256-2-01 (R2015)
	Heating and Cooling Equipment (2011)	UL/CSA	ANSI/UL 1995/C22.2 No. 236-15

Applying Standard 15 when designing a VRV System

First Step
Preliminary layout of the system

↓

Second Step
Determine the amount of refrigerant

↓

Third Step
Verify that the *VRV* system layout complies with Standard 15 requirements

↓

Fourth Step
Actions if a room is too small

Second Step
Determine the amount of refrigerant

Third Step
Verify that the *VRV* system layout complies with Standard 15 requirements

Fourth Step
Actions if a room is too small

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First Step
Preliminary layout of the system

VRV : Variable Refrigerant Volume

Source; www.ashrae.org 2010 ANSI/ASHRAE Standard 15

ASHRAE HVAC Applications Public Buildings

Office buildings HVAC equipment

Office HVAC systems generally range from small, unitary, decentralized cooling and heating up to large systems comprising central plants (chillers, cooling towers, boilers, etc.) and large air-handling systems.

HVAC systems such as water-source heat pump, and packaged terminal heat pump (PTHPs) with (VAV) systems

- **High-rise office buildings**
- Perimeter fan-powered VAV terminals, induction, or fan-coil systems
- **In small to medium-sized office buildings**, air-source heat pumps or mini-split systems heat pump such as variable refrigerant flow (VRF) may be chosen

Source: ASHRAE HVAC Applications 2019, COMMERCIAL AND PUBLIC BUILDINGS

Applicability of systems to typical office buildings

	Cooling/Heating Systems							Heating Only	
	Centralized			Decentralized					
Building Area/Stories	SZ[a]	VAV/ Reheat	Fan Coil (Two-and Four-Pipe)	PSZ/SZ* Split/ VRF	PVAV/ Reheat	WSHP	Geothermal Heat Pump and Hybrid Geothermal Heat Pump	Perimeter Baseboard/ Radiators	Unit Heaters
<25,000 ft^2, one to three stories				X		X	X	X	Special areas
25,000 to 150,000 ft^2, one to five stories	X	X	X	X	X	X	X	X	Special areas
>150,000 ft^2, low rise and high rise	X	X	X			X	X	X	Special areas

*SZ = single zone
VAV = variable-air-volume
PSZ = packaged single zone
PVAV = packaged variable-air-volume
WSHP = water-source heat pump
VRF = variable refrigerant flow

Typical decentralized systems include the following:

- Water-source heat pumps
- Geothermal heat pumps
- Hybrid geothermal heat pumps
- Packaged single-zone and variable-volume units
- Light commercial split systems
- Minisplit and variable refrigerant flow (VRF) units

Source: ASHRAE HVAC Applications 2019, COMMERCIAL AND PUBLIC BUILDINGS

Transportation centers

Transit facilities (rail transit, bus terminals, airports and cruise terminals).

Design Concepts

- Heating and cooling centralized for each building in a complex
- All-air system with zone control in large area such as transportation
- Hydronic perimeter radiant ceiling panels suited high-load areas.

Secondary systems such as variable air volume (VAV) are common in airports. Small, single-zone areas can be treated by constant-volume systems or fan coils.

Primary Systems

- Central cooling and heating plant
- Decentralized systems:
    - Water-source heat pumps (WSHP)
    - Light commercial split systems
    - Mini-split and variable-refrigerant-flow (VRF) units

Case 1: system selection - school (K-12)

Rooftop Units
- Low first cost
- Lower product life
- Temperature control issues

Chiller/Boiler
- Efficiency
- High first cost
- Occupy large footprint

Unit Ventilators
- Direct replacement generally
- High cost
- Occupy floor space

VRF System
- Retrofit and new design
- Efficient
- Great temperature control

Case 1: System comparison - school (K-12)

