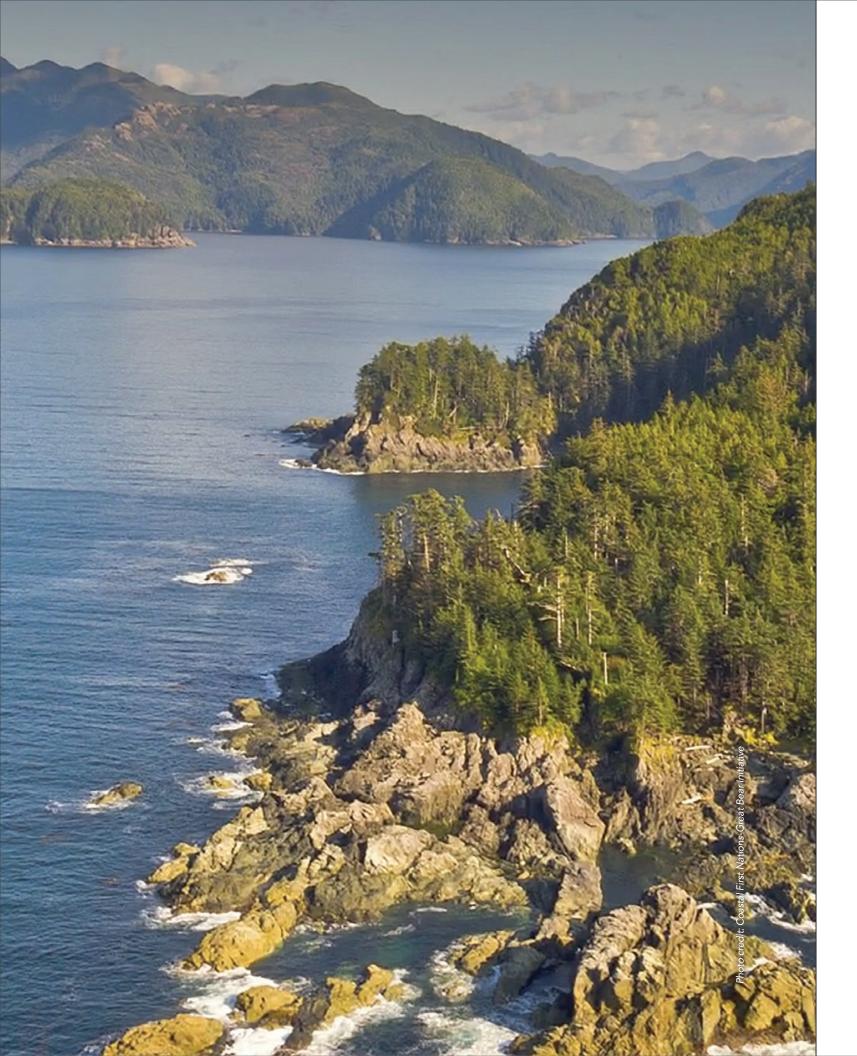




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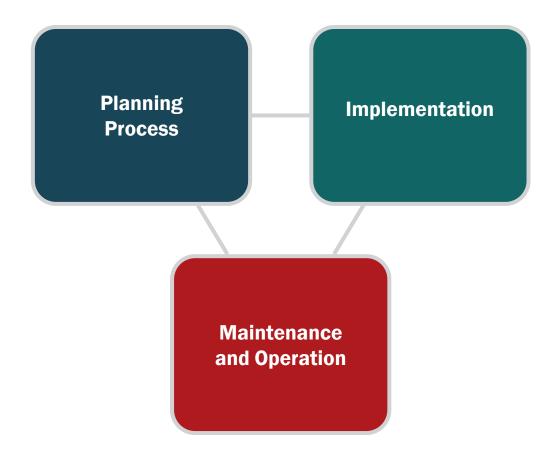


Executive Summary

Many remote Indigenous communities are installing heat pumps to provide indoor heating and cooling in residential and commercial buildings. Heat pumps are approximately 3 times more energy efficient than electric baseboard heaters, cost less to operate, and when electricity supply in community comes from renewable sources, are powered without the use of fossil-fuels. Heat pumps have demonstrated their ability to provide a reliable, economical, and sustainable source of indoor heating and cooling and can be a major step towards higher quality of living in remote Indigenous communities.

