A homeowner's guide to installing an air-source heat pump (ASHP)

Here is a step-by-step guide on installing an air-source heat pump in your home.

This includes:

- determining if a heat pump is right for your home;
- researching and selecting the appropriate system (and duct) design and type of heat pump;
- working with an installer using best practices; and operating and maintaining a heat pump system.

What's a heat pump?

Heat pumps extract heat from outside and push it into a building. The heat can come from the ground or from the air. Air-source heat pumps extract heat from even very cold air.

Heat pumps use less electricity to heat a space compared to electric baseboard heaters.

Heat pumps are:

- cheaper to operate;
- produce less greenhouse gas emissions; and
- reduce our dependence on imported heating fuels.

Heat pumps can work in Yukon's cold climate when the temperature drops as low as -25°C to -30°C. All heat pump systems are paired with electric or conventional back-up heating systems that provide supplemental heating on the coldest days.

Heat pump systems are available in a variety of configurations and sizes and can be integrated with a home's existing heating systems.

The Government of Yukon offers Good Energy rebates for installing cold-climate air-source heat pumps that are certified by the Northern Energy Efficiency Partnerships (NEEP).

Steps	Actions	Questions and considerations
Feasibility		
1	**Consider how you will integrate a heat pump into your home.**	**Ask yourself:** ▸ What is my heating goal? ▸ Do I want to keep one or multiple of my heating systems? ▸ Am I looking to heat my entire home or do I want zone heating? ▸ What kind of system do I want: centrally ducted, multi mini-split, or a single mini-split? ▸ How much maintenance am I willing to undertake? **Note:** Review the Key system design questions on page 2 to help you determine the appropriate heat pump system design for your home. As you embark on this project, we suggest that you keep good notes and records of the project and process from start to finish.
2	**Contact the Energy Branch and local heating contractors to learn about ASHPs.**	**Ask these and other questions:** ▸ My home is this size and has this layout, what kind of system do you recommend? ▸ My current heating system is _____, what options do I have? ▸ If I want to heat my entire home or I want zone heating, what are my options? **Note:** If you are building a new home with a heat recovery ventilator (HRV), discuss with your installer, homebuilder, contractor, etc. on how you could inter-connect the HRV with an ASHP.
3	**Call your utility (ATCO Electric Yukon or Yukon Energy Corporation) to check the amperage service of your home.**	**Ask your utility:** ▸ Do I have sufficient service to sustain an ASHP (typically this is 200-Amp)? **Ask your electrician:** ▸ Is there sufficient space in my existing panel to add an additional double-pole 40-Amp breaker?

Key system design questions

These questions can guide you in determining the appropriate heat pump system design for your home.

Is the ASHP being installed in a new home?

New homes built in Yukon often use electric heat and may not have ductwork. In this case, an ASHP mini-split may be the preferred option.

If using ductwork, an HRV can be inter-connected with a centrally ducted ASHP.

Does your new or existing home have electric baseboards?

An ASHP mini-split or multi-split would complement electric baseboards. A mini-split will reduce your electrical costs relative to baseboards.

Does your new or existing home have a wood stove?

A wood stove can be used when the heat pump locks out at cold temperatures, but cannot be the official back-up heating source.

If switching from predominantly wood heating to an electric ASHP, expect noticeably higher monthly electricity bills.

Does your new or existing home have multiple heating sources?

Depending on the sources, these existing heating systems could be integrated with an ASHP.

Does your new or existing home have ducts?

If yes, a centrally ducted system may be a good option. The ductwork from oil or propane furnaces will likely need to be upgraded to match the airflow required for efficient ASHP operation–this is very important. If you do not wish to upgrade existing ductwork, then the ASHP must be sized based on the ductwork airflow.

If not, a mini-split or multi-split may be the better option.

If you prefer a ducted system, it may be possible to add in ductwork to a home. This could mean opening the ceilings and can result in a larger project with additional costs.

For a new home being built, ducts may be incorporated into building plans and an HRV can be integrated with an ASHP.

Does your new or existing home have an oil or propane furnace?

If the oil or propane furnace is due for a replacement, consider what type of backup heating system you would prefer.

