Clean Foundation
126 Portland Street, Dartmouth, NS
www.clean.ns.ca

Net Zero ("NZ")
Frequently Asked Questions ("FAQs")

Recommended readings:

Homeowners – "FAQs for Homeowners"

Contractors – "FAQs for Homeowners" + "FAQs for Contractors"

Municipalities – "FAQs for Homeowners" + "FAQs for Contractors" + "FAQs for Municipalities"

NZ – FAQs for Municipalities

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Common Terms and Definitions

Deep Energy Retrofit (“DER”)

An advanced application of energy conservation measures to improve overall performance of an existing building.

EnerGuide Rating

Demonstrates a home’s annual energy performance.

Energy Advisor (“EA”)

An individual who evaluates how energy is being used in a home and identifies opportunities to reduce and optimize energy consumption.

Energy Efficiency (“EE”)

Using less energy to provide the same level of service.

Envelope Upgrades

Includes any retrofits to your home’s physical separation between the conditioned and unconditioned environment, including walls, floors, ceilings, windows, doors, etc.

Net Zero Energy (“NZE”)

A building standard designated to a building that produces as much energy on-site as it consumes annually.

Net Zero Energy Ready (“NZEr”)

A building standard designated to a home that could produce as much energy as it consumes annually, if a renewable energy generating system (such as Solar, Wind and/or Micro-hydro) existed on-site.

Pan-Canadian Framework

National framework developed with provinces and territories and in consultation with Indigenous Peoples, to help meet Canada’s emissions reduction targets, grow the economy, and build resilience to a changing climate.

Property Assessed Clean Energy (“PACE”) Financing

Provides homeowners within a participating municipality with financing at low lending rates for energy efficiency upgrades that pay for themselves within a set number of years. Should the home sell, the remaining payments become the obligation of the new homeowner. Specific municipalities may have different requirements.

Renewable Energy

Energy generated from a natural resource that is not depleted with use.

Retrofit

Addition of a component or accessory to a house after it was first built.

Return on Investment ("ROI")

The timeframe in which the energy savings from an upgrade will equal the capital cost or cost of financing (if financing is required).

Solar Photovoltaics ("PV")

Renewable energy technology that converts sunlight (solar radiation) to direct current (DC) electricity using semiconductors.

1. Why is a Net Zero Energy ("NZE") or Deep Energy Retrofit ("DER") Program needed?

The Pan-Canadian Framework on Clean Growth and Climate Change emphasizes that "taking strong action to address climate change is critical and urgent." One of the main pillars of this framework is complementary measures to further reduce emissions across the economy. This includes tightening energy efficiency standards and building codes to reduce greenhouse gas (GHG) emissions, while helping homeowners use less energy and save money.

Communities and residents across Canada are recognizing the need for ambitious ideas and action to meet Canada's climate change mitigation targets. NZE standards are one of these ideas, with new building codes around NZE design to be implemented by 2030. Although there are many opportunities to incorporate energy efficiency into a newly built home, many Nova Scotians live in older houses and there is little new development in rural areas. That is why retrofitting our existing building stock to improve energy efficiency will be a key component in reducing GHG emissions.

2. When designing a NZE/DER Program, where do I begin?

Identify goals

While energy and emissions reduction should be an inherent goal of any building performance retrofit program, the reason why a municipality would want to consider a NZE/DER retrofit program may vary between communities. The needs of the residents and building stock should be determined and incorporated into program goals, helping to design the program framework.

Some examples of potential program goals include

- Improve energy security
- Reduce energy poverty
- Create a risk mitigation strategy to plan for climate change and natural disasters that may cause power outages, extreme temperature fluctuations, flooding, etc.
- Stimulating local economic development
- Improved energy security (ensuring affordable, accessible, and sustainable energy)
- Increased community resiliency by helping to provide meaningful long-term upgrades to existing housing stock and protecting against energy instability
- Improved municipal self-sufficiency by reducing utility demand through energy conservation and on-site energy generation

Obtain a legal/risk assessment

Recognize that the cost of financing NZE upgrades for residents presents risks. An important stage of any project should be a study of the legal, financial, and insurance-related risks posed to participating municipalities and homeowners. The analysis of these risks allows you to reduce the risk profile for funders, participants and partners.

