# Enabling Energy Efficiency and Emission Reduction in Manufactured Homes

## Tools for Engaging Homeowners and Manufactured Home Park Owners

**Prepared for:**

CITY OF NANAIMO
THE HARBOUR CITY

REGIONAL DISTRICT OF NANAIMO

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dunsky
Energy + Climate

**Submitted to:**

**City of Nanaimo**

David Stewart
Environmental Planner, Sustainability
www.nanaimo.ca

**Regional District of Nanaimo**

Jessica Beaubier
Climate Change and Resilience Coordinator
www.rdn.bc.ca

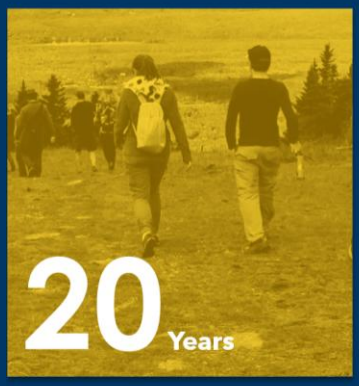
Dunsky Project Number: 24066

**Prepared by:**

**Dunsky Energy + Climate Advisors**
50 Ste-Catherine St. West, suite 420
Montreal, QC, H2X 3V4

www.dunsky.com | info@dunsky.com
+ 1 514 504 9030

## About Dunsky






Dunsky supports leading governments, utilities, corporations and others across North America in their efforts to accelerate **the clean energy transition**, effectively and responsibly.

With deep expertise across the Buildings, Mobility, Industry and Energy sectors, we support our clients in two ways: through rigorous **Analysis** (of technical, economic and market opportunities) and by designing or assessing **Strategies** (plans, programs and policies) to achieve success.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# EXECUTIVE SUMMARY

Manufactured homes are in a class of their own. They have distinct requirements for building code compliance, their operating cost structure is different than freehold homes, and their electricity infrastructure is provided by the community owner. Although heating costs are high, manufactured homes remain an important source of affordable housing. Despite this, this type of housing is rarely targeted by energy efficiency programs. This poses an equity challenge that exacerbates the issues of housing and energy affordability.

The City of Nanaimo (the City) and the Regional District of Nanaimo (RDN) engaged Dunsky Energy + Climate Advisors to develop tools tailored to support manufactured home residents and community owners. The overarching goal is to enable residents to improve the energy efficiency of manufactured homes in ways that will increase energy affordability while reducing greenhouse gas (GHG) emissions. These tools include:

A. An **outreach strategy** that defines the audience, key messages, design, and distribution considerations as the City and the RDN engage with manufactured homeowners and community owners and managers.

B. A **comprehensive and engaging educational guide** that provides information to enhance manufactured homeowners' and community owners' understanding of the benefits of fuel switching and energy efficiency measures. Further, the guide clarifies the process of navigating or enabling these upgrades and answers key questions and concerns.

Stakeholder engagement was essential to ensure that these two tools respond to the needs of manufactured home communities and leverage local expertise and resources. We undertook a multi-part engagement process with the City and the RDN to identify the barriers to these upgrades and potential solutions as identified by homeowners, community owners, and subject matter experts. This effort is summarized in:

C. An **engagement summary**, including the process, barriers for residents, community owners and installers as well as key content to inform the outreach strategy and educational guide.

The outreach strategy and guide aim to address educational barriers. For residents, these are barriers that, when addressed, are within their personal awareness and control. For manufactured home park (community) owners, it is to enable 'no regret' upgrades and reduce the uncertainty on electrical capacity assessment. The goal is to empower homeowners to move forward with heat pump and other energy-efficient upgrades, and to support park owners to enable those upgrades. However, there are barriers related to structural challenges (those outside of the homeowners' control) that these tools do not address.

This final report houses the content of the three project deliverables.

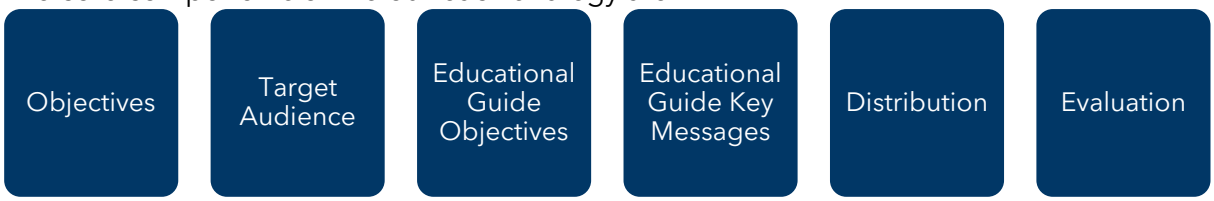
# Table of Contents

# 1. Manufactured Homes Outreach Strategy

## 1.1 Context

The City of Nanaimo and the Regional District of Nanaimo (RDN) engaged Dunsky Energy + Climate Advisors to develop an **outreach strategy** to encourage and help residents improve the energy efficiency of manufactured homes in ways that will benefit them economically while reducing greenhouse gas (GHG) emissions. This outreach strategy supports the development and distribution of the educational guide for manufactured home community owners and homeowners.

The core components of the outreach strategy are:




**Manufactured homes** are residential homes that is built off-site and then transported to a final location for installing. This definition does not include RVs.

## 1.2 Objectives

The outreach strategy objectives are:

1. To support manufactured home park landowners, managers and residents in fuel switching and improving the energy efficiency of manufactured homes.
2. To provide quality education and cost-effective, realistic solutions to reduce the likelihood that a resident is adversely impacted, financially or otherwise, by a decision to make an upgrade.
3. To provide residents, park owners, and managers with a clear understanding of potential electrical limitations and the necessary support to navigate capacity uncertainties.

The strategy will not provide guidance on activities or advocacy to address structural issues related to the electrical capacity and community legal structure with key players (BCH, Province, CleanBC, Residential Tenancy Branch, etc.) as outlined in the engagement memo, as it is outside the scope of this project.

## 1.3 Target Audience

This strategy is designed to support both manufactured homeowners and park owners/managers in the Nanaimo region as they navigate energy efficiency and fuel-switching decisions. By understanding the distinct needs and priorities of each group, we aim to provide relevant, accessible, and actionable information. While park owners and managers are **diverse** with a range of backgrounds and experiences, we have developed two general descriptions or 'personas' of the audience for this strategy. These descriptions represent **common characteristics that we heard in the engagement** process and are intended to provide more tangible context to inform the outreach. Further, by considering some more unique qualities (e.g., design for people who prefer printed materials over online resources), the outreach can reach a broader audience (e.g., people who prefer print *and* people who prefer online resources).

The statements below do not apply to all manufactured home owners or park owners/managers but capture general trends.

**Manufactured Homeowners**

- Late career or retired
- Prefer printed materials and trusted sources over online resources
- Affordability-focused, with some on fixed incomes
- Aware of heat pumps but may be uncertain about their relevance or benefits

**Park Owners & Managers**

- Based in British Columbia, often in the Nanaimo region
- Balancing rental income with maintenance and major upgrades, including electrical
- Capable professionals but not deeply familiar with community electrical infrastructure or manufactured home building science
- Interested in maintaining and improving homeowners' quality of life

### 1.3.1 Word choice

In the in-person session, we received feedback on word choice preferences. While not everyone in the room agreed, the following guidance was provided by one participant via email post-event:

"In your reports can you please not use the words: trailers, mobiles, parks, tenants, landlords, rent, pad fees." For those that live in these communities, the preferred terminology is: homes, homeowners, communities, landowners, land lease.

We are suggesting primarily using the language of primarily using the following word choices:

- Residents or homeowners (not tenants)
- Manufactured home communities (not manufactured home parks), unless the use of 'parks' provides more clarity given its current common use

## 1.4 Guide Objectives and Key Messages

Each guide will have focused objectives that will guide the key messages and content development:

### Homeowner

- To increase awareness of cost-effective energy efficiency upgrades, including air source heat pumps, and how to determine when they are appropriate for their home. Increased awareness includes benefits, costs, rebates, risks, and viability to allow the homeowner to move forward with an upgrade.
- To increase awareness of community electrical structure and considerations to support resdient to navigate engagement with community owner.
- To reduce the uncertainty on costs, equipment, technical needs, and contractors for residents interested in energy efficient upgrades to allow the homeowner to move forward with an upgrade.

### Park Owner or Manger

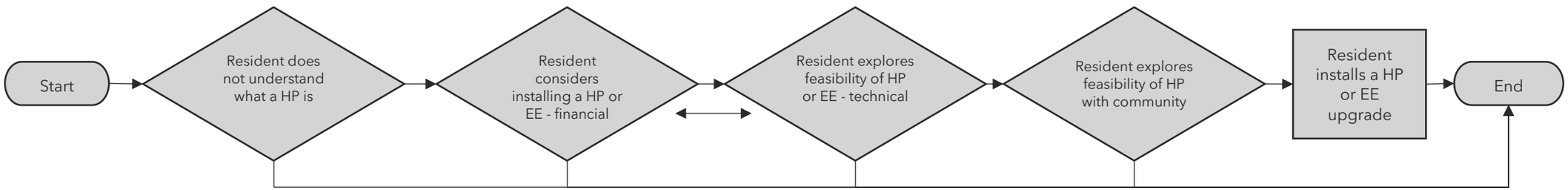
- To increase owner understanding of heat pump impact on community electrical capacity to enable more HPs to be installed.
- To increase owner understanding of the process to assess current capacity enable more heat pumps to be installed.
- To provide guidance on next steps to assess upgrades (if needed) to enable more heat pumps to be installed.
- To enable park owners to support manufatcured home owners to transition to more efficienct and lower emission energy sources and communicate park level electricial capacity needs effectively with manufatcued homeowners and heat pump contractors.

