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LEEP

LOCAL ENERGY EFFICIENCY PARTNERSHIPS

LEEP Resource Guide

CanmetENERGY

Canada

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LEEP
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Contents

About LEEP / Who LEEP Is

LEEP bridges the gap between codes, policy, regulations, and "boots on the ground" construction industry professionals like builders, renovators, contractors and their stakeholders like municipalities and the supply chain. LEEP events and knowledge resources respond to key gaps identified by the industry as they move towards higher energy performance in affordable, resilient and low carbon ways. LEEP offers a suite of resources including technology forums, innovation exchanges, workshops, guides, tools and videos designed to increase knowledge and capacity building in the construction industry as it transitions toward high-performing resilient and sustainable construction.

Working with local building and renovation industries across Canada, LEEP accelerates the development of reliable, robust and cost-effective solutions, encouraging uptake and acceptance of net-zero and net-zero-ready building codes, building capacity in carbon reduction and disseminating knowledge on increasing resilience in Canadian housing in the face of the changing climate. NRCan's LEEP process is designed to reduce builder time and risk in finding and trying innovations for building higher performance homes better, faster and more affordably. Builder groups use the LEEP process to work together to consider their opportunities and find innovations they believe are most feasible for the homes they build in their markets.

LEEP Workshops, Tools and Guides

LEEP events, tools, resources and guides provide time saving ways for industry to learn about the information they need so they can move confidently towards building higher performance, resilient homes faster and more affordably.

How LEEP Works

NRCan's Local Energy Efficiency Partnerships (LEEP) initiative is a proven innovation and technology accelerator that has a record of engaging key stakeholders, providing support and bridging RD&D and program delivery for the building industry. LEEP's "listen, build, deliver, trial" approach enables the LEEP team to gather critical market intelligence and use it to drive supply chain response to critical industry needs, support S&T development and inform housing and building related codes and programs.

How LEEP Works with Industry

Step 1. Listen

We conduct **tightly facilitated workshops with key industry stakeholders—builders, renovators, contractors and manufacturers**—to understand their needs and determine collective actions to help meet them.

Step 2. Build

We develop resources to help the industry move toward net-zero. We also challenge manufacturers and other supply chain stakeholders to provide needed solutions.

Step 3. Deliver

Based on Steps 1 and 2, we **deliver workshops, forums and seminars to share key information across the industry.** Long-term partnerships help us expand our network and reach more key players across the country.

Step 4. Trial

We facilitate **field trials and demo homes showcasing new technologies and higher performance standards,** proving their viability and encouraging the industry buy-in needed for widespread adoption.

The LEEP process was a success because it gave the builders the opportunity, through their participation, to steer the wheel toward what we believe will work locally instead of having a program created elsewhere and (maybe successfully) pushed onto us.

Dave Verville, Production Manager, Qualico Single Family Homes

While research, development and demonstration efforts create innovation, they often fail to address the realities of the marketplace. LEEP focuses on the vital "final step" in the innovation process by pursuing the builder-driven model for bringing new energy-efficient and renewable technologies to market.

Vince Laberge, former President, Canadian Home Builder's Association

LEEP Priorities

Working with local building and renovation industries across Canada, LEEP accelerates the development of reliable, robust and cost-effective solutions, encouraging uptake and acceptance of net-zero and net-zero-ready building codes, responding to industry needs as they address challenges and help pave the pathway to success through capacity building with knowledge resources and tools. Using a multi-solving approach, LEEP brings together critical information builders need so they can solve multiple challenges at once, continuously moving forward and reducing the backtracking that can come with addressing challenges separately instead of simultaneously.

LEEP supports the home building industry in six key areas:

LEEP supports the home building industry in six key areas:

1. Code Compliance

Workshops and resources to prepare them for upcoming National Building Code changes. LEEP develops resources designed for the building industry and disseminates this knowledge to the industry to build capacity and pave the way for its success today and into the future.

2. Energy and Carbon Reduction

Guides, technology forums, workshops, and tools, to help builders and renovators design energy efficient, low carbon homes. Resources like the Material Carbon Emissions Estimator (MCE2) Tool help builders carefully select materials to reduce the embodied carbon in new housing and the LEEP Wall guides offer builders technical resources on high-performance wall systems.

3. Adaptation and Resilience

Resilience workshops, tools, and checklists. This suite of resources guides the building industry through identifying the climate-related regional hazards and risks in their area, land planning considerations, and adaptation measures to increase the resilience of Canada's housing stock.

4. Affordability

Reducing costs and increasing affordability through the Cost Benefit Analysis Tool and Optimization Dashboard that provides guidance on cost-effective energy-efficient solutions and materials. Builders can reduce construction costs while lowering client's utility costs and improving affordability.

5. Energy Transition & Technology Innovation

LEEP supports the residential construction industry through the energy transition and technology innovation by exploring innovative technologies like heat pumps and offering innovative resources like the F280 Mechanical Sizing App to address today's challenges.

6. Responsiveness & Capacity Building

LEEP is responsive to the needs of the residential construction industry by providing ongoing training, education and support for builders. Through workshops, guides, tools, technology forums, videos and other resources, LEEP supports the industry with the knowledge and skills they need to implement energy-efficiency and carbon reduction measures while increasing the resilience of Canada's housing stock. By building capacity in the industry, LEEP helps to equip builders with the information they need to meet advancing codes and standards, fostering a more resilient and sustainable construction sector.

LEEP Focus Areas

Working with the local building and renovation industry across Canada, LEEP accelerates the development of reliable, robust and cost-effective solutions, encouraging uptake and acceptance of net-zero and net-zero-ready building codes, energy and carbon reduction measures, preparing for the energy transition and increasing housing resilience in the face of a changing climate.

LEEP focuses on twelve key areas and offers workshops, forums guides, tools and other resources to build capacity and support the construction industry toward increasing the sustainability and resilience of the Canadian housing stock.

Workshops/Forums (New Homes) | Workshops/Forums (Renovations) | Workshops/Forums (Multi-Unit Residential Buildings) | Workshop for Contractors | Videos | Guides | Tools | College

- Integrated Design Process
- Operational & Embodied Carbon
- Adaptation & Resilience
- Electrical Load Management
- Cost Benefit Analysis
- Envelopes
- Windows & Fenestrations
- Modular & Panelization
- Heat Pumps
- High Performance Mechanicals
- Solar PV
- Case Studies & Field Trials

LEEP IDP and Code Update Workshop

New Homes or Retrofit:
New Homes

Audience:
Builders, Designers, Energy Advisors, Trades, Consultants (technical & code focus)

Location:
In-Person or Online

Length:
6.5 hours

Description:
This full-day workshop demonstrates the value of an Integrated Design Process (IDP) for Code compliance. NBC 2020 Code Updates are compared to previous code requirements. Each workshop is customized with Provincial Code variations for each region and solutions illustrated using a local 'Archetype' home.