Provide financing options

- Property Assessed Clean Energy (PACE) Financing

  PACE is a financing mechanism which many municipalities use to provide low-interest financing to qualifying homeowners interested in undertaking efficiency and clean energy home upgrades. PACE-style financing for NZE/DER retrofits provides an opportunity for municipalities to help their residents adapt to growing energy costs and increase the value of their properties, while at the same time reducing greenhouse gases. Once the upgrades are complete, the homeowner repays the municipality over time through their property tax account. In many jurisdictions, PACE financing is applied as a Local Improvement Charge ("LIC").

  The PACE or LIC charge is placed as a lien on the property and stays with the property in the event of a sale. Unless paid in full by the current homeowner at the time of the sale, the payments are taken over by the new homeowner. (And the new homeowner also gets to enjoy the energy savings.)

  For more information on financing options available within Nova Scotia, please visit Clean Foundation's website.

- Lending institutions

  Due to the expense of NZE/DER retrofits, PACE financing may not cover all the cost of retrofits. The costs required to achieve NZE or another high-performance housing standard often exceed payback ratios required for PACE programs. In the PACE program Clean Foundation administers, a 1:1 cost-to-energy-savings payback ratio is required within 10 years. Therefore, PACE financing could be only one of a suite of financing choices provided to homeowners who wish to undertake these retrofits. Bringing in other lending institutions, like Credit Unions, as further options may:

  1. Protect the municipality from the risks associated with financing high retrofit costs
  2. Help ensure adequate retrofit funding is available to all who are interested
  3. Allow participation by homeowners living in municipalities where no current PACE programing is established

Develop an initial qualification process

Determining what homes qualify for the program could be achieved by using available community data to identify potential candidates, pre-screening of applicants at registration stage, and determining eligibility for financing and incentive programs. Municipalities and local energy utilities may consider working together, starting by identifying homes in the area that will see the greatest impact from NZE or DER upgrades. Homes having higher energy consumption levels compared to the regional averages based on size and occupancy can be identified.

3. What influences can municipalities have on upgrades?

Rebates and incentives

Program design can attempt to integrate rebates or incentives offered in the region. Click here to see financial incentives currently available by province, as compiled by Natural Resources Canada ("NRCan").

Applying for rebates and incentives allows a homeowner to save money, perform more upgrades, and reduce their payback period, ensuring the fastest return on investment.

While rebates can help make upgrades more cost effective, rebates alone should not dictate the upgrades proposed. A thorough understanding of building science and the house as a system should ultimately inform which upgrades get recommended.

Net-metering options

Net-metering requires a special electrical utility meter be installed on a home with on-site generation. This meter measures energy in (consumed) and energy out (generated). It allows a home to send excess generated electricity to the local utility for credit. This credit can later be redeemed when purchase of energy from the utility is required. Municipalities may have different credit limitations and knowing these limitations will help to size any on-site renewable energy generation system(s). Not all jurisdictions have the option of net-metering.

4. What are the existing practices for building/renovating houses and how are they changing?

National Building Code ("NBC")

While not necessarily a best practices guide, the NBC outlines the minimum building standards a home must meet. This includes a section on energy conservation measures (Part 9.36).

The Canadian Constitution states that regulating building construction is a provincial responsibility, and the NBC is published by the National Research Council as a "model code" for adoption (in whole or part) by provincial and municipal governments.

Residential construction falls under Part 9 of the NBC. Part 9 covers houses and low-rise residential buildings that have:

- Three or fewer above-ground stories
- A building area no more than 600 square meters (6,458 square feet)

This includes single detached dwellings, duplexes, townhouses, and small apartment buildings.