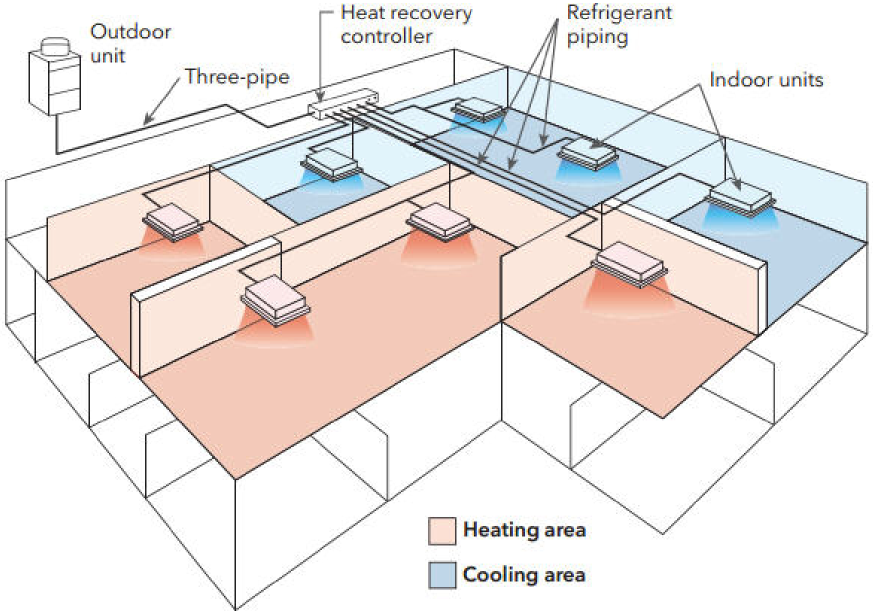
What are some important factors to consider?

- Different level of occupancy
- Different requirement for different spaces
- Common system within school boards
- Limited funding
- Lifecycle costs
- Limited construction schedules

Case 1: Energy efficient HVAC systems for school

Heating and Cooling

- Rooftop Units Heat pump
- VRF Hydronic System
- Ground Source Heat Pump

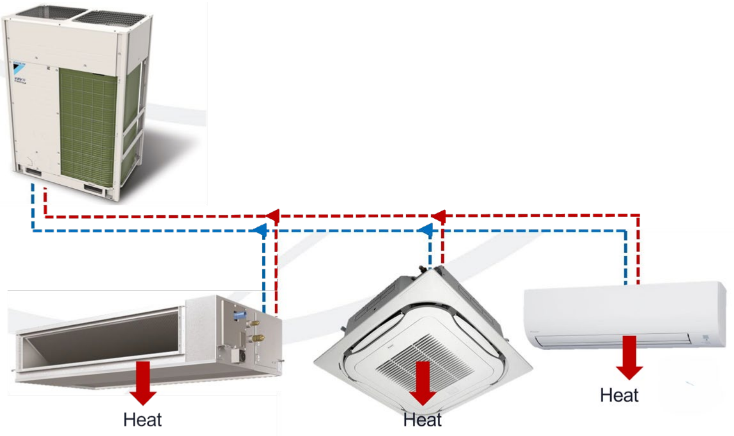


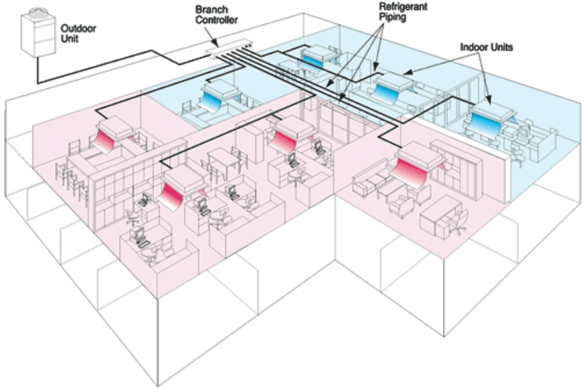
Case 1: Energy-efficient HVAC systems for schools

