Building Nova Scotia's Green Workforce: Addressing Labour Gaps for a Net-Zero Future

Prepared for EAC

Prepared by ASBB Economics and Research Ltd
March 2025

Contents

Acknowledgements

ASBB Economics and Research Ltd. would like to extend our sincere gratitude to all those who contributed to the development of this report. We acknowledge the valuable insights and collaboration provided by the EAC team, whose expertise and feedback were instrumental in shaping our analysis.

We also extend our appreciation to the industry stakeholders, policymakers, and training institutions who shared their perspectives and data, helping to enrich our understanding of Nova Scotia's labor market trends and workforce challenges.

A special thanks to the steering committee, the energy efficiency sector, and the Ecology Action Centre staff for their invaluable contributions, expertise, and commitment to fostering a sustainable and inclusive labor market.

We also extend our gratitude to the students and other participants who took part in the surveys. Your input provided crucial insights that helped shape this report's findings and recommendations.

Finally, we recognize the skilled trades professionals and workers in Nova Scotia whose commitment and adaptability are key to achieving the province's energy efficiency and net-zero goals.

What is this document?

This document is the complete version of the research conducted for **the Ecology Action Centre (EAC)** on Nova Scotia's workforce readiness for energy-efficient building retrofits.

This full report includes all primary and secondary research, detailed data analysis, stakeholder input, and job market forecasting. It presents a thorough examination of labor force trends, gaps, and opportunities, and provides the foundation for the recommendations aimed at supporting a just and effective energy transition in the province.

The body of this report holds an in depth analysis of all the research, while the appendices hold some of the raw data from key informant interviews, job market reports, statistics canada, literature reviews, jurisdictional scans, etc.

The appendices are structured in the following format:

- **Appendix 1: Methodology:** Holds a list of all key informants interviewed and explains in detail the steps taken to conduct the research and analysis.
- **Appendix 2: Literature review:** This section analyzes several papers, documents, and reports to identify key areas and knowledge gaps related to the Ecology Action Centre's "Skills for Net-Zero Initiative". Focusing primarily on energy-efficiency and the transition of the province's energy system and economy away from fossil fuels.
- **Appendix 3: Job Forecasts:** Holds a list of key professions (NOCs) identified as critical for energy efficient retrofits and data regarding them. Including graduation numbers, replacement demand, female to male ratio, and employment projections.
- **Appendix 4: Pathways to Education:** This section explores the education and upskilling opportunities for each one of the Key NOCs we identified in the previous sections. The list is broken down into two main groups: primary and secondary professions required for retrofits.
- **Appendix 5: Key Findings:** This section highlights the main findings and recommendations that were identified through key informant interviews.
- **Appendix 6: Jurisdictional Scan:** This section analyzes the landscape of energy efficiency in North America, focusing on Canada, for governmental and non-governmental programs to improve energy efficiency and support marginalized groups.

Executive Summary

This report examines Nova Scotia's workforce readiness for energy-efficient building retrofits, a key step in meeting the province's net-zero targets. It looks at labor market trends, workforce gaps, and opportunities to develop skilled workers. The research includes a review of industry data, consultations with stakeholders, and job forecasting to identify barriers and recommend workforce development strategies. Some of the key findings include:

1. **Labor Shortages and Workforce Aging**
    - Over 35% of the workforce in energy-efficient retrofits is aged 55+, with shortages expected in carpentry, HVAC, and electrical work.
    - Not enough new workers are entering the trades, with low graduation rates in fields like electricians (5.8%) and carpenters (2%).
2. **Workforce Diversity Gaps**
    - Women make up less than 10% of the workforce in key trades, with electricians and plumbers having as few as 1–3% women workers.
    - Visible minorities are underrepresented, making up less than 5% in many trades, even though they are 9.8% of Nova Scotia's population.
    - These gaps could make it harder for Nova Scotia to meet net-zero goals without targeted efforts to attract and train a more diverse workforce.
3. **Job Growth and Demand Gaps**
    - Construction managers, electricians, ironworkers, and plumbers will see strong demand due to energy efficiency investments.
    - Facility operation managers, welders, and power line workers may see job declines due to automation and industry changes.
    - By 2030, there could be significant worker shortages, especially for carpenters (-7,010 jobs) and electricians (-4,292 jobs), slowing down retrofit projects.
4. **Policy Uncertainty**
    - Nova Scotia has committed to Tier 3 building codes by 2029 but has no clear plan for Tiers 4 and 5, despite agreeing to a 2030 deadline with the federal government. This uncertainty may slow job growth.
5. **Education and Training Gaps**
    - Current training programs do not meet industry needs, and apprenticeships are not keeping pace with demand.
    - More flexible training options, such as short-term courses and micro-credentials, are needed to upskill existing workers and attract new ones.
    - Rural and Indigenous communities often lack access to training programs, limiting their participation in energy efficiency jobs.

Some of the recommendations for addressing these challenges include:

A. Workforce Development
- Expand apprenticeships and offer incentives for businesses to hire and train workers.
- Develop training programs for underrepresented groups, including women and visible minorities.

B. Policy and Regulation
- Speed up the adoption of Tier 4 and Tier 5 building codes to provide stability for the industry.
- Strengthen collaboration between the government and businesses to align workforce development with job market needs.

C. Education and Skills Training
- Create short-term skills training programs for energy efficiency trades.
- Increase funding for vocational training and STEM education to support green job opportunities.

D. Equity and Inclusion
- Promote careers in energy efficiency to women and visible minorities.
- Improve workplace conditions and retention efforts to support diverse workers.

E. Industry Collaboration
- Strengthen partnerships between government, industry, and schools to align job training with industry needs.
- Provide funding for businesses transitioning to energy-efficient building practices.

By addressing these issues, Nova Scotia will be better prepared to build a stronger workforce to meet the needs of its energy transition while creating long-term, sustainable job opportunities.

Section 1: Introduction

1.1 Context

Achieving Nova Scotia's ambitious climate goals—80% renewable energy by 2030 and net-zero emissions, from electricity generation, by 2050—requires significant progress in energy efficiency. Buildings represent the third-largest source of greenhouse gas emissions in the province, and energy efficiency retrofits are essential for reducing emissions, and meeting provincial and federal targets.

In laying the groundwork for strengthening the local economy in Nova Scotia, this report aligns with the key priorities outlined in Nova Scotia's 2025-26 budget. It outlines opportunities to uplift equity-deserving communities in skilled trades. It supports **making life more affordable** via the expansion of capacity in the construction sector to build energy-efficient housing and complete energy retrofits to lower energy bills. Reducing emissions also plays a vital role in **building a healthy population**, as cleaner air and greener electricity contribute to public health while mitigating the impacts of climate change.

According to an Atlantic Economic Council (AEC) report, approximately 41,000 homes and 2 million square meters of commercial space will require upgrades in the Atlantic region annually until 2040, at an estimated cost of $1.5 billion. AEC's report also highlights the importance of retrofits to Nova Scotia's aging building stock, in which 21% of residential units were constructed prior to 1960. Pembina Institute's 2021 report estimates that in Nova Scotia about 16,500 homes, and several commercial properties will require upgrades at an estimated cost of approximately $0.6 billion annually.

However, systemic challenges, including limited workforce capacity, outdated building codes, and barriers to workforce participation, slow down progress.

The provincial labour market faces unique challenges. An aging workforce, high retirement rates, and insufficient training opportunities create bottlenecks for scaling up the skilled labour needed for energy-efficient retrofits. Equity-deserving groups remain underrepresented in skilled trades, further limiting the available talent pool.

On February 19, 2025, the government of Nova Scotia introduced legislation aimed at strengthening the financial accountability and sustainability of post-secondary institutions, and alignment with government priorities. Some of the changes include amending existing laws to grant degree-awarding powers to Nova Scotia Community College, hoping to address work shortages, and establishing consistent governance standards across universities. While these measures intend to align educational offerings with provincial priorities, it remains uncertain whether they will effectively resolve the existing workforce gaps.

Additionally, in the 2024 Canadian Energy Efficiency Scorecard, by Efficiency Canada, Nova Scotia's ranking declined from second place to fifth. This drop reflects the province's need to intensify its energy efficiency initiatives and was attributed in part to the need to improve demand-side solutions on energy efficiency, and more ambitious net zero energy ready building codes. The table below shows the top 5 provinces in the 2024 scorecard.

Table 1: 2024 Efficiency Canada Scorecard

Province	2022 Ranking	2024 Ranking	Change in Rank
British Columbia	1	1	-
Québec	3	*2	+1
Prince Edward Island	4	*2	+2
New Brunswick	7	4	+3
Nova Scotia	2	5	-3

* QC & PEI are tied for second spot.

Energy efficiency is a growing sector that actively attracts more capital. The global market value for clean energy technologies like solar photovoltaic, wind, electric vehicles, batteries and heat pumps surpassed US$700 billion in 2023. Global investment in clean technology rose by 50%, reaching US$235 billion in 2023, and this increase is equal to nearly 10% of the world's growth in investment (Environment and Climate Change Canada, 2025). Improving energy efficiency is part of a global effort that is well underway, and Nova Scotia is well positioned to contribute.

1.2 Project Objectives

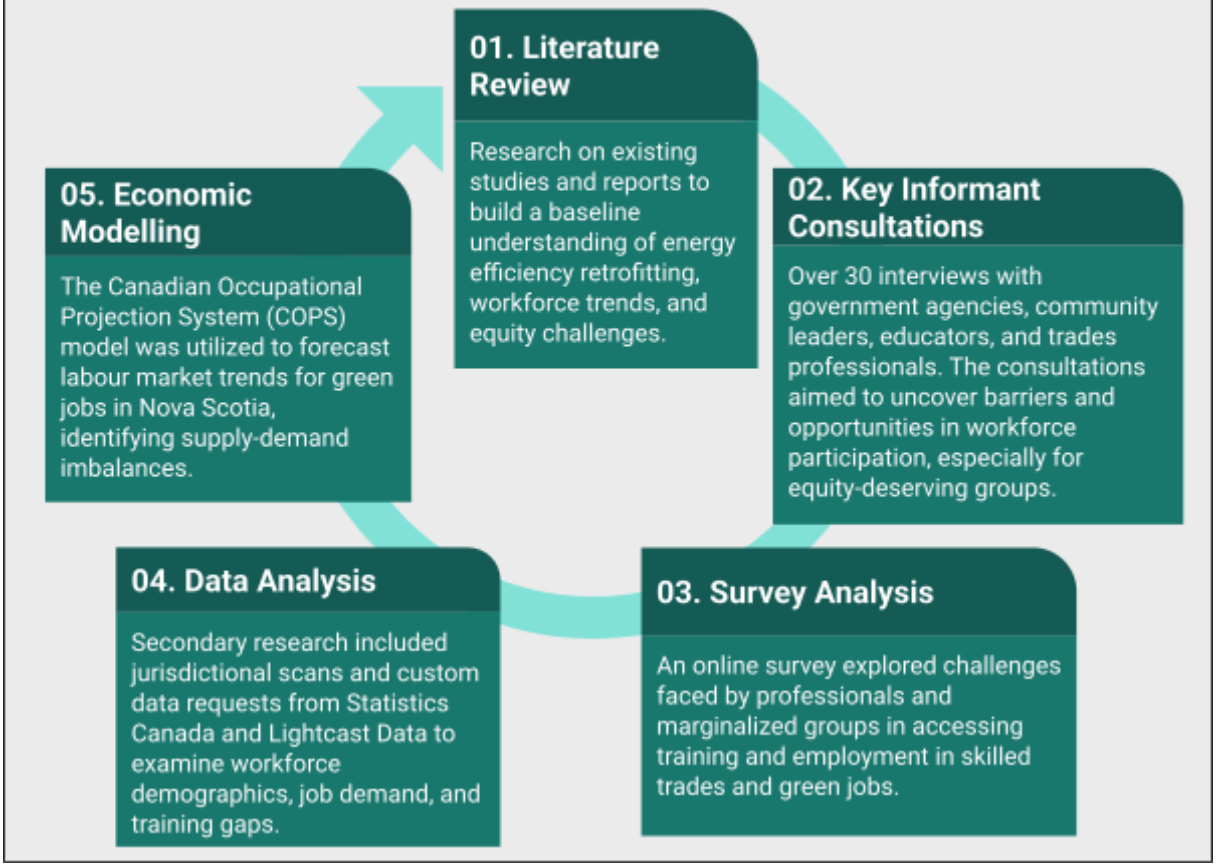
This report investigates the barriers, solutions, and socioeconomic implications of developing the workforce and skills needed to transition Nova Scotia's energy system and economy away from fossil fuels, and toward greater energy efficiency and conservation.

It focuses on developing an understanding of Nova Scotia's national position in energy efficiency, identifying the key challenges to develop workforce capacity, and providing clear recommendations for policy makers. The research is centred primarily on residential and commercial energy retrofits.

By exploring key opportunities, challenges, and gaps in the energy efficiency sector, this report aims to provide actionable insights for policy and decision-makers, educators, industry leaders, and equity-focused organizations.

Figure 1 below, is an overview of ASBB's approach to the research.

Figure 1: Our Approach



1.3 Organization of this Report

This report is organized into the following sections:

1. **Methodology**: Detailed explanation of research methods, including literature review, key informant interviews, survey design, and data analysis.
2. **Literature Review**: Overview of existing studies on energy efficiency retrofits, workforce trends, and equity-focused initiatives.
3. **Jobs Forecast**: Analysis of labour-market projections, including anticipated demand for skilled trades and green jobs.
4. **Pathways to Education and Training**: Examination of current training assets and strategies to address skills gaps for new and upgrading workers.
5. **Key Findings**: Summary of key informant input, survey results, and identified barriers and opportunities.
6. **Policy Recommendations**: Actionable strategies for policy, decision-makers and industry to support workforce development and equity in green retrofits.

Section 2: Methodology

This study employed a three-phase methodology to achieve its objectives: a literature review, secondary research, and key informant consultations. These methods aimed to develop an updated understanding of the barriers to implementing energy efficiency measures in Nova Scotia's building standards, with a particular focus on energy retrofits and challenges faced by individuals entering skilled trades and green jobs.

2.1 Literature Review (Phase 1)

Assembled a steering committee with energy and industry experts, and reviewed a list of relevant literature documents they provided to identify current challenges and knowledge gaps. Industry publications (e.g., BuildForce Canada, CCWESTT, YWCA) and Canadian energy efficiency programs informed this phase.

2.2 Secondary Research (Phase 2)

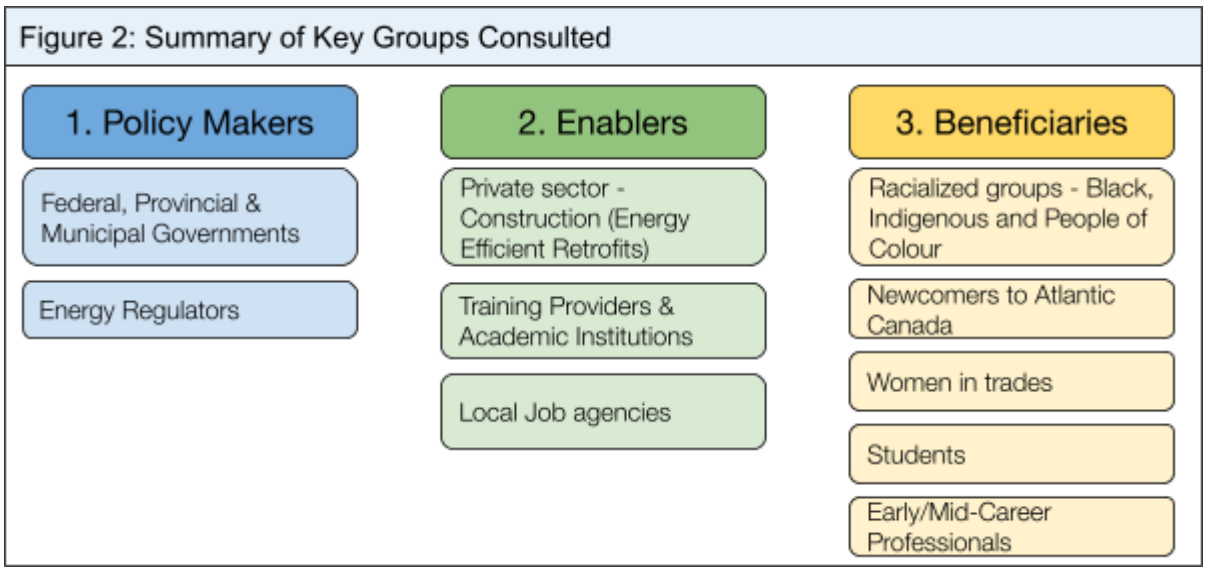
Data collection involved:

- **Background Reviews and Jurisdictional scans:** Analyzed energy efficiency and equity initiatives across Canada, identifying best practices.
- **Statistics Canada and Light Cast Data:** Custom data requests and publicly available information supplemented findings to inform forecasting models.

2.3 Key Informant Consultations (Phase 3)

To verify individual opinions reflecting the changes in job demand, we consulted with key informants from diverse groups listed in Figure 2 below. We conducted over 30 interviews and one survey, targeted to the “beneficiaries” category, which had 78 respondents. These consultations highlighted gaps in energy efficiency, skilled trades, and green jobs awareness. A detailed list of informants is included in Appendix 1.

This comprehensive approach ensured an inclusive and data-driven foundation for addressing challenges in Nova Scotia’s transition to energy efficiency and green jobs. A summary of the methodology is illustrated in Figure 1 of the full report, and additional details are available in Figure 2.



Section 3: Literature Review

3.1 Purpose and Scope

This literature review covers literature (governmental reports, academic and public policy reports) relevant to the transition of Nova Scotia's energy system and economy toward net-zero objectives, focusing on energy efficiency retrofitting. The primary objectives included:

1. Assessing job market impacts, including job creation and displacement.
2. Addressing barriers and opportunities for equity-deserving communities.
3. Identify resources available for education, training assets, and knowledge gaps.
4. Investigating resources and skills needed for net-zero retrofits and building construction.

3.2 Background on Energy Efficiency & Retrofits

Importance of Retrofitting: Achieving Nova Scotia's net-zero targets by 2050 demands significant retrofitting of older buildings, with about 21% of the housing stock constructed before 1960. Older homes contribute to inefficiencies and higher GHG emissions, making retrofitting critical (Atlantic Economic Council, 2024).

Retrofit Categories:

- Minor: Low-cost adjustments like sealing and insulation.
- Major: Larger upgrades, including HVAC and energy management systems.
- Deep: Comprehensive overhauls, with potential savings of up to 60% in energy costs including: replacing roof, adding windows, significantly reconfiguring interior, and HVAC upgrades (Natural Resources Canada).

Costs and Challenges: Annual retrofitting requirements in the Atlantic region include 41,000 residential units and 2 million square metres of commercial space, costing approximately $1.5 billion every year until 2040. On average residential retrofits cost $56,000-$96,000 for detached housing and $33,000-$43,000 per unit for apartments. Commercial retrofit costs vary from $250 to $500 per square meter. Challenges include a lack of data standardization, outdated housing stock, and limited workforce capacity. It is important to make an effort to construct to net-zero standards, despite that meeting efficiency requirements can cost up to 8-9%[1][2] more. These efforts bring energy cost savings in the long run from being over 70% more energy efficient than 2015 building (Atlantic Economic Council, 2024).

3.3 Workforce Impacts: Job Gains and Losses

Job Creation: There is a projected increase in demand for skilled labour in retrofitting and renewable energy sectors to meet Nova Scotia's targets of 80% renewable energy by 2030 and becoming net zero, in the electricity generated, by 2035 (NSPower, 2024).

- By 2033, Nova Scotia will require 10,600 additional workers in the construction industry due to retirements and new project demands. This takes into consideration the expected 8,200 workers, about 22% of the 2023 construction labour force, who are expected to retire, and the 7,400 new entrants to the industry (BuildForce Canada, 2024).
- Green jobs in Nova Scotia are projected to require approximately 3,190 new green job positions by 2033, with significant roles in energy efficiency and renewable energy projects, and an additional 11,720 job openings due to retirements (ECO Canada, 2024).

Job Displacement: A shift to lower emission-intensive industries and away from traditional non-renewable energy sources has been a big driver of change in the jobs market.

[1] Canada Green Building Council, 2019, *Making the Case for Building to Zero Carbon*
[2] Canadian Home Builders Association, 2018, A study by Industry for Consumers

- Traditional energy sectors, such as fossil fuels and coal mining, are declining, risking significant job losses by 2050 according to the Information and Communications Technology Council (ICTC). Employment in the industry is projected to decrease by up to 9% by 2030, and by 2050 about 50-70% of oil and gas jobs, approximately 312,000 to 450,000 people, are at risk of being eliminated (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023).
- Emission-intensive goods-producing industries in Nova Scotia have shifted towards providing services that are less emission-intensive. Between 2005-2018 most of Nova Scotia's GDP growth came from the service industry, while the oil and gas sector fell by 87%, coal mining by 84%, and forestry and logging by 42% (Canadian Climate Institute, 2020).

3.4 Training & Skills Development

Training Needs: In Nova Scotia, the adoption of more ambitious energy-efficient building codes and standards is a big driver of the demand for skilled workers.

- It's crucial to accommodate workers who are already employed full-time, as a big portion of the job gap will be filled by their upskilling. Specialized training for green construction workers, including flexible options like micro-credentials, is essential to meet new demands (Atlantic Economic Council, 2024).
- Programs like "Building it Green" and "Quick Train Canada" aim to prepare workers for energy-efficient practices and retrofitting.

Barriers to Participation: Post-pandemic levels of apprentice enrolment and graduation might impact long-term needs, while minority groups continue to face structural barriers to succeeding in the workforce.

- Low apprenticeship rates during 2019-20 can result in an insufficient number of newly certified journeypersons to sustain the requirements over the long run despite recent upward trends in completion rates (BuildForce Canada, 2024).
- Increasing the participation of traditionally underrepresented groups in the workforce can help mitigate labour shortages in the skilled trades and can be promoted by reducing harassment levels, and more accessible facilities in worksites, providing Personal Protective Equipment (PPE) that fits more body types, and other initiatives (CCWESTT, N/A).

Opportunities: Smaller, rural communities with high unemployment rates, specifically Indigenous populations, can greatly benefit from targeted retraining for net-zero building projects.

- In 2016, the Eskasoni First Nation in Cape Breton had the highest unemployment rate in the province at 26%. The same year, in the Atlantic Region, the

unemployment rate of Indigenous people was over 18% compared to 15% nationally (Canadian Climate Institute, 2020).

3.5 Equity Strategies and Inclusion

Workplace Equity: Creating safe and inclusive workplaces is critical to increasing diversity in the trade sector, and addressing wage gaps for minorities is key to ensuring equitable growth.

- In a 2024 YWCA publication, over 90% of women and gender-diverse participants reported experiencing at least one form of sexual or gender-based harassment (YWCA, 2024).
- African Nova Scotian communities still face wage gaps, and lower representation (Road to Economic Prosperity, 2024).

Community Engagement: Tailored outreach for each specific group of traditionally non-represented communities has to be developed to improve inclusivity and participation rates.

- Tailored strategies for marginalized groups can increase workforce participation and ensure equitable access to green jobs (CCWESTT, N/A).

Leadership Development: To increase the inclusivity of the workforce is important to make sure that traditionally underrepresented groups can access leadership roles and mentors.

- Programs promoting mentorship and leadership for underrepresented youth, including Black and Muslim individuals, are essential to breaking systemic barriers (Urban Alliance, 2023).

3.6 Partnerships and Successful Initiatives

Successful Canadian & International Models & Partnerships:

- Alberta's "Iron and Earth Initiative" and "EDGE UP" programs provide pathways for helping fossil fuel and Indigenous workers transition into clean energy roles (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023).
- National strategies like the "Green Building Strategy" serve as examples of impactful government-led initiatives that support the retrofitting of existing buildings and the development of standards for net-zero and climate-resilient buildings (Energy Management Action Network, 2023).
- Canada's partnership with the European Union helps to drive climate-oriented infrastructure investments while encouraging gender equality in the workforce by drawing inspiration from some of the European Nations' policies and technology (Parahoo, 2023 [CCWESTT]).

Academic Contributions:

- Research partnerships, such as Dalhousie University's battery storage technology development with Tesla, demonstrate the role of academia in driving innovation and workforce readiness (Canadian Climate Institute, 2020).

In the next section, we use the literature review to assess the current state of jobs and develop a statistical framework to predict future job requirements. This framework also evaluates how the current labour supply aligns with the projected demand.

The complete version of the literature review can be found in Appendix 2.

Section 4: Current and Future Job Landscape in Nova Scotia's Retrofitting Sector: Forecasting Workforce Needs to Meet Net-Zero Targets

The transition to energy-efficient building retrofits in Nova Scotia is expected to generate significant job opportunities in the construction and skilled trades sectors. However, workforce shortages and demographic trends pose challenges to meeting net-zero commitments and sustaining economic growth. This section provides a comprehensive analysis of the current and projected labor market for energy efficiency retrofits, identifying key occupations, workforce gaps, and job growth scenarios.

ASBB used a three-step approach to forecast job demand in the retrofitting industry, as described below. First, we identified key occupations within the sector. Next, we analyzed the current state of the industry by examining factors such as workforce replacement needs, student graduation rates, and the number of marginalized individuals in the labor force. Finally, we used Lightcast's specialized job prediction and demographic predictions to predict the current and future workforce demands for each NOC code.

Key findings highlight an aging workforce, low new entrant rates in skilled trades, and underrepresentation of women and visible minorities. The analysis also forecasts job demand growth, identifying critical labor shortages that could impact the province's ability to meet energy efficiency targets. The findings highlight the urgent need for targeted training programs, workforce development strategies, and policy interventions to bridge labor gaps and ensure a skilled workforce capable of meeting the demands of the green economy.

We first describe the overall methodology, followed by a summary of the various findings before using the later sections to provide additional details.

4.1 Data Sources and Methodology

4.1.1 Data Sources

In order to conduct the analysis of this section we have focused on a few key data sources:

- **Statistics Canada** - Labour Force Survey (LFS), and Census Profiles at the provincial levels. We used the labour force survey to outline the key trends in the occupations related to the retrofitting sector using the National Occupation Classification System (NOC's).
- **Light Cast** - ASBB's partnership with Lightcast Data Services, a leader in inclusive labor market analysis. Lightcast integrates diverse data sources to deliver comprehensive labor market projections, capturing industry growth, occupational demand, and workforce demographics.

4.1.2 Methodology for Forecasting Jobs Demand

ASBB used a three-step approach to forecast job demand in the retrofitting industry, as described below. First, we identified key occupations within the sector. Next, we analyzed the current state of the industry by examining factors such as workforce replacement needs, student graduation rates, and the number of marginalized individuals in the labor force. Finally, we used Lightcast's specialized job prediction and demographic predictions to predict the current and future workforce demands for each NOC code. A detail of the NOC can be found in Appendix 3, Table 14. This analysis is essential for assessing whether Nova Scotia's retrofitting workforce is prepared to meet labor demand requirements needed to achieve net-zero targets, which involve adopting new industry standards.

- **Step 1 - Identification of NOC's:**
  - Identified and mapped critical occupations related to retrofitting using the National Occupational Classification (NOC) 2021 framework.
  - Conducted a literature review and secondary research to identify essential NOCs for energy efficiency retrofits and identifying a common definition of green jobs.
  - Categorized 48 key NOCs into:
    - Primary Professions: 39 NOCs required for most retrofit projects.
    - Secondary Professions: 9 NOCs needed for specific retrofit projects.
- **Step 2 - Analysis of the Current State of Green Jobs in the Retrofitting Sector**
  - This section provides an overview of the current workforce in the energy efficiency sector. It examines employment trends across key National Occupation Classification (NOC) categories, analyzing participation rates by age, gender, and visible minority status.

    - We then conducted a customized data analysis using Statistics Canada and Lightcast to forecast key workforce trends. This included examining student graduation rates for each occupation by identifying relevant programs and estimating the number of graduates. Additionally, we analyzed replacement demand by assessing retirement rates within specified occupations and comparing them to the number of new workforce entrants to determine whether future labor supply will meet industry demand.
- **Step 3 - Future Job Demand Forecast and Scenario Analysis**
    - To forecast job demand in the retrofitting sector, we conducted a detailed analysis using data from Statistics Canada and Lightcast. This involved examining current and future labor demand based on projected industry conditions and comparing it to the existing labor supply to identify potential job gaps. By analyzing factors such as student graduation rates and workforce availability, we assessed whether the sector is prepared to meet future needs.
    - Using this data, we developed three scenarios based on different levels of building code adoption and industry growth. These scenarios provide insights into potential workforce shortages and help plan for a labor market that supports the transition to net-zero targets.

A more detailed approach is discussed in Appendix 3. We start with the analysis based on step 2 below and then move onto a more detailed analysis.

4.2 Summary of Current State and Forecast

This section of the report examines Nova Scotia's workforce readiness for energy-efficient retrofitting, analyzing employment trends, workforce demographics, and projected labor demands. Key challenges include labor shortages, aging workers, and diversity gaps, all of which impact the province's ability to meet net-zero targets. Key findings include:

1. **Workforce Aging and Shortages**
    - Over 35% of the retrofitting workforce is 55+ years old, with shortages expected in carpentry, HVAC, and electrical trades.
    - Graduation rates remain low, covering only 5.8% of electricians and 2% of carpenters needed annually.
    - Heavy equipment operators and welders have the highest replacement demands, with 82.3% and 88.2% nearing retirement.
2. **Diversity Gaps**
    - Women represent less than 10% of workers in key trades; electricians (3%) and plumbers (1%) have particularly low women participation.
    - Visible minorities account for under 5% of the workforce, despite making up 9.8% of Nova Scotia's population.
3. **Projected Job Growth and Trends**
    - High demand is projected for construction managers, electricians, ironworkers, and plumbers due to infrastructure projects and energy efficiency policies.
    - Carpenters could face a -7,010 job shortfall by 2030, and electricians -4,292, signaling a major labor gap.
    - Some trades, like welders and power line workers, are expected to decline due to automation and industry shifts.
    - HVAC sector jobs will grow 11.1% by 2031, aligning with retrofitting needs.
4. **Policy and Training Gaps**
    - Nova Scotia aims for Tier 3 efficiency standards by 2029 but lacks a clear plan for Tiers 4 and 5, which could impact job growth.
    - Limited access to training in rural and Indigenous communities restricts workforce participation in retrofitting jobs.

4.3 Industry Trends for Retrofitting Sector in Nova Scotia (NAICS)

To understand the overall job demand for occupations in the retrofitting sector, we first provide an analysis of the current and future state of employment in industries (all Canadian industries) related to retrofitting. This includes projected employment trends and overall industry performance over the next five years. This analysis is crucial for the job demand assessment in the next section, as workforce needs are influenced not only by policy changes, such as the introduction of new building standards, but also by the broader performance and growth of the industries these jobs belong to. For example, the demand for general laborers will be shaped not only by anticipated retrofitting projects and new builds but also by the overall trends and future outlook of the residential and commercial construction sectors. Understanding these broader industry dynamics ensures a more accurate forecast of workforce needs.

We used Lightcast Data and Statistics Canada projections to identify job growth trends for selected NOC codes in the retrofitting and new builds sector. The chosen industries reflect key labor and skilled trade needs, particularly for energy efficiency. Below we provide a brief overview of the selected important industries.

Industries tied to energy-efficient retrofits and construction in Nova Scotia show diverse job growth patterns from 2019 to 2028 contained below:

- **Home Builders:** The homebuilding industry faced significant shifts due to economic conditions and policy changes. After a slight decline in 2019 (-0.38%), the sector experienced a sharp -10% drop in 2020 due to COVID-19. A strong rebound followed in 2021-2022, driven by rising housing starts and disposable income. Growth stabilized in 2023-2024, but future expansion is expected to slow to 1.48% annually as residential construction value declines.
- **Apartment & Condominium Construction:** The sector saw early contractions in 2019 and 2021 due to lower residential investments. Recovery in 2022-2023 was fueled by population growth and increased private investments. By 2024, growth began to slow, with projected modest increases of 0.83% annually through 2027 before a slight rise to 1.64% in 2028.
- **Industrial Building Construction:** This segment fluctuated significantly. After an 8.49% increase in 2019, a -11.0% decline followed in 2020 due to non-residential contraction. Growth rebounded strongly in 2021 (18.2%) but slowed due to market volatility. Between 2023 and 2028, growth will moderate between 1.07% and 4.23%, supported by private investment and stable local construction spending.

- **Commercial Building Construction:** Employment rose sharply in 2019 (10.1%) but dropped in 2020 (-7.86%) due to pandemic-related disruptions. Growth rebounded in 2021-2022, but declining investments led to slight declines in 2023-2024. From 2025-2028, employment is expected to stabilize with moderate annual growth (1.87%-2.16%).
- **Municipal Building Construction:** Employment fluctuated significantly due to economic conditions and public investment trends. A decline in 2019-2020 (-5.67%, -4.94%) was followed by strong rebounds in 2021-2022 (11.1%, 17.5%). After slight dips in 2023-2024, steady growth (2.36%-2.88%) is expected through 2028, driven by infrastructure investment and sustainability initiatives.
- **Concrete Contractors:** This sector faced volatility, with sharp declines in 2019-2020, followed by recovery in 2021 due to government stimulus. A contraction in 2022 was linked to labor shortages and rising costs. Growth resumed in 2023, peaking at 8.46% in 2024. Post-2024, the industry is expected to stabilize with steady 1% annual growth.
- **Roofing Contractors:** The roofing industry saw rapid growth in 2019 (29.3%), followed by slower expansion in 2020 due to pandemic effects. After a brief decline in 2022, employment rebounded in 2023-2024. Future growth will moderate (2.76%-3.61%) through 2028, driven by demand across residential and non-residential projects.
- **Electricians:** Employment fluctuated due to external market conditions. Growth peaked in 2019-2020 (2.9%-4.96%) before a sharp -4.33% decline in 2021. A strong rebound followed in 2022 (8.54%), with continued moderate growth expected through 2028 (2%-3%), supported by infrastructure investments and green retrofits.
- **Heating & Air Conditioning Contractors:** COVID-19 caused a -10.3% drop in 2020, but employment rebounded in 2021 (10.6%). After moderate growth in 2022, a slight dip occurred in 2023 due to economic slowing. From 2024 onward, stable annual growth (1%-1.5%) is projected, driven by population expansion and demand for energy-efficient upgrades.
- **Plumbing**: The sector experienced a -8.03% contraction in 2020 due to reduced construction activity. A strong rebound followed in 2021 (6.61%), with steady moderate growth expected through 2028, supported by stable housing and renovation investments.

Table 2: Industry Job Growth Projections (2019-2028)

NAICS	Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
23611bCA	Homebuilders	-0.38	-10.0	11.3	9.91	5.19	7.01	3.03	1.71	1.45	1.48
23611bCA	Apartment and Condominium Construction	-5.36	0.94	-10.3	8.33	7.69	6.25	0.84	0.83	0.83	1.64
23621 CA	Industrial Building and Construction	8.49	-11.0	18.2	-1.81	1.07	4.23	1.48	1.14	1.08	1.25
23622aCA	Commercial building Construction	10.1	-7.86	8.43	12.1	-0.08	-3.00	1.87	2.16	1.80	2.07
23622bCA	Municipal Building construction	-5.67	-4.94	11.1	17.5	-1.04	-2.97	2.88	1.93	2.06	2.36
23811 CA	Concrete Contractors	-4.13	-9.84	8.07	-4.43	2.61	8.46	0.91	1.03	1.02	0.88
23816 CA	Roofing Contractors	29.3	1.87	6.99	-0.52	5.01	9.21	3.61	2.76	2.83	3.03
23821 CA	Electricians	2.90	4.96	-4.33	8.54	3.52	1.67	3.63	2.85	2.46	2.07
23822a CA	HVAC Contractors	3.01	-10.3	10.6	4.86	-0.72	3.49	1.21	1.07	1.18	1.54
23822bCA	Plumbing	2.81	-8.03	6.61	0.34	2.61	2.71	0.48	1.07	0.90	1.00

4.4 Current State of Occupations (In Retrofitting) in Nova Scotia

Building on the background information of the industries listed above, we analyze the current state of jobs within the energy efficiency sector, with a focus on retrofitting. This assessment includes key workforce variables such as:

- New entrants in the retrofitting sector, measured by graduation rates.
- Age and demographics of the workforce.
- Workforce transition, examining the number of retiring workers (ages 55-65) versus new entrants (ages 15-24).
- Representation of women and visible minorities in the sector.
- Overall labor demand and workforce sustainability to identify potential gaps.

4.4.1: New Entrants in the Retrofitting Labour Market for NS

Graduation rates are a critical measure of how well the workforce can replenish itself to meet future labour demands. Below we examine the supply of new graduates across key occupations (National Occupation Codes or NOCs) in trades, technical roles, and engineering compared to workforce needs for the retrofitting sector.

1. **Major Gaps in Trades**[3]:
    - New graduates make up less than **10% of the workforce** for most trade occupations.
    - **Carpenters (72310)**: Only **2%** of the workforce is replaced annually by graduates.
    - **Electricians (72200)**: Graduation rates cover just **5.8%** of the workforce size.
2. **Engineers Face Shortages**:
    - Graduation rates for civil, electrical, and computer engineers meet **15–40% of workforce needs**, which is inadequate given the growing demand for energy-efficient and infrastructure projects.
3. **Under-Supply in Technical Roles**:

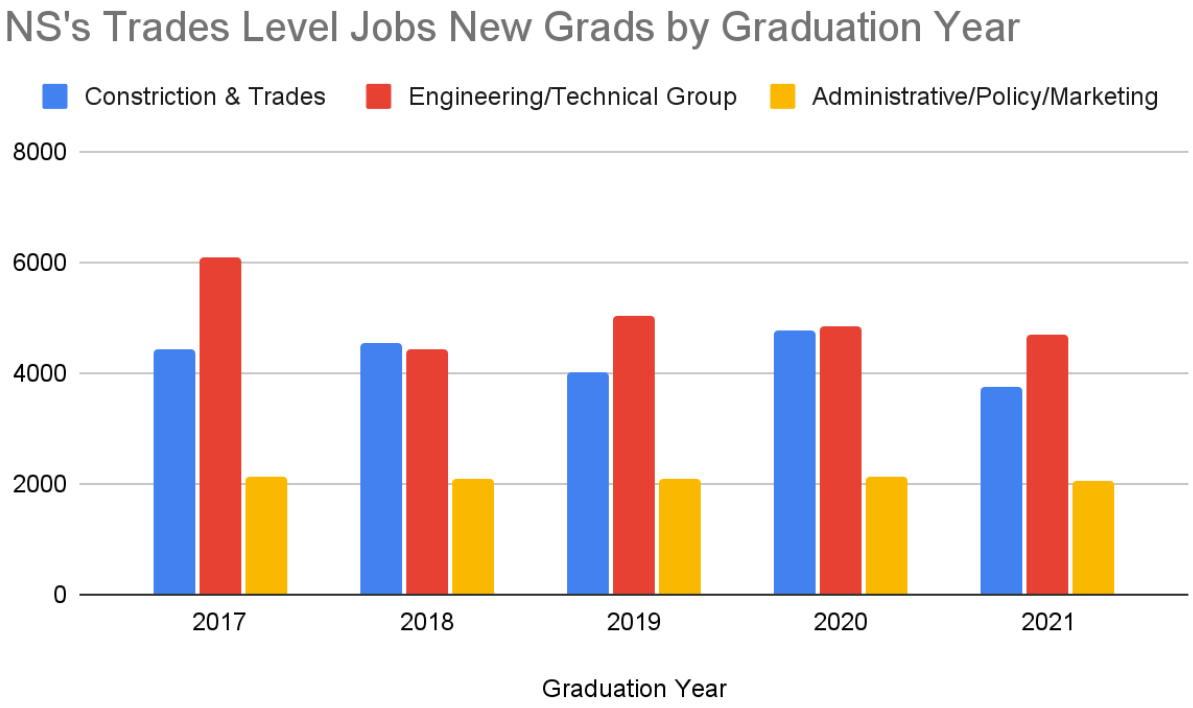
[3] This analysis uses 2021 graduation data (the most recent available from PSIS (Postsecondary Student Information System) compared to 2024 workforce projections, which introduces a mismatch in years. COVID-19's impact on education also limits the reliability of recent trends, potentially underestimating long-term recovery in graduate supply.

- Occupations like construction estimators and geomatics technicians see graduates replacing less than **<10% of their workforce**, creating critical gaps in key infrastructure-supporting roles.

4. **Impact of COVID-19**:
    - Graduation rates dropped significantly during the pandemic due to reduced access to training and delays in education completion. For example:
        - **Electricians (72200)**: Graduation rates fell by **26.9%** from 2017 to 2021.
        - **Carpenters (72310)**: A **12% drop** occurred over the same period.
5. **Heavy Reliance on Alternative Pathways**:
    - Immigration and upskilling of current workers are essential to address immediate shortages, as education pathways alone cannot fill the demand.

The graduation rates for three occupational groups are illustrated in Figure 3 below. The graduation rates for each NOC code relating to the retrofitting sector is attached in Table 14 in Appendix 3 .

Figure 3: Summary of Nova Scotia's Graduation Trends by job types (NOC Codes)



Source: PSIS (Postsecondary Student Information System) ,Light Cast, 2024

4.4.2: Aging Workforce and Replacement Demand for Retrofitting in NS

This section outlines the impact of the aging workforce for Nova Scotia on replacement demand for retrofit professions in Nova Scotia. Specifically, it highlights the total labour force aged 55-64 years (the primary retiring cohort) and calculates the replacement demand necessary (replacement coming from ages 15-24 new entry) to sustain workforce levels using Statistics Canada (Census 2021) data[4]. This is summarized in Table 3 below, however the detailed table of the replacement demand is in Table 16, Appendix 3.

Table 3 below highlights the concept of replacement demand, which occurs when the number of workers approaching retirement (ages 55–64) exceeds the number of younger workers entering the labor force (ages 15–24). This trend indicates a significant workforce gap over the next decade, leading to a potential loss of industry knowledge and a shortage of skilled trades essential for sustaining labor demand. The resulting worker shortage could cause substantial project delays, increased costs, and challenges in meeting Nova Scotia's Net-Zero adoption timeline. Addressing these labor shortages is critical for ensuring a sustainable workforce, as outlined in Section 7.7 on Workforce Transition under the policy recommendations.

The Replacement Demand Formula calculates the workforce gap created when retiring workers exceed new entrants in a specific occupation or industry. It is typically expressed as:

Replacement Demand = Workers Retiring - New Entrants

Where:

- **Workers Retiring** = Number of workers aged 55–64 expected to leave the workforce within a given period.
- **New Entrants** = Number of younger workers aged 15–24 entering the workforce in the same period.

If the result is positive, it indicates a labor shortage, requiring workforce planning to fill the gap. **If negative or zero**, it suggests a stable or oversupplied labor market for that occupation.

[4]To analyze age groups, ASBB used the 2021 Statistics Canada Census data, the most recent census profile available, which is published every five years.

Table 3: Summary of Replacement Demand for Retrofitting Sector in NS (2021)

Profession	55-64 Workforce (Total Labour Force for Retiring Workers)[5]	New Entrants (Total) Ages 15-24	Net Replacement Demand (Employed)	Replacement Demand (Unemployed)
Construction Managers	17,330	2,710	13695	925
Carpenters	29,010	17,880	8830	2300
Welders	15,285	9,915	4735	635
Heavy Equipment Operators	20,000	7,300	10410	2290
HVAC Technicians	4,340	3,505	790	45
Electricians	11,740	15,320	-3215	-365
Plumbers	6,310	6,995	-680	0
General Construction labourers	30,110	12,010	-12010	-985

Source: Statistics Canada, Census 2021 Provincial Profile. Table 98-10-0449-01 Occupation unit group by labour force status, highest level of education, age and gender: Canada, provinces and territories, census metropolitan areas and census agglomerations with parts

Professions such as Carpenters (25.9% of individuals falling under 55-64 out of the the total workforce), General Construction labourers (22.2%), and Construction Managers (24.5%) have substantial portions of their workforce aged 55-64, highlighting significant risks of labour shortages due to impending retirements. Trades like HVAC Technicians (4,340, 19.6%) and Electricians (11,740, 16.9%) also exhibit aging trends that require attention.

Replacement demand is particularly critical for Carpenters (11,130, 38.3% retiring workforce) and Construction Managers (14,620, 84.4%). Conversely, professions such as

[5] 55-64 workforce-Refers to whether a person aged 55-64 years and who is in the labour force was employed or unemployed during the week of Sunday, May 2 to Saturday, May 8, 2021.
19-24 workforce --Refers to whether a person aged 19-24 years and who is in the labour force was employed or unemployed during the week of Sunday, May 2 to Saturday, May 8, 2021.
Replacement Demand (employed)= 55-64 age workforce (employed) -19-24 age group (employed)
Replacement Demand (Unemployed)= 55-64 age workforce (Unemployed) -19-24 age group (Unemployed)

Electricians (-3,580) and Plumbers (-685) show an oversupply, indicating no immediate shortages despite aging trends.

For employed workers, Heavy Equipment Operators (10,410, 82.3% replacement demand) and Welders (4,735, 88.2%) require seamless transition strategies to ensure continuity. Opportunities for unemployed workers are notable in professions like Carpenters (2,300, 20.7%) and Heavy Equipment Operators (2,290, 22%), offering pathways to fill labour gaps.

These insights highlight the pressing need to address replacement demand by balancing workforce aging and entrants into certain jobs while leveraging training programs and targeted recruitment to sustain industry capacity.

4.4.3: Workforce Challenges by Age, Gender, and Diversity in Nova Scotia Retrofitting Sector

Building on the replacement demand analysis, this section examines workforce diversity in key occupations within the energy efficiency sector, focusing on age distribution, gender representation, and visible minority participation. Using data from Nova Scotia's 2021 Census profile, we assess demographic trends within the retrofitting workforce. The findings highlight significant challenges, particularly in workforce aging, gender imbalances, and underrepresentation of visible minorities. Addressing these gaps is crucial, as they could directly impact the province's ability to meet its net-zero 2030 targets, which rely on a skilled and growing workforce to support energy efficiency and retrofitting initiatives.

4.4.3.1 Workforce Age Groups in Nova Scotia Retrofitting Sector

- **Older Workers:**
  More than a third (**35.5%**) of the retrofitting workforce in Nova Scotia is aged **55 and older**, meaning a large portion of the skilled labour force is nearing retirement. This creates a major challenge, as these workers hold much of the sector's institutional knowledge and specialized skills. Their retirement could lead to a significant loss of expertise in areas critical to retrofitting projects, such as energy-efficient installations, retrofitting older buildings, and ensuring compliance with environmental standards.
- **Younger Workers:**
  Nova Scotia has a much smaller proportion of younger workers entering the retrofitting sector compared to the rest of Canada. Only **13.2%** of workers are aged **15-24**, compared to a national average of **33.2%**. This disparity indicates a weak talent pipeline to replace retiring workers. The limited influx of young workers

means fewer skilled professionals will be available to meet the increasing demand for retrofitting projects, particularly as climate initiatives ramp up toward 2030.

Why This Matters for Net-Zero Goals:

- The shift to net-zero emissions by 2030 requires an accelerated pace of retrofitting buildings and improving energy efficiency. However, the **shortage of younger workers** and the reliance on an **aging workforce** may slow the progress of these projects.
- Gaps in skilled labour could lead to project delays, increased costs, and a failure to meet the province's energy efficiency targets within the desired timeframe.

4.4.3.2 Representation of Women in Nova Scotia Retrofitting Sector

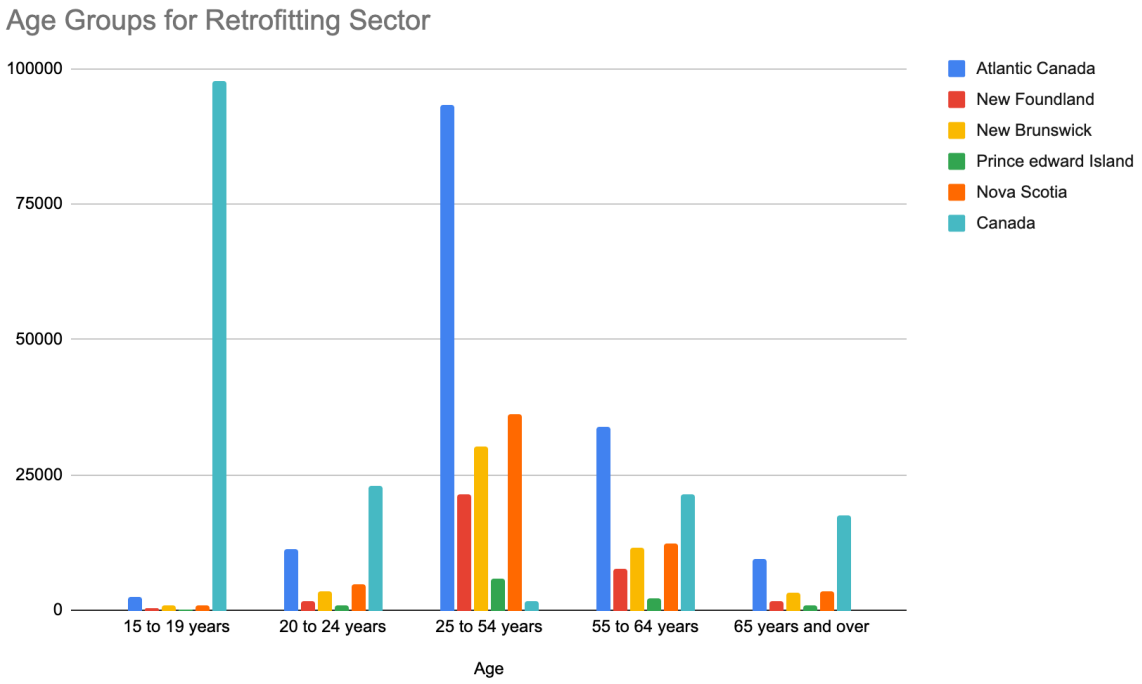
- **Current State:**
  Women are significantly underrepresented in the retrofitting sector, particularly in construction and trades, where many roles report **less than 10% women participation**:
  - **Electricians**: 3 women for every 100 men (ratio: **0.03**).
  - **Plumbers**: 1 woman for every 100 men (ratio: **0.01**).
  - **Construction Managers**: 17 women for every 100 men (ratio: **0.17**).
- **Better Representation in Some Technical Roles:**
  Certain technical jobs have slightly higher female participation, such as:
  - **Drafting Technologists**: 50 women for every 100 men (ratio: **0.5**).
  - **Industrial Designers**: More women than men (ratio: **1.3**).

Why This Matters for Net-Zero Goals:

- The underrepresentation of women limits the size of the labour pool available for retrofitting and energy-efficient construction. The province is effectively excluding a significant segment of the population from contributing to these efforts, which exacerbates existing labour shortages.Increasing the participation of women in these roles could provide a much-needed boost to the workforce, helping to meet the growing demand for retrofitting projects.

The number of workers by age groups by province are listed below in Figure 4.

Figure 4: Age Groups of Retrofitting Workforce



Source: Statistics Canada. Census Profiles 2021. Table 98-10-0449-01 Occupation unit group by labour force status, highest level of education, age and gender: Canada, provinces and territories, census metropolitan areas and census agglomerations with parts

4.4.3.3 Representation of Visible Minorities in Nova Scotia's Retrofitting Sector

- **Current State:**
  Visible minorities (racialized groups) are also underrepresented in Nova Scotia's retrofitting sector, with many trades having less than **5%** visible minority representation. This is a notable gap, considering that 9.8% of Nova Scotia's population identifies as a visible minority, according to the 2021 Census:
  - **Construction Managers**: 4.35% visible minorities.
  - **Electricians**: 3.52% visible minorities.
  - **Plumbers**: 2.56% visible minorities.
- **Higher Representation in Technical and Administrative Roles:**
  Some technical and administrative roles show modestly better representation:
  - **Computer Engineers**: 21.52% visible minorities (highest among technical roles).
  - **Electrical Engineers**: 18.89% visible minorities.
  - **Education Policy Researchers**: 10.24% visible minorities.