- Both Prescriptive and Performance Pathway 'Targets' are examined in detail.
- A builder from a local HBA presents an 'archetype' home which is modeled with different design options to demonstrate code-minimum vs. tiered upgrades, using codes specific to your Province/Territory.
- A simulated IDP 'charrette' (collaborative working session) takes participants through an IDP process using break-out groups and discussion to dig into the details, invite questions and reinforce learning.
- Participants take-home critical updates on code compliance for their region.

LEEP Tools, Guides, and Resources including the *LEEP NZE Wall Guides*, the Cost- Benefit Analysis Tool (CBAT), Material Carbon Emission Estimator (MCE2) Tool, Tableau Data-Dashboard, and others, are presented.

LEEP Introduction to IDP Seminar

New Homes or Retrofit:
New Homes and Retrofits

Audience:
Homebuilders Associations, Builders, Renovators, Designers, Energy Advisors, Trades, and Homeowners

Location:
In-Person or Online

Length:
1 to 1.5 hours

Description:
This is a concise introduction to the 'concept' and use of an Integrated Design Process: the 'how and why' of an IDP. It explains how IDP collaboration can be successfully applied to Part 9 housing or renovation projects of all sizes.

This session includes:

- Development of IDP and industry context
- 'what/how/why' IDP with focus on home building or renovation marketplace
- a simplified three-phase IDP process
- teamwork, collaboration and measured performance tools provide decision-support and optimization results, at any scale
- the renovation focussed session also presents 'case study' examples of renovation highlighting the benefits of IDP, and greater detail on the role of the 'IDP facilitator' and training pathways to build the skillset

Note: This session pairs well with "Building Science Fundamentals' to provide a full-day of training.

LEEP Embodied Carbon for Low-Rise Construction Workshop

New Homes or Retrofit:

New Homes

Audience:

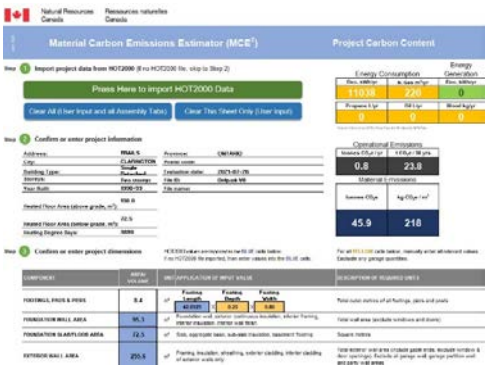
Energy Advisors, Designers and Builders

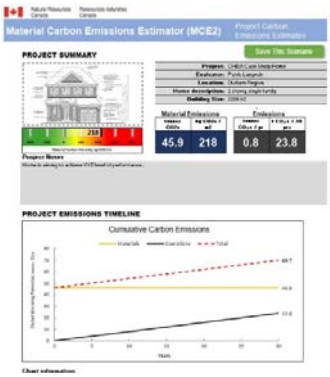
Location:

In-Person or Online

Length:

2 to 2.5 hours





Description:

This workshop enables industry to get a quick snapshot of both the operational and embodied carbon emissions associated with homes built in their region. The workshop takes participants through a case study home and shows how to use the NRCan's Material Carbon Emissions Estimator (MCE2) tool to understand which home components have the highest levels of embodied carbon, and how the tool can be used to reduce the first carbon impacts of the home through material trade-offs.

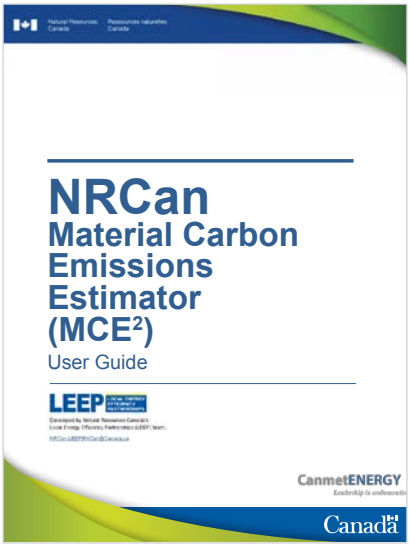
This workshop includes:

- An overview of embodied carbon terms, concepts, and data
- A tutorial of how to use the MCE2 tool
- A worked example of a typical Canadian home in MCE2, and review of strategies for reducing embodied carbon in the home

LEEP Material Carbon Emissions Estimator (MCE²) and Guide

Audience:

Energy Advisors, Builders, Designers



Description:

LEEP offers the MCE² downloadable tool and user guide designed to support the home building and renovation industries in making informed material choices to reduce up-front carbon emissions. The MCE² user guide describes the significance of material carbon emissions and provides instructions on how to use the tool. The tool quantifies the greenhouse gas (GHG) emissions associated with specific low-rise, residential building designs by providing two important estimates:

- The GHG emissions associated with manufacturing required building materials.
- The estimated GHG emissions from operating the home (calculated using results from a HOT2000 energy model).

Together, these results calculate the overall Greenhouse Gas (GHG) impact of a new home or renovation (its carbon use intensity, or CUI) and provide the industry with insights into reduction opportunities. The tool allows users to compare materials on a component-by-component basis, as well as by whole assemblies. The majority of a building's high impact materials are represented in the calculator. NRCan has included a wide range of structure and enclosure assemblies and materials, as well as many common cladding, sheathing and finishing materials for residential construction.

Link:

Tool - https://natural-resources.canada.ca/sites/nrcan/files/canmetenergy/files/NRCan_E2CM%20-%20V1.2.xlsm
User guide - https://natural-resources.canada.ca/sites/nrcan/files/canmetenergy/files/MCE2_USER_GUIDE.pdf

Recommendations: Energy Advisors and builders should look for opportunities to take NRCan's "Embodied Carbon for Low-Rise Construction Workshop" offered through the Canadian Association of Consulting Energy Advisors (CACEA).

LEEP Sustainable Resilient Housing Workshop and Tool

New Homes or Retrofit:

New Homes and Retrofit

Audience:

Builders, Renovators, Trades, Municipalities, Housing Providers, Designers, Engineers and Architects, Site Supervisors, Maintenance teams, Energy Advisors

Location:

In-Person or Online

Length:

6 hours

Description:

In this 2-part full day workshop, attendees will be introduced to considerations for constructing sustainable and resilient housing in the face of the changing climate. The workshop begins with an overview of the current climate hazards and risks to buildings, insurance impacts and trajectories based on current scientific information. Climate hazards included are: warming temperatures and extreme heat, heavy rainfall and urban stormwater flooding, heavier snow, increased ice and freeze-thaw, water shortage and drought, interface wildfire, wildfire smoke and air quality impacts, coastal flooding, river flooding, lake flooding, high winds and storms, extreme storms, thawing permafrost, and slope instability and landslides. Attendees will be guided through the use of the tool, beginning with the climate hazards, high level weather information and forecasts to identify historical and potential future climate-related risks for their region. Land planning and development factors and climate change considerations impacting buildings will also be covered. The second half of the session explores possible measures that could be used to increase resilience in houses. Risk preventative adaptation measures relevant to the climate hazards identified in the earlier session will be explored. Roundtable discussions on costs, benefits, challenges, gaps, opportunities and possible solutions will be explored and shared.