The following two sections outline the key messages that aim to meet these objectives by addressing key barriers. The key messages are intended to provide a high-level intention of the takeaways for the audience. The key messages are not the final wording but provide the guiding intention woven into the guide.

In general, the guide will provide readers with sufficient information to understand usual steps, questions, and barriers for retrofits in mobile homes, and guide conversations with technicians, but it will not include detailed technical guidance.

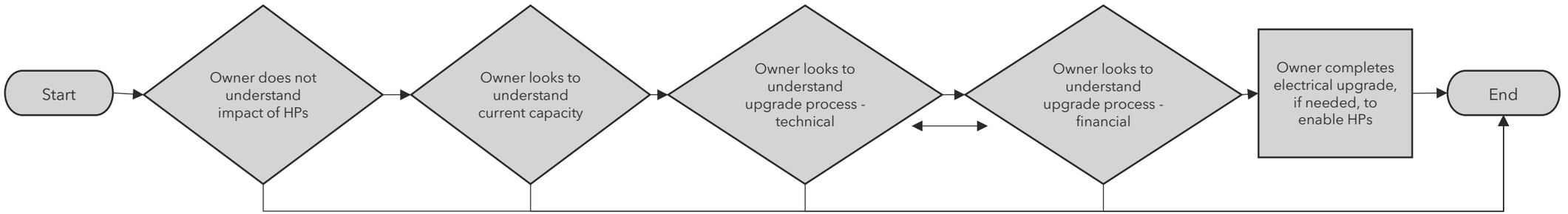
## 1.4.1 Key messages for residents

In the engagement memo, we defined which barriers would be addressed in the educational guide. To put the key messages and guide content in context, we have included a high-level summary of the customer journey, where barriers to heat pump (HPs) or energy efficient (EE) upgrades arise and the key messages and content that aim to mitigate those barriers.




| Stage | Resident does not understand what a HP is | Resident considers installing a HP or EE - financial | Resident explores feasibility of HP or EE - technical | Resident explores feasibility of HP with community |
|---|---|---|---|---|
| **Barriers addressed by guide** | • Lack of knowledge of HPs and rebates<br>• Noise concerns from HP equipment<br>• Poor view of HPs or favourable view of fossil fuels<br>• Limited online access/skills | • Lack of knowledge of HPs and rebates<br>• Investment in HP viewed as unreliable or a risky return on investment | • Lack of trust in or availability of trade professionals | • Community owners as gatekeepers |
| **Key Messages** | • HPs and other EE upgrades may save you money<br>• HPs provide comfortable heating and cooling<br>• HPs lower emissions; good for the environment | • You are likely eligible for rebates.<br>• Here's how to determine how much you would spend and save with an upgrade<br>• Here's how long HP's last and what conditions they work in | • Here's what to ask your contractor about an EE upgrade or HP install quote.<br>• Companion EE upgrades can improve comfort, too. | • It is important to talk to the park owner. Here's how to prepare.<br>• Parky owner may have valid capacity concerns and a valid reason to say no. |
| **Guide content** | • HP Basics (how it works)<br>• EE and HP benefits (AC, cost savings)<br>• Addressing myths/concerns (noise, backup fuel) | • HP rebate details and clarity on which ones are relevant for MH<br>• Case study with costs and savings<br>• Direction to Home Energy Navigator | • Qualified contractor list<br>• Navigating contractor relationship<br>• Technical considerations: current system, ducting, electrical capacity, siting, quality install<br>• Reminder to ensure maintenance | • Basic information on park elec. infrastructure ownership and potential limits (BCH vs. community vs. MH).<br>• How to approach/questions for community owner |

## 1.4.2 Key messages for park (community) owners




| Stage | Owner does not understand the impact of HPs | Owner looks to understand current electrical capacity | Owner looks to understand upgrade process - technical | Owner looks to understand upgrade process - financial |
|---|---|---|---|---|
| **Barriers addressed by guide** | • Lack of understanding of what an HP retrofit means for park capacity<br>• Concerned noise from HPs will impact other tenants | • Limited understanding of or ability to access current capacity availability/constraints<br>• Limited access to experienced electricians | • Limited access to reliable, trusted information on electrical upgrade process and costs | **Can be addressed in a future phrase of the project** |
| **Key Messages** | • HPs can save electrical capacity if switching from electrical heating<br>• A blanket no to HPs is not necessary.<br>• HPs can provide major benefits to residents (vs. other fuels/NG)<br>• It is important to be proactive because electrification is increasing.<br>• Here's what you need to ask for from an expert (electrician). | • Acknowledge the current and complex challenge (you're not alone).<br>• The first step is to understand the current capacity. Here's what you need to ask for from an qualified exprt<br>• Here's how to determine which experts (electricians) can support you. A blanket "no new demand" may or may not be valid. | • Here's what to ask your contractor to understand future demand and whether an upgrade is needed | |
| **Guide content** | • Information on electrical impacts from heat pumps and other electrical draws and their impact on electrical system operation risk. Identify no regrets options.<br>• Direction on what parks should consider or require when residents look to install heat pumps, including electrical information, noise, and siting. | • Spec sheet for electrical assessment to assess current capacity<br>• Guidance on how to understand the spec sheet and to understand expert feedback.<br>• Clarity on who to contact at BC Hydro to navigate capacity and upgrade questions (if provided by BC Hydro). | • Spec sheet for electrical assessment to forecast demand and determine if an upgrade is needed | |

## 1.5 Design Considerations

The educational guide will be provided in Microsoft Word format. The goal of the guide will be to be a two-to-four-page document, striving to be as concise as possible.

The design will follow Dunsky's general design guidelines that consider readability. The resident educational guide will consider that it will be easy to read (large, legible fonts), plain language, and ready for printing. Contact information will include telephone numbers and website, where feasible.

The resident and community owner/manager guides will be both included in one document. We will tailor the content for each audience but can be delivered and viewed as one.

## 1.6 Distribution

The City and Regional District of Nanaimo will be responsible for the planning or distribution of the education guide. Through the engagement process, we have identified some guidance to support the distribution.

**Resident considerations:**

- Printed versions are preferred and should be available at common locations. These locations can include community centres, libraries, senior centres. Community (park) offices may be a beneficial site, depending on the community.
- Electronic versions can be shared through the active Manufactured Home Owners Society (BCMHO), Home Energy Navigator (the regional energy concierge service), as well as through the City and RDN websites.

**Community owner/manager considerations:**

- Printed versions can be provided through the mail at the contact developed through the engagement process.
- Electronic versions can be distributed through the Manufactured Home Park Owners' Alliance of British Columbia (MHPO), as well as sharing the guide with other subject matter experts interviewed in the engagement process.
- There is an opportunity to share this project at the MHPO Spring Educational Conference in Nanaimo.

## 1.7 Evaluation

We recommend incorporating an evaluation component to determine the impact and success of the educational guide. Evaluation must be considered at the outset of the guide distribution planning. This section does not include a complete evaluation process, but we have included some metrics and strategies to support the evaluation.

**Example metrics**:

- Number of HPs installed in manufactured homes including original fuel and heating system.
- Number and type of EE measures installed
- Qualitative reports of reduced heating and cooling bills and/or bill cost concerns.

**Residents**:

- Assess if residents acted on HPs or EE measures following the guide. This could be assessed by requiring the Home Energy Navigator to ask questions on the guide when a participant is a manufactured homeowner.

- Assess change in awareness of HPs or EE measures following the guide. This could be assessed by providing a request for feedback in the guide. We suggest having one point of contact (phone and email) with a structured set of 3 to 6 questions to send to people who provide feedback and/or to categorize feedback.
    - Questions should be tailored to the key questions of interest. Some potential question ideas are: did you take action based on the guide and if yes, which action? Did you share the guide with a neighbour or park owner/manager? Which section was most useful? What is the guide missing?

**Owners**:

- Assess if owners or managers developed a clearer understanding of the current electrical capacity and/or scenarios where HP upgrades would not impact electrical capacity (e.g., replacing baseboards with a heat pump) through a follow-up survey.

# 2. Educational Guide

The educational guide for homeowners and community owners is provided as a separate design document titled **"Energy-Efficient Upgrades in Manufactured Homes: Guides for Residents & Manufactured Home Park Owners and Managers".**

# 3. Engagement Summary

## 3.1 Overview

The City of Nanaimo and the Regional District of Nanaimo (RDN) engaged Dunsky Energy + Climate Advisors to develop an **outreach strategy** to encourage and help residents improve the energy efficiency of manufactured homes in ways that will benefit them economically while reducing greenhouse gas (GHG) emissions. Following the outreach strategy, a comprehensive and concise **educational guide** designed by Dunsky will provide guidance and context to enable manufactured homeowners and community (park) owners. The guide aims to improve the understanding of the benefits of fuel switching, energy efficiency measures, and the process and key questions to consider and navigate these upgrades in manufactured homes and communities.