System	Pros	Cons
Heat pump with Rooftop Units	• Easy to install on existing rooftops, minimizing disruption to the school. • Can provide both heating and cooling. • Rooftop units are typically modular and can be easily expanded or replaced as needed. • Can be cost-effective compared to other systems for school applications leveraging existing infrastructure.	• May require regular maintenance and cleaning of rooftop units. • Efficiency can be affected by rooftop conditions such as shading and exposure to weather elements. • May not be as energy-efficient as other systems, especially in extreme temperatures.
VRF/VRV	• Highly efficient and energy-saving. • Can serve multiple zones with varying heating and cooling requirements. • Individual control over the temperature in each zone.	• Higher initial investment. • Requires professional installation and maintenance. • Complex systems with more components, can increase the likelihood of breakdowns.

Case 1: Heat pump VRF systems

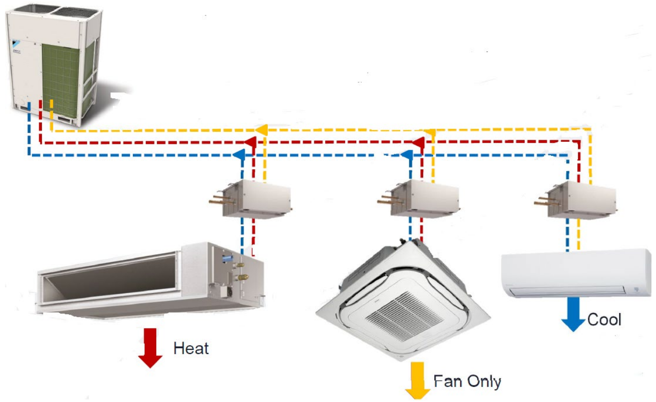
- All indoor units are in either heating or cooling
- Automatic switchover within minutes, year round
- Water cooled or air cooled
- Specific models with heating down to -30°C (-22 °F)
- Condensing unit sizes up to 38-tons
- Require a make-up air to DOAS system
- Smaller pipes for installation

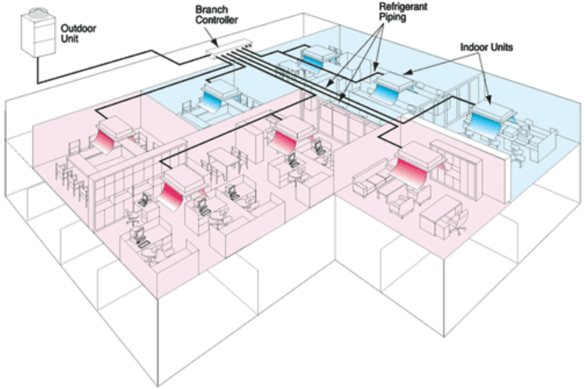




Case 1: Heat recovery VRF systems

- Simultaneous heating and cooling
- Liquid line, hot gas line, suction line
- Air cooled or water cooled
- Specific models with heating down to -30°C (-22 °F)
- Condensing unit sizes up to 38-tons
- Require a make-up air to DOAS system
- Smaller pipes for installation

