Resilient but Not Ready

Affordability, trade and workforce barriers limit Alberta's retrofit supply chain

June 2026

Raidin Blue, Ceileigh McAllister, Kevin Lockhart

PEMBINA Institute

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ALBERTA ecotrust

The Pembina Institute recognizes that the work we steward and those we serve span the lands of many Indigenous Peoples. We respectfully acknowledge that our organization is headquartered in the traditional territories of Treaty 7, comprising the Blackfoot Confederacy (Siksika, Piikani and Kainai Nations); the Stoney Nakoda Nations (Goodstoney, Chiniki and Bearspaw First Nations); and the Tsuut'ina Nation. These lands are also home to the Otipemisiwak Métis Government (Districts 5 and 6). These acknowledgements are part of the start of a journey of several generations. We share them in the spirit of truth, justice and reconciliation, and to contribute to a more equitable and inclusive future for all.

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Key terms

5As framework: Developed by the Government of Canada and Navigant Consulting, the 5As framework is a sequential barrier classification system for supporting market transformation of energy-efficient technologies.

1. **Availability**: Does the technology exist?
2. **Awareness**: Does the market know about the technology?
3. **Accessibility**: Does the market have easy access to the technology?
4. **Affordability**: Is the technology affordable?
5. **Acceptance**: Are the technology's form, fit, and function acceptable?

Deep retrofits: Similar to whole-building retrofits but with a goal of reducing energy use by 50% or more; one deep retrofit can move a building towards net-zero.

Distributor: Purchases products from manufacturers and sells them to retrofit service providers.

Incremental retrofits: Reduce energy use by less than 50%; multiple incremental retrofits must be performed on the same building to unlock net-zero.

Installer: Purchases products from suppliers and installs them for building owners.

Manufacturer: Produces or assembles equipment and products.

Supplier: An umbrella term for a provider of products, which could be a manufacturer but is most commonly a distributor; supplier is also used for organizations that supply parts to manufacturers to build their products.

Whole-building retrofits: A holistic approach to retrofitting that involves the comprehensive and interrelated improvement of multiple building systems at once, or over time, in a planned, deliberate manner.

Executive summary

Context

Alberta's retrofit market is maturing, with early signs of innovation, leadership, adaptability, and progress. To further increase the scope and scale of retrofits, a robust and resilient supply chain is critical. This research identifies key barriers within Alberta's supply chains for both retrofitting and constructing high-performance multi-unit residential buildings. It also explores where key equipment, products, and materials are manufactured and the supply routes they take to reach Alberta. This analysis of the retrofit supply chain highlights pressures faced by market participants and reveals opportunities for domestic production.

Opportunities

Revitalizing and upgrading Alberta's building stock through retrofits offers a direct path to more comfortable, affordable, and climate-resilient homes, while also creating significant economic opportunities for the province and retrofit industry. Modelling presented in this report explores supply chain needs and helps establish a clear provincial pathway for achieving net-zero residential buildings by 2050 through scaling retrofits 4–5% annually following a phased approach.

Challenges

While Alberta's retrofit industry has demonstrated adaptability and resiliency, it risks stagnation and the loss of significant economic opportunities without targeted intervention. Several supply chain challenges threaten progress, including the following:

- Existing skills and labour gaps will deepen if the demand for retrofits accelerates.
- Trade volatility with the United States has increased uncertainty, which drives up costs, disrupts supply chains, and risks export losses or the relocation of Canadian manufacturers.
- Affordability issues for mechanical equipment like heat recovery chillers and heat pumps are limiting adoption.
- Lean manufacturing capacity, long lead times, limited distribution options, and low local inventories hold back enclosure system technologies such as insulation, wall recladding systems, and high-efficiency window walls.

A business-as-usual approach will not resolve these challenges.

Key findings

Key findings from this research include:

- Clarity on the future scope and pace of retrofits in Alberta leads to market readiness.
- Alberta's supply chain shows resilience but support is needed to become ready for growth.
- Workforce occupational and skill gaps are emerging and expected to grow.

As this report reveals, there are possible ways to accelerate progress while improving supply chain resilience and supporting long-term economic growth. Further research, however, is needed to strengthen this evidence base and refine approaches.

1. Introduction

Supply chain vulnerabilities can affect access to key building retrofit technologies, as well as their affordability and timely delivery to project sites. This report examines the supply chains for retrofit equipment and materials used in multi-unit residential buildings (MURBs) in Alberta, including heat pumps, high-efficiency windows, and insulation. These components are essential to achieving whole-building and deep energy retrofits. Weaknesses across the supply chain can delay projects, increase costs, and ultimately limit the scale and pace of high-impact retrofits across the province.

1.1 Scope and methodology

This research primarily focuses on the retrofit supply chain in Alberta for MURBs. However, the analysis also provides insights relevant to other building types, high-performance new construction, and different retrofit depths (i.e., incremental, deep, whole-building), reflecting shared technologies, workforce requirements, and supply chains.

The research examines the risks and challenges to accessing retrofit technologies and the skilled labour needed to design, procure, install and maintain them. It identifies the core technologies commonly used in MURB retrofits and assesses supply chain readiness to support the scaling of retrofit activity across Alberta. A market scan is used to understand key supply chains; map the origins and supply pathways of retrofit technologies, products and equipment; highlight opportunities for domestic production; and identify potential impacts of tariffs. The report also explores why certain retrofit technologies are more vulnerable to supply chain disruptions and why they may experience delays or be inaccessible in the Alberta market.

Finally, this report presents key findings and possible solutions to bolster accessibility within Alberta's retrofit supply chain and nurture opportunities for localizing and reshoring manufacturing.

A variety of methods were used to support the analysis, including:

- interviews with key industry associations, suppliers, distributors, and manufacturers to better understand supply chain interactions (n = 12)
- a survey of retrofit service providers with specific questions on retrofit technology accessibility and constraints (n = 6)
- desktop research with a comprehensive media scan of trade publications and information published by leaders in Canada's retrofit sector

1.2 Alberta's retrofit ecosystem

The residential buildings sector in Alberta is responsible for about 3.22% (8.5 Mt CO_2)[1] of Alberta's total greenhouse gas emissions, with residential space and water heating accounting for about 6.3 and 2.2 Mt CO_2, respectively.[2] In Calgary, the province's largest city, buildings represent 60% of emissions (26% residential and 36% non-residential buildings).[3] Building retrofits, particularly deep energy-efficient retrofits, help to reduce these emissions, while also providing many added benefits.

Like putting a warm sweater over your home, as insulation upgrades and air sealing retain heat, making homes more comfortable and mitigating fluctuating energy costs. By providing a healthier indoor environment, they also contribute to better occupant health. Poor building conditions exacerbate respiratory, cardiovascular, and mental health conditions.[4]

Retrofits are an increasingly essential component for protecting both occupants and building assets in Alberta. Many of Alberta's buildings were built before the 1980s and designed for a more predictable and stable climate. However, with severe weather becoming more frequent, integrated whole-building retrofits are needed to prepare households and communities by reducing energy use and emissions, maintaining comfort, and strengthening resilience. Whole-building retrofits also ease demands on emergency management and reduce the cost of disaster recovery, including owner and occupant insurance claims. Moreover, by alleviating pressure on insurers and governments, they help policyholders maintain affordable access to insurance products.

Acknowledging climate change impacts, Alberta's retrofit ecosystem is progressively integrating resiliency measures into energy-efficient and low-carbon building retrofits.

1.3 Scale of retrofits

Approximately 70% of Alberta's 1.63 million residential buildings were constructed before energy efficiency requirements were introduced in Canadian building codes in the 1970s,

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[1] Government of Canada, "National inventory report 1990–2023: greenhouse gas sources and sinks in Canada," 2025. https://publications.gc.ca/site/eng/9.506002/publication.html

[2] Presented as averages of the last six reported years (2018–2023).

Natural Resources Canada, "Residential Sector – Alberta." https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_res_ab.cfm

[3] City of Calgary, "Net-zero emissions by 2050." https://www.calgary.ca/environment/policies/net-zero-by-2050.html

[4] Raidin Blue, Ceileigh McAllister, and Rachel Sutton. *Valuing Deep Retrofits: How better residential buildings can lower healthcare costs in Alberta* (Pembina Institute, 2025). https://www.pembina.org/pub/valuing-deep-retrofits

highlighting the role whole-building retrofits can play in renewing Alberta's aging assets to improve their energy and emissions performance, build resilience, and maintain affordability.

Alberta's residential sector consists of four building types (Table 1).

Table 1. Breakdown of Alberta's residential sector by building type

Building type	Number of dwellings
Single-family detached	994,410
Single-family attached	269,980
Semi-detached or double house	100,335
Row house	127,180
Apartment, duplex	42,465
Apartments	321,900
Apartment <5 storeys	247,030
Apartment ≥5 storeys	74,870
Other	46,925

Source: CMHC[5]

Retrofit activity in the province must move beyond conventional, incremental upgrades to individual building components or systems, as these measures deliver limited energy and emissions savings and provide only a narrow range of non-energy benefits. Incremental retrofits also fall short of achieving the long-term benefits associated with deeper interventions, such as improved weather resilience for both occupants and buildings, as well as broader societal benefits like economic development and grid resilience. Whole-building and/or deep retrofits, by contrast, involve upgrading multiple systems (e.g., HVAC, envelope, lighting) all at once or over time. This holistic approach yields comprehensive and integrated system-wide improvements across the building rather than the smaller-scale and single-system measures typical of an incremental retrofit.