Stakeholder engagement is essential to creating an outreach strategy and educational guide that accurately reflects the needs of the manufactured home (MH) community while leveraging local expertise and resources.

The project team completed a multi-part engagement process to identify the unique barriers and challenges specific to manufactured home heat pump and energy efficiency upgrades. This memo summarizes the key findings and takeaways from the engagement effort to inform the outreach strategy and educational guide.

The following figure summarizes the **three consulted groups** and activities.

| MH Residents | MH Park Owners and Managers | Subject Matter Experts (SMEs) |
|---|---|---|
| • Survey<br>• Townhall (in-person) meeting<br>• Online group session | • Online survey<br>• Online group sessions | • Online group sessions |

## 3.2 Engagement Approach

### 3.2.1 Manufactured Home Residents

We engaged manufactured home residents through two informational feedback sessions. Invitations were provided through the park (community) owners and managers as well as through the BC Manufactured Home Owners Society (BCMHO). To encourage participation grocery store gift card was offered as a door prize for both sessions. The sessions took place on:

- January 7, 7 to 8:30 PM on Zoom, and
- January 8, 1 to 2:30 PM in-person at the Country Grocer (second floor boardroom).

The sessions had 18 online and 24 in-person participants.

### 3.2.2 Community Owners and Managers

We engaged manufactured home community owners and managers through an online survey and two online group sessions. Owners and managers were provided with an invitation to the survey via mail, email, phone calls, and in-person visits. Survey respondents were invited to the group sessions via email provided through the survey.

The online survey was available in late October and November 2024 through Survey Monkey and received 14 responses.

Two 60-minute online group sessions were held via Zoom on November 22 and 25, 2024, with four and two participants, respectively.

### 3.2.3 Subject Matter Experts

We engaged twenty SMEs to participate in 45-60 minute online interviews focused on the following key themes:

- Technical considerations to MH retrofits and HP installation (including stakeholders such as HVAC installers, electricians)
- Financial and educational considerations for MH retrofits and HP installation (all)
- Financials and key considerations in buying and owning a MH (realtors, BCMHO, MHPO).

The SME participants were:

| SME Group | Organization | Number of participants |
|---|---|---|
| Home Owners. | Active Manufactured Home Owners Society (BCMHO) | 2 |
| Park Owners Alliance | Manufactured Home Park Owners' Alliance of British Columbia (MHPO) | 2 |
| Realtors | Royal LePage, REMAX | 2 |
| Electrical Contractors | JLO Electrical, CAN Electric, Coastline Contracting | 3 |
| HVAC Installers | Service Excel, Norm's mobile | 3 |

| SME Group | Organization | Number of participants |
|---|---|---|
| Technical Experts | City Green Solutions (NGO focused on energy efficiency); EcoLighten Energy Solutions (HVAC design/engineering firm familiar with MHs) | 3 |
| Electrical Safety | Technical Safety BC | 1 |
| Electric Utility | BC Hydro | 4 |

## 3.3 Current Context

The engagement process aimed to collect an understanding of the current home heating and electrical situation in manufactured home communities across the Nanaimo region. We included questions on this context in the owner survey and in the resident polls. This section provides a summary of the results.

This process did not provide a comprehensive survey of all communities and homes. Likewise, we could not audit the accuracy of technical questions. Therefore, the results should be viewed as indicative but not precise. As the values do not represent all communities or homes, they cannot be used to quantify the scale of the fuel switching or efficiency opportunities, for example.

### 3.3.1 Park Manger Current Community Context: Survey Results

The owner and manager survey aimed to understand the **current heating and electrical capacity context** in communities and **planned upgrades**, as well as an invitation to the group sessions.

The survey reached 14 owners and managers out of 40 communities in the region. The communities ranged from 10 to 156 pads (with a median of 43 pads per community) and 17 to 325 residents (and a median of 60 residents), though not all communities reported the number of residents. The most common heating fuel is electricity (Figure 1).

When asked to **rank heating sources in terms of their prevalence in their communities' manufactured home**, electricity appeared as the most common heating fuel, followed by heating oil (Figure 1).

When asked **what the total community electrical capacity was**, nine of the 14 respondents did not know their community's current electrical capacity. Other responses ranged from 100A to 2,000A over three powerhouses.

When asked **what the typical pad capacity in their community was**, the majority of respondents (70%) indicated 100A as being the most common. The "Both" respondent indicated that their community had pads with both 60A and 100A (Figure 2).

**Figure 1: Prevalence of heating sources**

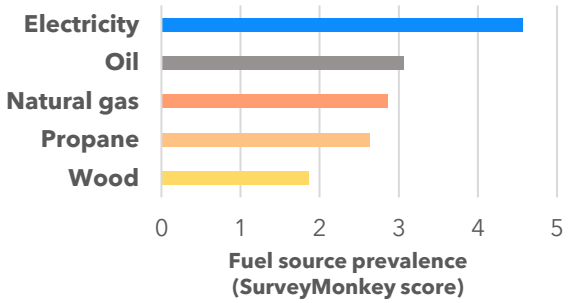
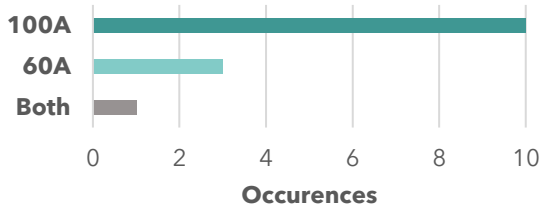



**Figure 2: Typical pad capacity**




Only one respondent had completed an electrical upgrade in the past five years, which was to make changes at individual sites to reduce the electrical capacity of a pad (50A down from 60A) to meet the Technical Safety BC requirement to enable new homes to be installed.

The respondent commented that they went this route to avoid "unaffordable" upgrades to the main service. Looking to the next five years, only 3 respondents were considering upgrades, driven by electrical demand including from heat pumps. However, in the comments, **multiple respondents indicated that part or all their electrical system was at capacity** and there was significant concern related to adding new demand from heat pumps and electric vehicles (EVs).

No landowner or manager indicated that they would be able to host a residents' engagement session. Many respondents indicated that it was because they did not have an onsite common space available.

### 3.3.2 Current Resident Context: Poll Results

During both engagement sessions, we conducted a resident poll aimed to collect information on current home comfort, heating and cooling systems, and electrical panel capacity. The polls were optional and anonymous. **The online session** had a shorter poll to minimize technical requirements for attendees on Zoom. The poll included four questions collected through the Zoom survey feature related to their current home. We received 17 responses from the 18 attendees, though not all respondents completed all responses. **The in-person session** had a longer survey with six multiple choice questions and one open-ended question. We received 17 responses from 24 attendees.

The following four questions include responses across **both** sessions.

When asked to **what heating sources they were using**, most respondents had homes that used either natural gas (48%) or electricity (39%) as their primary heating fuel (Figure 3).

The prevalence of oil heating is lower in this survey compared to the owner and manager survey. This difference could be due to the fact that owner and resident participants came from different manufactured home parks. Further, residents responded for their homes, whereas owners responded for the full manufactured home community, making it reasonable to have different responses.

When asked **what their electrical panel capacity was**, the majority of respondents (45%) had a 100A panel, though a large portion (38%) did not know their panel capacity. A smaller group indicated 200A capacity (Figure 4).

Residents who completed thein-person session, written survey indicated that while they have a 200A panel but "100A is what we get", indicating that the pad capacity is less than the panel capacity.

**Figure 3: Prevalence of heating sources**

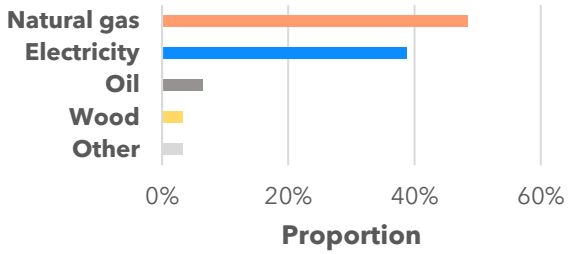
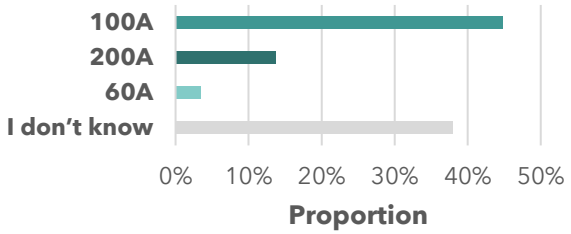



**Figure 4: Typical panel capacity**




When asked **about their heating bill during the winter**, most respondents (75%) indicated that it was not a concern. However, about 20% reported experiencing issues to varying degrees, including one respondent who mentioned that their heating bill causes distress (Figure 5). Just over a quarter of respondents (29%) had air conditioning (Figure 6).