Why This Matters for Net-Zero Goals:

- The shift to a greener economy requires a diverse and inclusive workforce to bring fresh perspectives, innovation, and ideas. Low representation of visible minorities means the sector is not fully utilizing the talents and contributions of these groups.
- Increasing diversity in the workforce is crucial for filling labour shortages and meeting the province's retrofitting targets. Without broader participation, Nova Scotia risks falling behind in developing the workforce needed for widespread energy efficiency projects.
- **Labour Shortages and Project Delays:** The lack of younger workers, women, and visible minorities[6] limits the size of the available workforce. This shortage will directly result in slower progress for retrofitting and energy efficiency projects, making it difficult to meet the tight timelines of net-zero goals.
- **Loss of Expertise:** With **35.5% of workers nearing retirement**, the sector risks losing experienced professionals who play key roles in project planning, energy-efficient installations, and compliance. Without a strong pipeline of younger workers to replace them, critical knowledge and skills will be lost.
- **Missed Opportunities for Innovation:** A lack of diversity (gender and ethnic) in the workforce reduces the potential for innovation. Diverse teams bring unique perspectives and problem-solving approaches, workplace cultural awareness and other changes which are essential for tackling the complex challenges of retrofitting and energy efficiency.
- **Failure to Scale Up:** Achieving net-zero targets requires the **rapid scaling** of retrofitting activities across homes, buildings, and infrastructure. With an aging workforce and a limited influx of new talent, the sector may struggle to expand at the pace needed to meet demand.
- **Economic Inefficiencies:** Workforce gaps could lead to higher costs for retrofitting projects due to competition for skilled labour. This may reduce the overall affordability and accessibility of energy-efficient retrofits, further slowing the transition to net-zero.

The major NOCs are listed below in Table 4, and the grouped NOCs are listed under Appendix 3.

Table 4: Female to Male Ratio and Visible Minority percentage

NOCs	Description	Female to male Ratio	Visible minority
70010	Construction managers	0.17	4%
72310	Carpenters	0.02	4%

[6] We did not specifically mention individuals with disabilities here because Statistics Canada does not provide data on individuals with disabilities in the Labour Force Survey, which is the primary source used.

72106	Welders and related machines operators	0.04	5%
72402	Heating, refrigeration and air conditioning mechanics	0.02	3%
73400	Heavy equipment operators	0.02	2%
72200	Electricians (except industrial and power system)	0.03	4%
72300	Plumbers	0.01	3%
75110	Construction trades helpers and labourers	0.06	6%
21310	Electrical and electronics engineers	0.1	19%
22303	Construction estimators	0.1	4%
22231	Engineering inspectors and regulatory officers	0.7	0%

4.5 Jobs Forecast for Retrofitting Sector in NS

The transition to energy-efficient building retrofits in Nova Scotia is expected to generate significant job opportunities in the construction and skilled trades sectors. However, workforce shortages and demographic trends pose challenges to meeting net-zero commitments and sustaining economic growth. This section provides a comprehensive analysis of the current and projected labor market for energy efficiency retrofits, identifying key occupations, workforce gaps, and job growth scenarios.

Drawing on data from Statistics Canada, LightCast, and industry reports, this section outlines employment trends, workforce participation rates, and labor market projections under different policy scenarios (detailed list is contained in Appendix 3). Key findings highlight an aging workforce, low new entrant rates in skilled trades, and underrepresentation of women and visible minorities. The analysis also forecasts job demand growth, identifying critical labor shortages that could impact the province's ability to meet energy efficiency targets.

By evaluating baseline employment trends and scenario-based labor projections, this section offers insights into the workforce capacity required to support Nova Scotia's energy transition. It underscores the urgent need for targeted training programs, workforce development strategies, and policy interventions to bridge labor gaps and ensure a skilled workforce capable of meeting the demands of the green economy.

4.5.1 NS Baseline Forecasts of Jobs in Retrofitting Sector

The evolving landscape of Nova Scotia's construction and retrofitting sector presents shifting job forecasts, influenced by industry trends, automation, and infrastructure investments. The baseline employment projections indicate a strong demand for skilled trades, with some occupations experiencing sustained growth, while others face stagnation or decline. These projections, based on industry trends, highlight the changing workforce needs and the necessity for targeted training and workforce development strategies.

Occupations such as construction managers, electricians, ironworkers, and plumbers are expected to experience steady employment growth due to rising infrastructure investments, green building policies, and the increasing demand for energy-efficient retrofits. Construction managers (NOC 70010) are projected to see 1.27% growth in 2025, driven by expanding housing developments, infrastructure projects, and energy-efficient building requirements. Similarly, electricians (NOC 72200) will remain in high demand, with 1.58% growth in 2025, benefiting from renewable energy projects and increasing electrification in residential and commercial buildings. Ironworkers (NOC

72105) are forecasted to experience strong employment growth of 2.30% in 2025, driven by public transit expansions, bridge repairs, and high-rise construction projects. Plumbers (NOC 72300) will see 1.39% growth in 2025, though this is expected to slow by 2030 as demand for new builds stabilizes. However, the need for water-efficient systems and retrofits will continue to sustain job opportunities in this sector. Steamfitters, pipefitters, and gas fitters will also see moderate growth due to advancements in heating, ventilation, and cooling (HVAC) technology.

Conversely, some trades will face stagnation or decline as industry shifts and automation reduce demand. Welders and related machine operators (NOC 72106) are projected to experience negative growth beyond 2025, with declines of -0.14% in 2025, -0.19% in 2028, and 2030, largely due to automation in welding processes and the increasing use of prefabricated modular construction, which requires fewer on-site welders. Industrial electricians (NOC 72201) will see minimal job growth of 0.29% annually through 2030, as factory automation and smart manufacturing systems replace traditional roles.

Some occupations face consistent job declines, particularly facility operation and maintenance managers (NOC 70012), who are projected to experience a -1.50% decline in 2025, stabilizing toward 2030. This is likely due to the automation of building management systems and the outsourcing of maintenance services, reducing the need for in-house facility managers. Electrical power line and cable workers (NOC 72203) will see job losses ranging from -0.53% to -2.55% annually, reflecting a slowdown in new power infrastructure projects and the increasing transition to underground power lines, which require specialized skill sets that current workers may not have.

The decline in some trades is also linked to demographic shifts, an aging workforce, and low new entrant rates in skilled trades programs, increasing shortages in critical roles. Many experienced tradespeople are retiring faster than new workers are entering the field (replacement demand), creating an imbalance in supply and demand. These job forecasts emphasize the importance of labour market adaptability, upskilling programs, and targeted recruitment strategies to address workforce gaps and sustain economic growth in the retrofitting sector. As Nova Scotia moves towards its net-zero targets, ensuring a skilled workforce capable of meeting the industry's evolving needs will be crucial.

4.5.1.1 Key Industry Trends (2025-2030)

The construction labour market will be shaped by several critical trends in the coming years. Skilled trades such as electricians, plumbers, and ironworkers will continue to see strong demand, driven by sustainability policies, housing expansion, and infrastructure projects. However, advancements in automation and changing construction techniques will impact traditional roles like welders and facility operation managers, requiring workers to adapt through upskilling and training programs. Additionally, the shift towards green building practices and net-zero initiatives will create new opportunities in energy-efficient construction, benefiting trades involved in electrical and mechanical installations.

4.5.1.2 Key Takeaways for Workers & Policymakers

To ensure long-term workforce stability, investment in training and certification programs will be crucial, particularly in renewable energy and smart building technology. Policymakers should focus on workforce development programs that support at-risk trades, such as welding, while promoting apprenticeships and technical education in growing sectors. Employers and industry associations must also prioritize reskilling efforts to help workers transition into new roles as automation reshapes traditional construction jobs.

Overall, the construction sector will remain a major employer, but adapt**ability will be key** for workers seeking long-term career opportunities in the evolving labour market. We include in Table 5 the growth rates of selected occupations, and have left the rest in the Appendix 3 (Table 20).

Table 5: Job Forecasts by major NOCs in NS's Retrofitting Sector (2024-2030)

NOCs	Description	2024	2025	2026	2027	2028	2029	2030
70010	Construction managers	2,049	2,051	2,077	2,088	2,113	2,128	2,151
72310	Carpenters	5,134	5,220	5,296	5,346	5,361	5,381	5,404
72106	Welders and related machine operators	2,147	2,139	2,136	2,135	2,135	2,131	2,131
72402	Heating, refrigeration and air conditioning mechanics	1,213	1,235	1,257	1,285	1,309	1,331	1,352
73400	Heavy equipment operators	2,358	2,384	2,430	2,468	2,490	2,505	2,526
72200	Electricians (except industrial and power system)	2,821	2,856	2,901	2,946	2,986	3,025	3,068
72300	Plumbers	1,425	1,443	1,463	1,482	1,496	1,509	1,521
75110	Construction trades helpers and labourers	4,269	4,268	4,285	4,309	4,326	4,348	4,374
21310	Electrical and electronics engineers	706	704	706	707	710	711	712

22303	Construction estimators	417	417	418	421	423	425	427
22231	Engineering inspectors and regulatory officers	214	216	218	221	223	225	227

4.5.2 Scenario Analysis Methodology

This analysis evaluates labour demand growth for selected NOCs under three scenarios:

1) Scenario 1 (Immediate adoption of Tier 1 of the 2020 NBC): This business-as-usual scenario analyzes housing supply and demand under current market conditions. It assumes the 2020 National Building Code (NBC) is in place, with construction companies building to Tier 1 standards starting April 1, 2025. Tier 1 maintains existing energy performance standards without mandating higher efficiency. Scenario 1 represents the current trajectory without significant policy or industry disruptions.

2) Scenario 2 (Immediate adoption of Tier 5 of the 2020 NBC): This scenario explores the impact of immediately adopting the highest efficiency standards from the 2020 National Building Code (and provincial commitments to Net-Zero Buildings/Retrofits). Under this approach, all new buildings would be constructed to Tier 5, achieving 80% greater energy efficiency than the current minimum requirements. It does not include mandatory alterations to existing buildings through retrofits. Scenario 2 assumes that federal and provincial governments prioritize stimulus spending on green building initiatives.

3) Scenario 3 (Immediate adoption of the 2025 NBC): This scenario evaluates the effects of immediately adopting a more strict 2025 federal energy efficiency standard. The 2025 National Building Code (NBC) is expected to build upon previous energy efficiency requirements while introducing important changes, including the Alterations to Existing Buildings (AEB) Code, which extends standards beyond new construction to existing buildings. Additionally, it incorporates measures to reduce operational GHG emissions, which are those produced during the building's use phase.

Growth rates were adjusted based on historical trends, forecasted labour demand, and scenario-specific impacts, with adjustments tailored by NOC category.

The scenarios were based on insights from key reports that provided crucial context for labour market trends. The *Net Zero Buildings Report* highlighted challenges related to retrofitting and

regulatory compliance. The *Nova Scotia Construction & Maintenance Report* offered data on labour shortages in the industry. The *Step Code Costing Report* detailed how energy efficiency standards impact labour demand. Finally, the *National Labour Market Report* provided a broader perspective on workforce trends in the transition to a green economy. We describe the scenarios briefly below.

1. **Baseline Growth Rates**:
    - The baseline growth rate is calculated by taking the difference between the projected employment in 2031 and the employment level in 2024. This difference is then divided by the 2024 employment level and multiplied by 100 to express the growth rate as a percentage.This baseline reflects trends before applying the scenarios below.
2. **Scenario Descriptions and Adjustments**:
    - **Scenario 1 (Tier 1 of the 2020 NBC)**: Assumes increased retrofitting and compliance demand of:
        - **10–15%** for construction and technical roles, driven by extensive retrofitting needs as per adopting the 2020 federal building standards.
        - **5%** for administrative roles, reflecting indirect impacts of demand.
    - **Scenario 2 (Tier 5 of 2020 NBC)**: Addresses projected labour shortages in trades and skilled roles due to the net-zero targets.
        - **15%** for trades, where shortages are critical (e.g., carpenters, welders).
        - **10%** for technical roles and **5%** for administrative roles.
    - **Scenario 3 (2025 NBC)**: Reflects stricter standards requiring advanced skills and technologies due to adopting 2025 Federal standards which have higher technical requirements in GHG emissions and alterations to existing buildings (AEB). (Speculative)
        - **20–25%** for construction and engineering roles due to increased technical complexity.
        - **10%** for administrative roles to support compliance and communication efforts.
3. **NOC Categorization**:
    - NOCs were grouped into **Construction/Trades**, **Engineering/Technical**, and **Administrative/Policy/Marketing** based on their roles in construction, energy efficiency, and policy support.
4. **Application of Multipliers**:
    - For each job category, scenario-specific adjustments were made to the baseline growth rates by applying a multiplier. This means the original growth rate was adjusted based on different factors influencing each role. The multiplier values ranged from 1.05 to 1.25, representing the varying impact of different scenarios on employment growth.

4.5.3: Scenario 1 - Adopting Tier 1 of the 2020 National Building Code

Scenario 1 examines the effects of adopting the 2020 federal energy efficiency standards on labour demand in the construction sector. These standards are expected to drive increased demand for retrofitting and regulatory compliance, leading to:

- **10–15% increase** in construction and technical roles
- **5% increase** in administrative roles

Employment projections from 2025 to 2031 indicate steady growth in energy-efficiency-related trades, while some traditional roles are expected to decline due to automation and evolving industry demands. Detailed scenario 1 for each NOC is listed under Appendix 3 (Table 21).

Table 6: Scenario 1: Employment projections (2025-2031) for NS for retrofitting sector as per 2020 standards

Scenario 1								
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
70010	Construction managers	2256.1	2284.7	2296.8	*2324.3*	*2340.8*	2366.1	2387
72310	Carpenters	5742	5825.6	5880.6	*5897.1*	*5919.1*	5944.4	5965.3
72106	Welders and related machine operators	2352.9	2349.6	2348.5	*2348.5*	*2344.1*	2344.1	2339.7
72402	Heating, refrigeration and air conditioning mechanics	1358.5	1382.7	1413.5	*1439.9*	*1464.1*	1487.2	1509.2
73400	Heavy equipment operators	2622.4	2673	2714.8	*2739*	*2755.5*	2778.6	2803.9
72200	Electricians (except industrial and power system)	3141.6	3191.1	3240.6	*3284.6*	*3327.5*	3374.8	3416.6
73300	Transport truck drivers	8435.9	8577.8	8705.4	*8827.5*	*8941.9*	9073.9	9205.9

75110	Construction trades helpers and labourers	4694.8	4713.5	4739.9	*4758.6*	*4782.8*	4811.4	4846.6
21310	Electrical and electronics engineers	809.6	811.9	813.05	816.5	817.65	818.8	818.8
22303	Construction estimators	479.55	480.7	484.15	486.45	488.75	491.05	494.5
22231	Engineering inspectors and regulatory officers	248.4	250.7	254.15	256.45	258.75	261.05	263.35

4.5.3.1 Key labour Market Trends Under Scenario 1

1. Strongest Growth in Energy-Efficiency Trades

- Electricians (NOC 72200) will see a +8.8% increase in employment from 2025 to 2031, rising from 3,141 to 3,416 workers. This reflects the growing need for upgraded electrical systems, smart grid installations, and renewable energy integrations in retrofitted buildings.
- HVAC Mechanics (NOC 72402) will experience a +11.1% rise in demand, increasing from 1,358 workers in 2025 to 1,509 in 2031. This is driven by stricter regulations requiring high-efficiency heating, ventilation, and cooling systems in older buildings.
- Plumbers (NOC 72300) will also experience solid job growth of +6.1%, increasing from 1,587 workers in 2025 to 1,684 by 2031, reflecting demand for water-efficient systems, piping upgrades, and sustainable retrofitting.

2. Moderate Growth in Supervisory and Structural Trades

- Construction Managers (NOC 70010) will see +5.8% growth, reaching 2,387 workers by 2031, as the sector needs more project oversight and coordination for large-scale retrofitting projects.
- Contractors & Supervisors (NOC 72014) will experience +3.6% growth, reaching 1,796 workers in 2031, indicating a steady demand for professionals overseeing compliance-heavy construction projects.
- Ironworkers (NOC 72105) will see +10.2% growth, reaching 686 workers by 2031, as reinforcement and structural upgrades become essential to meet higher building efficiency standards.

3. Declining Demand for Traditional and Manual Roles

While many construction jobs grow under this scenario, some occupations experience **declines due to automation, changing technologies, and prefabrication trends**:

- Facility Operation & Maintenance Managers (NOC 70012) will see a -3.5% decline, dropping from 807 to 778 workers by 2031, reflecting increased use of automated building management systems.
- Electrical Power Line & Cable Workers (NOC 72203) will experience a -7.7% decline, reducing from 441 to 407 workers, likely due to the transition to underground power lines and smart energy grids.
- Bricklayers (NOC 72320) will experience a -10.8% drop, declining from 255 workers in 2025 to 227 in 2031, as modular construction and prefabricated materials reduce demand for traditional brickwork.

4. Growth in Specialized Trades and Retrofit-Specific Roles

- Roofers & Shinglers (NOC 73110) will experience +14% growth, from 840 workers in 2025 to 958 in 2031, as demand for energy-efficient roofing materials and insulation increases.
- Steamfitters, Pipefitters & Sprinkler System Installers (NOC 72301) will see a +7.5% increase, from 1,098 to 1,181 workers, as retrofits require more advanced piping and fire safety installations.
- Plasterers, Drywall Installers & Finishers (NOC 73102) will see +10.2% growth, reaching 924 workers in 2031, reflecting increased demand for interior upgrades and insulation work.

Key Takeaways from Scenario 1

- The highest job growth is in trades related to energy efficiency, including electricians, HVAC mechanics, plumbers, and roofers, as demand for sustainable construction and retrofitting increases.
- Manual labour and traditional roles, such as bricklayers, facility managers, and electrical line workers, will decline due to automation, prefabrication, and evolving construction practices.
- Construction management and supervisory roles will experience steady but moderate growth, as energy efficiency retrofitting requires expert oversight and compliance coordination.
- Skilled labour shortages could impact retrofitting progress, highlighting the need for investment in training programs for high-demand green building trades.

4.5.4: Scenario 2 - Natural Workforce Expansion Due to Increased Provincial Demand (Tier 5 of 2020 NBC)

Scenario 2 evaluates labour market changes under a workforce expansion model designed to address projected shortages in key construction trades and skilled roles. While not specifically built around Net-Zero targets, this scenario accounts for anticipated demographic shifts and the expected growth in both residential and non-residential construction due to a forecasted population increase in the province of NS.

Under this scenario, labour demand is projected to rise as follows:

- **15% increase** in critical trades
- **10% increase** in technical roles
- **5% increase** in administrative positions

Employment projections from 2025 to 2031 indicate strong growth in high-demand trades, particularly among electricians, carpenters, and HVAC mechanics. However, certain roles are expected to decline due to automation and industry shifts.

Table 7 outlines the major NOC projections, while Table 22 in Appendix 3 provides a detailed breakdown for each NOC classification.

Table 7: Scenario 2 : Employment projections (2025-2031) as per 2020 standards.

Scenario 2								
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
70010	Construction managers	2358.65	2388.55	2401.2	2429.95	2447.2	2473.65	2495.5
72310	Carpenters	6003	6090.4	6147.9	6165.15	6188.15	6214.6	6236.45
72106	Welders and related machine operators	2459.85	2456.4	2455.25	2455.25	2450.65	2450.65	2446.05
72402	Heating, refrigeration and air conditioning mechanics	1420.25	1445.55	1477.75	1505.35	1530.65	1554.8	1577.8
73400	Heavy equipment operators	2741.6	2794.5	2838.2	2863.5	2880.75	2904.9	2931.35
72200	Electricians (except industrial and power system)	3284.4	3336.15	3387.9	3433.9	3478.75	3528.2	3571.9
73300	Transport truck drivers	8819.35	8967.7	9101.1	9228.75	9348.35	9486.35	9624.35
75110	Construction trades helpers and labourers	4908.2	4927.75	4955.35	4974.9	5000.2	5030.1	5066.9
21310	Electrical and electronics engineers	774.4	776.6	777.7	781	782.1	783.2	783.2
22303	Construction estimators	458.7	459.8	463.1	465.3	467.5	469.7	473
22231	Engineering inspectors and regulatory officers	237.6	239.8	243.1	245.3	247.5	249.7	251.9

Key labour Market Trends Under Scenario 2

1. High-Demand Trades See Strongest Growth

- Electricians (NOC 72200) will experience an +8.8% employment increase, growing from 3,284 workers in 2025 to 3,572 by 2031. This is driven by infrastructure expansions, renewable energy projects, and net-zero building retrofits.
- HVAC Mechanics (NOC 72402) will grow by +11.1%, increasing from 1,420 workers in 2025 to 1,578 in 2031, reflecting a surge in demand for energy-efficient heating, cooling, and ventilation systems.
- Plumbers (NOC 72300) will see +6.1% growth, rising from 1,659 to 1,761 workers, as urban expansion and water efficiency regulations drive demand for skilled professionals.

2. Continued Expansion for Supervisory and Structural Roles

- Construction Managers (NOC 70010) will grow by +5.8%, reaching 2,495 workers by 2031, reflecting the increased need for leadership in large-scale infrastructure and residential projects.
- Contractors & Supervisors (NOC 72014) will see +3.6% growth, reaching 1,878 workers by 2031, indicating sustained demand for on-site leadership and skilled workforce management.
- Ironworkers (NOC 72105) will experience +10.2% job growth, increasing from 651 to 718 workers, as urban development and public infrastructure projects expand.

3. Declining Roles in Manual and Traditional labour

Some occupations will continue to decline due to **automation, prefabrication, and efficiency improvements**:

- Facility Operation & Maintenance Managers (NOC 70012) will decline by -3.5%, decreasing from 844 to 814 workers, reflecting the increasing adoption of automated building management systems.
- Electrical Power Line & Cable Workers (NOC 72203) will see a -7.7% decline, reducing from 461 to 425 workers, due to shifts toward smart grid technologies and underground cabling systems.
- Bricklayers (NOC 72320) will experience a -10.8% decline, dropping from 267 to 238 workers, as modular construction reduces traditional masonry work.

4. Increased Growth in Specialized Trades

- Carpenters (NOC 72310) will experience +3.9% growth, increasing from 6,003 workers in 2025 to 6,236 in 2031, as demand for housing and commercial building projects remains strong.
- Steamfitters, Pipefitters & Sprinkler System Installers (NOC 72301) will grow +7.5%, from 1,149 to 1,235 workers, as fire safety retrofits and industrial expansions drive demand.
- Roofers & Shinglers (NOC 73110) will experience +14% growth, from 879 workers in 2025 to 1,002 by 2031, as building envelope improvements and extreme weather adaptation efforts rise.

Key Takeaways from Scenario 2

- The highest employment growth is seen in electricians, HVAC mechanics, and carpenters, reflecting urban expansion, energy efficiency upgrades, and infrastructure growth.
- Roles in bricklaying, electrical line work, and facility operations will continue to decline, as automation and prefabrication replace manual tasks.
- Supervisory roles will see steady growth, as demand for construction management and skilled trade oversight increases.
- labour shortages in key trades could limit expansion efforts, making investment in training and apprenticeship programs essential to meeting workforce needs.

4.5.5: Scenario 3 - Adoption of 2025 National Building Code (NBC) (Aggressive Growth)

Scenario 3 assesses the effects of adopting the more stringent 2025 federal energy efficiency standards. These regulations introduce advanced skills and technologies, driving increased labour demand across key roles:

- **20–25% increase** in construction and engineering roles
- **10% increase** in administrative roles to support compliance

Employment projections from 2025 to 2031 indicate significant growth in energy-efficiency-focused trades, while some traditional roles are expected to see moderate declines due to automation and prefabrication. The detailed projections of Scenario 3 are listed in Table 23 of Appendix 3.

Table 8: Scenario 3: Employment projections (2025-2031) as per 2025 standards for NS's Retrofitting Sector.

Scenario 3								
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
70010	Construction managers	2563.75	2596.25	2610	2641.25	2660	2688.75	2712.5
72310	Carpenters	6525	6620	6682.5	6701.25	6726.25	6755	6778.75
72106	Welders and related machine operators	2673.75	2670	2668.75	2668.75	2663.75	2663.75	2658.75
72402	Heating, refrigeration and air conditioning mechanics	1543.75	1571.25	1606.25	1636.25	1663.75	1690	1715
73400	Heavy equipment operators	2980	3037.5	3085	3112.5	3131.25	3157.5	3186.25
72200	Electricians (except industrial and power system)	3570	3626.25	3682.5	3732.5	3781.25	3835	3882.5
73300	Transport truck drivers	9586.25	9747.5	9892.5	10031.25	10161.25	10311.25	10461.25
75110	Construction trades helpers and labourers	5335	5356.25	5386.25	5407.5	5435	5467.5	5507.5
21310	Electrical and electronics engineers	880	882.5	883.75	887.5	888.75	890	890
22303	Construction estimators	521.25	522.5	526.25	528.75	531.25	533.75	537.5
22231	Engineering inspectors and regulatory officers	270	272.5	276.25	278.75	281.25	283.75	286.25

Key labour Market Trends Under Scenario 3

1. High Growth in Energy-Efficiency Trades

- Electricians (NOC 72200) will see an +8.7% employment increase, rising from 3,427 workers in 2025 to 3,727 by 2031, due to the increased integration of smart grid systems, advanced energy storage, and net-zero buildings.
- HVAC Mechanics (NOC 72402) will experience +11.1% growth, reaching 1,646 workers in 2031, as stricter heating, ventilation, and cooling efficiency standards create demand for retrofits and new installations.
- Plumbers (NOC 72300) will see +6.1% growth, increasing from 1,732 workers in 2025 to 1,837 in 2031, as advanced water conservation systems become a regulatory requirement in new and existing buildings.

2. Increased Demand for Skilled Supervisory and Structural Roles

- Construction Managers (NOC 70010) will experience +5.8% growth, reaching 2,604 workers in 2031, as more complex and regulation-heavy projects require skilled oversight.
- Contractors & Supervisors (NOC 72014) will grow +3.6%, reaching 1,960 workers by 2031, reflecting a sustained need for specialized leadership in implementing high-efficiency construction practices.
- Ironworkers (NOC 72105) will expand by +10.3%, reaching 749 workers in 2031, due to the need for stronger, more sustainable materials in high-performance buildings.

3. Declining Demand for Manual and Traditional Roles

While most skilled trades benefit from the **higher standards, automation and new construction methods** will lead to declines in certain roles:

- Facility Operation & Maintenance Managers (NOC 70012) will decline by -3.5%, decreasing from 881 to 850 workers, as smart building technology reduces the need for manual oversight.
- Electrical Power Line & Cable Workers (NOC 72203) will see a -7.7% decrease, dropping from 481 to 444 workers, as more underground transmission lines and automated grid management systems are adopted.
- Bricklayers (NOC 72320) will experience a -10.8% decline, reducing from 278 to 248 workers, as prefabrication and modular construction limit the need for traditional brickwork.

4. Growth in Retrofit-Specific and Specialized Trades

- Roofers & Shinglers (NOC 73110) will grow by +14%, reaching 1,045 workers in 2031, as energy-efficient roofing materials become standard for insulation and solar panel installations.

- Steamfitters, Pipefitters & Sprinkler System Installers (NOC 72301) will experience +7.5% growth, increasing from 1,199 to 1,289 workers, due to rising demand for fire safety systems and high-performance pipe installations.
- Plasterers, Drywall Installers & Finishers (NOC 73102) will see +10.2% growth, reaching 1,008 workers by 2031, reflecting an increase in high-performance insulation installations.

Key Takeaways from Scenario 3

- The highest employment growth is seen in electricians, HVAC mechanics, and plumbing trades, as stricter energy efficiency regulations create demand for advanced installations.
- Supervisory roles will see steady increases, with construction managers and contractors experiencing strong demand due to the complexity of energy-efficient retrofits.
- Declining employment in bricklaying, electrical power line work, and facility operation management highlights the effects of automation, prefabrication, and smart building technologies.
- To meet labour demands, the workforce must develop advanced technical skills, making investment in specialized training essential to adapting to higher energy efficiency requirements.

The adoption of 2025 energy efficiency standards will drive strong demand for skilled construction and technical workers, particularly those involved in retrofits, insulation, and advanced mechanical systems. However, traditional manual roles will continue to decline, reinforcing the need for upskilling programs and workforce adaptation strategies. Government and industry must both collaborate to invest in reskilling initiatives to ensure enough trained professionals can meet the evolving green building requirements.

4.5.6: Labour Demand Gaps Forecast (By Scenario)

The labour gaps were calculated by subtracting baseline employment forecasts from scenario-based projections to determine workforce shortages or surpluses. A positive gap indicates higher demand for workers, signaling potential labour shortages, while a negative gap reflects declining job demand due to automation, prefabrication, or efficiency improvements. These insights help identify priority areas for workforce development, training programs, and policy interventions to align labour supply with evolving industry needs. The Gaps for each scenario and NOC is mentioned in Table 21, Table 22, Table 23 under Appendix 3.

The below presents the projected percentage shortages from 2026 to 2030:

Scenario 1: Labour Market Gaps Under 2020 Energy Efficiency Standards

In **Scenario 1**, labour demand is expected to rise due to increased energy efficiency measures in new buildings and retrofitting projects. However, despite employment growth, major workforce gaps are expected in **skilled trades, engineering, and administrative roles.**

In this Scenario the energy efficiency standards lead to moderate job gaps. Skilled workers such as carpenters, electricians, and truck drivers are most affected. Although there is growth in the construction and energy efficiency sectors, many key roles will struggle to meet the demand. This scenario shows the need for early investment in training programs and better recruitment strategies to avoid delays in projects.

Major Labour Shortages

Several occupations are expected to experience acute shortages by 2030, with some exceeding a 2% gap between demand and available workers.

- **Ironworkers** – The most severe shortage is anticipated in 2026 (2.30%), with a persistent gap above 1% through 2030.
- **Gas Fitters** – A peak shortage of 2.69% in 2026, remaining above 1% for the following years.
- **Roofers and Shinglers** – Facing critical shortages, particularly in 2026 (3.66%), with continued high demand.
- **Plasterers, Drywall Installers, and Finishers** – Expected to experience a major deficit of 2.23% in 2026, tapering off gradually.
- **Industrial and Manufacturing Engineers** – Projected demand outpaces supply with a 3.09% shortage in 2026, persisting through 2030.
- **Metallurgical and Materials Engineers** – The highest engineering shortage, peaking at 4.35% in 2026 and remaining elevated.

Key Takeaways

- Trades-Based Professions Will Experience Persistent Shortages – Construction and mechanical trades, including roofers, gas fitters, and ironworkers, will face labour shortages in the next decade.
- Engineering Disciplines Will Encounter Talent Gaps – Metallurgical, industrial, and manufacturing engineers will be in particularly high demand, necessitating increased recruitment efforts.
- Electricians and Mechanical Technicians Face Workforce Challenges – Electricians, crane operators, and millwrights will struggle to meet industry demand due to insufficient workforce availability.

- Surpluses Exist in Select Professions – Certain roles, including architects, facility operations managers, and electrical power line workers, may experience an excess of available professionals.
- Some Labour Gaps Will Stabilize Over Time – While shortages will be acute in the short term, some positions may see demand normalize by 2030.

Table 9: Heat Map1 : Scenario 1 Baseline labour shortages

Occupation	2026	2027	2028	2029	2030
Ironworkers	2.3	1.9	1.7	1.5	1.3
Gas Fitters	2.69	2.3	1.9	1.5	1.2
Roofers and Shinglers	3.66	3.1	2.8	2.4	2.1
Plasterers, Drywall Installers, and Finishers	2.23	2	1.8	1.5	1.2
Industrial and Manufacturing Engineers	3.09	2.8	2.5	2.2	1.9
Metallurgical and Materials Engineers	4.35	4	3.6	3.2	2.8

Colours

Sky Blue (1-2 % shortage) – Minimal impact

Light Yellow (2-3-% shortage) – Moderate concern

Green (3 % and 4%) – Significant shortage

Red (4% and above)- Critical shortage

Scenario 2: Increased labour Demand with Persistent Workforce Gaps

In **Scenario 2**, the demand for labour is even higher due to greater adoption of green building practices and a faster transition to energy efficiency. The workforce gaps grow across multiple occupations.

This presents a tougher situation as the move toward green building practices speeds up. The demand for labour rises even more, and the shortages for construction managers, carpenters, electricians, welders, and truck drivers grow larger. While engineering and administrative roles also face gaps, the most serious issues lie with the skilled trades. This means that as green construction becomes more popular, the industry will need even more support through targeted education and recruitment efforts.

Major Labour Shortages by Occupation

- **Ironworkers** – Ironworkers play a vital role in the construction industry, ensuring structural integrity in buildings and infrastructure. However, a persistent shortage is forecasted, with a peak gap of 2.30% in 2026, continuing above 1.3% through 2030.
- **Gas Fitters** – The role of gas fitters is crucial in ensuring safe and efficient gas systems in residential, commercial, and industrial settings. A peak shortage of 2.69% is expected in 2026, with workforce gaps continuing in subsequent years.
- **Roofers and Shinglers** – This occupation is essential in maintaining the durability and weatherproofing of structures. The highest shortage is forecasted in 2026 (3.66%), with demand exceeding supply through 2030.
- **Plasterers, Drywall Installers, and Finishers** – Skilled workers in this occupation are necessary for interior construction and renovation. The labour gap is projected to be 2.23% in 2026, declining gradually but remaining significant.
- **Industrial and Manufacturing Engineers** – These engineers are integral to optimizing production and manufacturing processes. With demand increasing, a shortage of 3.09% is expected in 2026, continuing through 2030.
- **Metallurgical and Materials Engineers** – The role of metallurgical and materials engineers is fundamental in materials innovation and industrial applications. The highest engineering shortage is projected at 4.35% in 2026, maintaining a high demand through 2030.

Key Takeaways

1. **Construction and Skilled Trades Remain Critical** – Roles such as ironworkers, gas fitters, and roofers are fundamental to infrastructure development and maintenance.
2. **Engineering Professions Face Persistent Deficits** – Industrial, metallurgical, and materials engineers play a key role in technological advancements and industry growth, yet their demand far outpaces supply.
3. **Electrical and Mechanical Trades Require More Skilled Labour** – Occupations like electricians, crane operators, and millwrights are essential but are experiencing continuous shortages.
4. **Labour Surplus in Some Occupations** – While certain fields, such as facility operation managers and architects, may have sufficient workforce availability, key technical professions remain understaffed.
5. **Proactive Workforce Strategies Are Necessary** – Increased labour demand continues to outpace workforce availability in multiple key sectors, requiring immediate intervention.

Table 10: Heat Map 2: Scenario 2 Increase labour demand

Occupation	2026	2027	2028	2029	2030
Ironworkers	2.76	2.4	2.16	1.8	1.56
Gas Fitters	3.228	2.88	2.52	2.16	1.8
Roofers and Shinglers	4.392	3.84	3.36	2.88	2.4
Plasterers, Drywall Installers, and Finishers	2.676	2.4	2.04	1.8	1.44
Industrial and Manufacturing Engineers	3.708	3.36	3	2.64	2.28
Metallurgical and Materials Engineers	5.22	4.8	4.44	3.96	3.6

Colours

Sky Blue (1-2 % shortage) – Minimal impact

Light Yellow (2-3-% shortage) – Moderate concern

Green (3 % and 4%) – Significant shortage

Red (4% and above)- Critical shortage

Scenario 3: High Labour Demand with Severe Workforce Shortages

Scenario 3 assumes a large-scale expansion of energy-efficient construction and retrofitting, leading to the most severe workforce shortages.

This Scenario is the most challenging, with very high labour demand and severe shortages across the board. Skilled trades like carpenters, electricians, and truck drivers experience the biggest gaps. Engineering and policy roles also see significant shortfalls. Without quick and strong actions to boost training and recruitment, these shortages could slow down or even stop many energy-efficient construction projects, making it hard to meet industry goals.

Major Labour Shortages by Occupation

- **Ironworkers** – Ironworkers are essential for ensuring the stability and safety of infrastructure projects. However, severe shortages are projected, peaking at 2.30% in 2026 and remaining above 1.3% through 2030.

- **Gas Fitters** – Gas fitters play a critical role in maintaining and installing gas systems across various sectors. The highest shortage is expected in 2026 (2.69%), with continued workforce gaps in the following years.
- **Roofers and Shinglers** – This profession is vital for constructing and maintaining weather-resistant buildings. The workforce deficit is forecasted to reach 3.66% in 2026, with sustained high demand through 2030.
- **Plasterers, Drywall Installers, and Finishers** – These workers are crucial for interior construction and renovation projects. The shortage is projected at 2.23% in 2026, gradually declining but still notable.
- **Industrial and Manufacturing Engineers** – These engineers are fundamental in optimizing production systems and ensuring industrial efficiency. A severe shortage of 3.09% is expected in 2026, continuing through 2030.
- **Metallurgical and Materials Engineers** – This occupation is crucial in material science and industrial applications. The workforce gap is expected to peak at 4.35% in 2026, remaining a significant challenge through 2030.

Key Takeaways

1. **Severe Shortages in Skilled Trades** – Occupations such as ironworkers, gas fitters, and roofers will face critical workforce deficits, impacting infrastructure and construction sectors.
2. **Engineering Fields Will See Substantial Workforce Gaps** – Industrial, metallurgical, and materials engineers are in high demand, yet their supply remains inadequate.
3. **Persistent Gaps in Electrical and Mechanical Trades** – Electricians, crane operators, and millwrights are essential roles facing ongoing shortages.
4. **Limited Workforce Availability in Key Sectors** – Despite efforts to meet growing demand, many industries will struggle to fill these crucial positions.
5. **Proactive Workforce Development is Needed** – Training, education, and retention strategies must be strengthened to address these workforce gaps.

Table 11: Heat Map 3: Scenario 3 High Labour Demand With Severe shortages

Occupations	2026	2027	2028	2029	2030
Ironworkers	3.45	3	2.7	2.25	1.95
Gas Fitters	4.035	3.6	3.15	2.7	2.25
Roofers and Shinglers	5.49	4.8	4.2	3.6	3
Plasterers, Drywall Installers, and Finishers	3.345	3	2.55	2.25	1.8
Industrial and Manufacturing Engineers	4.635	4.2	3.75	3.3	2.85

Metallurgical and Materials Engineers	6.525	6	5.55	4.95	4.5

Colours

Sky Blue (1-2 % shortage) – Minimal impact

Light Yellow (2-3-% shortage) – Moderate concern

Green (3 % and 4%) – Significant shortage

Red (4% and above)- Critical shortage

Section 5: Pathways to Education & Training for New and Upgrading Workers

This section focuses on **mapping common education pathways in the available services.** For detailed education available for each of the Key NOCs of the report, refer to Appendix 4.

5.1 Mapping of Pathways to Education

These pathways are designed to provide professionals with basic skills and credentials to join the workforce, but the educational organizations have been slow to respond to the evolving needs of workforce demands for green retrofits and sustainable construction. University and apprenticeship programs and curriculums often do not include formal training in energy efficiency, low-carbon materials, or sustainability. This is worsened by the fact that most of the continuing professional development in green building practices are voluntary, leading to inconsistent adoption of the required competences by the workforce. For these pathways to meet the growing demand of energy-efficient retrofits and net-zero buildings, they will need to include specialized training in green energy and technologies in their curricula.

The common educational pathways highlighted by **Figure 5** show the roadmap to enter into construction trades, and **Figure 6** shows the traditional roadmaps to enter engineering, architectural, and construction management professions.

Figure 5: Common Education Pathways for Construction Trades

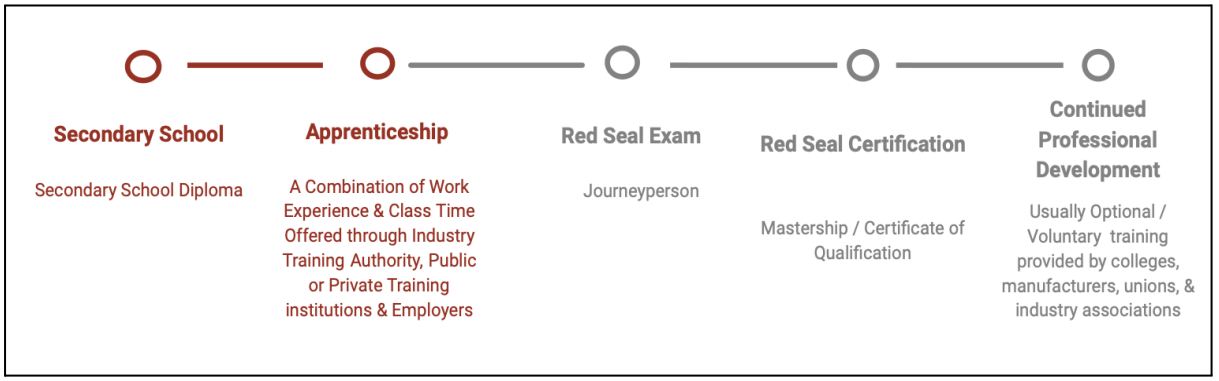
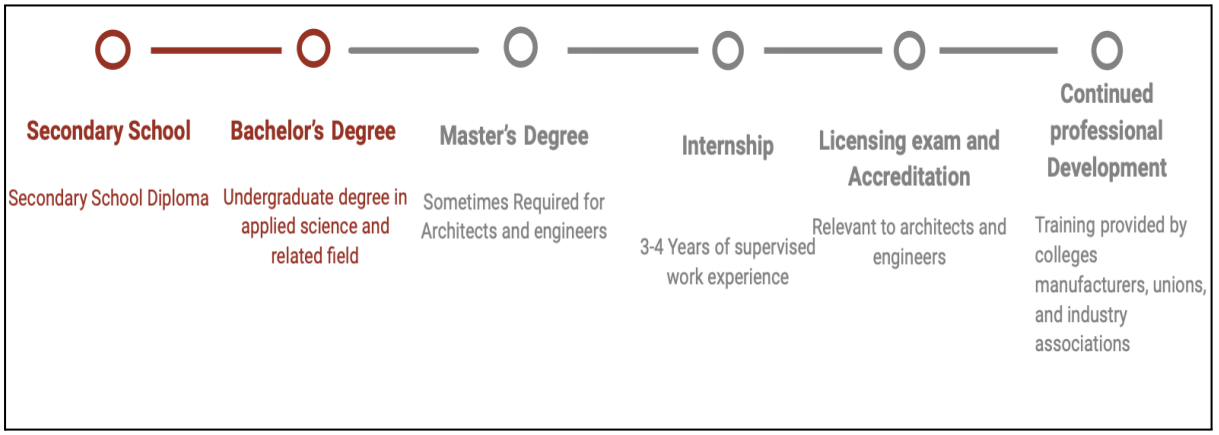


Figure 6: Common Education Pathways for Engineers, Architects, and Construction Managers



5.2 Mapping of Training Assets for New and Upgrading Workers

5.2.1 Top 12 Skills Needed for Primary Professions

Primary professions required for energy-efficient retrofits include builders and trades, consultants, owners, and regulators. The following are the top 15 skills identified as crucial for workers in these sectors:

1. Installation and maintenance of energy-efficient lighting systems (e.g., LED, occupancy sensors).
2. Knowledge of Building Automation Systems (BAS), digitization for energy management, and Building Information Modeling (BIM) software.
3. Electrification of mechanical systems, including heat pumps and electric water heating.
4. Installation and maintenance of photovoltaic (solar) systems and energy storage solutions.
5. Understanding of low-carbon building materials and embodied carbon.
6. Building science fundamentals and the "Building-as-a-System" approach.
7. Green building construction strategies, including insulation and air sealing.
8. Energy efficiency and lifecycle assessments for retrofit projects.

9. HVAC retrofitting and maintenance for optimized energy performance.
10. Knowledge of evolving building codes and standards for energy efficiency.
11. Safe handling and disposal of materials in compliance with environmental standards.
12. Soft skills: communication, problem-solving, and project coordination.

5.2.2 Top 12 Skills Needed for Secondary Professions

Secondary professions, including environmental health specialists, interior designers, and heavy equipment operators, require skills that support the implementation of energy-efficient retrofits:

1. Handling and managing sustainable building materials, and adapting construction methods for low-carbon solutions.
2. Operating specialized tools for energy-efficient construction.
3. Understanding of digital monitoring and verification systems.
4. Familiarity with advanced finishes, coatings, and sustainable flooring solutions.
5. Safe operation of heavy equipment for site preparation.
6. Compliance with sustainability standards, eco-friendly practices, and ability to interpret and apply green certifications (e.g., LEED, Net Zero, Passive House).
7. Awareness of environmental health and safety standards.
8. Knowledge of smart metering and energy efficiency tracking systems.
9. Integration of weather and environmental data for climate-adaptive designs.
10. Conducting whole-building life cycle assessments.
11. Customer and stakeholder engagement to support sustainable retrofits.
12. Soft skills: adaptability, teamwork, and problem-solving.

5.2.3 Institutions Offering Education and Training

Training opportunities for retrofit professionals are offered through traditional educational institutions and targeted microcredential programs. Below is a breakdown of institutions and their key offerings:

Universities & Colleges Offering Formal Education Programs

These institutions provide degree and diploma programs relevant to energy-efficient retrofits:

- **Dalhousie University**
  - Civil and Resource Engineering (Master, Doctorate)
  - Mechanical Engineering (Bachelor, Master)
  - Public Administration (Graduate Diploma, Master)
- **Nova Scotia Community College (NSCC)**
  - Electrical Technician (focus on renewable energy)

    - Gas Technician (practical experience in gas fitting)
    - Environmental Engineering Technology – Water Resources
    - Energy Sustainability Engineering Technology (ESET)
- **Cape Breton University**
    - Business Administration (Bachelor)
    - Engineering Advanced Diploma
- **St. Francis Xavier University**
    - Adult Education (Advanced Diploma, Master)
    - Management and Leadership (Bachelor)
- **Mount Saint Vincent University**
    - Business Administration (Bachelor)
    - Education (Bachelor, Master, Doctorate)

Microcredential Programs for Rapid Upskilling

Microcredentials offer short-term, targeted training to address skills gaps in the retrofit workforce:

- **Quick Train Canada**
    - Safety and Environmental Impact
    - Construction and the Environment
    - Whole-Building Life Cycle Assessment Professional
    - Essentials of Net-Zero and Passive House Construction
- **Canada Green Building Council (CaGBC)**
    - Calculating the Zero Carbon Balance
    - Introduction to Embodied Carbon in Buildings
    - Fundamentals of Zero Carbon Transition Planning
- **NSCC**
    - Introduction to Construction Management
    - Climate Literacy for Construction
    - Introduction to Solar Photovoltaic Systems
    - Construction Estimating, Contracts, and Project Management

Nova Scotia's education and training programs offer a solid base, but need to address gaps in specialized green retrofit skills, digital literacy, and interdisciplinary coordination. Expanding microcredentials and integrating sustainability into core programs will be crucial for meeting the rising demand for energy-efficient retrofits and overcoming lengthy duration of some apprenticeships, ultimately accelerating the adoption of sustainable solutions.

Section 6: Key Findings

6.1. Summary of Survey

A voluntary online survey was conducted to explore perspectives, challenges, and opportunities in Nova Scotia's green jobs and skilled trades, with a focus on marginalized groups (Indigenous, African Nova Scotian, newcomers, and women). There were 78 respondents, and the key findings are outlined below.

The survey aimed to identify workforce capacity challenges in the green retrofit sector, assess awareness of sustainable technologies and systems, and highlight gaps in existing training programs. Its findings will help inform public policy and support the development of inclusive and accessible training initiatives.

6.1.1 Key Findings

Demographics and Participation

- **Age Distribution:**
  The 25-44 age bracket constituted 52% of the total. This age bracket is important as it is representative of the workforce.

- **Gender & Background:**
  - Women: 59%, Men: 37%, Remainder: non-binary or preferred not to indicate a gender.
  - White: 68%, African NS & Black: 12%, Asian: 8%, Indigenous: 7%, Remainder: other

Regional Distribution and Accessibility

- **Impact of Location:**
  Approximately 37% of the rural respondents reported that geographical isolation to a great extent inhibits training and job opportunities. The challenge is further exacerbated by a lack of infrastructure and limited resource availability.

- **Urban-Rural Divide:**
  Compared to rural participants, urban participants reported fewer structural barriers. Thus, the findings indicate the need for targeted intervention efforts in order to bridge the difference in accessibility and provide equal opportunities among rural populations.

Rural Barriers and Expanding skilled Trades Participation for Green Retrofits Success

Participants reported that urban areas offer better access to jobs, training, salaries and networking opportunities in the green sector. In contrast rural areas face challenges due to limited access to specialized training, institutions and jobs in the net zero sector.

Urban Opportunities: Urban areas provide more job and training opportunities, higher salaries, and networking events. Hybrid options have increased.

Challenges in Rural Areas: Rural areas have limited access to training programs, specialized institutions, and job opportunities in green sectors.

Proximity to Training and Jobs: Proximity to urban centres like HRM offers advantages in accessing jobs, events, and colleagues.

Interest in Skilled Trades

- **Interest Levels:**
  Electricians and project managers are the most appealing roles overall. Respondents have less strong interest in Welders, plumbers, and heavy equipment operator roles, while trades like bricklayer and heat and frost insulator show more disinterest. Many respondents were unsure about certain trades, especially in the "Other" category.
- **Identified Barriers:**
  High cost of training, very few programs available locally, and too little mentorship.

Figure 7: What kind of skilled trade job interests you the most?