Both the rate and depth of residential retrofits in Alberta have not kept pace with those in other provinces, based on national datasets that primarily track "low-rise housing." (In Table 1, this consists of "single-family detached and single-family attached.") Analysis by Green Communities Canada found that from 2020 to 2024, only about 3.3% of Alberta's low-rise houses were retrofitted, equivalent to an annual retrofit rate of around 0.66% per year,

[5] CMHC, "Housing Stock 2021 – Alberta." www03.cmhc-schl.gc.ca/hmip-pimh/en/Profile/DetailsHousingStock?geographyId=48&t=2

compared to a national rate of 5.5% (1.1% per year).[6] This means that Canada's average annual retrofit rate for low-rise houses (in Figure 1), referred to as "single family detached and attached" and excluding apartments and MURBs, over this period was nearly double Alberta's retrofit rate.

The province's retrofits were largely driven by incentives offered under the now defunct Canada Greener Homes Grant and Loan programs and were primarily incremental retrofits. Of the approximately 3.3% of low-rise houses that underwent retrofits in Alberta, only 6.8% qualified as deep retrofits.[7]

Less information is available on the retrofit rate for other residential building types across Alberta. However, because most residences in Alberta are single detached homes (61%), the existing data reflects a considerable proportion of Alberta's residential building stock.[8]

1.4 Ramping up retrofits

In 2021, the Pembina Institute published the *Renovation Wave* report,[9] which modelled a path to retrofitting most of Canada's buildings by 2050. Achieving this pace would help Canadians maintain home insurance and access affordable housing, enhance the resilience of existing buildings, and reduce healthcare impacts by improving indoor air quality and reducing exposure to extreme temperature fluctuations. The report highlighted that in order to serve multiple objectives, retrofits must be designed to address the holistic, long-term needs of the building.

The original modelling done for *Renovation Wave* assumed that about 15% of Alberta's existing housing stock would be retrofitted to achieve net-zero by the end of 2026. (We will refer to this as the "original model.") According to an analysis done by Green Communities Canada, Alberta is not on track to reach that milestone. Therefore, we revised the *Renovation Wave* model to provide an updated retrofit scenario that would still see Alberta reaching net-zero residential buildings by 2050 (Figure 1).

[6] Kai Millyard and Jared Kolb, *Retrofitting Canada's Homes: Progress Report #2* (Green Communities Canada, 2025), 8. https://greencommunitiescanada.org/2025-national-progress-report-on-retrofitting-canadas-homes/

[7] *Retrofitting Canada's Homes: Progress Report #2*, 19. https://greencommunitiescanada.org/2025-national-progress-report-on-retrofitting-canadas-homes/

[8] Statistics Canada, "Household type including multigenerational households and structural type of dwelling: Canada, provinces and territories, census metropolitan areas and census agglomerations," *2021 Census of Population*. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/index-eng.cfm

[9] Madi Kennedy and Tom-Pierre Frappé-Sénéclauze, *Canada's Renovation Wave: A plan for jobs and climate* (Pembina Institute, 2021). https://www.pembina.org/pub/canadas-renovation-wave

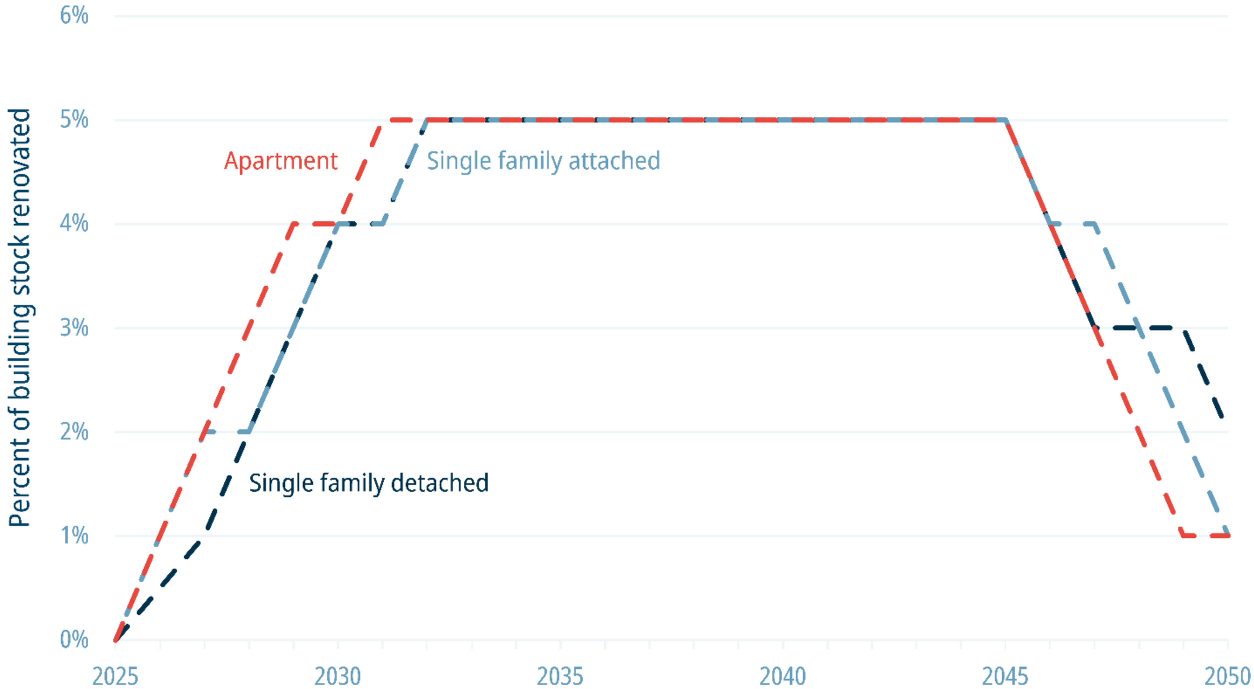

Figure 1. Retrofit rate as a percentage of building stock in Alberta to meet net-zero by 2050

Full data table available in Appendix A

The updated retrofit scenario follows the three phases identified in the *Renovation Wave* report:

1. Ramp up (2026–2029): Capacity building and incentives lead to a rapid ramp up in fuel-switching from current levels to 4–5% of stock per year.
2. Steady state (2030–2045): All heating equipment replacements are with low-carbon systems, combined with efficiency and resiliency upgrades. Each year, 4–5% of vintage building stock is retrofitted.
3. Ramp down (2046–2050): Retrofitting of the "contemporary" stock (buildings built between 2020 and 2030) that were not built to a net-zero standard.

In the original model, the initial ramp-up phase was 2021–2025. This phase has been shifted by five years due to limited progress, consequently shifting the other phases. This shortens the ramp down period from a decade to five years.

1.5 Challenges and opportunities

Rapidly growing Alberta's retrofit supply chain to keep pace with the updated model introduces two key barriers. First, compressed timelines increase the stakes for coordinated building retrofits and give Alberta less flexibility to manage capacity shocks or supply chain challenges while retrofit activity ramps up to a steady state of activity. Second, if demand growth is not coordinated with supply chain and workforce capacity, a rapid expansion of the retrofit market will introduce major supply shocks and compound existing pain points. The latest *Renovation Wave* model suggests that retrofit capacity must scale quickly during the ramp-up period. To address these challenges in tandem, Alberta's retrofit sector will need to pursue strategic market development and build sector-wide partnerships to unlock efficient technology networks and a strong retrofit supply chain.

Beyond tight timelines and rapid expansion, several policy and regulatory factors are affecting Alberta's retrofit ambition. Recently, there has been a shift from an incentive-driven to a market-driven approach for retrofits. The original model counted on incentive programs to drive demand. These programs have been successful at spurring home upgrades, but not necessarily deep or whole-building retrofits due to program design.[10]

The end of the Canada Greener Homes programs, especially without serious progress having been made in the development of a stable market for deep or whole-building retrofits, is a major barrier. Fortunately, there are early signs that a market-driven approach to retrofits is emerging in Alberta. The October 2025 mandate letter to the Alberta minister of Affordability and Utilities directed the minister to pursue demand-side management (DSM), signalling a policy shift that could help to advance a market-driven approach to retrofits through utility-led DSM programs.

Despite the withdrawal of select policy tools at the federal level, Alberta's policy move should bolster retrofits across the province. In other provinces, DSM has been a significant driver of retrofit activity, providing stable investments in retrofits and enhancing job security for workers in the construction, manufacturing and trade-adjacent industries. Alberta is one of the few remaining regions in North America without utility-led DSM in place.[11] The mandate letter, however, indicates that this situation may soon be coming to an end.[12] Implementing DSM in Alberta would strengthen the retrofit supply chain through stable, long-term support for retrofit activity. This sustained demand would, in turn, reduce the province's exposure to damaging boom-bust cycles that has been seen from the comings and goings of incentive programs.

1.5.1 The impact of trade turbulence on Alberta's retrofit market

The tightly integrated global economy creates a high degree of interdependence among countries in the manufacturing and procurement of goods. Alberta's building sector is no exception. High-performance buildings rely on goods manufactured across the globe. As the

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[10] Green Communities Canada, *Retrofitting Canada's Homes: Progress Report #1* (November 2023). https://greencommunitiescanada.org/wp-content/uploads/2025/10/FINAL-GCC-DER-Report.pdf

[11] Kari Hyde, Ceileigh McAllister, and Emma Caramazza, *Beyond the Meter: Harnessing demand-side management to power Alberta's energy future* (Pembina Institute, 2025), 7. https://www.pembina.org/pub/beyond-meter

[12] Government of Alberta, "Mandate letters to ministers [2025]," October 28, 2025. https://open.alberta.ca/publications/mandate-letters-to-ministers-2025

global marketplace becomes increasingly volatile, renewed attention is being paid to a "Made-in-Canada" approach to reduce exposure to external market shocks, including product shortages and price swings. For Alberta, this approach signals the kind of market certainty that the retrofit sector needs, clearly indicating that domestically produced technologies are valued and preferred.