**Figure 5: Impact of heating bill**

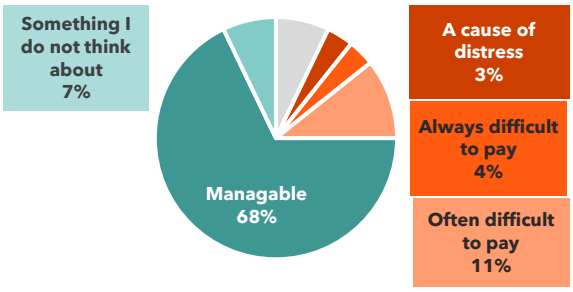
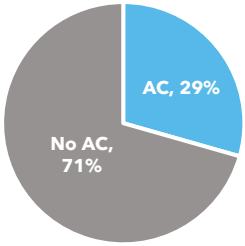
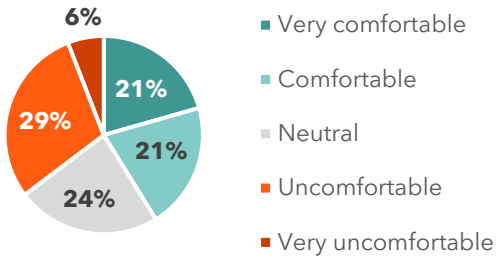



**Figure 6: Prevalence of AC**




Nearly a third (29%) of respondents indicated that their home was uncomfortable on really cold or hot days and one participant indicated that their home was very uncomfortable. Further, roughly a quarter were neutral on the topic. For the majority of residents, the results indicate that their home comfort needs are not being met. So, while many residents are able to comfortably navigate extreme temperatures, there is a significant portion that can not.

*Figure 7 Home comfort on very hot or very cold days*



## 3.4 Barriers for Residents

In the residents' sessions, we received insights into the **real-life experience** and challenges of installing or attempting to install, heat pumps. In the interviews, the subject matter experts (SMEs) raised a wide range of **barriers that manufactured home residents face** when installing heat pumps. We synthesized the feedback into a long list of barriers, which were identified in one or more sessions or interviews, and categorized them into three general types: technical, economic, and social. The detailed table of barriers is presented in Table 1. We reviewed the barriers for themes and counted the number of times that each barrier was mentioned in a engagement (either in a session or in an interview. A count of mentions should not deemphasize some important barriers that were only mentioned once by one participant but are helpful as an indicator of trends. The list of barriers and mentions is summarized in Table 1.

We found **four common barrier themes**. The count of mentions by theme is presented in Figure 8. To provide some additional context to these themes, we have included the most common barriers raised under each theme:

- **MH Community Structure**: social and technical barriers related to Manufactured Home (MH) communities (rather than an individual MH)
- **Resident perspective:** social barriers related to the residents' perspectives and experience
- **Business case:** primarily economic barriers that make the business case challenging to install a heat pump (HP)
- **MH Design:** technical barriers (including electrical panel capacity, HP demand) that are unique to MH, but can influence the economic barriers

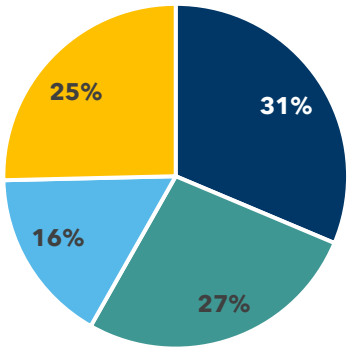



**Figure 8: Proportion of Barriers Indicated by Residents, Park Owners, and SMEs by Category**

Based on this engagement, the **top three barriers** are:

### MH community structure:

- This group had fewer barriers raised but is critical. The **park owner as a gatekeeper** was raised as a significant challenge. Landowners can require specific upgrades or fuels, deny upgrades and even refuse to sign paperwork required to access financing. Residents may not feel empowered to make changes and some are **hesitant to create conflict.**
- Considering the **risk of overloading community electrical services**, many communities currently **do not allow HP installs** due to electrical capacity concerns, creating a direct barrier that stems from often valid concerns. Residents raised a need for information sharing: whether wanting to contact **BC Hydro** to understand the community capacity or to have the community owner provide the information it had available.

### Resident perspective:

- Some residents **lack knowledge of HPs and associated rebates**, where HPs are not considered or not viewed as relevant. When considered, there is sometimes an expectation that the HPs would be free (i.e., a full rebate) or other uncertainties (including reliability, back-up fuel, and lifespan).
- The lack of knowledge is likely compounded by three other barriers: a **lack of trust and availability of qualified contractors** and a history of fraudsters targeting MH residents (particularly seniors), a **poor view of HPs** and/or a favourable view of fossil fuels, and a lack of **online access**.
- We also heard that **non-heating related costs** were significant – affordability and housing stability are bigger concerns than HVAC. In addition, there is a **resistance to change**, HP or otherwise.

> **Affordability is very real concern.** The community upgrades are a concern even beyond the MH retrofit. For example, we heard that one community owner spent millions upgrading electrical capacity for the community. These costs are collected in part through raised pad fees for residents by **$200/month**, leading to affordability issues for the residents.

### Business Case:

- **High upfront capital requirement** of HP upgrades (and HVAC, in general) is the leading barrier. This cost is sometimes driven by the less common, higher-cost equipment required to suit a MH.
- Capital cost concerns are exacerbated by **two** related barriers: **limited rebate coverage** (where MHs often have unique features that limit the costs that rebates can cover or residents are not certain if they are eligible, or may not be eligible if currently using electricity) and residents have **limited financing available** (and hesitancy to take on

debt). The **number** and **varying requirements** of rebate programs added to the uncertainty.

- Even if the upfront cost was manageable, HP upgrades are viewed as having a **risky return on investment**. Uncertainty in the costs (e.g., community disallowing HPs, unexpected costs, rebate expiry) and HP lifetime creates concern and hesitation. With the age of residents skewing older, some participants did not expect a return on investment in their lifetime.

### MH Design

The remainder of the barriers fall into the three themes that are related to the **unique nature** of MHs. MH have unique layouts, are designed in climates different from where they are located. These barriers were **raised by SMEs** and were not raised much at the residents' sessions, which does not necessarily reflect a lack of relevance, but that residents are not engaged in the detailed technical aspects of MH installs.

For example, a top barrier technical barrier as indicated by SMEs is the **increased heating, and therefore, electrical load for HPs** due to a poor envelope (and can create other complexities and costs) as well as **undersized ducting and limited space to replace or adjust ducting** that makes for a challenging HP sizing and install

A technical challenge related to the MH's electrical system includes the frequent requirement to have the CSA recertification of the MH's electrical system, leading to additional costs. These barriers are related to electrical impacts at the scale of the MH, not related to the MH impact on the community's electrical distribution.

**Community Voices**

Throughout our resident sessions, we heard compelling personal stories that offered valuable insights into lived experiences. These insights are captured in the barrier summary, but we believe **personal stories** are powerful reminders of the real-life experience. We have included a selection of stories to add depth to this review.

One resident wanted to replace their oil system with a HP. They were approved for a rebate. HVAC installer confirmed their MH has enough power, but the **community owner has stopped it,** potentially due to capacity issues or perceived capacity issues elsewhere in the MH community. The HVAC installer spoke with the park owner and didn't get a positive response and then the park owner stopped communicating entirely.

One resident was advised to go to **arbitration** over the landowner's decision not to allow a HP install, but they did not want to create **conflict** with the owner/manager.

One resident noted that new developments (e.g., the large new housing development in Nanaimo) will get sufficient BC Hydro electrical infrastructure because it is a new build and feels an **equity issue** with not having sufficient infrastructure investment for **existing** residential areas.

One resident had a ductless HP unit installed but it did not reach the **cold corners or one of their rooms**. Even with a HP, they noted, "I guess I will just use space heaters."

One resident has an electric furnace but noted that they installed a propane fireplace as a secure heat source during a **power outage**.

### 3.4.1 Solutions for Residents and Content for the Educational Guide

While this summary focused on **barriers**, we also included a selection of the **solutions** and **opportunities** noted in sessions and interviews:

- Some insurance companies require the replacement of the oil heating system, so some residents are actively investigating HVAC retrofits as an alternative to oil to meet insurance requirements, changing the business-as-usual business case.
- HP users to date are enthusiastic about them, praising their effectiveness.

Residents generally relayed positive experiences or **positive word-of-mouth** with heat pumps. However, grid reliability can affect this perspective and trust in fully electric systems. This reliability is top of mind given the recent extended power outages of the November 2024 windstorm.

In both residents' sessions, participants provided feedback what they would like to see included in the educational guide's content language and on its distribution.

Residents flagged the following **content** would be useful to include:

- General **description and facts** on HPs, including:
  - How HPs work
  - Lifespan
  - Noise
  - No requirement for a second fuel
- Guidance on what to consider when **exploring** an HVAC upgrade (including a HP):
  - Details on rebates confirmed to be available for manufactured homes in the region
  - Case studies and typical values for costs, incentives, bill savings, and payback periods
  - List of qualified contractors (that can ensure quality install such that rebate is received) + contact info
- Guidance on what to consider when **installing** a HP:
  - Navigating the contractor relationship (including asking for multiple quotes)
  - Selecting the right HP equipment
  - Ducting sizing/changes needed
  - Siting a HP (noise, flooding)
  - Ensuring quality installation (e.g., ample airflow; siting considerations for outdoor units; shielding/pad placement; surge protection; safe electrical connections)
  - Maintaining the HP (e.g., cleaning filters; ductwork for ducted systems; keeping outdoor unit free of debris; regular servicing; ensuring residents know how to use HP properly) to ensure lifespan
- Guidance on navigating the **conversation with the community owner or manager:**
  - How to approach the landowner or manager
  - What information to provide (current system size, home panel size, change in demand with HP addition, etc.)