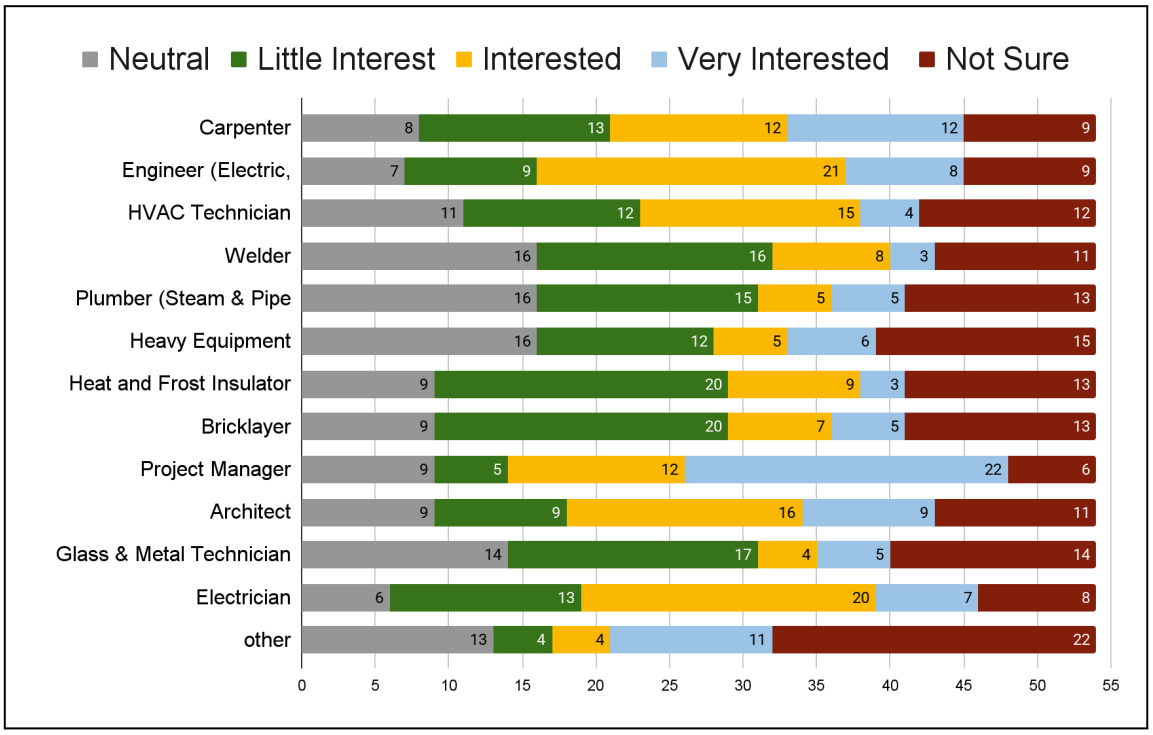
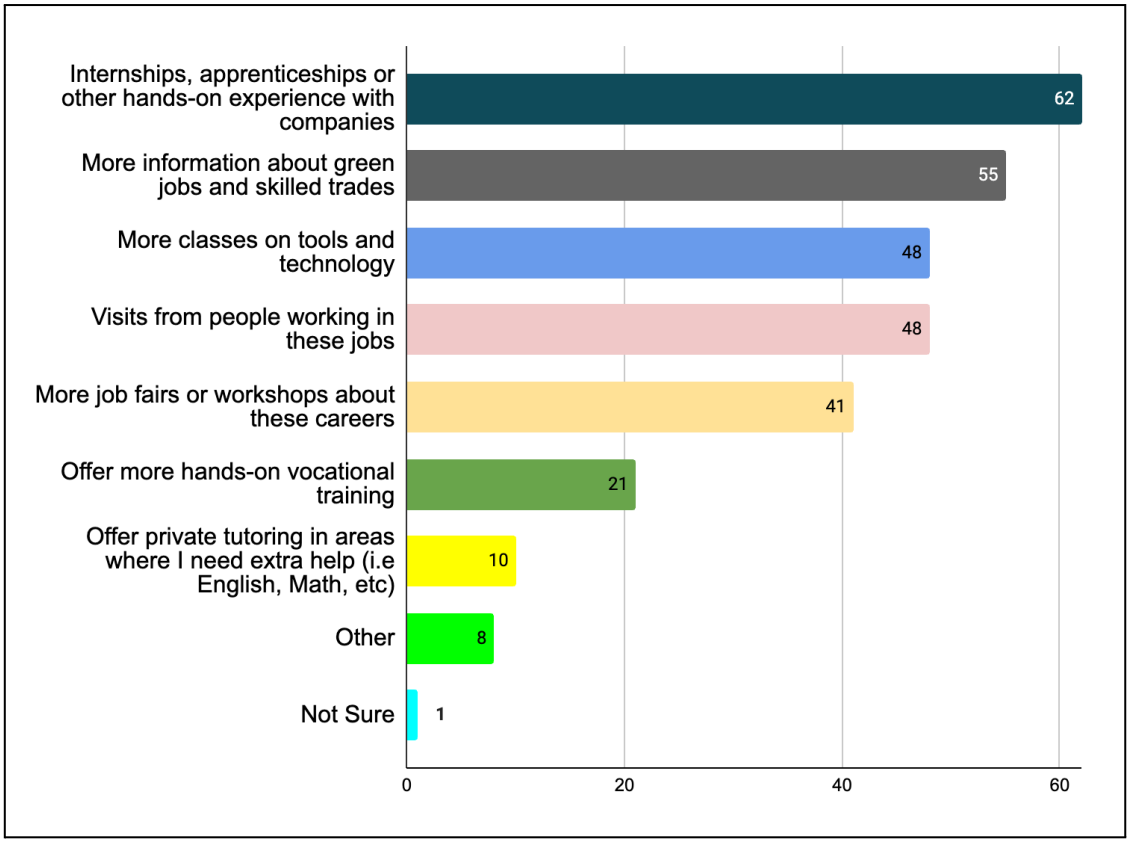


Figure 8: What do you think schools or training programs can do to help you get ready for a skilled trade?



Skill Development and Training Needs

Critical Competencies:

- Building science and energy efficiency principles-expertise.
- Skills related to technical domains include advanced usage of tools and the integration of technologies.
- Development of key soft skills, including teamwork, effective communication, and adaptability to dynamic work environments.

Preferred Training Modalities:

- 85% of the respondents preferred internships and apprenticeships, showing a greater emphasis on learning by experience.
- Vocational skills training, more practical and directly job-related, was desired by 60%, showing a bias toward hands-on vocational training.

Awareness of Green Jobs

General Awareness:

61.1% of survey respondents reported having a little to no awareness of green jobs. This lack of awareness was also supported in our one-on-one interviews, where participants shared their lack of knowledge of what a career pathway into green jobs looks like. This discrepancy reveals a highly critical need for effective communication and educational outreach.

Information Channels:

The key information channels identified included those from educational institutions and digital platforms. These are quite important channels through which the general populace can have their perceptions shaped in the direction of green

careers.

Figure 9: Do you know about green jobs? [Q17]

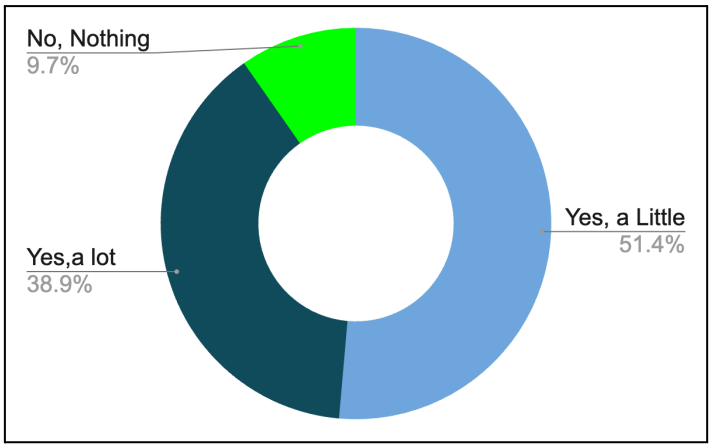
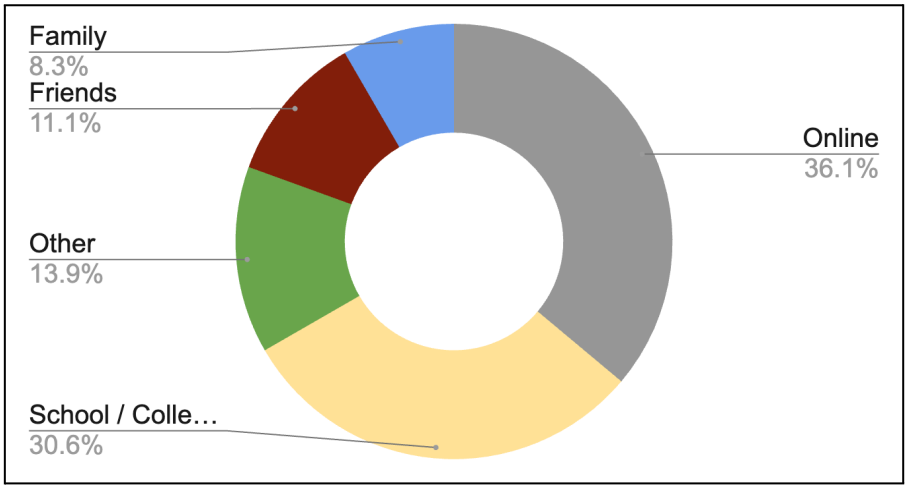


Figure 10: Where did you hear about green jobs? [Q18]



Barriers for Women and Marginalized Groups

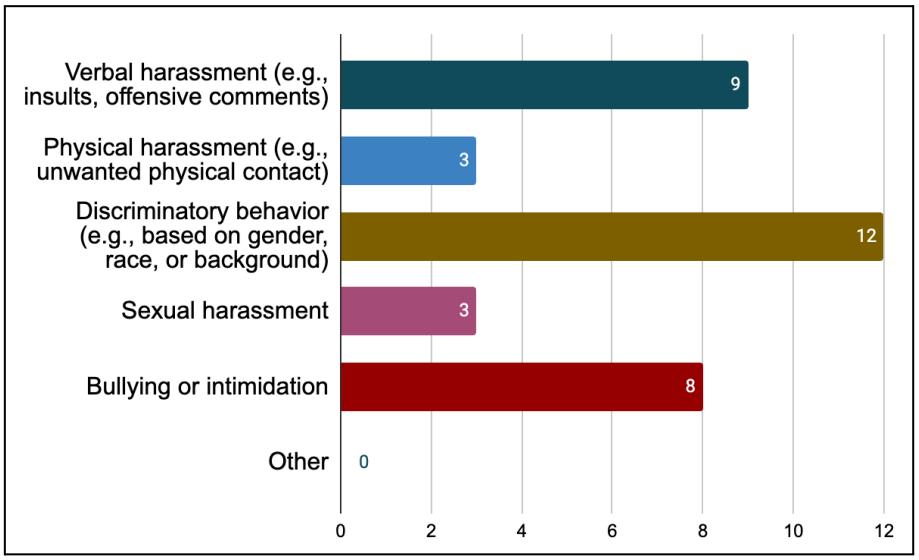
- Barriers women face in entering skilled trades, include workplace culture and sexism, which discourage participation. A lack of representation and stigma stereotypes further limits the interest and accessibility for women. Physical demands and biases about strength, along with insufficient education and early exposures to trades, also hinder entry to the field.
- One in four of the respondents cited a lack of representation and supportive networks as some of the major barriers to inclusion, especially for marginalized groups.

Top Barriers Identified	
1	Workplace Culture and Sexism
2	Stigma and Stereotypes
3	Lack of Representation
4	Physical Demands and Bias About Strength
5	Education and Early Exposure
6	Work-Life Balance and Childcare
7	Limited Opportunities and Resources

Workplace Harassment in Trades

- A significant proportion (30%) of respondents have either experienced or witnessed harassment in the net-zero or construction-related sectors. This indicates that workplace culture may still be a barrier to inclusion, particularly for women and other marginalized groups in green retrofits.
    - A survey, by YWCA Halifax in 2024, had similar results showing that out of 101 women respondents, 82% reported experiencing sexual and gender-based harassment multiple times (YWCA, 2024).
- Verbal harassment was the most commonly reported form of harassment, but sexual harassment and bullying also surfaced as critical issues. This suggests that negative workplace cultures, including sexism, are affecting those entering skilled trades, including green retrofits.

Figure 11: What was the nature of workplace harassment that you witnessed/experienced? [Q32]

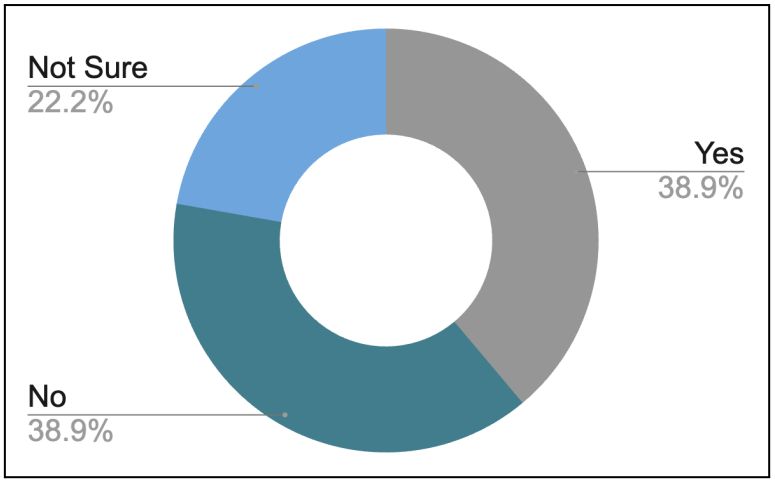


Mid-Career Transitions to Green Jobs

Interest Levels:

38% of respondents were identified as mid-career professionals who were interested in transitioning into the green trades. This is a very valuable pool of experienced people seeking career changes.Their interest is driven by factors such as environmental responsibility and addressing climate change, career growth and job security, and engaging in tangible, impactful work.

Figure 12: Are you a mid-career professional interested in transitioning into green trades or skilled trades? [Q37]



Mid-Career Transitions to Green Jobs

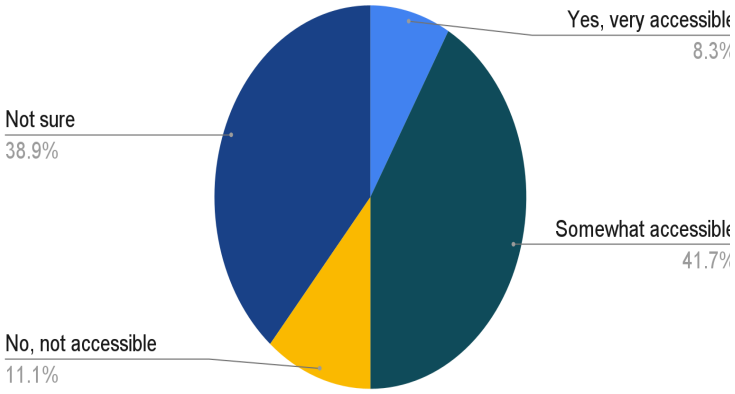
Accessibility

- Only a minority of respondents feel the transition to green jobs is very accessible, while 41.7% believe it is somewhat accessible and 35.3% are unsure.

Key Barriers

- This included financial constraints, a lack of training programs tailored to suit them, and no networking opportunities.

Figure 13: How accessible do you consider transitioning to the green jobs industry? [Q39]



Key Barriers Identified	
1	Lack of Accessible Information and Guidance
2	Limited Opportunities for Mid-Career Professionals
3	Financial and Logistical Challenges
4	Barriers for Entry-Level Professionals
5	Systemic and Cultural Challenges
6	Challenges in Training Access
7	Need for Industry Mentorship and Networking

Overcoming Accessibility

Mid-career professionals need centralized resources, paid and flexible training opportunities, and tailored education to ease their transition into green trades. There is also a strong demand for mentorship, networking, inclusivity, and long-term career growth within the sector.

Organizational Support for Expanding Access to Trades for Women & Marginalized Groups

Key priorities to overcome barriers:

- Financial support was the top priority, followed by the need for accessible training programs and transportation.
- Government policies and broader career counseling and awareness efforts were also seen as essential for making skilled trades more accessible.
- Childcare support for those balancing family responsibilities, job placement, and networking opportunities to facilitate career entry.

Respondents' suggestions to help Women and Marginalized groups:

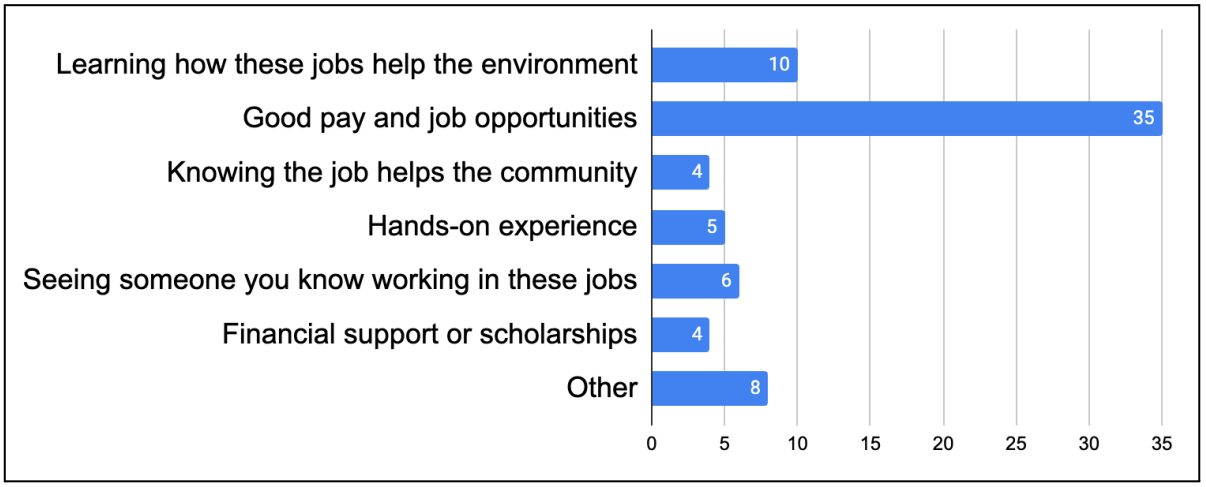
- The most common recommendations were providing mentorship and promoting inclusivity within the workforce.
- Increasing financial support and offering greater access to training were also seen as critical to ensuring more equitable access to skilled trade opportunities.

Figure 14: How can government or organizations help address barriers faced by women and marginalized groups in skilled trades? [Q48]

Motivation and Policy Changes driving interest and accessibility in green jobs

- Good pay and job opportunities (41.6%) are the main motivators for interest in green jobs, followed by hands-on experience (9.7%) and knowing the job helps the community (5.8%).
- Financial support, flexible training, and targeted diversity initiatives are the top policy changes needed to make skilled trades and green jobs more accessible

Figure 15: What would make you or your friends and community members more interested in skilled trades or green jobs? [Q55]



The survey highlights the urgent need for timely interventions related to workforce capacity and skill gaps in the green retrofit sector. Through better alignment of training with emerging technologies and sustainability principles, Nova Scotia can position itself as a leading province in attaining energy-efficient retrofits with economic growth and environmental resilience.

6.2. Summary of Engagements

This section provides a high-level overview of the main findings and key challenges identified through interviews for our three types of informants: Policy Makers, Enablers, and Beneficiaries. A detailed version of the interviews can be found in Appendix 5.

6.2.1 Policy Makers:

A. **Access & Inclusion Gaps:** Rural communities struggle to access training and employment opportunities due to a lack of tailored outreach, low awareness of opportunities for career pathways, and missing wraparound supports offered.
B. **Cultural & Systemic Barriers in Trades:** Harassment, low inclusivity, improper change rooms, washrooms, and protection equipment deter the participation of underrepresented groups.
C. **Complexity & Resistance in Energy Efficiency Implementation:** Permitting processes for energy efficiency retrofitting can be too bureaucratic, the industry resists stricter building codes, and low green literacy limits adoption.
D. **Skills Development Misalignment:** Training programs struggle to align with the needs of green economies, especially the timing of the training to match future construction demand and adoption of new building codes.
E. **Lack of Collaboration:** Community organizations, government, and industry must develop effective partnerships to centralize resources, align market needs, reduce emissions, and improve accessibility.

6.2.2 Enablers:

A. **Financial and Accessibility Barriers:** High upfront costs for some trade programs, logistical challenges for transportation and childcare, and limited training access for marginalized groups and low-income individuals.
B. **Workplace Culture and Inclusivity:** Visible minorities and women are deterred from entering and thriving in skilled trades by harassment, toxic masculinity displays, exclusionary practices, and inadequate accommodations.

C. **Education, Training, and Skills Gaps:** Misalignment between training programs and industry needs exist, limiting workforce readiness and green literacy in the workforce.

D. **Awareness and Representation:** Lack of public education on the benefits and urgency of energy efficiency and demand for skilled trades combined with minimal representation of marginalized communities.

E. **Policy and Industry Resistance:** Delays in building code adoption & implementation and regulatory requirements for retrofits paired with industry resistance to change due to cost concerns slow down energy efficiency adoption.

6.2.3 Beneficiaries:

A. **Barriers to Education & Training:** High costs, long duration of programs, and limited access to financial support, especially for older, mid-career students and marginalized groups, make pursuing a career in skilled trades & green jobs difficult.

B. **Challenging Workplace Culture:** Biases against women, young professionals, and marginalized groups along with a lack of diversity in trades create an unwelcoming environment that limits professional development.

C. **Low Awareness of Opportunities & Green Literacy:** Green job opportunities are poorly advertised in job postings and education centres, with unclear pathways for entry and certifications required and a lack of rural outreach.

D. **Workforce Retention Challenges:** Comparatively low wages in Nova Scotia and insufficient job openings lead to a brain drain, as skilled professionals leave the province looking for better opportunities.

E. **Educational Misalignment with Industry:** Training programs often fail to align with industry requirements, leaving students unprepared and unaware of essential certifications needed for green job roles, and career pathways.

6.3 Gaps 1: Interviews and Literature Review

This section highlights and analyzes common gaps identified through jurisdictional scans, literature reviews, and key informant interviews, grouped into five main categories. These four gaps, primarily drawn from interviews, represent the most frequently mentioned topics and challenges in the ecosystem. Below is a list of the identified gaps to guide this section:

1. Low Green Literacy & lack of awareness
2. Cultural Representation & Worksite Readiness
3. Slow Building Code Adoption (Residential &. Commercial)
4. Educational and Training Barriers

6.3.1 Low Green Literacy & lack of awareness

6.3.1.1

Low Green Literacy levels and a lack of awareness of the benefits of energy efficiency are barriers to increasing energy efficiency and getting more representation from equity-deserving communities in the skilled trades.

Green literacy refers to the knowledge, skills, and awareness of environmental issues, and the urgency of action to promote sustainability.

There are also very low awareness levels of how energy efficiency can generate financial savings in a household through lower electricity bills. This is also partly due to the low knowledge of how to access incentive programs for energy-efficiency retrofits. Informants report that this information is scattered in different locations and difficult to access.

> "There is a significant need for more education on climate change and energy efficiency, [and] the importance of meeting people where they are, and focusing on how energy efficiency can save money, improve air quality, and lower bills." - Hannah Minzloff

6.3.1.2

Informants reported a resistance to the implementation of new energy-efficiency measures by some members of the residential construction and Industrial, commercial, and Institutional (ICI) workforces. They have gathered a considerable amount of experience doing things a certain way, and to some extent, there is a perception that new energy-efficient practices are being imposed.

This resistance is partly due to low green literacy levels, specifically a lack of awareness of why implementing energy-efficiency solutions are important. Energy-efficient retrofits can also be associated with more expensive materials and longer projects driving up costs.

> "Developers resist adopting higher building codes because of increased costs, while the lack of enforcement means current standards fail to drive meaningful efficiency improvements." – Brad Smith

6.3.1.3

There is a lack of awareness of career pathways into green jobs, and a view of trades as undervalued compared to career paths through traditional university degrees, particularly among marginalized communities.

Although racialized communities show interest in working in skilled-trade green jobs, they report having little to no guidance or information available regarding what pathway they must follow to get to them. This lack of information also creates a lack of awareness of available bursaries or grants. They report a lack of support from learning institutions connecting students with the green jobs industry. Youth members show little interest in going into the trades and report it as an undervalued career compared to other offerings from universities.

> "There is no information about how or what is needed to get a job in green energy (wind energy)." - Morgan Middleton

> "For efficiency and green jobs, they need to provide more information because people aren't informed." - Morgan Middleton

6.3.1.4

There is a misconception about the lack of transferable skills from skilled trades to green jobs. The current skills base of the workforce has many of the skills required for energy-efficiency green trade jobs, with only minor adjustments needed to handle net-zero requirements.

The skilled trades industry already has to upskill to adjust to new technologies in construction, and they would only need to focus on training areas specifically related to energy efficiency to increase capacity. Most of this experience will occur on the job sites. The challenge is ensuring buy-in from construction companies to help with the acquisition of skills for the workforce as they take on more energy-efficiency projects.

> "Carpenters require only minor adjustments to handle net-zero requirements, such as insulation and vapor barrier installation." - Mark Bourque

> "The majority of skill acquisition (60–70%) occurs on the job." - Mark Bourque

6.3.2 Cultural Representation & Worksite Readiness

6.3.2.1

Low representation of marginalized groups in the skilled trades industry causes conflicts in fostering a safe workplace culture and inclusion. Traditionally under-represented communities like African Nova Scotians, newcomers to Canada, Indigenous workers, and women struggle to fit into a white-male dominated industry that often doesn't incorporate cultural and gender sensitivity training initiatives. This low representation is also evident at the classroom level, where they are also underrepresented. Also, harassment levels, especially towards women, remain at high levels in Nova Scotia.

> "There is a very low percentage of Mi'kmaq and African Nova Scotians working in green jobs, especially in trades." - Hannah Minzloff
>
> "There are so few women represented at conferences or in classrooms." – Melanie Davis.
>
> "Gender-based harassment persists on construction sites, often taking the form of jokes that escalate to more overt hostility" - Matt Cottrell

6.3.2.2

The skilled trades worksite struggles to be ready to accommodate more genders and people with disabilities. Key informants report struggles in finding properly fitting personal protective equipment for all body shapes and sizes, which is essential for a safe working environment. Facilities often fail to accommodate accessible and inclusive change rooms and washroom facilities. Lastly, people with disabilities, or who become disabled, struggle with the right support to succeed in a career in trades. Despite it being a physically intensive job, injured workers are not offered the proper accommodation or task adjustments to re-enter the workforce.

> "[There is a] lack of appropriate personal protective equipment (PPE) for women and people with disabilities in the skilled trades." - Matt Cottrell
>
> "Injured tradespeople struggle to re-enter the workforce due to limited opportunities for accommodations or task adjustments." - Matt Cottrell

6.3.2.3

Underrepresented groups lack mentorship programs to inspire youth and help them succeed. There is a gap in connecting youth and young professionals from equity-deserving groups with established individuals from the same backgrounds who are thriving in the industry. It is already harder for any person who is not male and white to break in and thrive in this sector, and not having mentors makes it difficult for them to access the right opportunities and avoid making career mistakes. This support is also missing in apprenticeship programs where equity-deserving groups struggle to obtain tailored support for their training gaps.

> "Enhancing training programs and on-the-job mentorship can fill the skill gaps left by formal education." - Mark Bourque
>
> "Introduce targeted initiatives to attract women and underrepresented groups, including outreach and mentorship programs." - Court Goudy
>
> "Younger generations need more role models and mentors to see green jobs as viable career paths." - Heather LeBlanc (Beneficiary - Indigenous)

6.3.2.4

Job seekers from equity-deserving communities struggle to find placements to complete their apprenticeship and obtain their red seal. The construction industry is, in large part, composed of unions, which are also white-male-dominated. This lack of representation creates challenges for African Nova Scotians, Indigenous groups, Newcomers, and women to obtain the hands-on skills they require and meet their placement hours for their apprenticeship.

> "A lot of Black folks have a hard time finding an industry placement because of their colour." - Barbara Roberts

6.3.3 Slow Building Code Adoption (Residential & Commercial)

6.3.3.1

Residential building and energy efficiency codes in Nova Scotia are currently behind federal standards for energy efficiency. This has resulted in slow implementation of energy efficiency standards. The province has committed to meeting Tier 3 (of 5) of the federal 2020 building codes by 2029.

In addition, the federal government will update Alterations to Existing Buildings (AEB) in its 2030 National Model Codes. Efficiency Canada has stated that "The AEB is expected to incrementally increase the energy efficiency of existing buildings but not likely to provide the volume, scale, or depth of building retrofits needed to reach Canada's net zero commitments".

Delays to require higher efficiency during major renovations is a missed opportunity. Lax building codes, and difficult permitting processes paired with low awareness of incentives and programs for existing renovations, are holding back energy efficiency adoption as standard practice. This is in the federal government's hands and is happening at a slow pace.

> "[There is a] lack of strong building codes and regulations to drive the adoption of energy efficiency measures" - Nan McFadgen

> "Policymakers should push for higher mandatory standards within building codes to encourage broader adoption." Lara Ryan
>
> "Retrofits are not required to meet new energy codes, even during major renovations." - Lara Ryan

6.3.3.2

The construction industry demonstrates resistance to adopting stricter energy codes due to concerns about increased costs. One of the biggest concerns for construction companies is staying within budget and minimizing costs. Although energy efficient buildings have significantly lower operational costs, to the construction industry they represent more expensive materials, longer construction durations, and complex permitting processes, which all represent more costs.

This disincentivizes industry from building beyond what they are required by law in terms of energy efficiency. Paired this with increasing housing demand, this creates a strong incentive to meet demand at the lowest possible cost.

> "Unless financing entities give you more money and you incentivize them they won't want to do it." - Ross Cantwell
>
> "It was pushed back because developers didn't want to build to the higher code as it costs more." - Brad Smith

6.3.4 Educational and Training Barriers

6.3.4.1

There is low access to skilled trades training programs in rural areas. Limited access to transportation makes it challenging to access offerings in towns. Marginalized groups are negatively impacted by a lack of accessible education, as transportation into urban education centres is not readily available.

Indigenous job seekers face historical traumas associated with leaving their communities, which makes it even more difficult for them to access support offered outside.

The little access to training in rural communities limits the exposure of the youth and keeps interest in the trades at a low level since they are not aware of the opportunities and support that exist for them, ultimately contributing to the low representation levels.

> "Rural areas could be addressed by piloting mobile training centres or online apprenticeship components to bridge gaps." - Brad Smith

> “Lack of transportation and infrastructure in rural areas can limit the ability of residents to access training and job opportunities.” - Chris Lanteigne

6.3.4.2

The curriculums of trade programs are slow to adjust to industry needs, leading to a knowledge gap in the workforce. Despite best efforts from education centres to keep curriculums updated, there is a mismatch between what is taught and what the market demands, and even with what apprenticeship programs are testing for. This mismatch can result in slow adoption of the evolving demands of energy efficiency, especially with emerging technologies like heat pumps and solar energy installations.

Training programs need to develop practical on-the-job skills that employers require, and include new federal regulations, in order to close skills gaps in the workforce.

> “There is a significant gap between what is taught at NSCC and what is tested by the Nova Scotia Apprenticeship Agency (NSAA), leading to high failure rates and costly retakes for apprentices.” - Curt Goudy

> “Existing employment services and training programs are not tailored to the green economy's needs.” - Gail Keeping

> “There is often a mismatch between the skills imparted by formal education programs and what employers require, highlighting the need for more agile, competency-based training.” - A. J. Fraser

6.3.4.3

Financial barriers prevent members of equity-deserving groups from pursuing education in trades, especially during unpaid training periods. This barrier prevents these job seekers from succeeding and deters many from participating.

While going through apprenticeship programs, participants often work unpaid for extended periods, adding an extra layer of stress to an already challenging situation: completing the program and passing exams. On top of covering subsistence costs, students have to incur other training expenses such as tools, materials, textbooks, personal protective equipment (PPE), and transportation costs. In addition, students incur costs associated with housing, food, family, and transportation. This results in lower retention rates and passing rates among equity-deserving groups for skilled trade apprenticeship programs.

> “Offering accessible childcare, transportation, and financial assistance during training fosters retention.” - Brad Smith

> “The financial burden of education and living costs makes it challenging for many to pursue these career paths.” - Barbara Roberts

> “Apprentices must complete 34 weeks of training over four years, unpaid during training periods, and earn about $20/hour during work.” - Dwayne Raynard
>
> “Financial hardships deter individuals with responsibilities, such as families, from pursuing apprenticeships.” - Dwayne Raynard

6.3.4.4

Available training fails to accommodate learning disabilities and accessibility measures like shorter duration of programs. Individuals who struggle to pass their apprenticeship exams have difficulties with learning the theoretical components, like math, while they might excel with hands-on training.

This struggle originates from marginalized communities' historical trauma with schooling systems, and from individuals having unique learning styles that require accessibility support. For those with learning disabilities, there are virtually no tailored support solutions to help them succeed in the apprenticeship programs.

Furthermore, not all individuals can enroll in programs that have long durations, and they are automatically excluded from training and even upskilling.

> “Many apprentices learn best through hands-on training, but some struggle with theoretical components. There is a lack of adequate support for these learners, particularly those with learning disabilities.” - Donna Karsten
>
> “Many participants struggle with the theoretical aspects of programs, even if they excel in practical, hands-on work, highlighting a mismatch in teaching methods.” - Southwest Nova Scotia
>
> “Challenges include the cost, time commitment, and difficulty passing required exams.” - A. J. Fraser

6.4 Gaps 2: Jobs Forecast Demand

Identified Gaps and Policy Recommendations in the Energy Efficiency Sector

Key Gaps Identified from the Data

6.4.1 Aging Workforce & Lack of Replacement Workers

- Over 35% of the energy efficiency workforce is aged 55 and older, with high retirement rates expected in key trades such as carpentry (25.9% of workforce) and construction labourers (22.2%).
- Graduation rates for critical occupations, such as electricians (5.8%) and carpenters (2%), are far below workforce replacement needs.
- Immigrant workers and upskilling initiatives are currently insufficient to fill this gap.

6.4.2 **Underrepresentation of Women & Visible Minorities**

- Women represent less than 10% of the workforce in most skilled trades. For example, only 1% of plumbers and 3% of electricians are women.
- Visible minorities are underrepresented across most key trades, averaging below 5% in roles such as construction managers (4.35%), plumbers (2.56%), and electricians (3.52%).
- These gaps contribute to labour shortages and limit the sector's capacity for inclusive workforce development.

6.4.3 **Lack of Skilled Workers for Energy-Efficient Retrofits**

- Skilled trade occupations essential for retrofitting—such as HVAC technicians, electricians, and building finishing contractors—show demand outpacing supply.
- While demand for energy-efficient construction grows, training programs and workforce planning remain misaligned with these needs.

6.4.4 **Mismatch Between Training & Industry Needs**

- Current apprenticeship and training programs do not produce enough skilled graduates to meet the anticipated demand from retrofitting and net-zero initiatives.
- Workforce expansion scenarios indicate continued shortages even with policy interventions.
- Lack of structured training for modern energy efficiency techniques and retrofitting hinders workforce adaptability.

6.4.5 **Regional Workforce Imbalances**

- Most job growth is concentrated in urban areas, while rural regions struggle with workforce retention and training access.
- Smaller and rural communities lack specialized training facilities for retrofitting and green construction skills.

6.4.6 **Automation & Technological Shifts Impacting Traditional Jobs**

- Roles such as facility operation managers and welders face stagnation or decline due to automation and prefabrication.
- Without upskilling, workers in these sectors risk job displacement instead of transitioning into energy-efficient roles.

Section 7: Policy Recommendations

This section builds on the analysis presented throughout the report, offering targeted policy recommendations in five key areas. Each area provides context and the recommendations framed as calls to action.

7.1 Workforce Transition

Strengthening Workforce Transition and Regional Training for Energy-Efficient Jobs.

7.1.1 Context:

Nova Scotia faces critical workforce shortages in energy-efficient construction due to high retirement rates among skilled trades, insufficient new graduates, and limited rural workforce retention. Additionally, automation and new technologies are reshaping the construction industry, leaving workers in traditional roles at risk of job displacement. Without a structured plan for workforce transition, training expansion, and rural labour attraction, Nova Scotia may struggle to meet its net-zero targets.

By ensuring an effective transition strategy for retiring workers, modernized training programs, and strong rural workforce support, Nova Scotia can close labour gaps and meet its net-zero goals efficiently.

7.1.2 Current Problem(s):

7.1.2.1 Aging Workforce & Lack of Replacement Workers: Over 35% of the workforce is nearing retirement, particularly in trades like carpentry and HVAC, yet apprenticeship and recruitment efforts are insufficient to replace them. During informant consultations with EDI, and minority groups experts they highlighted that youth are not interested in joining

trades due to negative perceptions of the profession, and lower apprenticeship pass rates from minorities only worsen this problem.

7.1.2.2 Mismatch Between Training & Emerging Industry Needs: Traditional training programs do not fully equip workers with automation, smart construction, and energy-efficient retrofitting skills, leaving them unprepared for industry shifts. The workforce is also reluctant to have to go through extensive and expensive training to upskill, while they are not confident in emerging trends, especially surrounding energy efficiency. The lack of accessible, micro credential and shorter duration programs make the upskilling more challenging for the workforce.

7.1.2.3 Workforce Gaps in Rural Areas: Skilled trades professionals are concentrated in urban areas, while rural communities and First Nations lack training facilities and incentives to attract labour for retrofitting and construction projects. It is especially important to work closely with Mi'kmaw communities, including housing directors and employment directors, to extend energy-efficiency, and education opportunities. Issues with intergenerational colonial trauma makes leaving the community and going to urban centres a challenging one.

7.1.3 Solution(s) for Problem #1: Aging Workforce

7.1.3.1 Create a Workforce Transition and Mentorship Program: Providing incentives for retiring tradespeople to become mentors and instructors in training programs, ensuring knowledge transfer to younger workers. This can be especially helpful for youth minority members, as having more mentors from their background can drastically improve their experiences through apprenticeship programs and developing professionally.

7.1.3.2 Offer fast-track apprenticeship matching grants: Encouraging companies to hire and train replacements before experienced workers retire. This can help the industry get ahead of the forecasted 10,600 workers that are expected to retire in Nova Scotia during the next decade.

7.1.3.3 Expand immigration pathways for skilled trades: Allowing foreign-trained professionals to help fill critical labour shortages. Some initiatives that can support this are improving the validation of foreign credentials and experience, and creating intern program streams for mid-career professionals and newcomers who are older than 30.

7.1.4 Solution(s) for Problem #2 Mismatch of Needs and #3 Rural Gaps:

7.1.4.1 Expand Rural and on-Reserve Training & Retention Programs: Establishing mobile training units to bring hands-on retrofitting, HVAC, and green construction training to rural areas. It is very important to bring opportunities inside rural communities, including reserves. Partner with Mi'kmaw communities, including housing and employment directors,

to deliver energy-efficiency education within their communities. This is crucial given the impact of intergenerational colonial trauma, which makes leaving communities for urban educational opportunities especially challenging.

7.1.4.2 Offer relocation and retention bonuses: Incentivizing workers willing to to work in high-demand rural areas.

7.1.4.3 Develop community-based training partnerships: Working with Indigenous organizations, local trade schools, and municipalities to ensure workforce development aligns with regional needs. Organizations like Trade Winds to Success, are already successfully training Alberta's Indigenous people for success in the trades. It will be important to increase support to organizations similar to this to ensure workforce development from indigenous communities.

7.1.5 Recommended Actions:

7.1.5.1 We recommend the Governments of Canada and Nova Scotia, in collaboration with industry, trade unions, and training institutions:

a. Implement a workforce transition program to train apprentices before retirements create labour shortages.
b. Expand mobile training centres and workforce retention programs to ensure rural and Mi'kmaw communities have access to skilled labour.
c. Establish fast-track immigration pathways for skilled tradespeople in energy efficiency and retrofitting sectors.

7.2 Inclusion

Addressing the inclusivity challenges in the skilled trades workforce for job seekers and workers from equity-deserving communities like African Nova Scotians, Indigenous, Women, Youth, Newcomers to Canada and people with Disabilities will be crucial to increasing their representation and success in the trades industry.

7.2.1 Context:

Equity-deserving groups, including African Nova Scotians, Indigenous peoples, women, Black individuals, newcomers, and people with disabilities, are significantly underrepresented in Nova Scotia's skilled trades workforce. This lack of diversity reinforces workplace cultures that are often hostile or exclusionary, making it difficult for minorities to succeed.

Our interviews, survey and research identified the following key issues:

- **Workplace Harassment:** Over 90% of women and gender-diverse participants reported harassment (YWCA, 2024). Harassment is also prevalent across other minority groups, with 31% of respondents to our survey experiencing or witnessing it. Verbal harassment is the most common, followed by sexual harassment and bullying.
- **Cultural and Structural Barriers:** Women face workplace sexism, stereotypes, and stigmas, with 76.4% of respondents identifying specific barriers to women entering trades. Nearly 73% of women noted that culturally inclusive programs could build trust and interest in green construction and skilled trades.
- **Accessibility Issues:** Workers with disabilities face inadequate accommodations, such as poorly designed personal protective equipment and inaccessible facilities. There is also low awareness among management regarding the unique needs of minority workers.

7.2.2 Current Problem(s):

7.2.2.1 Low Representation: People from equity-deserving communities lack mentors, role models, and decision-making power in the trades sector. Informant interviews of minority youth members currently pursuing their post-secondary degree highlighted this issue. They vocalized their concerns about not being able to find the right mentor to complete their apprenticeships. They said that ideally they would like to find someone from a shared background but due to the lack of diversity they are better off trying to fund other members of a minority group to mentor them. Hiring processes often exclude minorities, especially disabled individuals, through non-inclusive language and practices. For example, replacing "must be able to walk" with "must be able to move".

7.2.2.2 Limited Awareness of Accessibility Needs: Many employers fail to provide adequate tools and facilities for individuals with disabilities. Some of the barriers to accessibility include inappropriate changing rooms or washroom facilities, personal protective equipment that doesn't fit all body types. An informant interview with an inclusivity expert shined a light that this issue even extends to white male trades workers who are injured and unable to return to work later due to low accessibility support.

7.2.2.3 High Harassment Rates: Informants and survey responses indicate widespread harassment in a culture that has normalized negative stereotypes and exclusionary practices. We surveyed 78 individuals interested in energy efficiency and trades, and a significant proportion (30%) of respondents have either experienced or witnessed harassment in the net-zero or construction-related sectors. This supports the results from a 2024 YWCA report where over 90% of women and gender-diverse participants reported experiencing at least one form of sexual or gender-based harassment.

7.2.3 Solution(s) to Problem #1 & 2:

7.2.3.1 Increase Representation in Leadership: Support mentorship programs and implement pro-diversity policies to prepare professionals from equity-deserving groups for management roles. Programs like PREP Academy, in partnership with EfficiencyOne, help pair Black mentors in the Clean Energy sector with students to learn directly from industry professionals

7.2.3.2 Make Hiring Processes Inclusive: Tailor job postings to attract diverse candidates and provide accommodations for applicants with disabilities throughout the recruiting cycle. This can include using more gender neutral language and being intentional with descriptions of tasks for example using the word "move" instead of "walk".

7.2.3.3 Improve Accessibility Awareness: Train management to understand and meet the needs of workers from equity-deserving communities. Partner with successful programs like the CWB Welding Foundation's *Women of Steel* initiative to eliminate stigmas and enhance hiring practices.

7.2.4 Solution(s) to Problem #3:

7.2.4.1 Eliminate Workplace Harassment: Proactively address harassment through workshops and inclusivity training for management and staff. Expand partnerships with programs that improve workplace culture and inclusivity, like YWCA, to create a more welcoming trades sector.

7.2.5 Recommended Actions:

7.2.5.1 We recommend the trades of Nova Scotia:

- **a.** Improve communication with equity-deserving communities to improve awareness of their specific challenges and accessibility needs, including:
  - **i.** More accessible worksites with adequate changerooms, washrooms, and personal protective equipment.
  - **ii.** Greater support for individuals with physical or cognitive disabilities to thrive in the trades sector.
- **b.** Take strong action against all forms of harassment experienced in trade worksites, especially by women.
- **c.** Facilitate mentoring programs for workers and students from equity-deserving communities, founded on understanding their challenges to connect with mentors from similar backgrounds.
- **d.** Work towards fostering increased representation at all levels of the workforce, especially in management roles.

e. Incorporate accessibility measures through hiring processes, including support for applicants with disabilities, and using inclusive language in job postings. These include:

   i. **Using Inclusive Language in Job Postings**: Avoid terms like "must be able to walk" when not essential and instead say "must be able to move independently."

   ii. **Using Gender-Neutral in Job Postings:** Instead of "He/she will lead the team," say "The candidate will lead the team."

   iii. **Use Clear and Simple Language**: Instead of "leverage cross-functional synergies," say "work with different teams to achieve shared goals."

7.2.5.2 We recommend the Governments of Canada and Nova Scotia, in collaboration with the construction sector:

a. Adopt more partnerships with organizations with missions to eradicate negative preconceptions regarding equity-deserving groups.

b. Monitor representation rates of women, African Nova Scotians, Mi'kmaq, people with disabilities, and other equity-deserving groups, in the sector, especially in management roles, and support each other to improve diversity.

7.3 Equity

Addressing the root causes of challenges faced by equity-deserving communities can positively impact all aspects of people's lives.

7.3.1 Context:

Equity-deserving communities in Nova Scotia, including African Nova Scotians, Indigenous peoples, women, Newcomers to Canada, and people with disabilities, face long-standing challenges rooted in historical injustices. These include generational wealth gaps, mistrust of institutions, and geographical barriers in rural areas that limit access to opportunities and resources.

Our survey to industry professionals and students, paired with interviews with construction companies, support organizations, and accessibility consultants highlighted these challenges. For example, while 61.1% of individuals from rural areas expressed a desire to remain in their communities after completing school or training, only 22.7% believed there were enough local opportunities. Many individuals prefer to stay local, but a lack of resources and infrastructure often forces them to leave. Mistrust toward institutions and

initiatives also make it more difficult for people from equity-seeking communities to thrive in the workforce.

7.3.2 Current Problem(s):

7.3.2.1 Legacy of Colonialism and Generational Trauma: Lack of essential supports like food, housing, and education leads some minority groups to live in "survival mode" rather than thriving. Generational barriers to wealth accumulation, like lower access to education, lower graduation rates, and lower rates of homeownership make breaking poverty cycles difficult. Historical injustices result in feelings of shame or disconnection from cultural identities, in part caused by high levels of harassment and racism that minority groups face.

7.3.2.2 Limited Career Support Beyond STEM Fields: While STEM fields receive significant support, arts, humanities, and skilled trades are often overlooked. Skilled trades face negative stigmas, perceived as less prestigious career choices. These stigmas are caused by low awareness of the financial viability of trades careers and the opportunities that exist, especially in energy efficiency. During informant interviews of youth interested in energy efficiency careers, they highlighted the lack of awareness of how to enter jobs in energy efficiency and that their post-secondary institution was not doing a great job at informing and connecting them with opportunities in this space.

7.3.3 Recommendation(s) to Problem #1: Generational Trauma:

7.3.3.1 Expand Wraparound Support for Youth: Increase student support for food security, housing, and education to better prepare equity-deserving youth for success. There is an opportunity to increase the support to organizations like Iron & Earth (Non-Profit), Energy Trailblazer Program (Efficiency Canada), and Building UP (Non-Profit) to increase their impact. During our consultations with one organization fomenting inclusivity, they noted that whenever wraparound supports have been offered, pass rates are considerably higher than other programs.

7.3.3.2 Improve Cultural Sensitivity: Educate employers and the public about Indigenous, African Nova Scotian, and other cultures. Building cultural awareness can foster pride and empowerment within these communities, helping individuals thrive socially and professionally. Furthermore this can help break down barriers and stigmas about minority groups, and foment inclusivity.

7.3.4 Solution(s) to Problem #2: Limited Career Support:

7.3.4.1 Support a broader range of careers for racialized students: Although support in more technical fields (STEM) is crucial, it is also important that other jobs are supported.

There is an opportunity to improve the confidence the youth has if they are supported regardless of what their dream career is. One informant interview with an expert in Indigenous affairs brought this challenge to our attention, and he mentioned that supporting a broader range of career options can help build a positive personal perspective for many youth members.

7.3.5 Recommended Actions:

7.3.5.1 We recommend the Governments of Canada and Nova Scotia in collaboration with the private sector and learning institutions:

- **a.** Increase wraparound-supports for youth, focusing on food security, housing, education, and employment.
- **b.** Provide cultural training for employers. Look to existing models such as YWCA's Shift Change, which is comprehensive and hands-on.

7.4 Adoption

Adopting higher energy-efficient building codes in Nova Scotia & advocating for improved collaboration between the government and construction industry to reach Nova Scotia's 2050 Net-Zero objective.

7.4.1 Context:

In late 2024, Nova Scotia committed to reaching Tier 3 (of 5) of the 2020 National Building Codes by 2029, which included higher energy efficiency standards. While a positive step, key informants, including construction companies, sustainability consultants, and trade unions, believe the codes are not strict enough to meet the 2050 net-zero targets. Aligning financial and operational incentives with these targets is essential to accelerate adoption.

The construction sector is also under pressure to meet growing housing demand, often building to minimum energy standards, which may soon require retrofits to reach net zero. Challenges include navigating permitting processes, fluctuating funding availability tied to government changes, and a lack of mandatory energy efficiency requirements for existing buildings undergoing renovations. This leaves a critical gap in leveraging retrofits to improve energy performance, which can potentially be addressed through the Alterations to Existing Buildings (AEB) retrofit code.

7.4.2 Current Problem(s):

7.4.2.1 Costs and Awareness: The 2020 National Building Code relies on provinces to adopt new standards, which currently leave it up to constructor's voluntary measures to

exceed baseline energy efficiency. Nova Scotia's new National Building Code will implement a tiered system for energy efficiency, with each tier requiring progressively higher levels of performance, ultimately leading towards (Tier 5) net-zero energy-ready buildings. This adds costs for construction companies hesitant to go beyond minimum standards as they have to extend project timelines to improve insolation, use specialised materials, and go through an extra set of permitting to build to higher standards. Limited awareness of implementation timelines creates uncertainty and resistance within the sector as they will most likely keep building to the minimum standard until they are forced to increase it. This creates an issue of building the right capacity for when this time comes, not too early because it's too costly, nor too late because they won't meet the standards.

7.4.2.2. Unpredictable Funding: Funding for energy efficiency projects fluctuates due to changes in government or the termination of programs, limiting widespread adoption. For instance the Canada Greener Homes Grant (CGHG), started in 2020 and it is being called back in February 2025. This type of inconsistencies and changes in governments from liberal to conservatives make it harder for customers to be aware and develop trust in efficiency programs. Long-term, stable financial incentives are necessary to motivate adoption.

7.4.2.3 Inefficient Building Practices: Building to low energy-efficiency standards now leads to future costs for retrofitting and results in higher energy bills for homeowners and tenants. These higher costs are associated with high upfront costs to retrofit, higher electricity bills over the lifetime of the building, and others. Although the timelines for implementation to Tier 5, Net-Zero Energy Ready are a little unclear, since it is evident that is where we are heading there is an opportunity to start building closer to that standard sooner and limit the need for retrofits in the future. Retrofit codes like Alterations to Existing Buildings (AEB) currently rely on voluntary measures, missing opportunities to mandate efficiency upgrades during renovations.

7.4.3 Solution(s) to Problem #1 & 2: Efficiency Requirements & Incentives:

7.4.3.1 Tailored Incentives: Develop more stable financial and operational incentives to support higher energy efficiency in new and existing buildings. This stability refers to creating long-lasting programs so consumers have time to develop higher awareness of their existence and for more people to make use of them. Streamline permitting processes to make them more accessible faster, and diversify funding sources to ensure resilience against government changes. Long processing times overextend project timelines, causing higher costs, and reluctance to apply. Solving this can increase the amount of people using the incentives.

7.4.3.2 Enhanced Public-Private Communication: Strengthen dialogue between government, construction industry members, and the nonprofit sector, to align net-zero goals with market demands. During our informant consultations with some of the groups mentioned above, we heard that although the government wants to increase energy

efficiency to meet their net zero by 2050 target, the construction industry is reluctant to show support because of the higher costs associated with doing so. Better communication between these groups can improve the awareness of implementation timelines and help construction companies adapt progressively to new requirements.

7.4.4 Solution(s) to Problem #3: Inefficiencies:

7.4.4.1 Mandatory Upgrades for Retrofits: Incorporate mandatory energy efficiency requirements into retrofit projects. Eventually, most buildings should get to Tier 5, net-zero energy ready, so major renovations should be used as an opportunity to improve efficiency. Pair this with enhanced financial incentives to reduce future costs and encourage constructing new buildings to net-zero standards from the beginning.

7.4.5 Recommended Actions:

7.4.5.1 We recommend the Governments of Canada and Nova Scotia, in collaboration with the construction sector:

a. Accelerate adoption of net-zero energy ready standards for new buildings and retrofitting projects to set the province up for success in meeting its 2050 Net-Zero objectives.
    i. Publish a clear timeline for the implementation of these standards to provide the construction sector with adequate preparation time.
b. Expand the Alterations to Existing Buildings (AEB) code to require mandatory energy efficiency improvements during renovations (minor and major).
c. Streamline application processes and establish long-term, diversified funding mechanisms to ensure the sustainability of financial incentives for energy efficiency projects.
d. Enhance government-industry collaboration through recurrent meetings and joint task forces that help align industry needs and evolving market demands with government net-zero objectives.