One of the greatest sources of global market uncertainty is the changing tariff landscape in the United States. The country currently has broad tariffs in place that affect globally produced goods, including those originating in Canada. While tariffs are not unusual globally, the increased use of tariffs by the United States has an outsized impact across Canada given the size of the U.S. economy and the highly integrated trade relationship between the two countries. Canadian counter-tariffs were initially put in place in March 2025, but most were removed in September 2025. Counter-tariffs remain for steel, aluminum and automobiles.[13] Tariff-sensitive imports present a risk to Alberta's retrofit supply chain.

Although Canadians do not pay additional taxes on American imports in the absence of counter-tariffs, American tariffs do affect local supply chains and import prices. Three primary threats are highlighted below:

- **Disruptions to global markets:** New tariffs disrupt the balance of the economy, but a changing tariff environment is worse. Uncertainty hinders investment and innovation and hurts profits. Obstacles to the manufacturing or distribution of key retrofit technologies can raise costs or create market gaps for high-performance buildings.
- **Rise in final price of manufactured complex commodities:** Many high-performance building technologies, like heat pumps and heat or energy recovery ventilators, are complex goods made up of many components. Oftentimes, the manufacturers of the final goods purchase these components from firms across the globe. If a U.S.-based firm manufactures heat pumps in Texas with components imported from tariff-impacted countries, the final commodity price will rise across all markets.[14] This risk is especially relevant to high-performance building materials because many global firms have only a few North American manufacturing hubs. If a heat pump manufacturer's only North American manufacturing site is in the U.S., the tariffs on the product components may drive up the price of the finished product.

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[13] Department of Finance, "Canada's response to U.S. tariffs on Canadian goods," January 15, 2026. https://www.canada.ca/en/department-finance/programs/international-trade-finance-policy/canadas-response-us-tariffs.html

[14] Bank of Canada, "Evaluating the potential impacts of US tariffs: Monetary Policy Report – January 2025," (2025). https://www.bankofcanada.ca/publications/mpr/mpr-2025-01-29/in-focus-1/

- **Reduced demand for products from Canadian manufacturers**: Canada is home to a number of innovative manufacturers focused on high-performance buildings. Many of these firms likely distribute across North America, including to the U.S. The current tariff landscape disincentivizes U.S. buyers from purchasing products from these firms, which hurts business. If Canadian companies respond to trade pressures by scaling down production, shutting down operations, or relocating to the larger U.S. market to avoid tariffs, this uncertain and constrained environment could lead to widening supply chain gaps and increased damage to the Canadian economy.

2. Alberta’s retrofit supply chain

Alongside incremental, deep, and whole-building retrofits, Alberta’s retrofit sector includes more general renovations and repairs to existing residential buildings. In total, retrofit and renovation activity in Alberta represents nearly $12 billion in investment each year and provides 60,585 jobs.[15]

Alberta’s retrofit sector is well represented by small and medium-sized enterprises (SMEs), defined as firms with up to 99 employees for small business and 100 to 499 employees for medium-sized businesses. As in many sectors across the province, SMEs are especially prominent in Alberta’s retrofit supply chain. Small and medium-sized firms make up much of the construction, manufacturing, transportation, and warehousing sectors.[16] The latter three categories together comprise a significant component of Alberta’s retrofit supply chain and include product and equipment manufacturers, as well as distributors and suppliers responsible for warehousing and transporting building products and equipment.

Manufacturing, transportation, and warehousing represent potential vulnerabilities within the retrofit supply chain given their reliance on highly integrated and resource-intensive logistics networks. These sectors also experience persistent labour challenges, including high employee turnover, difficulty in attracting a diverse workforce, and rapidly evolving skills requirements.[17] These risks may be exacerbated by the predominance of SMEs, which are less likely to have access to the data and analytics needed to manage inventory efficiently and respond effectively to fluctuations in demand.[18,19]

2.1 Supply chain risks

Rapidly growing the retrofit market introduces considerable risk to the Alberta retrofit supply chain, compounded by uncertainties in the global market. This potential risk should not deter retrofit investment. In fact, coordinated investment and careful supply chain management

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[15] Canadian Home Builders’ Association, *Economic Impacts of the Residential Construction Industry* (2024). https://www.chba.ca/assets/pdf/2024-Economic-Impacts-of-the-Residential-Construction-Industry-Factsheets/

[16] Innovation, Science, and Economic Development Canada, *Key Small Business Statistics* (2024). https://ised-isde.canada.ca/site/sme-research-statistics/sites/default/files/documents/ksbs-2024-v1-en.pdf

[17] TruckingHR Canada, *Alberta Labour Market Report: Alberta’s Trucking and Logistics Industry 2024-2030*. https://issuu.com/truckinghr.com/docs/thrc_comprehensive_alberta-lmi-2024-final?fr=xKAE9_zU1NQ

[18] Government of Alberta, *Transportation and Warehousing Industry Profile, 2021 and 2022* (2023). Available from https://open.alberta.ca/publications/alberta-transportation-warehousing-industry-profile

[19] PwC, *Shifting patterns: The future of the logistics industry*. https://www.pwc.com/sg/en/publications/assets/future-of-the-logistics-industry.pdf

would create good jobs across the retrofit value chain and promote economic development across Alberta. The 2021 *Renovation Wave* report found that investing $2.5 billion annually in Alberta would generate $5.8 billion in gross GDP growth per year and sustain 24,000 jobs (Table 2).

Table 2. Economic growth and job creation for residential and commercial retrofits in Alberta

	Total investment (billions per year)	Gross GDP growth (billions per year)	Gross jobs per year
Residential	$1.6	$3.7	15,200
Commercial	$0.9	$2.1	8,800
Total	**$2.5**	**$5.8**	**24,000**

Source: Pembina Institute[20]

Scaling up retrofit activity in Alberta will generate unprecedented demand for high-performance building materials and equipment over a relatively short timeframe. This surge will both amplify existing gaps and introduce new challenges. While access to products and materials is an issue in some cases, many of Alberta's supply chain challenges arise from affordability and market acceptance, particularly when compared with conventional products.

The 5As of barrier classification

Developed by the Government of Canada and Navigant Consulting, the 5As framework is a sequential barrier classification system for supporting market transformation of energy-efficient technologies.[21]

1. **Availability**: Does the technology exist?
2. **Awareness**: Does the market know about the technology?
3. **Accessibility**: Does the market have easy access to the technology?
4. **Affordability**: Is the technology affordable?
5. **Acceptance**: Are the technology's form, fit, and function acceptable?

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[20] Madi Kennedy and Tom-Pierre Frappé-Sénéclauze, *Canada's Renovation Wave: A plan for jobs and climate* (Pembina Institute, 2021), 18. https://www.pembina.org/pub/canadas-renovation-wave

[21] Katherine N. Delve, Anne Wilkins, Federico Garcia, and Michael J. Scholand, *Five A's: Barrier Classification and Market Transformation Program Design for Energy Efficient Technologies* (Natural Resources Canada and Navigant Consulting Inc., 2004). https://www.aceee.org/files/proceedings/2004/data/papers/SS04_Panel6_Paper10.pdf

2.1.1 Interview findings

To understand supply chain constraints in Alberta, we invited retrofit service providers, industry associations, distributors, and manufacturers to participate in guided discussions. Participation was limited given the relatively small size of Alberta's retrofit market and the modest scale of retrofit-focused organizations within the supply chain. However, the discussions yielded valuable insights on supply chain successes, challenges, and potential vulnerabilities.

Interviewees generally spoke positively about the province's retrofit supply chain, signalling its adaptability and resilience to trade-related turbulence. The ongoing trade dispute and tariffs with the U.S. emerged as a main constraint. Windows were presented as an example of a particularly exposed product given their dependence on steel or aluminum, gaskets, and hardware components sourced from other countries. Despite these challenges, interviewees showed a great ability to adapt by pivoting from U.S. distributors to dealing directly with manufacturers in Europe, Asia, or domestically. They noted the relative ease of working with Chinese and European suppliers, as well as the cost competitiveness of alternative materials and equipment. Overall, supply chain issues may slow projects, but the work will not stop.

Interviewees observed an increased reliance on "lean manufacturing" following COVID-19. During the pandemic, many manufacturers switched from bulk storage of their inventory to on-demand procurement. By responding to actual demand rather than forecasted orders, firms can save on warehousing costs. However, this approach can also result in longer lead times.

Interviewees indicated that the supply chain takes the brunt of failures rather than creating difficulties for the retrofit process. Projects may see constraints from delays and increased costs for retrofit technologies, but not because products are unavailable or inaccessible. As one interviewee said, "Delays are just a requirement for more and better planning but can be derailed by a lack of up-front decision-making, clearly understanding what is desired (and why), and last-minute value engineering, driven [by] owners' and consultants' competing values and business models."

2.1.2 Survey findings

A survey was developed and distributed to retrofit service providers to explore supply chain challenges for heating systems, electrical and control systems, ventilation systems, enclosure systems, and concrete, wood and steel products.

Responses pointed to potential supply chain challenges stemming from tariffs on the following heating systems:

- heat recovery chillers
- wastewater heat recovery heat pumps
- rooftop heat pump units and make-up air systems
- gas back-up systems and controls
- ground-source heat pumps

The responses also emphasized that the tariffs and high costs primarily affected the *affordability* of these heating systems, not the *accessibility*.

In contrast, enclosure systems, insulation and air-barrier systems, wall recladding systems, and high-efficiency window walls are more likely to experience *accessibility* challenges. These include long lead times, limited distribution options, and low local warehousing.

Accessibility was also raised as a concern for mass distribution of timber and wood products, a relatively nascent product category that may not yet be easily integrated within Alberta's retrofit supply chain.

Innovative technologies present an additional challenge. For example, new building-enclosure products may not yet be approved for use in the province or may be unfamiliar to local permitting officials. This can lead to project delays as proponents navigate the Alberta Safety Codes Council's approval process for new materials or apply for exceptions within the current permitting process. These challenges, however, are expected to be resolved once the products become more commonly used.