    - Who to contact (flagged BC Hydro) to ask about community capacity and what alternate options they have with an unresponsive owner
- Clarity on **who to contact** with questions for all of the above

Residents were interested in seeing what would be given to the owners/managers, too.

To ensure the guide is **accessible**, residents preferred a large font size, including telephone numbers (not only websites) for all resources, and to ensure there is a printed version (not only an online PDF).

On **distribution**, residents flagged that the printed versions could be available through the Active Manufactured Home Owners Society (BCMHO), community centres, senior centres, and libraries. Some residents indicated that the park (community) owner or manger office would be a useful location, but other residents indicated it depended on the community and the relationship between owners and residents. An important source could also be the communities themselves – positive word-of-mouth among neighbours can be a powerful tool.

**On Word Choice**

In the in-person session, we received feedback on word choice preferences. While not everyone in the room agreed, the following guidance was provided by one participant via email post-event:

*"In your reports can you please not use the words "Trailers, mobiles, parks, tenants, landlords, rent, pad fees." For those that live in these communities the preferred terminology is* ***"Homes, homeowners, Communities, landowners, land lease."***

**Table 1 Resident barrier list and categorization with an indicator of which actor(s) raised the barrier**

| Barrier | Type | Resident engagement | Home Owners Assoc. | Park Owners Alliance | Realtors | Electrical Contractors | HVAC Installers | Technical Experts | TSBC | BC Hydro | Count (at least 2 mentions) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **High upfront capital requirements** | Economic | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | **6** |
| **Limited rebate coverage** | Economic | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | **5** |
| **Community owners as gatekeepers** | Social | ✓ | ✓ | | ✓ | | ✓ | | | ✓ | **5** |
| **Lack of knowledge of HPs and rebates** | Social | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | **5** |
| **Poor view of HPs or favorable view of fossil fuels** | Social | ✓ | ✓ | | ✓ | ✓ | ✓ | | | | **5** |
| **Lack of trust in or availability of trade professionals** | Social | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | **5** |
| **Resistant to (most) change** | Social | | ✓ | ✓ | ✓ | | | | | ✓ | **4** |
| **Investment in HP viewed as risky ROI** | Economic | ✓ | | ✓ | ✓ | | | ✓ | | | **4** |
| **Limited MH financing available** | Economic | | | | ✓ | ✓ | ✓ | | | | **3** |
| **Undersized ducting leads to difficult HP install** | Technical | ✓ | | ✓ | | | ✓ | ✓ | | | **4** |
| **Poor envelope increases retrofit complexity, heating load requirements and costs** | Technical | | | ✓ | | | ✓ | ✓ | | | **3** |
| **Risk of overloading community elec. services** | Technical | ✓ | | | | ✓ | | | ✓ | | **3** |
| **Noise concerns from HP equipment** | Technical | ✓ | | | | | | ✓ | | ✓ | **3** |
| **Unique MH electrical upgrades increase complexity and cost** | Technical | | | ✓ | | ✓ | | | | | **2** |
| **Insufficient physical space for HP equipment** | Technical | | | | | | | ✓ | | ✓ | **2** |
| **Disruptive retrofit** | Technical | | | | | | | ✓ | | ✓ | **2** |
| **Structural modifications lead to difficult HP install** | Technical | | | | | | ✓ | ✓ | | | **2** |
| **Limited home panel elec. capacity restrict HP install** | Technical | | | | | ✓ | | ✓ | | | **2** |
| **Limited online access/skills** | Social | | | | ✓ | ✓ | | | | | **2** |

## 3.5 Barriers for Park (Community) Owners and Managers

Through the group sessions, park owners and managers were reasonably **aligned** in the key concerns and interests. Broadly, we heard that owners and managers were supportive of enabling their residents to install heat pumps **theoretically**, noting the importance of cooling especially for seniors, interest in rebates, and increasing popularity. We also heard support for other energy efficiency upgrades that would reduce heating bills but not add to electrical demand. However, this **support was limited** when it came into conflict with the leading barriers. To note, participants in the session may be considered more proactive on this topic, rather than the owners and managers who declined to participate in either engagement.

However, in the group sessions and interviews, the owners, managers, and SMEs raised a wide range of **barriers that MH landowners face** to enabling or supporting HP retrofits. We synthesized the feedback into a long list of barriers, which were identified in one or more interviews, and categorized them into three general types: technical, economic and social. The detailed table of barriers is presented in Table 2.

**Many MH parks have HP policies in place today**

Concerns and uncertainty related to electrical capacity have led many communities to institute heat pump policies. We have not reviewed these policies, but summarize the feedback we received related to them.

Some communities require an application to be completed for a HP install, which are typically assessed on a case-by-case basis. One community will allow HP installs only where the resident is switching from electricity (furnace or baseboards), but not other fuels. Some communities have provided letters to residents directing them not to install heat pumps regardless of their current heating system. We heard from the resident engagement that in one community heat pumps were not allowed and could be subject to removal at the residents' expense.

We reviewed the barriers for themes as well as the count of mentions by participant, which were fewer in number as the focus of our interviews was primarily on the residents. A count of mentions should not deemphasize some important barriers that were only mentioned once by one participant but is helpful as an indicator of trends. The list of barriers and mentions is summarized in Table 2. We found **two common barrier themes**. The count of mentions by theme is presented in Figure 9.

**MH Community Electrical Capacity:** electricity-related technical barriers that are unique to MH communities, but can influence the economic barriers

**Business case:** primarily economic barriers that make the business case challenging to install a HP

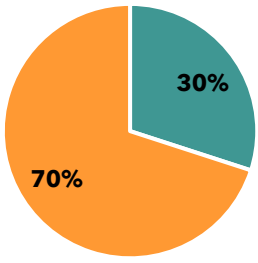



**Figure 9: Proportion of Barriers Indicated by SME Interviewees by Category**

To provide some additional context to these themes, we have included the most common barriers raised under each theme:

### MH Community Electrical Capacity

- Landowners were **very concerned that electrical upgrades were needed due to limited capacity** and that those upgrades are costly. This challenge is particularly acute for the many communities built in the 1970's when the was less electrical demand (more oil, less AC, etc.) and the availability of parts today is limited or requires entire replacement. Any electrical service issue could lead to longer blackouts due to the lack of parts in the market and/or elaborate repairs if parts are no longer produced.
- There is **significant uncertainty** in the current capacity and future needs in the whole or parts of the community. This uncertainty is due in part by a lack of familiarity of **how heat pumps would impact current capacity,** how it varies by current heat fuel, and uncertainty on other future loads (e.g., electric vehicles).
- Owners have difficulty obtaining an **accurate assessment of the current capacity** and how it varies across the community. Upgrades may or may not be necessary in the near-term, but owners have limited understanding and few **tools to assess need.** Owners who assume or have confirmed that upgrades are needed still have challenges getting **accurate costs and clarity on the process** to complete the upgrades. In contrast, natural gas can be viewed as a more **accessible option** where Fortis provides information sessions to encourage landowners to switch to natural gas and free infrastructure upgrades.
- We heard that some owners were not able to find contractors, particularly electricians, with expertise in manufactured home community systems and upgrades.
- While not directly related to electrical capacity, we heard that owners were uncertain on what they should or should not regulate (e.g., HP installation, noise, siting, etc.) and for any items that should be regulated by the park, which specifications are appropriate.

**Limited capacity** can vary even within a community. One interviewee noted that typically the panels inside MHs are properly sized (usually around 100-200 amps). However, electrical distribution equipment in MH communities feeding electricity to MHs can be very undersized – anecdotally, we heard mentions of **60 amps servicing multiple homes.**

### Business case

- Owners view investment in electrical upgrades as a risk because some view it as poor ROI, and for others there is not a clear understanding of what an electrical upgrade entails. Even if upgrades are completed, owners have **limited (and not guaranteed) means to recoup** electrical infrastructure upgrade costs. In order to recoup costs from rents, the owner would need to complete the upgrade and then submit a request to the Residential Tenancy Board (RTB) with the costs and rationale as to why the costs are valid. The RTB can approve or deny the ability for the owner to add costs to the rent. This approval creates significant uncertainty and risk because the owner must pay for all costs prior to applying. If the application is approved, costs will be passed on to MH residents.

- Many owners are taking a 'wait and see' approach, looking for others to upgrade first and learn from their experience including RTB decisions on whether electrical upgrade costs can be recouped through pad fee increases.

## 3.6 Solutions for Landowners and Content for the Educational Guide

While there are many challenges, stakeholders provided some solutions to the owner and manager barriers:

- Many residents and owners pointed to **the provincial government and BC Hydro to** provide support, financial and otherwise, to the landowners to navigate and complete the needed upgrades to allow these new technologies that are being promoted by the province, including HPs and EVs.
- Owners suggested the RTB should allow them to submit costs for approval before they were incurred
- Other **utility upgrades** are happening in communities today, which landowners flagged as a model for HPs and electrical upgrades. Telus' fiberoptic upgrade work required ongoing engagement with the landowners and managing disruptive work. Telus informed the community and then completed the work, without requiring owner request or funding.