Consider inter-connecting the current furnace with a ducted ASHP. Do review the considerations about ductwork listed in the previous question. The furnace can be used as the official back up heating source when the heat pump locks out at cold temperatures. This can help reduce your electricity bills.

If switching from predominantly oil or propane to fully electric heating, expect higher monthly electricity bills.

Steps	Actions	Questions and considerations

Electrical service upgrade

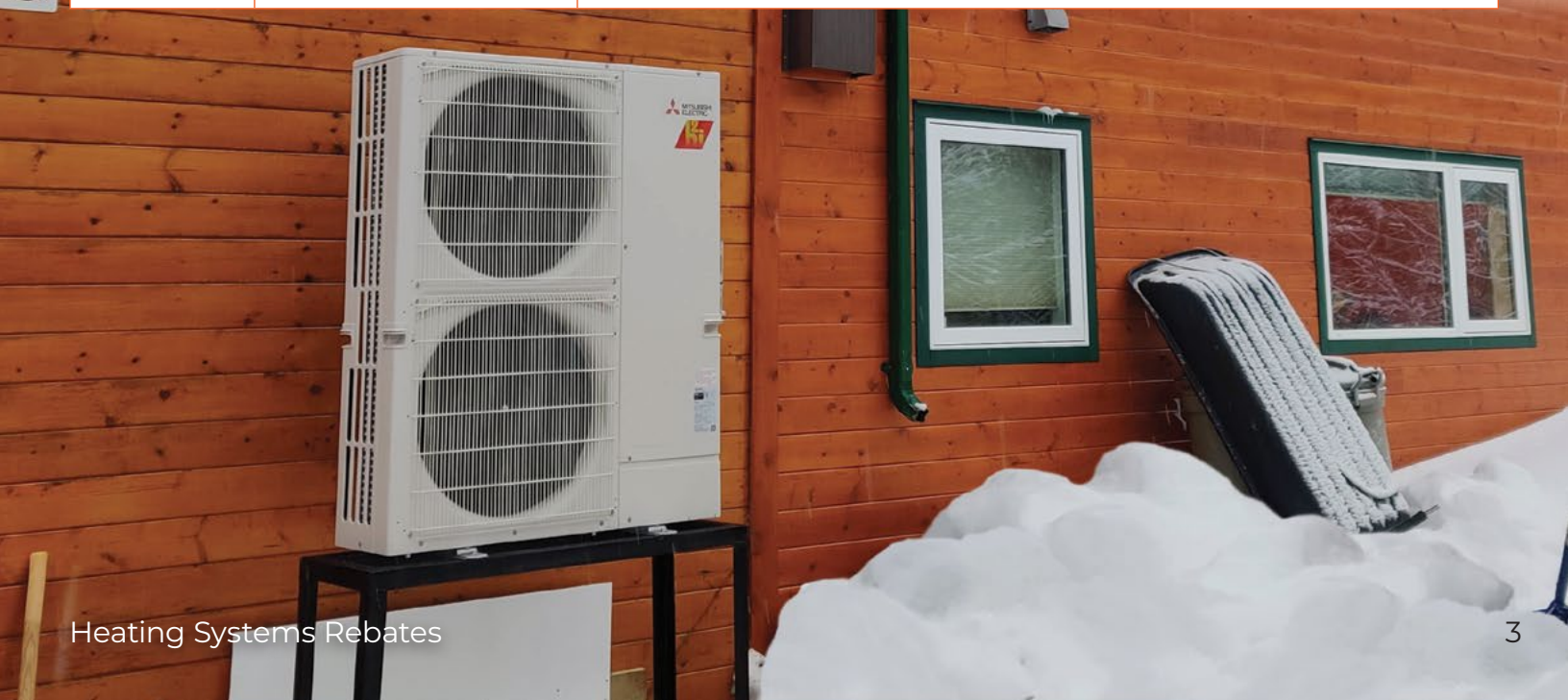
4 *For some installs only.*	**If needed, take the steps outlined by the utility or your electrician to upgrade to a 200-Amp service.** **You will need to contract an electrician to complete the panel upgrade.**	**Ask both your electrician and your utility:** ▸ What is my estimate cost for this service upgrade? ▸ How long does it take to get a service upgrade completed?