In assessing supply chain vulnerabilities and tariff impacts, distinguishing between a simple good and a complex good is important. Simple goods are raw materials or products derived from a processed raw material, like wood or insulation. Complex goods, such as a heat pump or solar panel, are products made of multiple pre-processed components. Because of the greater number of components, more globalized sourcing, and greater exposure to international trade dynamics, complex goods are more likely to face supply chain challenges.

2.2 Literature review

Desktop research was done to gather information and perspectives on the supply chain for retrofitting and constructing high-performance buildings in Alberta. Sources included search engine reviews, trade publications, and other institutions.

As detailed earlier, Alberta's residential retrofit rate remains relatively low, reflecting a small and still-developing market.[22] This weak demand presents a challenge to relying solely on demand-side initiatives to scale up retrofit activity. To prevent capacity constraints as demand grows, parallel efforts are needed to expand the retrofit workforce, develop expertise in high-performance retrofits, and support manufacturers and distributors of low-carbon technologies.

In response to these supply chain risks, the Southern Alberta Institute of Technology (SAIT) and WSP Canada Inc. analyzed the technologies, workforce capabilities, and training systems required to ramp up Alberta's retrofit rate.[23] They found that progress in high-performance buildings in Alberta has been driven by municipal leadership and educational efforts. This progress is attributed to the work of the Alberta Ecotrust Foundation, through its Emissions-Neutral Buildings Information Exchange, and SAIT in promoting sustainable construction and workforce development. [24] Broad adoption of deeper retrofit technologies has been constrained by the notable lack of strong regulatory mandates from senior levels of government and absence of utility-led DSM programs such as those established in British Columbia, Ontario, and Quebec. This is partly reflected in the heat pump adoption data listed by Natural Resources Canada, however, it must be noted that Alberta's relative low-cost of conventional fuels hinders the uptake of electricity-based heat pump technologies.[25] Comparing the total number of heat pump installations (with federal and provincial support) versus total number of dwellings (Figure 2) underlines the stark difference in adoption rates across the provinces and territories; Alberta falls nearly ten times below the Canadian average at just 156 heat pumps per 100,000 (full data table available in appendix).

[22] Green Communities Canada, *Retrofitting Canada's Homes: Progress Report #1* (November 2023). https://greencommunitiescanada.org/wp-content/uploads/2025/10/FINAL-GCC-DER-Report.pdf

[23] WSP Canada Inc., *Deep Retrofit Accelerator Initiative Technologies and Skills Memo*, prepared for the Southern Alberta Institute of Technology (2025). https://www.enbix.ca/wp-content/uploads/2025/09/2025.08.22_SAIT_WSP_TechSkills_Memo_Final-4.pdf

[24] ENBIX, "Emissions-Neutral Buildings Information Exchange (ENBIX)." https://www.enbix.ca/

[25] Natural Resources Canada, "Heat pumps at a glance," February 25, 2026. https://natural-resources.canada.ca/energy-efficiency/home-energy-efficiency/canada-greener-homes-initiative/heat-pumps-uptake-glance-0

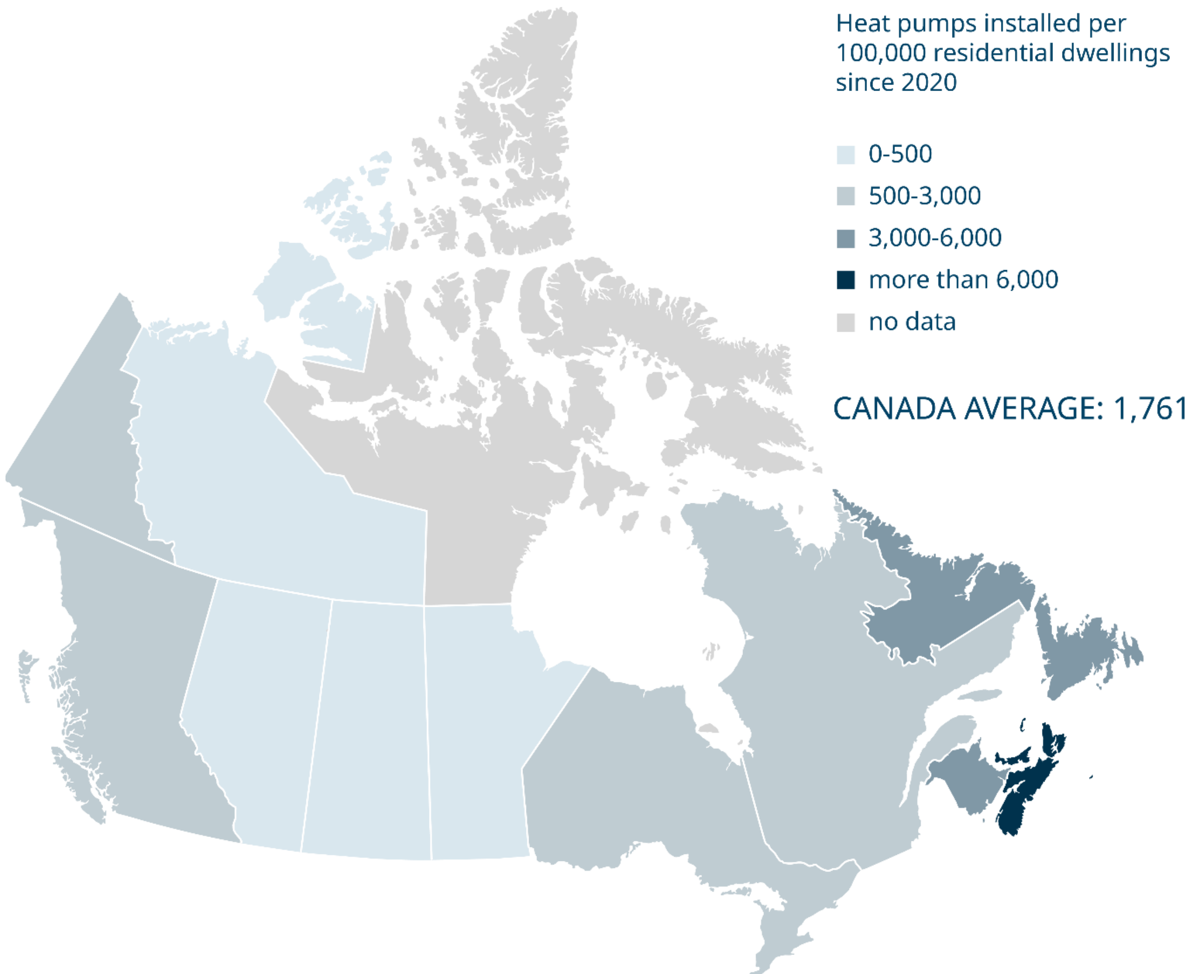

Figure 2. Heat pump installations across Canada since 2020

Full data table available in Appendix A

Market transformation strategies in the building sector

In 2017 and 2018, Canada saw a concerted effort by federal, provincial and territorial governments and building-sector stakeholders to transform the market for windows, space heating, and water heating technologies. This was a collaborative effort to boost market adoption of these low-carbon technologies.

Through this process, they identified market barriers, assessed products using the 5As framework, proposed initiatives to address the barriers, and outlined the roles different stakeholder groups should fulfill.

While the specific details and outcomes cannot be directly applied eight years later, given how technologies and markets have evolved, the resulting roadmaps remain instructive. They demonstrate the range of possible solutions to transform the retrofit market and underlining the need for a nation-building, industrial policy-level approach to supporting the retrofit supply chain. [26,27]

In 2022, the Delphi Group (Delphi) investigated Canada's retrofit supply chain, highlighting the challenges related to the COVID-19 pandemic.[28] In 2026, this work has renewed relevance, as supply chains are once again facing volatility (although due to global conflicts, trade disputes, and political shifts). While Delphi's research focused on market participants' awareness and the accessibility[29] and affordability of retrofit technologies, its findings remain relevant in assessing Canada's overall market readiness and are summarized in Table 3 and in the text below.

Table 3. Readiness evaluation of technologies and products in a deep retrofit

LEGEND High Moderate Low/none

Technology/Product	Awareness	Accessibility	Affordability
Electrical			
LED lighting products	High	High	High
Lamps and ballasts	High	High	High
Building automation systems	Moderate	High	Moderate
Premium efficiency motors	High	High	High
EV Chargers	Moderate	Moderate	Moderate
Enclosure			
Clips and frames	High	High	Moderate
Energy efficient windows/doors	Moderate	High	Moderate
High R-value roll-up receiving doors	Low/none	Low/none	Low/none
Insulation	High	High	Moderate

[26] Natural Resources Canada, "Market transformation strategies for energy-using equipment in the building sector: Supporting the transition to a low-carbon economy," *Energy and Mines Ministers' Conference, St. Andrews by-the-Sea, New Brunswick, August 2017*. https://natural-resources.canada.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/Market-Transformation-Strategies_en.pdf

[27] Natural Resources Canada, "Market transformation strategies for energy-using equipment in the building sector: Supporting the transition to a low-carbon economy," *Energy and Mines Ministers' Conference, Iqaluit, Nunavut, August 2018*. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/energy-efficiency/18-00072-nrcan-road-map-eng.pdf

[28] Ben Clark, *Green Retrofit Economy Study: Technical Memo: Supply Chain Readiness* (The Delphi Group, 2022). https://delphi.ca/wp-content/uploads/2022/10/Technical-Memo-Supply-Chain-Readiness.pdf

[29] Delphi followed the 5As framework, but used slightly different definitions for "availability" and "accessibility." For this report, we refer to "availability" as the existence of a technology and "accessibility" as the ability for consumers to access products. We apply these definitions when presenting Delphi's findings.