This Toolkit for Installing Heat Pumps in Remote Indigenous Communities was developed upon request of communities, and in partnership with communities to support implementation of community-wide heat pumps projects in remote Indigenous communities. The toolkit builds from knowledge shared by communities and partners who have already successfully installed heat pumps in their communities. This toolkit is tailored as a knowledge sharing platform for remote Indigenous communities and has been developed for anyone interested in learning about the do's, don'ts, and other considerations for heat pump installations.

The toolkit is made up of a step-by-step list of actions and considerations, and is presented in the flow chart below. Although this toolkit provides an overview and possible pathway to success, the needs and solutions of every community are different, and thus the steps can be modified as required to suit the unique needs of each community.



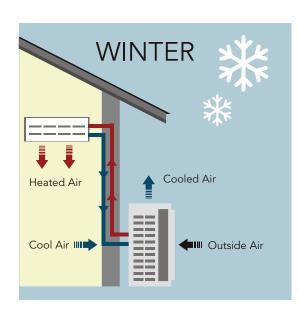


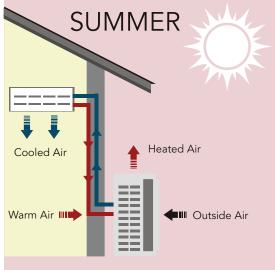
Why Install a Heat Pump?

This section provides general information about heat pumps and their benefits, especially for remote Indigenous communities. Links to specific resources have also been provided, that may be helpful in building a business case for community-wide heat pump installations. For information on the types of heat pumps available to install, please see Appendix A: Types of Heat Pumps.

How a Heat Pump Works

Heat pumps provide efficient heating and cooling for buildings through the transfer of air. Heat pumps utilize technology similar to that found in refrigerators and air conditioners to extract heat from various sources such as outside air. Once extracted, the heat is then amplified and transferred to inside the building to provide heating. Compared to conventional heating technologies such as boilers or electric heaters, heat pumps are much more efficient because they transfer heat instead of generating it, which can result in lower operating costs. During winter months, a heat pump transfers heat from outside to inside the building. In the summer months, the heat pump provides cooling by working in reverse and transferring heat from inside to outside the building.





Heat Pumps Benefits

Many remote communities are installing heat pumps to reduce their cost of indoor heating, ensure comfort during winter months, and reduce energy and fossil-fuel consumption. Communities greatly value the improvement in quality of life and energy security achieved with installing heat pumps, especially in households with elders or without prior reliable heating source. Switching to heat pumps supports the transition away from using fossil fuel-based systems for heating, while advancing community sustainable development goals.

"It comes from a need to save money and have more efficient space heating for the homes." - Climate Action Coordinator

Key benefits of heat pumps are summarized below.



Energy Efficiency: Since heat pumps transfer heat between inside and outside the building, they have an efficiency of 300% or more when operated within an outdoor temperature range.¹



Budget Friendly: Due to their high efficiency, heat pumps consume less electricity than electric baseboards and thus cost significantly less to operate.



Climate Friendly: If heat pumps replace a fossil-fuel based heating system they can significantly reduce the carbon footprint of a building, so long as the electricity used to power the heat pump is renewable.