Home energy assessment

5	**Get an energy assessment done by a NRCan-registered Energy Advisor.**	***Notes:*** ▸ An energy assessment will determine your home's energy consumption, and will estimate your home's heating and cooling loads.

System design

6	**Determine a basic system design and ASHP type (ducted, mini-split or multisplit).**	***Notes:*** ▸ There are different considerations when designing and installing an ASHP system in a new home versus an existing home. ▸ Use the Key system design questions on page 2 to determine a basic ASHP system design. ▸ The Energy Branch considers a new home to be one that was recently built and is under 5 years old. A home that is 5 years or older is considered an existing home.
7	**Now that you have decided on your basic system design and heat pump type, do research on the brand you would like to install.**	**Find the heat pumps that best suit your needs:** ▸ Visit the NEEP website and review the cold climate ASHP listing for the recommended systems with verified cold weather performance. An ASHP must be NEEP-listed to be eligible for the Government of Yukon Good Energy rebate.



Steps	Actions	Questions and considerations
Contact ASHP installers and gather information		
8	**Contact ASHP installers listed on the Good Energy Network.** **To find an ASHP installer, contact the Energy Branch or consult the Good Energy Network list at yukon.ca/good-energy.**	**Ask potential installers:** ▸ Which types of systems do you have expertise installing? ▸ Are you able to install centrally ducted systems or mini-splits or multi-splits? ▸ Is a refrigeration or mechanical technician involved in the installation? ▸ What ASHP brands have you installed? ▸ How many ASHP have you installed to date? ▸ Do you offer a warranty for the system and for your work? If yes, how long does the warranty last? ▸ What have you learned from completing previous installations? ▸ What are the general maintenance tasks when owning an ASHP? ▸ What is your availability to do a home visit and provide a quote? **Provide this information to potential installers:** ▸ Your home's current heating systems. ▸ A description of your home's square footage, style, number of stories, location. ▸ The ASHP systems you might be interested in installing. ▸ The purpose of your home heating system (i.e. full home heating, zone heating).
9	**Get more than one ASHP installer to complete a home visit, recommend a brand and size of heat pump, and provide quote.**	**During the home visit, ask the potential installer:** ▸ What kind of ASHP system would you recommend and why? ▸ This is the ASHP system I was thinking of installing for the following reasons, what is your opinion and why? ▸ What method do you use to size the ASHP units to different homes? ▸ Do you know of or use the NRCan sizing tool? What size would you recommend for my home? ▸ Where would you place the outdoor unit and why? ▸ Can the outdoor unit be located away from the driveway or frequent traffic areas? ▸ For a ducted system, where would you place the indoor unit and why? ▸ For a ducted system, would you recommend a horizontal or vertical installation and why? ▸ For a ducted system, will I need new ducting or upgrade existing ducting to support the system? How do you determine the size of the ducts relative to the size of the unit? Will we need to increase the size of the ducts or can we use the existing ducts as is? ▸ Where would you put the refrigerant lines? How do we ensure they are as short and as straight as possible? ▸ What's the requirements for managing water runoff? How do you suggest we manage the water runoff? How frequently do we need to manage water runoff? ▸ How noisy are the indoor and outdoor units? ▸ For a mini-split system, how do you size a mini-split unit for zone heating? ▸ For a mini-split system, how many heads would you recommend? ▸ For a mini-split system, how do you determine the ceiling clearance of the indoor mini-split head?

Steps	Actions	Questions and considerations

Review information gathered and installation best practices		
10	**Review the installation best practices.**	Before making a final decision on an ASHP system, review the best practices for ASHP installations.