7.5 Education & Expansion

Educating more people in skilled trades and green jobs, improving graduation rates and awareness of pathways for jobs in these industries.

7.5.1 Context:

Interviews with trade councils, learning institutions, and the construction sector revealed that apprenticeship and Red Seal exam success, and school graduation rates are lower among candidates from equity-deserving communities, such as African Nova Scotians, Indigenous peoples, women, Black individuals, and Newcomers. Three key challenges emerged:

7.5.1.1 **Financial Constraints**: Many marginalized individuals struggle to afford tuition, training materials, transportation, housing, and essential living costs. These financial burdens often prevent participation in or completion of trades programs.

7.5.1.2 **Exam Anxiety and Academic Struggles**: Historical trauma related to education systems and the technical nature of lengthy exams cause significant stress for marginalized groups. Although many excel in practical skills, math, and technical components often pose challenges. Women, in particular, face additional stress due to their low representation in classrooms and difficulty finding partners for group activities.

7.5.1.3 **Lack of Support Systems**: Limited accommodations for learning disabilities, cultural differences, and mentorship opportunities hinder success. The lack of representation in leadership roles further limits networking and guidance. Additionally, rural communities often lack resources, with 35.2% of rural respondents identifying location as a barrier to training and job access.

A promising solution is an initiative by Mainland Nova Scotia Building Trades that provides wrap-around support, including assistance with childcare, transportation, and housing. This approach led to a significant increase in trade exam pass rates, from 42% to 70%, highlighting the effectiveness of offering targeted support for marginalized groups.

7.5.2 Current Problem(s):

7.5.2.1 Financial Constraints: Marginalized individuals struggle to afford tuition, training materials and protective gear, transportation, housing, and other essential needs, limiting their ability to succeed in trades programs. Even if minorities can afford the initial investment required, the periods of unpaid training and commitments with personal life and family responsibilities make it difficult for them to succeed when they have to live without a source of income during training.

7.5.2.2 Exam Anxiety and Academic Struggles: Members of equity-deserving communities often experience greater stress from technical exams, worsened by historical traumas and long exam durations. Two of the biggest factors contributing to this are that exams test participants on theoretical knowledge and mathematical skills, while the job they are doing and their experience is with using their body and physical tools. Also, the limited support for different learning styles and accessibility during exams worsens the problems. Women face additional challenges due to low representation in classrooms and struggles with classroom-partner dynamics during group activities. During informant interviews with youth minorities who were enrolled in post-secondary trades education,

they pointed out that in most of his classes there were very few women. In one case his class had only one woman, and he reported that she struggled through the program, especially with activities that required forming pairs to work together.

7.5.2.3 Lack of Support Systems: Limited mentorship, accessibility accommodations, and resources in rural areas are a barrier to progress. More than 35% of rural survey respondents cited location as a barrier to accessing training or job opportunities in the survey we conducted. Outreach to rural communities remains low, and on top of that the traumas of leaving their local communities still causes friction for rural minority groups to leave to urban centres.

7.5.2.4 Limited Awareness of Career Pathways: There is a lack of clear, accessible information on pathways to green energy careers. During informant interviews with minorities enrolled in post-secondary programs, they noted that educational institutions do not sufficiently connect students with resources or promote green jobs.

7.5.2.5 Stigma Around Trades as a Career Option: Trades are often viewed as less prestigious compared to other professions, which discourages marginalized groups from pursuing these careers. This was evidenced during informant interviews with EDI experts, where it was noted that especially among black minorities in Nova Scotia, trades are not viewed as a viable, respected career option, contributing to the stigma around these professions

7.5.3 Solution(s) to Problems #1, 2 & 3:

7.5.3.1 Increase Availability of Micro-Credential Programs: Micro-credentials offer a more accessible and flexible way for marginalized communities to build workforce capacity. These shorter, online programs at a lower cost can address barriers such as transportation, affordability, and long program durations, enabling individuals to gain necessary skills in less time. Furthermore, these programs can be developed in specialized areas such as heat pump installations, to facilitate the adoption of these technologies in the province.

7.5.3.2 Greater Availability of Wraparound Support Programs: Programs that address childcare, transportation, housing, and other barriers are crucial for marginalized individuals to succeed in trades. The Mainland Nova Scotia Building Trades initiative demonstrates how tailored support can significantly improve apprenticeship completion and exam pass rates.

7.5.4 Solution(s) to Problems #4 & 5:

7.5.4.1 Increase Awareness of Career Pathways: Outreach programs that, like *Shift Change* from YWCA Halifax, provide clear, accessible information about careers in trades and the green energy sector are essential. These programs should focus on rural areas and marginalized communities, partnering with schools, community organizations, and

employers to offer mentorship and resources that showcase the viability and financial rewards of these careers.

7.5.4.2 Combat Stigma Through Public Campaigns: Public campaigns can help change perceptions by highlighting success stories from diverse backgrounds, emphasizing the sustainability aspects of trades, and showcasing the financial and career opportunities within these fields. This approach can reduce stigma and encourage more people from equity-deserving communities to consider trades as a respected career option.

7.5.5 Recommended Actions:

7.5.5.1 We recommend the Governments of Canada and Nova Scotia, working with post-secondary institutions and nonprofit partners like Green Schools Nova Scotia, the Mi'kmaq Employment Training Secretariat, and Building to Zero Exchange:

a. Increase availability of micro-credential programs to provide accessible, flexible pathways for marginalized groups to build workforce capacity, particularly in skilled trades and green energy sectors.

b. Work closely with Mi'kmaw communities, including housing directors and employment directors, to extend energy-efficiency educational opportunities into Mi'kmaw communities, where intergenerational colonial trauma makes leaving the community for urbanized educational experiences particularly daunting.

7.5.5.2 We recommend the Governments of Canada and Nova Scotia, in collaboration with educational institutions, the construction sector, and local employers to:

a. Develop targeted outreach programs to raise awareness of career pathways in skilled trades and green energy, focusing on rural areas and marginalized communities.

b. Combat stigma around trades careers by promoting success stories, emphasizing the financial viability, and showcasing growth opportunities to make these professions more attractive to diverse groups.

7.5.5.3 We recommend the Governments of Canada and Nova Scotia, in collaboration with the construction sector, educational institutions, and community organizations:

a. Expand wraparound support programs to address barriers like childcare, transportation, housing, and accessibility, ensuring marginalized groups have the resources to succeed in apprenticeship programs and green jobs.

7.6 Collaboration

Increasing collaboration and coordination between public and private sectors to use resources more effectively and address workforce shortage, gaps, and evolving industry needs.

7.6.1 Context:

The labour market for energy efficiency retrofits requires a coordinated effort between the public and private sectors to effectively address workforce shortages, training gaps, and evolving industry needs. Currently, workforce planning efforts are fragmented, with limited collaboration between government agencies, training institutions, trade organizations, and private industry. Employers often struggle to find workers with the necessary skills, while training programs may not align with industry needs. Furthermore, there is no formal mechanism to ensure long-term, sustainable workforce development strategies that evolve with technological advancements and policy changes in energy efficiency.

By strengthening collaboration between public and private sectors, Nova Scotia can create a resilient, adaptive workforce that meets labour demands for energy efficiency retrofits while supporting long-term economic growth.

7.6.2 Current Problem(s):

7.6.2.1 Fragmented Workforce Planning Efforts: There is no centralized framework for aligning government policies, industry demands, and educational programs for energy-efficient construction and retrofitting. During informant consultations with industry, government organizations, and sustainability experts, a common topic discussed was the political divide on topics surrounding efficiency and climate change. This trickles down to smaller communities where people with different viewpoints struggle to work together. They also mentioned that there can be mismatches between the requirements during renovations and new building construction, further contributing to the fragmentation.

7.6.2.2 Limited Industry Involvement in Curriculum Development: Training programs do not always reflect real-time labour market needs due to a lack of structured industry input. Although institutions like Nova Scotia Apprenticeship Agency (NSAA) perform annual industry meetings, during our consultations with industry informants they reported that there is still a mismatch between training curriculums and labour market needs. For instance installing a heat pump requires a certified Refrigeration and Air Conditioning Mechanic, a compulsory certification, which demands over 5,000 hours of training. Given the high demand for this service, it is worth exploring alternatives for faster training solutions to increase workforce capacity.

7.6.2.3 Weak Public-Private Partnerships in Workforce Investment: The private sector often lacks incentives to invest in workforce development, and government programs do

not always effectively engage industry players to create sustainable funding models. Our interviews with sustainability informants pointed out that financing has to be mobilized at a greater scale, and application processes have to be streamlined as federal funding tends to be too bureaucratic. Furthermore the lack of clear building code implementation guidelines makes it difficult for the industry to time the development of the workforce. They don't want to overspend and train too early, not wait too long and be struggling to meet requirements.

7.6.3 Solution(s) for Problem #1: Fragmented Planning

7.6.3.1 Establish a Provincial Green Workforce Council: Create a dedicated council with representatives from government agencies, trade unions, industry associations, and post-secondary institutions to guide workforce strategy for the energy efficiency sector. Highlighting the importance of working together despite political divides and differing viewpoints. Also increase the collaboration with Building to Zero Exchange (BTZx), to implement best practices in Nova Scotia.

7.6.4 Solution(s) for Problem #2: Limited Industry Involvement in Curriculum

7.6.4.1 Integrate Industry-Led Curriculum Development: Require trade schools and apprenticeship programs to collaborate with industry experts in designing training curricula to ensure alignment with current and emerging job market needs. Although institutions like Nova Scotia Apprenticeship Agency (NSAA) already hold yearly meetings with industry, it is important to generate accountability and ensure topics like micro-credential and fast track training are developed. This can target some of the problems from compulsory trades slowing down some efficient implementations, like heat pumps.

7.6.5 Solution(s) for Problem #3: Weak Public-Private Investment Partnerships

7.6.5.1 Expand Public-Private Funding Partnerships: Develop co-funded training initiatives where government investment is matched by private sector contributions, creating sustainable funding streams for upskilling and workforce expansion programs. It could be advantageous to also direct some of this funding to already existing training centres for minority groups like YWCA's *Shift Change* program, or *Women of Steel* by the CWB Foundation.

7.6.6 Recommended Actions:

7.6.6.1 We recommend the Governments of Canada and Nova Scotia, in collaboration with industry, trade unions, and educational institutions:

a. Establish a Provincial Green Workforce Council to align workforce planning efforts with industry demands and policy goals.
b. Mandate industry involvement in training curriculum development to ensure programs produce job-ready graduates.
c. Develop co-funded workforce investment models to encourage long-term employer participation in workforce training and hiring initiatives.

7.7 Awareness

Promoting Green Literacy levels and incentive programs to increase the rate of adopting Energy Efficiency in Nova Scotia's Retrofitting, Construction, and Homeowner Sectors.

7.7.1 Context:

A challenge identified in interviews, ranging from government agencies to private-sector companies, is the need to boost green literacy across Nova Scotia's construction, homeowner, and energy sectors. Green literacy refers to understanding the environmental impacts of human actions, which is crucial for motivating energy efficiency adoption.

According to a 2024 report by the Atlantic Economic Council, Nova Scotia has 21% of its housing stock built before 1960, leading to inefficiencies and higher greenhouse gas (GHG) emissions. With the 2020 National Building Codes starting to be implemented, there's a need to increase green literacy and drive energy efficiency to meet Nova Scotia's Net-Zero targets, of energy generation, by 2050. Achieving this will require a combination of financial incentives and strong regulatory standards.

7.7.2 Current Problem(s):

7.7.2.1 High Costs: Key informants from the construction sector, note that there are higher costs with building to higher efficiency requirements. These are associated with the need to use more expensive insulation materials, longer project durations from permitting lags and extended project timelines, and the need for specialized skills from compulsory trades. Nova Scotia has 13 compulsory certified trades that make it mandatory for workers to be registered apprentices to perform work on that trade. For instance, to install a heat pump you need 2 different red seals: an electrician and an air mechanic to install it legally. Incentive programs like rebates exist, but our consultations with sustainability informants, noted that the process to access them often results in further delays because of unfamiliarity with the application process.

7.7.2.2 Workforce Capacity: The construction workforce needs more workers with skills and knowledge related to energy efficiency to meet evolving energy standards and adapt to the new building codes. These include basic green literacy, and knowledge of technologies like insulation, high performance windows, efficient HVAC systems (i.e. heat pumps), and renewables like solar panels. Although some trades workers already have the basic skills that can be transferable to green, energy efficiency, jobs, there is still reluctance to develop the specialized skills. This is due to the slow implementation of mandatory requirements through building codes, low awareness levels of available resources and the urgency for action, the cost and time associated with upskilling, and uncertainty about the future. Without workforce buy-in, large-scale implementation will be challenging.

7.7.3 Solution(s) to Problem #1: High Cost:

7.7.3.1 Increase Green Literacy: An important action is educating property managers, homeowners, and tenants on the real benefits of energy efficiency (e.g., lower electricity bills, better air quality) and the consequences of inaction (e.g., climate change, extreme weather). The end goal will be to encourage consumers, and industry, to modify their long-term energy consumption habits with energy-efficient initiatives, rebates, and education campaigns. Furthermore, as the demand for energy efficiency increases more construction companies and municipalities will become more familiar with permitting processes, accelerating them.

7.7.3.2 Clear Communication of Incentives: Simplifying the communication of financial incentives and benefits can encourage wider adoption. For instance, showing how heat pumps can save $1,400 to $2,200 annually in energy costs will resonate more than discussing GHG emissions. The public and industry most likely care more about how they are impacted financially above anything else, so it is important that incentive programs communicate this in a clear, accessible language.

7.7.4 Solution(s) to Problem #2: Building Capacity:

7.7.4.1 Awareness Campaigns for the Construction Sector: The government and educational institutions could educate the workforce on the importance of their work in implementing energy efficiency solutions to achieve Net-Zero targets by 2050. This includes providing access to upskilling programs for new and existing professionals who want to shift careers in the trades, including flexible options like micro-credentials, which can be done online and in shorter durations, and environmental awareness. Training solutions could consider offering shorter duration specialized programs. For instance, to install a

heat pump a registered refrigeration and air conditioning apprentice is required. This person would have needed to complete around 7,000+ hours to be certified. Offering specialized solutions can help target areas like heat pump installations and offer faster training, to have more people in the workforce. Also there is an opportunity to work towards validating foreign experience, if it meets benchmarks of proficiency, in a more agile way to meet the growing demand for trades workers in the province.

7.7.4.2 Standardizing Compulsory Trade Requirements: Standardizing trade certifications across provinces can prevent workers from migrating to areas with lower requirements, making it easier to implement retrofitting projects. Nova Scotia has 13 compulsory certified trades that make it mandatory for workers to be registered apprentices to perform work on that trade. Compared with other provinces like Prince Edward Island, which has 4 compulsory trades, and the comparatively high number in Nova Scotia can encourage workers to leave to provinces where they can work without having to go through long training periods. Standardizing compulsory requirements nationally can help decrease brain drain to less demanding provinces.

7.7.5 Recommended Actions:

7.7.5.1 We recommend the Governments of Canada and Nova Scotia:

- **a.** Continue and expand the incentive programs for energy efficiency retrofitting and new constructions, following the leads of British Columbia, Quebec, Prince Edward Island and New Brunswick.

7.7.5.2 We recommend the Governments of Canada and Nova Scotia, in collaboration with the construction sector:

- **a.** Provide a clear timeline for implementing the 2020 National Building Codes in full and enough time for the construction industry to prepare.
- **b.** Streamline the application process to access financial incentives and other supports for energy efficiency retrofits and new construction.
- c. Structure incentive programs to be more resilient to political changes, ensuring stable funding mechanisms that can withstand shifts in government priorities.

7.7.5.3 We recommend the Governments of Canada and Nova Scotia, in collaboration with the construction sector, and with learning and apprenticeship institutions:

- **a.** Better align the skills, training, and certificates required for incorporating higher energy efficiency standards into building codes.

Appendices

Appendix 1: Methodology

1. List of Interviews:

This is a list of the key informants interviewed by ASBB Consulting for the report. Interviews were conducted from October 2024 to January 2025, both virtually and in-person.

Table 12: List of Policy Makers & Enablers Interviewed

01. Policy Makers & Enablers		
	Name	**Organization**
1.	Gail Keeping	Department of Labour Skills & Immigration
2.	Trish McCourt	Nova Scotia Non-Profit Housing Association
3.	A.J. Fraser	Cape Breton University (Microcredentials Department)
4.	Matt Cottrell	YWCA
5.	Brad Smith	Mainland Nova Scotia & Nova Scotia Building Trades Council
6.	Rochelle Owen	RochelleOwenConsulting (Business Owner)
7.	Lara Ryan	Build Green Atlantic and Building to Zero Exchange
8.	Hannah Minzloff	Ecology Action Centre
9.	Donna Karsten	Nova Scotia Apprenticeship Agency
10.	Kelsey White	Confederacy Of Mainland Mi'Kmaq
11.	Ross Cantwell	The Housing Trust of Nova Scotia & HRM Apartments (Business)
12.	Chris Lanteigne	Nova Scotia Power
13.	Nan McFadgen	CUPE Nova Scotia
14.	Mark Bourque	Delmar Construction (Business Owner)

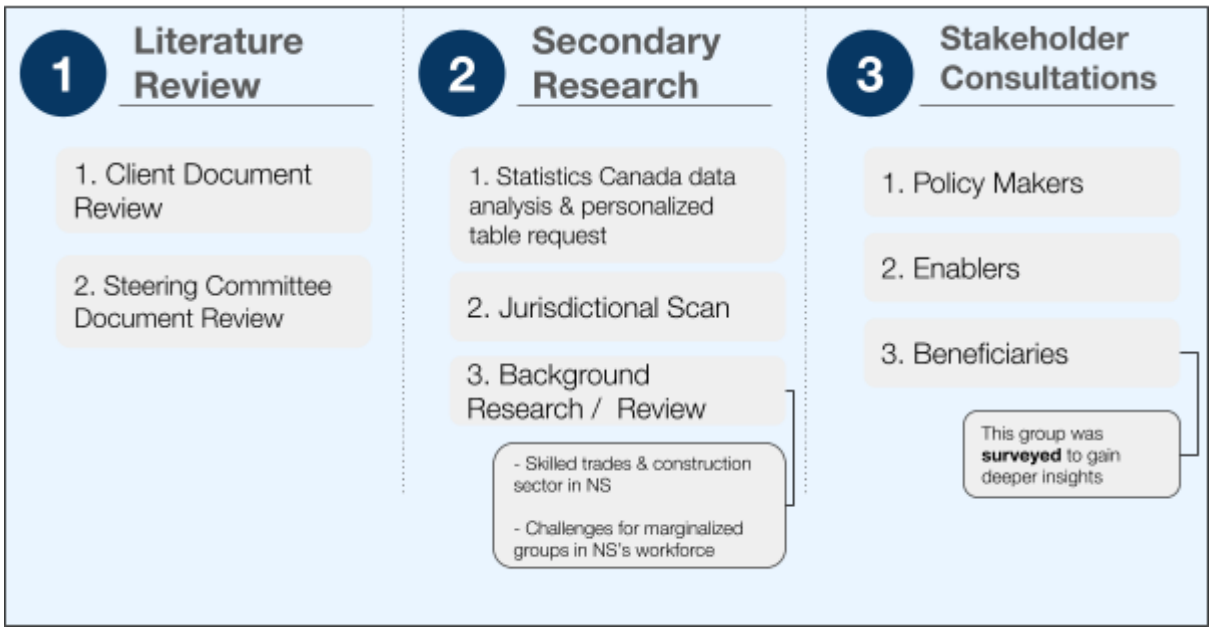
01.	Policy Makers & Enablers	
15.	Kyla Skidmore	Southwest Refrigeration Ltd. (Business)
16.	Dwayne Raynard	Graves Electrical (Business)
17.	Curt Goudy	Bramac Plumbing and Heating Ltd (Business)
18.	Randy Fells	Southwest Employment Services
19.	Rhonda Zasitko	Southwest Employment Services
20.	Jessica Ward	Atlantic Homebuilding & Renovation
21.	Cory Rafuse	Aboriginal Peoples Training & Employment Commission - Coldbrook Regional Office - Native Council of Nova Scotia
22.	Craig Anderson	International Brotherhood of Electrical Workers (IBEW 1928)
23.	Jarvis Googoo	Atlantic Indigenous Economic Development Integrated Research Program (AIEDIRP)
24.	Charity Carr	Efficiency One
25.	Trent Soholt	Nova Scotia Construction Sector Council (ICI)
26.	Barbara Roberts	Roberts Wellness Services (workshops on diversity)
27.	Emma Norton	Recover Initiative
28.	Rob Harris	Clean Foundation
29.	Matthew Martel	Black Business Initiative (BBI)
30.	Duncan Williams	Construction Association of Nova Scotia

Table 13: List of Beneficiaries Interviewed

02.	Beneficiaries
	Description
1.	Conducted ten one-on-one interviews with Indigenous, Black, Asian, White, Male, Female, and Non-Binary Individuals.
2.	Conducted a Focus Group with over ten participants at Yarmouth Southwest Nova.

2. Methodology for the Research Process

Figure 16: Methodology for the Research Process



Appendix 2: Literature Review

This section analyzes several papers, documents, and reports and it is organized in the following way:

1. Introduction
2. Jobs Losses and Gains
3. Training Requirements & Annual Investment
4. Equity strategies and partnerships
5. What key initiatives exist in other places that are seeing success?

1. Introduction

Purpose of the Literature Review

This Literature Review aims to identify key areas and knowledge gaps related to the Ecology Action Centre's "Skills for Net-Zero Initiative". This initiative focuses primarily on energy-efficiency –including operational and embodied energy in buildings– and

conservation work on Nova Scotia's buildings to transition the province's energy system and economy away from fossil fuels.

Some of the key areas of the research are:

1. The impact of the green-energy transition on the provincial job market, including new opportunities and job losses.
2. Barriers and opportunities for equity-deserving communities.
3. Resources needed for inclusive workspaces.
4. Identifying available educational training assets.
5. Identifying skills needed for net-zero energy building construction and retrofits, including areas where further training is needed

To develop a knowledge base on the areas mentioned above, this report will use existing data, a survey, and key informant interviews to develop a broader understanding of the complex and different perspectives on the green-energy transition of Nova Scotia. Special attention will be given to address the needs of each unique group and how to address their needs effectively. The existing data consulted originated from studies, governmental, institutional, and company reports, Statistics Canada data, and grey literature documents.

The document review insights contributed to identifying knowledge gaps and key areas of focus, which were later used as focal points during interviews. These were also important areas that were considered during the survey design process.

2. Job Losses and Gains

Background on Nova Scotia's Energy Efficiency

The province of Nova Scotia set emission targets of achieving 80% renewable energy by 2030 and becoming net zero by 2050 - this is for electricity generation (NSPower). These targets were set by the provincial government and align with Canada's commitment as a country to achieve net-zero emissions by 2050 (Canada Gov). This research examines the dynamics of demand and supply in the green jobs market to support Nova Scotia's goal of achieving greater energy efficiency.

To achieve net-zero by 2050 there are two key pathways that Nova Scotia must follow. First, phasing out the generation of electricity through fossil fuels and moving towards renewable

energy such as wind and solar energy produced in Nova Scotia, or as part of a shared inter-jurisdictional grid.

Second, improving energy efficiency in homes and buildings, as well as factories, to minimize the strain they place on the electric grid with their heating, cooling, and other electrical demands (NSPower). Using energy more efficiently and creating it through more sustainable mechanisms will play a crucial role in pushing forward the province's net-zero objectives.

One big area that has tremendous potential to advance the province's energy efficiency, and is the primary focus of this project, is improving the energy usage of buildings. According to the Government of Nova Scotia, the third largest source of greenhouse gas emissions in the province is buildings (NS Gov, 2023).

Improvement in energy efficiency is achieved through retrofits. The Government of Canada officially defines energy-efficiency retrofitting as any upgrade of the building's energy-consuming systems which might involve replacing lighting fixtures, ventilation systems, or windows and doors, or adding insulation where it makes economic sense, in addition to including energy efficiency measures in all the renovation and repair activities (Natural Resources Canada).

In Nova Scotia, where many buildings still rely on heating oil, it is also essential that we electrify our buildings as part of the green transition. Often this will mean installing heat pumps to replace oil furnaces. In summary, these retrofits are meant to reduce the building's operational costs by reducing its energy usage. Retrofits are most often in older buildings, as newer ones tend to follow more efficient energy usage guidelines. To implement these solutions, the government and several agencies have set up a series of incentives and guidelines.

Energy-efficiency retrofits are broken into three main categories: minor, major, and deep retrofits. Minor retrofits can be viewed as easy wins, and include low-cost modifications with a high return on investment by substantially reducing the building's energy consumption. They can include sealing with caulking or spray foam, adding insulation, or upgrading lighting systems.

Major retrofits involve a more holistic approach as they focus on replacing window glazing and doors, updating inefficient heating and cooling systems, installing low-flow faucets with sensors and automatic shut-offs, or installing sub-metering. Although it is a step up from the last category, they are still minimally disruptive to the building's occupants (Natural Resources Canada).

Lastly, deep retrofits involve an extensive overhaul of a building's system and are more disruptive to the occupants, but often generate as much as 60% in energy-cost savings. Alterations can include significantly reconfiguring the interior, replacing the roof, adding or rearranging windows for increased daylight, and replacing the heating, ventilation, and air conditioning system with an efficient technology like a ground-source heat pump (Natural Resources Canada).

Jobs Gained

According to various studies, powering a Green Nova Scotia will generate significant new employment opportunities for the province, as well as hurdles that will have to be overcome to achieve net zero by 2050. The green economy will demand technical expertise for the construction of new energy infrastructure and to provide services like improving home energy efficiency and adopting green transportation technologies (NSPower). We will start by analyzing the potential jobs gained from the green energy transition, followed by the potential job losses.

As indicated before, buildings have climbed from being the fourth to the third largest emissions source from 2021 to 2023 (Atlantic Economic Council, 2024, and NS Gov). This is largely why it is a focal point for achieving emission reductions, requiring a large number of green building trade workers to implement the solutions. This change in the workforce needs will result in an elevated demand across all renewable energy sector and clean tech sector workers. Ultimately, these efforts will help reduce emissions from this sector and facilitate the transition to a greener economy and improved energy efficiency.

To address the high emission levels from the building sector, both new constructions and the existing building stock will require a significant number of skilled green building trade workers. Many of these workers will come from the traditional trades but will need additional expertise in retrofitting buildings to meet green energy and efficiency standards.

One challenge this presents is the recruitment of sufficient green trade workers to be able to support this expanded workload (Atlantic Economic Council, 2024). Provincial investments in renewable energy projects are expected to help sustain the increasing demand for non-residential construction workers from Nova Scotia, and projects will keep contributing to the growth of jobs in the sector (BuildForce Canada, 2024).

According to projections from BuildForce Canada, by 2033 the construction industry in Nova Scotia will need to recruit and retain as many as 10,600 additional workers to keep pace with expansion and replacement demands. This takes into consideration the expected

8,200 workers, about 22% of the 2023 construction labour force, who are expected to retire, and the 7,400 new entrants to the industry (BuildForce Canada, 2024). The trend is caused in part due to the aging population of Nova Scotia representing a higher percentage compared to some of the other provinces. Nova Scotia's population of age 65 or older increased to 22.2% in 2021, from 17.1% in 2016 (Government of Nova Scotia, 2022). The increased demand from the workforce of the construction industry is fueled by a higher demand for housing as well as the retrofitting of buildings to achieve higher energy efficiency.

In Canada, the clean energy workforce employed around 430,500 people. This number is projected to reach 639,200 by 2030, which represents an addition of about 200,000 jobs (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023). The substantial projected growth in clean energy employment can be interpreted as the market being considerably robust and likely to become a key driver in Canada's net-zero transition throughout the next decade.

According to a study conducted by the Information and Communications Technology Council (ICTC) in 2023, the clean energy labour demand is growing at an estimated 4% annually, with rapid expansion to be expected in renewable energy projects and energy efficiency roles (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023). A lot of this growth is driven by projects like the Point Tupper Green Ammonia Project in Nova Scotia, which focuses on producing green hydrogen energy. These types of projects are driving an increased demand for skilled workers in clean energy both at the provincial and national levels.

This trend of increased demand for clean energy professionals is seen across Canada, including Nova Scotia, and will be materialized in some of the following ways. A study by ECO Canada estimates that the province of Nova Scotia is projected to require approximately 3,190 new green jobs by 2033, with a further 11,720 job openings expected due to retirements and sector growth (ECO Canada, 2024). The data points to an increasing regional reliance on green jobs, particularly in renewable energy and retrofitting. As these two sectors become more essential, they are generating a pathway in which strong employment drives forward environmental goals and regional and national economic growth.

The changes that the workforce from Nova Scotia is experiencing are part of a recent trend caused by shifts in green-energy objectives. According to research by the Canadian Climate Institute from 2020, which focused exclusively on analyzing the province of Nova Scotia, they found that the province provides a tangible example of what clean growth means in practice. The study found that the clean tech and energy efficiency sectors in the province

saw a 27% job increase from 2012 to 2018, providing stability in these industries and offsetting the declines in traditional energy roles. This showcases the long-term potential for these fields to generate steady employment and is partly driven by Nova Scotia's ambitious climate targets (Canadian Climate Institute, 2020).

Job Losses

Although the clean energy sector has been experiencing recent growth, driven by provincial and federal net-zero emissions targets, the workforce of traditional energy industries and resource-based sectors have been negatively impacted. One of these industries is the fossil-fuel sector, which has been experiencing a decline in employment levels.

According to the Information and Communications Technology Council (ICTC), approximately 81% of Canada's greenhouse gas emissions can be attributed to the generating of energy, primarily from fossil fuels such as oil, gas, and coal. Because its consumption levels are decreasing due to the phasing out of fossil fuels, employment in the industry is projected to decrease by up to 9% by 2030. By 2050 about 50-70% of oil and gas jobs, approximately 312,000 to 450,000 Canadians, are at risk of being eliminated (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023).

These projections highlight the other side of the green energy transition and emphasize the need to proactively develop workforce planning and re-skilling programs for these heavily affected sectors where the economy is heavily dependent on fossil fuels.

In Nova Scotia, this change has also been felt by the good-producing sector, particularly emission-intensive industries. The province has experienced a gradual shift from emissions-intensive goods towards services, which has facilitated the province's drop in emission levels.

According to a report by the Canadian Climate Institute, between 2005-2018 most of Nova Scotia's growth in GDP and jobs was in the services sector. This sector is generally less emissions-intensive.

Meanwhile, in the same timeframe, the province's goods-producing sectors steadily contracted, the oil-and-gas sector fell by 87%, coal mining by 84%, and forestry and logging by 42% (Canadian Climate Institute, 2020). The economic shift, characterized by the sharp decline in GDP from traditional industries, reinforces the importance that green industry jobs have to provide stability for urban and rural communities.

An aging workforce will be another factor that will present some challenges to the green transition. The Canadian Coalition of Women In Engineering, Science, Trades, and Technology (CCWESTT) has highlighted that around 40% of Canada's workforce is over 55 years of age, which poses a big labour challenge in traditional and green sectors as large

numbers of workers retire. This could generate labour shortages in green-building trades, and friction in the transition of the workforce towards clean energy (CCWESTT, N/A).

As a lot of the skilled trades professionals are exiting the workforce it will generate a gap that has the potential to be exacerbated by the increasing demand for green sector jobs. This challenge raises the urgency to implement retraining initiatives to bring younger workers into energy transition roles, particularly in the skilled trades sector.

Other resource-intensive industries are also forecasted to experience job declines in upcoming years. Sectors such as mining, quarrying, and oil and gas extraction, have been negatively impacted by policy initiatives that increasingly prioritize renewable energy (ECO Canada, 2024). The decline will be driven to a lesser degree by the automation of some processes. It will be important to ensure clear education and upskilling pathways are available to displaced workers so that they can be reabsorbed into different sectors of the economy.

3. Training Requirements & Annual Investment

Training Requirements

The transition to a green economy will require the development of new skills, while also increasing the demand for some skills that are currently present in the workforce. In Nova Scotia, the provincial government's implementation of higher energy efficiency standards is a big driver of the demand for high skilled workers. A skillful workforce will be in charge of implementing Nova Scotia's ambitious 2030 and 2050 climate targets.

To achieve this, construction workers and even government staff will have to go through training to upgrade their skill sets. The provincial and federal governments have taken the initial steps to deliver and develop the right training pathways for a green transition. Nevertheless, updated building codes and other energy-efficiency legislation will drive the demand for specialized workers higher (Atlantic Economic Council, 2024).

The training pathways developed must offer efficient and accessible learning solutions. Some of the programs being implemented focus on preparing the construction industry for the green-energy transition. They offer flexible solutions with a wide array of education options to accommodate the busy schedules of individuals who want to upgrade their skills.

Some of these upskilling solutions are offered through college and building trade union partnerships in the form of micro-credentials. Training flexibility is needed to accommodate

workers who are already employed full-time, as a big portion of the job gap will be filled by full-time workers already in the workforce (Atlantic Economic Council, 2024).

An important consideration is that training solutions must address the decline in apprenticeship rates that Nova Scotia experienced post-pandemic. The pandemic brought significant challenges to apprenticeship in the province, which is a key source of labour for the construction industry. New registrations in 2020 were about 25% lower than 2010 levels and have seen a faster decline than overall trade employment. However, completions have had an upward trend over the last decade driven partly by the increase in construction activity (BuildForce Canada, 2024).

From 2021 onwards, new registrations have rebounded and completion has also increased. Despite this, reduced registration levels during the pandemic could result in an insufficient number of newly certified journeypersons to sustain long-term requirements. This is why it is important to develop accessible programs, encourage new apprenticeship entries, and boost completion rates to maintain a skilled pipeline of skilled tradespeople in Nova Scotia.

The adoption of more inclusive training and workplaces for women, historically marginalized individuals, Indigenous peoples, New Canadians, 2SLGBTQIA+ workers, and people with disabilities will be crucial to mitigating labour shortages in the skilled trades. . These initiatives start from making sure equipment is available that fits all different body shapes and sizes, the workplace accommodates all genders in washroom facilities, and anti-harassment and respectful workplace policies are in place(CCWESTT, N/A).

Smaller, rural communities with high unemployment rates, specifically Indigenous populations, can greatly benefit from targeted retraining for net-zero building projects. Eskasoni First Nation in Cape Breton had the highest unemployment rate in Nova Scotia in 2016, at 26%. The same year in the Atlantic Region, the unemployment rate of Indigenous peoples was over 18% compared to 15% nationally (Canadian Climate Institute, 2020). By providing the right training, Nova Scotia can support these communities to increase their employment levels, and it can bring labour to remote projects.

The green energy transition offers a unique opportunity to make positive change by bridging community needs with green job demands. Addressing this structural unemployment won't be easy, and it will depend on whether the low-carbon economy can maintain the demand for this type of worker as the green economy transition advances for the training to achieve its full potential.

Annual Investment Needs

Some of the costs associated with the green energy transition have been estimated by the Atlantic Economic Council in a 2024 report focusing on the net-zero building sector. They

identified that about 41,000 residential units and about 2 million square metres of commercial space in Atlantic Canada will have to be retrofitted annually until 2040 to meet net-zero targets. All of these renovations will add up to almost $1.5 billion per year. Although the data available on the progress is not extensive, it has been identified that the region is falling short of this need (Atlantic Economic Council, 2024). To address these elevated costs, joint efforts between the public and private sectors will be instrumental in achieving the net-zero targets.

The Maritime provinces have an older housing stock compared to the rest of Canada. This means more energy-efficient retrofitting efforts will be required. Older homes are notably less energy efficient, and more complex and costly to retrofit (Atlantic Economic Council, 2024).

The projected investment in non-residential construction is another important factor driving high demand for construction-sector workers. BuildForce Canada predicts that non-residential construction investment will peak in 2025 (BuildForce Canada, 2024). It is important to be aware of this strong upward trend as there is a clear increased demand for construction workers, and they must be presented with clear pathways to learn or upskill into green-energy-required skills. If left unchecked, the region risks growing a labour force that is not qualified for the green transition.

The Nova Scotia Construction sector must attract, train, and retain about 10,600 workers over the next decade to replace retiring workers and meet new project demands (BuildForce Canada, 2024). Achieving this will require a significant amount of investment to develop recruitment and training programs. These should have a dedicated focus to encourage diverse hiring, as this gap will be even harder to close if traditionally underrepresented groups are not supported.

Furthermore, considerable efforts have to be made in the construction sector, a male-dominated sector, to bring long-term changes in the workspace culture to attract a broader labour base (CCWESTT, N/A). This can be achieved by Equity, Diversity, Inclusion & Accessibility (EDIA)-focused initiatives and investments that will hopefully create a better workplace culture for everyone.

4. Equity strategies and partnerships

Equity Strategies

As we highlighted before, it will be crucial to support traditionally underrepresented groups in joining the construction workforce in order to meet the net-zero targets in Nova Scotia and Canada. It is estimated that to meet the demand, there will be around 7,400 first-time new entrants in the construction sector under the age of 30, and there will still be a gap of about 3,200 workers that will need to be recruited from outside the local construction labour force (BuildForce Canada, 2024). This problem will require a combination of strategies to increase the share of traditionally underrepresented groups in the construction sector by training workers from other industries and the recruitment of newcomers who have some foundational knowledge.

The development of tailored programming through a public-private collaboration approach will be necessary to improve inclusivity and secure the shift in participation ratios of traditionally underrepresented groups. These types of solutions should be specific to each community, such as Mi'kmaq, women in trades, Newcomers to Canada, etc (CCWESTT, N/A). They will not only promote equity but also empower these communities to actively engage and have a say in the green transition. The key informants who will be driving this shift will be federal and provincial governments, industry leaders, and educational providers, which all have to work together to develop strategies for diversifying and upskilling the construction labour force (Atlantic Economic Council, 2024). The end result should provide clear pathways for all these groups to succeed in the skilled trades.

An important challenge that must be addressed is ensuring fair wages for these traditionally underrepresented groups as they enter the construction sector. African Nova Scotian communities still face wage gaps and lower representation (Road to Economic Prosperity, 2024). At the same time as we develop training initiatives, it will be important to prioritize communication with African Nova Scotian communities to address their local needs and challenges, some of which include lower employment rates, historically lower wages, and education levels. This is the only way to promote equitable economic growth, foster trust within these communities, and make sure that the workforce enjoys long-term engagement levels.

Another important step is making sure traditionally underrepresented groups can access leadership roles. The Urban Alliance on Race Relations highlights some of the barriers, especially for Black and Muslim youth to access leadership roles. Several systemic, societal, organizational, and individual barriers have to be addressed to foster leadership opportunities. Some of these can be partly solved through an emphasis on programs that promote mentorship, networking, and support for youth-led initiatives both by the government and other organizations (Urban Alliance, 2023).

Partnerships

To solve the challenges of the green energy transition, partnerships will have to be formed to divide the work among different organizations. One key partnership will be at the Federal-Provincial level to establish green building standards. These play a critical role in advancing Nova Scotia's net zero objectives. The Energy Efficiency Hub's 2023 annual report highlighted progress at the federal level to harmonize building codes and advance net-zero standards across Canada (Energy Management Action Network, 2023). This benefits regional programs by ensuring alignment between resources and policies to maximize impact. Another way to increase support is through federal investments in infrastructure and energy-efficiency retrofitting programs.

Collaboration with workforce development agencies, governments, industry, and academic institutions will be needed to develop an equitable clean-energy transition. International cooperation is also needed, for example, with countries like Germany and South Korea, to enhance training of the Canadian workforce in green energy (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023). This type of international partnership supplements local workforce development efforts by importing advanced technologies and best practices and ensuring workers from all groups are trained equitably.

A diverse labour force in Nova Scotia should be pursued as the region transitions to a greener economy. Provincial and federal governments must partner with labour organizations and educational institutions to deliver tailored programming that supports traditionally underrepresented communities (BuildForce Canada, 2024). The training has to be inclusive and accessible to all, with special considerations for the systemic barriers to entry for those outside the traditionally male-dominated trades (Parahoo, 2023 [CCWESTT]). Although this will be quite challenging, it presents a unique opportunity to uplift underrepresented communities while building a sustainable future.

5. What key initiatives exist in other places that are seeing success?

Across Canada and around the world some successful green initiatives have often been powered by strong public-private partnerships targeting workforce training programs. One example is Alberta's Iron and Earth Initiative, a non-profit led by former oil sands workers, which focuses on helping fossil fuel and Indigenous workers transition into clean energy. The organization helps workers re-skill for roles in renewable energy, using existing experience.

EDGE UP is another program, developed by Calgary Economic Development (CED) and the Information and Communications Technology Council, which focuses on providing

pathways for oil and gas workers to transition into the digital economy. In Toronto, Build Up is a nonprofit social enterprise with some public funding, which works to "improve Toronto's environmental efficiency and affordable housing stock to give people experiencing barriers to employment paths to successful careers in the trades." These programs highlight the value and importance of coordinated efforts in workforce initiatives that are quick to respond to local labour shifts and economic demand changes (Clark, A. and Matthews, M., Clean energy and pathways to net-zero, 2023).

At a national level, Canada's Green Building Strategy represents an impactful government-led approach to advancing net zero infrastructure and promoting growth in green jobs. This strategy includes several programs such as the Greener Homes Program, and initiatives such as the Deep Retrofit Accelerator, all of which collectively support the retrofitting of existing buildings and the development of standards for net-zero and climate-resilient buildings.

Creating nationwide regulatory frameworks and data disclosure practices is a task that the federal government has to undertake to ease the green energy and infrastructure transition.These initiatives showcase how policy-driven infrastructure investments can accelerate green transition, especially when they adapt to address the needs of small and medium-sized enterprises (Energy Management Action Network, 2023).

Some international partnerships have notably contributed to green economy goals by supporting equality and standardization policy adoption. Canada's partnership with the European Union helps to drive climate-oriented infrastructure investments while encouraging gender equality in the workforce by drawing inspiration from some of the European Nations. For instance, Lithuania's legislation mandates gender equality compliance across all employers.

All of these collaborations provide Nova Scotia with blueprints to institute equitable policy reforms and ensure an equitable workforce transition to a greener economy (Parahoo, 2023 [CCWESTT]).

Lastly, we will highlight the importance of academic institutions in advancing the green transition through industry collaboration. Some notable partnerships like Dalhousie University and Tesla developing battery storage technologies or the Tidal Energy Institute at Acadia University advancing tidal energy harnessing, showcase the potential of university-led research in driving innovation. Through the integration of private sector support, these institutions have been able to create a model for rapid development and deployment of green technologies, and support the readiness of the workforce in the green energy transition (Canadian Climate Institute, 2020).

Appendix 3: Job Forecasts

1. National Occupation Classification (NOCs 2021)

Table 14: NOCs for Retrofitting and New Build Sector

Primary Professions Required for Retrofits	NOC
Owner	NOC
Asset Managers	10022
Project managers / owners rep (Construction GCs, CMs, PMs)	70010
Property Managers, Facility managers	70012
Consultants	NOC
Architects/Heritage Planners	21200
Envelope consultants, Façade Engineers	21300
Electrical & Electronics Engineer	21310
Electronic Service Technicians	21311
Mechanical Engineers	21321
Metallurgical & Materials Engineer	21322
Energy Auditors	22211
Lighting Designers	22214
Energy Modellers & simulation	22301
Quantity surveyors, cost consultants (estimators) & Specifiers	22303
Builders & Trades	NOC

Building Automation Technicians	22311
Exterior Insulated Finish Systems Mechanic	72014
Sheet Metal Installer (Residential (Low Rise))	72102
Boilermaker (Construction)	72103
Ironworker (Generalist, Structural and Ornamental)	72105
Welder	72106
Electricians	72200
Solar Installers	72201
Powerline Technician	72203
Plumbers	72300
Sprinkler and Fire Protection Installer	72301
Gas Fitter	72302
General Carpenters	72310
Brick and Stone Mason	72320
Heat and Frost Insulator	72321
HVAC and mechanical trades	72402
Crane operators	72500
Cement (Concrete) Finisher	73100
Tilesetters	73101
Steel stud and drywall installers	73102
Roofers	73110
Architectural Glass and Metal Technician	73111

Heat and Frost Insulators	73200
Material handlers	75101
Regulators	NOC
Building officials	22231
Municipal sustainability staff/planners	41405
Secondary Professions Required for Retrofits	NOC
Hazardous Materials Worker	21120
BIM technologists	22212
Interior Designers	52121
Construction Millwrights	72400
Heavy Equipment Operators	73400
Painters	73112
Flooring Finishers	73113
Drivers	73300
General Construction Labour	75110

3. Graduation Numbers

Table 15: Graduation Numbers Data Nova Scotia (2017-2021)

NOCS	Occupational Description	Grad_2017	Grad_2018	Grad_2019	Grad_2020	Grad_2021
10022	Advertising, marketing and public relations managers	1,693	1,696	1,634	1697	1524
21120	Public and environmental health and safety professionals	397	405	1,634	745	859
21200	Architects	110	95	117	99	102
21300	Civil engineers	450	445	441	472	453

21310	Electrical and electronics engineers	558	636	564	619	531
21311	Computer engineers (except software engineers and designers)	643	716	757	887	1054
21321	Industrial and manufacturing engineers	532	529	516	563	531
21322	Metallurgical and materials engineers	392	393	354	392	359
22211	Industrial designers	135	101	138	143	97
22212	Drafting technologists and technicians	190	128	186	143	121
22214	Technical occupations in geomatics and meteorology	153	117	186	106	126
22231	Engineering inspectors and regulatory officers	400	391	339	383	371
22301	Mechanical engineering technologists and technicians	663	610	609	706	640
22303	Construction estimators	105	99	609	95	72
22311	Electronic service technicians (household and business equipment)	1,736	161	191	227	215
41405	Education policy researchers, consultants and program officers	326	305	339	348	447
52121	Interior designers and interior decorators	108	86	99	86	76
70010	Construction managers	973	1,000	908	1048	826
70012	Facility operation and maintenance managers	1027	1038	962	1045	953
72014	Contractors and supervisors, other construction trades, installers, repairers and servicers	15	156	18	44	31
72102	Sheet metal workers	172	156	153	152	145
72103	Boilermakers	172	156	153	152	143
72105	Ironworkers	178	174	156	188	166
72106	Welders and related machine operators	172	156	153	152	145

72200	Electricians (except industrial and power systems)	223	198	205	200	163
72201	Industrial electricians	223	198	205	200	163
72203	Electrical power line and cable workers	217	189	195	197	160
72300	Plumbers	181	147	132	129	105
72301	Steamfitters, pipefitters and sprinkler system installers	181	147	132	129	105
72302	Gas fitters	232	198	183	177	156
72310	Carpenters	117	109	102	108	103
72320	Bricklayers	3	15	6	6	6
72321	Insulators	6	18	3	35	21
72400	Construction millwrights and industrial mechanics	108	105	93	108	90
72402	Heating, refrigeration and air conditioning mechanics	117	129	135	239	99
72500	Crane operators	24	21	18	22	6
73100	Concrete finishers	9	33	9	41	27
73101	Tilesetters	9	33	9	41	27
73102	Plasterers, drywall installers and finishers and lathers	9	33	9	41	27
73110	Roofers and shinglers	6	18	3	35	21
73111	Glaziers	6	18	3	35	21
73112	Painters and decorators (except interior decorators)	6	18	3	35	21
73113	Floor covering installers	6	18	3	35	21
73200	Residential and commercial installers and servicers	78	105	95	230	72
73300	Transport truck drivers	24	21	18	22	6
73400	Heavy equipment operators	24	21	18	22	6

75101	Material handlers	0	0	0	3	0
75110	Construction trades helpers and labourers	24	21	18	22	6

4. Replacement Demand

Table 16: Replacement Demand Data (2021)

NOCs	Replacement Demand _ Total	Replacement Demand _ Employed	Replacement Demand -Unemployed
10022 Advertising, marketing and public relations managers	-5,015	-4,740	-275
70010 Construction managers	-14,620	-13,695	-925
70012 Facility operation and maintenance managers	-18,460	-17,720	-730
21200 Architects	-2,790	-2,740	-45
21300 Civil engineers	-8,070	-7,895	-180
21310 Electrical and electronics engineers	-7,160	-7,070	-85
21311 Computer engineers (except software engineers and designers)	-3,490	-3,465	-20
21321 Industrial and manufacturing engineers	-1,630	-1,565	-60
21322 Metallurgical and materials engineers	-385	-390	10
22211 Industrial designers	-470	-485	25
22214 Technical occupations in geomatics and meteorology	-780	-735	-45
22301 Mechanical engineering technologists and technicians	-3,265	-3,095	-165
22303 Construction estimators	-4,105	-3,940	-160
22311 Electronic service technicians (household and business equipment)	-5,435	-5,180	-260

72014 Contractors and supervisors, other construction trades, installers, repairers and servicers	-8,895	-8,320	-565
72102 Sheet metal workers	-1,400	-1,205	-190
72103 Boilermakers	-365	-300	-70
72105 Ironworkers	-125	-40	-80
72106 Welders and related machine operators	-5,370	-4,735	-635
72200 Electricians (except industrial and power system)	3,580	3,215	365
72201 Industrial electricians	-3,345	-3,095	-265
72203 Electrical power line and cable workers	105	75	20
72300 Plumbers	685	680	0
72301 Steamfitters, pipefitters and sprinkler system installers	-1,415	-1,010	-415
72302 Gas fitters	-630	-600	-25
72310 Carpenters	-11,130	8830	-2,300
72320 Bricklayers	-1,765	-1,460	-305
72321 Insulators	-470	-360	-110
72402 Heating, refrigeration and air conditioning mechanics	-835	-790	-45
72500 Crane operators	-1,950	-1,765	-200
73100 Concrete finishers	-585	-440	-140
73101 Tilesetters	-970	-805	-160
73102 Plasterers, drywall installers and finishers and lathers	-1,780	-1,420	-355
73110 Roofers and Shinglers	1,315	1,290	35
73111 Glaziers	-535	-455	-90

73200 Residential and commercial installers and servicers	1,430	1,140	290
75101 Material handlers	-1,010	-3,280	2,270
22231 Engineering inspectors and regulatory officers	-1,145	-1,130	-5
41405 Education policy researchers, consultants and program officers	-3,620	-3,600	-20
21120 Public and environmental health and safety professionals	-2,455	-2,435	-25
22212 Drafting technologists and technicians	-2,520	-2,320	-205
52121 Interior designers and interior decorators	-3,430	-3,195	-230
72400 Construction millwrights and industrial mechanics	-11,515	-10,825	-685
73400 Heavy equipment operators	-12,700	-10,410	-2,290
73112 Painters and decorators (except interior decorators)	-4,875	4,070	-805
73113 Floor covering installers	-970	855	-120
73300 Transport truck drivers	-75,550	68,525	-7,035
75110 Construction trades helpers and labourers	13,010	-12,010	985

5. Female to Male Ratio (2021)

Table 17: Female to Male Ratio and Visible minority Counts of Construction & Trade Group

NOCs	Description	Female to male Ratio	Visible minority
70010	Construction managers	0.17	4%
70012	Facility operation and maintenance managers	0.3	5%
72014	Contractors and supervisors, other construction trades, installers, repairers and servicers	0.06	4%