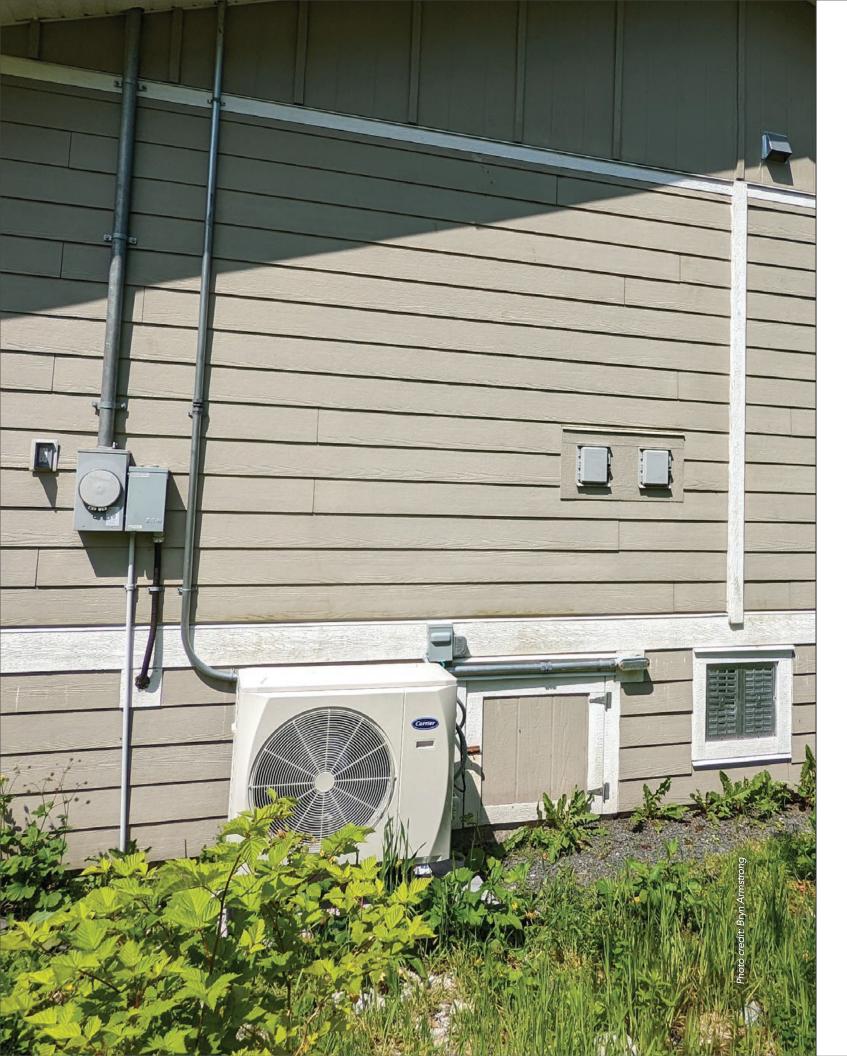
Indoor comfort: Heat pumps facilitate active air circulation inside the house, improving indoor air quality and comfort. Heat pumps can directly eliminate indoor air pollution and harmful toxins that are caused by fossil-fuel based heat systems, or woodstoves. Through proper air circulation, heat pumps can also reduce mold growth.



All Weather: Heat pumps can be used during both winter and summer months. There has been a lot of positive feedback from community members of CFN-GBI partner communities that had a heat pump during the summer, especially during the 2021 heat wave.

Heat pumps present a very cost-effective space heating solution which has a potential to increase quality of life for community members. It also reduces the cost of electricity bills." - Climate Action Coordinator

Most air-source heat pumps have a minimum operating outside temperature, generally between -15°C to -25°C, below which they are unable to operate



"Cooling in summer is becoming very important. In Heiltsuk they had 150 HPs during that heatwave and their people were so happy about them" - Program Partner

Heat Pumps Considerations

Before considering the installation of heat pumps in their community, each remote community should consider the following factors:



Efficiency in very cold temperatures: The efficiency of heat pumps begins to reduce at very cold temperatures (around -25°C, depending on the model). For communities located in very cold climates, ensuring a specialized cold climate heat pump is installed, as well as having a supplementary heating source, can provide additional comfort during the coldest winter spells.



Increased reliance on electricity: Heat pumps operate solely on electricity and thus rely on stable electric supply. This has implications for grid load management. Communities must be mindful of how the increase in load requirements will be met by the electricity supply system. Further, incommunities that have limited electric capacity or encounter power outages, a stable supplementary heating source is recommended (for example, a wood stove).



Summer cooling: All heat pumps can provide cooling mode in the summer, which can provide relief during high temperatures. This benefit can increase the cost of electricity in summer months.



How to Install Community-wide Heat Pumps

The following sections outline key stages and steps for a successful community-wide heat pump project, as described in the diagram below.

Planning Process

- 1. Purpose and intention Community goals and vision
- 2. Community engagement Involve the community early in the planning process. Familiarize with heat pumps
- 3. Project scope Number of heat pumps, total cost, and resources needed
- 4. Finding funding Identify and apply for funding
- 5. Home energy evaluations
- 6. Prioritization of homes Ensure seniors and community members without heating source receive heat pumps

Implementation

- 1. Hiring the right contractor Ensuring right qualifications and readiness to work with Indigenous communities
- 2. Working with the contractor Know your contractor and share community values
- 3. Pre-visit Contractor and electrician identify each home's heat pump needs
- 4. Installation considerations Consider community installation factors such as homes, weather and units.