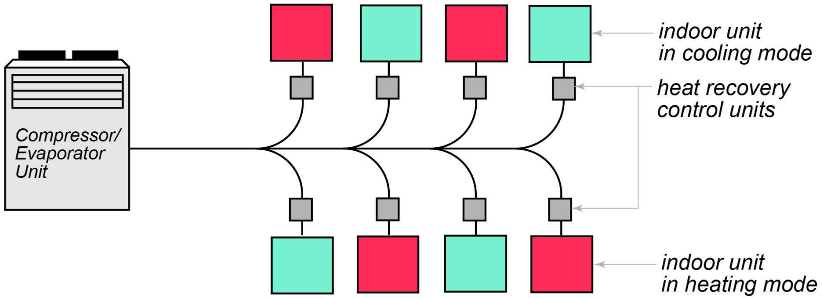




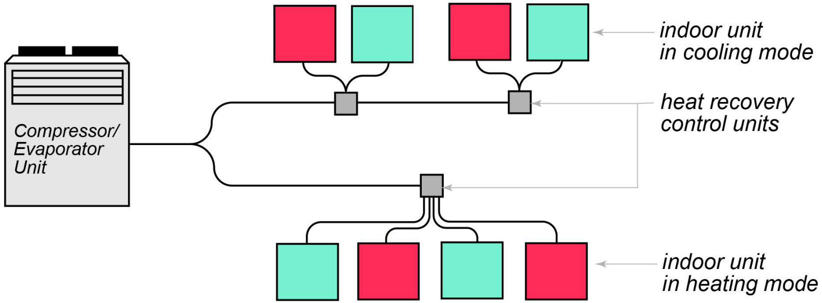
Case 1: ASHRAE guide for schools

Water- and Ground-Source Heat Pumps with DOAS	
GSHP cooling efficiency[1]	18.0 EER at 59°F entering water
GSHP heating efficiency[1]	3.7 COP at 50°F entering water
WSHP cooling efficiency[1]	14.0 EER at 86°F entering water
WSHP heating efficiency[1]	4.6 COP at 68°F at entering water
Compressor capacity control	Multistage or VSD compressor
Water circulation pumps	VSD and National Electrical Manufacturers Association premium efficiency
Cooling tower/fluid cooler[2]	VSD on fans
Boiler efficiency[2]	Condensing boiler, 92% efficiency
VRF Heat Pump with DOAS	
Air-cooled VRF multisplit with heat recovery (cooling mode)[3]	Comply or exceed ASHRAE 189.1-2017 <65,000 Btu/h; 15.0 SEER; 12.5 EER ≥65,000 Btu/h and <135,000 Btu/h; 11.1 EER; 14.4 IEER ≥135,000 Btu/h and <240,000 Btu/h; 10.7 EER; 13.7 IEER <240,000 Btu/h; 10.1 EER; 12.5 IEER
Air-cooled VRF multisplit with heat recovery (heating mode)[3]	Comply or exceed ASHRAE 189.1-2017 <65,000 Btu/h; 8.5 HSPF ≥65,000 Btu/h and <135,000 Btu/h; 3.4 COP ≥135,000 Btu/h; 3.2 COP
Water-cooled VRF multisplit with heat recovery (cooling mode)[2]	Comply or exceed ASHRAE 189.1-2017 <65,000 Btu/h; 13.8 EER; 15.8 IEER ≥65,000 Btu/h and <135,000 Btu/h; 14.0 EER; 16.0 IEER ≥135,000 Btu/h and <240,000 Btu/h; 13.8 EER; 15.8 IEER <240,000 Btu/h; 11.2 EER; 13.8 IEER
Water-cooled VRF multisplit with heat recovery (heating mode)[2]	Comply or exceed ASHRAE 189.1-2017 <135,000 Btu/h; 4.6 COP ≥135,000 Btu/h 4.2 COP
Compressor capacity control	Multistage or VSD compressor

A. Parallel Configuration



B. Hybrid Series / Parallel Configuration



Case 1: Ground source heat pumps (GSHP) in schools

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Case 2: Community housing buildings