72102	Sheet metal workers	0	5%
72103	Boilermakers	0	0%
72105	Ironworkers	0.03	0%
72106	Welders and related machines operators	0.04	5%
72200	Electricians (except industrial and power system)	0.03	4%
72201	Industrial electricians	0.03	0%
72203	Electrical power line and cable workers	0	5%
72300	Plumbers	0.01	3%
72301	Steamfitters, pipefitters and sprinkler systems installers	0.02	0%
72302	Gas fitters	0	0%
72310	Carpenters	0.02	4%
72320	Bricklayers	0.03	0%
72321	Insulators	0.03	0%
72402	Heating, refrigeration and air conditioning mechanics	0.02	3%
72500	Crane operators	0	0%
73100	Concrete finishers	0	18%
73101	Tilesetters	0	15%
73102	Plasterers, drywall installers and finishers and lathers	0.04	5%
73110	Roofers and shinglers	0.03	5%
73111	Glaziers	0	0%

73112	Painters and decorators (except interior decorators)	0.13	10%
73113	Floor covering installers	0	6%
73200	Residential and commercial installers and servicers	0.05	3%
73300	Transport truck drivers	0.03	8%
73400	Heavy equipment operators	0.02	2%
75101	Material handlers	0.13	9%
75110	Construction trades helpers and labourers	0.06	6%

Table 18: Female to Male Ratio and Visible minority Counts of Engineering/Technical Group (2021)

NOCs	Description	Female to Male Ratio	Visible Minority
21200	Architects	0.5	9%
21300	Civil engineers	0.2	10%
21310	Electrical and electronics engineers	0.1	19%
21311	Computer engineers (except software engineers and designers)	0.1	22%
21321	Industrial and manufacturing engineers	0.4	14%
21322	Metallurgical and materials engineers	0	0%
22211	Industrial designers	1.3	20%
22212	Drafting technologists and technicians	0.5	5%
22214	Technical occupations in geomatics and meteorology	0.6	6%

22301	Mechanical engineering technologists and technicians	0.1	9%
22303	Construction estimators	0.1	4%
22311	Electronic service technicians (household and business equipment)	0.1	7%
22231	Engineering inspectors and regulatory officers	0.7	0%
72400	Construction millwrights and industrial mechanics	0	2%

Table 19: Female to Male Ratio and Visible minority Counts for Administrative/Policy/Marketing (2021)

Administrative/Policy/Marketing			
NOCs	**Description**	**Female to Male Ratio**	**Visible Minority**
10022	Advertising, marketing and public relations managers	1.7	9%
41405	Education policy researchers, consultants and program officers	2.6	10%
52121	Interior designers and interior decorators	5.3	0%

Table 20: job historical growth rates and forecasts by NOC groups

Construction & Trade													
NOCs	**Description**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
70010	Construction managers	1,424	1,483	*1,587*	*1,686*	1,756	1,999	2,049	2,051	2,077	2,088	2,113	2,128	2,151
70012	Facility operation and maintenance managers	974	890	*758*	*758*	766	763	746	734	723	715	712	709	708
72014	Contractors and supervisors, other construction trades, installers, repairers and servicers	1,409	1,442	*1,431*	*1,477*	1,569	1,562	1,567	1,577	1,587	1,600	1,607	1,616	1,625
72102	Sheet metal workers	725	715	*633*	*616*	577	586	580	579	578	578	580	581	582
72103	Boilermakers	157	160	*148*	*157*	166	161	161	163	163	164	165	167	168
72105	Ironworkers	393	418	*379*	*396*	475	536	550	566	579	591	600	609	617
72106	Welders and related machine operators	2,054	2,259	*2,108*	*2,178*	2,251	2,148	2,147	2,139	2,136	2,135	2,135	2,131	2,131

72200	Electricians (except industrial and power system)	2,560	2,576	*2,483*	*2,597*	2,684	2,801	2,821	2,856	2,901	2,946	2,986	3,025	3,068
72201	Industrial electricians	1,031	1,083	*1,003*	*1,018*	1,040	1,040	1,039	1,035	1,038	1,041	1,044	1,047	1,051
72203	Electrical power line and cable workers	549	579	*528*	*538*	500	428	411	401	392	382	379	375	373
72300	Plumbers	1,169	1,144	*1,103*	*1,172*	1,290	1,411	1,425	1,443	1,463	1,482	1,496	1,509	1,521
72301	Steamfitters, pipefitters and sprinkler system installers	968	954	*894*	*920*	951	961	976	999	1,017	1,035	1,043	1,051	1,063
72302	Gas fitters	147	144	*141*	*146*	155	176	181	186	191	195	197	199	201
72310	Carpenters	4,755	4,644	*4,154*	*4,358*	4,914	5,080	5,134	5,220	5,296	5,346	5,361	5,381	5,404
72320	Bricklayers	394	389	*310*	*290*	283	258	242	232	225	217	214	210	208
72321	Insulators	346	337	*296*	*267*	274	270	268	269	270	272	273	275	275
72402	Heating, refrigeration and air conditioning mechanics	658	710	*713*	*925*	1,153	1,191	1,213	1,235	1,257	1,285	1,309	1,331	1,352
72500	Crane operators	325	321	*295*	*358*	385	384	387	387	387	391	395	400	403

73100	Concrete finishers	219	219	*209*	*204*	205	216	215	217	220	222	222	223	225
73101	Tilesetters	178	162	*151*	*153*	153	156	156	157	157	158	158	158	158
73102	Plasterers, drywall installers and finishers and lathers	556	568	*566*	*648*	718	722	743	762	779	795	807	819	830
73110	Roofers and shinglers	565	573	*519*	*558*	625	709	731	764	792	817	829	844	858
73111	Glaziers	193	189	*180*	*186*	194	203	204	207	209	212	214	216	216
73112	Painters and decorators	1,584	1,509	*1,325*	*1,262*	1,234	1,249	1,218	1,216	1,227	1,234	1,239	1,238	1,241
73113	Floor covering installers	469	450	*376*	*372*	360	345	334	337	344	349	350	350	351
73200	Residential and commercial installers and servicers	1,177	1,349	*1,346*	*1,364*	1,390	1,381	1,361	1,374	1,393	1,405	1,407	1,412	1,419
73300	Transport truck drivers	7,462	7,369	*6,657*	*7,047*	7,313	7,342	7,506	7,669	7,798	7,914	8,025	8,129	8,249
73400	Heavy equipment operators	2,390	2,395	*2,212*	*2,228*	2,358	2,394	2,358	2,384	2,430	2,468	2,490	2,505	2,526
75101	Material handlers	4,378	4,544	*4,592*	*4,834*	4,876	4,923	4,942	4,971	5,000	5,021	5,052	5,076	5,107
75110	Construction trades helpers and labourers	4,188	4,245	*3,962*	*4,019*	4,123	4,309	4,269	4,268	4,285	4,309	4,326	4,348	4,374

Engineering/technology														
NOCs	**Description**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
21200	Architects	127	371	*353*	*367*	369	367	365	361	356	353	352	351	351
21300	Civil engineers	1,188	1,167	*1,090*	*1,181*	1,250	1,280	1,272	1,270	1,273	1,278	1,286	1,293	1,300
21310	Electrical and electronics engineers	723	686	*604*	*589*	611	704	706	704	706	707	710	711	712
21311	Computer engineers (except software engineers and designers)	364	371	*412*	*430*	396	375	375	376	377	377	381	383	387
21321	Industrial and manufacturing engineers	163	172	*202*	*203*	218	334	344	356	367	374	380	387	392
21322	Metallurgical and materials engineers	46	64	*65*	*65*	66	62	65	69	72	75	77	80	82
22211	Industrial designers	143	149	*142*	*138*	149	148	149	149	149	150	150	151	151
22212	Drafting technologists and technicians	814	781	*629*	*621*	692	706	702	697	694	693	692	691	690
22214	Technical occupations in geomatics and meteorology	203	206	*186*	*213*	256	263	271	277	282	287	289	292	294

22301	Mechanical engineering technologists and technicians	300	320	*286*	*297*	308	342	345	350	354	357	364	369	372
22303	Construction estimators	430	436	*396*	*386*	416	420	417	417	418	421	423	425	427
22311	Electronic service technicians	1,632	1,605	*1,489*	*1,487*	1,523	1,490	1,520	1,544	1,565	1,586	1,600	1,617	1,630
22231	Engineering inspectors and regulatory officers	211	195	*176*	*184*	199	213	214	216	218	221	223	225	227
72400	Construction millwrights and industrial mechanics	1,753	1,826	*1,710*	*1,895*	2,130	2,338	2,414	2,482	2,540	2,589	2,631	2,667	2,700
Administrative														
NOCs	**Description**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
10022	Advertising, marketing and public relations managers	637	607	*530*	*554*	645	788	807	827	846	864	881	898	914
41405	Education policy researchers, consultants and program officers	837	928	*968*	*1,179*	1,312	1,374	1,428	1,478	1,508	1,539	1,572	1,596	1,621
52121	Interior designers and interior decorators	295	283	*263*	*295*	332	349	356	361	367	373	376	380	383

Table 21: Scenario 1: Employment projections (2025-2031) as per 2020 standards for each NOC.

Construction and Trade		Scenario 1						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
70010	Construction managers	2256.1	2284.7	2296.8	*2324.3*	*2340.8*	2366.1	2387
70012	Facility operation and maintenance managers	807.4	795.3	786.5	*783.2*	*779.9*	778.8	778.8
72014	Contractors and supervisors, other construction trades, installers, repairers and servicers	1734.7	1745.7	1760	*1767.7*	*1777.6*	1787.5	1796.3
72102	Sheet metal workers	636.9	635.8	635.8	*638*	*639.1*	640.2	642.4
72103	Boilermakers	179.3	179.3	180.4	*181.5*	*183.7*	184.8	185.9
72105	Ironworkers	622.6	636.9	650.1	*660*	*669.9*	678.7	686.4
72106	Welders and related machine operators	2352.9	2349.6	2348.5	*2348.5*	*2344.1*	2344.1	2339.7

72200	Electricians (except industrial and power system)	3141.6	3191.1	3240.6	*3284.6*	*3327.5*	3374.8	3416.6
72201	Industrial electricians	1138.5	1141.8	1145.1	*1148.4*	*1151.7*	1156.1	1159.4
72203	Electrical power line and cable workers	441.1	431.2	420.2	*416.9*	*412.5*	410.3	407
72300	Plumbers	1587.3	1609.3	1630.2	*1645.6*	*1659.9*	1673.1	1684.1
72301	Steamfitters, pipefitters and sprinkler system installers	1098.9	1118.7	1138.5	*1147.3*	*1156.1*	1169.3	1181.4
72302	Gas fitters	204.6	210.1	214.5	*216.7*	*218.9*	221.1	224.4
72310	Carpenters	5742	5825.6	5880.6	*5897.1*	*5919.1*	5944.4	5965.3
72320	Bricklayers	255.2	247.5	238.7	*235.4*	*231*	228.8	227.7
72321	Insulators	295.9	297	299.2	*300.3*	*302.5*	302.5	304.7
72402	Heating, refrigeration and air conditioning mechanics	1358.5	1382.7	1413.5	*1439.9*	*1464.1*	1487.2	1509.2
72500	Crane operators	425.7	425.7	430.1	*434.5*	*440*	443.3	445.5
73100	Concrete finishers	238.7	242	244.2	*244.2*	*245.3*	247.5	249.7
73101	Tilesetters	172.7	172.7	173.8	*173.8*	*173.8*	173.8	174.9

73102	Plasterers, drywall installers and finishers and lathers	838.2	856.9	874.5	*887.7*	*900.9*	913	924
73110	Roofers and shinglers	840.4	871.2	898.7	*911.9*	*928.4*	943.8	958.1
73111	Glaziers	227.7	229.9	233.2	*235.4*	*237.6*	237.6	240.9
73112	Painters and decorators (except interior decorators)	1337.6	1349.7	1357.4	*1362.9*	*1361.8*	1365.1	1371.7
73113	Floor covering installers	370.7	378.4	383.9	*385*	*385*	386.1	388.3
73200	Residential and commercial installers and servicers	1511.4	1532.3	1545.5	*1547.7*	*1553.2*	1560.9	1568.6
73300	Transport truck drivers	8435.9	8577.8	8705.4	*8827.5*	*8941.9*	9073.9	9205.9
73400	Heavy equipment operators	2622.4	2673	2714.8	*2739*	*2755.5*	2778.6	2803.9
75101	Material handlers	5468.1	5500	5523.1	*5557.2*	*5583.6*	5617.7	5649.6
75110	Construction trades helpers and labourers	4694.8	4713.5	4739.9	*4758.6*	*4782.8*	4811.4	4846.6
	Engineering/Technology		Scenario 1					
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
21200	Architects	415.15	409.4	405.95	404.8	403.65	403.65	402.5

21300	Civil engineers	1460.5	1463.95	1469.7	1478.9	1486.95	1495	1504.2
21310	Electrical and electronics engineers	809.6	811.9	813.05	816.5	817.65	818.8	818.8
21311	Computer engineers (except software engineers and designers)	432.4	433.55	433.55	438.15	440.45	445.05	448.5
21321	Industrial and manufacturing engineers	409.4	422.05	430.1	437	445.05	450.8	455.4
21322	Metallurgical and materials engineers	79.35	82.8	86.25	88.55	92	94.3	95.45
22211	Industrial designers	171.35	171.35	172.5	172.5	173.65	173.65	173.65
22212	Drafting technologists and technicians	801.55	798.1	796.95	795.8	794.65	793.5	793.5
22214	Technical occupations in geomatics and meteorology	318.55	324.3	330.05	332.35	335.8	338.1	340.4
22301	Mechanical engineering technologists and technicians	402.5	407.1	410.55	418.6	424.35	427.8	433.55
22303	Construction estimators	479.55	480.7	484.15	486.45	488.75	491.05	494.5
22311	Electronic service technicians (household and business equipment)	1775.6	1799.75	1823.9	1840	1859.55	1874.5	1891.75
22231	Engineering inspectors and regulatory officers	248.4	250.7	254.15	256.45	258.75	261.05	263.35

72400	Construction millwrights and industrial mechanics	2854.3	2921	2977.35	3025.65	3067.05	3105	3138.35
Administrative		Scenario 1						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
10022	Advertising, marketing and public relations managers	868.35	888.3	907.2	925.05	942.9	959.7	977.55
41405	Education policy researchers, consultants and program officers	1551.9	1583.4	1615.95	1650.6	1675.8	1702.05	1727.25
52121	Interior designers and interior decorators	379.05	385.35	391.65	394.8	399	402.15	405.3

8. Employment Projections: Scenario 2

Table 22: Scenario 2: Employment projections (2025-2031) as per 2020 standards for each NOC

Construction/Trade		Scenario 2						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
70010	Construction managers	2358.65	2388.55	2401.2	2429.95	2447.2	2473.65	2495.5
70012	Facility operation and maintenance managers	844.1	831.45	822.25	818.8	815.35	814.2	814.2

72014	Contractors and supervisors, other construction trades, installers, repairers and servicers	1813.55	1825.05	1840	1848.05	1858.4	1868.75	1877.95
72102	Sheet metal workers	665.85	664.7	664.7	667	668.15	669.3	671.6
72103	Boilermakers	187.45	187.45	188.6	189.75	192.05	193.2	194.35
72105	Ironworkers	650.9	665.85	679.65	690	700.35	709.55	717.6
72106	Welders and related machine operators	2459.85	2456.4	2455.25	2455.25	2450.65	2450.65	2446.05
72200	Electricians (except industrial and power system)	3284.4	3336.15	3387.9	3433.9	3478.75	3528.2	3571.9
72201	Industrial electricians	1190.25	1193.7	1197.15	1200.6	1204.05	1208.65	1212.1
72203	Electrical power line and cable workers	461.15	450.8	439.3	435.85	431.25	428.95	425.5
72300	Plumbers	1659.45	1682.45	1704.3	1720.4	1735.35	1749.15	1760.65
72301	Steamfitters, pipefitters and sprinkler system installers	1148.85	1169.55	1190.25	1199.45	1208.65	1222.45	1235.1
72302	Gas fitters	213.9	219.65	224.25	226.55	228.85	231.15	234.6
72310	Carpenters	6003	6090.4	6147.9	6165.15	6188.15	6214.6	6236.45
72320	Bricklayers	266.8	258.75	249.55	246.1	241.5	239.2	238.05

72321	Insulators	309.35	310.5	312.8	313.95	316.25	316.25	318.55
72402	Heating, refrigeration and air conditioning mechanics	1420.25	1445.55	1477.75	1505.35	1530.65	1554.8	1577.8
72500	Crane operators	445.05	445.05	449.65	454.25	460	463.45	465.75
73100	Concrete finishers	249.55	253	255.3	255.3	256.45	258.75	261.05
73101	Tilesetters	180.55	180.55	181.7	181.7	181.7	181.7	182.85
73102	Plasterers, drywall installers and finishers and lathers	876.3	895.85	914.25	928.05	941.85	954.5	966
73110	Roofers and shinglers	878.6	910.8	939.55	953.35	970.6	986.7	1001.65
73111	Glaziers	238.05	240.35	243.8	246.1	248.4	248.4	251.85
73112	Painters and decorators (except interior decorators)	1398.4	1411.05	1419.1	1424.85	1423.7	1427.15	1434.05
73113	Floor covering installers	387.55	395.6	401.35	402.5	402.5	403.65	405.95
73200	Residential and commercial installers and servicers	1580.1	1601.95	1615.75	1618.05	1623.8	1631.85	1639.9
73300	Transport truck drivers	8819.35	8967.7	9101.1	9228.75	9348.35	9486.35	9624.35
73400	Heavy equipment operators	2741.6	2794.5	2838.2	2863.5	2880.75	2904.9	2931.35

75101	Material handlers	5716.65	5750	5774.15	5809.8	5837.4	5873.05	5906.4
75110	Construction trades helpers and labourers	4908.2	4927.75	4955.35	4974.9	5000.2	5030.1	5066.9
Engineering/ Technology		Scenario 2						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
21200	Architects	397.1	391.6	388.3	387.2	386.1	386.1	385
21300	Civil engineers	1397	1400.3	1405.8	1414.6	1422.3	1430	1438.8
21310	Electrical and electronics engineers	774.4	776.6	777.7	781	782.1	783.2	783.2
21311	Computer engineers (except software engineers and designers)	413.6	414.7	414.7	419.1	421.3	425.7	429
21321	Industrial and manufacturing engineers	391.6	403.7	411.4	418	425.7	431.2	435.6
21322	Metallurgical and materials engineers	75.9	79.2	82.5	84.7	88	90.2	91.3
22211	Industrial designers	163.9	163.9	165	165	166.1	166.1	166.1
22212	Drafting technologists and technicians	766.7	763.4	762.3	761.2	760.1	759	759
22214	Technical occupations in geomatics and meteorology	304.7	310.2	315.7	317.9	321.2	323.4	325.6

22301	Mechanical engineering technologists and technicians	385	389.4	392.7	400.4	405.9	409.2	414.7
22303	Construction estimators	458.7	459.8	463.1	465.3	467.5	469.7	473
22311	Electronic service technicians (household and business equipment)	1698.4	1721.5	1744.6	1760	1778.7	1793	1809.5
22231	Engineering inspectors and regulatory officers	237.6	239.8	243.1	245.3	247.5	249.7	251.9
72400	Construction millwrights and industrial mechanics	2730.2	2794	2847.9	2894.1	2933.7	2970	3001.9
Administrative		Scenario 2						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
10022	Advertising, marketing and public relations managers	868.35	888.3	907.2	925.05	942.9	959.7	977.55
41405	Education policy researchers, consultants and program officers	1551.9	1583.4	1615.95	1650.6	1675.8	1702.05	1727.25
52121	Interior designers and interior decorators	379.05	385.35	391.65	394.8	399	402.15	405.3

9. Employment Projections: Scenario 3

Table 23: Scenario 3: Employment projections (2025-2031) as per 2020 standards for each NOC

Construction & Trade		Scenario 3						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
70010	Construction managers	2563.75	2596.25	2610	2641.25	2660	2688.75	2712.5
70012	Facility operation and maintenance managers	917.5	903.75	893.75	890	886.25	885	885
72014	Contractors and supervisors, other construction trades, installers, repairers and servicers	1971.25	1983.75	2000	2008.75	2020	2031.25	2041.25
72102	Sheet metal workers	723.75	722.5	722.5	725	726.25	727.5	730
72103	Boilermakers	203.75	203.75	205	206.25	208.75	210	211.25
72105	Ironworkers	707.5	723.75	738.75	750	761.25	771.25	780
72106	Welders and related machine operators	2673.75	2670	2668.75	2668.75	2663.75	2663.75	2658.75

72200	Electricians (except industrial and power system)	3570	3626.25	3682.5	3732.5	3781.25	3835	3882.5
72201	Industrial electricians	1293.75	1297.5	1301.25	1305	1308.75	1313.75	1317.5
72203	Electrical power line and cable workers	501.25	490	477.5	473.75	468.75	466.25	462.5
72300	Plumbers	1803.75	1828.75	1852.5	1870	1886.25	1901.25	1913.75
72301	Steamfitters, pipefitters and sprinkler system installers	1248.75	1271.25	1293.75	1303.75	1313.75	1328.75	1342.5
72302	Gas fitters	232.5	238.75	243.75	246.25	248.75	251.25	255
72310	Carpenters	6525	6620	6682.5	6701.25	6726.25	6755	6778.75
72320	Bricklayers	290	281.25	271.25	267.5	262.5	260	258.75
72321	Insulators	336.25	337.5	340	341.25	343.75	343.75	346.25
72402	Heating, refrigeration and air conditioning mechanics	1543.75	1571.25	1606.25	1636.25	1663.75	1690	1715
72500	Crane operators	483.75	483.75	488.75	493.75	500	503.75	506.25
73100	Concrete finishers	271.25	275	277.5	277.5	278.75	281.25	283.75
73101	Tilesetters	196.25	196.25	197.5	197.5	197.5	197.5	198.75

73102	Plasterers, drywall installers and finishers and lathers	952.5	973.75	993.75	1008.75	1023.75	1037.5	1050
73110	Roofers and shinglers	955	990	1021.25	1036.25	1055	1072.5	1088.75
73111	Glaziers	258.75	261.25	265	267.5	270	270	273.75
73112	Painters and decorators (except interior decorators)	1520	1533.75	1542.5	1548.75	1547.5	1551.25	1558.75
73113	Floor covering installers	421.25	430	436.25	437.5	437.5	438.75	441.25
73200	Residential and commercial installers and servicers	1717.5	1741.25	1756.25	1758.75	1765	1773.75	1782.5
73300	Transport truck drivers	9586.25	9747.5	9892.5	10031.25	10161.25	10311.25	10461.25
73400	Heavy equipment operators	2980	3037.5	3085	3112.5	3131.25	3157.5	3186.25
75101	Material handlers	6213.75	6250	6276.25	6315	6345	6383.75	6420
75110	Construction trades helpers and labourers	5335	5356.25	5386.25	5407.5	5435	5467.5	5507.5
Engineering/ Technology		Scenario 3						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
21200	Architects	451.25	445	441.25	440	438.75	438.75	437.5

21300	Civil engineers	1587.5	1591.25	1597.5	1607.5	1616.25	1625	1635
21310	Electrical and electronics engineers	880	882.5	883.75	887.5	888.75	890	890
21311	Computer engineers (except software engineers and designers)	470	471.25	471.25	476.25	478.75	483.75	487.5
21321	Industrial and manufacturing engineers	445	458.75	467.5	475	483.75	490	495
21322	Metallurgical and materials engineers	86.25	90	93.75	96.25	100	102.5	103.75
22211	Industrial designers	186.25	186.25	187.5	187.5	188.75	188.75	188.75
22212	Drafting technologists and technicians	871.25	867.5	866.25	865	863.75	862.5	862.5
22214	Technical occupations in geomatics and meteorology	346.25	352.5	358.75	361.25	365	367.5	370
22301	Mechanical engineering technologists and technicians	437.5	442.5	446.25	455	461.25	465	471.25
22303	Construction estimators	521.25	522.5	526.25	528.75	531.25	533.75	537.5
22311	Electronic service technicians (household and business equipment)	1930	1956.25	1982.5	2000	2021.25	2037.5	2056.25
22231	Engineering inspectors and regulatory officers	270	272.5	276.25	278.75	281.25	283.75	286.25

72400	Construction millwrights and industrial mechanics	3102.5	3175	3236.25	3288.75	3333.75	3375	3411.25
Administrative		Scenario 3						
NOCs	**Description**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
10022	Advertising, marketing and public relations managers	909.7	930.6	950.4	969.1	987.8	1005.4	1024.1
41405	Education policy researchers, consultants and program officers	1625.8	1658.8	1692.9	1729.2	1755.6	1783.1	1809.5
52121	Interior designers and interior decorators	397.1	403.7	410.3	413.6	418	421.3	424.6

10. Methodology: Lightcast Forecasts Workforce Trends

Lightcast combines data from various sources to create a comprehensive picture of the labour market, covering industries, occupations, and education trends across Canada. By integrating datasets like SEPH (Survey of Employment, Payroll, and Hours), Census, LFS (Labour Force Survey), and PSIS (Postsecondary Student Information System), Lightcast compensates for the limitations of individual sources. The result is a detailed and user-friendly dataset covering over 300 industries, 500 occupations, and 5,000 geographic areas.

Key Steps:

1. **Data Integration**: Lightcast harmonizes employment, earnings, and demographic data from multiple sources to ensure accuracy and consistency. For example, SEPH data is supplemented with Census data to fill gaps in employment coverage.
2. **Projections**: Workforce projections are based on historical data (from 2001) and trends extending to 2031. Lightcast uses linear regression models combined with adjustments from COPS (Canadian Occupational Projection System) to ensure realistic forecasts.
3. **Occupation and Industry Insights**: Staffing patterns are derived from industry data, which is considered more reliable than self-reported occupation data. This ensures accurate representation of how industries employ different occupations.
4. **Geographic and Demographic Context**: The data accounts for regional differences and demographic factors like aging, fertility, and migration, providing a localized view of workforce dynamics.
5. **Self-Employment and Education Data**: Lightcast estimates self-employed workers and tracks education completions, helping to understand workforce supply from new graduates and other entrants.

This methodology supports the identification of labour shortages, aging workforce trends, and potential replacements, offering actionable insights for workforce planning.

11. Scenario Gaps

Table 24: Gaps For Scenario 1, 2, and 3 for Construction and Trade Group

Construction & Trade		Scenario 1 (Gaps)						Scenario 2 (Gaps)						Scenario 3 (Gaps)					
NOCs	Description	2025	2026	2027	2028	2029	2030	2025	2026	2027	2028	2029	2030	2025	2026	2027	2028	2029	2030
70010	Construction managers	-205	-208	-209	-211	-213	-215	-308	-312	-313	-317	-319	-323	-513	-519	-522	-528	-532	-538
70012	Facility operation and maintenance managers	-73.4	-72.3	-71.5	-71.2	-70.9	-70.8	-110.1	-108.45	-107.25	-106.8	-106.35	-106.2	-183.5	-180.75	-178.75	-178	-177.25	-177
72014	Contractors and supervisors,	-158	-159	-160	-161	-162	-163	-237	-238	-240	-241	-242	-244	-394	-397	-400	-402	-404	-406
72102	Sheet metal workers	-57.9	-57.8	-57.8	-58	-58.1	-58.2	-86.85	-86.7	-86.7	-87	-87.15	-87.3	-144.75	-144.5	-144.5	-145	-145.25	-145.5
72103	Boilermakers	-16.3	-16.3	-16.4	-16.5	-16.7	-16.8	-24.45	-24.45	-24.6	-24.75	-25.05	-25.2	-40.75	-40.75	-41	-41.25	-41.75	-42
72105	Ironworkers	-56.6	-57.9	-59.1	-60	-60.9	-61.7	-84.9	-86.85	-88.65	-90	-91.35	-92.55	-141.5	-144.75	-147.75	-150	-152.25	-154.25

72106	Welders and related machine operators	-214	-214	-214	-214	-213	-213	-321	-320	-320	-320	-320	-320	-535	-534	-534	-534	-533	-533
72200	Electricians	-286	-290	-295	-299	-303	-307	-428	-435	-442	-448	-454	-460	-714	-725	-737	-747	-756	-767
72201	Industrial electricians	-104	-104	-104	-104	-105	-105	-155	-156	-156	-157	-157	-158	-259	-260	-260	-261	-262	-263
72203	Electrical power line and cable workers	-40.1	-39.2	-38.2	-37.9	-37.5	-37.3	-60.15	-58.8	-57.3	-56.85	-56.25	-55.95	-100.25	-98	-95.5	-94.75	-93.75	-93.25
72300	Plumbers	-144	-146	-148	-150	-151	-152	-216	-219	-222	-224	-226	-228	-361	-366	-371	-374	-377	-380
72301	Steamfitters, pipefitters and sprinkler system installers	-99.9	-102	-104	-104	-105	-106	-149.85	-153	-155	-156	-158	-159	-249.75	-254	-259	-261	-263	-266
72302	Gas fitters	-18.6	-19.1	-19.5	-19.7	-19.9	-20.1	-27.9	-28.65	-29.25	-29.55	-29.85	-30.15	-46.5	-47.75	-48.75	-49.25	-49.75	-50.25
72310	Carpenters	-522	-530	-535	-536	-538	-540	-783	-794	-802	-804	-807	-811	-1,305	-1,324	-1,337	-1,340	-1,345	-1,351
72320	Bricklayers	-23.2	-22.5	-21.7	-21.4	-21	-20.8	-34.8	-33.75	-32.55	-32.1	-31.5	-31.2	-58	-56.25	-54.25	-53.5	-52.5	-52
72321	Insulators	-26.9	-27	-27.2	-27.3	-27.5	-27.5	-40.35	-40.5	-40.8	-40.95	-41.25	-41.25	-67.25	-67.5	-68	-68.25	-68.75	-68.75
72402	Heating, refrigeration and	-124	-126	-129	-131	-133	-135	-185	-189	-193	-196	-200	-203	-309	-314	-321	-327	-333	-338

	air conditioning mechanics																	
72500	Crane operators	-38.7	-38.7	-39.1	-39.5	-40	-40.3	-58.05	-58.05	-58.65	-59.25	-60	-60.45	-96.75	-96.75	-97.75	-98.75	-100	-100.75
73100	Concrete finishers	-21.7	-22	-22.2	-22.2	-22.3	-22.5	-32.55	-33	-33.3	-33.3	-33.45	-33.75	-54.25	-55	-55.5	-55.5	-55.75	-56.25
73101	Tilesetters	-15.7	-15.7	-15.8	-15.8	-15.8	-15.8	-23.55	-23.55	-23.7	-23.7	-23.7	-23.7	-39.25	-39.25	-39.5	-39.5	-39.5	-39.5
73102	Plasterers, drywall installers and finishers and lathers	-76.2	-77.9	-79.5	-80.7	-81.9	-83	-114.3	-116.85	-119.25	-121.05	-122.85	-124.5	-190.5	-194.75	-198.75	-201.75	-204.75	-207.5
73110	Roofers and shinglers	-76.4	-79.2	-81.7	-82.9	-84.4	-85.8	-114.6	-118.8	-122.55	-124.35	-126.6	-128.7	-191	-198	-204.25	-207.25	-211	-214.5
73111	Glaziers	-20.7	-20.9	-21.2	-21.4	-21.6	-21.6	-31.05	-31.35	-31.8	-32.1	-32.4	-32.4	-51.75	-52.25	-53	-53.5	-54	-54
73112	Painters and decorators (except interior decorators)	-122	-123	-123	-124	-124	-124	-182	-184	-185	-186	-186	-186	-304	-307	-309	-310	-310	-310
73113	Floor covering installers	-33.7	-34.4	-34.9	-35	-35	-35.1	-50.55	-51.6	-52.35	-52.5	-52.5	-52.65	-84.25	-86	-87.25	-87.5	-87.5	-87.75
73200	Residential and commercial	-137	-139	-141	-141	-141	-142	-206	-209	-211	-211	-212	-213	-344	-348	-351	-352	-353	-355

	installers and servicers																	
73300	Transport truck drivers	-767	-780	-791	-803	-813	-825	-1,150	-1,170	-1,187	-1,204	-1,219	-1,237	-1,917	-1,950	-1,979	-2,006	-2,032	-2,062
73400	Heavy equipment operators	-238	-243	-247	-249	-251	-253	-358	-365	-370	-374	-376	-379	-596	-608	-617	-623	-626	-632
75101	Material handlers	-497	-500	-502	-505	-508	-511	-746	-750	-753	-758	-761	-766	-1,243	-1,250	-1,255	-1,263	-1,269	-1,277
75110	Construction trades helpers and labourers	-427	-429	-431	-433	-435	-437	-640	-643	-646	-649	-652	-656	-1,067	-1,071	-1,077	-1,082	-1,087	-1,094

Table 25: Gaps For Scenario 1, 2, and 3 for Engineering/Technology Group

Engineering		Scenario 1(Gaps						Scenario 2 (Gaps)						Scenario 3 (Gaps)					
NOCs	Description	2025	2026	2027	2028	2029	2030	2025	2026	2027	2028	2029	2030	2025	2026	2027	2028	2029	2030
21200	Architects	-36.1	-35.6	-35.3	-35.2	-35.1	-35.1	-36.1	-35.6	-35.3	-35.2	-35.1	-35.1	-90.25	-89	-88.25	-88	-87.75	-87.75
21300	Civil engineers	-127	-127	-128	-129	-129	-130	-127	-127	-128	-129	-129	-130	-318	-318	-320	-322	-323	-325
21310	Electrical and electronics engineers	-70.4	-70.6	-70.7	-71	-71.1	-71.2	-70.4	-70.6	-70.7	-71	-71.1	-71.2	-176	-176.5	-176.75	-177.5	-177.75	-178

21311	Computer engineers (except software engineers and designers)	-37.6	-37.7	-37.7	-38.1	-38.3	-38.7	-37.6	-37.7	-37.7	-38.1	-38.3	-38.7	-94	-94.25	-94.25	-95.25	-95.75	-96.75
21321	Industrial and manufacturing engineers	-35.6	-36.7	-37.4	-38	-38.7	-39.2	-35.6	-36.7	-37.4	-38	-38.7	-39.2	-89	-91.75	-93.5	-95	-96.75	-98
21322	Metallurgical and materials engineers	-6.9	-7.2	-7.5	-7.7	-8	-8.2	-6.9	-7.2	-7.5	-7.7	-8	-8.2	-17.25	-18	-18.75	-19.25	-20	-20.5
22211	Industrial designers	-14.9	-14.9	-15	-15	-15.1	-15.1	-14.9	-14.9	-15	-15	-15.1	-15.1	-37.25	-37.25	-37.5	-37.5	-37.75	-37.75
22212	Drafting technologists and technicians	-69.7	-69.4	-69.3	-69.2	-69.1	-69	-69.7	-69.4	-69.3	-69.2	-69.1	-69	-174.25	-173.5	-173.25	-173	-172.75	-172.5
22214	Technical occupations in geomatics and meteorology	-27.7	-28.2	-28.7	-28.9	-29.2	-29.4	-27.7	-28.2	-28.7	-28.9	-29.2	-29.4	-69.25	-70.5	-71.75	-72.25	-73	-73.5
22301	Mechanical engineering technologists and technicians	-35	-35.4	-35.7	-36.4	-36.9	-37.2	-35	-35.4	-35.7	-36.4	-36.9	-37.2	-87.5	-88.5	-89.25	-91	-92.25	-93

22303	Construction estimators	-41.7	-41.8	-42.1	-42.3	-42.5	-42.7	-41.7	-41.8	-42.1	-42.3	-42.5	-42.7	-104.25	-104.5	-105.25	-105.75	-106.25	-106.75
22311	Electronic service technicians	-154	-157	-159	-160	-162	-163	-154	-157	-159	-160	-162	-163	-386	-391	-397	-400	-404	-408
22231	Engineering inspectors and regulatory officers	-21.6	-21.8	-22.1	-22.3	-22.5	-22.7	-21.6	-21.8	-22.1	-22.3	-22.5	-22.7	-54	-54.5	-55.25	-55.75	-56.25	-56.75
72400	Construction millwrights and industrial mechanics	-248	-254	-259	-263	-267	-270	-248	-254	-259	-263	-267	-270	-621	-635	-647	-658	-667	-675

Table 26: Gaps For Scenario 1, 2, and 3 for Administrative Group

Administrative		Scenario 1(Gaps)						Scenario 2 (Gaps)						Scenario 3 (Gaps)					
NOCs	Description	2025	2026	2027	2028	2029	2030	2025	2026	2027	2028	2029	2030	2025	2026	2027	2028	2029	2030
10022	Advertising, marketing and	-41.35	-42.3	-43.2	-44.05	-44.9	-45.7	-41.35	-42.3	-43.2	-44.05	-44.9	-45.7	-82.7	-84.6	-86.4	-88.1	-89.8	-91.4

	public relations managers																	
41405	Education policy researchers, consultants and program officers	-74	-75	-77	-79	-80	-81	-74	-75	-77	-79	-80	-81	-148	-151	-154	-157	-160	-162
52121	Interior designers and interior decorators	-18.05	-18.35	-18.65	-18.8	-19	-19.15	-18.05	-18.35	-18.65	-18.8	-19	-19.15	-36.1	-36.7	-37.3	-37.6	-38	-38.3

Appendix 4: Pathways to Education

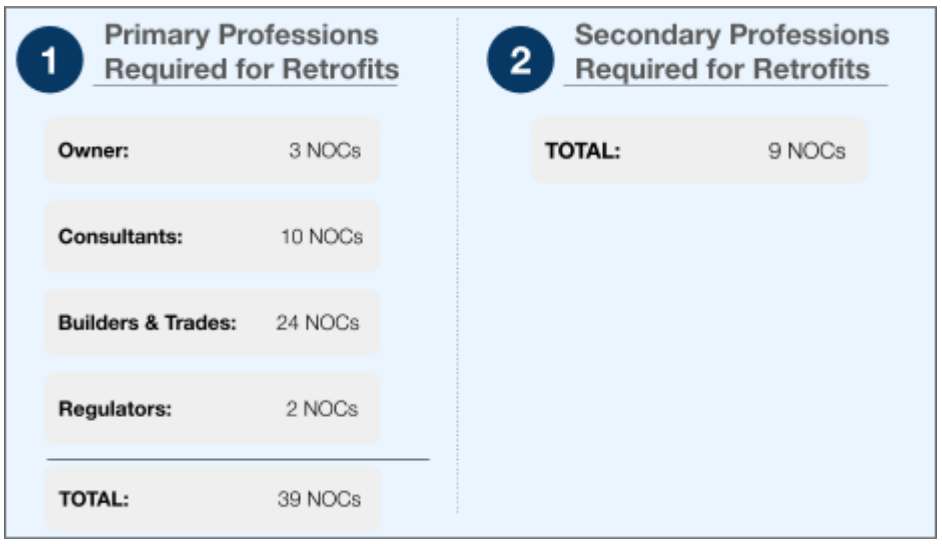
This section explores the education and upskilling opportunities for each one of the Key NOCs we identified in the previous sections. The list is broken down into two main groups: primary and secondary professions required for retrofits. The primary professions category is further subdivided into four categories, Owner, Consultants, Builders & Trades, and Regulators. An outline for this organization is provided below in **Figure 17.**

For each unique NOC, we provide the following information, which was compiled through consultations of the Government of Canada's NOC system, job posting descriptions, Nova Scotia Works and the Canada Job Bank.

- Typical education background needed to work in that occupation.
- What are the key competences required?
- Educational organizations that support the development of key competences.
- Some of the responsible organizations that oversee the specific sectors of workforce & industry.

We also provide information about Considerations on Workforce Capacity & Skills, and Micro Credentials available for upskilling. However, this analysis is not available for each NOC rather at the group level (Owners, Consultants, Builders & Trades, Regulators, and Secondary Professions)

Figure 17: Categorization of Key NOCs



1. Availability of Services/Education For Each NOC

Table of Institutions that offer these types of credentials

The analysis identified and categorized relevant NOCs into primary and secondary professions associated with energy-efficient retrofits. We profiled, for each NOC, the base-level qualifications required for entry and advancement in the occupation, including diplomas, degrees, certifications, apprenticeships, as well as specialized training and microcredentials responding to green job demands, such as energy efficiency retrofits.

This detailed breakdown outlined the integration of green job competencies within each NOC, putting into perspective the required skills to support Canada's transition toward a sustainable, low-carbon economy. Using electricians as an example (NOC 7241), they would require traditional trade certifications but also new credentials in areas such as photovoltaic system installation and Building Automation Systems. Similarly, the core NOC 7313 of HVAC technicians will also be supplemented with knowledge in heat pumps and energy-efficient systems. The emphasis will be on green jobs, ensuring that each profession is adequately prepared for the technical and sustainability needs of today's energy-efficient retrofitting, cultivating a workforce ready for the green transition.

2. PRIMARY PROFESSIONS REQUIRED FOR RETROFITS

This section highlights the NOCs that are almost always needed when undertaking an energy efficiency retrofit. The Primary professions section is divided into four groups, **Owners, Consultants, Builders & Trades, Regulators**. Each group has a general commentary section on

Considerations on Workforce Capacity & Skills, and Micro Credentials available for upskilling, which apply to all NOCs within that group.

To identify the National Occupational Classifications (NOCs) relevant to energy-efficient retrofits and their associated educational requirements, we conducted a comprehensive review using the Government of Canada's NOC system, supplemented by job postings and insights from Nova Scotia Works and the Canada Job Bank.

1. OWNER

1.1. ADVERTISING, MARKETING AND PUBLIC RELATIONS MANAGERS

NOC 10022- Advertising, marketing and public relations managers

Advertising, marketing, public relations and e-business managers plan, organize, direct, control and evaluate the activities of establishments and departments involved in commercial, industrial and e-business advertising, marketing and public relations. They are employed by commercial and industrial establishments, government departments, and advertising, marketing and public relations firms or consulting businesses.

Typical education background:

Advertising and Public Relations Managers

- A university degree or college diploma in communications, public relations, marketing, journalism or in a related field and several years of experience in an advertising, public relations or communications officer position or in a related occupation are required.

Marketing Managers

- A university degree or college diploma in business administration or in a related field with a specialization in sales or marketing and several years of experience as a sales, marketing or public relations representative or in a related occupation are required.

E-business Managers

- A university degree or college diploma in a field related to electronic commerce, website content development, or Internet and mobile services and experience in website design, interactive media development, data administration or information systems analysis or experience related to website content are usually required.

Key Competencies for Retrofits

- Development of communication strategies to promote energy-efficient retrofits in Nova Scotia.
- Designing campaigns to educate homeowners, businesses, and municipalities about benefits and incentives for retrofits.
- Building partnerships with energy organizations, contractors, and government bodies to amplify awareness of retrofit programs.
- Conducting market research to understand consumer attitudes and barriers to green retrofit adoption.
- Utilizing digital platforms (SEO, paid social media, Google Ads) and traditional media to target diverse audiences.
- Soft Skills: Demonstrating strong leadership, interpersonal, and communication skills to manage teams and build trust.

Support for Key Competencies	**Acadia University** • Business Administration, Bachelor • Marketing, Bachelor **Cape Breton University** • Business Administration, Bachelor • Communication, Bachelor • Marketing, Bachelor **Dalhousie University** • Business Administration, Master • Commerce, Bachelor • Digital Business, Graduate Certificate • Digital Innovation, Master • Intercultural Communication, Advanced Certificate • Journalism Studies (minor), Bachelor • Marketing Management, Bachelor, Advanced Certificate • Professional Communications, Certificate • Technical Writing, Certificate **Nova Scotia Community College** • Business Administration, Diploma • Business Fundamentals, Certificate • Digital Marketing, Advanced Certificate • IT Web Programming, Diploma • Public Relations, Advanced Certificate
Responsible Organizations	• Efficiency Nova Scotia: A key partner in promoting retrofit incentives and energy efficiency programs. • Nova Scotia Power: Offers energy-saving programs and rebates for residential and commercial retrofits. • Atlantic Canada Opportunities Agency (ACOA): Supports green initiatives and provides funding opportunities. • Canada Green Building Council – Atlantic Chapter: Promotes green building practices and collaboration. • Nova Scotia Home Builders' Association (NSHBA): Engages with retrofit and residential construction markets. • Local municipalities and community groups advocating for sustainable housing and energy efficiency.

1.2. CONSTRUCTION MANAGERS

NOC 70010 – *Construction managers*

Construction managers plan, organize, direct, control and evaluate the activities of a construction company or a construction department within a company, under the direction of a general manager or other senior manager. They are employed by residential, commercial and industrial construction companies and by construction departments of companies outside the construction industry.

Typical education background:

- A university degree in civil engineering or a college diploma in construction technology is usually required.
- A master's degree in project management may be required.

- Several years of experience in the construction industry, including experience as a Construction Supervisor or Field Superintendent, are usually required.
- Extensive experience in the construction industry may substitute for post-secondary education requirements.
- Professional engineering status or construction trade certification may be required by some employers.

Key Competencies for Retrofits

- Overseeing the planning, coordination, and execution of green retrofit projects to ensure they meet energy efficiency and sustainability standards.
- Managing budgets, schedules, and resource allocation for retrofit projects while adhering to environmental compliance requirements.
- Ensuring proper integration of low-carbon materials, energy-efficient systems, and renewable energy solutions into building retrofits.
- collaboration with engineers, contractors, and energy specialists to implement innovative technologies such as heat pumps, photovoltaic systems, and Building Automation Systems (BAS).
- Monitoring and ensuring compliance with building codes, safety regulations, and green building certification standards, such as LEED.
- Soft Skills: Demonstrating strong communication, leadership, and conflict-resolution skills to effectively manage diverse teams.

Responsible Organizations	• Efficiency Nova Scotia: Provides technical and financial support for energy-efficient retrofit projects. • Nova Scotia Power: Collaborates on electrification initiatives and energy-saving measures. • Construction Association of Nova Scotia (CANS): Offers resources and networking opportunities for construction managers involved in retrofits. • Canada Green Building Council – Atlantic Chapter: Provides education and resources on green building certifications and practices. • Nova Scotia Community College (NSCC): Supports workforce development with relevant training programs for construction professionals.
Support for Key Competencies	Dalhousie University • Civil Engineering Bachelor • Construction Management Certificate • Project Management Certificate

1.3. FACILITY OPERATION AND MAINTENANCE MANAGERS

NOC 70012 – *Facility operation and maintenance managers*

Facility operation managers plan, organize, direct, control and evaluate the operations of commercial, transportation and recreational facilities and the included real estate. Facility operation managers are employed by a wide range of establishments, such as airports, harbours, canals, shopping centres, convention centres, warehouses and recreational facilities. Maintenance managers plan, organize, direct, control and evaluate the maintenance department within commercial, industrial, institutional, recreational and other facilities. Maintenance managers are employed by a wide range of establishments, such as office buildings, shopping centres, airports, harbours, warehouses, grain terminals, universities, schools and sports facilities, and by the maintenance and mechanical engineering departments of manufacturing and other industrial establishments.

Typical Educational Background:

Facility Operation Managers require completion of a college or university program in business administration or in a discipline related to facility operation and maintenance or an equivalent combination of technical training and experience in administration or maintenance.

Key Competencies for Retrofits

- **Managing the operation and maintenance of energy-efficient systems** in retrofitted buildings, including HVAC, lighting, photovoltaic systems, heat pumps, energy storage solutions, and renewable energy technologies.
- Implementing energy-saving strategies and monitoring Building Automation Systems (BAS) to optimize energy use.
- Assessing existing building systems, conducting energy audits, and identifying areas for improvement, including embodied carbon and efficiency.
- Understanding building science fundamentals and integrating low-carbon materials and technologies into building operations.
- Demonstrating strong business acumen for creating cost-effective retrofit proposals and managing budgets.
- Leveraging digital literacy to operate automated systems and optimize energy management.
- **Soft Skills:** Managing teams effectively, engaging tenants, negotiating with contractors, and solving problems to ensure smooth facility operations.

Responsible Organizations	• Efficiency Nova Scotia: Offers programs for the maintenance and optimization of energy-efficient building systems. • Nova Scotia Power: Provides expertise in energy management and renewable energy systems. • Canada Green Building Council – Atlantic Chapter: Promotes green building certifications and sustainable operations in retrofitted facilities. • Nova Scotia Community College (NSCC): Provides training in sustainable facility management and energy efficiency.
Support for Key Competencies	**Acadia University** • Applied Science Bachelor • Business Administration Bachelor **Cape Breton University** • Business Administration Bachelor • Business Management Advanced Diploma • Engineering Advanced Diploma **Dalhousie University** • Commerce Bachelor • Engineering Bachelor, Master, Doctorate • Maintenance Management Certificate • Managing People and Organizations Bachelor • Mechanical Engineering Bachelor **Nova Scotia Community College** • Business Administration Diploma • Business Fundamentals Certificate • Mechanical Engineering Technology Diploma

1.4 . Considerations on Workforce Capacity & Skills for **Owners**

- Knowledge gaps & Work Shortages:
    - Low knowledge in low-carbon technologies and with integrating sustainability principles into asset and project management may slow down the adoption of energy efficient practices.
    - Need for enhanced training in life cycle cost analysis, sustainability reporting, and performance tracking to support retrofit projects effectively.
    - Workforce shortages in experienced property and facility managers with expertise in energy efficiency could slow retrofit implementation.
    - Increasing updates of digital tools and technical skills (e.g., Building Automation Systems, green technology and energy monitoring platforms) requires upskilling in technology use and data interpretation.
- Financial Constraints and Complexity of Retrofits
    - Financial constraints and extended project timelines associated with retrofits may deter owners from undertaking such projects without clear cost-benefit analyses and incentives.
    - Navigating complex government incentives, and preparing for new building code adoptions for green retrofits can be challenging, requiring specialized knowledge to maximize funding opportunities.
- Low Awareness of Opportunities in Workforce
    - A widespread lack of green literacy, including understanding sustainability principles, net-zero construction strategies, and the urgency to implement them, limits the ability to identify and implement retrofit solutions at a larger scale.
    - Lack of awareness of financial and environmental benefits of retrofits will require tailored campaigns to reach diverse and rural communities.
    - Marketing managers must align messaging with federal and provincial retrofit programs, grants, and rebates.

1.5 Microcredentials for Owners

Nova Scotia Community College:

1. **Introduction to Construction Management**
   Mode (online)

- **Course Objective:** Develop a framework for monitoring and evaluating construction projects using industry methodologies and sustainable practices.
- **Target Audience:** Individuals with experience in the construction sector, but open to all.
- **Key Learning Outcomes**: Understanding project phases, financial management, environmental impacts, and safety regulations.
- **Greenhouse Gas Emissions:** Buildings account for 18% of Canada's national greenhouse gas emissions.
- **National Retrofit Code:** By 2030, Canadians can expect a national retrofit code for existing buildings.
- **Green Building Workforce:** The green building workforce needs to triple by 2030 to meet the demand for sustainable building construction and renovation.

2. **Climate Literacy for Construction**

   Mode (Online)

- **Course Focus:** Explores the role of the construction industry in climate change, focusing on carbon emissions, energy efficiency, and lifecycle carbon.
- **Target Audience:** Designed for individuals working in the construction industry, although no prior experience is required.
- **Learning Outcomes:** Students will understand climate change impacts, the construction industry's role, adaptation strategies, and climate change mitigation and adaptation in the context of Nova Scotia's future climate.

3. **Introduction to Solar Photovoltaic Systems**

Mode(online)

- **Course Objective:** To provide foundational knowledge on solar photovoltaic (PV) technology and systems, including the science behind solar energy conversion, system operation, and component characteristics.
- **Learning Outcomes**: Students will be able to explain solar PV system fundamentals, describe electricity concepts in solar PV design, explain solar PV panels and system operation, and assess the characteristics and applications of solar PV components.
- **Career Path:** This course serves as a pathway to becoming a solar PV installer, a crucial role in Canada's transition to a low-carbon economy.

2. CONSULTANTS

2.1. ARCHITECTS

NOC 21200 – *Architects*

Architects conceptualize, plan and develop designs for the construction and renovation of commercial, institutional and residential buildings. They are employed by architectural firms, private corporations and governments, or they may be self-employed.