Maintenance and Operation

- 1. Training during installation Basic heat pump operations knowledge
- 2. Regular upkeep Preventative measures such as cleaning filters
- 3. Maintenance training Training for in-depth maintenance tasks

Figure 1: Process for community-wide heat pump installation





Planning **Process**

Purpose and intention

Heat pumps have many benefits, and the specific motivations for each community will be different. Before beginning the project, it is important to have clarity on the purpose and intentions of why heat pumps are being installed community-wide. For many communities, it is a mix between lowering greenhouse gas emissions, lowering energy costs, and making homes more comfortable. It is important to be clear on community intentions for this project, and be in alignment with community leadership, in order to communicate those intentions to the community.

"[We] want the community to be off diesel as much as possible and the prices for heating oil were really high. We also want to save people money. ... There was also an oil spill a few years back when barrels of heating oil leaking into the ground and millions of dollars worth of fixing up the ecosystem and the houses that are damaged was needed. So, there are a lot of reasons why we want to do it." - Climate Action Coordinator

STEP 2 **Community engagement**

It is important to involve the community early in the planning process. A useful first step is to develop a community energy plan and determine how the community's values align with the heat pump project. Being in close contact with the community can also help to build trust, understand individual needs, and determine the most suitable process of the heat pump project.

Community members may not be familiar with or aware of the benefits of a heat pump. Community staff can share key information on heat pumps through information pamphlets, sessions, conversations, and workshops. Including community members early in the heat pump planning process and answering questions can build support for the project, and help it to be successful. Engagement may also lead to identifying individuals who are interested in supporting with heat pump installation, maintenance and repair, as well as supporting elders though the transition. In some cases, energy savings can be put towards salaries for new energy efficiency related positions in a community.

STEP 3 **Project scope**

A project plan provides an outline of how the project will unfold. It includes an initial estimate of how much the project will cost, and what resources are needed. Determining project scope can involve the following steps:

- · Discussing with leadership how much budget there is to move forward with this project, and considering both external and internal funding sources (see Step 4 – Finding funding).
- · Discussing with a heat pump contractor(s) how many heat pumps can be installed based on the amount of budget available.
- Estimating how many houses and/or buildings will receive a heat pump.
- Working with technical professionals to ensure the electrical grid can support increased load requirements.
- Seeking additional funding if required (see Step 4 Finding funding).
- Building a project timeline, which can Include the steps laid out in this toolkit.

Finding funding STEP 4

After confirming with leadership how much internal funding is available, it is likely that additional external sources of funding will be necessary. According to the CACs interviewed, applying for funding takes a big part of their job as multiple sources need to be identified, secured, and reported on after project completion.

There are primarily two types of external funding available for heat pump projects: initial funding for the capital cost, and rebates. The rebate pathway will require a community to ensure it can cover the upfront costs as rebates can take time to process after installation is complete. Communities can consider funding options based on the heating source that the community members are moving away from. There may be grants or rebates that provide funding for heat pump installations for lowering greenhouse gas emissions through switching from fossil-fuel based heating systems. Many funding opportunities have pre-requisites before applying for the funding, while other funding programs are working to address application barriers by supporting applicants through the funding process.

As funding sources and eligibility requirements change frequently, we have provided details of common funding sources in Appendix 2: Funding. Please be advised that this is not a complete list of funding opportunities available for remote Indigenous communities, and is meant to be used as a starting point.