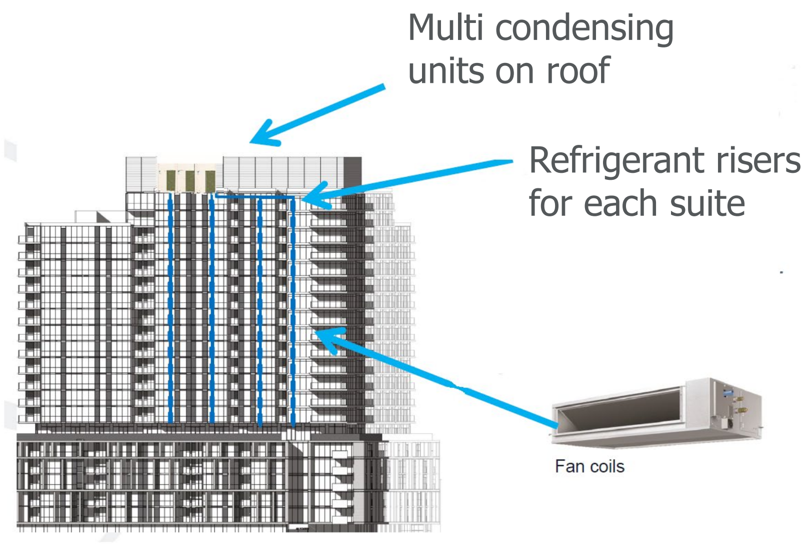
- **What type of system should we choose?**
- Large scale VRF
- Vertical stacked heat pumps
- Vertical stacked fan coil units

What are some important factors to consider?

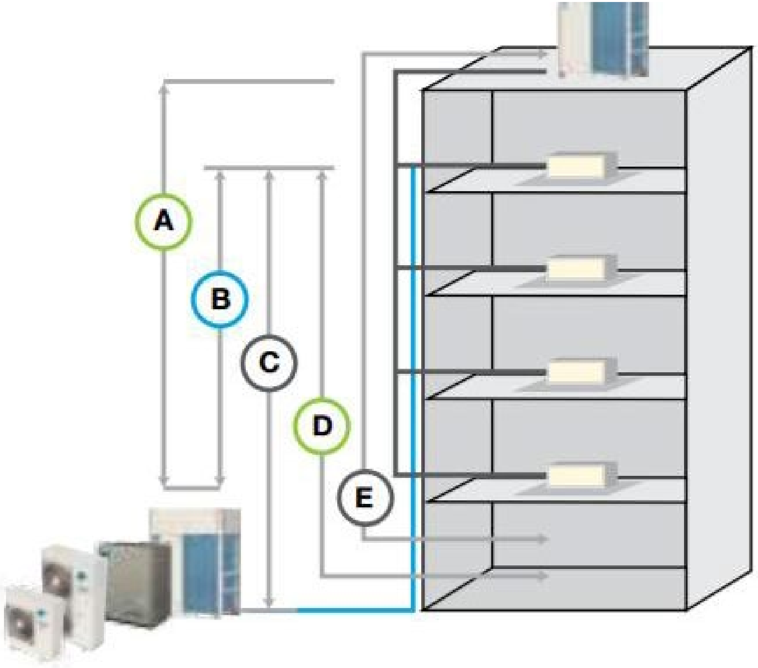
- First cost
- Utility cost
- Available floor space
- Individual room temperature control
- Tenant billing
- Installation time
- Maintenance

Case 2: Large scale VRF systems - air cooled

- Multiple condensing units on roof (on condensing unit per system serving each floor)
- Refrigerant rises for each suite stack (2 (HP) /3 (HP)-pipes per riser,
- In heat recovery (HR) systems, an individual floor for more diversity
- Make-up air (MUA) unit required



Case 2: Large scale VRF systems - air cooled



Liquid Line Max (feet)		VRV-IV Heat Pump	VRV-IV Heat Recovery	VRV Aurora Series	VRV-IV W-Series Water Cooled	VRV-IV S (36)	VRV-IV S (48-60)
A	Vertical Drop	164 (295)*	164 (295)*	164 (295)*	164	98	98
B	Between IDU	100	100 (49)†	100 (49)†	49	33	49
C	Vertical Rise	130 (295)*	130 (195)*	130 (195)*	130	98	98
D	From 1st Joint	130 (295)**	130 (295)**	130 (295)**	130 (295)**	130	130
E	Linear Length	540	540	540	390	164	230
	Total Network	3280	3280	1640	980	820	984

* Setting adjustment on condensing unit required.

** Fan coil distance differentials need to be met

† Possible refrigerant noise can be mitigated (via setting adjustments on ODU) when linear length exceeds 390FT.