LEGEND ● High ◓ Moderate ○ Low/none

Technology/Product	Awareness	Accessibility	Affordability
Reflective roofs	◓	●	●
High efficiency curtain walls	○	○	○
Wall cladding systems	○	○	○
Thermal break technology	◓	●	◓
Mechanical			
Heat pumps	◓	◓	◓
Variable air volume systems	●	●	●
Airside economizer damper controls	●	●	●
Electric high efficiency domestic hot water	◓	◓	◓
Modulating burners	●	●	●
Heat and energy recovery systems	●	●	◓
Demand controlled ventilation	●	●	●
Piping and duct work	●	●	◓
Distribution system insulation	●	●	●
Renewables			
PV systems	◓	◓	◓
Solar domestic hot water	◓	◓	◓
Building integrated photovoltaics	◓	○	○
Energy storage	◓	○	○
Hybrid (wind and photovoltaics)	○	○	○

Data source: The Delphi Group[30]

30 *Green Retrofit Economy Study*, 8–9.

Based on these findings, Delphi identified the following key challenges and opportunities for developing Canada's retrofit supply chain (Table 4).

Table 4. Key challenges and opportunity presented by Delphi

Challenges	Opportunities
Low awareness of retrofit technology is limiting adoption rates	Industry associations can highlight impactful technologies among owners, designers, contractors and building operators
Non-energy benefits are not adequately valued	NGOs, governments, and industry associations need to further develop the business case for retrofits and translate it into financial terms that resonate with building owners
Entry-level labour supply is being outpaced by retirements	Educators can bolster workforce skills and competencies by focusing skills development on priority technologies
Key retrofit technologies are not accessible or may face future shortfalls	Government, industry, and economic development agencies could work with global manufacturers to expand key technology accessibility and ensure access to low-carbon technologies, while exploring opportunities to invest in domestic manufacturing
Retrofit technologies can be cost prohibitive	Government and industry can reduce costs by bulk purchasing, subsidizing technologies, and developing procurement policies that support easier adoption and lower costs
A coordinated approach is needed to meet growing demand for retrofits	Industry associations and government can establish a strategy for procuring made-in-Canada low-carbon technologies
Inconsistent provincial policies are slowing the uptake of deployable technologies	Governments can develop more financial tools to support adoption and the retrofit business case. They can also amend building codes and standards to be carbon based rather than energy based

2.3 Workforce constraints

In addition to supply chain limitations, workforce capacity is a key constraint for Alberta's retrofit market. Scaling retrofit activity depends on the availability of workers with the right skills and expertise.

Workforce gaps manifest as both occupational gaps and skill gaps.[31] Occupational gaps arise when a region does not have enough workers in specific trades or professions, like electricians or plumbers. Skills gaps occur when the existing workforce lacks the competencies required to

[31] *Deep Retrofit Accelerator Initiative Technologies and Skills Memo*, 12. https://www.enbix.ca/wp-content/uploads/2025/09/2025.08.22_SAIT_WSP_TechSkills_Memo_Final-4.pdf

deliver building retrofits, including capabilities such as heat pump installation or integrated project delivery.

Delphi identified and modelled workforce demand across Canada under different scenarios of rising retrofit activity.[32] Alberta will see its largest rise in workforce demand in retail, office, and low-rise MURBs, with around 90 million square metres of floorspace to be retrofitted between 2022 and 2050. This is the fourth highest demand in Canada behind Ontario, Quebec and British Columbia. In full-time equivalent person years, this will require roughly 60,000 in HVAC trades, 50,000 contractors, 45,000 electricians, 40,000 carpenters, and 15,000 glaziers.

The anticipated growth in retrofit demand may be constrained because of a national workforce deficit.[33] This can be attributed to significant attrition through retirements and challenges in growing a diverse workforce. While women represent a higher proportion of the workforce in residential construction compared to the broader construction workforce, the rate of employment, at 7%, has not grown significantly over the past decade. Similarly, while immigrants make up 28% of the total workforce, they are underrepresented in the construction industry at approximately 20%.[34] The federal cap on international students has also hindered recruitment at polytechnic schools and colleges in Alberta, with the schools seeing an up to 80% drop in international student applications.[35] These issues will intensify as new technologies requiring different skills and expertise emerge more frequently.

To offset retirements and respond to growing retrofit demand, Alberta will need to recruit 25,000 workers by 2030.[36] It is anticipated that only 23,000 new journeypersons will enter the provincial workforce between 2022 and 2027. This is expected to result in a skills gap more than an occupational gap, particularly in advanced HVAC systems, building automation, energy modelling, and renewable energy integration.[37]

Delphi also attempted to identify workforce supply challenges using an estimated apprenticeship certification requirement. This indicated a potentially inadequate supply of entrants in Alberta for carpenters, glaziers, and insulators. Conversely, a shortfall was not

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[32] The Delphi Group, *Green Retrofit Economy Study: Technical Memo: Summary of Workforce*. https://delphi.ca/wp-content/uploads/2022/10/Technical-Memo-Summary-of-Workforce-Supply.pdf

[33] *Green Retrofit Economy Study: Technical Memo: Summary of Workforce*.

[34] Government of Canada, Construction (NAICS 23): Alberta, 2025. https://www.jobbank.gc.ca/trend-analysis/job-market-reports/alberta/sectoral-profile-construction

[35] Emily Williams, "How the cap on international students is hurting Alberta's smaller post-secondary school," *CBC News*, March 12, 2025. https://www.cbc.ca/news/canada/edmonton/alberta-small-postsecondary-impact-of-international-student-cap-1.7480047

[36] *Green Retrofit Economy Study: Summary Report*.

[37] *Deep Retrofit Accelerator Initiative Technologies and Skills Memo*, 12.

expected for steamfitters, refrigeration and air conditioning mechanics, electricians, and gasfitters.[38]

Drawing on their research, Delphi spotlighted several key technologies that should be prioritized by strengthening awareness, accessibility, and affordability to support a successful retrofit market. These technologies include building automation systems, heat pumps, heat and energy recovery systems, wall recladding systems, building-integrated photovoltaics, and energy storage.

SAIT and WSP’s analysis of Alberta’s retrofit workforce identified similar risks of future capacity constraints as retrofit activity ramps up in the province.[39] Their primary finding points to a projected shortfall of more than 4,000 electricians by 2030 as demand grows for electrical upgrades and alternative energy systems. The analysis also anticipates shortages among plumbers, as well as mechanical and electrical contractors and supervisors.

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[38] *Green Retrofit Economy Study: Summary Report.*

[39] *Deep Retrofit Accelerator Initiative Technologies and Skills Memo.*

3. Retrofit equipment and product technology spotlight

Unlocking whole-building retrofits requires strategic intervention across a building's major systems. These upgrades must be planned as an integrated project to maximize efficiency gains and avoid redundant future work.

To achieve deeper retrofits that provide meaningful reductions in energy use and emissions, as well as deliver non-energy benefits such as improved weather resilience and indoor air quality, four parallel actions are required:[29]

- **Load reduction** to improve building energy efficiency. Measures to reduce a building's annual energy demand and heating loads include installing energy-efficient equipment and lighting, and more importantly, undertaking robust building envelope upgrades, such as increasing insulation levels.
- **Electrification** of heating and cooling systems. This involves replacing conventional fossil fuel-fired heating, cooling, and water-heating systems with electric alternatives. Cooking equipment can likewise be electrified, offering efficiency gains over conventionally fuelled counterparts. In Alberta, this is most effective when paired with renewable energy generation.
- **Advanced controls** to manage energy use. Intelligent controls enable more efficient and responsive management of heating, ventilating and air-conditioning systems, increasing operational flexibility while improving occupant comfort.
- **Renewable energy generation and storage** to reduce reliance on power from fossil fuels. On-site solar photovoltaics, wind, and other off-site clean energy sources are most effective when a building's energy demand has been reduced.

Below, we assess four key retrofit technologies to explore the state of Alberta's retrofit supply chain. First, we provide an overview of each technology and its supply chain. Second, we review import trends using data from the Canadian International Merchandise Trade Web Application.[40] Lastly, we highlight Canadian manufacturing facilities using data from manufacturer associations.

[40] Government of Canada, "Canadian International Merchandise Trade Web Application," February 19, 2026. https://www150.statcan.gc.ca/n1/pub/71-607-x/71-607-x2021004-eng.htm

3.1 Heat pumps

Heat pumps are used to heat and cool buildings. Unlike one-size-fits-all technologies like insulation or solar panels, heat pumps vary considerably by building type. A MURB generally cannot use the same heat pump technology as a single-family home.[41]

The Government of Canada tracks heat pump imports using several different product codes, including:

- HS 8415.82.10: Domestic heat pumps and air conditioners
- HS 8418.61: Heat pumps other than those in HS 84.15

In 2025, Alberta imported nearly $2 million worth of heat pumps under HS 8418.61, mostly from the United States (49%), Italy (39%), and Japan (9%). In the same year, Alberta imported an additional $1 million worth of general cooling technologies, including heat pumps, under HS 8415.82.10, mostly from China (50%), South Korea (33%), and the United States (14%). Figure 3 illustrates the breakdown.

Several global heat pump manufacturers have a presence in Canada. Thirty-three members of the Heating, Refrigeration and Air Conditioning Institute of Canada manufacture air-source heat pumps and an additional twelve members manufacture geothermal heat pumps.[42] Most of these firms do not have plants in Canada; they are subsidiaries of global enterprises that manufacture in Asia. Those companies that do have North American manufacturing capacity often elect to manufacture in the United States given its significantly larger market.