Home energy evaluations STEP 5

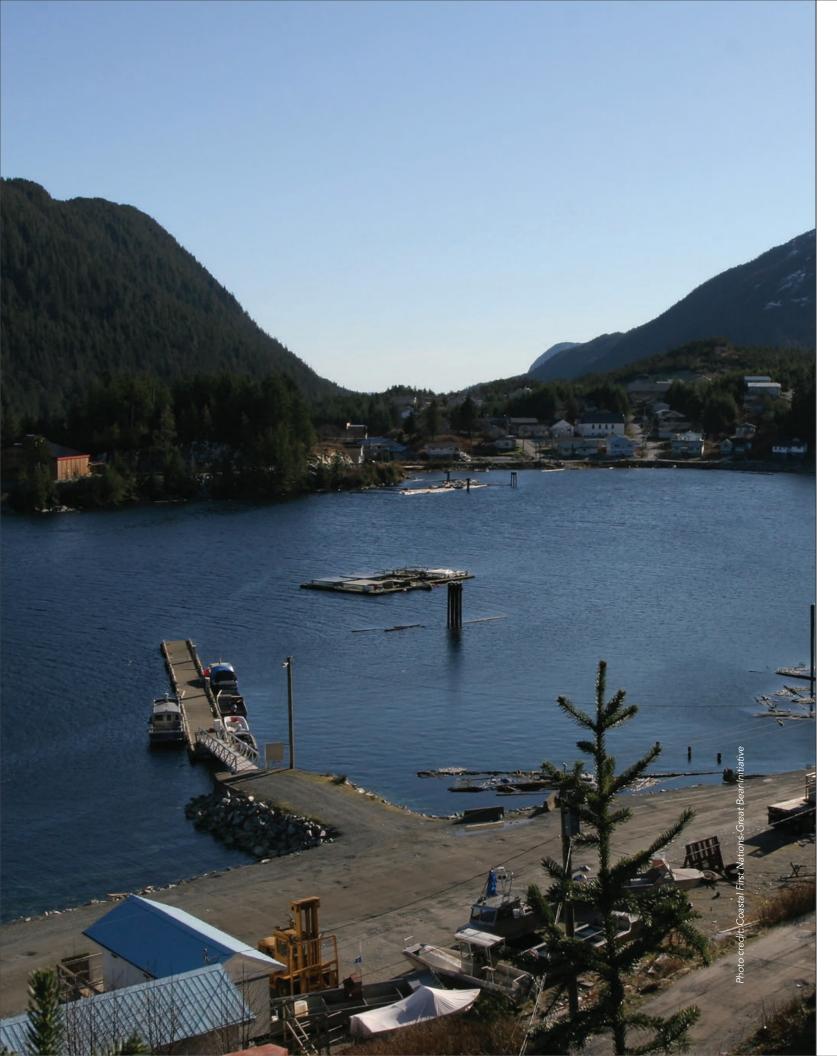
The overall energy efficiency of a home, including its building envelope, is an important factor in how effective heat pumps are to heat and cool homes. Home energy evaluations, or EnerGuide evaluations, assess the overall energy efficiency of a home, and help identify ways to improve efficiency. This includes the level of a home's airtightness, the insulation levels of walls, ceilings and basements, and other factors. This evaluation can help to understand what other work might need to be done to increase the energy efficiency of homes.

Many funding sources, for example the Federal Greener Homes Grant, require an EnerGuide evaluation when applying for funding. This EnerGuide evaluation must be undertaken by a Certified Energy Advisor, which can be found online. The funding programs that are summarized in Step 5 can support with this process.

Prioritization of homes STEP 6

Once a community has secured funding, and determined how many homes in the community will receive heat pumps, it can build a plan of how to decide which homes will receive heat pumps first. Through support from Band Council, community leadership and community members, a needs-based process can be developed, ensuring those who need heat pumps most receive them first. This can involve making a list of homes without any existing heating source, elders, or vulnerable community members and prioritising heat pump installations in those homes. This is a strategy that has worked well for some CFN-GBI communities, especially if the heat pump installations are undertaken in multiple phases. It is important that this strategy is shared with the community, so community members understand the intention for a fair and equitable process.





Implementation

Hiring the right contractor STEP 1

Finding the right contractor who is able to work with a remote Indigenous community throughout the lifetime of the heat pumps is a crucial step. In some instances, it is important to make sure that the selected contractor has the required certifications as it may be a prerequisite to funding sources.

Where multiple contractors are available for heat pump installations, it is recommended for the community to request an estimate or tender (request for bid) to help select the most appropriate contractor for a fair price. This tender should include (but is not limited to): unit costs, equipment costs, personnel cost, labour and travel and accommodation costs. It is helpful to share the project scope during the bidding process to ensure contractors have a full understanding of the purpose and intentions of the heat pump program. In addition, requesting information on the contractors' experience working with remote Indigenous communities and references from past clients will be helpful in determining the most suitable contractor.

The contractor may only install a certain brand of heat pump. If this is the case, the community should be aware of the heat pump units being installed, certifications, warranty of the units being provided, and most importantly making sure that the units are eligible for the rebate program.

When in doubt – ask a Climate Action Coordinator. The Indigenous Climate Action Network has worked with a lot of contractors, and would be happy to recommend those who have worked successfully with communities in the past. It's always a good idea to check references when going with someone new.

BC Hydro and the Province are working with the Home Performance Stakeholder Council to maintain and expand the list of qualified contractors within the Home Performance Contractor Network and to provide training on heat pump installation best practices in BC.2 These contractors are trained on rebate program requirements as well, so they can ensure that eligible systems are installed and help with the paperwork to support rebate applications.