Typical Educational Background:

- A bachelor's degree from an accredited school of architecture or completion of the syllabus of studies from the Royal Architectural Institute of Canada (RAIC) is required.
- A master's degree in architecture may be required.
- Completion of a three-year internship under the supervision of a registered architect is required.
- Completion of the architect registration examination is required.
- Registration with a provincial regulatory body is required in all provinces and the Northwest Territories.
- Leadership in Energy and Environmental Design (LEED) certification is offered by the Canada Green Building Council and may be required by some employers.

Key Competencies for Retrofits
• Designing energy-efficient, sustainable buildings and retrofits, ensuring adherence to green building standards and energy codes. • Assessing existing buildings, conducting energy audits, and identifying opportunities for improvement, including embodied carbon analysis and energy efficiency. • Integrating legacy systems with high-performance systems, including mechanical, passive systems, and on-site renewable energy solutions. • Applying building science principles (Building-as-a-System) to ensure optimal integration of all systems and energy efficiency. • Utilizing digital tools like CAD, laser scanning (LIDAR), and photogrammetry for accurate building assessments and design. • Incorporating low-carbon materials and performing Life Cycle Assessment (LCA) to reduce environmental impacts in retrofit designs. • Utilizing adaptive and resilient design strategies to ensure that retrofits are energy-efficient and able to withstand environmental changes. • **Soft Skills:** Such as communication, negotiation, problem-solving, and project coordination for managing client expectations and working with contractors.

Responsible Organizations	• Canada Green Building Council – Atlantic Chapter: Provides resources on green building practices and certifications such as LEED. • Efficiency Nova Scotia: Offers programs to support energy-efficient retrofits and sustainable design. • Nova Scotia Power: Collaborates on energy efficiency and renewable energy initiatives for retrofitted buildings. • Nova Scotia Association of Architects (NSAA): Provides professional development, training, and advocacy for sustainable architecture. • The Royal Architectural Institute of Canada (RAIC): Supports architects with resources on sustainable architecture and green building certifications.

Support for Key Competencies	**Dalhousie University** • Architecture Master

2.2. CIVIL ENGINEERS

NOC 21300 – *Civil Engineers*

Civil engineers plan, design, develop and manage projects for the construction or repair of buildings, earth structures, powerhouses, roads, airports, railways, rapid transit facilities, bridges, tunnels, canals, dams, ports and coastal installations and systems related to highway and transportation services, water distribution and sanitation. Civil engineers may also specialize in foundation analysis, building and structural inspection, surveying, geomatics and municipal planning. They are employed by engineering consulting companies, in all levels of government, by construction firms and in many other industries, or they may be self-employed.

Typical Educational Background:

- A bachelor's degree in civil engineering or in a related engineering discipline is required.
- A master's degree or doctorate in a related engineering discipline may be required.
- Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional Engineer (P.Eng.).
- Engineers are eligible for registration following graduation from an accredited educational program, and after three or four years of supervised work experience in engineering and passing a professional practice examination.
- Leadership in Energy and Environmental Design (LEED) certification is offered by the Canada Green Building Council and may be required by some employers.

Key Competencies for Retrofits

- Designing and implementing sustainable civil infrastructure for green retrofits, such as stormwater management, drainage, and site preparation.
- Conducting assessments of existing civil infrastructure to identify energy-efficient and low-carbon opportunities for retrofitting.
- Integrating renewable energy solutions like geothermal, solar panels, and wind into civil engineering designs for retrofits.
- Utilizing building science principles (Building-as-a-System).
- Using digital tools such as CAD, GIS, and energy modeling software for planning and designing.
- Ensuring retrofitted infrastructure meets sustainability standards, including compliance with environmental, energy efficiency, and building codes.
- Soft Skills: Demonstrating strong project management, communication, and collaboration skills to work with multidisciplinary teams.

Responsible Organizations	• Engineers Nova Scotia: Provides professional resources and support for civil engineers working on sustainable infrastructure. • Canadian Society for Civil Engineering (CSCE): Promotes sustainable civil engineering practices and training. • Canada Green Building Council – Atlantic Chapter: Supports civil engineers with resources on green building certifications and sustainable retrofitting practices. • Efficiency Nova Scotia: Offers guidance and programs to support energy-efficient infrastructure retrofits.

	• Nova Scotia Power: Collaborates with civil engineers on energy management and renewable energy initiatives in retrofitted buildings.
Support for Key Competencies	**Acadia University** • Engineering and Applied Science Bachelor **Dalhousie University** • Civil and Resource Engineering, Master, Doctorate • Civil Engineering Bachelor, Master • Engineering Bachelor, Master, Doctorate

2.3. ELECTRICAL ENGINEERS

NOC 21310 – *Electronic and Electrical engineers*

Electrical and electronics engineers design, plan, research, evaluate, and test electrical and electronic equipment and systems. They are employed by electrical utilities, communications companies, manufacturers of electrical and electronic equipment, consulting firms, and a wide range of manufacturing, processing,g and transportation industries and government.

Typical Educational Background:

- A bachelor's degree in electrical or electronics engineering or in an appropriate related engineering discipline is required.
- A master's or doctoral degree in a related engineering discipline may be required.
- Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional Engineer (P.Eng.).
- Engineers are eligible for registration following graduation from an accredited educational program, and after three or four years of supervised work experience in engineering and passing a professional practice examination.
- Leadership in Energy and Environmental Design (LEED) certification is offered by the Canada Green Building Council and may be required by some employers.

NOC 22301- *Mechanical engineer technologists and engineers*

Mechanical engineering technologists and technicians provide technical support and services or may work independently in mechanical engineering fields such as the design, development, maintenance, and testing of machines, components, tools, heating, and ventilating systems, geothermal power plants, power generation and power conversion plants, manufacturing plants and equipment. They are employed by consulting engineering, manufacturing, and processing companies, institutions and government departments.

Typical Educational Background:

- Completion of a two- or three-year college program in mechanical engineering technology is usually required for Mechanical Engineering Technologists.
- Completion of a one- or two-year college program in mechanical engineering technology is usually required for Mechanical Engineering Technicians.
- Certification in mechanical engineering technology or in a related field is available through provincial associations of Engineering/Applied Science Technologists and Technicians and may be required for some positions.
- A period of supervised work experience, usually two years, is required before certification.

Key Competencies for Retrofits

- Conducting thorough assessments of existing buildings, including energy audits, evaluating current electrical

systems, and identifying opportunities for improving energy efficiency and reducing embodied carbon. • Integrating legacy electrical systems with high-performance solutions, including renewable energy systems (e.g., solar panels) and energy storage. • Designing and implementing energy-efficient electrical systems, such as LED lighting, HVAC integration, and energy automation, while maintaining system compatibility. • Applying building science fundamentals (Building-as-a-System) to ensure seamless integration of electrical and mechanical systems for energy optimization. • Utilizing green building construction strategies such as improving water and energy efficiency, enhancing indoor environmental quality, and reducing electrical consumption. • Applying Life Cycle Assessment (LCA) to evaluate low-carbon materials and the embodied carbon in electrical system components. • Developing adaptive and resilient systems that ensure retrofits are energy-efficient and climate-resilient. • Soft Skills: such as communication, negotiation, problem-solving, and project coordination when collaborating with architects, contractors, and other professionals involved in green retrofits.

Responsible Organizations	• Nova Scotia Power: Provides expertise in energy management, electrical system integration, and renewable energy solutions. • Engineers Nova Scotia: Supports electrical engineers with training and resources for energy-efficient systems in retrofitted buildings. • Canadian Electrical Contractors Association (CECA): Represents electrical contractors implementing energy-efficient solutions and renewable energy systems. • Canada Green Building Council – Atlantic Chapter: Provides resources on green building practices, certifications, and energy-efficient systems. • Efficiency Nova Scotia: Offers support for energy-efficient retrofits, including optimizing electrical systems for reduced consumption.
Support for Key Competencies	**Acadia University** • Engineering and Applied Science Bachelor **Dalhousie University** • Electrical and Computer Engineering Bachelor, Master, Doctorate • Engineering Bachelor, Master, Doctorate

2.4. COMPUTER ENGINEERS

NOC 21311 – *Computer engineers (except software engineers and designers)*

Computer engineers (except software engineers and designers) research, plan, design, develop, modify, evaluate and integrate computer and telecommunications hardware and related equipment, and information and communication system networks including mainframe systems, local and wide area networks, fiber-optic networks, wireless communication networks, intranets, the Internet and other data communications systems. They are employed by computer and telecommunication hardware manufacturers, by engineering, manufacturing and telecommunications firms, in information technology consulting firms, by governmental, educational and research institutions and in information technology units throughout the private and public sectors.

Typical Educational Background:

- Computer Engineers require a bachelor's degree in computer engineering, electrical or electronics engineering, engineering physics or computer science.
- A master's or doctoral degree in a related engineering discipline may be required.
- Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional Engineer (P.Eng.).
- Engineers are eligible for registration following graduation from an accredited educational program, three or four years of supervised work experience in engineering and passing a professional practice examination.

Key Competencies for Retrofits

- Designing and implementing smart building technologies, such as building automation systems (BAS) and energy management systems (EMS) to optimize energy efficiency in green retrofits.
- Integrating renewable energy solutions, such as solar power and energy storage, into smart building designs.
- Conducting energy audits and system assessments to identify opportunities for improving energy efficiency through automation and advanced control systems.
- Applying building science principles (Building-as-a-System) to ensure seamless integration of digital systems with mechanical, electrical, and architectural systems in retrofitted buildings.
- Utilizing digital tools and technologies such as sensors, IoT devices, and real-time monitoring systems to enhance the energy performance of retrofitted buildings.
- Implementing low-carbon technologies, such as energy-efficient lighting systems, electric vehicle (EV) charging stations, and smart grid systems, within retrofit projects.
- Ensuring that all integrated systems are adaptable and resilient to future energy needs and climate change impacts.
- Soft Skills: Demonstrating strong problem-solving, communication, and project management skills to collaborate with engineers, architects, and others involved in green retrofit projects.

Responsible Organizations	• Nova Scotia Power: Provides expertise in integrating smart grid systems, energy storage, and renewable energy solutions in retrofit projects. • Engineers Nova Scotia: Offers resources and training for computer engineers involved in energy-efficient system design and implementation. • Canada Green Building Council – Atlantic Chapter: Promotes green building standards, certifications, and smart building technologies for retrofitting projects. • Efficiency Nova Scotia: Offers support for energy-efficient retrofit programs, including those that leverage smart building and automation technologies. • Canadian Energy Efficiency Alliance (CEEA): Supports engineers in the development and deployment of energy-efficient technologies for building retrofits.
Support for Key Competencies	**Acadia University** • Engineering and Applied Science Bachelor **Dalhousie University** • Artificial Intelligence and Intelligent Systems Advanced Certificate • Electrical and Computer Engineering Bachelor, Master, Doctorate • Engineering Bachelor, Master, Doctorate **St. Francis Xavier University** • Artificial Intelligence Graduate Diploma

2.5. INDUSTRIAL AND MANUFACTURING ENGINEERS

NOC 21321 – *Industrial and Manufacturing engineers*

Industrial and manufacturing engineers conduct studies and develop and supervise programs to achieve the best use of equipment, human resources, technology, materials and procedures to enhance efficiency and productivity. They are employed in consulting firms, manufacturing and processing companies, in government, financial, health care and other institutions, or they may be self-employed.

Typical Educational Background:

- A bachelor's degree in industrial engineering or in a related engineering discipline is required.
- A master's degree or doctorate in a related engineering discipline may be required.
- Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional Engineer (P.Eng.).

- Engineers are eligible for registration following graduation from an accredited educational program, and after three or four years of supervised work experience in engineering and passing a professional practice examination.

Key Competencies for Retrofits

- Optimizing manufacturing processes for low-carbon building materials and components used in green retrofits.
- Assessing and designing energy-efficient systems to reduce operational energy consumption in retrofitted buildings.
- Applying life-cycle assessment (LCA) to evaluate the environmental impact of materials and processes in green retrofits.
- Integrating automation and digital tools to improve the efficiency of manufacturing and installation processes for retrofit projects.
- Implementing adaptive and resilient design strategies for materials and systems to enhance durability and sustainability.
- **Soft Skills:** Strong communication, problem-solving, and collaboration skills to coordinate with architects, contractors, and material suppliers.

Responsible Organizations	• Engineers Nova Scotia: Provides training, certification, and resources for industrial engineers focusing on sustainable practices in retrofitting. • Canadian Manufacturers & Exporters (CME): Offers resources on integrating sustainable manufacturing practices to support green building initiatives. • Canada Green Building Council – Atlantic Chapter: Supports the adoption of green materials and technologies in manufacturing processes for retrofits. • Efficiency Nova Scotia: Provides guidance on energy-efficient systems and sustainable practices relevant to manufacturing and installation in retrofit projects.
Support for Key Competencies	**Acadia University** • Engineering and Applied Science, Bachelor **Dalhousie University** • Engineering, Bachelor, Master, Doctorate • Industrial Engineering, Bachelor, Master, Doctorate • Materials Engineering, Master, Doctorate • Mechanical Engineering, Bachelor, Master, Doctorate

2.6. METALLURGICAL AND MATERIAL ENGINEERS

NOC 21322 – *Metallurgical and Material Engineers*

Metallurgical and materials engineers conduct studies of the properties and characteristics of metals and other non-metallic materials and plan, design and develop machinery and processes to concentrate, extract, refine and process metals, alloys and other materials such as ceramics, semiconductors and composite materials. They are employed in consulting engineering firms, mining, metal processing and manufacturing companies, and in government, research and educational institutions.

Typical Educational Background:

- A bachelor's degree in metallurgical, materials, ceramic or chemical engineering or in a related engineering discipline is required.
- A master's degree or doctorate in a related engineering discipline may be required.
- Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional Engineer (P.Eng.).
- Engineers are eligible for registration following graduation from an accredited educational program, and after three or four years of supervised work experience in engineering and passing a professional practice examination.

Key Competencies for Retrofits

- Evaluating and selecting sustainable and low-carbon materials for use in green retrofit projects.
- Developing advanced materials with enhanced durability and performance for energy-efficient and climate-resilient retrofits.
- Conducting life-cycle assessments (LCA) to analyze the environmental impact of materials used in retrofit construction.
- Researching and applying techniques to minimize embodied carbon in materials, including recycling and reuse strategies.
- Ensuring compliance with environmental standards and certifications related to materials in retrofits.
- **Soft Skills:** Strong communication, problem-solving, and collaboration skills to coordinate with architects, contractors, and manufacturers.

Responsible Organizations	• Engineers Nova Scotia: Offers professional development and certification for metallurgical and materials engineers in sustainable practices. • Canadian Institute of Mining, Metallurgy and Petroleum (CIM): Provides resources for sustainable material development and recycling processes. • Canada Green Building Council – Atlantic Chapter: Promotes sustainable material use and certification for green retrofit projects. • Efficiency Nova Scotia: Supports material selection and energy-efficient strategies for retrofits.
Support for Key Competencies	**Acadia University** • Engineering and Applied Science, Bachelor **Dalhousie University** • Engineering, Bachelor, Master, Doctorate • Materials Engineering, Master, Doctorate

2.7. INDUSTRIAL DESIGNERS

NOC 22211- *Industrial Designers*

Industrial designers conceptualize and produce designs for manufactured products. They are employed by manufacturing industries and private design firms or they may be self-employed.

Typical Educational Background:

- A university degree in industrial design, architecture, or engineering or a college diploma in industrial design is required.
- Creative ability, as demonstrated by a portfolio of work, is required.

Key Competencies for Retrofits

- Designing sustainable products and systems for green retrofits, including energy-efficient materials, low-carbon construction components, and eco-friendly finishes.
- collaboration with architects and engineers to integrate industrial design solutions into retrofit projects, such as furniture, fixtures, and custom components that enhance energy efficiency and sustainability.
- Applying building science principles (Building-as-a-System) to ensure that all design elements contribute to the overall energy performance of the building.
- Understanding the environmental impact of materials and designing for circularity, using materials with low embodied carbon and promoting reuse and recycling.
- Utilizing advanced design tools such as CAD, 3D modeling, and rapid prototyping to create efficient, sustainable design solutions for retrofits.
- Contributing to green building construction strategies, including improving indoor environmental quality, energy efficiency, and resource conservation in retrofitted spaces.
- Ensuring designs are adaptable and resilient to future environmental and energy needs, enhancing the long-term sustainability of retrofitted buildings.
- Soft Skills: Demonstrating strong communication, problem-solving, and project coordination skills to work with architects, engineers, and contractors on complex retrofit projects.

Responsible Organizations	• Nova Scotia Design and Manufacturing Association: Supports industrial designers in sustainable design practices and green manufacturing techniques. • Canada Green Building Council – Atlantic Chapter: Provides guidance on integrating sustainable industrial design into green building projects and retrofits. • Canadian Industrial Designers Association (CIDA): Offers resources and training to industrial designers focused on sustainability and energy-efficient design practices. • Efficiency Nova Scotia: Supports industrial design projects focused on reducing energy consumption and promoting sustainability. • Green Building Council of Canada: Provides certification programs and resources for industrial designers to implement green solutions in retrofit projects.
Support for Key Competencies	**Dalhousie University** • Environmental Design Master • Environmental Engineering Master • Mechanical Engineering Bachelor

2.8. TECHNICAL OCCUPATIONS IN GEOMATICS AND METEOROLOGY

NOC 22214- *Technical occupations in Geomatics and Meteorology*

Technical occupations in geomatics include aerial survey, remote sensing, geographic information systems, cartographic and photogrammetric technologists and technicians, who gather, analyze, interpret and use geospatial information for applications in natural resources, geology, environmental research and land use planning. Meteorological technologists and technicians observe weather and atmospheric conditions, record, interpret, transmit and report on meteorological data, and provide weather information to the agricultural, natural resources and transportation industries and the public. Geomatics technologists and technicians are employed by all levels of government, utilities, mapping, computer software, forestry, architectural, engineering and consulting firms and other related establishments. Meteorological technologists and technicians are employed by all levels of government, the media, natural resources, utilities and transportation companies and consulting firms.

Typical Educational Background:

- Completion of secondary school is required.

- Geomatics Technologists require completion of a two- to three-year college program in cartography, photogrammetry, aerial survey, remote sensing, geographic information systems or geomatics.
- Meteorological Technicians require completion of a one-year meteorological technician program provided by the Meteorological Service of Canada.
- Further specialized training is available for Meteorological Technicians and may be required by some employers.
- Further specialized training is available for Meteorological Technicians and may be required by some employers

Key Competencies in Retrofits

- Conducting site assessments using geomatics technologies (e.g., GPS, GIS) to map and analyze building sites for green retrofit projects, optimizing energy efficiency and sustainability.
- Using remote sensing and meteorological data to support climate-resilient building designs by assessing environmental conditions and weather patterns.
- Integrating environmental data with building information modeling (BIM) to improve the accuracy of energy audits, site preparation, and performance simulations in retrofits.
- Performing geospatial analysis to assess potential impacts of green retrofits on the surrounding environment and identifying sustainable land use practices.
- Assisting in the planning and implementation of renewable energy systems (e.g., solar energy) by providing data on optimal site locations, solar exposure, and environmental factors.
- Contributing to climate-adaptive strategies by using weather and climate data to design retrofits that are resilient to climate change and extreme weather events.
- Ensuring compliance with environmental standards and regulations, including land conservation, water management, and carbon emissions reductions, during the retrofit process.
- Soft Skills: Demonstrating strong problem-solving, communication, and collaboration skills when working with architects, engineers, and others involved in green retrofit projects.

Responsible Organizations	• Geomatics Association of Nova Scotia: Provides professional development, resources, and support for geomatics professionals, focusing on sustainable practices in land and building assessment. • Engineers Nova Scotia: Offers training and resources for professionals working on energy-efficient systems and climate-resilient building strategies in green retrofits. • Canadian Meteorological and Oceanographic Society: Provides expertise on meteorological data and its integration into green building and retrofit projects, particularly in assessing environmental impacts. • Canada Green Building Council – Atlantic Chapter: Promotes green building standards and practices, offering resources on integrating environmental data into building retrofit projects. • Efficiency Nova Scotia: Supports energy-efficient retrofits and sustainable building practices, providing resources for site and environmental assessments.
Support for Key Competencies	**Acadia University** • Applied Geomatics Master **Dalhousie University** • Geographic Information Science (GIS) Advanced Certificate • Meteorology Advanced Diploma **St. Francis Xavier University** • Geography Bachelor, Master **Nova Scotia Community College (NSCC)** • Geographic Information Systems Advanced Certificate • Geographic Information Systems - Cartography and Geovisualization

	Diploma • Geographic Information Systems Technician Diploma • Geomatic Engineering Technology Diploma • Geospatial Data Analytics Advanced Certificate • Marine Geomatics Advanced Certificate • Remote Sensing Advanced Certificate

2.9. CONSTRUCTION ESTIMATORS

NOC 22303- *Construction Estimators*

Construction estimators analyze costs of and prepare estimates on civil engineering, architectural, structural, electrical and mechanical construction projects. They are employed by residential, commercial and industrial construction companies and major electrical, mechanical and trade contractors, or they may be self-employed.

Typical Educational Background:

- Completion of a three-year college program in civil or construction engineering technology or several years of experience as a qualified tradesperson in a construction trade such as plumbing, carpentry or electrical, are required.
- Certification by the Canadian Institute of Quantity Surveyors is usually required.

Key Competencies for Retrofits

- Assessing existing building systems, including auditing current energy efficiency, and embodied carbon, and checking the suitability of prefabrication for retrofitting.
- Understanding the preparation required for demolition, service disconnections, and materials remediation during green retrofits.
- Strong business acumen to optimize cost and performance while ensuring green retrofit goals are met.
- Applying building science fundamentals (Building-as-a-System) to ensure comprehensive energy-saving solutions.
- Familiarity with green building construction strategies, including water and energy efficiency, and improving indoor environmental quality.
- Knowledge of high-performance, low-carbon equipment, and materials, including sustainable alternatives for retrofitting projects.
- Performing life-cycle assessments (LCA) to evaluate environmental impacts, including calculating embodied carbon in retrofit projects.
- Understanding adaptive and resilient building strategies to make retrofitted buildings more sustainable in the long term.
- Soft Skills: Strong communication, negotiation, problem-solving, and project coordination skills to collaborate effectively with multidisciplinary teams.

Responsible Organizations	• Construction Association of Nova Scotia: Supports construction estimators with resources and professional development for green building practices and retrofitting. • Canadian Construction Association: Provides guidelines and best practices for green retrofit projects, including estimating costs for sustainable technologies. • Canada Green Building Council – Atlantic Chapter: Offers resources for construction estimators to integrate green building standards and certifications into their cost assessments. • Efficiency Nova Scotia: Offers tools and programs that help estimators evaluate energy-efficient solutions and sustainable materials for retrofits.

Support Key Competencies	**Nova Scotia Community College** • Architectural Engineering Technician, Diploma • Construction Management Technology, Diploma **Nova Scotia Apprenticeship Agency** • Carpenter - Apprenticeship, Certificate of Qualification • Carpenter - Trade Qualifier, Certificate of Qualification • Construction Electrician - Apprenticeship, Certificate of Qualification • Construction Electrician - Trade Qualifier, Certificate of Qualification • Industrial Electrician - Apprenticeship, Certificate of Qualification • Industrial Electrician - Trade Qualifier, Certificate of Qualification • Plumber - Apprenticeship, Certificate of Qualification • Plumber - Trade Qualifier, Certificate of Qualification

2.10. Considerations on Workforce Capacity & Skills for **Consultants**

- Limited knowledge of energy efficiency, green energy, and sustainability
    - Limited expertise in integrating advanced energy modeling and simulation tools into the design process for retrofits can slow down achieving net-zero energy goals.
    - Limited experience with life-cycle assessments (LCA) and embodied carbon calculations may impact the accuracy of cost estimates.
    - Lack of familiarity with innovative materials, such as low-carbon or adaptive materials, and their lifecycle impacts can restrict the adoption and implementation and scalability of sustainable design solutions.
    - Limited experience in integrating advanced technologies, such as automation and digital tools, in retrofit-specific manufacturing processes could delay project timelines.
- Difficulty coordinating across disciplines to implement energy efficiency
    - Professionals often face challenges in coordinating across disciplines to ensure seamless integration of mechanical, electrical, and structural systems in retrofitted buildings.

    - Collaboration between geomatics professionals and other building disciplines (e.g., architects, and engineers) is essential, which may require additional coordination and project management skills.
    - The integration of sustainable design principles with mechanical and architectural systems requires close collaboration, which may challenge coordination and timelines.
- Complexity of permits and changing codes for energy-efficiency retrofits
    - Navigating evolving codes, standards, and certification requirements for sustainable construction requires continuous professional development.
- Financial challenges due to high retrofitting costs
    - Difficulty in justifying the upfront costs of high-performance building systems to clients, despite long-term savings, poses a barrier to implementing energy-efficient retrofits.

2.11. Micro-credentials for Consultants

1. **Calculating the Zero Carbon Balance (Canada Green Building Council)**

This course, part of the Zero Carbon Building Micro-Credential, teaches participants about the Zero Carbon Balance and its role in achieving zero-carbon buildings. It covers carbon accounting, embodied and operational carbon, avoided emissions, and renewable energy.

2. **Introduction to Embodied Carbon in Buildings (Canada Green Building Council)**

This course provides building sector professionals with knowledge of embodied carbon emissions in construction projects. It covers understanding embodied carbon, calculating it through Life Cycle Assessments, and strategies to reduce emissions.

3. **Fundamentals of Zero Carbon Transition Planning (Canada Green Building Council)**

This course focuses on eliminating onsite combustion from building operations to achieve zero-carbon performance. Participants will learn how to develop Transition Plans, including fuel switching, energy efficiency upgrades, and capital planning.

4. **Environmental Engineering Technology – Water Resources (Nova Scotia Community College)**

The Environmental Engineering Technology - Water Resources program prepares students to address environmental issues and protect natural resources. The program covers groundwater exploration, water treatment, soil analysis, and more, with a focus on practical application through field experience and work-integrated learning opportunities. Graduates may be eligible for membership with TechNova and are prepared to work safely in the industry.

5. **Energy Sustainability Engineering Technology (ESET) (Nova Scotia Community College)**

This program prepares students for careers in alternative energy, sustainability, and energy systems management. Students learn about energy auditing, modeling, and improving energy efficiency in buildings.

6. **The Sustainability in Energy (by Geologic)**

The Sustainability in Energy Micro-Credential program is designed for professionals in the energy industry, offering in-demand skills and career advancement opportunities. The program, developed through industry consultation and expert insights, covers sustainability and ESG concepts, environmental, social, and governance issues, and provides practical knowledge for navigating the evolving energy sector. Employers can benefit from attracting talent, equipping their teams for the future, and retaining their workforce through this program**.**

- **Target Audience:** New graduates, early to mid-career energy professionals, engineers, geoscientists, technical professionals, operations and maintenance specialists, and corporate services employees.
- **Career Fields:** Engineering, geoscience, operations and maintenance, and corporate services.
- **Specific Roles:** Business development and sales professionals.

7. **Construction Estimating, Contracts and Project Management (NSCC)**

This certificate program teaches construction estimating, contracting, and project management. It includes three

courses that can be taken individually or together for a certificate.

3. BUILDERS & TRADES

3.1. ELECTRONIC SERVICE TECHNICIANS

NOC 22311- ***Electronic service technicians (household and business equipment)***

Electronic Service Technicians service and repair household and business electronic equipment like audio and video systems, computers, servers, photocopiers, printers, and other office equipment. Alarm and Security Technicians install and maintain electronic security alarm systems of 50V or less for homes and businesses, but this does not include fire alarm systems. They work for electronic service and retail companies, wholesale distributors, and within service departments of electronic manufacturing companies.

Typical Educational Background:

- A two-to-three-year college program in electronics or completion of high school or college courses in electronics and on-the-job training is required.
- Trade Qualifier option, 8,100 hours, and other criteria.
- Certification for Alarm and Security Technicians is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Nova Scotia Provincial Certification Exam for Alarm and Security Technicians as a trade qualifier.

Key Competencies for Retrofits

- Setting up energy efficient systems, such as LED lighting, Energy Star-rated appliances and HVAC controls.
- Replace the outdated electronic components with advanced energy-efficient alternatives.
- Implement smart home or office technologies that allow automated and optimized energy use.
- Soft Skills- independence, collaboration adaptability, analytical thinking, active learning and attention to detail.

Responsible Organizations	• Tech Nova -This is the organization for the professional technicians, certifies and regulates the use of designations • Efficiency Nova Scotia -providing rebates for energy efficiency upgrades including those involving in electronic systems
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Alarm and Security Technician - Trade Qualifier *Certificate of Qualification* **Nova Scotia Community College** • Information Technology Technician *Diploma* • *Electrical Engineering Technology (pre-apprenticeship) Diploma*

3.2. CONTRACTORS AND SUPERVISORS

NOC 72014-*Contractors and supervisors, other construction trades, installers, repairers and servicers*

Contractors and supervisors, other construction trades, installers, repairers and servicers supervise and coordinate the activities of various tradespersons, installers, repairers and servicers classified in the following minor groups: Bricklayers and Insulators, Concrete finishers, tile setters and plasterers, Roofers, Glaziers, Painters, decorators and floor covering installers, and Building maintenance installers, servicers and repairers. They are employed by a wide range of establishments; places of employment are indicated in the unit group descriptions. Contractors may be self-employed. This unit group also includes prefabricated product installation and service contractors and proprietors of some repair and service establishments.

Typical Educational Background:

- Completion of secondary school is usually required.
- Several years of experience in the trade or in the work area supervised are usually required.
- Journeyman/Woman trade certification may be required for some occupations in this unit group.

Key Competencies for Retrofits

- Expanded knowledge of supply chains for energy efficient and low carbon equipment, materials, and technology
- Interdisciplinary skills in mechanical, electrical, and plumbing systems, as well as digital technology
- Assessment of existing building, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- Understanding the amount of building preparation required, for demolition, services disconnect and materials remediation.
- Building science fundamentals (Building-as-a-system)
- Green building construction strategies such as water efficiency, energy efficiency, indoor environmental quality
- Low carbon materials, embodied carbon in construction and performing Life Cycle Assessment (LCA)
- Adaptive and resilient building strategies
- Soft skills such as communication, negotiation, problem-solving, and project coordination

Responsible Organizations	• Construction Association of Nova Scotia -CANS supports contractors, supervisors, and construction professionals through training programs, networking events, and industry advocacy.
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Concrete Finisher - Trade Qualifier, Certificate of Qualification • Drywall Finisher and Plasterer - Trade Qualifier, Certificate of Qualification • Floor Covering Installer - Trade Qualifier, Certificate of Qualification • Glazier - Trade Qualifier, Certificate of Qualification • Insulator (Heat and Frost) - Apprenticeship, Certificate of Qualification • Insulator (Heat and Frost) - Trade Qualifier, Certificate of Qualification • Lather (Interior Systems Mechanic) - Trade Qualifier, Certificate of Qualification • Painter and Decorator - Trade Qualifier, Certificate of Qualification • Roofer - Apprenticeship, Certificate of Qualification • Roofer - Trade Qualifier, Certificate of Qualification • Tile Setter - Trade Qualifier, Certificate of Qualification

3.3. SHEET METAL WORKERS

NOC 72102-*Sheet Metal Workers*

Sheet Metal Workers fabricate, assemble, install and repair sheet metal products. They are employed by sheet metal fabrication shops, sheet metal products manufacturing companies, sheet metal work contractors and various industrial sectors.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option: 10,800 hours and other criteria.
- Certification for Sheet Metal Workers is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Sheet Metal Workers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Crafting custom ductwork and HVAC elements to optimize airflow and minimize energy loss, thereby enhancing system efficiency.
- Operating CNC machines and other digital fabrication equipment to produce precise components that meet energy efficiency standards.
- Ensuring compliance with green building certifications like LEED by following best practices in material selection and installation methods.
- Soft skills- Communication, problem-solving, attention to detail, creativity, collaboration.

Responsible Organizations	• Sheet metal workers and roofer local 409- Representing over 340 sheet metal workers and roofers across mainland Nova Scotia

	• Nova Scotia Apprenticeship Agency -Training and trade certification for sheet metal workers • **Sheet Metal Workers' International Association (SMWIA**) – Provides training programs and certifications for energy-efficient and sustainable HVAC and sheet metal work. • **Canadian Council of Sheet Metal Workers and Roofers** – Represents sheet metal workers and offers apprenticeship and continuing education opportunities for green building skills. • **ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) –** Offers guidelines and standards on energy-efficient HVAC systems relevant to sheet metal workers.
Support for Key Competencies	**Nova Scotia Community College** • Sheet Metal Systems (pre-apprenticeship) Certificate **Nova Scotia Apprenticeship Agency** • Sheet Metal Worker - Apprenticeship (Certificate of Qualification) • Sheet Metal Worker - Trade Qualifier (Certificate of Qualification)

3.4. BOILERMAKERS

NOC 72103-Boilermakers

Boilermakers build, test and repair air-tight and liquid-tight containers like boilers and storage tanks. The name originated from workers who would make boilers, but they may work on projects as diverse as bridges to blast furnaces to the construction of mining equipment. Boilermakers work for boiler manufacturing, metal fabricating, shipbuilding, construction, electric power generation, rail transport, petrochemical and coal products, and similar industrial companies. Apprentices are included in this group.

Typical Educational Background:

- High school or equivalent.
- Training through a 5,400-hour apprenticeship program with three apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 8,100 hours and other criteria.
- Certification for Boilermakers is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for boilermakers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for the Retrofits

- Designing and constructing boilers, tanks, and pressure vessels optimized for energy efficiency.
- Inspecting boilers and pressure vessels to identify inefficiencies and recommend upgrades to meet modern energy standards.
- Designing systems that are durable and adaptable to changing energy requirements and environmental conditions.
- Communicating effectively with team members, contractors, and clients. Demonstrating problem-solving and leadership skills during complex retrofit projects.

Responsible Organizations	• International Brotherhood of Boilermakers (IBB) – Offers training and certifications focused on energy-efficient systems and sustainable practices. • Canadian Welding Bureau (CWB) – Provides certifications and resources for advanced welding techniques required in green retrofits. • National Association of Power Engineers (NAPE) – Offers resources and certifications on energy-efficient power systems relevant to boilermakers. • Canadian Standards Association (CSA) – Sets standards for boilers and pressure vessels, ensuring adherence to energy-efficient and green building practices.
Support for Key Competencies	**Nova Scotia Community College** • Metal Fabrication (pre-apprenticeship) *Diploma (NSCC)* • *Welding (pre-apprenticeship) Diploma* **Nova Scotia Apprenticeship Agency** • Boilermaker - Apprenticeship *Certificate of Qualification* • *Boilermaker - Trade Qualifier Certificate of Qualification*

3.5. IRONWORKERS

NOC 72105-*Ironworkers*

Ironworkers fabricate, construct, and join scaffolding, structural steel buildings, bridges, ornamental ironwork, and precast structures. They work for construction ironwork contractors.

***Typical E**ducational Background:*

- High school or equivalent (usually).
- Reinforcing: training through a 3,600-hour apprenticeship program with two apprenticeship levels.
- Structural/Ornamental: training through a 5,400-hour apprenticeship program with three apprenticeship levels.
- To become an apprentice, you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier Generalist option, 8,100 hours, and other criteria.
- Trade Qualifier Reinforcing option, 5,400 hours, and other criteria.
- Trade Qualifier Structural/Ornamental option, 8,100 hours, and other criteria.
- Certification for Ironworkers (generalist, reinforcing, and structural/ornamental) is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for appropriate trade.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits
• Retrofitting Techniques include Modifying existing steel structures to improve energy performance, such as integrating thermal breaks or insulation materials. • Enhance building frameworks to support energy-efficient upgrades, such as solar panels and green roofs. • Knowledge of efficient building practices includes familiarity with the building codes and standards related to energy efficiency. • Soft skills such as communication, team collaboration, Problem-solving

Responsible Organizations	• **Nova Scotia Apprenticeship agency offers** apprenticeship training and certification for ironworkers. • **Iron Works Local 752-union** local delivers apprenticeship-level training for ironworkers in Nova Scotia.
Support for Key Competencies	**Nova Scotia Apprenticeship Agency:** • Ironworker (Generalist) - Trade Qualifier • *Certificate of Qualification* • Ironworker (Reinforcing) - Apprenticeship • *Certificate of Qualification* • Ironworker (Reinforcing) - Trade Qualifier • *Certificate of Qualification* • Ironworker (Structural/Ornamental) - Apprenticeship • *Certificate of Qualification* • Ironworker (Structural/Ornamental) - Trade Qualifier • *Certificate of Qualification*

3.6. WELDERS

NOC 72106-*Welders and related machine operators*

Welders join, cut or shape metal using a variety of welding processes and equipment. This group also includes machine operators who use previously set up production welding, brazing, and soldering equipment. They work for companies that manufacture structural steel and platework, boilers, heavy machinery, aircraft and ships and other metal products, and by welding contractors and welding shops, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 5,400-hour apprenticeship program with three apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option: 8,100 hours and other criteria.

- Certification for welders is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for welders.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.
- High pressure welding requires a licence.

Welding, Brazing and Soldering Machine Operators:

- Some high school education.
- Several months of on-the-job training.
- Experience as a machine operator helper may be required.
- Experience with robotics may be required.

Key Competencies for Retrofits

- Welding and fabrication of structural reinforcements for energy-efficient building upgrades, such as insulated panels and steel supports.
- Retrofitting and repairing existing metal structures to support renewable energy systems (e.g., solar panels, wind turbine mounts).
- Precision welding for the installation of heat exchangers, high-efficiency HVAC systems, and piping for geothermal systems.
- Use of sustainable and low-carbon metals to reduce the embodied carbon in retrofit projects.
- Adapting welding techniques for materials used in green retrofits, including lightweight alloys and advanced composites.
- Ensuring welded components align with energy performance goals, including airtightness and thermal efficiency standards.
- Soft skills such as teamwork, adaptability, and problem-solving for integration with multidisciplinary retrofit teams.

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies welders and related trades in the province). • Nova Scotia Construction Sector Council (Supports training and workforce development for sustainable construction).
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Welder - Apprenticeship *Certificate of Qualification* • Welder - Trade Qualifier *Certificate of Qualification* ***Nova Scotia Community College*** • Metal Fabrication (pre-apprenticeship) *Diploma* • Welding (pre-apprenticeship) *Diploma*

3.7. CONSTRUCTION ELECTRICIANS

NOC 72400- *Construction Electricians*

Construction Electricians install, repair, and maintain electrical systems that are designed to provide heat, light, power, control, signals, or fire alarms for all types of buildings, structures, and premises. Construction electricians may work for electrical contractors and maintenance departments of buildings and other institutions, or they may be self-employed. Apprentices are included in this group.

Typical Educational Background:

- High school or equivalent.
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
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- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for Construction Electricians is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for construction electricians.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Assessment of existing building, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- Understanding the amount of building preparation required, for demolition, services disconnect and materials remediation.
- Business acumen, including business case for optimizing cost and performance.
- Building science fundamentals (Building-as-a-system)
- Green building construction strategies such as water efficiency, energy efficiency, indoor environmental quality
- Knowledge on high performance and low carbon equipment, and materials.
- Performing life-cycle assessment (LCA) and calculating embodied carbon
- Adaptive and resilient building strategies
- Soft skills such as communication, negotiation, problem solving, project coordination

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies electricians and oversees training programs in the province). • International Brotherhood of Electrical Workers (IBEW Local Chapters in Nova Scotia support training and advocacy).
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • *Industrial Mechanic (Millwright) - Apprenticeship Certificate of Qualification* • *Industrial Mechanic (Millwright) - Trade Qualifier Certificate of Qualification* ***Nova Scotia Community College*** • Electro-Mechanical Technician (pre-apprenticeship) Diploma • Industrial Mechanical (pre-apprenticeship) *Certificate*

3.8. INDUSTRIAL ELECTRICIANS

NOC 72201- *Industrial Electricians*

Industrial electricians install, maintain, test, troubleshoot and repair industrial electrical equipment and associated electrical and electronic controls. They are employed by electrical contractors and maintenance departments of factories, plants, mines, shipyards and other industrial establishments. Apprentices are also included in this unit group.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with three apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours, and other criteria.
- Certification for Industrial Electricians is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Industrial Electricians.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.
- Additional Construction Electrician Certification may be required for Industrial Electricians when the employers are not owners of the industrial electrical equipment.

Key Competencies for Retrofits

- Installation, retrofitting, and maintenance of energy-efficient industrial electrical systems in retrofits.
- Integration of renewable energy systems, including solar panels, wind turbines, and industrial-scale battery storage.
- Commissioning and maintaining energy management systems for industrial facilities to optimize energy usage.
- Electrification of industrial processes, including converting fossil fuel-driven systems to electric alternatives
- Installation of EV charging infrastructure and power distribution upgrades for industrial sites.
- Use of low-carbon, energy-efficient electrical components to support green retrofits in industrial settings.
- Soft skills such as problem-solving, project management, and communication to effectively collaborate on retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies industrial electricians and oversees training). • International Brotherhood of Electrical Workers (IBEW Local Chapters in Nova Scotia provide advocacy and training) •
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Industrial Electrician - Apprenticeship *Certificate of Qualification* • *Industrial Electrician - Trade Qualifier Certificate of Qualification* ***Nova Scotia Community College*** • Electrical - Industrial Maintenance and Controls (pre-apprenticeship) *Diploma* • *Electrical Construction and Industrial (pre-apprenticeship) Certificate* • *Electro-Mechanical Technician (pre-apprenticeship) Diploma* ***Building trade advancement college of nova scotia***

	• *Electrical Construction and Industrial Pre-Employment (pre-apprenticeship) Certificate*

3.9. ELECTRICAL POWERLINE AND CABLE WORKERS

NOC 72203- *Electrical Powerline and Cable Workers*

Electrical power line and cable workers construct, maintain and repair overhead and underground electrical power transmission and distribution systems. They are employed by electric power generation, transmission and distribution companies, electrical contractors and public utility commissions. Apprentices are also included in this unit group.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours, and other criteria.
- Certification for Powerline Technicians is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Powerline Technicians.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Upgrading powerline and cable systems to support renewable energy integration, including solar, wind, and battery storage.
- Installation of energy-efficient transmission and distribution infrastructure to reduce power losses.
- Retrofitting power grids to accommodate electric vehicle (EV) charging networks and electrified building systems.
- Maintenance and optimization of grid connections for retrofitted buildings with distributed energy systems (e.g., microgrids).
- Expertise in working with advanced, low-carbon materials for powerline and cable installations.
- Ensuring retrofitted systems meet safety and energy performance standards for green retrofit projects.
- Soft skills such as problem-solving, adaptability, and communication for effective collaboration on complex retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies powerline and cable workers in the province). • Canadian Electrical Contractors Association (Supports electrical trades nationally). • International Brotherhood of Electrical Workers (IBEW Local Chapters in Nova Scotia provide training and advocacy). • NETCO (Promotes training for green and energy-efficient practices in electrical trades).

Support for Key Competencies	***Nova Scotia Community College*** • *Power and Utility Line Work (pre-apprenticeship) Certificate* **Nova Scotia Apprenticeship Agency** • Powerline Technician - Apprenticeship *Certificate of Qualification*

3.10. MECHANICAL SYSTEMS AND TRADES

NOC 72300- *Plumbers*

Plumbers plan, install and repair piping and other equipment used to move, store or dispose of water, gas and sewage. They work for maintenance departments of factories, plants, and similar businesses, for plumbing contractors, or they may be self-employed.

Typical Educational Background:

- High school or equivalent.
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for Plumbers is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for plumbers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

NOC 72301- *Steamfitters, pipefitters and sprinkler system installers*

Steamfitters and Pipefitters install piping, equipment, and controls for hot water, steam, process and chemical piping. Sprinkler Fitters install and maintain permanent fire extinguishing systems. Steamfitters and Pipefitters and Sprinkler Fitters work for maintenance departments of factories and plants and similar work sites, for pipefitting or sprinkler system contractors, or may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for Steamfitter-Pipefitters is compulsory in Nova Scotia.
- Certification for Sprinkler Fitters is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Sprinkler Fitters or Steamfitter-Pipefitter.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.
- Petroleum Storage Tank Installers must complete industry training and then apply for certification from Nova Scotia Environment and Climate Change.

NOC 72302- *Gas Fitters*

Gas Fitters (Gas Technicians) install, service and maintain gas-utilizing appliances, piping and equipment. There are two classes of Gas Fitter – Gas Fitter A and Gas Fitter B. Gas Fitter A installs, services and maintains any size of gas-utilizing appliances, piping and equipment. Gas Fitter B installs, services and maintains any size of gas-utilizing appliances, piping and equipment with an input rate of 400,000 Btu/h or less. They work for gas utility companies and gas servicing companies.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a one-level Class A, 1,800-hour or two-level Class B, 3,600-hour apprenticeship program: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 2,700 hours Class A or 5,400 hours Class B and other criteria.
- Certification for Gas Fitters is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Gas Fitters.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.
- Obtain a Fuel Safety Technician license from Technical Safety. A Gas Fitter A or Gas Fitter B Certificate of Qualification is required to apply for a license.

NOC 72402-*Heating, refrigeration and air conditioning mechanics*

Heating, refrigeration and air conditioning mechanics install, maintain, repair and overhaul residential central air conditioning systems, commercial and industrial refrigeration and air conditioning systems and combined heating, ventilation and cooling systems. They are employed by heating, refrigeration and air conditioning installation contractors, various industrial settings, food wholesalers, engineering firms and retail and servicing establishments. Transport refrigeration mechanics are included in this unit group. Apprentices are also included in this unit group.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for refrigeration and air conditioning mechanics is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for refrigeration and air conditioning mechanics.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Knowledge on high performance mechanical systems, including efficient heating, cooling, ventilation and domestic hot water technologies, equipment, and associated distribution solutions
- Knowledge on heat recovery systems including heat recovery ventilators, heat scavengers and wastewater heat extractors
- Knowledge of renewable solutions such as solar hot water heating and photovoltaic systems
- Understanding of air flow in mechanical and ventilation systems.
- Building science fundamentals (Building-as-a-system)
- Green building construction strategies such as water efficiency, energy efficiency, indoor environmental quality
- Soft skills such as communication, negotiation, problem solving, project coordination

Responsible Organizations	• **Nova Scotia Apprenticeship Agency** (Certifies HVAC professionals, gas fitters,steamfitters, pipefitters, and sprinkler installers, plumbers and overseas training).
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Plumber - Apprenticeship *Certificate of Qualification* • *Plumber - Trade Qualifier Certificate of Qualification* • *Sprinkler Fitter - Apprenticeship Certificate of Qualification* • *Refrigeration and Air Conditioning Mechanic - Apprenticeship Certificate of Qualification* ***Nova Scotia Community College*** • *Pipe Trades (pre-apprenticeship) Diploma* • *Gas Technician (pre-apprenticeship) Certificate* • *Building Systems Technician (HVAC&R) (pre-apprenticeship) Diploma* • *Refrigeration and Air Conditioning - Geothermal (pre-apprenticeship) Certificate* ***UA 56 Pipe Trades Career College Ltd.*** • *PipeSteamfitting/Pipefitting (pre-apprenticeship) Certificate Trades (pre-apprenticeship) Diploma*

3.11. CARPENTERS

NOC 72310- *Carpenters*

Carpenters build, install, renovate, maintain, and repair structures and components of structures made of wood, wood substitutes, lightweight steel, concrete, and other materials. They work for construction companies, carpentry contractors, and maintenance departments of factories, plants and other businesses, or they may be self-employed. Boat builders build, assemble and repair small commercial vessels used to navigate in, on through or above water using any method of propulsion. They work for boat building companies and repair shops.

Typical Educational Background:

High school or equivalent (usually).

- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for Carpenters is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Carpenters.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Boat Builders:

- High school or equivalent (usually).

- Training through a 5,400-hour apprenticeship program with three apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after completing industry training; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 9,450 hours and other criteria.
- Certification for Boat Builders is voluntary in Nova Scotia.

Key Competencies for Retrofits

- Knowledge on Passive House airtightness levels and air/vapor barrier systems
- Understanding of building envelope and thermal bridges
- Knowledge on low carbon building materials and embodied carbon
- Building science fundamentals (Building-as-a-system)
- Green building construction strategies such as energy efficiency, indoor environmental quality
- Soft skills such as communication, problem solving, project coordination

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies carpenters and oversees their training). • Nova Scotia Construction Sector Council (Supports skills development for sustainable construction practices). • Carpenters' Union Local (Supports workforce development and advocacy for carpenters in Nova Scotia).
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Carpenter - Apprenticeship *Certificate of Qualification* **Nova Scotia Boat Builders Association** • Boat Builder - Apprenticeship*Certificate of Qualification* • Boat Builder - Trade Qualifier *Certificate of Qualification*

3.12. BRICKLAYERS

NOC 72320- ***Bricklayers***

Bricklayers build and repair walls, floors, fireplaces, and walkways with bricks, blocks and stones. Restoration stone masons build and repair structures using stone. Bricklayers work for construction companies, landscaping companies, bricklaying or masonry contractors or they may be self-employed. Apprentices are included in this group.

Typical Educational Background:

- High school or equivalent.
- Training through a 5,400-hour apprenticeship program with three apprenticeship levels: to become an apprentice first you need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade qualifier option, 8,100 hours and other criteria.
- Trade certification for Bricklayers is compulsory in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for bricklayers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Restoration Stone Mason:

- High school or equivalent.
- Trade qualifier option, 10,800 hours and other criteria.
- Trade certification for Restoration StoneMasons is available, but voluntary, in Nova Scotia.
- Write and score a minimum of 70% on the certification exam for Restoration Stone Masons.

Key Competencies for Retrofits

- Retrofitting masonry walls and facades to improve thermal efficiency and reduce energy loss in buildings.
- Installing and repairing high-performance building envelopes, including insulated masonry systems and energy-efficient cladding.
- Working with low-carbon, sustainable building materials, such as recycled bricks, permeable masonry, and insulating mortars.
- Incorporating advanced masonry techniques to enhance airtightness and thermal insulation.
- Constructing masonry supports for renewable energy systems, such as solar panel mounts and green roofs.
- Application of building science principles to ensure masonry retrofits align with overall building energy performance goals.
- Soft skills such as problem-solving, teamwork, and communication to collaborate effectively with other trades in retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies bricklayers and supports training). • Nova Scotia Construction Sector Council (Promotes sustainable construction practices and workforce development).
Support for Key Competencies	**Building Trades Advancement College of Nova Scotia** • Bricklayer (pre-apprenticeship) *Certificate* **Nova Scotia Apprenticeship Agency** • Bricklayer - Apprenticeship *Certificate of Qualification* • *Bricklayer - Trade Qualifier Certificate of Qualification* • *Restoration Stone Mason - Trade Qualifier Certificate of Qualification* ***Nova Scotia Community College*** • Brick and Stone Masonry *Certificate* • Bricklayer (pre-apprenticeship) *Certificate*

3.13. INSULATORS

NOC 72321- *Insulators*

Insulators (heat and frost) install insulating materials in commercial and industrial structures and remove existing insulating materials like asbestos. They work for construction companies and insulation contractors, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours, and other criteria.
- Certification for Insulators (heat and frost) is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Insulators (heat and frost).
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Installing high-performance insulation systems to improve building energy efficiency and reduce heat loss.
- Retrofitting walls, roofs, and floors with advanced insulation materials, including spray foam, rigid panels, and blown-in insulation.
- Ensuring airtightness and vapour barrier integrity in retrofit projects to enhance thermal performance.
- Working with sustainable and low-carbon insulation materials, such as recycled or bio-based products.
- Installing insulation for HVAC ductwork and piping systems to optimize energy use in retrofitted buildings.
- Understanding building science principles to ensure insulation aligns with "building-as-a-system" energy goals.
- Soft skills such as communication, problem-solving, and teamwork to collaborate effectively with other

trades on retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency (Certifies insulators and oversees their training). • Nova Scotia Construction Sector Council (Supports skills development in sustainable and energy-efficient practices). • Insulators Local 116 (Nova Scotia): This represents heat and frost insulators in Nova Scotia and promotes training and best practices. • Efficiency Nova Scotia: Advocates for energy-efficient practices and supports programs that may involve insulation retrofits.
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • *Insulator (Heat and Frost) - Apprenticeship Certificate of Qualification* • Insulator (Heat and Frost) - Trade Qualifier *Certificate of Qualification*

3.14. CRANE OPERATORS

NOC 72500-Crane Operators

Crane Operators operate cranes or draglines to lift, move, position or place machinery, materials, equipment and other large things at construction or industrial sites, ports, railway yards, surface mines and other similar locations. They work for construction, industrial, ship building, transport sector, mining, cargo handling and railway companies and public utilities.