There are, however, a few manufacturers with plants in Canada, including:

- **AO Smith and CGC Group**, with plants in Fergus, Ontario
- **Dettson**, with a plant in Sherbrooke, Quebec
- **Nordic**, with a plant in Petitcodiac, New Brunswick

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[41] Arthur Zhang, "Heat pumps continue to push fossil fuels out of Canadian homes," *440 Megatonnes*, May 22, 2025. https://440megatonnes.ca/insight/heat-pumps-continue-to-push-fossil-fuels-out-of-canadian-homes/

Natural Resources Canada, "Heating and cooling with a heat pump," December 24, 2025. https://natural-resources.canada.ca/energy-efficiency/energy-star/heating-cooling-heat-pump

Ottawa Home Services, "Ottawa's guide to buying the best heat pump for your home," February 13, 2026. https://www.ottawahomeservices.ca/blog/guide-to-buying-heat-pump/

[42] HRAI, "HRAI Manufacturer Members," 2023. https://portal.hrai.ca/HRAI/HRAI/Directories/HRAI_Manufacturer_Member_List.aspx

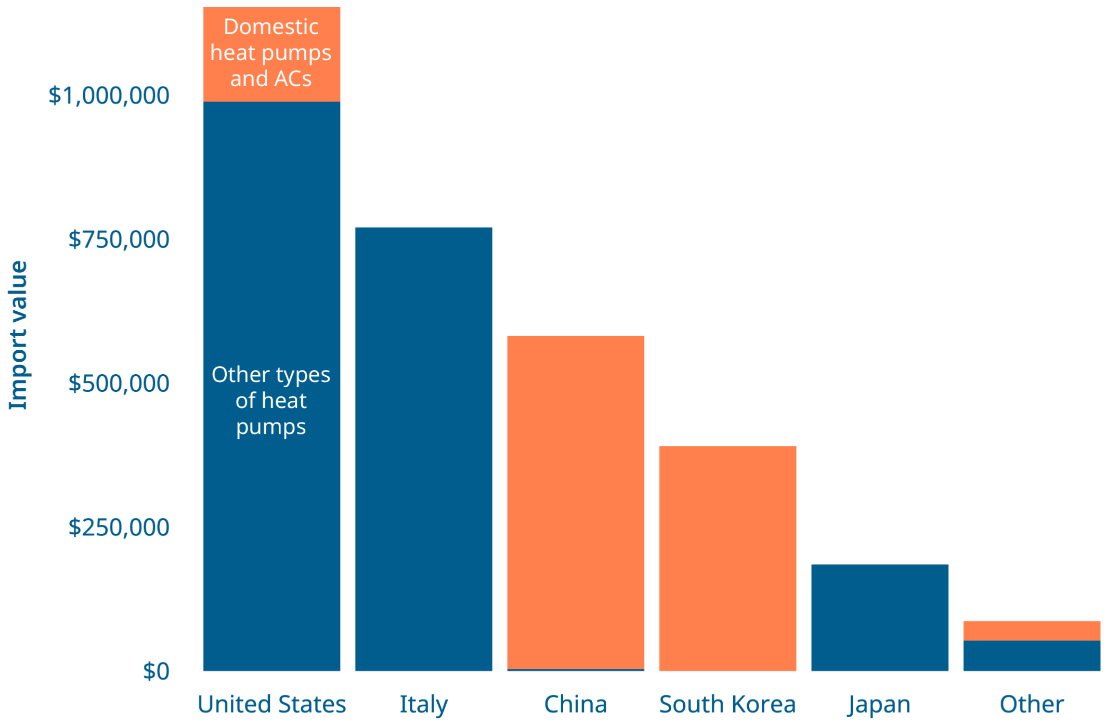

Figure 3. Heat pump and cooling technology imports to Alberta, 2025

Data source: Government of Canada[43]

3.2 Insulation

Insulation is an essential material for an effective building envelope. It is applied in various places across the building structure, including the walls, attic and foundation.

Since insulation can be made of many different materials, such as mineral wool, cellulose and fibreglass, it is difficult to gauge exactly how much Alberta imports. Two key product codes used by the Government of Canada are:

- HS 3921.13.00.10: Polyisocyanurate insulation
- HS 6806.10.00.10: Slag, rock, and simulated mineral wools insulation products

In 2025, $6.1 million worth of insulation was imported to Alberta in these two product categories alone: $2.6 million under HS 3921.13.00.10, mostly from the United States (96%), and $3.5 million under HS 6806.10.00.10, mostly from the United States (51%) and China (41%). Figure 4 provides a more detailed breakdown.

[43] Government of Canada, "Canadian International Merchandise Trade Web Application," February 19, 2026. https://www150.statcan.gc.ca/n1/pub/71-607-x/71-607-x2021004-eng.htm

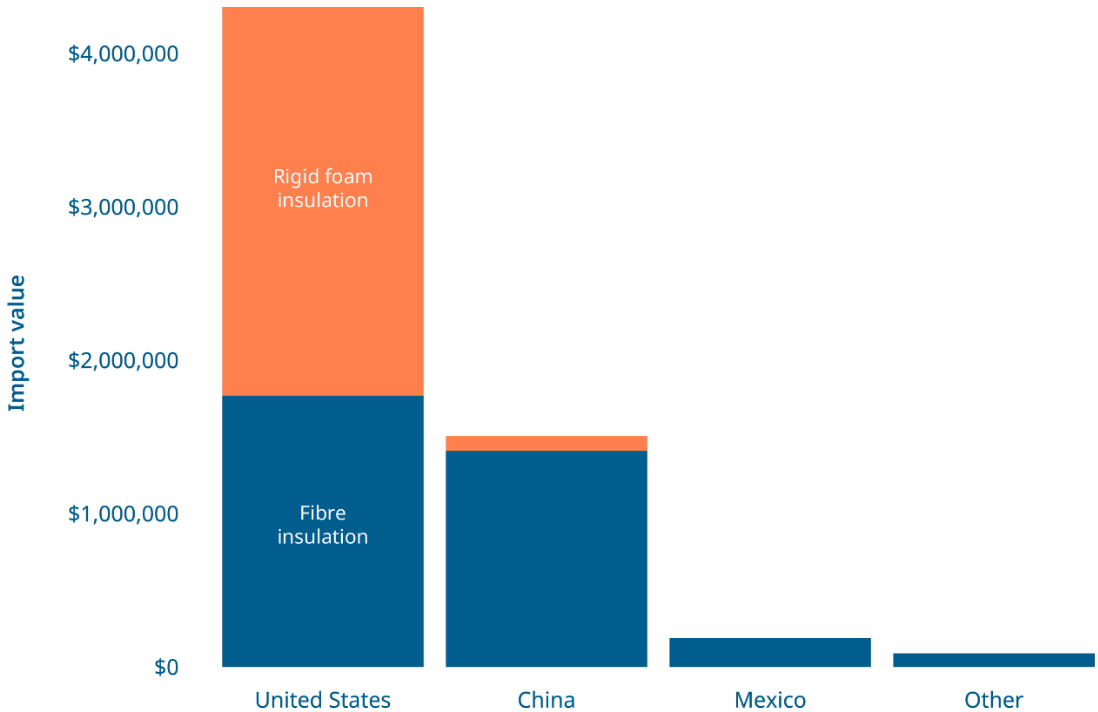

Figure 4. Insulation imports to Alberta, 2025

Data source: Government of Canada[44]

NAIMA Canada represents mineral fibre insulation manufacturers across Canada. They represent five major manufacturers, four of which have facilities in Canada:

- **CertainTeed**, with plants in Red Cliff, Alberta, and Ottawa, Ontario
- **Johns Manville**, with plants in Edmonton and Innisfail, Alberta, and Mississauga, Ontario
- **Knauf**, with no plants in Canada
- **Owens Corning**, with plants across Canada, including in Edmonton, Alberta
- **ROCKWOOL**, with plants in Grand Forks, British Columbia, and Milton, Ontario

3.3 Solar

Solar panels are an effective energy source for on-site generation to fully or partially meet building energy demand. It is especially favourable in Alberta because of the province's relatively high levels of solar radiation.[45]

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44 Government of Canada, "Canadian International Merchandise Trade Web Application.,"

45 Natural Resources Canada, "Photovoltaic potential and solar resource maps of Canada," January 16, 2025. https://natural-resources.canada.ca/energy-sources/renewable-energy/photovoltaic-potential-solar-resource-maps-canada

Assembled solar panels are imported to Canada under HS 8541.43.00.00: Assembled photovoltaic cells. In 2025, Alberta imported nearly $47 million worth of solar panels from 20 different countries, including Malaysia (45%), Vietnam (38%), and Indonesia (12%), as shown in Figure 5.