The workshop includes:

- An overview of climate change and its impacts on Canadian housing,
- A guided walkthrough of the Sustainable Resilient Housing Tool specific to the geographic region of the workshop attendees,
- Land planning and development considerations in the context of climate-related impacts,
- Resilience/adaptation measures and implementation plans for increasing sustainability and resilience in Canada's housing stock.

2-Part Series

- Part 1: Climate change hazards, risks to buildings and land development and planning considerations
- Part 2: Adaptation measures (standards, best practices and guides) and implementation plans

LEEP Wildfire Resistant Net Zero Housing Workshop

New Homes or Retrofit:

New Homes

Audience:

Builders, Developers, Utilities, Electrical Inspectors, Municipalities

Location:

In-Person

Length:

7 hours

Description:

This workshop was developed to support PacifiCan's Lytton Homeowner Resilient Rebuild Program (LHRRP).
It is being delivered for the first time in May 2024 through a series of events with 4 local British Columbia Home Building Associations. The 'multisolving' workshop addresses both wildfire resistance and net-zero, broadening the collaboration required to define practical solutions.

This workshop includes:

- An expert presentation introducing key concepts in wildfire resistant construction including the results of recent fire testing of common generic approaches to envelope construction.
- An introduction to a series of Wildfire Resistant Construction Technical Sheets that provide information on reducing risk of damage due to ignitions of buildings in wildfire zones.
- See and touch demonstration of wildfire-resistant net zero energy details and assemblies.
- Product manufacturers selected by the home building industry with component products applicable to fire-resistant wall assemblies.

LEEP Panel Upgrades and Electrical Service Management for Heat Pump Retrofits Workshop

New Homes or Retrofit:

Retrofits

Audience:

Utilities, Electrical Trades, Hvac Trades, Energy Advisors

Location:

In-Person

Length:

4.5 hours

Description:

This session (to be piloted in BC) will focus on electrical service and panel implications for heat pump retrofits, dispelling the notion that panel/service upgrades should be the default for routine heat pump retrofits.

The workshop will focus on strategies to minimize the need for unnecessary upgrades, including:

- An “envelope first” approach to manage home heating loads
- Right-sizing heat pumps
- Strategic sizing of back-up and supplementary heating requirements
- CEC compliant tools to analyse home electrical loads and available panel capacity
- An overview of tools and products to manage peak demand post-retrofit

LEEP Grid Interactive Technologies Workshop

New Homes or Retrofit:

New Homes

Audience:

Builders, Developers, Utilities, Electrical Inspectors, Municipalities

Location:

In-Person

Length:

Full Day (7 hours)

Description:

Electrification of new homes would provide significant GHG savings for low incremental cost in many jurisdictions in Canada. However, because all-electric homes electrify conventionally fossil fuel met loads (heating and hot water), the mass adoption of all-electric homes would likely cause a significant increase in peak loads on the electrical grid. The workshop highlights and quantifies these issues, and discusses ways builders can reduce this peak load impact. Conversations are facilitated between builders, utilities, and energy advisors to help find ways to collaborate towards the realization of all-electric communities.

This workshop includes:

- Presentations by experts about the challenges and opportunities related to electrified homes and the grid
- Analysis of the impact of grid interactive technologies on an example all-electric home
- Facilitated breakout sessions where participants can discuss the pathways to low peak electrified homes
- Potentially, this workshop could lead to future sessions where more detailed information about specific, high impact technologies would be presented

LEEP Home Optimization Dashboards

New Homes or Retrofits:

Both New Homes and Renovations

Audience:

Home Builders, Developers, Renovators, Energy Advisors

Description:

These dashboards make costed parametric energy simulations easy to navigate, allowing builders, energy advisors, and renovators to explore many thousands of different combinations of technologies. For new construction, these dashboards allow builders to find an optimized design that meets their energy or GHG targets, while minimizing costs and taking into account the preferences and constraints of the builders.

For retrofit scenarios, the dashboards allow energy advisors and renovators to help homeowners find optimized designs that meets the homeowners energy or GHG targets, while minimizing costs and taking into account the preferences of the homeowner and constraints of the particular home.

This tool includes:

- Costed parametric runs of 50,000+ energy modelled homes, each with a unique set of upgrades (or retrofits)
- A simplified interface that lets users easily explore the potential options for the home, and quickly find optimal points
- The tool can be of an archetype home, or a specific home, depending on the needs of the user and/or the workshop
- Includes heating and cooling design information (which can be used to select appropriately sized HVAC systems)

Link: https://public.tableau.com/app/profile/austin.selvig/vizzes

LEEP Cost-Optimized Affordable Housing Pathways Workshop

New Homes or Retrofit:

New Homes

Audience:

Affordable Housing Providers, Municipal Affordable Housing Agencies, HBAs

Location:

In-Person or Online

Length:

6 hours

Description:

Participants will explore lower cost technology pathways for taking their affordable housing projects to Tiers 3, 4 or 5 including deep dives into key technologies. The workshops will focus on cost-optimized pathways to achieve higher tiers of performance for affordable housing archetypes in 7 regions across Canada.

This two-part workshop series includes:

- Exploring a dataset and identify solutions, processes, and technologies of interest.
- A deep dive into technology, products and practices of interest
- Subject matter experts presenting on implementation best practice, trade-offs, costs, and buildability.
- Supply chain presentations on products and support (optional)

LEEP Cost Benefit Analysis Tool (CBAT) and Workshop

New Homes or Retrofits:
New Homes

Audience:
Energy Advisors and Builders

Location:
In-Person

Length:
3.5 hours

Description:
This workshop helps uncover the numerous design combinations that builders can choose from to reach energy efficiency targets set out by local building codes. This includes BC Energy Step Code, National Building Code 2020, CHBA Net Zero Energy and more. Participants will see examples of how EA's and builders used CBAT to combine real-time costing data with HOT2000 energy efficiency simulations to identify cost-optimal recipes for their upcoming Part 9 construction project.