The NBC is primarily concerned with health, safety, accessibility, and the protection of buildings from fire or structural damage. It applies to new construction, demolition, relocation, some aspects of renovation and change of building use. Energy efficiency requirements were added to the NBC in 2010. By 2030 the NBC will require all new construction to be NZEr, meaning building to NZEr standard will be a minimum building requirement.

To obtain a copy of the National Building Code of Canada 2015, click here.

Training availability

Currently no certified training is required for a contractor to complete a NZE or NZEr project. Technical training needed by contractors and energy advisors will be variant and existing levels of training should be recognized when working within a NZE/NZEr program.

Please see Question 15 for further information

5. What are some parameters to consider when determining the goals for the program?

What are the overarching targets?

- Reduce the amount of energy used by municipal housing stock
- Reduce the amount of municipal greenhouse gas (“GHG”) emissions
- Reduce energy costs for residents/reduce energy poverty/increasing energy security

What are factors that will influence/impact your program?

- Local net-metering and grid-tie policies
- Available incentives and rebates
- Local energy prices
- Electrification/fuel switching implications
- Quality of existing housing stock

6. What elements help identify program success?

Performance metrics related to the goals of a program should be tracked to monitor and help ensure success. The following are some possible areas of focus that can assist in determining a program's success:

- Number of homeowners engaged
- Amount of energy reduction per-house and across the program
- Amount of GHG emissions reduced
- Increased capacity/training of contractors
- Extent to which homeowners include DER or NZE measures into their retrofit plans
- Dollar savings due to reduced energy costs
- Increase in property value for homeowners
- Improved indoor environment (requires air quality monitoring)

7. What is the best way to measure elements that identify program success?

Elements that can be used to measure program success include measuring energy usage data to determine any reductions and soliciting feedback from homeowners on improvements to their level of comfort in the home. Homeowners can provide their energy usage before and after installing energy saving upgrades. This will require them keeping careful record of energy expenses, which will include items such as electricity bills, fuel fill-ups, and secondary costs like maintenance.

A more accurate way to measure energy usage is through installation of energy monitoring equipment. Energy monitoring equipment records the amount of energy being used in a home. Advanced energy monitoring equipment can even determine the energy being used by individual devices and equipment, helping to identify areas of improvement. While energy bills may show how much energy was used over the course of weeks or months, energy monitoring equipment shows usage in real-time and maintains detailed records of usage during a given period. Over time, energy monitoring offers homeowners a stream of information about their energy usage that helps them to make informed decisions about their energy use habits. Energy monitoring equipment is recommended as the first upgrade in a retrofit plan whenever feasible.