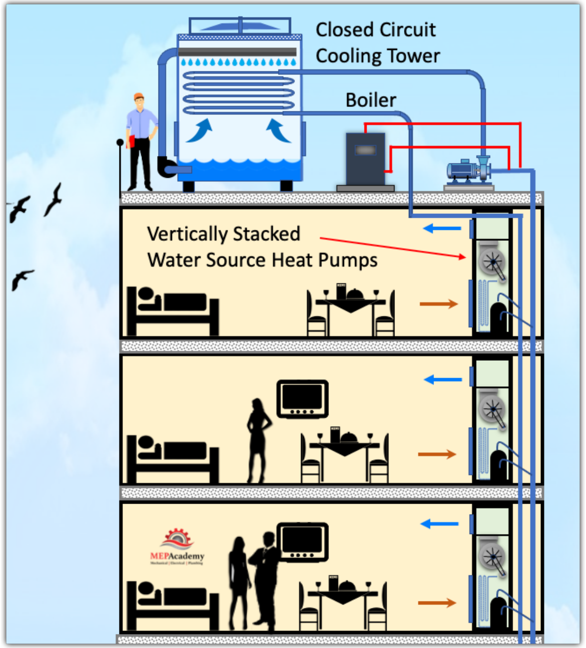
Case 2: Large scale VRF systems - water cooled

- Water cooled condensing unit at each floor
- Connected to ground source heat pump

Case 2: Large scale VRF systems - vertical stacked

- Standard stacked fan coil unit size (88" tall) with risers
- Heat pump or heat recovery
- 1-2 tons

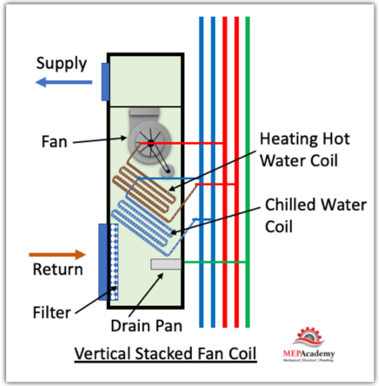
Case 2: Vertical stacked heat pumps

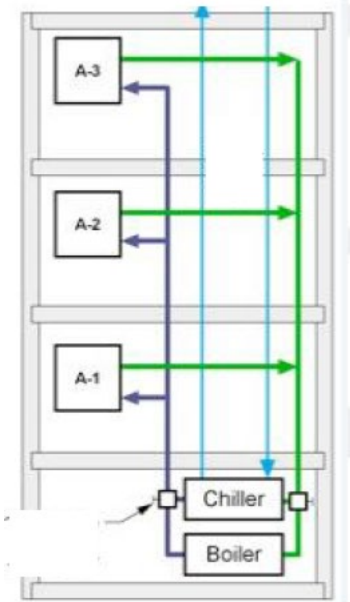


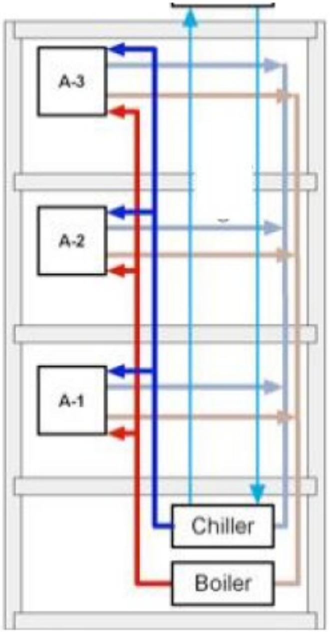
- Reasonable up-front cost for medium/large projects
- Individual temperature control
- Tenant metering
- Corridor MUA
- Noise
- Size: ½ - 3 tons

Case 2: Vertical stacked fan coil units

- Individual temperature control
- Reasonable up-front cost for medium/large projects
- Low noise
- Low maintenance
- Corridor MUA
- ½-3 tons