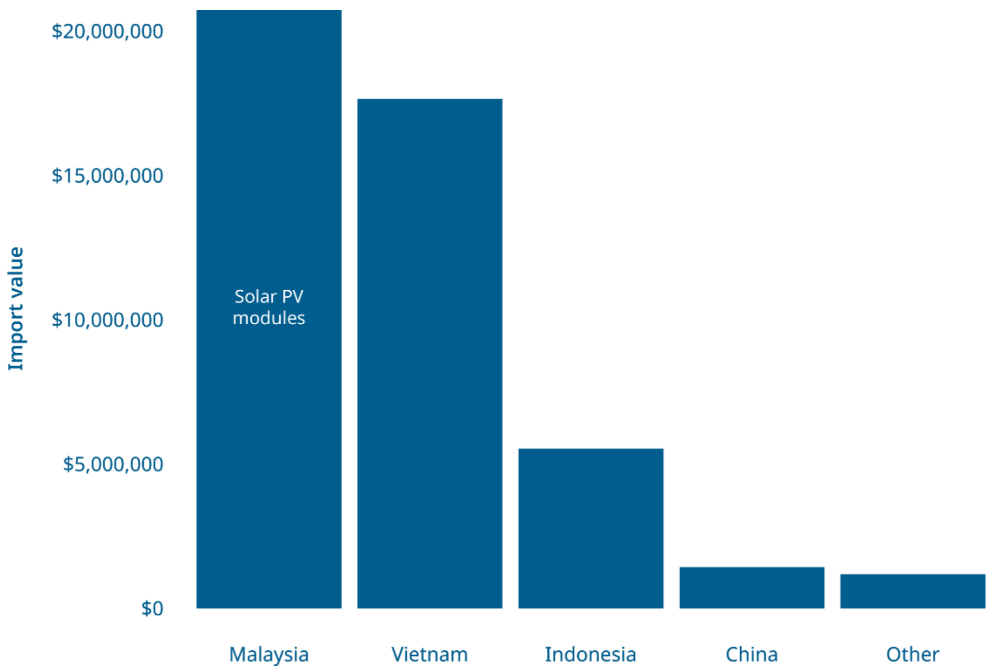

Figure 5. Solar imports to Alberta, 2025

Data source: Government of Canada[46]

Canada currently does not have a national association that represents solar manufacturers, likely due to limited domestic solar manufacturing. One of the only domestic manufacturers is Mitrex, located near Etobicoke, Ontario.[47] Canadian Solar is a multinational firm headquartered in Kitchener, Ontario, but it is unclear whether any manufacturing takes place domestically.[48]

3.4 Windows

High-performance windows are another essential material for a quality building envelope. Energy Star-certified windows, for instance, are about 20% more efficient than average windows, crucial for retrofits.[49]

[46] Government of Canada, "Canadian International Merchandise Trade Web Application."

[47] Inayat Singh, "Solar energy is growing fast in Canada, but panels are imported. Could we try to make them here?," *CBC News*, April 23, 2025. https://www.cbc.ca/news/science/solar-energy-manufacturing-canada-1.7515581

[48] Canadian Solar, "About us." https://www.canadiansolar.com/aboutus/

[49] Natural Resources Canada, "Windows, doors and skylights," October 7, 2025. https://natural-resources.canada.ca/energy-efficiency/energy-star/products/list-certified-products/windows-doors-skylights

Windows are often manufactured locally because they are fragile, difficult to transport, and highly variable across different projects. They are a complex product, with the glass imported and hardware, spacers, and other components locally sourced for assembly.[50] Due to the highly customizable nature of windows, there are over 2,000 window and door manufacturers across Canada, most of which are local or regional small- to medium-sized businesses.[51]

Alberta imports a wide variety of window products and components every year. Below, we highlight two product codes:

- HS 3925.20.00.90: Windows, window frames and thresholds for doors, of plastics
- HS 4418.19.90.00: Windows, French windows and their frames, of wood other than tropical wood

In 2025, more than $4.8 million worth of window and door products were imported to Alberta under HS 3925.20.00.90, mostly from the United States (29%), Ukraine (29%), and Poland (13%). Additionally, more than $1 million worth of window products were imported to Alberta under HS 4418.19.90.00, mostly from the United States (72%) and Austria (17%). See Figure 6 for more details.

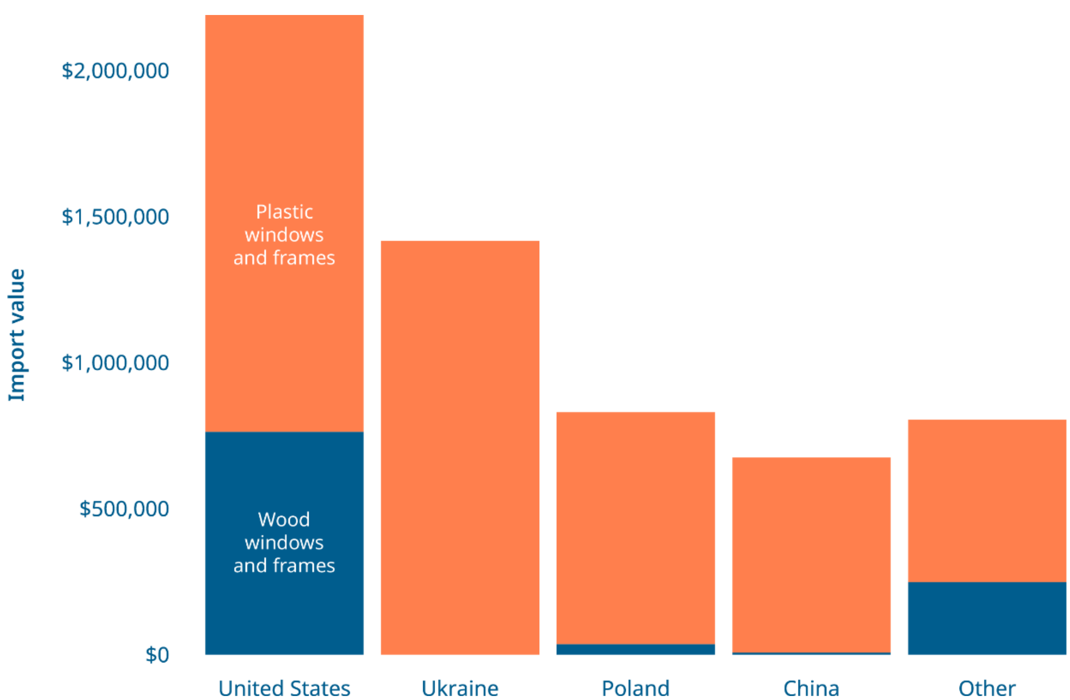

Figure 6. Window imports to Alberta, 2025

Data source: Government of Canada[52]

[50] Brendan Haley and Carol Maas, *Energy Efficiency: The "Made-in-Canada" Resource*," (Efficiency Canada, 2025). https://www.efficiencycanada.org/wp-content/uploads/2025/07/Energy_Efficiency_the_made-in-Canada-_resource_FINAL.pdf

[51] *Energy Efficiency: The "Made-in-Canada" Resource*."

[52] Government of Canada, "Canadian International Merchandise Trade Web Application."

Hundreds of Canadian manufacturers produce Energy Star-certified windows, including several brands in Alberta, that can be found through product databases.

Product databases

Natural Resource Canada and Energy Star both host searchable product databases for finding energy-efficient products.

The Energy Star database has information on appliances, electronics, food equipment, heating and cooling systems, lighting and fans, networking infrastructure, pools, vehicle charging, water heaters, windows and doors, and insulation.[53]

The Natural Resources Canada database covers appliances, mechanical systems, windows and doors, electronics, heating and cooling systems, ventilation equipment, industrial/commercial equipment, lighting and fan products, and water heaters. The database also allows search requests to be filtered by federal program.[54]

These two databases are quite useful for planning incremental or whole-building retrofits.

For the deeper emissions cuts required for whole-building retrofits, the Passive House Institute hosts an international component database for Passive House-certified products. The database features construction systems, ventilation systems, façades, windows and doors, drain water heat recovery, heat pumps and combined systems, airtightness systems, and sun protection systems.[55]

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[53] Energy Star, "Energy Star Product Finder," (2026). https://www.energystar.gov/productfinder/

[54] Natural Resources Canada, "Energy efficiency for products," (2025). https://natural-resources.canada.ca/energy-efficiency/product-energy-ratings

[55] Passive House, "Component database," (2026). https://database.passivehouse.com/en/components/

4. Discussion

4.1 Uncertainty has exacerbated supply chain challenges

As this report has highlighted, the retrofit supply chain is a complex and resource-intensive ecosystem made up of a dynamic, interconnected network of suppliers, manufacturers and distributors. Logistics operations also play a critical role in this network, ensuring products and goods are moved between different actors while providing warehousing and distribution.

Disruptions in the supply chain, particularly those driven by uncertainty, can cause delays and increase costs for highly sequenced construction projects that depend on the timely provision of equipment, products or materials used in retrofits. As noted earlier, trade policy volatility from 2025 through early 2026 has exacerbated uncertainty across the retrofit supply chain. Manufacturers are reassessing production levels or plant locations, project buyers are adjusting equipment or material purchases, and suppliers are modifying inventory levels in anticipation of future changes.[56] U.S. tariffs have also reduced cross border trade, increasing pressure on logistics providers and favouring larger firms that are better able to withstand the operational challenges of this uncertain environment.

This uncertainty has further strained supply chains overall and intensified existing workforce shortages, causing gaps or bottlenecks, particularly in transportation operations.[57] High turnover and difficulty attracting a diverse workforce are persistent challenges. As the retrofit sector scales up, addressing workforce challenges in the manufacturing and transportation sectors will strengthen supply chain resilience and efficiency, enabling more cost-effective and consistent delivery of retrofits.