Best practices for ASHP system installations

- ☐ Ensure the heating ducts are the right size for the ASHP unit.
- ☐ Ensure that the outdoor unit is installed away from vents that might exhaust moist air. Ideally, the unit is placed on the North side of the home.
- ☐ Ensure that the outdoor unit is installed on a platform and stand that is larger than the unit and that there is space to allow defrost ice to settle.
- ☐ Ensure the outdoor unit is installed away from walkways and driveways.
- ☐ For drainage, locate the outdoor unit at a highpoint or with proper grading so the defrost water can drain downhill and away from the building(s) and traffic areas (if possible). If drainage is a challenge, make a plan on how you will manage water accumulation in this area.
- ☐ Install a wind guard (baffles) on the outdoor unit to protect it from wind and snow and to optimize its efficiency.
- ☐ Install the indoor unit in a low traffic area.
- ☐ Consider the indoor unit's placement in the home to manage any potential noise.
- ☐ For mini-split heads, ensure there is sufficient space between the head and the ceiling for air circulation.
- ☐ Determine if the unit needs single-side return or dual-side return as per the manufacturer's recommendations. Larger units usually need dual-side return if installed vertically to ensure sufficient air flow. Ensure there is sufficient space. Consider installing the indoor unit horizontally (if possible).
- ☐ Ensure the refrigerant lines are as short and as straight as possible.
- ☐ Ensure the system's static pressure is meets manufacturer's requirements to avoid reduced airflow of the unit.
- ☐ Ensure there are no loose pieces or connections in the ductwork that could cause additional noise when system is operating.

Steps	Actions	Questions and considerations

Review information gathered and installation best practices

11	**Ensure correct sizing of your proposed ASHP.** **Provide the heating demand load (found in your home's energy assessment report) to the installer to get sizing recommendations.**	**Ask your installer:** ▸ I have decided on a specific system, what are your opinions or recommendations on this system and why? ▸ Can you help me size the system to my heating and cooling loads? Note that heat pumps operate most efficiently when down-sized relative to conventional (fossil-fueled) heating systems. ▸ Is my ductwork properly sized for the unit's airflow?
12	**Decide on the ASHP system you want to install and ask the installers for quotes**	**Notes:** ▸ Determine what needs are important to you and make these priorities clear with the installer (i.e. reduced noise, placement of outdoor unit). ▸ Ask the installer to provide a quote with a detailed cost breakdown. ▸ If you have questions about the quote or do not understand something, ask the installer.

Steps	Actions	Questions and considerations
Installation		
13	**Select an installer, a system, and a size.** **Schedule the system's installation.**	**Before you schedule the installation work, ask your installer:** ▸ How disruptive will this installation be? ▸ How long will the installation take? **Notes:** Check and confirm with your installer that they are working with an electrician on this installation project. If not, you need to book an electrician to connect the system once it is installed. If your installer is not a refrigerant technician, they will need to sub-contract the work to a refrigerant technician who can connect the refrigerant lines. Installations can be completed in the winter. Ask your installer about how the season may impact the installation process.
14	**The indoor and outdoor units are installed.**	**Notes:** As the installation is underway, continue to refer to the best practices for ASHP system installations. If you have any concerns or questions during the installation, make sure to discuss with your installer. Ask your installer to provide regular updates on the installation's progress.
15 *For some installs only.*	**Ductwork is upgraded for a centrally ducted system.**	**Ask the installer:** ▸ Have they encountered any issues during the installation or ductwork upgrades?
Operation and maintenance		
16	**Once the installation is complete, discuss with the installer about how to operate the system.**	**Ask the installer:** ▸ What do I need to do for the daily operation of the heat pump? ▸ What does the defrost cycle look like and how often should it occur? ▸ How does the thermostat work? ▸ What do I need to do if there is a power outage? ▸ What are signs too look out for when the indoor or outdoor units are not functioning properly?
17	**Talk to the installer about how to maintain the system.**	**Ask the installer:** ▸ What are the maintenance tasks I need to do with this system? ▸ How often do I have to change or clean the filters in the indoor unit? ▸ What are the steps in changing or cleaning the indoor and outdoor units? ▸ If there are any maintenance issues, can I contact you (the installer)? **Notes:** Get the documentation for the ASHP system. This may be a link to a website or a system manual.

Homeowner's notes

Government of Yukon – Energy Branch

Phone: (867) 393-7063
Toll free in Yukon: 1-800-661-0408 extension 7063
Email: energy@yukon.ca

Location: Energy Solutions Centre
206A Lowe St. Whitehorse
Office hours: 8:30 a.m. to 4:30 p.m.
Mail: PO Box 2703 (EMR-206) Whitehorse, YT Y1A 2C6

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