This workshop includes:

- An expert presentation from an Energy Advisor on current and upcoming building codes for energy efficiency and their requirements
- A local case study from a builder and an Energy Advisor who have completed a cost-optimization using CBAT
- An introduction on how to use CBAT (excel-based)
- A take home version of CBAT preloaded with the case-study house

LEEP Cost-Optimized Pathways to High Performance MURBS Workshop

New Homes or Retrofit:

New Homes

Audience:

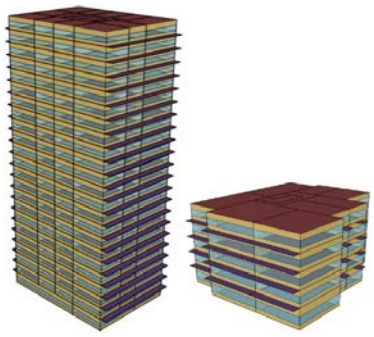
Builder/Developers, Consultants, Modellers and HBAs

Location:

In-Person

Length:

4.5 hours



Description:

Workshop participants will explore lower cost technology pathways for taking four Multi-Unit Residential Buildings (MURBs) archetypes to higher tiers of the energy code in the city where the event is taking place. Technologies that are part of these lower cost solutions will be explored in depth. The underlying parametric analysis and cost-optimized solution sets for the archetype MURBs will be developed prior to the event using NRCan's Building Technology Assessment Platform (BTAP). The results will support workshop participants in determining their design targets in relation to tiered code.

Participants will review the dataset and multiple energy conservation measures (ECMs) modelled, and discuss costs, applicability, buildability, and relevance for regional code and energy performance targets. Participants will select technologies and products of interest for a deep dive, featuring Subject Matter Experts (SMEs) presentations, implications for upcoming codes and Green Development Standards (GDS) targets and case studies.

This workshop includes:

- Exploration of local regions code requirements and/or program requirements
- Archetype MURB models representative of the region
- Energy and cost optimized ECM packaged pathways
- Technology deep dives

LEEP Building Science Fundamentals

New Homes or Retrofit:
New Homes and Retrofit

Audience:
Builders, Renovators, Trades

Location:
In-Person or Online

Length:
4 hours

Description:
In this 4-hour session builders, renovators and trades will learn the fundamental building science principles for residential housing. Occupants desire a comfortable home with healthy indoor air quality and lower utility bills. This workshop discusses how to achieve these benefits through building science principles and the house-as-a-system approach. Heat, air and moisture flow, air and vapour barriers, and water management systems will be presented. How the different systems within the house like the envelope, windows, and mechanicals impact one another will be discussed. Key details, risks to watch out for and unintended consequences will be reviewed.

This workshop includes:

- A review of how heat, air and moisture move, how to control them why this is important,
- An explanation of the House-as-a-system and how different components impact one another,
- An overview of what happens when you add insulation and increase air tightness of the home, and what to consider to ensure you are selecting the right windows and mechanicals for your home,
- A look at why building science needs to be considered to avoid unintended consequences as homes become increasingly efficient.

Recommendations:

This workshop offers a good building science foundation for many of the LEEP resources, including envelope, PEER, and mechanicals for both new homes and retrofit workshops and forums.

LEEP Envelope Technology Forums

New Homes or Retrofit:

New Homes and Retrofit

Audience:

Builders, Renovators, Trades, Energy Advisors, Energy Utilities, Home Building Associations, Municipal and Provincial Governments, Conservation Authorities, Academic Institutions

Location:

In-Person

Length:

4 to 6 hours

Description:

The LEEP Envelope Technology Forum is a big tent event, where participants find out how experts and manufacturers respond to challenges set for them by: 1) regional builders as they reach towards Tier 3, 4, and 5 of the National Building Code for housing, or 2) renovators focussed on deep energy retrofits. Events are focused on a singular case study so that participants can compare technologies in a specific application and determine which ones best fit their regional needs.

LEEP Forums typically include optimization and up-front building science and best practice information to set the technical context on the performance requirements to achieve these levels of code. The Forums' leverage detailed guidance on construction detailing from the LEEP's Net Zero Wall Guides, resilience measures, and embodied carbon considerations resulting from analysis carried out using the Material Carbon Emissions Estimator (MCE2). This is followed by manufacturer presentations that provide fully costed wall system solutions that address the needs identified by the construction industry.

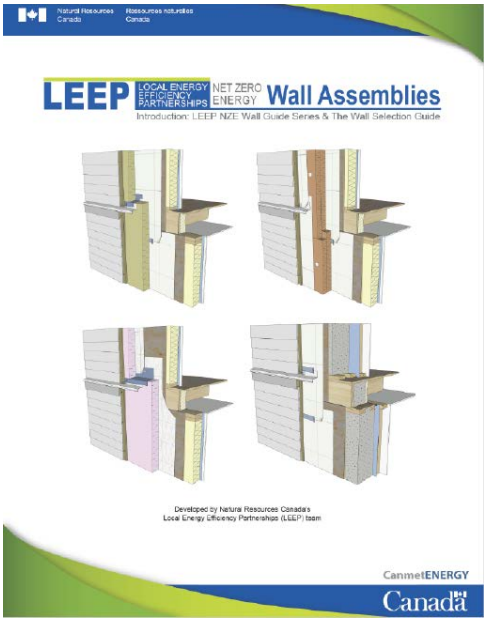
These Forums includes:

- Whole home cost optimization to help participants consider how far they want to improve envelope performance.
- An expert presentation on building science and best practices to achieve higher tiers of the National Building Code.
- Presentations from invited manufacturers that respond to the builder set challenges for a specific case study home.

LEEP Net Zero Wall Guide Series

Audience:

Builders, Renovators, Designers, Students in any construction skills, technology, building science or building design program



Description:

The LEEP NZE Wall Guide Series includes seven (7) downloadable documents that offer detailed design support, risk assessment, construction tips and large-scale construction details. The four Wall Assembly Guides #1-4 in this series demonstrate a variety of construction approaches and each allows a range of R-values. Each assembly has unique benefits and drawbacks and therefore must be carefully selected and tailored to meet climate zone and regulatory requirements. The series provides technical guidance for the design and detailing of these four high-performance wall assemblies. Critical barriers (water/air/vapour) are examined, as is risk relative to climate zone, temperature, and humidity. Topics include long-fasteners, condensation risk, permeability vs. non-permeability of insulation and air-barriers, durability, and difficult details at transition points in the building envelope

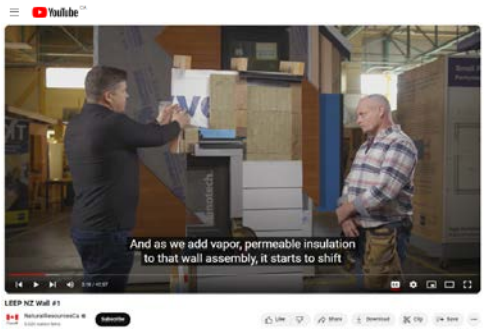
The guide series includes:

- Intro & Wall Selection Guide gives an overview of each wall assembly and guidance on selection.
- Three (3) wall guides for 'split wall' systems (walls with continuous outboard insulation) including: mineral wool, wood fiber insulation, and foamed plastic insulation.
- One (1) fourth wall guide provides details for a double stud wall with an optional service cavity.
- Appendix A looks at the building materials and products required in the construction of high-performance walls.
- Appendix B takes a deeper dive into the building science of wall design including insulation ratios, condensation risk, temperature and humidity by climate zone, and code requirements.