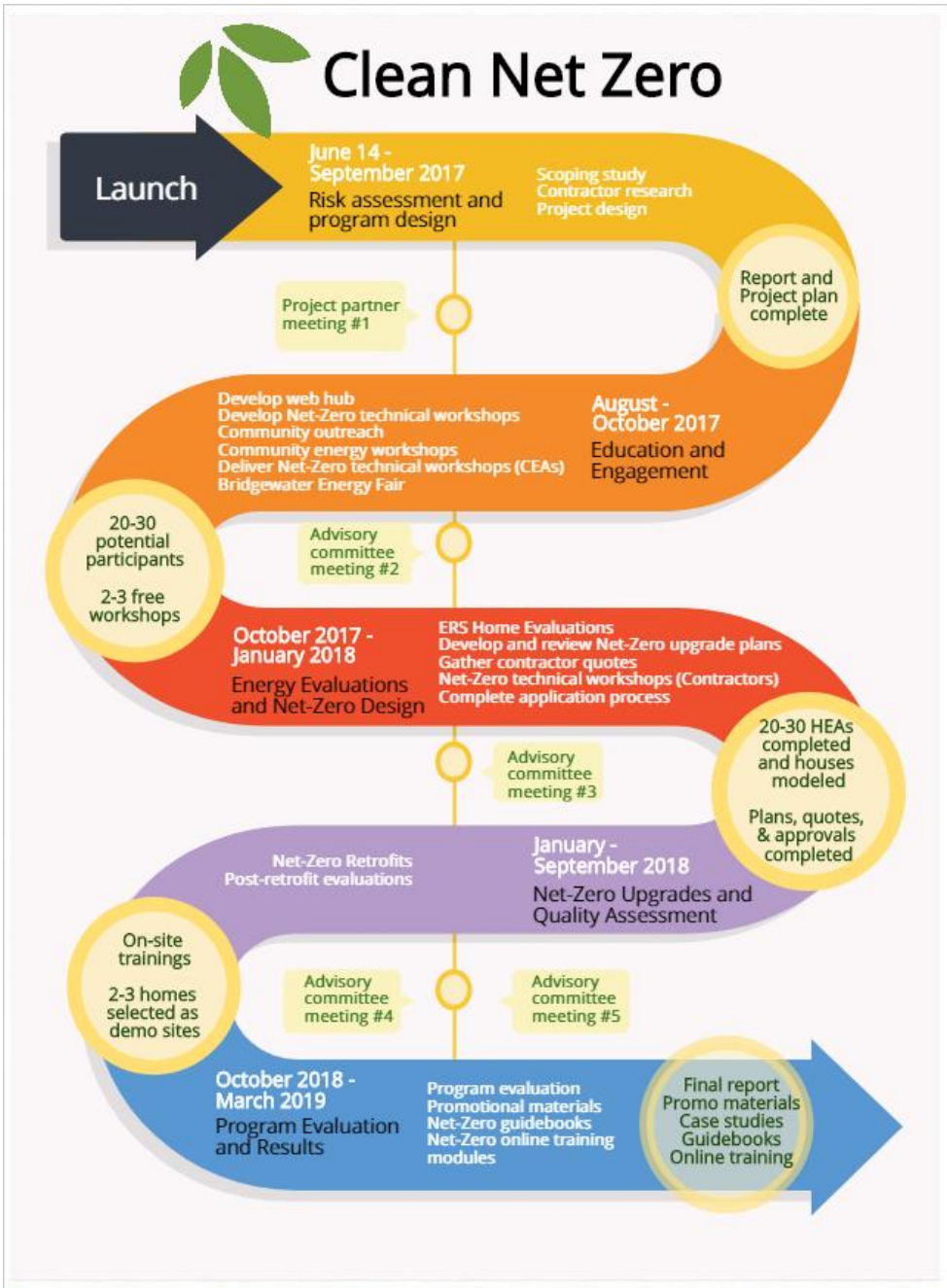
For homes that have issues with indoor air quality, it may be informative to install air quality monitoring equipment prior to the installation of upgrades. Without the presence of such monitoring equipment, the effect of upgrades intended to improve air quality can only be qualitatively measured through homeowner surveys and site inspections. Installing temporary data loggers to monitor the effects of upgrades on air quality adds an additional metric for success to NZE/DER programs.

8. What does a NZ program outline look like?

Risk Assessment & Program Design
SCOPING STUDY
CONTRACTOR CAPACITY RESEARCH
PROJECT DESIGN (INCLUDES PROMOTION)
Education & Engagement
DEVELOP WEB HUB WITH NET ZERO AND REGISTRATION INFORMATION
DEVELOP NET ZERO TECHNICAL WORKSHOPS FOR ENERGY ADVISORS AND CONTRACTORS
CREATE PROMOTIONAL MATERIALS
COMMUNITY OUTREACH
COMMUNITY ENERGY WORKSHOPS
NET ZERO TECHNICAL WORKSHOPS – REGISTERED ENERGY ADVISORS
NET ZERO TECHNICAL WORKSHOPS - CONTRACTORS
Energy Evaluations & Net Zero Design
HOMEOWNER COMPLETES VETTING/APPLICATION PROCESS
HOME EVALUATIONS - ENERGUIDE RATING SYSTEM
DEVELOP AND REVIEW NET ZERO UPGRADE PLANS
GATHER CONTRACTOR QUOTES
Net Zero Retrofits & Quality Assurance (QA)
NET ZERO RETROFITS
POST-RETROFIT EVALUATIONS
Program Evaluation
PROGRAM EVALUATION
CASE STUDIES

This NZ Program Outline was taken from the Clean Net Zero Pilot Project.