² http://homeperformance.ca/about-the-network/#

STEP 2 **Working with the contractor**

Once a contractor is secured, set up an initial meeting with the contractor to discuss the project scope. This initial meeting can provide an opportunity to get to know the contractor, understand what processes they follow and why, and share the project timeline. The purpose and intention of this heat pump project should also be shared, along with considerations based on this toolkit, community experience, for what will work best in the community.

Heat pump installation, as well as repair and maintenance, are a great opportunity to employee community members interested in this type of work. Contractors can hire community members to train and support with the labour of heat pump installation. This can ensure that community members know the basics of how to operate and maintain heat pumps following installation.

STEP 3 **Pre-visit**

The first step of heat pump installation will be for the hired contractor to conduct a pre-visit inspection of houses to identify each home's individual heat pump requirements. It is important that the community's electrician joins the installer during the pre-visit to identify correct placement of the heat pump inside and outside units, and check if the home's electrical panel needs to be upgraded to operate the heat pump. This can be an opportunity to join as well if the community member has any concerns and discuss the benefits of heat pumps, as well as how to operate and maintain them. Brochures or pamphlets can also be provide during this visit.

"A very important step is to have a pre-visit from a certified installer. He comes to the community, walks into every single home and identifies each home's individual heat pump solutions. This is the most crucial first step! Professional installer must do a pre-visit. Included in that is also the electrician. Community's electrician and heat pump installer working together and it is very important. This includes the placement of heat pump, outside unit, break up panel, how far the outside unit is from break up panel, condition of existing break up panel, does it need to be renewed or upgraded to operate the heat pump." - Climate Action Coordinator

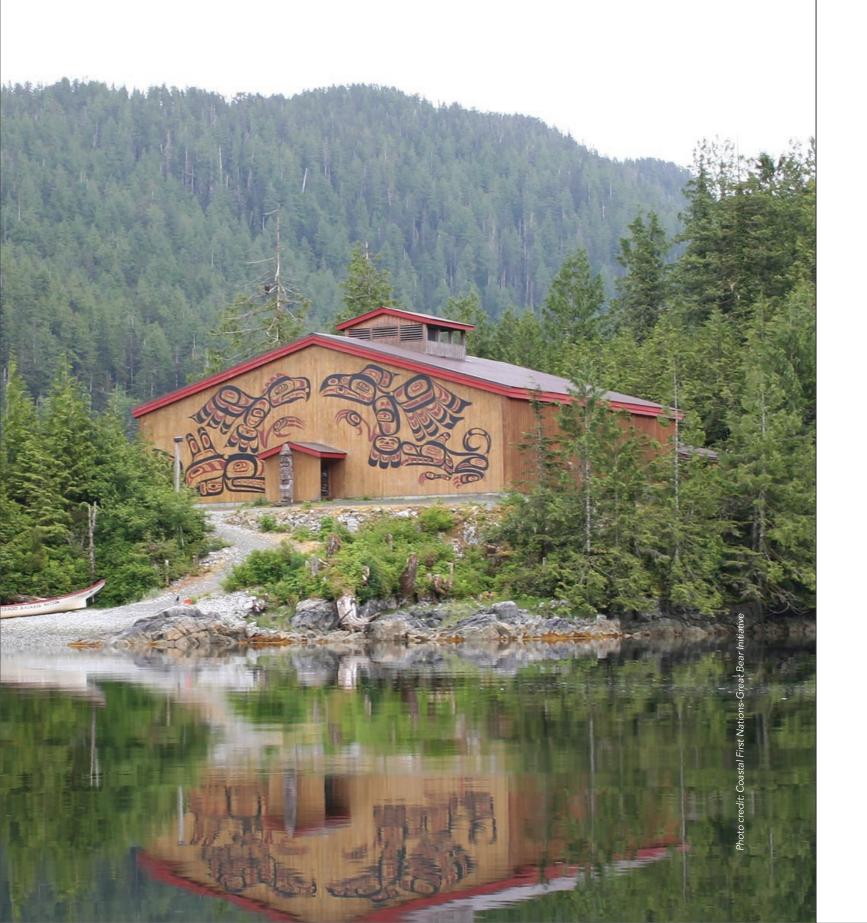
STEP 4 **Installation considerations**

The following considerations need to be taken into account prior to the installation process for community-wide heat pumps.