LEEP Net Zero Wall Videos

Audience:

Builders, Renovators, Designers, Students in any construction skills, technology, building science or building design program



Description:

The NRCan LEEP Team collaborated with British Columbia Institute of Technology (BCIT) to create this series of six (6) **construction training videos** that correspond directly to the **LEEP NZE Wall Guide Series**. RDH Building Science and LEEP developed the wall guide series in response to LEEP builder-workshops. BCIT built full-scale mock-ups of the four wall assemblies and used them to developed high-performance construction training to compliment the *Red Seal Carpentry Program* and to provide learning support for the LEEP NZE Wall Guides, for Net Zero Energy, Tiered-Codes, and the construction of high-performance, wood-framed buildings.

AT A GLANCE: 4 NET ZERO WALL TYPES

These videos include:

- Expert instructors from RDH Building Science and BCIT's Zero Energy Buildings Learning Center lead viewers through a detailed examination of constructibility, pros, cons and critical details of each wall.
- Guidance on material and wall-type selection uses an easy-to-follow decision process.
- Appendix A takes viewers through many building materials and products used in high-performance walls.
- Appendix B takes a deeper dive into the building science of wall design including insulation ratios, condensation risk, temperature and humidity by climate zone, and regional code requirements.

Video:

https://www.youtube.com/playlist?list=PL4IzHQKIa2ZxZbEkYfWeS_DfDpwdLYERU
or web search "youtube LEEP Wall Videos"

LEEP Windows Workshop

New Homes or Retrofit:

New Homes and Retrofits

Audience:

Builders, Renovators, Developers, Designers, Energy Advisors, Window Installers, Property Managers

Location:

In-Person or Online

Location:

7 hours

Description:

This LEEP Windows Workshop provide an in depth look at window performance, selection and installation. Technical presentations by Canadian window experts address four topic areas with handouts of slide decks for future reference.

This includes:

- Information on the design and technology of window frames and glass units
- Building Codes and Standards for windows
- Windows selection tools and measured performance evaluation
- New, best practices in window installation per CSA A440.4 for reliability and durability
- Product manufacturers presenting responses to challenge questions set by industry including those related to tiered code compliance
- Detailed instructional videos demonstrating window in accordance with the CSA A440.4, and spray rack testing to verify durability and performance.

Note: the four technical presentations can be offered as 4 hours of intensive learning. The manufacturers presentations in the installation and testing videos require the additional 3 hours.

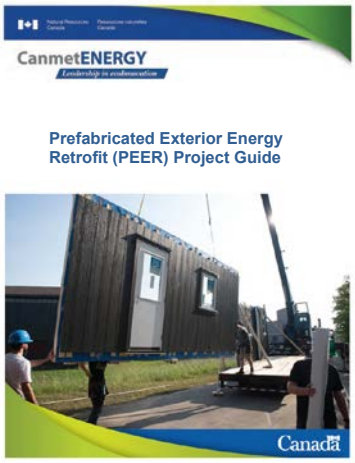
PEER Building Science Considerations for Exterior Retrofits Workshop

New Homes or Retrofit:
Retrofit

Audience:
Housing providers, Renovators, Manufactured Housing, Trades

Location:
In-Person or Online

Length:
4.5 hours



Description:
This workshop is based upon the applied research by CanmetENERGY'S Housing and Buildings team on Prefabricated Energy Exterior Retrofit (PEER) technology. In this second of the 3-part series, participants will gain an understanding of how best to implement PEER approaches to reduce on-site time required to carry out deep energy retrofits. This workshop introduces the PEER technology, explains how it works and is implemented, and provides a case study example with key lessons learned. It provides exterior retrofit specific building science considerations that need to be factored in during design, planning and construction to avoid unintended consequences.

This workshop includes:

- An overview of the PEER concept and the role of Integrated Project Design and Planning,
- A deep dive into the five wall assembly types discussed in the PEER Guide,
- How heat, air and moisture are considered and planned for in PEER retrofits,
- A case study and lessons learned from pilot PEER projects.

3-Part Series:
Part 1: LEEP Building Science Fundamentals, Part 2: PEER Building Science Considerations, and Part 3: PEER Adaptation Measures for Exterior Retrofits.

Link:
https://natural-resources.canada.ca/energy-efficiency/data-research-insights-energy-efficiency/housing-innovation/peer-prefabricated-exterior-energy-retrofit/19406

Recommendation:
It is recommended to take the LEEP Building Science Fundamentals workshop first to gain foundational knowledge on the principles of heat, air and moisture flow and house-as-a-system concepts.

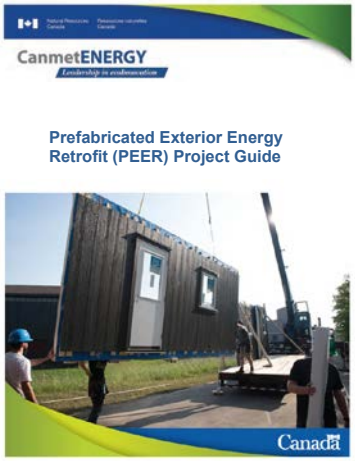
PEER Adaptation Measures for Exterior Retrofits Workshop

New Homes or Retrofit:
Retrofit

Audience:
Housing Provider Teams, Any Groups Considering Panelization for Their Project, Designers, Engineers and Architects, Renovators, Panel Manufacturers, Trades, Maintenance Teams

Location:
In-Person or Online

Length:
3 hours



Description:
In the third of this 3-part series, attendees will gain an understanding of the PEER approach and application options, explore considerations in design, planning and implementation, and gain insights on climate-related extreme weather impacts that should be considered during the design and planning phase of the project. This workshop builds on the PEER Building Science Considerations for Exterior Retrofits Workshop. by exploring details on how to increase resilience to climate change impacts through adaptation measures applied in the high performance, energy efficient, low carbon PEER projects.

This workshop includes:
- An overview of climate-change related hazards like extreme heat events, flooding, wildfire, high winds, droughts, cold snaps, extreme snow fall, ice storms and power outages,
- A look at the dual approach to sustainable housing through mitigation - carbon and environmental impact reduction, and adaptation - increased resilience against climate-related impacts,
- A review of adaptation approaches to consider when planning PEER projects to increase resilience against climate-related hazards,
- Exploration of health impacts from Radon exposure and solutions to reduce impacts.