Typical Educational Background:

- High school or equivalent (usually).
- High school, college or industry courses in crane operating (usually).
- Certification for Mobile Crane Operators is voluntary in Nova Scotia.
- Certification for Tower Crane Operators is voluntary in Nova Scotia.
- Mobile Crane Operators may require a provincial license to drive mobile cranes on public roads.
- Internal company certification as a Crane Operator may be required by some employers.
- Trade Qualifier option: write and score a minimum of 70% on the Red Seal exam for either Mobile Crane or Tower Crane Operators.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.
- A license is required from the Technical Safety Division to work in the mobile or tower crane operator trades.

Key Competencies for Retrofits

- Operating cranes to support the installation of renewable energy systems, such as solar panels, wind turbines, and energy storage units.
- Lifting and placing prefabricated energy-efficient building components, such as insulated panels and modular systems.
- Assisting in retrofits of high-performance building envelopes by hoisting heavy materials, such as low-carbon cladding or glazing systems.
- Handling specialized equipment and materials for green construction, including sustainable and low-carbon building elements.
- Ensuring safe operation and adherence to environmental standards during retrofitting projects.
- Coordinating with multidisciplinary teams to align crane operations with project timelines and energy performance goals.
- Soft skills such as communication, adaptability, and teamwork to integrate crane operations seamlessly into retrofit projects.

Responsible Organizations	• **International Union of Operating Engineers (IUOE)** – Offers training and certifications for crane operators, including green construction practices. • **Construction Safety Association of Ontario (CSAO)** – Provides resources and guidelines on safety in crane operations for retrofits. • **Canadian Hoisting & Rigging Safety Council (CHRSC)** – Offers resources and best practices for handling materials safely during retrofitting projects.
Support for Key Competencies	**Operation Engineers Training Institute of Nova Scotia** • Mobile Crane Operation *Certificate* **Nova Scotia Apprenticeship Agency** • Mobile Crane Operator - Trade Qualifier *Certificate of Qualification* • Tower Crane Operator - Trade Qualifier *Certificate of Qualification*

3.15. CONCRETE FINISHERS

NOC 73100-Concrete Finishers

Concrete Finishers place, finish, cut, and repair concrete floors, driveways, sidewalks, curbs, bridge decks, and other concrete structures. They work for construction companies, cement and concrete contractors, and manufacturers of precast concrete products, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- Over three years of work experience in the trade and some high school, college, or industry courses in cement finishing.
- Trade Qualifier option, 5,400 hours, and other criteria.
- Certification for Concrete Finishers is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Concrete Finishers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Applying advanced finishing techniques to enhance the energy efficiency of concrete surfaces, such as polished or thermally reflective finishes.
- Retrofitting concrete floors and structures to support energy-efficient systems, including radiant heating and cooling systems.
- Repairing and upgrading existing concrete elements to reduce thermal bridging and improve energy performance.
- Using sustainable, low-carbon concrete materials, including recycled aggregates and carbon-reducing additives.
- Assisting in retrofitting building foundations for renewable energy systems, such as wind turbine bases or solar panel supports.
- Ensuring concrete finishing aligns with energy performance and sustainability goals, including airtightness and thermal mass optimization.
- Soft skills such as teamwork, problem-solving, and adaptability to collaborate with multidisciplinary teams in green retrofits.

Responsible Organizations	• Nova Scotia Apprenticeship Agency: Oversees certification and training for concrete finishers in the province. • Nova Scotia Construction Sector Council: Provides training and development resources for green construction practices. • Concrete Association of Nova Scotia (CANS): Promotes best practices in concrete use and sustainability. • Nova Scotia Community College (NSCC): Offers programs related to sustainable construction and advanced concrete techniques.
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Concrete Finisher - Trade Qualifier *Certificate of Qualification*

3.16. TILESETTERS

NOC 73101-Tile Setters

Tilesetters cover interior and exterior walls, floors and ceilings with ceramic, marble and quarry tile, mosaics or terrazzo. They are employed by construction companies and masonry contractors, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- A combination of over three years of work experience in the trade and some high school or college courses in tile setting.
- Trade Qualifier option, 8,100 hours, and other criteria.
- Certification for Tilesetters is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Tilesetters.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Installing energy-efficient and sustainable tile systems, including thermal and radiant flooring compatible tiles.
- Retrofitting surfaces with tiles that improve thermal mass and contribute to energy efficiency in retrofitted buildings.
- Using sustainable, low-carbon, or recycled tile materials to reduce environmental impact in green retrofits.
- Applying advanced waterproofing and insulation techniques to tiled surfaces, enhancing airtightness and thermal performance.
- Coordinating with HVAC specialists for integrating tiles with underfloor heating and cooling systems.
- Restoring and reusing existing tiles where possible to align with sustainable practices and waste reduction goals.
- Soft skills such as teamwork, attention to detail, and communication to collaborate with other trades in retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency: Overseas training and certification for tile setters in the province. • Tilesetters' Local (Nova Scotia): Represents tile setters and supports training and advocacy in the trade.
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Tile Setter - Trade Qualifier *Certificate of Qualification*

3.17. PLASTERS, DRYWALL INSTALLERS AND FINISHERS AND LATHERS

NOC 73102- Plasterers, drywall installers and finishers and lathers

Plasterers apply, finish, and maintain and restore plaster or similar materials, on interior and exterior walls, ceilings and building partitions to produce plain or decorative surfaces. Drywall Installers and Finishers install and finish drywall sheets and various types of ceiling systems. Lathers install support framework for ceiling systems, interior and exterior walls and building partitions. They are employed by construction companies and by plastering, drywalling and lathing contractors, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- A combination of over three years of work experience and some high school, college, or industry courses in plastering, drywalling, or lathing.
- Trade Qualifier option for Drywall Finisher and Plasterer, 8,100 hours, and other criteria.
- Trade Qualifier option for Lather (interior systems mechanic), 8,100 hours, and other criteria.
- Certification for Drywall Finishers and Plasterers is voluntary in Nova Scotia.
- Certification for Lathers (interior systems mechanics) is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Drywall Finisher and Plasterer or Lathers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Installing energy-efficient drywall systems, including insulated and moisture-resistant drywall for high-performance building envelopes.
- Retrofitting walls and ceilings to improve thermal performance and airtightness, contributing to energy efficiency goals.
- Applying advanced plastering techniques to support airtightness and thermal insulation in green retrofits.
- Using sustainable and low-carbon materials, such as recycled drywall or environmentally friendly plaster products.
- Repairing and upgrading interior surfaces to integrate with other energy-efficient systems, such as HVAC or radiant heating.
- Constructing durable and airtight lath and plaster systems in retrofits to reduce heat loss and improve energy performance.
- Soft skills such as teamwork, problem-solving, and communication to collaborate effectively with multidisciplinary retrofit teams.

Responsible Organizations	• Nova Scotia Apprenticeship Agency: Certifies plasterers, drywall installers, and finishers, ensuring industry standards. • Nova Scotia Construction Sector Council • United Brotherhood of Carpenters Local (Nova Scotia): Represents tradespeople involved in drywall installation and finishing. • Nova Scotia Community college
Support for Key Competencies	**Carpenter Millwright College (CMC) Inc.** • Drywall Applications *Certificate* **Nova Scotia Apprenticeship Agency** • Drywall Finisher and Plasterer - Trade Qualifier *Certificate of Qualification* • Lather (Interior Systems Mechanic) - Trade Qualifier *Certificate of Qualification*

3.18. ROOFERS AND SHINGLERS

NOC 73110-Roofers and Shinglers

Roofers install, repair or replace flat roofs as well as shingles, shakes or other roofing tiles on sloped roofs. Shinglers install and replace shingles, tiles and similar coverings on sloped roofs. They are employed by roofing and general contractors, or they may be self-employed. Apprentices are also included in this unit group.

Typical Educational Background:

- High school or equivalent (usually).

Roofers

- Training through a 5,400-hour apprenticeship program with three apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 8,100 hours, and other criteria.
- Certification for Roofers is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Roofers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Shinglers

- Shinglers require one to two years of on-the-job training.

Key Competencies for Retrofits

- Retrofitting roofs to improve energy efficiency, including the installation of reflective roofing materials and green roofs.
- Installing and maintaining photovoltaic (solar) panel systems and their integration with existing roofing structures.
- Working with advanced roofing materials, such as sustainable shingles and low-carbon membranes, to reduce embodied carbon.
- Enhancing thermal performance through airtight roofing systems and additional insulation layers.
- Waterproofing and weatherproofing retrofitted roofs to align with energy-efficient building envelope standards.
- Installing roof-based rainwater harvesting systems and other sustainable water management solutions.
- Soft skills such as problem-solving, teamwork, and communication to collaborate effectively with other trades in retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency • Nova Scotia Construction Sector Council • Roofers Local 409 (Nova Scotia) • Nova Scotia Community College (NSCC)
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Roofer - Apprenticeship *Certificate of Qualification*

	• Roofer - Trade Qualifier *Certificate of Qualification*

3.19. GLAZIERS

NOC 73111-Glaziers

Glaziers prepare, install and replace glass. They work for construction glass installation contractors, retail service and repair shops and glass fabrication shops, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.
- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for Glaziers is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Glaziers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Installing high-performance energy-efficient windows and glazing systems to improve building thermal performance.
- Retrofitting older buildings with advanced glazing technologies, such as double or triple-glazed units and low-emissivity (Low-E) coatings.
- Replacing or upgrading glass façades with systems designed to reduce heat transfer and energy loss.
- Integrating glazing systems with renewable energy components, such as building-integrated photovoltaics (BIPV).
- Utilizing sustainable and low-carbon glass products to reduce the environmental impact of retrofits.
- Applying airtight installation techniques to enhance building envelope performance and reduce energy consumption.
- Soft skills such as attention to detail, problem-solving, and teamwork to coordinate effectively with other trades in retrofit projects.

Responsible Organizations	• Nova Scotia Apprenticeship Agency • Nova Scotia Construction Sector Council • Nova Scotia Community College (NSCC)
Support for Key Competencies	**Nova Scotia Apprenticeship Agency** • Glazier - Apprenticeship *Certificate of Qualification* • Glazier - Trade Qualifier *Certificate of Qualification*

3.20. RESIDENTIAL AND COMMERCIAL INSTALLERS AND SERVICES

NOC 73200-Residential and commercial installers and servicers

Residential and commercial installers and servicers install and service a wide variety of interior and exterior prefabricated products such as windows, doors, electrical appliances, water heaters, fences, play structures and septic and irrigation systems at residential, commercial or institutional properties. They are employed by companies specializing in specific product installation and service.

Typical Educational Background:

- Some secondary school education is usually required.
- On-the-job training and several months of related installing, repairing or servicing experience are usually required.
- A driver's licence may be required.

Key Competencies for Retrofits

- Knowledge in digitization, and automation including Building Automation System (BAS).
- Installation and maintenance of photovoltaic systems
- Knowledge on low carbon building materials and embodied carbon
- Building science fundamentals (Building-as-a-system)
- Green building construction strategies such as water efficiency, energy efficiency
- Soft skills such as communication, problem solving, negotiation, project coordination

Responsible Organizations	• Nova Scotia Department of Environment and Climate Change
Support for Key Competencies	**Nova Scotia Department of Environment and Climate Change** • Septic Installers Compulsory Certification (Mandatory) • Septic Selectors/Designers Compulsory Certification (Mandatory)

3.21. MATERIAL HANDLERS

NOC 75101-Material Handlers

Material handlers handle, move, load and unload materials by hand or using a variety of material handling equipment. They are employed by transportation, storage and moving companies, and by a variety of manufacturing and processing companies and retail and wholesale warehouses.

Typical Educational Background:

- Some secondary school education may be required.
- Physical strength is required for manual material handlers who work with heavy materials.

Key Competencies for Retrofits

- Handling and transporting sustainable and energy-efficient building materials for retrofitting projects.
- Supporting logistics for the delivery and storage of low-carbon materials, such as recycled or bio-based components.
- Organizing and managing materials required for the installation of renewable energy systems, such as solar panels and energy storage units.
- Assisting with waste management practices by separating recyclable materials and reducing landfill contributions.
- Operating equipment safely to move heavy or fragile energy-efficient components, including glazing, insulation, and HVAC units.
- Ensuring materials are stored and handled to maintain quality and performance, especially for sensitive green building products.
- Soft skills such as communication, organization, and teamwork to coordinate effectively with multiple trades on retrofit sites.

Responsible Organizations	• **Nova Scotia Apprenticeship Agency** • **Nova Scotia Construction Sector Council** • **Nova Scotia Trucking Safety Association** • **Labourers' International Union of North America (LiUNA)** – Provides training and certifications for safe and efficient material handling practices. • **Workplace Safety and Prevention Services (WSPS)** – Offers resources on safe handling of materials in construction and retrofit environments. • **Canadian Green Building Council (CaGBC)** – Promotes sustainability guidelines for handling and storing eco-friendly building materials. • **Canadian Standards Association (CSA)** – Establishes standards for handling and managing construction materials with a focus on sustainability.
Support for Key Competencies	**Nova Scotia Community College** • Adult Learning Program Nova Scotia High School Graduation Diploma for Adults

3.22. Considerations on Workforce Capacity & Skills for **Builders and Trades**

- Low green literacy levels and knowledge on energy efficiency and sustainability
    - Limited understanding of green construction principles, including embodied carbon, energy efficiency, and sustainable building systems, inhibits trades people's ability to align with green retrofit goals.
    - There is some degree of resistance from skilled trades professionals to adopt new sustainable techniques and materials due to long-standing practices and skepticism toward unproven methods creates friction in retrofit projects.
- Challenge to keep up with technology advancements and energy efficiency development
    - Increasing reliance on advanced technology, such as Building Automation Systems (BAS), renewable energy installations, and smart systems, demands digital upskilling for effective implementation.
    - Limited awareness and training in handling new, high-performance materials and low-carbon technologies can hinder the quality and efficiency of retrofits.
- Difficulties in coordinating across disciplines to implement energy efficiency
    - Inadequate coordination between trades, engineers, and architects in retrofit projects can lead to delays and inefficiencies, underscoring the need for collaboration and communication.
- Complexity of permits and changing codes for energy efficient retrofits
    - Navigating complex incentive programs and meeting the stringent requirements for energy-efficient retrofits require better literacy in policy frameworks and compliance standards.
- Difficulty to meet high demand for homes while still prioritizing implementation of energy efficiency
    - There is a challenge between meeting the growing demand for homes, while still maintaining energy efficiency standards as a guiding principle.

3.23. Microcredentials for Builders & Trades

1. **Electrical Technician (Nova Scotia Community College)**

This program provides practical and theoretical training in electrical construction and industrial electricity, with a focus on alternative energy systems. Graduates gain skills in green energy systems, including solar photovoltaic, wind, and smart grid technologies. The program includes field experience and optional cooperative education opportunities.

2. **Gas Technician (Nova Scotia Community College)**

This program prepares students for Gas Fitter B Level 1 certification through theory and hands-on training. Students gain practical experience through a mandatory field experience course.

3. **Electrical – Industrial Maintenance and Controls (NSCC)**

Program Focus: Provides practical experience and deeper insights into electrical motors, controls, transformers, solid-state technologies, and automation.

Skill Development: Emphasizes troubleshooting, problem-solving, and managing transistors for various circuits.

Work Experience: Mandatory field experience course (unpaid, approximately 5 weeks) to apply knowledge and skills.

4. **Electro Mechanical Technician (NSCC)**

Program Focus: This program provides training in both electrical and mechanical trades, preparing students for careers in construction and manufacturing.

Skills Developed: Students learn to operate industrial hydraulic and pneumatic systems, weld, install wiring, design motor control circuits, and work in industrial mechanics, electrical, electronic, and computer controls.

Work Experience: Mandatory field experience (unpaid, 5 weeks) and optional cooperative education (paid, full-time, 12 weeks) provide hands-on experience and industry connections.

Physical Demands: Requires adequate vision and colour perception for safe operation.

5. **Carpentry Certificate (NSCC)**

Develop essential skills in the carpentry trade, from construction techniques to adherence to building codes and safety standards.

Program Duration: 6.5 months (accelerated version)

- Program Focus: Provides comprehensive carpentry skills, including wood construction techniques, building codes, and problem-solving, for individuals interested in hands-on work in building and construction.
- Work Experience: Mandatory, unpaid, 5-week field experience course to apply knowledge and skills in a workplace setting.

6. **Metal Fabrication (NSCC)**

This program provides the knowledge and skills to enter the metal fabrication industry, including reading blueprints, using tools and techniques to cut, bend, and join metal, and applying metallurgy knowledge.

7. **Power and Utility Line Work (NSCC)**

Build knowledge of the systems and computer controls, safety training and environmental awareness needed to work as a powerline technician.The Powerline Technician program prepares students for careers in power generation, transmission, and distribution. The program emphasizes safety, electrical technology, and hands-on field experience.

8. **Building It Green (Canada's Building Trades Union)**

Building It Green is a free national training program for the construction industry, developed by tradespeople. The program provides foundational knowledge for delivering high-performance, green construction projects.

9. **Building Envelope Science: Principle and Practices (RRC Polytech)**

This microcredential teaches building science, focusing on the building envelope and its interaction with the environment. It covers topics like energy efficiency, sustainability, and building codes, preparing learners for the low-carbon economy.

10. **Supervising Net Zero and Passive House Construction (quick train Canada)**

Online

The Supervising Net-Zero and Passive House Construction microcredential is for construction industry professionals seeking skills to manage Net-Zero, Net-Zero-Ready, or Passive House projects. Learners will gain knowledge of BC Energy Step Code and Passive House standards, practical construction details, and tools for site supervision.

11. **Heat Pump Installation Advance**
Hybrid (quick train canada)

The Advanced Heat Pump Installation course builds upon basic knowledge, focusing on complex heat pump systems for experienced technicians and engineers. It covers advanced topics like system design, troubleshooting, and energy efficiency optimization.

4. REGULATORS

4.1. ENGINEERING INSPECTORS AND REGULATORY OFFICERS

NOC 22231- Engineering inspectors and regulatory officers

Engineering inspectors and regulatory officers inspect transportation vehicles such as aircraft, watercraft, automobiles and trucks and weighing and measuring devices such as scales and meters as well as industrial instruments, processes and equipment for conformity to government and industry standards and regulations. They are employed by government agencies and in the private sector.

Typical Educational Background:

- University degree or college diploma in an appropriate engineering field or trade qualifications and extensive related work experience are required.
- Appropriate professional engineering or engineering technology certification and license may be required.

Key Competencies for Retrofits

- Inspecting retrofitted systems and materials to ensure compliance with energy efficiency and green building standards.
- Verifying that retrofits meet local and national codes, including environmental regulations and safety standards.
- Assessing the performance of renewable energy installations, such as photovoltaic panels, wind turbines, and battery systems.
- Reviewing designs and construction methods for adherence to sustainability principles, such as low-carbon construction practices.
- Monitoring the use of sustainable materials, ensuring they meet quality and performance criteria for retrofitting projects.
- Conducting energy audits and performance evaluations to certify retrofits meet energy efficiency benchmarks.

Responsible Organizations	• Nova Scotia Department of Labour, Skills, and Immigration • Efficiency Nova Scotia • Nova Scotia Building Officials Association (NSBOA) • Nova Scotia Community College (NSCC)
Support for Key Competencies	**Acadia University** • Engineering and Applied Science *Bachelor* **Saint Mary's University** • Engineering *Advanced Diploma* **Dalhousie University** • Engineering *Bachelor* **Dalhousie University Faculty of Agriculture** • Engineering *Advanced Diploma* **Cape Breton University** • Engineering *Advanced Diploma* **St. Francis University** • Engineering *Advanced Diploma*

4.2. EDUCATION POLICY RESEARCHERS, CONSULTANTS AND PROGRAM OFFICERS

NOC 41405- Education policy researchers, consultants and program officers

Education policy researchers, consultants and program officers conduct research, produce reports and administer elementary, secondary and post-secondary education policies and programs. They are employed by government departments, school boards, research institutes, professional associations and educational and other organizations throughout the public and private sectors, or they may be self-employed.

Typical Educational Background:

- A bachelor's degree in education or in a discipline such as social science or business administration is required.
- A master's degree in education may be required.
- Specialized training or certification may be required.
- Several years of experience as a school teacher are usually required.
- A teacher's certificate for the province of employment is usually required when employed by provincial education ministries.

Key Competencies for Retrofits

- Designing and developing education policies to address workforce needs in energy-efficient retrofitting projects.
- Conducting research on skills gaps and labour market trends to align education programs with green retrofit demands.
- Collaboration with government, industry, and educational institutions to develop curriculum focused on sustainability and energy efficiency.
- Evaluating the impact of policies and programs designed to support green retrofit workforce development.
- Advocating for funding and resources to support education and training initiatives in energy efficiency and sustainability.
- Soft skills such as strategic planning, public engagement, communication, and data-driven decision-making for effective program development.

Responsible Organizations	• Nova Scotia Department of Education & Early Childhood Development, Office of Teacher Certification
Support for Key Competencies	**Acadia University** • Business Administration *Bachelor* • Education *Bachelor, Master, Doctorate* **Cape Breton University** • Business Administration *Bachelor* • Education *Bachelor, Graduate Diploma* **Dalhousie University** • Adult Learning and Teaching *Certificate* • Public Administration *Graduate Diploma, Master* **Mount Saint Vincent University** • Business Administration *Bachelor* • Education *Bachelor, Master, Doctorate* • Management *Bachelor* **Saint Mary's University** • Linguistics - Post-Graduate Certificate for Teachers *Graduate Certificate* • *Management Bachelor* **St. Francis Xavier University** • Adult Education *Advanced Diploma, Master* • *Business Administration Bachelor* • *Education Bachelor, Master, Doctorate* • *Management and Leadership Bachelor* **Université Sainte-Anne** • *Business Administration Bachelor* • *Education Bachelor*

4.3. Considerations on Workforce Capacity & Skills for Regulators

- Low green literacy levels and knowledge on energy efficiency and sustainability
    - Limited knowledge of energy-efficient retrofit technologies and practices among building officials and municipal staff can result in slow decision-making.
    - A lack of green literacy and training on sustainable construction principles, such as embodied carbon and lifecycle assessments, can impact the effectiveness of policy enforcement.
- Complexity of permits and changing codes for energy efficient retrofits
    - Time lags in approving permits arise due to insufficient familiarity with retrofit-specific requirements among both applicants and approvers, delaying project timelines.
    - Challenges in interpreting and applying evolving codes and standards for retrofits often result in confusion or errors in approvals, requiring continuous professional development.
- Difficulties in coordinating across disciplines to implement energy efficiency
    - Limited interdepartmental collaboration and coordination between planners, building officials, and sustainability staff can create bottlenecks in managing retrofit projects efficiently.

4.4. Microcredentials for Regulators

1. **GIS and Data Collection Technologies (Seneca Polytechnic)**
   Online (Quick Train Canada)

This microcredential covers Geographic Positioning System (GPS) and Real Time Kinetic (RTK) data collection, editing, integration, and visualization. It prepares students for careers in Geographic Information Systems (GIS), drone piloting, and environmental analysis. The program is part of a suite of GIS microcredentials, focusing on data collection and analysis for a low-carbon economy.

2. **Introduction to Construction Management**
   Mode (online) NSCC

- **Course Objective:** Develop a framework for monitoring and evaluating construction projects using industry methodologies and sustainable practices.
- **Target Audience:** Individuals with experience in the construction sector, but open to all.
- **Key Learning Outcomes**: Understanding project phases, financial management, environmental impacts, and safety regulations.
- **Greenhouse Gas Emissions:** Buildings account for 18% of Canada's national greenhouse gas emissions.
- **National Retrofit Code:** By 2030, Canadians can expect a national retrofit code for existing buildings.
- **Green Building Workforce:** The green building workforce needs to triple by 2030 to meet demand for sustainable building construction and renovation.

3. **The Consulting Process (The RRC polytech)**

   Online (Quick Train canada)

This microcredential teaches participants how to effectively communicate with Indigenous communities and navigate the consultation process. Participants will learn to identify key people, compile initial assessments, negotiate budgets, and present final reports. This prepares learners for the low-carbon economy by equipping them with skills to navigate consultation processes in industries transitioning to sustainable practices.

4. **Measurement, Monitoring and Verification**

   Online (quick train Canada)

This 60-hour online course, Measurement, Monitoring & Verification (MMV), explores carbon sequestration, focusing on CO2 characteristics, regulations, and technologies. It prepares students for Canada's low-carbon workforce by providing practical knowledge and insights for immediate application.

SECONDARY PROFESSIONS REQUIRED FOR RETROFITS

1. PUBLIC AND ENVIRONMENTAL HEALTH AND SAFETY PROFESSIONALS

NOC 21120-Public and environmental health and safety professionals

Public and environmental health and safety professionals review, evaluate and monitor public health and environmental safety hazards and develop strategies to prevent, control and eliminate disease and environmental impact caused by biological and chemical factors. They inspect restaurants, industrial establishments, municipal water systems, public facilities and institutions to ensure compliance with government regulations regarding sanitation, pollution control and the handling and storage of hazardous substances. They are employed throughout the public and private sectors.

Typical Educational Background:

- A bachelor's degree in a discipline such as food science, environmental studies, chemistry or health and safety is usually required.
- Public health inspectors employed outside Quebec require certification with the Canadian Institute of Public Health Inspectors.
- Environmental health and safety professionals may require certification with the Board of Canadian Registered Safety Professionals (BCRSP).

Key Competencies for Retrofits

- Conducting environmental impact assessments to evaluate the sustainability of retrofitting projects.
- Ensuring compliance with health and safety regulations during retrofits, particularly for hazardous materials like asbestos and lead.
- Implementing best practices in air quality management, waste reduction, and water conservation in retrofit projects.
- Advising on indoor environmental quality (IEQ) to ensure healthy living conditions post-retrofit.
- Knowledge of building codes and green certifications (e.g., LEED, BREEAM) to guide retrofit project compliance.
- **Soft Skills:** Strong communication, problem-solving, and project coordination skills to collaborate with construction teams and partners.

Responsible Organizations	• Nova Scotia Environment: Provides guidelines and regulations for environmental health and safety in construction projects. • Canadian Environmental Health Association: Offers resources on sustainable building practices and environmental health. • Canada Green Building Council – Atlantic Chapter: Promotes sustainable health and safety practices in green retrofitting. • Efficiency Nova Scotia: Supports sustainable retrofit projects that improve environmental health and energy efficiency.
Support for Key Competencies	Acadia University • Chemistry, Bachelor, Master • Environmental and Sustainability Studies, Bachelor Cape Breton University • Chemistry, Bachelor • Environmental Studies, Bachelor Dalhousie University • Chemistry, Bachelor, Master • Environmental Studies (minor), Bachelor • Food Bioscience (minor), Bachelor • Food Science and Technology, Master, Doctorate Dalhousie University Faculty of Agriculture • Food Bioscience (minor), Bachelor Mount Saint Vincent University • Chemistry, Bachelor Saint Mary's University • Chemistry, Bachelor • Environmental Studies, Bachelor St. Francis Xavier University • Chemistry, Bachelor, Master • Climate and Environment, Bachelor University of King's College • Chemistry, Bachelor • Environmental Studies (minor), Bachelor
Considerations on Workforce Capacity & Skills	• Increasing demand for professionals with expertise in sustainable health and safety practices may create workforce gaps. • Limited understanding of green building certifications and IEQ standards may slow green retrofit adoption. • Ongoing training is required to keep up with evolving environmental health regulations and sustainability trends.

2. TECHNOLOGISTS AND TECHNICIANS IN GEOMATICS AND METEOROLOGY

NOC 22212-Technologists and Technicians in Geomatics and Meteorology

Drafting technologists and technicians prepare engineering designs, drawings and related technical information, such as building information models (BIM), in multidisciplinary engineering teams or in support of engineers, architects or industrial designers, or they may work independently. They are employed by consulting and construction companies, utility, resource and manufacturing companies, all levels of government and by a wide range of other establishments.

Typical Educational Background:

- Completion of secondary school is usually required.
- Completion of a two- to three-year college program in engineering design and drafting technology or in a related field is usually required for Drafting and Design Technologists.
- Completion of a one- to two-year college program in drafting or completion of a three- to four-year apprenticeship program or four to five years of related experience plus completion of college or industry courses in drafting are usually required for Drafting Technicians.
- Trade certification for Draftspersons is available, but voluntary in Ontario.
- Certification in engineering design and drafting technology or in a related field through provincial associations of Engineering/Applied Science Technologists and Technicians may be required by employers.
- A period of supervised work experience, usually two years, is required before certification.

Key Competencies for Retrofits

- Conducting site surveys using tools such as GIS and LIDAR to assess existing conditions for retrofit planning.
- Creating accurate digital models of building sites to guide retrofit design and implementation.
- Mapping energy efficiency and climate impact data to inform retrofit strategies.
- Applying knowledge of geographic and weather data to support the integration of adaptive and resilient building strategies.
- Collaboration with project teams to ensure geospatial data aligns with green retrofit goals.
- Soft Skills: Strong problem-solving, data analysis, and communication skills to deliver actionable insights for retrofit projects.

Responsible Organizations	• Geomatics Association of Nova Scotia (GANS): Provides training and support on GIS and data applications for sustainable projects. • Canadian Institute of Geomatics (CIG): Offers education on integrating geomatics into green building initiatives. • Canada Green Building Council – Atlantic Chapter: Promotes the use of geospatial data in sustainable design and retrofitting. • Efficiency Nova Scotia: Supports geospatial analyses for optimizing retrofit strategies.
Support for Key Competencies	Dalhousie University • AutoCAD, Certificate Nova Scotia Community College • CAD Technician - Mechanical, Diploma

	• Drafting - Architectural, Diploma
Considerations on Workforce Capacity & Skills	• Limited availability of professionals skilled in applying geomatics to green retrofits may slow project timelines. • Demand for expertise in advanced tools like GIS, LIDAR, and energy mapping could create skills gaps. • Continuous training is essential to adopt emerging geospatial technologies and integrate them into green retrofits.

3. INTERIOR DESIGNERS AND INTERIOR DECORATORS

NOC 52121-Interior designers and interior decorators

Interior designers and interior decorators conceptualize and produce aesthetic, functional and safe designs for interior spaces in residential, commercial, cultural, institutional and industrial buildings. They are employed by architectural and interior design firms, retail establishments, construction companies, hospitals, airlines, hotel and restaurant chains, and other establishments, or they may be self-employed.

Typical Educational Background:

Interior Designers

- A university degree or college diploma in interior design is usually required.
- The National Council for Interior Design Qualification (NCIDQ) examination may be required after six years of combined study and experience.
- Certification by a provincial institute or association is required to use protected titles related to interior designers in all provinces except Prince Edward Island.

Interior Decorators

- A college certificate or diploma in interior decoration is usually required.
- Membership in the Canadian Decorators' Association is available to qualified decorators.

Key Competencies for Retrofits

- Selecting and recommending sustainable and low-emission interior materials, such as recycled finishes, non-toxic paints, and eco-friendly furnishings.
- Incorporating energy-efficient lighting and adaptive lighting systems into interior designs.
- Applying design principles to optimize natural light and improve indoor environmental quality.
- Ensuring designs align with green building standards and contribute to energy performance improvements.
- Understanding life cycle assessment (LCA) and embodied carbon to guide sustainable material selection.
- Soft Skills: Strong communication, client engagement, and problem-solving skills to align designs with retrofit goals and occupant needs.

Responsible Organizations	• Interior Designers of Nova Scotia: Provides education on sustainable design practices. • Canada Green Building Council – Atlantic Chapter: Promotes green building principles for interior design professionals. • International Interior Design Association (IIDA): Offers resources for integrating sustainable materials into designs. • Efficiency Nova Scotia: Supports adoption of energy-efficient lighting and materials in retrofits.
Support for Key Competencies	Eastern College • Interior Decorating, Diploma Maritime Business College • Interior Decorating, Diploma
Considerations on Workforce Capacity & Skills	• Limited knowledge of sustainable materials and green design strategies may hinder progress in retrofits. • Growing demand for designers with expertise in energy-efficient and sustainable interiors could create skills gaps. • Continuous training is necessary to stay updated on emerging green building technologies and certifications.

4. CONSTRUCTION MILLWRIGHTS AND INDUSTRIAL MECHANICS

NOC 72400- Construction millwrights and industrial mechanics

Construction Millwrights and Industrial Mechanics (Millwrights) install and maintain machinery and equipment in factories and production plants. This group includes Industrial Textile Machinery Mechanics and Repairers. Construction Millwrights work for millwrighting contractors. Industrial Mechanics (Millwrights) work for manufacturing plants, utilities, and other industrial firms.

Typical Educational Background:

- High school or equivalent (usually).
- Training through a 7,200-hour apprenticeship program with four apprenticeship levels: to become an apprentice you first need to have a job - enter an apprenticeship agreement either directly through an

employer or after graduating from a college-level pre-apprenticeship program; learn on the job, mentored by a certified journeyperson who signs off on skills in a logbook.

- Trade Qualifier option, 10,800 hours and other criteria.
- Certification for Industrial Mechanics (Millwrights) is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Industrial Mechanics (Millwrights).
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Installing and maintaining energy-efficient mechanical systems, such as HVAC systems, heat pumps, and ventilation units.
- Retrofitting and optimizing existing mechanical systems to improve energy performance and reduce emissions.
- Assessing and repairing mechanical components to align with green building standards and sustainability goals.
- Knowledge of low-carbon and high-performance equipment to support energy-efficient retrofits.
- Ensuring compliance with environmental and safety standards during installation and maintenance activities.
- Soft Skills: Strong communication, problem-solving, and teamwork skills to collaborate effectively with retrofit teams and clients.

Responsible Organizations	• Canadian Millwright and Machine Erectors Association: Provides resources and training on sustainability-focused mechanical work. • Efficiency Nova Scotia: Supports initiatives for integrating energy-efficient systems in retrofits. • Nova Scotia Apprenticeship Agency: Offers training for millwrights and mechanics in green building technologies. • Canada Green Building Council – Atlantic Chapter: Promotes education on sustainable practices for mechanical systems in retrofits.
Support for Key Competencies	Nova Scotia Community College • Electro Mechanical Technician (pre-apprenticeship), Diploma • Industrial Mechanical (pre-apprenticeship), Certificate Nova Scotia Apprenticeship Agency

	• Industrial Mechanic (Millwright) - Apprenticeship, Certificate of Qualification • Industrial Mechanic (Millwright) - Trade Qualifier, Certificate of Qualification
Considerations on Workforce Capacity & Skills	• Increased demand for skilled millwrights with expertise in energy-efficient systems may lead to workforce gaps. • Limited familiarity with low-carbon equipment and retrofitting techniques could slow project progress. • Continuous training is essential to stay updated on green building technologies and compliance requirements.

5. HEAVY EQUIPMENT OPERATORS

NOC 73400-Heavy equipment operators

Heavy Equipment Operators use a variety of mobile machines and attachments. They excavate, grade, and landscape earth. They also move materials and equipment. They work for construction companies, heavy equipment contractors, public works departments and pipelines, logging, cargo handling, and other companies.

Typical Educational Background:

- High school or equivalent (usually).
- Some high school, college, or industry courses in heavy equipment operating combined with on-the-job training are required.
- Internal company certification may be required by some employers.
- Trade Qualifier option, 8,100 hours, and other criteria.
- Certification for Heavy Equipment Operators is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Heavy Equipment Operators.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Operating equipment for site preparation and demolition with minimal environmental impact.
- Managing material handling for green retrofits, including efficient movement and disposal of debris.
- Familiarity with low-emission and fuel-efficient heavy machinery to support sustainable construction practices.
- Ensuring compliance with environmental standards and safety regulations during operations on retrofit sites.
- Adopting precision techniques to minimize waste and preserve existing building elements during retrofits.
- Soft Skills: Strong teamwork, adaptability, and problem-solving skills to coordinate effectively with construction teams and site managers.

Responsible Organizations	• Nova Scotia Road Builders Association: Provides resources and training for operators on sustainable equipment use. • Canadian Association of Equipment Distributors: Offers guidance on adopting eco-friendly heavy machinery. • Efficiency Nova Scotia: Supports the integration of low-emission equipment in retrofit projects. • Canada Green Building Council – Atlantic Chapter: Promotes sustainable practices for construction equipment use.
Support for Key Competencies	Commercial Safety College • Backhoe Operator, Certificate • Dozer Operator, Certificate • Excavator Operator, Certificate • Heavy Equipment Operator Training, Certificate • Loader Operator, Certificate Dexter Institute • Heavy Equipment Operator, Certificate Maritime Environmental Training Institute • Construction and Oilfield Driver (Class 3), Certificate • Earthmoving Operator, Certificate Nova Scotia Community College • Heavy Equipment Operator, Certificate Operating Engineers Training Institute of Nova Scotia • Fundamentals of Earthmoving, Certificate Nova Scotia Apprenticeship Agency • Heavy Equipment Operator (Dozer) - Trade Qualifier, Certificate of Qualification • Heavy Equipment Operator (Excavator) - Trade Qualifier, Certificate of Qualification • Heavy Equipment Operator (Tractor-Loader-Backhoe) - Trade Qualifier, Certificate of Qualification
Considerations on Workforce Capacity & Skills	• Increased demand for operators trained in sustainable and low-emission practices may create workforce shortages. • Limited availability of low-carbon heavy equipment could delay green retrofit projects. • Ongoing training is needed to adopt environmentally responsible techniques and technologies.

6. FLOOR COVERING INSTALLERS

NOC 73113-Floor covering installers

Floor Covering Installers install many types of resilient or carpet floor coverings in residential, commercial, industrial, and institutional buildings. They work for construction companies, floor-covering contractors, and carpet outlets, or they may be self-employed.

Typical Educational Background:

- High school or equivalent (usually).
- Over four years of work experience in the trade and some courses in floor covering installation are usually required to be eligible for trade certification.
- Trade Qualifier option, 8,100 hours, and other criteria.
- Certification for Floor Covering Installers is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Floor Covering Installers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Installing sustainable and low-emission flooring materials, such as bamboo, cork, and recycled products, to support green retrofit goals.
- Ensuring proper insulation and underlayment to improve energy efficiency and indoor environmental quality.
- Familiarity with materials that reduce embodied carbon and comply with green building standards.
- Applying waste reduction practices during material installation, including precise cutting and recycling leftover materials.
- Maintaining compliance with environmental safety standards, including proper handling of adhesives and finishes.
- Soft Skills: Strong communication, teamwork, and problem-solving skills to coordinate effectively with construction teams and clients.

Responsible Organizations	• Construction Association of Nova Scotia: Provides training and resources for floor covering installers on sustainable practices. • National Floor Covering Association of Canada: Offers guidance on green materials and installation techniques. • Canada Green Building Council – Atlantic Chapter: Promotes resources on green building practices for floor installers. • Efficiency Nova Scotia: Offers support and resources for adopting energy-efficient flooring solutions in retrofits.

Support for Key Competencies	Carpenter Millwright College (CMC) Inc. • Floor Covering Installation, Certificate Nova Scotia Apprenticeship Agency • Floor Covering Installer - Trade Qualifier, Certificate of Qualification
Considerations on Workforce Capacity & Skills	• Limited familiarity with sustainable and low-emission flooring materials may hinder green retrofit progress. • Increased demand for installers skilled in sustainable flooring solutions may create workforce gaps. • Ongoing training is necessary to keep up with green building standards and material advancements.

7. TRANSPORT TRUCK DRIVERS

NOC 73300-Transport truck drivers

Transport truck drivers drive straight trucks or tractor-trailers to transport freight. Long-haul truck drivers operate heavy trucks over urban, interurban, provincial and international routes, while short-haul and local transport truck drivers operate over urban and short interurban routes. They are employed by transportation, manufacturing, distribution and moving companies, and trucking employment service agencies, or they may be self-employed.

Typical Educational Background:

- Completion of secondary school is usually required.
- On-the-job-training is provided.
- Completion of an accredited driver training course of up to five months duration, through a vocational school or community college, may be required.
- A Class 3 or D licence is required to drive straight-body trucks.
- A Class 1 or A licence is required to drive long combination vehicles.
- Air brake endorsement (Z) is required for drivers who operate vehicles equipped with air brakes.
- Transportation of dangerous goods (TDG) certification is required for drivers who transport hazardous products or dangerous goods.
- Additional licensing endorsement or certification may be required to drive articulated trucks.

Key Competencies for Retrofits

- Transporting low-carbon building materials and equipment for green retrofit projects efficiently and safely.
- Familiarity with handling and transporting prefabricated retrofit components to minimize waste and energy use.
- Understanding logistical requirements for delivering materials to retrofitting sites while reducing fuel consumption and emissions.
- Maintaining compliance with environmental standards, such as idling reduction policies and eco-friendly driving practices.
- **Soft Skills:** Strong communication, adaptability, and organizational skills to coordinate with contractors, suppliers, and construction teams.

Responsible Organizations	• Nova Scotia Trucking Safety Association: Provides training on eco-friendly driving practices and transport safety for retrofit projects. • Canadian Trucking Alliance: Promotes green transportation initiatives and best practices for reducing emissions. • Efficiency Nova Scotia: Supports initiatives to incorporate fuel-efficient and low-emission transportation strategies. • Trucking HR Canada: Offers resources and training for sustainable practices in the trucking industry.
Support for Key Competencies	Breton Commercial Truck Training • Miles to Go Class 1 (Tractor Trailer), Certificate • Miles to Go Class 3 (Straight Truck), Certificate Commercial Safety College • Straight Truck Training, Certificate • Tractor Trailer Internship Program, Certificate Dexter Institute • Truck Driver Class 3, Certificate Maritime Environmental Training Institute • Class 1 Driver Tractor Trailer, Certificate Operating Engineers Training Institute of Nova Scotia • Truck Driver Class 3, Certificate

	Transport Training Centres of Canada • Straight Truck Program (Class 3), Certificate • Transport Training Program (Class 1) with Internship, Certificate
Considerations on Workforce Capacity & Skills	• Increased demand for transport drivers with knowledge of sustainable logistics for green retrofits may lead to shortages. • Limited availability of low-emission transport vehicles could impact green retrofit project timelines. • Ongoing training is needed for drivers to adopt eco-friendly driving habits and understand their role in green construction.

8. CONSTRUCTION TRADE HELPERS AND LABOURERS

NOC 75110-Construction trades helpers and labourers

Construction trades helpers and labourers assist skilled tradespersons and perform labouring activities at construction sites, in quarries and in surface mines. They are employed by construction companies, trade and labour contractors, and surface mine and quarry operators.

Typical Educational Background:

- Some high school education may be required.
- On-the-job training is provided.
- Some experience as a General Construction Labourer may be needed for Construction Trade Helpers.
- Some pipeline workers, like Stabbers, Mandrel Operators and Preheater Tenders, usually need one season of experience in oil and gas pipeline construction.
- Flagmen/women may need a traffic control certificate.
- Riggers and slingers may require a rigging certificate.
- Trade Qualifier option for Construction Craft Workers, 5,400 hours, and other criteria.
- Certification for Construction Craft Workers is voluntary in Nova Scotia.
- Write and score a minimum of 70% on the Red Seal exam for Construction Craft Workers.
- Red Seal Endorsement (RSE) allows for interprovincial mobility.

Key Competencies for Retrofits

- Assisting in the installation of energy-efficient systems such as HVAC units, lighting, and insulation for green retrofits.
- Preparing sites for retrofitting, including demolition, materials removal, and remediation while adhering to environmental standards.
- Handling and managing sustainable and low-carbon building materials during retrofitting projects.
- Supporting construction teams in implementing adaptive and resilient building strategies to improve energy performance and durability.
- Maintaining safety and environmental compliance during the handling and disposal of materials.
- **Soft Skills:** Strong teamwork, adaptability, and problem-solving skills to collaborate effectively with contractors and specialists on retrofit sites.

Responsible Organizations	• Construction Association of Nova Scotia: Provides training and resources for labourers to develop green building and retrofitting skills. • Efficiency Nova Scotia: Offers guidance on energy-efficient construction practices for labourers. • Labourers' International Union of North America (LiUNA): Supports training and certification in green construction and safety practices. • Canada Green Building Council – Atlantic Chapter: Promotes education and resources on green building for construction trades.
Support for Key Competencies	Commercial Safety College • Road Building Labourer, Certificate Dexter Institute • Heavy Civil Skilled Worker, Certificate Maritime Environmental Training Institute • Safety Certified Labourer, Certificate • Scaffolding, Certificate Nova Scotia Community College • Housing Construction Fundamentals, Certificate of Completion

	Nova Scotia Apprenticeship Agency • Construction Craft Worker - Trade Qualifier, Certificate of Qualification
Considerations on Workforce Capacity & Skills	• Growing demand for labourers with experience in handling sustainable materials and supporting energy-efficient retrofits may create workforce shortages. • Limited awareness of sustainability practices among construction helpers could slow down green retrofitting adoption. • Ongoing training is necessary to ensure labourers are familiar with energy-efficient technologies and environmental standards.

9.Considerations on Workforce Capacity & Skills for Secondary Professions

- Low green literacy levels and knowledge on energy efficiency and sustainability
    - Limited green literacy and an understanding of sustainable practices, energy-efficient materials, and low-carbon technologies, slows down the rate of energy efficient solutions being implemented.
    - Resistance to adopting new sustainability-focused processes and methods can arise due to reliance on traditional approaches, causing inefficiencies in retrofitting projects.
- Challenge to keep up with technology advancements and energy efficiency development
    - Lack of sufficient training in handling innovative materials and tools, such as energy-efficient finishes, low-carbon flooring, and specialized retrofit equipment, can compromise project quality.
    - Challenges in operating advanced tools, such as Building Information Modeling (BIM) software or machinery suited for sustainable construction, necessitate targeted upskilling efforts.
- Difficulties in coordinating across disciplines to implement energy efficiency
    - Difficulty in coordinating interdisciplinary tasks, especially for general construction labourers and equipment operators, emphasizes the need for better communication and team integration in retrofitting projects.

10. Microcredentials for Secondary Professions

1. **Safety and Environmental Impact (Quick Train Canada)**

   Online

This microcredential focuses on mechanically driven boat operation, emphasizing operator safety and environmental impact reduction. It covers topics like limiting air pollution and controlling hazardous spills in waterways.

This microcredential prepares for a low-carbon economy by:

- Understanding environmental impacts and carbon emissions reduction
- Safe boat operation reduces water incidents and pollution
- Minimizing the environmental impact of drive systems

Canada's Action Plan Framework considers the impacts of emissions-intensive trade on exposed sectors, including resource sectors. It aims to avoid carbon leakage and achieve co-benefits like improved health and job growth.
New Action (Transportation) sets emission standards and improves efficiency.

2. **Sustainable food supply chain system in track and trace (Quick Train Canada)**
   Online

This course focuses on developing a comprehensive understanding of monitoring shipments with tracking and tracing practices, technology, and transaction protocols. The course explores the complexities of track and trace in relation to authenticity, safety, and sustainability, addressing issues related to environmental impact, social equity, and economic viability.

3. **Construction and the Environment (Quick Train Canada)**

   Online

This course equips students with knowledge and skills to thrive in a low-carbon economy by analyzing and managing environmental impacts in construction. Students learn about environmental regulations, sustainable practices, and innovative materials to reduce the carbon footprint in the construction industry.

4. **Mapping and Compassing (Quick Train Canada)**

   Online

This microcredential teaches map interpretation, ground and map measurements, and internet mapping software basics. It prepares learners for careers in ecological conservation, environmental tourism, and resource management.

5. **Whole building life cycle assessment (LCA) Professional**

   Online (Quick Train canada)

The Whole-Building Life Cycle Assessment Professional microcredential equips learners with knowledge and skills to effectively use LCA in construction design. Learners will gain foundational knowledge of life cycle thinking, embodied carbon, and LCA standards and methods, enabling them to conduct whole-building LCAs and calculate the carbon impact of building materials. Upon completion, learners will have advanced knowledge and skills in whole-building LCA, experience conducting whole-building LCA using Athena LCA software, and the ability to interpret results and

create proper environmental building declarations.

6. **Essentials of Net-Zero and Passive House Construction (British Columbia Institute of Technology)**

   Online

The Essentials Net-Zero and Passive House Construction microcredential equips individuals with the skills to construct high-performance buildings meeting BC Energy Step Code, Net-Zero Energy, and Passive House standards. The program covers building enclosures, electrical and mechanical systems, and processes for these new codes and standards. Upon completion, learners will have the confidence and skills to ensure project compliance and achieve high-performance levels.

7. **Diesel Exhaust Emission Reduction System (RRC Polytech)**

   In Person

The Diesel Exhaust Emissions Reduction Systems microcredential covers the latest technologies in emission reduction systems for diesel and heavy-equipment technicians. Participants will learn to diagnose and repair after-treatment systems, including EGR, DPF, and SCR systems, contributing to reduced emissions.

8. **Design of Carbon Transportation infrastructure (Quick Train Canada)**

   Online

This 32-hour online course, Design of Carbon Transportation Infrastructure, covers carbon pipeline transportation, from conceptualization to design and validation. It prepares students for Canada's low-carbon workforce by teaching principles of CO2 pipeline transportation, including system design, simulation, and life cycle assessments**.**

9. **Sustainability within supply chain (Quick Train canada)**

   Online

This microcredential focuses on sustainability practices within the supply chain sector, using the Supply Chain Operations Reference (SCOR) Model to navigate sustainability through environmental, social, and economic pillars. Students will learn about sustainability's importance, business drivers, supplier relationships, and improvement strategies, preparing them for the low-carbon economy.

Appendix 5: Key Findings

What We Heard During Interviews

This section highlights the main findings and recommendations that were identified through key informant interviews. It is separated by the three types of stakeholders interviewed:

1. Policy Makers
2. Enablers
3. Beneficiaries

i. Policy Makers

Challenges Identified

Policy makers include those who participate in or influence federal, provincial, or municipal governments and energy regulators. We interviewed 8 policy makers.

Challenges fell under two categories:

A. Energy Efficiency in Implementation of Retrofits
B. Engaging Marginalized Communities in Skilled Trades

A. Incorporating Energy Efficiency into the Implementation of Retrofits

Permitting and Rebates

- Unfamiliarity with permitting processes and accessing rebates to undertake energy efficiency retrofits by homeowners, contractors, and municipalities creates delays and discourages project implementation.
- Compulsory certification requirements in Nova Scotia related to energy efficiency retrofits can overcomplicate and prolong project approvals, especially when adopting new technologies.
- The process to access federal funding, grants, and other incentives is complex, slowing down the adoption of energy-efficiency measures and frustrating those willing to go through the arduous process.