- Installer and electrician working together: It is important to have the community electrician accompany the installer during the heat pump installations to check the electrical panel and if any upgrades are required. The community electrician is someone who ideally has been working with the Indigenous community for years and thus understands the houses and community needs through the installation process. They can help guide the installer appropriately. For example, it is important to identifying the most appropriate placement of the units with respect to the existing electrical panel and orientation of the homes.
- **Difference among homes:** Each home has different heating requirements based on size and type of home. It is important for the CAC to communicate to the community members that the estimation of number of units required for each house is a professional decision made by the contractor during the pre-visit and is dependent on the size and characteristics of the house. The comfort level required for each home may also vary based on its residents (e.g.: if there is an elder living in the house).
- Installation weather: Consider the weather when undertaking heat pump installations as the contractor will need to work both inside and outside the house. Many remote Indigenous communities are located in the north or may have extreme weather. Fall months can be especially harsh as it is difficult to do electrical work outdoors during the rain or storm.
- Installed units: It is important to ensure that the heat pump units being installed by the contractor are eligible for the rebates the community intends to apply for. If wrong units are installed that are not eligible for the rebate programs, the community would need to arrange for funding from other sources. This is an important detail to double check before installing.

Participating Indigenous communities have pointed to the Covid-19 pandemic as a major barrier in procuring equipment as well as restrictions around being able to invite outsiders into the community for heat pump installation work. However, even under normal circumstances CACs warn of slow supply chain of equipment, especially to remote communities. Planning around the equipment required, equipment cost, personnel cost, storage of units prior to installation and travel costs is key to timely completion and success of the heat pump installations.





Maintenance and Operation

Training during installation

Following heat pump installation, the installer should demonstrate to each household the correct heat pump operation practices, as well as how to clean the filters regularly. Contractors should ensure residents have access to the manuals for the specific heat pump model that was installed in their home. Further, correct operating ranges of the heat pumps and remote controls must also be explained to the residents. This is an important step to ensure that the residents are aware of how to use the heat pumps effectively.

Regular upkeep

Preventative measures such as cleaning filters every six months, replacing them when needed, operating the heat pumps optimally can go a long way to ensure smooth longer-term functioning of the units. A reminder for these upkeep measures can be taken up by the CAC or a designated person from the community who can go house to house in the beginning of the winter season, and at other times of year, to make sure the heat pumps are correctly maintained. One CAC worked with BC Hydro to create a seasonal maintenance schedule to ensure maintenance needs happened regularly in their community. Elders in the community who cannot reach the units themselves may require additional support from younger family members or community members to ensure regular upkeep of their heat pumps.



STEP 3

Maintenance training

It is difficult to arrange for certified contractors to regularly visit remote communities for small to moderate maintenance work. This is especial true in the winter months when there is more need for smooth functioning of heat pumps. Arranging for the contractor to train community member(s) to undertake basic to intermediate maintenance work on heat pumps can thus be extremely beneficial in developing internal capacity in the community to maintain the heat pumps.

There is increasing interest among the members of the Indigenous Climate Action Network to train and certify a community member or community electrician interested to be able to undertake complex heat pump maintenance tasks. This will help build internal capacity in remote Indigenous communities to ensure secure heating during winter months and reduce reliance on outside contractors.

One CAC developed a heat pump maintenance and repair training program and received funding to implement. This program included hiring a heat pump contractor to come into community to complete general heat pump maintenance and repair, while pairing them with community members to train them in this work. Other CACs are now working to implement similar training programs.



Suggestions for Future Work

This toolkit provides stages and steps to successfully install community-wide heat pumps. The following are two avenues for future research work:

- Maintenance: As mentioned in Stage 3: Maintenance and Operation, conversations and steps to promote in-depth maintenance training for someone internally from the community are gaining interest. Resources that support maintenance and operation training would add great value.
- House as a system: It is important to look at the house as a system. Making the heating system more efficient by installing heat pumps does not ensure the efficiency of the house to retain the heat generated. Doing a home energy evaluation to identify any leaks in the building envelope, doors, and windows is a crucial first step to creating an efficient home. Further work on undertaking such assessments on a community scale can be especially valuable.

"There are two aspects of an inefficient house: there's inefficient heating and then there's an inefficient building envelope. So, if you upgrade the energy system but your building is super leaky, you are still using way more energy." - Program Partner

Acknowledging that every community is different and has different requirements, we highly encourage that the solutions be tailored to what works best for the needs of an individual community. We wish each community all the best on the journey and that this toolkit is supportive. Further resources and information pertaining to heat pumps and funding is provided in the appendices.



Appendix 1: Types of Heat Pump

Sources

Air Source: Air-source heat pumps extract heat from the air outside the building during heating season, and releases heat from the air inside the building to outside during the summer season.