3-Part Series:
Part 1: LEEP Building Science Fundamentals, Part 2: PEER Building Science Considerations for Exterior Retrofits, and Part 3: PEER Adaptation Measures for Exterior Retrofits.

Link:
https://natural-resources.canada.ca/energy-efficiency/data-research-insights-energy-efficiency/housing-innovation/peer-prefabricated-exterior-energy-retrofit/19406

Recommendation:
It is recommended to take the LEEP Building Science Fundamentals and PEER Building Science Considerations for Exterior Retrofits prior to taking the PEER Adaptation Measures for Exterior Retrofits as the information in each workshop builds on each other.

LEEP Heat Pump Capacity Building Workshop

New Homes or Retrofit:
Retrofit

Audience:
HVAC Installers, Energy Advisors, HVAC Designers, Distributors

Location:
In-Person

Length:
4.5 hours

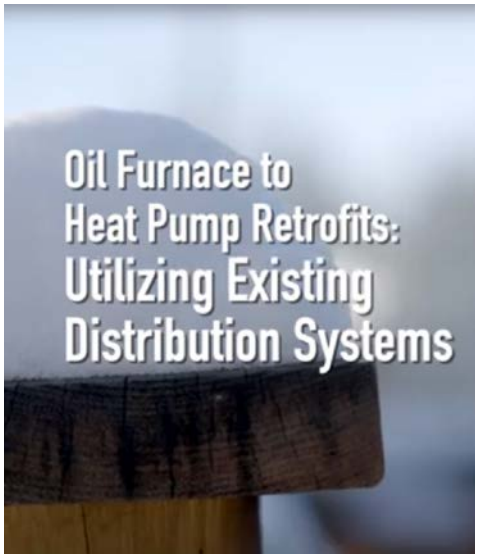
Description:
This workshop series provides contractors with best practices for sizing and selecting heat pumps for retrofit installations. Regional interests may vary from oil furnace or oil boiler to heat pump conversions, to mini split applications, to hybrid heat pump gas furnace systems. Local industry can choose 3 or 4 of the 6 developed learning modules based upon the applications of most interest in their region. These modules are updated with energy analysis for the region in which the workshops are taking place. A couple of manufacturers then make best practice presentations with the equipment they would select for a specific case study home. Alternatively, the last session of the half-day delivery may be a discussion of a specific mechanical challenge.

Developed modules include:
1. Heat Loss calculations for right-sized heat pumps – featuring a demo of a new tool that uses a HOT2000 file as input for providing whole home F280 calculations for the heating equipment replacement market.
2. Duct flow testing – how to measure existing airflow and pressure, and utilize this information to maximize the size and benefit of a heat pump without needing to replace existing ductwork.
3. Controls strategy – Understand the implications of different controls strategies and settings on operating costs, GHG impacts, peak electrical demands on the grid, and the amount of heat pump and backup heating system operation.
4. Panel sizing and electrical upgrades – Strategies to minimize the need for panel and service upgrades during retrofits.
5. Demo of NRCan's ASHP Sizing and Selection Tool – Deep dive into using the tool to produce cost saving estimates for quoting retrofit jobs.
6. Hydronics distribution system – The importance of knowing maximum distribution capacity at heat pump operating temperature capacities.

LEEP Retrofit Heat Pump Best Practice Videos

Audience:

HVAC Designers, HVAC Contractors, Homebuilders, Homeowners



Description:

This video series showcases best practices in heat pump sizing, selection and installation in case study homes across Canada. Learn how heating, ventilation and air conditioning (HVAC) contractors, energy advisors, builders and renovators can apply these principles to design and install heat pump systems that are cost-effective, comfortable and deliver utility and greenhouse gas (GHG) savings for Canadians in a diverse range of homes.

The video series includes:

- The importance of proactive planning and heat pump retrofits
- An envelope first approach to heat pump retrofits
- Making a business case for gas furnace retrofits
- An introduction to cold climate heat pumps
- Oil furnace to heat pump retrofits: utilizing existing distribution systems
- Oil furnace to heat pump retrofits: A whole home approach
- A business case for community housing retrofits

Video:

https://natural-resources.canada.ca/energy-efficiency/homes/local-energy-efficiency-partnerships-leep/leep-videos/best-practices-heat-pump-retrofits/25293

LEEP Heat Pump Sizing and Selection App

Audience:

HVAC Designers, HVAC Contractors, Home Builders, Homeowners

Description:

This new web application for heat pump sizing and selection supports industry in properly sizing and selecting heat pumps in new and retrofit housing. Aimed primarily at HVAC contractors and designers, it guides users through a series of steps to consider homeowner and builder objectives, ductwork options, heat pump selections, and the implication of those selections. It can also enable key stakeholders to quickly collaborate on decision making or communicate the results of the decisions that have been made. Key outputs of the tool are comparing heat pump on GHG emissions, energy consumption, and operating cost.

The tool includes features such as:

- An independent flow of best practice steps for new housing, deep retrofits, additions, and light retrofit.
- A homeowner and builder needs assessment that are used to make suggestion on the various steps within the app.
- A share feature allowing tracking collaboration and sharing key steps with collaboration on a project-by-project basis.
- Key metric and output that can be used to support the sales of heat pump system in new and retrofit housing.

Link:

The tool is part of a toolkit on heat pump sizing and selection that can be accessed here: https://natural-resources.canada.ca/maps-tools-and-publications/tools/modelling-tools/toolkit-for-air-source-heat-pump-sizing-and-selection/23558

LEEP Mechanicals Forum: Options and Best Practices for New or Retrofit Housing

New Homes or Retrofit:

New Homes or Retrofits

Audience:

Builders, Trades, Energy Advisors, Energy Utilities, Home Building Associations, Municipal And Provincial Governments, Conservation Authorities, Academic Institutions

Location:

In-Person

Length:

4 to 6 hours

Description:

The LEEP Technology Forum is a big tent event, where participants find out how experts and manufacturers respond to challenges set for them by the regional builders as they reach towards Tier 3, 4, and 5 of the National Building Code for housing. Events are focused on a singular case study so that participants can evaluate technologies against each other and determine what is the best fit for their regional needs.

LEEP Forums typically include optimization and up-front building science and best practice information to set the technical context on the performance requirements to achieve these levels of code. For mechanicals forums, LEEP tools and best practice guidelines are used to support informed decision making on mechanical systems, including the Heat Pump Sizing and Selection App, duct flow testing and CSA F280-12 in retrofits. This is followed by manufacturer presentations that provide fully costed HVAC system solutions that meet the needs of the local industry.

These forums include:

- a local industry panel reviewing the most common mechanical challenges in new builds, and the mechanical implications of the different tiers of the code,
- the use of new apps to support builders in working with designers and trades to size and select equipment,
- a presentation on controls for heat pumps and hybrid systems, and
- presentations from invited manufacturers that respond to the builder set challenges for a specific case study home.