9. What does a high-level workflow timeline look like?



This sample workflow timeline was taken from the Clean Net Zero Pilot Project.

10. Why should NZE/DER be a municipality-led program?

Reasons why a municipality should take on a leadership role in implementing a Net Zero/Deep Energy Retrofit program include:

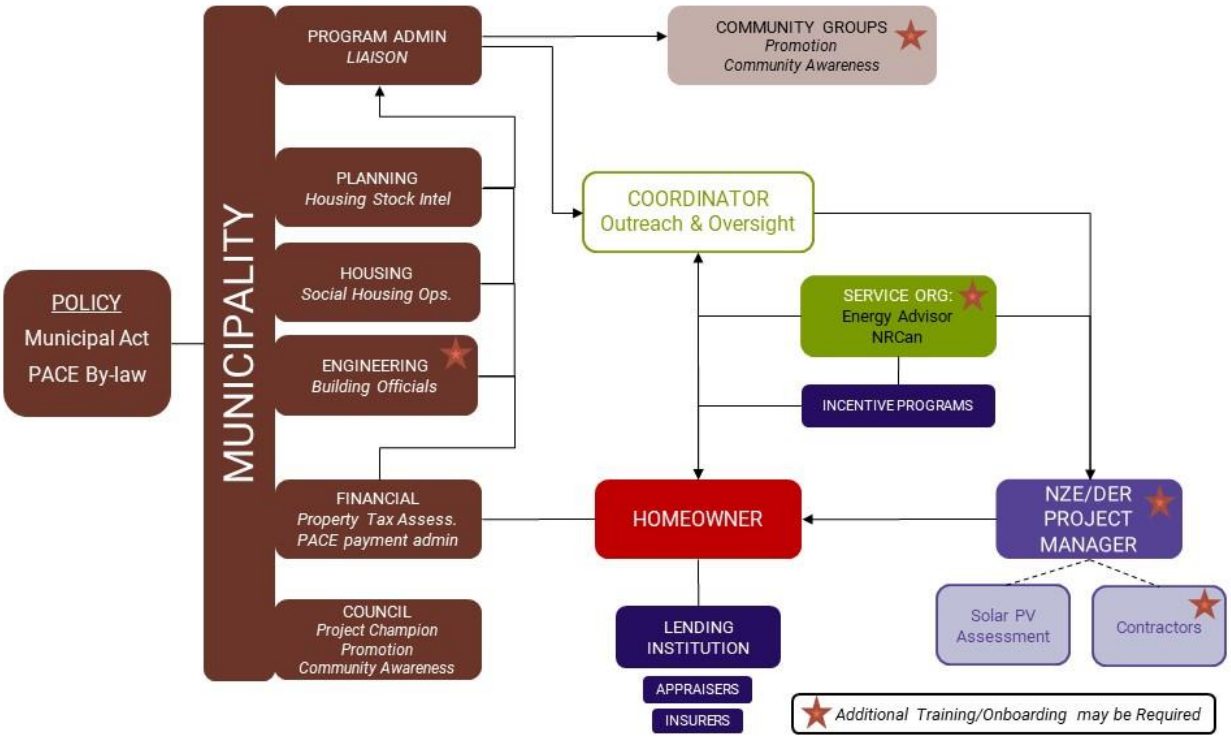
- Stimulating local economic development
- Improved energy security (ensuring affordable, accessible, and sustainable energy)
- Increased community resiliency by helping to provide meaningful long-term upgrades to existing housing stock
- Improved municipal self-sufficiency by reducing utility demand through energy conservation and on-site energy generation

There is a greater ability to leverage financing at the municipal level than at an individual level. Municipalities can specify which energy conservation measures are eligible and uphold quantifiable cost-effective upgrade measures. Municipal oversight of NZE and DER programs helps ensure the best interest of homeowners.