Resistance to Stricter Building Codes

- Developers' are resistant to adopting higher energy efficiency standards due to perceived increased costs and misalignment with market demand for affordable and quickly available housing.
- Current codes can be perceived as inadequate for driving meaningful energy efficiency gains, yet enforcement of stricter codes is met with significant pushback, as it can result in added construction costs for projects.
- The lack of climate literacy among developers and existing tradespeople generates resistance to change and in the adoption of new efficiency initiatives. There is a limited sense of the urgency and importance of these initiatives.

Low green literacy

- A general lack of awareness and urgency exists among developers and property owners, about the financial and environmental benefits of retrofits and energy efficiency. This is partly due to the perceived non alignment between the government's emissions goals & rising housing demand.
- There is a need to educate and inform communities in smaller and rural areas as many of them remain unaware of green career pathways, opportunities and the support available for retrofits. Tailored community outreach must be consistent and respect cultural differences.
- Misaligned communication channels have resulted in low public engagement, particularly in rural regions. There is support for individuals and incentives they can access, but a lack of centralization and consistent outreach to generate necessary climate literacy remains.

Delivery and Navigation Support

- The skilled trades sector can have pinch points in service delivery due to inefficiencies in deliveries of material to construction sites, rendering workers unable to start working. This can be misinterpreted as a labour or supply shortage.
- Property owners struggle with navigating the complexity of available supports and construction permits. Accessible advisory services and awareness campaigns are needed to guide residential property owners through complex information about financial incentives and rebates, as well as retrofit strategies and options.

Awareness

- Retrofits often focus on superficial fixes like heating systems without prioritizing foundational measures like insulation, even though there are incentives to support deeper retrofits.
- Scheduled residential retrofits do not always take full advantage of efficiency opportunities, accessing all available incentives.
- Collaboration between tradespeople and policymakers could better align retrofit designs with practical needs of homeowners and developers. Collaboration is needed to build workforce capacity and match increasing demand.

Complexity of Retrofit Requirements

- There is a burden on residential property owners to navigate energy retrofit requirements without professional support. Support offered is not centralized and can be challenging to access.
- Limited architectural or engineering guidance often leads to suboptimal decisions, reducing the effectiveness of retrofits. Especially when not taking advantage of all available financial incentives.
- Programs providing education and advisory services for property owners could alleviate this challenge, and although more are being developed, there is still a long way to go.

B. Engaging Marginalized Communities

Workplace Harassment, Cultural and Systemic Barriers

- Prevalence of workplace harassment and lack of inclusivity are significant deterrents for women and underrepresented groups to participate and thrive in skilled trades.
- Personal protective equipment (PPE) often does not accommodate diverse needs, creating a poor fit that can be hazardous to individuals and peers.
- Cultural sensitivity training for instructors and employers is insufficient, leading to uncomfortable or hostile work environments where stigmas and stereotypes are commonly accepted.

Lack of Rural Access & Transportation

- Opportunities are often concentrated in urban areas, making them inaccessible to rural and Indigenous communities who lack proper access to transportation.

- There is a significant need for distributed education models to bring affordable and accessible training closer to rural and on-reserve apprentices, both via online resources, and extending training to rural areas.
- Lack of transportation and infrastructure in rural areas worsens the accessibility challenge, as individuals who are interested cannot mobilize to where the training is offered, and satellite campuses or spaces available are scarce.

Inaccessible Training Schedules Wraparound supports like childcare and transportation are essential to help people from marginalized communities participate in training.

- Many programs do not offer flexible scheduling, leaving individuals unable to balance work, training, and personal responsibilities.
- There is limited financial assistance for tools and resources like PPE, which is expensive and required for some base-level trades training.
- Creating new opportunities for marginalized communities is not addressing the root cause of all the challenges which stem from historic racism and harassment.

Long Certification Process

- Trades requiring multiple certifications, such as heat pump installation, discourage new entrants due to complexity. This happens more for trades with compulsory red seal requirements.
- Variability in certification standards across provinces further complicates entry into the skilled trades. Some provinces have more relaxed compulsory trades requirements, making them more appealing for some individuals.
- Addressing certification challenges requires simplification and alignment of standards, particularly for new green technologies.

Historical Mistrust, Low Representation, & Lack of Tailored Outreach

- There is a lack of tailored communication efforts to inform equity-deserving communities about skilled trade opportunities. It is necessary to ensure outreach reaches beyond traditional bubbles.
- Historical mistrust of institutions and initiatives has created barriers to engagement. This is especially true with initiatives to improve schooling success of Indigenous communities. Education and training options must be made available in Mi'kmaw communities.
- Trusted community champions are needed to act as bridges for building awareness and trust. These individuals can inspire and guide youth members to succeed in the industry. But first, there must be an increase in representation rates of people from equity-deserving communities.

Low Apprenticeship Completion Rates

- Financial constraints and a lack of support systems contribute to low completion rates among marginalized groups often struggling financially or with hard skills like math.
- Exam anxiety and inadequate preparation are barriers to successful certification, especially to those individuals who do not have a history of thriving in schooling systems.
- Programs offering mentorship and academic assistance have shown promise in improving completion rates but remain limited in scope.

ii. Enablers

Challenges Identified

Enablers include those in the private sector (construction & energy efficiency retrofits), training providers, academic institutions, and local job agencies. We interviewed 21 enablers). They identified challenges in two categories:

A. Implementation of Retrofits
B. Engaging Marginalized Communities in Skilled Trades

A. Challenges in the Implementation of Retrofits

High Upfront Costs

- The high initial costs (reimbursable) for upgrading electrical panels or installing heat pumps are a significant burden for low-income households. Rebate programs often require upfront payments for complementary required services or contractors, which excludes those without access to sufficient capital.
- Even with rebates, the out-of-pocket expenses remain prohibitive for many homeowners, especially when not covered by financial incentives.
-
- Financial incentives are heavily reliant on government funding, creating uncertainty and instability with political shifts.

Low Awareness of Incentives

- Many homeowners, especially in rural and low-income areas, are unaware of available programs, financial incentives and other benefits they can access.
- Green literacy among professionals and the general public is inconsistent; even architects and tradespeople lack basic knowledge about energy-efficient practices.
- Education efforts fail to emphasize practical benefits such as cost savings and improved air quality, limiting uptake and interest.
- Misaligned promotion and communication strategies hinder engagement with marginalized groups who still report low awareness of career pathways for green jobs and how to access energy efficiency support.

Delayed Building Codes

- Delays in implementing updated building codes, such as Nova Scotia's slow adoption of national standards, impede energy efficiency progress.
- New codes do not require energy efficiency upgrades during major renovations, missing opportunities for impactful retrofits.
- Lack of integration between energy efficiency goals and affordable housing development creates tension, as higher energy efficiency is perceived to come at a higher cost.
- Voluntary measures in building codes fail to drive widespread adoption of energy-efficient retrofits.

Complex Incentives & Inconsistent FundingMultiple steps and extensive paperwork make rebate programs challenging to navigate, particularly for marginalized groups.

- Inconsistent funding for programs like Canada Greener Homes creates uncertainty for consumers and contractors of what is available at the moment of application.
- Coordination between different programs, such as those managed by Efficiency Nova Scotia and Nova Scotia Power, is lacking, and information is not centralized.
- Homeowners often lack guidance to choose and access the most suitable incentives, and take advantage of their retrofitting project.

Worker Shortages

- There is a shortage of tradespeople trained in emerging technologies like solar installations and deep retrofits. Despite transferable skills, more efficiency specific knowledge is needed.
- Microcredentials for tasks like HVAC installation address gaps but need scaling and alignment with industry needs in regards to energy efficiency.
- Practical training on energy efficiency retrofits is insufficient, with 60–70% of skills learned on the job site rather than through formal education.

- Some universities resist non-credit training models, such as microcredentials, slowing upskilling.

Price Sensitivity

- The construction industry prefers minimal compliance with energy efficiency standards due to cost concerns coming from more expensive materials and longer duration of construction.
- Builders prioritize speed over meeting net-zero goals to be able to meet high housing demand.
- Subcontracting specialized tasks like solar installations prevents companies from building internal capacity to implement energy efficiency at a large scale.
- Industry members often resist stricter building code requirements, even when feasible, because the permitting processes take too long.

B. Challenges in Engaging Marginalized Communities in Skilled Trades

Workplace Culture, Harrassment, and Exclusion

- Persistent harassment and exclusion in male-dominated worksites deter women and other marginalized groups from succeeding.
- Toxic masculinity reinforces dangerous behaviours. Lack of accessibility accommodations prevents injured workers from joining the trades workforce after healing.
- Predominantly white workplace cultures make it hard for Black, Indigenous, and People of Colour to integrate, unless they conform to norms and accept discrimination.
- Inadequate accommodations, such as Personal Protective Equipment (PPE) that doesn't fit women and disabled workers, creates exclusion in the workforce.

Inaccessible Education

- Training programs are geographically concentrated in urban areas, making them inaccessible for rural residents and Mi'kmaw communities.
- Apprenticeship programs don't have standardized teaching methods, which leads to uneven learning and skill development.
- Unpaid training periods disproportionately affect marginalized individuals with family responsibilities who cannot afford to stop receiving an income.
- Awareness of alternative training models like microcredentials, offering more flexible and affordable options, is limited due to lack of publicity and scarcity of such programs.

Lack of Representation

- Women and people from equity-deserving communities rarely see role models in trades, reducing interest and confidence due to their low representation.
- Recruitment efforts often fail to connect with grassroots networks in marginalized communities, which are better positioned to help.
- Racism and sexism in unions and industry bodies create barriers for the certification and advancement opportunities for Black workers.
- DEI initiatives are seen as superficial and fail to address root causes of exclusion, there is an opportunity to have a more honest discussion about the topic. These initiatives are very important but perhaps it is useful to start talking more about inclusivity and equity, and not diversity for the sake of diversity.

Transportation and Finances

- Costs associated with training and relocating for programs are significant hurdles for many participants who cannot continue their development after a rural training centre is closed.
- Lack of transportation and childcare options disproportionately impacts marginalized individuals who do not have the financial means to cover these expenses.
- Criminal records and test anxiety prevent individuals from entering or succeeding in skilled trades even if support programs are offered.
- Insufficient wraparound supports, such as wage subsidies, limit program effectiveness as participants cannot fully concentrate on succeeding in the training to meet their other responsibilities.

Students Struggle to Pass Exams

- High failure rates on certification exams, like the Red Seal, discourage participation. The training received and what candidates are tested on can have disparities causing challenges, and expensive retakes limit success rates.
- Training programs often lack alignment with real-world job requirements, creating skill gaps.
- Apprenticeship structures do not adequately prepare marginalized groups for industry demands.
- There is limited guidance for educators on addressing the diverse needs of students' cultural backgrounds and learning styles, including learning disabilities.

Stigma

- Trades are undervalued in some communities, viewed as a last resort compared to university education. This is partly due to low awareness of career pathways and negative stereotypes.
- Negative perceptions of trades discourage women, minorities, and young workers from exploring these careers.
- Efforts to promote trades fail to highlight their financial viability and societal importance.
- Marginalized communities face generational and cultural barriers to seeing trades as viable career options.

iii. Beneficiaries

Challenges Identified

Beneficiaries are Black, Indigenous or People of Colour, or are Newcomers to Canada, women, students, or early/mid-career professionals. We interviewed 10 beneficiaries.

A. Challenges to joining skilled trades workforce and entering green jobs

Low Green Literacy and Awareness of Opportunities

- Green literacy levels are low, especially with individuals who are not actively involved in green jobs, and in rural areas.
- Green jobs are poorly marketed, and sometimes don't have accurate job titles or clear descriptions.
- With the high demand for trades, there is an opportunity for the government to increase promotion of trades and green jobs to match with the increased demand for housing and combat labour shortages.

Financial & Systemic Barriers

- Older and mid-career professionals face hardships securing access to loans and financial support for their education and training. They can be stereotyped and expected to already be established professionals.
- Lack of clear guidance of required certifications creates confusion and leaves candidates unprepared when neither job postings or educational institutions can articulate clear career pathways and requirements.
- Common preconception of trades as a white male-dominated field creates cultural and systemic barriers. Women report struggling to be taken seriously, and racial

biases discourage entrants from diverse backgrounds, reporting having some clients initially doubting their skill level due to their background.

Underrepresentation of People from Equity-Deserving Communities

- Underrepresentation is a self-reinforcing cycle. Lack of clear representation of women and other equity-deserving groups discourages participation. Informants say few women are present in the HVAC industry, conferences, and classrooms.
- Younger generations want more role models and relatable mentors to see green jobs as viable career paths, especially for Black, Indigenous and People of Colour in rural areas.
- Due to deeply entrenched stereotypes about people from equity-deserving communities, they have to put in extra effort to succeed. A young professional even reported facing criticism for being young and stereotyped as a "dumb blonde."

Access to Education

- Training programs are often too time-intensive and expensive, making them inaccessible to a large number of individuals who lack the financial resources and transportation.
- Rural and Mi'kmaw communities lack access to training because of a lack of training facilities and no adequate availability of transportation.
- Sustainability and green literacy education are introduced too late in children's schools and even post-secondary programs, creating a lack of basic knowledge and interest.

Low Retention

- Comparatively lower salaries for green job professionals in Nova Scotia causes skilled workers to leave the province, stifling innovation and local expertise.
- Perceived limited job opportunities, even for qualified professionals, can be discouraging for those who are interested in joining the local workforce.
- Lack of suitable facilities and amenities in construction worksites, specially with smaller non-unionized businesses, creates a challenging working environment. This includes washrooms and changing facilities, PPE, and other necessities.

Low Prioritization of Sustainability

- Individuals with experience in trades have noted that often contractors prioritize cost over sustainability and quality in retrofitting projects.

- Education centres fail to highlight green career pathways and connect students with key organizations, worsening the lack of centralization of resources and fomenting low awareness and interest levels.
- Older generations and contractors have demonstrated friction in the adoption of green energy initiatives. This issue tends to be experienced to a greater degree in rural communities.

Appendix 6: Jurisdictional Scan

This section analyzes the landscape of energy efficiency in North America, focusing on Canada, for governmental and non-governmental programs to improve energy efficiency and support marginalized groups.

Items in Jurisdictional Scan Section:

1. Energy Efficiency Index (Scorecard)
2. Energy Efficiency Programs by Province
3. Tool to Support Local Climate Action & Workforce Development
4. Programs to Include Marginalized Groups in Skilled Trades & Green Jobs in Canada
5. Construction Industry Sectors
6. Building Codes in Canada

1. Energy Efficiency Index (Scorecard)

Efficiency Canada – 2024 Canadian Energy Efficiency Scorecard

Energy efficiency and a green energy transition have been a priority across all Canadian provinces, as they all must work together to achieve the country's net-zero objectives. A good way to conceptualize current efforts and progress in energy efficiency at a provincial level is through Efficiency Canada's Scorecard. The most recent version was released in 2024 (Efficiency Canada, 2024).

The scorecard tracks Canadian provinces and territories on 45 metrics across 16 topics and categorizes them into five main policy areas to provide an overall score: Energy Efficiency Programs, Enabling Policies, Buildings, Transportation, and Industry. The report measures

progress on energy efficiency programming and takes all of these factors into account when rating each province's efforts. The ranking scores provinces out of 100 available points, with the highest score representing best-in-class benchmarks and best-practice policy.

The maximum points should not be analyzed as percentage grades but rather as reflecting best-in-class policies and performances consistent with the ambitious requirements to meet and surpass the national policy objectives (Efficiency Canada, 2024). The 2024 scorecard was released in December 2024, and it is an update to their 2022 scorecard. Both maintained virtually the same scoring mechanisms and give us an insight of the energy efficiency progress across Canada.

Efficiency Canada 2024 Energy Efficiency Scorecard (Scored out of 100)

1. British Columbia (54)
2. Prince Edward Island (45)
3. Quebec (45)
4. New Brunswick (43)
5. Nova Scotia (40)
6. Ontario (33)
7. Yukon (32)
8. Manitoba (30)
9. Saskatchewan (16)
10. Newfoundland and Labrador (14)
11. Alberta (8)

Compared to the 2022 scorecard, British Columbia retained first place, while Prince Edward Island rose to second place, and Quebec City climbed to third place. Nova Scotia slipped from second to fifth (Efficiency Canada, 2022).

Nova Scotia's lower ranking in the latest scorecard can be attributed to a few reasons, most notably the struggle to keep up with neighbouring provinces with efficiency rebates and outreach and education campaigns. Time lags in new building code adoptions and a lack of a timeline to reach net-zero energy-ready code requirements has been another downfall. Another reason is the failure to adopt and implement mandatory energy and emissions performance standards for existing buildings (Efficiency Canada [NS], 2024).

2. Energy Efficiency Programs by Province

This section will provide an overview of the current state of 5 of the provinces listed on the scorecard from the previous section: British Columbia, Nova Scotia, Quebec, Prince Edward Island and Ontario. It will highlight the province's net-zero targets and energy efficiency objectives as well as their flagship programs related to energy efficiency. This discussion is followed by a table that summarizes the main programs across all provinces.

A. British Columbia

The province of British Columbia has been a national leader in reducing greenhouse gas emissions by developing proactive policies and investing in green energy. One of the primary drivers of this success is the CleanBC Roadmap to 2030, released by the province in 2021, setting ambitious goals for reducing greenhouse gas emissions. The roadmap aims for a 40% reduction below 2007 levels by 2030, making all new buildings zero carbon, requiring space and water heating to be 100 percent efficient by 2030, and implementing energy efficiency labels during home sales (CleanBC, 2021).

BC plans to achieve these goals through several initiatives, including prioritizing energy efficiency in buildings through retrofits, and low-carbon construction to transition the province's housing and commercial sectors toward net-zero energy standards (Efficiency Canada, 2022). To address the retrofitting challenge, the province has directed resources to their Better Homes and Better Buildings programs to reduce emissions

One of the province's flagship energy efficiency retrofit programs is CleanBC's Better Homes Energy Savings Program. The program is designed to make energy-efficient retrofits more accessible to homeowners, businesses, and building operators across the province. Some of the key offerings are rebates for energy-saving upgrades like insulation, energy efficient windows and doors, heat pumps, and ventilation systems. The incentives take into consideration the income levels of the households, providing accessible solutions to low-and-moderate-income households to ensure equitable access to energy saving upgrades.

The program also offers tools for energy assessments, which helps users understand the most cost-effective improvements for energy efficiency. Their energy savings program offers up to $44,900 to any B.C. citizen who lives in an eligible home and meets income qualification requirements, and it is funded by the government of Canada, the Province of British Columbia, and BC Hydro (Clean BC - Energy Savings Program).

As part of CleanBC, they also offer the Better Buildings Program, tailored to commercial properties. It offers incentives both for energy-efficient renovations and for new constructions. The incentives for upgrades to existing buildings target sectors like small businesses, non-profit organizations, and multi-unit residential buildings. The funding targets improvements such as advanced lighting, HVAC systems, insulation, and energy management systems. Part of the program also offers energy assessments, which help businesses identify what upgrades would be most impactful for energy savings and emissions reduction. Incentives go as high as $100,000 per project(Clean BC - Better Buildings).

B. Nova Scotia

Nova Scotia has set ambitious climate and sustainability goals, such as achieving net-zero by 2050. All of these objectives were laid by their 2021 Environmental Goals and Climate Change Reduction Act (EGCCRA), which mandates progressive targets to achieve greenhouse gas reductions and improved energy efficiency (Environmental Goals and Climate Change Reduction Act. 2021).

Initiatives that help support these objectives are essential to achieving the province's long-term environmental objectives. Building retrofits play a significant role in energy use, being the third largest source of greenhouse gas emissions in the province (Urgent Action - Gov. of NS). There is significant alignment with federal initiatives and most provincial level programs are delivered primarily through partnerships. The most important organization delivering support through energy efficiency programs and incentives is Efficiency ONE. They offer services at the residential level, such as home energy assessments (after which households could qualify for up to $30,000 in rebates), rebates for heating systems, heat pumps (up to $10,000) and other energy saving products (up to $400) (Efficiency ONE - Residential).

Other energy efficiency-focused programs by Efficiency ONE are the New Home Research Project, which offers energy efficiency evaluations at no charge, and the Affordable Housing Development Program, focused on funding affordable housing providers' energy efficiency improvements like insulation and heating and window upgrades, on the condition that the housing providers commit to long-term affordable rent prices (Gov of NS New Supports, 2024).

The second program targets multi-family housing complexes that serve low and moderately low income tenants, and helps to keep operating costs low for housing providers. The funding available is up to 50% of the rental units in a project. For projects with fewer than 10 rental units, the funding available is for 100% of the units (Gov of NS - apply for funding).

The remaining costs will be paid for by the owner. The projects must offer rental units at least 20% below the average market rent, for a minimum of 15 years (Turner & Drake, 2024).

Lastly, Efficiency ONE also provides a program targeted to small businesses through the Small Businesses Energy Efficiency Solutions Program. This involves financial incentives (24-month interest-free financing) for energy assessments and upgrades to improve energy efficiency in small commercial spaces. Some eligible upgrades include HVAC, refrigeration, lighting, and insulation (Efficiency - Small Businesses). This program is important because improving the operational costs and energy uses from local businesses is an important step to reducing overall emissions levels.

C. Quebec

Quebec has made important progress towards achieving a greener energy and economy, and all of its efforts are consolidated in the province's 2030 Plan for a Green Economy. This plan signals the start of an ambitious project to fight climate change and improve energy efficiency. It commits to a reduction of 37.5% of greenhouse gas emissions below 1990 levels by 2030, and for the improvement of energy efficiency in buildings, transportation, and industry to support the province's environmental and economic goals (QC - Plan for a Green Economy, 2020).

Quebec's flagship program for residential energy efficiency is Rénoclimat, which focuses on offering financial incentives for energy-efficiency upgrades. The financial assistance supports improving insulation, improving airtightness, replacement of doors and windows, and installing mechanical systems. After the retrofitting takes place, the participant must schedule an assessment. For insulation, the program offers up to $1,500 for roof upgrades, up to $3,750 for wall upgrades, up to $2,500 for foundation improvements, and $370 for exposed floor upgrades. If the airtightness performance is improved by 20%, it offers up to $800 in financial assistance, and up to $150 per door/window if it meets ENERGY STAR standards (Renoclimat).

As part of Quebec's energy efficiency programs offered for businesses, they have created the ÉcoPerformance Program. This program targets energy saving projects in the commercial, industrial, and institutional sectors. It also offers financial assistance for projects like HVAC system upgrades, lighting retrofits, and energy-efficient process improvements. The amount of financial support offered is case and scope dependent, for some cases, providing up to 50% of eligible costs for retrofits (EcoPerformance).

D. Prince Edward Island

The province of Prince Edward Island has identified the objectives of reducing greenhouse gas emissions by less than 1.2 megatons of carbon dioxide equivalent per year, and by 2040 onwards be carbon neutral. About 18% of total emissions in PEI come from residential, commercial and government buildings, and approximately 78% of existing homes still rely on heating oil (Gov. PEI - Net Zero Framework).

To implement the objectives the province has for 2040, PEI has developed the Building Resilience: Climate Adaptation Plan, which focuses on addressing climate change by improving energy efficiency across buildings, transportation, and other key sectors (Gov. PEI - Climate Adaptation Plan). As a part of this plan, the province offered to prioritize rebates available for retrofits for energy efficiency, taking into account low-income households, and climate disaster mitigation. The goal is to reduce emissions and lower energy costs, helping residents and the commercial sector transition to a low-carbon economy.

The Government of Prince Edward Island has established Energy Efficiency rebates and programs. The focus is on providing rebates on energy-efficient equipment and products, and offering free services. Islanders with an annual household net income of $100,000 or less may be eligible for a free heat pump and electric water heater for their home.

Another incentive provides rebates for improving attic, walls, floors, windows, doors, and skylight insulation. A unique incentive is offering instant rebates on energy efficiency products like smart thermostats (up to $100), dehumidifiers (up to $30), utility fans ($25), and many more items that fall under their energy efficiency product list. The program also offers up to up to 40% of installed costs, to a maximum of $10,000 in rebates for residential, businesses, and farms to install solar photovoltaic (PV) systems (Gov PEI - Energy Efficiency).

E. Ontario

In 2018, Ontario introduced its Made-in-Ontario Environmental Plan, originally set the goal of reducing greenhouse gas emissions by 80% below 1990 levels by 2050. To help keep progress on track, two midterm targets were set at achieving 15% below 1990 emissions levels by 2020, and 37% below 1990 levels by 2030 (Ontario Climate Strategy).

These targets were scaled back from their original levels by the government of Ontario to now cut emissions by 30% below 2005 levels. This change of targets caused a controversy, after a youth-led climate case against the Ontario government in October of 2024 claimed these weaker targets exacerbate climate risks. The case is currently being reevaluated

(Global News, 2024). The province's key priorities focus on enhancing the energy performance of buildings through financial incentives to help residents and businesses making energy-efficient upgrades.

The flagship energy efficiency program in Ontario is the Save ON Energy Platform, which helps to use energy more efficiently at homes and businesses, and offers the incentives and programs created by the Independent Electricity Systems Operator (IESO, 2024). Save ON Energy offers support in four key areas: homeowners, businesses and industry, First Nations energy programs, and support resources and training programs.

For homeowners, it offers AC yearly checkups, up to $10,000 in heat pump rebates, up to $1,360 rebates on insulation, air sealing, and HVAC installations. For businesses the program offer rebates of up to $3,000 for lighting upgrades, and $2,500 for non-lighting upgrades, and instant point-of-sale discounts on many lighting products. For First Nations, there is up to $330,000 in funding for the installation of energy-efficiency upgrades on reserve band-owned and operated commercial and institutional buildings. This program also gives them on-site energy assessments, community benchmarking to compare with other similar facilities, and project support (Save ON Energy, 2024).

F. Summary of Key Targets & Programs

Table 27: Summary of Provinces' Efficiency Outlooks

Province	Net-Zero Target	Key Programs & Initiatives	Residential Focus	Commercial Focus	Incentives & Support
British Columbia	40% GHG reduction below 2007 levels by 2030	CleanBC, Better Homes Energy Savings, Better Buildings Program	Energy-saving rebates (insulation, windows, heat pumps), income-based support	Energy-efficient renovations for small businesses, multi-unit buildings	Up to $44,900 in rebates for homeowners, up to $100,000 for commercial projects
Nova Scotia	Net-zero by 2050	Efficiency ONE (home energy assessments, small business energy programs)	Rebates for heating, heat pumps, insulation, energy assessments, up to $30,000	Incentives for energy upgrades in multi-family and small businesses	Up to 50% rebates for affordable housing improvements, 24-month interest-free financing for small businesses
Quebec	37.5% GHG reduction below 1990 levels by 2030	Rénoclimat, ÉcoPerformance Program	Rebates for insulation, windows, air sealing, and mechanical systems	Financial support for HVAC, lighting, and energy-efficient improvements	Up to $3,750 for residential upgrades, up to 50% of costs for commercial upgrades
Prince Edward Island	Carbon neutral by 2040	Energy Efficient Rebates and Programs, Building Resilience Plan	Rebates for heat pumps, insulation, and energy-efficient products	Support for energy-efficient systems in businesses, farms	Up to 40% of installed costs for solar PV systems, rebates up to $10,000
Ontario	30% GHG reduction below 2005 levels by 2030	Save ON Energy Platform	Rebates for heat pumps, insulation, HVAC, air sealing, and more	Rebates for lighting and non-lighting upgrades for businesses	Up to $10,000 for residential rebates, up to $3,000 for business lighting upgrades

3. Tool to Support Local Climate Action & Workforce Development

Climate Opportunity Map - Brown University

The Climate Opportunity Map, created by Brown University's Climate Solutions Lab, in Providence, Rhode Island, is an interactive tool that helps users discover the local benefits of investing in clean energy and climate solutions. The user is presented with the U.S. map, and can access information on the following topics: potential job creation in renewable energy, energy efficiency upgrades, and other climate-positive actions within their area by providing a zip code. The map also highlights important community impacts, such as reduced travel delays, energy savings, and improved air quality, offering a clear picture of how climate action can enhance local well-being.

Some of the filters that can be applied to the map and information available include:

- Renewable Construction Jobs
- Renewable Operations Jobs
- Energy Efficiency Jobs
- Reduced Travel Delays
- Electricity Savings
- Lives Saved by Cleaner Air
- labour Hours Saved

This tool can be useful to empower individuals, policymakers, and organizations to better understand the positive benefits of investing in climate solutions and energy efficiency in their communities. By illustrating how taking action on climate change can lead to job opportunities, health improvements, and cost savings, the Climate Opportunity Map encourages people to engage in building a more sustainable and equitable future. Although it is only available for the US, a model could be developed to have similar capabilities at the Canadian level. It will most likely prove a helpful tool in advancing advocacy efforts for energy efficiency, and education of its benefits to the population (Brown University, 2022).

4. Programs to Include Marginalized Groups in the Skilled Trades & Green Jobs in Canada

This section analyzes some programs and organizations that are focused on supporting individuals from traditionally underrepresented groups entering the skilled trades sector. Although some of these programs have offerings that focus on energy efficiency, which directly supports the green energy transition, they primarily focus on helping people have successful careers in the trades.

The entire skilled trades sector will be working to implement the green energy transition. There is significant overlap between their current skills and what is considered green skilled trades skills. The same fundamental skills like carpentry, plumbing, electrical work, HVAC and others, will be adapted to support energy efficiency. The green aspect refers more to what types of retrofitting and renovations are implemented, like energy efficiency, renewable energy adoption, sustainable materials, water conservation, and environmental compliance. The difference lies in the context and application rather than the fundamental skill set needed. This is why programs that support the growth of the skilled trades workforce will directly support the growth of the green skilled trades workforce.

The three types of programs analyzed in this section are:

A. Programs and Organizations helping **Women** join the skilled trades workforce
B. Organization helping the **Indigenous** join the skilled trades workforce
C. Organizations helping **all equity-deserving groups** join the skilled trades workforce

A. Programs and Organizations helping Women join the skilled trades workforce

Shift Change - YWCA Halifax

Shift Change is dedicated to fostering inclusive skilled trade workplaces for women, gender-diverse individuals, and other marginalized groups, who often face significant barriers like harassment. Through initiatives like the Women in Skilled Trades Advocacy Network (WiSTAN), which provides resources via nstrades.ca, and the Gender-Inclusive Leadership Course (GILC), Shift Change equips leaders with the tools to create safer, more equitable work environments, addressing the skilled trades labor shortage by improving retention. Resources like the We Are Trades Toolkit and great training offered further support for this mission, encouraging businesses to embrace diversity and build a more resilient industry (YWCA Halifax).

Women in the Skilled Trades Initiative - Government of Canada

The first program we will outline is the "Women in the Skilled Trades Initiative", which was created by the Government of Canada in support of their Canadian Apprenticeship Strategy. This initiative focuses on providing funding to projects across Canada that help recruit, retrain and help women apprentices succeed in the 39 eligible Red Seals trades, mostly for construction and manufacturing. In 2022, this initiative funded 15 projects, with a total investment exceeding $30 million.

The projects focused on providing mentorship by women role models, networking opportunities, and wraparound support, including child care assistance and travel subsidies. The initiatives supported many groups, especially Indigenous and Immigrant women. A new set of programs were announced on March 7, 2024 that will be receiving funding in the upcoming months (Gov. CAN, Women in the Skilled Trades, 2024).

Women of Steel - CWB Foundation

The CWB Foundation launched their "Women of Steel" program during the 2022-23 period. This program focuses on bridging the skilled labour gap and addressing the underrepresentation of women in the skilled trades workforce across Canada. Women of Steel identified the high demand for welding professionals, and the risk of the welding workforce as only 4,088 Red Seal completions were projected for the 2023-27 period, with 12,485 required to meet industry demand.

Although the female Red Seal completion rates have increased by 8% between 2017-22, women are a considerable untapped resource of labour and potential to drive economic growth and innovation, representing only 4.5% of the skilled trades workforce (CWB Foundation, 2024).

The Women of Steel initiative was launched to address this gap in the workforce, providing access to hands-on pre-employment welding training, soft skills development, and wrap-around support for all of its participants. These included racialized women, Indigenous women, women with disabilities, and women from the 2SLGBTQI+ community. The program also prioritized workplace inclusivity across Canada by closely working with employers to improve access to employment and the long-term retention of women. The program exceeded expectations, having 212 participants in 18 cohorts across Canada, surpassing the initial target of 180. This resulted in 620 welding qualifications issued, and 77% of participants reported becoming employed or continuing education in a welding-related field after completion of the program (CWB Foundation - Forging Forward (Impact Report), 2024).

A unique initiative from this program was the Workplace Inclusivity Pilot, which aimed to break stereotypes and improve the workplace environments for women in welding and

skilled trades. The program did this by addressing misconceptions about physical, technical skills, and worksite suitability. The program provided training to managers and staff, reviewed HR policies, and helped to foster better communication in the workplace. The end result was a significant shift in attitudes among industry partners, especially from employers who had been hesitant to hire women, which began offering permanent placements as they were impressed with their performance. This pilot also offered wraparound support like grocery cards, childcare, and rent subsidies to help participants overcome barriers to employment (CWB Foundation - Forging Forward (Impact Report), 2024).

The Women of Steel program reported over $9 million dollars in revenue during their funding fiscal year of 2024, with about $4.89 million coming from government grants, $991,132 from corporate donors, $80,812 from non-profits, foundations and individuals, and the rest from other sources. Their expenses on programs and investments were for the same period were approximately $7.73 million dollars, with $5.28 million invested in pre-employment and up-skilling, $1.05 million in secondary school programing support, $733,641 in youth programs, and the rest on other types of programs (Annual Report, 2024).

Women Building Futures (WBF) - Non-Profit Organization

Women Building Futures (WBF) is a not-for-profit organization that focuses on offering free skills training and support services to women and gender-diverse individuals who seek to enter skilled trades careers, including trucking and related fields. The organization makes it a priority to surround women with the support they need to succeed. The organization was founded in 1998 in Edmonton, AB where it began supporting women to get into entry-level roles in the skilled trades industry (WBF, 2024).

The organization offers support in readiness and coaching, both in skills needed to join new jobs, academic and personal life skills. It also provides safe and affordable housing for participants while they are enrolled in a WBF program, at their apartments in Edmonton, or through access to funding for accommodation in other places. They also offer 18 different programs in Alberta and Saskatchewan, including Journey to Trades, a 12-17 week construction trades program that prepares students to begin apprenticeships. It had 89 graduates in the 2022-23 period across 6 classes offered across Edmonton & Fort McMurray.

Another program is the Construction Bootcamp, which is a 4-week program focused on equipping students with skills needed to start entry-level work in the construction industry. It had 18 graduates during the 2022-23 period across 3 classes in Edmonton, Calgary, and Grande Prairie (WBF (impact report), 2022-23).

A unique quality of this organization is its industry-sponsored programs. Some of these programs include BHP Trades Readiness, Power Engineer Career Accelerator, Suncor Heavy Equipment Operator, Vestas Wind Turbine Readiness, Driver and Operator, Pre-Apprenticeship Heavy Equipment Technician, and Introduction to Heavy Equipment Operating. Across all of these programs there have been about 81 graduates. Programs ranged from 2-6 weeks in duration and were offered in Saskatoon, Lanigan, Edmonton, Lloydminster, Fort McMurray, and Lethbridge.

The program promoted a positive change in the workforce by working with employers to raise the bar on inclusivity and building safe workplace cultures where people feel comfortable and supported. During 2022-23 they had 45 partners from industry, government, community organizations, and post-secondary institutions, where they delivered 8 inclusivity workshops. They also make an effort to collaborate with Elders, Indigenous partners and community members to shape strategies, community relations, education and inclusion with these groups (WBF (impact report), 2022-23).

WBF's funding for their 2023 year reported revenues of about $9.56 million, with $3.98 million coming from grants, $969,793 coming from sponsorships, $146,300 from donations, and the rest from other sources. Their expenses for the same year were about $9.68 million, of which $5.4 million came from salaries and benefits, $1.5 million from administrative tasks, $1.5 million from program expenses, and the rest from other sources (WBF (impact report), 2022-23).

B. Organization helping the Indigenous join the skilled trades workforce

AKI Solutions Group - Non-Profit (First Nation Managed Social Enterprise)

AKI Solutions Group, a First Nations-managed non-profit social enterprise, prioritizes community needs, developing customized solutions through an Indigenous-based business model. Incorporating traditional teachings into its operations and governance, AKI empowers communities by making them project board members, ensuring client needs are central. Focused on building opportunities, communities, enterprises, and entrepreneurs, AKI creates sustainable business units that generate employment, develop local capacity, and leave a legacy of self-sufficiency in each partner community (AKI Energy).

NEWO - Non-Profit

Newo, meaning "four" in Plains Cree and given its name by Elder Roy Louis, is a social enterprise born from the University of Alberta Augustana's Spirit of the Land program.

Guided by principles of community collaboration and respect, Newo operates as a non-profit, using market tools to achieve its goals of fostering positive social and ecological change. Beyond its work in the solar industry, Newo provides education and training, particularly for marginalized groups and those transitioning from fossil fuels, while prioritizing a holistic approach that addresses both the technical and cultural aspects of sustainability (NEWO).

Trade Winds to Success - Non-Profit Organization

The Trade Winds to Success was established in 2005 and provides free programming for participants and pre-apprenticeship training programs. It partners with Indigenous community organizations and government funding agencies to provide First Nation, Metis, and Inuit people pre-apprenticeship training and shop experience in the following trades Boilermaker, Carpenter, Construction Craft Labourer, Electrician, Ironworker, Industrial Mechanic (Millwright), Plumber, Steamfitter-Pipefitter, and Welder (Trade Winds to Success, 2024).

Between 2022-23, the program had 485 individuals who attended information sessions, and 89 started training across 7 cohorts. There were 53 graduates who completed training across 6 different cohorts, and 32 of the graduates were able to secure employment. The make-up of the participants was 24% women, and 81% youth aged 18-30. The way the programming is offered starts with Pre-Program Support. There are a series of screening processes, including information sessions, which lead to academic assessments and training (6-weeks total), where living allowances are provided. Cultural practices like smudging, talking circles, and resiliency workshops, alongside employment readiness preparation are integrated into the curriculum (Trade Winds (annual report), 2024).

The participants of the programs can then choose between three different program streams. The first one focused on residential construction, where they learn hands-on carpentry training through eco-smart home construction. Another one is focused on commercial & industry trades where participants receive training for pipe trades, welding, and electrical work in partnership with unions. The last one is a specialized program offering apprenticeship preparation for electricians, pipe trades, and welders. During 2023 they offered 12 scholarships of $500 each to students, between the fall and spring sessions (Trade Winds (annual report), 2024).

The program received $2.48 million in funding, with 32.2% coming from the Government of Alberta, 20.9% from the Government of Canada, 8.7% from general donations, and the rest through various other sources (Trade Winds (annual report), 2024).

C. Organizations helping all Equity-Deserving groups join the skilled trades workforce

PREP Academy (Partnership with Efficiency Nova Scotia)

This initiative represents a strategic partnership between the PREP Academy and EfficiencyOne, focused on expanding career pathways for African Nova Scotian youth within the energy efficiency sector. EfficiencyOne's support of the PREP Academy's Micro-Internship Program for 2025 will provide students with practical experience, mentorship, and exposure to the diverse opportunities within green building and energy-efficient practices. This collaboration aims to address the underrepresentation of minority groups in these crucial fields.

A key component of the partnership is the emphasis on mentorship, with EfficiencyOne actively supporting the PREP Academy in recruiting Black mentors within the clean energy industry. This mentorship, combined with hands-on learning experiences such as workshops and site tours, will provide students with valuable insights and connections, empowering them to pursue successful careers in sustainable industries. (PREP, 2025).

Building UP - Non-Profit Social Enterprise

Building UP is an organization that operates in Toronto, ON, which aims to improve the environmental efficiency and affordable housing stock in the city by giving people who experience barriers to employment paths to successful careers in the skilled trades industry. Their primary focus is to break the cycles of systemic inequity through support to participants to rebuild careers and access upward wealth mobility in the long-run. The organization has offered training to over 800 individuals across their different support streams which include 1:1 coaching, mentorship, long term wraparound support (hard & soft skill development & real life and on the job experience), training, and employment opportunities. They have been in operation for over 9 years, over which they have completed over 6,500 retrofits of 30,000 units, and about 90% of their grads have obtained full time employment thanks to the over 90,000 hours of paid training the program offers every year (Build UP, 2024).

One of their flagship offerings is the Pre-Apprenticeship Training Program, which is a 16-week training program offering full time paid training, with wages of up to $17.20 per hour through its duration. It provides hands-on learning and 85% of its graduates end up working full time in the trades. The program is broken down into 8-weeks in-class training where participants have access to trades math, trades class, and career success class. The

following 8 weeks are in-field training where they work on site, gain general labour experience, and general contracting experience (Build UP, 2024).

The non-profit's operating model offers services to its clients through which their students are able to get hands-on experience. As insurance, they offer a 1-year warranty on all of their labour, and they are a licensed contractor in the City of Toronto. People can hire Building UP for projects like, general contracting, retrofits, insulation, general labour, temporal labour, and recruitment services (Build UP, 2024).

Iron & Earth - Non-Profit Organization

Iron & Earth is a Canadian worker-led organization dedicated to helping workers from the fossil fuel industry, Indigenous communities, and other underrepresented groups transition into the growing renewable energy sector. It was founded in 2016 as a response to the oil crash of 2015. It provides practical training programs, like the Renewable Skills Initiative, and resources through tools such as the Climate Career Portal, helping individuals gain the skills needed to thrive in the green economy. By focusing on inclusive, community-driven solutions, Iron & Earth works to create equitable opportunities and ensure a fair transition to a sustainable energy future for all (Iron&Earth, 2024).

Energy Trailblazer Program - Efficiency Canada

Efficiency Canada's Energy Trailblazer Program celebrates and supports professionals from diverse and underrepresented backgrounds who are making an impact in Canada's energy efficiency sector. This program shines a spotlight on their achievements, giving them a platform to share their stories, inspire others, and demonstrate the importance of diversity in driving innovation and sustainability. The goal is to, by amplifying these voices, participants will build a stronger and more inclusive energy efficiency community.

Participants, or as the program refers to them, "trailblazers", benefit from mentorship, networking opportunities, and connections with industry leaders. This helps them grow personally and professionally and opens doors to new opportunities and leadership roles. The program also serves as a welcoming space for individuals from all backgrounds to engage with the energy efficiency field and find meaningful pathways into the industry. By supporting and empowering these leaders, the Energy Trailblazer Program is shaping a more equitable and sustainable energy future for everyone in Canada (Efficiency Canada, 2024).

5. Building Codes in Canada

This section analyzes the impact and background of building codes in Canada, it is separated into three main sections:

A. Impact of Building Codes in the Construction Industry Sectors
B. Background on Canadian Building Codes
C. Absence of Alteration of Existing Building Code (AEB)

A. Impact of Building Codes in the Construction Industry Sectors

Building Regulations play a crucial role in guaranteeing that residential buildings have predetermined requirements of energy efficiency, durability, and safety. These rules are governed by the Building code Act in Nova Scotia and a complete guide is provided by the Nova Scotia Building Code regulations. (Nova Scotia Building Codes Regulations).

Beginning on 1 April 2025, the province is ready to begin implementing the 2020 National Building Codes. To improve accessibility and energy efficiency in building construction, these standards implement a tiered approach. The building industry will have enough time to adjust to the new regulations due to gradual implementation. (Nova Scotia Access News)

Anticipated effects from the implementation of new building codes:

Increase in energy efficiency:

Improved energy performance is emphasized in the new standards, which could raise the construction prices because more insulation, energy-efficient windows, and sophisticated heating systems are required. Nonetheless, it is expected that these actions will save households money in the long run by lowering energy usage. (Nova Scotia News)

Energy efficient Retrofits

Energy-efficient retrofits involve upgrading building systems to enhance energy efficiency. Key measures include replacing outdated equipment, such as HVAC systems, with energy-efficient alternatives (Redaptive), improving or updating insulation and sealing air leaks using weatherstripping and caulking (Natural Resources Canada).

Upgrading to energy-efficient windows and doors is another critical step. Sustainable energy sources like solar panels or wind turbines can also be installed (wattlogic). Additional measures include installing smart thermostats for better temperature regulation (British Columbia real estate association),improving ventilation systems (Natural Resources

Canada), and using energy modelling to optimize energy performance. Ensuring an energy-efficient fresh air supply further enhances building efficiency. (zero energy project).

B. Background on Canadian Building Codes

How do Building Codes Work?

In 2022, the Government of Canada passed the Canadian Commission on Building and Fire Codes (CCBFC), 2020 National Building Code (NBC). They operate at the federal level and aim that all new buildings will be built to net-zero energy-ready standards by 2030.

These standards operate on a tier structure, with Tier 1 being the lowest and reflecting current energy efficiency standards, and Tier 5 being the highest reflecting 80% efficiency compared to today's building code minimum energy occupancy. Achieving Tier 5 is one of the standards a Net Zero Energy (NZE) building needs, with the addition that this one needs to be able to produce as much clean energy as it consumes. Meanwhile, if a building achieves Tier 5 but does not have on- or off-site renewable energy components in place, it is considered a Net Zero Energy ready (NZEr) building.

The 2020 models include the National Energy Code for Buildings (NECB) for large buildings and the NBC for low-rise residential buildings. The main points for net-zero energy readiness are that buildings must have improved air sealing, increased insulation levels, and high-performance windows and doors to reduce thermal demand and facilitate appropriately sized space and water heating equipment (Efficiency Canada "Net-Zero Energy Ready Buildings in Canada", 2024).

It is estimated that in Canada, less than 1% of buildings can be considered NZEr, which quickly needs to change through the adoption of more ambitious building codes. Although these codes affect only the construction of new buildings, it is very important to understand that if the stock of newly constructed buildings is unable to meet the future energy efficiency requirements, they will need to be retrofitted if Canada wants to meet their reduction targets. Even with the proliferation of low-cost renewable energy, if energy usage from buildings does not become more efficient, it won't help to reduce the amount of energy consumption and emission levels of the nation. These upgrades will have an envelope-first approach, which emphasizes improving airtightness, insulation, window performance, and more efficient HVAC equipment (Efficiency Canada "Net-Zero Energy Ready Buildings in Canada", 2024).

C. Absence of Alteration of Existing Building Code (AEB)

Although progress is being made with the 2020 NBC and the NECB, the scope of operations of these is to new constructions only. The absence of requirements to drive energy efficiency and emissions performance of the existing building stock has been recognized in Canada's Pan-Canadian Framework on Clean Growth and Climate Change (PCF). Here, governments laid out a new future for the building sector of Canada, focusing on fostering commitments at the federal, provincial and territorial levels to work together in developing a model code for existing buildings to help guide energy efficiency improvements during renovations.

The Alterations to Existing Buildings Code (AEB) will be based on the most recent 2020 NBC and 2020 NECB, and will focus on addressing the challenges of applying current code requirements when in some cases they are based on the voluntary renovation actions of the building owner. They will try to find ways to capitalize on the opportunity a renovation presents to implement energy efficiency improvements, while avoiding unnecessary burdens on the building owner (Efficiency Canada: "Regulating Energy and Emissions in Existing Buildings", 2023).

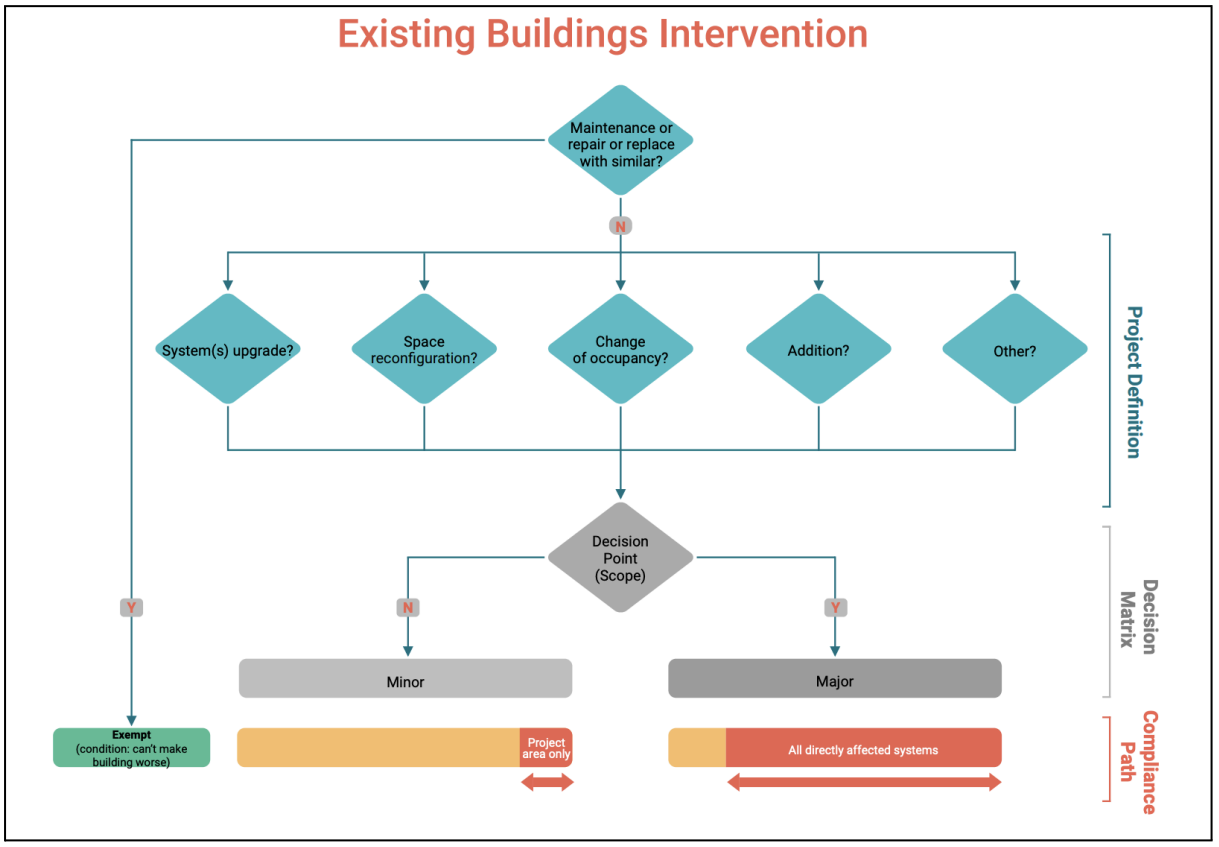
The AEB code will be triggered under special circumstances related to renovation actions taken by the owner, such as upgrades, repairs or replacements to a given system or component of a system. It will apply to the portion of the building that is being altered or any new additions to the existing building.

How the code will be triggered is a critical challenge in the AEB, and aims to capitalize on the voluntary action of the building owner to alter or add portions to the existing building, while balancing the cost, scope, and complexity of the planned alteration in a respectful way. These voluntary renovations can be a monumental opportunity to increase the adoption of energy efficiency measures to cut emissions.

Some key triggers include, system upgrades (e.g., HVAC or insulation enhancements), new additions to the structure (space reconfiguration or changes to the building's layout), and change in occupancy type (which often necessitates safety and performance evaluations) (Efficiency Canada: "Regulating Energy and Emissions in Existing Buildings", 2023).

Once these mechanisms are triggered, the AEB renovation falls under three distinct categories, exempt, minor alteration, and major alteration. Projects that maintain, repair, or replace any system can be exempt as long as the energy efficiency performance of the building is no worse than before the intervention. On the other hand, based on building type, project size and complexity, and based off the activity level, these retrofits might fall under minor or major alterations and will require mandatory energy efficiency upgrades aligned with the corresponding alteration size (Efficiency Canada: "Regulating Energy and Emissions in Existing Buildings", 2023).

Figure 18: Efficiency Canada: Building Intervention Decision Process



Source: [Efficiency Canada: "Regulating Energy and Emissions in Existing Buildings", 2023]