LEEP Forced-Air Mechanical System Planning Forums

New Homes or Retrofit:
New Homes

Audience:
Builders, HVAC Trades, Distributors

Location:
In-Person

Length:
2-4 hours

Description:
This workshop models how builders, HVAC designers and contractors can quickly work together to improve mechanical outcomes for their new builds using a simple guide or tool. Participants will learn how to use the tool to quickly make and record decisions that improve distribution system effectiveness, size mechanical equipment, and select the functionality the equipment needs to have to work effectively in their builds.

The workshop includes:

- A facilitated session where a builder, mechanical contractor, an HVAC designer, and an energy advisor focus on common mechanical challenges in today's new housing in the local market.
- A local builder and a designer demonstrate the process for a case study home where they use the 13-step process to make distribution system choices such as supply and return register location, and equipment selection criteria such as load calculations, sizing and staging.
- Two building industry selected manufacturers each briefly present their proposed best practice equipment selection for the case study home.

LEEP Technology Forum for Renovations - High Performance Mechanicals

New Homes or Retrofit:

Retrofit

Audience:

Renovators, HVAC Contractors, Energy Advisors, Energy Utilities, Home Building Associations, Municipal and Provincial Governments, Conservation Authorities, Academic Institutions

Location:

In-Person

Length:

4 to 6 hours

Description:

In this big tent event, participants learn how to make decisions on how best to retrofit a heat pump as part of a fully electric or hybrid heating system.

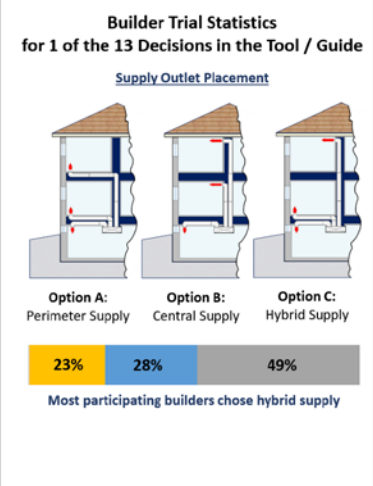
These forums include:

1. a local industry panel reviewing the most common mechanical challenges in new builds, and the mechanical implications of the different tiers of the code,
2. the use of new apps to support builders in working with designers and trades to size and select equipment,
3. a presentation on controls for heat pumps and hybrid systems, and
4. presentations from invited manufacturers that respond to renovator set challenges for a specific case study home.

LEEP Master Planning and Decision Tool and Guide for Natural Gas Mechanical Systems

Audience:

Builders, HVAC Designers, HVAC Contractors



Description:

The tool and guide help users quickly define the HVAC system that will meet the needs of their next new home or subdivision project. Users first start by identifying common problems and situations found in today's new housing, and then are pointed to potential solutions to consider in selecting their HVAC system. The tool and guide make it easier for builders, designers and contractors to quickly discuss options and decide how they can move towards better, more comfortable, and less expensive HVAC systems. In the initial builder trial, 97% of builders used the guide to make at least one incremental change to their current practice. On average, builders used it to make three changes.

The Master Planning and Decision Tool and Guide for Natural Gas Mechanical Systems includes:

- Selecting house type, consider a list of the more common mechanical issues that are most likely to arise, and confirm which ones they wants to focus upon.
- Using the first 7 steps to choose: supply outlet placement, supply duct velocity and static pressure, supply duct zoning, equipment zoning, return air placement, and duct sealing level.
- Using remaining steps to support equipment selection by focusing on: load calculations, cooling capacity, dehumidification strategy, space heat equipment size range, and staging or modulation.
- Recording decisions and confirm them between the builder, the HVAC designer and the mechanical contractor.

Links:

- https://natural-resources.canada.ca/energy-efficiency/homes/local-energy-efficiency-partnerships-leep/leep-technology-guides/17346

LEEP Mechanical Practices in New Housing Video Series

Audience:

Builders, Designers, HVAC Designers, Mechanical Contractors

Description:

This series of 14 videos provides case studies on how builders have addressed the comfort and efficiency needs of today's new housing by selecting the options that work best for them on the homes they build in their markets. It aligns well with the distribution system options and sizing practices outlined in the Master Planning and Decision Guide and Tool for Natural Gas Mechanical Systems.

The series includes videos on:

- Right sizing using CSA F280-12 for comfort and quality assurance
- Framing layout coordination with mechanical design
- Zone ready systems
- High wall supply registers for improved air circulation
- Window solar heat gain and its importance in modern home mechanical design
- Simplified return air systems

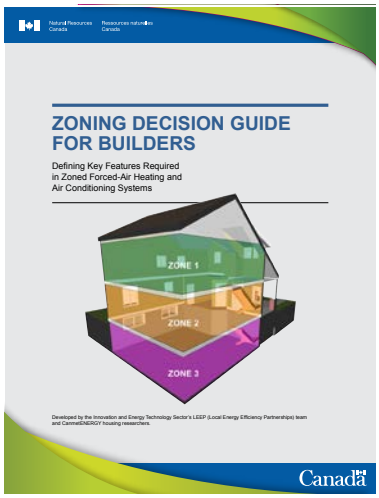
Links:

- https://www.youtube.com/playlist?list=PL4IzHQKla2Zzd0fh14AsDXBGqHZ0hTqZT

LEEP Zoning Decision Guide for Builders with Zoning Checklist

Audience:

Builders, HVAC Designers, Mechanical Contractors



Description:

Today's homes often are tall, have a small footprint, and have three or sometimes four finished floor levels. Homeowners expect similar comfort levels on each floor and this can be challenging using traditional forced air ducting systems rulesets that were created for the homes of the 1960s. Zoned forced air technology can be used to address comfort these comfort issues and reduce energy consumption. New forced air zoning technology and related cost reductions are increasing its use in tract housing. As well as improving comfort, zoning can be used to reduce overall energy consumption and reduce summer peak electrical loads on the grid.

This guide includes:

- Steps builders and their mechanical designers can take together to define, communicate, discuss and finalize design features of zoned heating and cooling systems.
- Steps to quickly consider a full range of zoning product and practice options including how to select zones, choosing the type of zoned HVAC system to install, choosing the approach to meeting demand from a single zone, choosing change over approach between heating and cooling, and choosing the duct system air flow velocity and static pressure.
- A zoning checklist with seven decision points to record decisions so that the HVAC designer or contractor can be clear on builder expectations before starting the design.