Landowners and managers provided some guidance on the content they would like to see covered in the guide:

- Information on electrical impacts from heat pumps and other electrical draws and their impact on electrical system operation risk.
- Direction on what communities should consider or require when residents look to install heat pumps, including electrical information, noise, and siting.
- Guidance on how to collect accurate information on the communities' current electrical capacity, including how to navigate different feedback from different electricians or experts.
- Guidance on the process of assessing and completing electrical upgrades, and if there is a possibility or benefit of a staged approach.
- Indicative costs for upgrades, as well as guidance or support on how to recoup those costs through rent or other supports.
- Clarity on who to contact at BC Hydro to navigate capacity and upgrade questions.

**Table 2 Owner barrier list and categorization with an indicator of which actor(s) raised the barrier**

| Barrier | Type | Owners and Managers (Group Sessions) | Home Owners Assoc. | Park Owners Alliance | Electrical Contractors | HVAC Installers | Technical Experts | TSBC | BC Hydro | Count |
|---|---|---|---|---|---|---|---|---|---|---|
| **Limited community electrical service capacity** | Technical | ✓ | | | ✓ | ✓ | ✓ | ✓ | | **5** |
| **High cost of community electrical upgrades** | Economic | ✓ | ✓ | ✓ | ✓ | | | | | **4** |
| **Aging elec. infrastructure adds to upgrade costs and complexity** | Economic | ✓ | | ✓ | | | | | | **2** |
| **Limited means and uncertainty to recoup electrical infrastructure upgrade costs** | Economic | ✓ | | ✓ | | | | | | **2** |
| **Lack of understanding on what an HP retrofit means for community capacity** | Social | ✓ | | | | | | | ✓ | **2** |
| **Limited understanding of or ability to access current capacity availability/constraints** | Technical | ✓ | | | | | | ✓ | | **2** |
| **Limited access to reliable, trusted information on electrical upgrade process and costs** | Social | ✓ | | | | | | | | **1** |
| **Limited access to experienced electricians** | Social | ✓ | | | | | | | | **1** |
| **Investment in electrical upgrades is viewed as poor ROI** | Economic | | | | | | ✓ | | | **1** |
| **Uncertainty on what park owners should or should not regulate (installs, noise, placement, etc.) and how to do so** | Social | ✓ | | | | | | | | **1** |

## 3.7 Barriers to Installers

We focused our interviews on residents and landowners. However, some barriers are specific to the workforce that were raised. We have not summarized these barriers into themes. However, the most common barriers include:

- The **technical** barriers of a MH-specific retrofit expertise (including lack of ducting evaluation). Further, some installers consider back-up (gas) heating a requirement.
- The **social** barriers include a preference towards 'natural' gas and RNG rather than HPs. In addition, some noted that MH work was burdensome. The contractor qualification to install HPs was raised by landowners, though we did not hear this barrier from the installers themselves.

## 3.8 What We Heard Summary Shared with SMEs

For participating interviewees, we sent the brief 'What We Heard' summary below to participants via email in March 2025. This method acknowledges their contributions and fosters a sense of inclusion and engagement, which is crucial for building trust and ensuring the smooth implementation of project recommendations.

We also recommend that the City of Nanaimo and the Regional District of Nanaimo maintain communication with these groups to inform them of the outcomes of this project.

What We Heard:

- The leading barriers for residents are related to awareness and the cost.
- On awareness:
  - Residents are generally less familiar with HPs and associated rebates, where HPs are not considered or not viewed as relevant. When considered, there is sometimes an expectation that the HPs would be free (i.e., a full rebate) or other uncertainties, which may not or may not be the case depending on eligibility to provincial or federal programs.
  - This lack of knowledge is likely compounded by three other barriers: a lack of trust and knowing how to find qualified contractors and a history of fraudsters targeting MH residents (particularly seniors), a poor view of HPs and/or a favourable view of fossil fuels, and a lack of online access/capabilities that affects everything from accessing information necessary to determine loads through to applying for rebates.
- On costs:
  - High upfront capital requirement of HP upgrades (and HVAC, in general) is the leading barrier, as expected
  - Capital cost concerns are exacerbated by two related barriers: limited rebate coverage (where MHs often have unique features that limit the costs that rebates can cover) and residents have limited financing available (and hesitancy or inability to take on debt)
  - Even if the upfront cost was manageable, HP upgrades are viewed as having a risky return on investment for MHs
- Other barriers are related to the unique nature of MHs and their communities. The landowner is a key player in enabling or discouraging HP retrofits.
- There are a range of technical barriers including poor envelope increasing heating load requirements (and other complexities and costs). Similarly, undersized ducting that makes for a challenging HP install and poor heat pump performance if installed poorly.
- The leading barriers for landowners include electrical upgrades and the business case:
  - Owners are concerned that electrical upgrades were needed due to limited capacity and that those upgrades are costly. This challenge is particularly acute for the many communities built in the 1970's under a previous electrical code and the availability of parts today is limited or requires entire replacement.
  - Investment in electrical upgrades viewed as poor ROI, and there is not always a clear understanding of what a HP retrofit entails. Even if upgrades are completed, owners

have limited (and not guaranteed) means to recoup electrical infrastructure upgrade costs.

- On solutions:
  - There are examples of how to upgrade utilities today, such as Telus' engagement with community owners to upgrade fiberoptic in communities.
  - There is a current shift away from oil due to insurance requirements which could support proactive heat pump installations, lead to significant GHG emission reduction and cost savings in MH communities by changing the business-as-usual business case.
  - Education/awareness-building for landowners and residents on questions to ask during heat pump installations.
  - Some raised a desire for financial and policy support to landowners from the Province and BC Hydro to complete park electrical upgrades.

## 3.9 Barriers Addressed and Considerations for Future Work

This section outlines the barriers that were addressed through the educational guide. The barriers that are not covered by the current project scope could be addressed in a future project phase.

### 3.9.1 Barriers Addressed in the Educational Guide

The educational guide is designed be a document that includes both the resident and owner/manager guidance. This approach ensures it will play a role in fostering understanding and reducing friction between residents and community owners. The guide provides clarity on HPs to encourage fuel switching and improve the energy efficiency of manufactured homes. While the guide provides clarity regarding electrical capacity limitation in parks, it cannot solve this issue, which is structural in nature (e.g., limited electrical capacity, limited means and uncertainty to recoup electrical infrastructure upgrade costs, etc.).

#### 3.9.1.1 Resident Educational Guide Content

For the resident guide, we focused on it providing:

1. Key information to **enable HP and EE upgrades where possible** and
2. Context to **understand the potentially valid electrical limitations** with support to **navigate community owner engagement**.

For residents, we focused on the following content and barriers content which are appropriately tackled through education:

- **Resident perspective**: addressing key facts (and misconceptions) related to heat pumps; identify 'no regret' upgrades based on current heating fuel; include short list of other energy efficient retrofits.
    - **Barriers addressed**:
        - Lack of knowledge of HPs and rebates
        - Noise concerns from HP equipment
        - Poor view of HPs or favourable view of fossil fuels
        - Limited online access/skills
        - Lack of trust in or availability of trade professionals
- **Business case**: provide high-level costs and guidance on rebates. Note: the guide will provide education on costs, though will not fundamentally address the business case barrier
    - **Barriers addressed**:
        - Lack of knowledge of HPs and rebates
        - Investment in HP viewed as risky ROI
- **MH community structure:** provide information on MH community electrical arrangement and valid community owner concerns; identify questions and information to engage with the community owner/manager
    - **Barriers addressed:**
        - Community owners as gatekeepers

These barriers are within the resident's personal perspective and awareness. The goal of the guide is to empower MH residents to understand HP benefits, understand the parks' potential electrical constraints, and how to move forward with HP and EE upgrades. This guide **does**

**not** provide support to residents who live in communities **with current HP bans** or have incommunicative community owners/managers.

#### 3.9.1.2 Community Owners and Managers Educational Guide Content

For the community owner and manager guide, we focused on addressing the **MH Community Electrical Capacity**, particularly in providing landowners and managers with the **information and support to navigate the electrical capacity uncertainty** many communities are experiencing. This effort focuses on enabling "no regret" HP installations and providing a pathway to enable broader HP adoption. For this guide, we focused on the following content and barriers:

- **MH Community Electrical Capacity**: highlight the value of HPs for residents and the importance of preparing for increasing electrification; highlight why a blanket "no heat pumps" policy is overly restrictive and the value of accommodating no-regret cases; how to assess community electrical capacity, forecast future needs, and plan upgrades. Include detailing the scope of a quality electrical assessment.
    - **Barriers addressed**:
        - Lack of understanding on what an HP retrofit means for park capacity
        - Limited understanding of or ability to access current capacity availability/constraints
        - Limited access to experienced electrician
        - Limited access to reliable, trusted information on electrical upgrade process and costs

We did not address the business case barrier, as this barrier is secondary to the current primary barriers around uncertainty, planning and misconceptions of demand. However, the guide covers the electrification context and the importance of being proactive in addressing electrical needs.

### 3.9.2 Structural Barriers Remaining and Recommendations for Phase Two

While the educational guide sets a strong foundation for decarbonization of manufactured homes, it does not address the structural barriers. We heard clearly from residents and manufactured home park owners that there are barriers that need to be addressed to enable widespread, equitable access to heat pumps.