Providing residents with a way to decrease their energy costs through housing upgrades leads to immediate savings on energy bills, reducing energy poverty and helping to increase economic activity in the region. Economic growth is possible when private money can be spent in areas other than home energy bills.

11. How to develop a NZE/DER program structure?

A recommended NZE/DER program structure is shown in the graphic below. In the Clean Net Zero Pilot Project, some of the identified roles were combined. As the lead of PACE and home retrofit programs in Nova Scotia, Clean Foundation played the roles of Coordinator, Service Organization and Project Manager. If no single entity has experience in program delivery, energy evaluations, and retrofits then separation of the Coordinator, Service Organization and Project Manager roles is recommended, per the graphic below.



12. Should an advisory committee be involved?

If a municipality is creating a program from the ground up, assembly of an advisory committee or council should be considered to ensure that interested stakeholders are included during program design process.

Interested local stakeholders who could be represented include: community groups focused on energy conservation, community colleges, homeowners, energy efficiency utility companies, lending institutions, building officials, insurers and appraisers, service organizations (specializing in energy conservation/efficiency), homebuilder/renovator associations, building material suppliers and mechanical system distributors.

13. Who could be Stakeholders in your area?

Community groups/NGOs focused on energy conservation

Community groups and local NGOs that focus on energy conservation education, awareness, and/or implementation are natural partners in this type of program. Collaborate with on-the-ground organizations to expand and enhance outreach.

Community colleges

Where training to build trade capacity is required, local community colleges might be an appropriate place to host classes. Trades instructors may even consider incorporating NZE/DER training into their curriculum, allowing students to participate for credit. Also, where possible, in-field training with contractors exposes students to real-word scenarios and contractors to potential new hires.

Energy efficiency utilities

Energy efficiency utilities often offer incentive programs and financing options that may contribute to the success of upgrades within the program.

Local trades

Local trades can benefit from the increased work opportunities that energy efficiency retrofits bring. This work could also allow local trades to expand their skilled labour force.

Lending institutions

Lending institutions need to understand the NZE/DER process and that PACE financing works.

Appraisers & insurance providers

Appraisers and insurance providers should note the process involved in NZE/DER upgrades, acknowledging the improvements to both durability and safety.

14. What are some of the key roles within a NZE/DER program?

Municipal Program Administrator

This role ensures the best interests of the municipality are protected.

The administrator role may include working with municipal planning, financial, engineering, and legal departments to ensure the program design complies with municipal policies, protocols, and directives.

Program Coordinator

A Program Coordinator would typically report directly to the Municipal Program Administrator. This role can be taken on within or outside of the municipality. The Program Coordinator role is pivotal, with two major responsibilities: outreach to encourage program participation and oversight to ensure program goals are achieved. In a large municipality expecting broader participation, those responsibilities could potentially be split into two roles.

The Program Coordinator is the primary liaison with homeowners. They work with the municipality to pre-screen candidate houses, promote the program throughout the municipality and invite homeowners to join the program. They also help shepherd the homeowner through the program. This may begin with a financial eligibility test, followed by ensuring eligible homeowners are assigned an Energy Advisor through a participating service organization, and a DER Project Manager where appropriate.

The Program Coordinator may also be responsible for additional training and onboarding for the various roles in the project.

Project Manager

A Project Manager role may be needed to help ensure retrofit projects in the program are completed and that retrofits achieve intended outcomes, including homeowner energy savings. Without retrofit oversight from the Project Manager, there is a risk that specific conservation measures will be overlooked or avoided due to a lack of understanding among homeowners and involved contractors. The Project Manager must collaborate with homeowners, energy advisors and local trades to define the scope and cost effectiveness of the project.