4.2 Alberta has great potential for reshoring and localizing retrofit innovation

This report found significant Canadian, including Alberta-based, manufacturing capacity for enclosure and material components (such as insulation, windows, and structural materials), while complex mechanical and electrical systems remain more reliant on imports. In response to

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[56] Derek Couthier, "Canadian supply chain faces a reality check heading into 2026," *Inside Logistics*, December 9, 2025. https://www.insidelogistics.ca/features/canadian-supply-chain-faces-a-reality-check-heading-into-2026/

[57] Descartes Systems Group, *How Bad Is The Supply Chain and Logistics Workforce Challenge?* (2024). https://www.descartes.com/sites/default/files/media/documents/2024-01/wp-how-bad-is-the-supply-chain-and-logistics-workforce-challenge-2024-final.pdf

increasing global market volatility, there is renewed interest in building on existing capacity in additional segments of the market and "reshoring" manufacturing of high-performance segments such as HVAC and electrical system products. However, within the Canadian context, reshoring *innovation* may be a more strategic approach than reshoring *manufacturing*, especially considering the highly competitive nature of global manufacturing. Reshoring innovation is well suited to Alberta, as the province hosts a robust innovation ecosystem, built around the research and granting capacity of Alberta Innovates, Emissions Reduction Alberta and the province's university network.[58,59] Canada's industry and government already have a solid track record on collaborating to unlock clean energy innovation through direct investment. Examples include the electric vehicle supply chain rollout, as well as incentives like the clean technology manufacturing investment tax credit.[60]

Given the province's history as an energy leader, Alberta has strong potential to expand its energy innovation capacity for both domestic and export markets. For example, as the province with the third-highest photovoltaic potential, Alberta accounts for a significant share of total Canadian solar panels imports.[61] Pairing this proven demand for renewable energy with growing interest in utility-led DSM approaches could create new opportunities in distributed energy resources. Alongside opportunities to enhance grid resilience and stability, the province could leverage new market demand for battery storage paired with imported solar panels to develop and export innovative energy solutions. These export opportunities go beyond the manufacturing of single products and instead focus on innovative, high-value supply chains like grid-connected charging infrastructure and the IT resources required to enable virtual power plants across the world. In fact, the development of Canadian intellectual property for critical energy transition technologies has already been recognized as a means of strengthening Canada's business environment for energy-efficient technologies.[62]

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[58] Alberta Innovates, "Alberta's Innovation Engine." https://albertainnovates.ca/

[59] Emissions Reduction Alberta, "Invested in Technology." https://www.eralberta.ca/

[60] Canada Revenue Agency, "Clean Technology Manufacturing (CTM) Investment Tax Credit (ITC)," October 18, 2024. https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/business-tax-credits/clean-economy-itc/clean-technology-manufacturing-itc.html;

Jill Giswold, "Tallying Government Support for EV Investment in Canada," *Office of the Parliamentary Budget Officer*, June 18, 2024. https://www.pbo-dpb.ca/en/additional-analyses--analyses-complementaires/BLOG-2425-004--tallying-government-support-ev-investment-in-canada--bilan-aide-gouvernementale-investissement-dans-ve-canada

[61] Natural Resources Canada, "Photovoltaic potential and solar resource maps of Canada," January 16, 2025. https://natural-resources.canada.ca/energy-sources/renewable-energy/photovoltaic-potential-solar-resource-maps-canada

[62] Brendan Haley and Carol Maas, *Energy Efficiency: The "Made-in-Canada" Resource* (Efficiency Canada, 2025). https://www.efficiencycanada.org/wp-content/uploads/2025/07/Energy_Efficiency_the_made-in-Canada-_resource_FINAL.pdf

4.3 Promising technologies are emerging in Alberta

Alberta is home to global building and energy innovators. The examples below highlight early-market implementations that demonstrate an appetite for continued innovation.

Directionally drilled urban geothermal wells: Urban geothermal wells under a building are drilled at an angle or curved, a drilling technique used in the oil and gas and utilities sectors, rather than through the traditional method of vertical drilling. Retrofit Canada, in partnership with Avonmore Community League (Edmonton), ReNü Engineering Inc. and Mack Construction, is testing the feasibility of this type of low-impact geothermal retrofit beneath existing buildings in dense, urban environments. Drilling is expected to be completed in 2026.[63]

Electrochromic / photochromic glass: A dynamic glazing system that automatically adjusts the window's tint to manage heat gains and reduce glare. It is currently being piloted, with a project at the Calgary Cancer Centre designed and built by PCL, Dialog, and Stantec.[64,65]

Modular ice-based energy storage system: To alleviate cooling demand during the day, this system produces ice overnight when grid demand is low and then uses the ice for air conditioning during the day when grid demand is high. Alberta Health Services has trialled the system in its healthcare facilities.[66]

Phase change materials (PCMs): These are materials in a thermal energy storage system that release or absorb large amounts of heat when changing between solid and liquid form. SAIT has been testing PCM use in walls for their ability to reduce temperature swings, as well as in hot water heating.[67]

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[63] Rebecca Pinto, Retrofit Canada, personal communication, March 17, 2026.

[64] *Deep Retrofit Accelerator Initiative Technologies and Skills Memo*, 7.

[65] CCE Staff, "2024 #CCEAwards Showcase: Arthur: J.E. Child Comprehensive Cancer Centre," *Canadian Consulting Engineer*, October 31, 2024. https://www.canadianconsultingengineer.com/features/2024-cceawards-showcase-arthur-j-e-child-comprehensive-cancer-centre/

[66] *Deep Retrofit Accelerator Initiative Technologies and Skills Memo*, 7.

[67] *Deep Retrofit Accelerator Initiative Technologies and Skills Memo*, 7.

Tyler Willson, *Capture the heat: Thermal batteries promise efficiency, reliability* (SAIT, 2022). https://www.sait.ca/news/2022/10/capture-the-heat-thermal-batteries-promise-efficiency,-reliability

5. Conclusion

5.1 Key findings and possible solutions

Alberta's retrofit supply chain is functioning, adaptable, and well-positioned for growth. Interviews and survey results show that suppliers, manufacturers, and contractors have demonstrated resilience and problem-solving capabilities, successfully navigating recent trade disruptions, tariffs, and supply volatility by diversifying sourcing, substituting products, and refining project planning.

Headwinds persist, however, largely related to workforce capacity, the affordability of complex mechanical systems, and access to certain high-performance enclosure products. These challenges are well understood and are already being actively managed by the retrofit sector, providing a foundation for future success. Building on the sector's adaptability and resilience, existing domestic and regional manufacturing capacity for key retrofit components, and a growing ecosystem of innovation and emerging technologies, efforts to enhance market certainty, develop the workforce, and improve coordination can prevent future bottlenecks and enhance economic opportunities.

The primary barrier to accelerating retrofits is not a lack of capability, but a lack of coordination, certainty, and long-term market signals. With targeted action to align policy and procurement signals, improve supply chain coordination, and strengthen workforce readiness, Alberta can leverage existing strengths to develop a resilient, competitive retrofit supply chain that supports economic development, emissions reductions, and long-term affordability.

Table 5. Key findings and possible solutions

Key findings	Solutions
Clarity on the future scope and pace of retrofits in Alberta leads to market readiness	A coordinated roadmap can help align provincial building codes, benchmarking and disclosure programs, municipal standards, and utility-led demand side-management programs.
Alberta's supply chain shows resilience but support is needed to become ready for growth	Adjusting procurement practices to deal directly with suppliers, connecting with diversified supplier networks, and prioritizing Canadian and Alberta-made retrofit products, where feasible. Identifying retrofit-critical materials and technologies not currently manufactured in Alberta and assess feasibility of local or Canadian production.

	Easing product accessibility constraints with strengthened warehousing and logistics capacity, improved inventory visibility, lead-time transparency, and demand signalling. Integrating supply chain risk, lead-time uncertainty, and substitution planning into bids and schedules.
Workforce occupational and skill gaps are emerging and expected to grow	Preparing trade workers and professionals to integrate high-performance envelope systems, heat pumps, ventilation, controls, and electrification technologies. Coordinating funding and planning across trades, manufacturing, logistics, and transportation. Designing curriculum focused on whole-building retrofit delivery. Focusing efforts on HVAC, automation, and electrification. Working with builders, manufacturers, utilities, and government to identify priority skill shortages and updating training programs accordingly.

5.2 Next steps for further research

This research mapped Alberta's retrofit supply chain to assess the risks, challenges and successes related to high-performance building products and to identify vulnerabilities that may limit the scaling of retrofit activity in the province. Based on semi-structured interviews with manufacturers, component suppliers, distributors, and retrofit service providers, it identified common constraints, emerging trends, and possible solutions. These interviews were bolstered by a survey that elicited information on the availability, affordability, and accessibility of key retrofit technologies.

To broaden participation and strengthen the evidence base of this report, future research should use additional qualitative exercises, such as focus groups, to capture a wider range of industry perspectives, as well as develop closer partnerships with large manufacturers and distributors.

Building on the findings presented in this report, future research should also consider:

- analyzing supplier, distribution, manufacturing and shipping flows for both simple and complex products to better understand product flows into and out of the province.
- expanding the lists of manufacturers and distributors identified in this report to explore the roles of domestic and foreign manufacturing and ownership structures on Alberta's retrofit ecosystem.
- conducting post-implementation reflection studies as retrofit projects become more common place, with a focus on product substitutions occurring between planning and schematic design phases. This is likely being done to avoid product delays from accessibility or affordability challenges.

Appendix A. Additional data tables

Table 6. Modelled retrofit rates per year in Alberta, 2026–2050

Year	Apartment units	Single-family attached	Single-family detached
2026	3,219	2,700	4,972
2027	6,438	5,400	9,944
2028	9,657	5,400	19,888
2029	12,876	8,099	29,832
2030	12,876	10,799	39,776
2031	16,095	10,799	39,776
2032–45	16,095	13,499	49,721
2046	12,876	10,799	39,776
2047	9,657	10,799	29,832
2048	6,438	8,099	29,832
2049	3,219	5,400	29,832
2050	3,219	2,700	19,888

Table 7. Heat pump installations across Canada since 2020

Province	Heat pumps installed since 2020	Number of private dwellings, 2021	Incidence rate per 100,000
Canada	284,952	16,284,235	1,750
Alberta	2,757	1,772,670	156
British Columbia	31,132	2,211,694	1,408
Manitoba	1,480	571,528	259
New Brunswick	16,090	366,146	4,394

Province	Heat pumps installed since 2020	Number of private dwellings, 2021	Incidence rate per 100,000
Newfoundland and Labrador	10,177	269,184	3,781
Northwest Territories	3	17,603	17
Nova Scotia	37,070	476,007	7,788
Nunavut	No data	11,720	No data
Ontario	105,551	5,929,250	1,780
Prince Edward Island	9,750	74,934	13,011
Quebec	70,522	4,050,164	1,741
Saskatchewan	261	513,725	51
Yukon	159	19,610	811

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