We address the educational barriers to electrical capacity. The guide will enable owners/managers to have a better understand of the current situation and future needs. The understanding of current capacity may enable higher HP adoption in some communities. For many (and likely most) parks, some upgrades are needed, which requires planning and investment. The challenges are the responsibility of the park owner, yet, until addressed, create a further barrier to homeowner action. The park owner and manager barriers identified but are not yet addressed include:

- **MH Community Electrical Capacity**:
    - Limited community electrical service capacity
    - High cost of community electrical upgrades
    - Aging elec. infrastructure adds to upgrade costs and complexity
- **Business Case**:

- Limited means and uncertainty to recoup electrical infrastructure upgrade costs
- Investment in electrical upgrades is viewed as poor ROI

There are additional structural barriers not addressed in this guide. As manufactured homes have a different treatment through building code and financing institutions, there are barriers that cannot be addressed through education:

For residents:

- **MH Community Structure:**
  - Community owners as gatekeepers (partially addressed in educational guide)
  - Risk of overloading community elec. services
- **Business case**:
  - High upfront capital requirements
  - Limited MH financing available

To note, the MH design barriers are not fully addressed in the educational guide but are not flagged as focus of a second project phase. These design barriers create challenges to completing upgrades and should be considered. However, the structural barriers create a major (often complete) block to upgrades that must first be addressed.

**We recommend that a next phase of the project should pivot toward addressing structural barriers through targeted outreach to key players**, such as BC Hydro, the BCUC, BC's Residential Tenancy Branch, and the provincial government. This work would focus on developing potential solutions at the City and Regional scale, as well as key advocacy points and solutions for other actors.

For example, phase two project content include:

- **A brief report** summarizing stakeholder insights and highlighting necessary steps before widespread education (e.g., assessing park capacity, financing upgrades).
- **Recommendations** for program support, from BC Hydro, CleanBC to assess park capacity and allow for upgrades.
- **Potential ownership models** where BC Hydro manages electrical systems in MH parks.
- **Proposals for municipal actions**, such as by-laws preventing blanket heat pump bans without proper capacity assessments.
- **Proposals for provincial actions**, such as manufactured home park parallels for changes made to the *Strata Act* to a) ensure that individual residents have a higher chance of having their request for EV charging or a heat pump approved or b) require electric planning report (EPR) requirement
- **An electrical capacity scan** of MH parks to determine park capacity and the typical cost of electrical upgrades.

# Appendix A

# Detailed summary of barriers for MH residents to HP retrofits, as raised by residents and SMEs.

**Table 3 Detailed summary of barriers for MH residents to HP retrofits, as raised by residents and SMEs. Select items of interest in orange.**

| Actor | **Technical** *Unique technical challenges to installing or operating HPs in MH* | **Economic** *Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **Resident sessions** | **Risk of overloading park elec. services [technical or social depending on the park owner reason]**: Several residents were **approved for grants and/or had engineers/contractors** confirm capacity and suitability, but HP was not allowed by park owner. Many parks do not currently allow HPs and some state that new HPs installed after the notice will be required to be removed. Also, multiple respondents have a 200A panel but only get 100A from park. Many flagged that EVs will be causing similar challenges in the near future,<br><br>**Noise concerns from HP equipment:** residents had questions on the noise level from HPs<br><br>**Undersized ducting leads to difficult HP install:** one resident had a ductless system but found it drafty and uncomfortable. Other noted that ductless unit did not reach cold corners and **planned to use space heaters to suppliant.** | **High upfront capital requirements:** Residents noted that the high capital cost is challenging for installation. Some noted the high cost of some MH-specific HP equipment (including HP water heaters)<br><br>**Investment in HP viewed as risky ROI:** Residents wanted rough estimates cost of different types of HP (e.g., ducted vs. ductless), incentive amount, bill savings and payback period. The high upfront cost presents a major risk, especially with changing park HP policies (new HPs not allow, and **removal required**), changing rebates (i.e., if park approval takes a long time, and the rebate approval expires and needs a reapplication). | **Land owners as gatekeepers:** Perception of land owners as 'bottlenecks' in enabling HPs and in communication. On communication, owners either not trusted or there is not an established system. In some parks, there appears to be pre-existing strained relationships that pre-dates HPs, but HPs are a new source of tension. Residents felt that any electrical capacity information land owners/managers have should also be shared with park residents. Perception that land owners are reactively saying 'no' without complete information.<br><br>**Lack of trust in or availability of trade professionals:** Contractors may be uncertain of park capacity, which can tip scales to other fuels, or not have MH expertise which can lead to improper installation/siting (e.g., placement in flooding area)<br><br>**Lack of knowledge of HPs and rebates:** residents sought clarity on second/backup fuel requirement, HP lifetime, electrical impact of HP relative to other items (window AC), sizing and design for their home.<br><br>**Limited rebate coverage:** Residents perceived that they not were eligible for rebates, considering some HP rebates are not available for MHs.<br><br>**Poor view of HPs or favorable view of fossil fuels:** some residents had concerns about **reliability during power outages** (incl. long storm outages) |

| Actor | **Technical**<br>*Unique technical challenges to installing or operating HPs in MH* | **Economic**<br>*Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **Home Owners Assoc.** | | **High upfront capital requirements** (many have lack of financial means to access financing; some financially conservative and uninterested in taking on new debt)<br><br>**Non-heating related cost concerns or priorities** (affordability is the primary motivator over upgrades or climate concerns; park redevelopment can lead to pressure to sell or, if lack of agreement home can become worthless; concerns of potential pad fee increases due to park electrical capacity upgrades) | **Competing priorities for MH upgrades** (if owners are able to make an upgrade, HVAC systems not a priority)<br><br>**Resistant to (most) change** (HVAC viewed as new system that requires learning)<br><br>**Land owners as gatekeepers** (some owners difficult to contact; some owners focus on aesthetics (paint colour) rather than HVAC; onsite managers are not always decision makers)<br><br>**Lack of trust in or availability of trade professionals** (Cautious of fraudsters targeting seniors in MH parks)<br><br>**Poor view of HPs or favourable view of fossil fuels** (Natural gas viewed as 'clean'; Many still believe natural gas is "clean," influencing heating choices) |
| **Park Owners Alliance** | **Undersized ducting leads to difficult HP install** (difficult Installation due to the volumetric size of ducting being insufficient in matching HP capacity)<br><br>**Poor envelope increases retrofit complexity, heating load requirements and costs** (some homes are older, not well maintained, increasing exacerbate retrofit costs.)<br><br>**Unique MH electrical upgrades increase complexity and cost** (Some homes need electrical recertification, increasing costs. Land owners can require recertification for HP install) | **High upfront capital requirements** (Limited or no capital for HP retrofits; many residents are seniors or low-income)<br><br>**Investment in HP viewed as risky ROI** (Some owners do not see future value in HP or other HVAC upgrades) | **Resistant to (most) change** (Little motivation to switch to HPs)<br><br>**Lack of trust in or availability of trade professionals** (limits pool of contractors to do HP work)<br><br>**Lack of knowledge of HPs and rebates** (HP not feasible for extreme temperatures; considered a deterrent to HPs) |

| Actor | **Technical**<br>*Unique technical challenges to installing or operating HPs in MH* | **Economic**<br>*Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **Realtors** | | **High upfront capital requirements** (many have lack of financial means to pay or to access financing, so upgrades not priority; many owners are debt adverse /proud to own without debt)<br><br>**Investment in HP viewed as risky ROI** (**upgrade requires higher sale costs, which limits pool of buyers who are in MH market for lower prices**)<br><br>**Limited MH financing available** (**mortgages only available at two banks – TD and RBC**; land owners may choose not to sign form required for mortgage, limiting to cash buyers) | **Lack of knowledge of HPs and rebates** (familiar rebates exist, but little else; uncertain which HP is appropriate for their MH and is rebate eligible)<br><br>**Land owners as gatekeepers** (larger retrofits, which can include HPs, require park owner approval; **land owners may choose not to sign form required for mortgage, limiting to cash buyers**)<br><br>**Lack of trust in or availability of trade professionals** (Cautious of fraudsters targeting seniors in MH parks)<br><br>**Resistant to (most) change** (work with what they have (make do); mental block to renovations; significant level of effort required to complete a retrofit)<br><br>**Limited online access/skills** (online-only information and rebates not accessible ("daunting") to old owners)<br><br>**Poor view of HPs or favourable view of fossil fuels** (Natural gas is considered cheaper to operate compared to electricity) |