Ground Source: Ground-source heat pumps extract heat from the earth, ground water, or both during the winter season, and also use this as a reservoir to release and store heat during the summer season.

Types of Air-Source Heat pumps

There are two main types of air-source heat pumps:

Ducted: This is a popular type of heat pump in houses with existing duct system. In this the indoor coil of the heat pump is located inside the duct system of the home and air is heated or cooled as it passes over the coil.

Ductless: This type of heat pump is more common in houses without an existing duct system. In this, the indoor coil is located inside an indoor unit that generally sits on the floor or wall of the house and heats or cools the space directly.

Ductless heat pumps can further be divided into mini-splits where a single indoor unit is located in the house connected to a single outdoor unit, and a multi-split where multiple indoor units are located in the house connected to a single outdoor unit.

Please visit the links below for more information on heat pumps, types of heat pumps, and their technical functionality:

- Some great information on Heating and Cooling Systems by Clean BC Better Homes: https://betterhomesbc.ca/product_categories/heating-and-cooling-systems/
- Natural Resources Canada, Heating and Cooling with a Heat Pump: https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about/energy-star-announcements/ publications/heating-and-cooling-heat-pump/6817#w

Appendix 2: Funding

The table below provides quick details of some common funding sources. Please be advised that this is not a complete list of funding opportunities available for remote Indigenous communities. A comprehensive list of funding sources can be found on the link here.

As funding requirements and opportunities change frequently, please use this as a starting point, do your research, talk to people, and ask for support where needed. Here is a link to a funding finder tool created by Clean BC to help search for eligible funding options.

ELINDED AND ELINDING NAME	AMOUNT (FUNDING AVAILABLE	LINK
Province of B.C. Indigenous Community Energy Coach & Indigenous Community Heat Pump Incentive	Residential – up to 80% capital cost, max \$10,000 per heat pump Community building – up to 80% capital cost, max \$200,000 per heat pump Total – max incentive of \$200,000 per Indigenous community per application Offers energy coaching services to identify energy efficiency projects, assist with heat pump installation planning, and provide support with Clean BC funding application	https://betterhomesbc.ca/ indigenous-coach/
BC Hydro BC Hydro Indigenous Communities Conservatino Program	 Provides free energy-saving products. Provides training to upgrade homes in communities for local contractors and installers. Offer rebates on home efficiency upgrades including: insulation, ventilation, windows, doors, furnaces, heat pumps, water heaters, and new appliances. 	https://www.betterhomesbc. ca/rebates/indigenous- communities-conservation- program/
New Relationship Trust BC Indigenous Clean Energy Initiative	Up to \$500,000 in assisted project costs	http://www. newrelationshiptrust.ca/ initiatives/bcicei/
Province of B.C. First Nations Clean Energy Business Fund	 Capacity Funding – up to a maximum of \$50,000 Equity Funding – up to a maximum of \$500,000 	https://www2.gov.bc.ca/gov/ content/environment/natural- resource-stewardship/ consulting-with-first-nations/ first-nations-clean-energy- business-fund
Federation of Canadian Municipalities Green Municipal Fund	 For studies/plans - up to 50% of eligible costs to a maximum of \$175,000. For pilot projects - up to 50 or 80% of eligible costs to a maximum of \$500,000. For capital projects - up to 80% of eligible costs, with a grant of up to 15% of the loan amount. Note: even though this funding program is called Green Municipal Fund, it is open to Indigenous communities 	https://www.fcm.ca/en/ funding

(table cont'd on next page>)

Appendix 2: Funding (cont'd)

FUNDER AND FUNDING NAME	AMOUNT/FUNDING AVAILABLE	LINK
Fortis BC Heat pump Rebate – Income Qualified	Max up to \$5,000 per heat pump	https://www.fortisbc. com/rebates/home/ iqheatpump?b=d99ccd66- 99be-4b5c-8eb2- d22105198c9e&l=
Natural Resources Canada Canada Greener Homes Grant	Max up to \$5,600 per home	https://www.nrcan.gc.ca/ energy-efficiency/homes/ canada-greener-homes- grant/start-your-energy- efficient-retrofits/eligibility- criteria/24450
		For Indigenous Governments: https://www.nrcan.gc.ca/ sites/nrcan/files/energy/ efficiency/Greener%20 Homes%20Grant%20 Form%20Indigenous%20 -%20EN-rr.pdf



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