The Project Manager also ensures the work leading to energy reductions is eligible under PACE financing and/or other supporting incentive programs available to homeowners. This role can assist the homeowner to arrange contractor estimates/quotes, to determine ROI, to interpret quotes, or to schedule trades. Typical homeowners may not have the time or knowledge to be able to do this on their own.

Homeowner

The Homeowner has the responsibility to ensure that they are eligible for financing. Once finances are confirmed, homeowners are matched with an Energy Advisor who will carry out an assessment of the home. There is an educational process that should be delivered to the homeowner by the Project Manager, helping the homeowner understand the project, their responsibilities, obligations, and what they can expect from the program.

Energy Advisor ("EA") and Service Organization

The Energy Advisor and Service Organization report to the homeowner as per NRCan policies. They also work with the Project Manager to develop the phased DER or NZEr plan for each homeowner. Clean Foundation and other Service Organizations have in-house expertise on costing for renovations, return on investments, and creating work orders for energy conservation measures. Energy Advisors must be part of a collaborative upgrade process, lending their skill set to both Homeowners and the Program Manager.

Contractors

Each contractor entering the program should enroll in the program's vetting process. The vetting process should outline the workmanship standards, safety responsibilities, goals for the program, billing processes, etc.

Contractors will work directly with the Project Manager. The Project Manager works directly with the Homeowner to plan and provide proscribed upgrade solutions tailored to the home. The Project Manager helps the Homeowners make the best decisions based on their needs, program goals and financing limitations.

15. What type of training should be considered?

Training may be required for groups that will be on-site and directing or carrying out the planning and renovation work:

- DER Project Managers

  Qualified construction project managers or site managers who will lead each renovation project will require experience building science, renovating for high performance, hazardous materials and safety issues in renovations (common examples: asbestos, lead paint, knob and tube wiring). They will also need onboarding or briefing on the ways in which the program will calculate ROI or other metrics used for cost comparison/cost-effectiveness of energy conservation measures and phases.

- Contractors

  Contractors may require expanded technical training on building science, renovating for high performance, hazardous materials and safety issues in renovations (common examples: asbestos, lead paint, knob and tube wiring), sourcing and costing materials/equipment, and possibly project management skills that align with the program goals.

- Energy Advisor

  Experienced, registered Energy Advisors specializing in existing houses will require training on phased deep energy retrofits, broader technical training on building science and renovating for high performance, as well as training on deeper manipulation and interpretation of energy modelling software. Canadian Home Builders Association (CHBA) has a list of certified NZ EAs.

- Building Officials

  Building officials will require onboarding so they understand the program goals and the process. They will also require technical training on building science and renovating for high performance, work that is impacted by Section 9.36 of the National Building Code.

For a contractor to be a leader in this growing industry they will need to seek further training and continuing education as home building and renovation standards are continually changing. CHBA offers NZ training and can certify the company and the NZ home.

For further information on leading developments and demonstrations in the field of clean energy technologies, search CanmetENERGY publications. CanmetENERGY is Canada's leading federal research and technology organization in the field of clean energy.

16. What if I still have questions regarding NZE?

Please feel free to contact an Energy Professional with the Clean Foundation to discuss your question.

- Click here for contact information

Resources

Canadian Home Builders Association ("CHBA")

The voice of Canada's residential construction industry.

https://www.chba.ca

CanmetENERGY

Canada's leading federal research and technology organization in the field of clean energy.

https://www.nrcan.gc.ca/energy/energy-offices-and-labs/canmetenergy/5715

Natural Resources Canada ("NRCan")

The ministry of the Canadian government for natural resources, energy, minerals and metals, forests, earth sciences, mapping and remote sensing.

https://www.nrcan.gc.ca/home

SolarAssist

A user interface developed by Nova Scotia Department of Energy and Mines and Clean Foundation, used to quickly estimate a home's solar potential.

https://www.solarassist.ca/

SolarHomes

A program offering rebates to Nova Scotia homeowners for installing eligible solar photovoltaic systems. Efficiency Nova Scotia administers the program.

https://www.efficiencyns.ca/service/solarhomes/