| Actor | **Technical**<br>*Unique technical challenges to installing or operating HPs in MH* | **Economic**<br>*Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **Electrical Contractors** | **Limited elec. capacity restrict HP install** (MH panel does not have capacity to install a HP)<br><br>**Risk of overloading elec. services** (overloads from heating can cause other electrical systems in MH to shutdown; can require creative solutions that require park owner permission)<br><br>**Unique MH electrical upgrades increase complexity and cost** (breakers as expensive as panels; unique/specific equipment can be high cost; panel upgrade costs partially or not covered, including CSA stickers, Silver Labels and re-inspections) | **Limited MH financing available** (not commonly used by clients)<br><br>**Limited rebate coverage** (only fuel-switching panel upgrades eligible; only high eff HPs eligible)<br><br>**Drawn-out rebate process** (application approval delays are significant. Phasing out oil systems and switching to HPs can take several months). | **Poor view of HPs or favourable view of fossil fuels** (contractors pushing dual [HP + gas] fuel currently, especially due to rebates and rising electricity costs)<br><br>**Limited online access/skills** (older residents lack online access, complicating efforts to retrieve technical safety and historical data) |
| **HVAC Installers** | **Undersized ducting leads to difficult HP install** (ducting system designed for gas, undersized for HP, can increase retrofit cost; excess noise problem)<br><br>**Poor envelope increases retrofit complexity, heating load requirements and costs** (installers specifically flagged impact of heating load calculations due to lack proper insulation and membranes)<br><br>**Structural modifications lead to difficult HP install** (modified in ways that make installations difficult) | **Limited rebate coverage** (elec. upgrades make a substantial portion of upfront costs, not covered by rebates; owners often back out after finding out upfront costs not covered)<br><br>**Limited MH financing available** (financing is new; 3-4 years ago financing for MHs wasn't available)<br><br>**Structural modifications make MH ineligible for rebate** (modified in ways that make ineligible for rebates, such as MHs have a whole another unit on top of original) | **Lack of trust in or availability of trade professionals** (previously out of province installers with poor work)<br><br>**Poor view of HPs or favourable view of fossil fuels** (preference from owners to switch to propane or gas from oil, not HPs)<br><br>**Park owner as gatekeeper** (not willing in invest in upgrades, making HP install difficult; difficult communication between MH owner and park owner; owner may force rapid fuel system changes from oil to propane, creating financial and logistical pressure on homeowners.)<br><br>**Lack of knowledge of HPs and rebates** (Homeowners expect "free" HPs due to advertising and word of mouth of out-of-prov improper installs) |

| Actor | **Technical**<br>*Unique technical challenges to installing or operating HPs in MH* | **Economic**<br>*Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **Technical Experts** | **Poor envelope increases retrofit complexity, heating load requirements and costs** (not designed for correct climate zone with poor performing envelops, unreliable/damaged ductwork that leads to increased enabling work; no moisture barrier, leading to condensation)<br><br>**Structural modifications lead to difficult HP install and heating load req.** (poor performing/non-code compliant additional sections which need to be considered when calculating heating loads; does not allow ductless options to be used; ducting can also be damaged during a transport)<br><br>**Limited elec. capacity restrict HP install** (some MHs do not have capacity to install a HP, for example, if switching from oil)<br><br>**Undersized ducting increases retrofit complexity and costs**<br><br>**Insufficient physical space for HP equipment**<br><br>**Disruptive retrofit** (HVAC/HP installs are disruptive, invasive to a household)<br><br>**Noise concerns from HP equipment** | **High upfront capital requirements** (high costs of HP retrofits)<br><br>**Investment in HP viewed as risky ROI** (owners don't see pay off in their lifetime)<br><br>**Limited rebate coverage** (poor insulation quality makes rebates ineligible; system design can be a large cost and not covered) | **Lack of load management behaviour and knowledge**<br><br>**Lack of knowledge of HPs and rebates** (unclear what rebate will be covered and which HPs and work can be covered; Filter cleaning viewed as challenging; Upgrades without sufficient preparation: owners engage in HP retrofits without understanding bylaws and their specific requirements.) |

| Actor | **Technical**<br>*Unique technical challenges to installing or operating HPs in MH* | **Economic**<br>*Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **TSBC** | **Risk of overloading elec. services**<br><br>**Uncertainty of real load requirements** (may overestimate load when doing load calculations; difficult to collect neighbour data on the same park panel) | **High upfront capital requirements** | |
| **BC Hydro** | **Insufficient physical space for heat pump equipment**<br><br>**Disruptive retrofit** (installation process is disruptive/invasive in a household)<br><br>**Noise concerns from HP equipment** (from condenser units) | **Limited rebate coverage** (fuel switching not covered under the program; low rebates and presence of better alternative programs have led to drop in program participation)<br><br>**Poor envelope increases HP operational costs** | **Resistant to (most) change** (HPs are new to North America)<br><br>**Park owner as gatekeeper** (difficult communication between MH owner and park owner) |

# Detailed summary of barriers for MH owners to enabling HP retrofits, as raised by owners/managers and SMEs

**Table 4 Detailed summary of barriers for MH owners to enabling HP retrofits, as raised by owners/managers and SMEs. Select items of interest in orange.**

| Actor | **Technical** *Unique technical challenges to enabling HPs in MH* | **Economic** *Financial barriers to enabling HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| **Land owners and Managers** | **Limited park electrical service capacity** (Owners had concerns of overloading the current system and powerhouses, which can vary across the park.)<br><br>**Aging elec. infrastructure adds to upgrade costs and complexity (**Old infrastructure also means there is a major risk of a catastrophic failure due to the length of time to replace equipment that is no longer commonly available or available at all.) | **High cost of park electrical upgrades** (Comprehensive upgrades are major costs, often $100-200k)<br><br>**Limited means and uncertainty to recoup electrical infrastructure upgrade costs** (Owners must pay costs before asking the tenancy board for a rental increase, a major risk. Limited ability to increase rents in recent years. Some see their role as providing affordable housing and rent increases could be challenging for some residents.) | **Lack of understanding on what an HP retrofit means for park capacity** (some owners uncertain on impact, even if switching from electricity. Uncertain on what the impact is for one or multiple HPs on their powerhouses).<br><br>**Limited access to reliable, trusted information on electrical upgrade process and costs** (Owners found it difficult to get clear, trusted information on current electrical system capacity and required upgrades (scope, length, stages or process). Received different opinions and misinformation. Uncertain who to contact at BC Hydro. Noted that Telus FiberOp upgrades were a good example of infra. Upgrade support.)<br><br>**Limited understanding of or ability to access current capacity availability/constraints** (Owners unsure of how to accurately determine current electrical situation)<br><br>**Limited access to experienced electricians** (few have MH park experience, some will retire) |
| **Home Owners Assoc.** | | **High cost of electrical upgrades** | |
| **Park Owners Alliance** | | **High cost of electrical upgrades** (upgrades may be needed to the power source which can include new buildings, upgrading telephone poles and transformers; underground utilities/wires costly to upgrade) | |

| Actor | **Technical** *Unique technical challenges to enabling HPs in MH* | **Economic** *Financial barriers to enabling HPs in MH* | **Social** *"Soft" challenges, including education, personal priorities, communication, access to expertise, etc.* |
|---|---|---|---|
| | | **Aging elec infras. adds to upgrade costs** (need to upgrade from 60A panels; limited availability of switches/breakers for older systems)<br><br>**Limited means to recoup elec. infra. upgrade costs** (rent control; **infra-related increases improved on a case-by-case basis POST installation by external panel**) | |
| **Realtors** | n/a | n/a | n/a |
| **Electrical Contractors** | **Limited electrical service capacity** (4-5 services for 10-12 homes). | **High cost of electrical upgrades** (underground services complex to upgrade) | |
| **HVAC Installers** | **Limited electrical service capacity** (panels in parks feeding electricity to MHs often undersized and lack sufficient elec. capacity: 60 amp vs. 100-200 amp needed vs. MH have proper size panel) | | **Limited understanding of or ability to access current capacity availability/constraints** Installers framed this is a solution for HPs to to take the same approach as Fortis, which offers information sessions to educate homeowners and land owners about the benefits of switching to gas from oil. This educational effort could be make natural gas more accessible from an informational perspective. |
| **Technical Experts** | **Limited electrical service capacity** | **Investment in elec. upgrades viewed as poor ROI** (Land owners don't see value in upgrading the park's electrical capacity and are set in their ways) | |
| **TSBC** | **Limited understanding with current capacity availability/constraints**<br><br>**Limited electrical service capacity** | | |
| **BC Hydro** | | | **Lack of understanding on what a HP retrofit entails** (land owners think that HP installations always lead to park capacity exceedances, which is not the case when going from elec resistance -> HPs.) |

# Detailed summary of barriers for MH HVAC installers, as raised by SMEs

**Table 5 Detailed summary of barriers for MH HVAC installers HP retrofits, as raised by SMEs**

| Actor | **Technical** *Unique technical challenges to installing or operating HPs in MH* | **Economic** *Financial barriers to installing or operating HPs in MH* | **Social** *"Soft" challenges, including education, communication, access to expertise, etc.* |
|---|---|---|---|
| **Home Owners Assoc.** | n/a | n/a | n/a |
| **Park Owners Alliance** | | | **Contractor qualification** (limits pool/availability of contractors) |
| **Realtors** | n/a | n/a | n/a |
| **Electrical Contractors** | **Technical Safety BC concerns** (it is a big process to get the MH up to code)<br><br>**Contractors hesitant to install HPs without a backup heating system.** | | **Contractors find MH work burdensome** |
| **HVAC Installers** | **Duct evaluations not common** (should be conducted before recommending a system. However, contractors do not all follow a standardized approach for this and can be slow to implement changes)<br><br>**Tight spaces** (minor issue)<br><br>Few **MH-specific models** available and/or limited experience with the needs for MHs | | **Preference towards gas/RNG** (Technicians believe HPs can be made to work in MHs, but their efficiency will be lower than alternate systems such as RNG furnaces since MHs built to accommodate such tech) |
| **Technical Experts** | **Lack of expertise in MH-specific retrofits** | | |
| **TSBC** | n/a | n/a | n/a |
| **BC Hydro** | n/a | n/a | n/a |

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