Case 2: Conclusion: community housing buildings

System Type	VRF (Air cooled)	VRF (Water cooled)	Water Source Heat Pump	Fan coil	Packaged Terminal AC
Efficiency	High	High	High	Medium-High	Low
Comfort	Good	Good	Medium-Good	Depends	Medium
Tenant billing	Medium	Medium	Easy	Difficult	Easy
Small Project cost (less than 100 units)	$$	$$$$	$$$$	$$$$$	$
Med project cost (between 100-300 units)	$$	$$$	$$$	$$$	$
Large project cost (more than 300 units)	$$$	$$$	$$	$$	$
Noise	Low	Low	Medium	Low	Medium

Factors affecting ASHP return on investment (ROI)

The **cost of purchase and installation** over like-for-like (incremental cost).

Whether any **financial or other incentives** are available.

The **cost of electricity** and therefore the **operating costs** of a heat pump.

The **cost of heating fuel** used in legacy system and **increasing carbon pricing**.

The **efficiency** of the heat pump and how well it is maintained.

The **size and power output** of heat pump dependent on design heat.

The **local climate.**

Heat pump myth buster

- Myth: Electric grids don’t have the capacity for heat pumps.
- Fact: Electricity grid operators can manage the transition to electric heat through various strategies, including more energy efficiency, more innovative timing of electricity demands, and backup fuels.

Heat pump myth buster

- Myth: A heat pump is more expensive than a fossil-fuel-based heating system.
- Fact: A heat pump is less expensive over the lifespan of the equipment in almost every scenario due to higher efficiency.

- Myth: Canada is too cold for heat pumps.
- Fact: Heat pumps are a proven technology in cold climates down to -31°C.

Heat pump myth buster

- Myth: Canada would be alone if requirements for cleaner and more efficient heating were introduced.
- Fact: Austria, France, Ireland, the Netherlands, and Norway all have bans on oil and gas boiler installation in new buildings by 2023.
- New York State legislature recently approved a state budget prohibiting natural gas and other fossil fuel heating and cooking equipment in new buildings shorter than seven stories by 2026 and by 2029 for taller buildings.
- San Francisco will require all new water heaters and furnaces to have zero emissions of nitrogen oxides, effectively banning fossil fuels in buildings, excluding cooking appliances.

Heat pump myth buster

- Myth: Heat pumps are not climate friendly because of their refrigerants.
- Fact: While most heat pumps in Canada currently contain higher global warming potential (GWP) refrigerants, emissions savings of 20-80% are still positive and low GWP refrigerants are gaining traction. Refrigerants do not provide a reason for slowing down heat pump adoption.

Heat pump myth buster

- Myth: HVAC contractors do not support heat pumps.
- Fact: Contractor associations support heat pumps: better work and better customer experiences, New business opportunity.

- Myth: A gas furnace can still heat if there is an electrical power outage.
- Fact: Natural gas furnaces need electricity to operate. Improved building envelopes are a better way to promote resilience when faced with power outages.

Installation

- It is a best practice to follow all manufacturer recommendations when installing new heat pump equipment.
- All local, provincial, and national codes must be met.
- Equipment performance must be verified using published product data.
- The jobsite must be clean and presentable when the installation is finished.

Tips on finding and working with contractors

Factors impact the feasibility of ASHP

- **Codes, standards and regulations, permit requirements**
- **Supplementary heating options**
- **Existing heating and cooling system**
- **Electric capacity at the panel and feeder**
- **Financial support**

Questions?

Stay connected with tools and resources

- Virtual one-on-one coaching: post-webinar support intake form for tailored support for organizations to manage energy resources effectively.
- Monthly bulletin: sign up to receive monthly training updates on all Save on Energy training and support new tools and resources.
- Live training calendar: visit this page to easily register for upcoming events and workshops.
- Training and support webpage: visit this page to access all training and support materials.

Thank you!

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