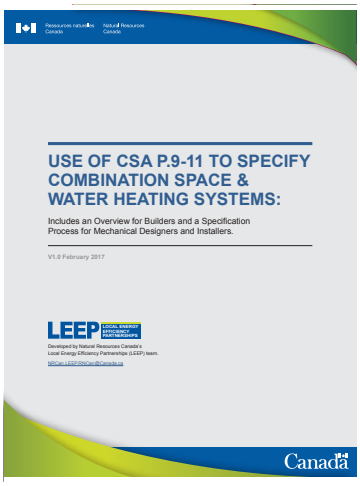
Link:

https://natural-resources.canada.ca/energy-efficiency/homes/local-energy-efficiency-partnerships-leep/leep-technology-guides/17346

LEEP Guide on Use of CSA P.9–11 To Specify Combination Space & Water Heating

Audience:

Builders, HVAC Designers, Mechanical Contractors



Description:

This guide supports the selection and specification of efficient and appropriately sized combination systems. The CSA P.9-11 test results provide capacity and efficiency ratings, component lists for purchasing, and information for installation and commissioning. Test results enable combination systems to be compared on a level playing. Test results are used to reduce the risk of under sizing combination systems and related customer complaints. Listed test results also provide critical information related to the energy performance of the complete combination systems with operational controls. Water heater or boiler ratings do not provide an accurate substitute for space heating mode efficiency and capacity ratings with a particular air handler and controls regime.

The guide includes:

- A short overview to support builders as they engage with their HVAC designers and contractors to get an appropriate combination systems for their next housing projects.
- A more detailed 3 step process for HVAC designers and mechanical contractors to use that includes a worked example.
- Step 1 focusses on defining the design requirements for water heating capacity, space heating capacity, the maximum static pressure in the duct system, and energy efficiency.
- Step 2 focusses on selecting a combination system that meets the design requirements.
- to set the design requirements for combination systems, short-list candidate systems that meet the design requirements so, and select an appropriate system.
- Step 3 focuses on matching the 'as installed' system components and related installation and commissioning to the lab tested system results.

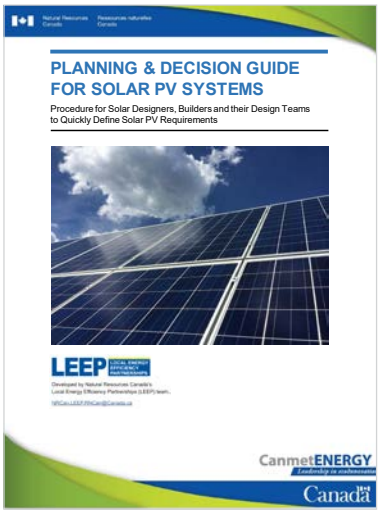
Link:

https://natural-resources.canada.ca/energy-efficiency/homes/local-energy-efficiency-partnerships-leep/leep-technology-guides/17346

LEEP Planning and Decision Guide for Solar PV Systems

Audience:

Solar PV Consultants, Builders, and Homeowners



Description:

The Planning and Decision Guide for Solar PV Systems is for the use of solar PV consultants and installation contractors, together with their home builder and homeowner clients, to assist them in integrating solar PV technologies into residential applications. This guide responds to a knowledge gap identified by homebuilders in different regions where LEEP workshops have taken place. It provides a framework to ensure important, project-specific needs are met, which could improve both performance and affordability. The guide also helps make new homes ready for solar PV and supports goals for Net-Zero and Net-Zero ready home planning. Additionally, it also addresses off-grid solutions, including options for battery storage. By promoting an integrated design and construction team approach, the guide focuses on collaborative decision-making to align solar PV goals with project expectations and utility requirements.

This guide includes:

- Planning matrices, checklists and a solar PV system integration worksheet that define renewable energy objectives and streamline the process of meeting renewable energy targets,
- A 10-step process that guides the integration of solar PV systems into construction projects,
- An appendix with builder questions about Solar PV and related responses,
- Documents with customizable templates that help in defining and organizing services required from PV consultants across the design and installation phases.

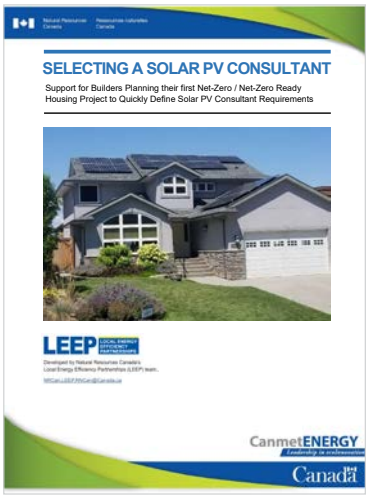
Links:

- LEEP Technology Guides and Tools (canada.ca)
- Planning and Decision Guide for Solar PV systems

LEEP Selecting a Solar PV Consultant Guide

Audience:

Builders and Homeowners



Description:

This guide provides home builders with a framework to help select a solar photovoltaic (PV) system consultant who will provide the type and quality of services that they require, and who will best-fit with the design and construction teams working on the residential Net Zero Housing project. It was developed to address a market gap identified by the Canadian Home Builders' Association's Net Zero Council. This resource was developed in collaboration with leading experts to simplify the complex process of defining and engaging a solar PV consultant.

This guide includes:

- A templated Scope of Work that lays out the essential services required from PV consultants, categorized into design and installation phases for clarity and ease of use.
- A Solar PV Consultant Interview Checklist that includes business information, services provided, qualifications, risk mitigation strategies, and more.
- How to work with a PV consultant to review plans and make suggestions to help optimize the cost-efficiencies of integrating PV into high performance, Net Zero Ready, or Net Zero home designs.
- Suggestions for where to involve the PV consultant in the overall design and planning stage of the project.
- A listing of additional resources to further enhance project planning and execution.

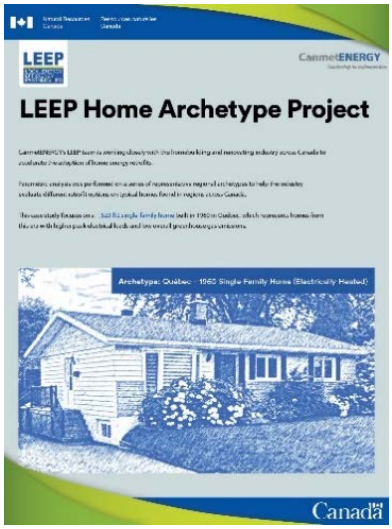
Links:

- LEEP Website: LEEP Technology Guides and Tools (canada.ca)
- Guide Link: Selecting a Solar PV Consultant Guide
- Appendix A: Template Scope of Work for Net Zero PV Design and Installation Best Practices
- Appendix B: Solar PV Consultant Interview Checklist

LEEP Home Archetype Project

Audience:

Energy Advisors, Renovators, Homeowners, Contractors, Municipal Governments, Manufacturers, Policy Makers



Description:

The Home Archetype Dashboard fills a recognized gap in analysis in the renovation sector. This project leverages CanmetENERGY's Canadian archetypes database of energy models, and selects representative homes from across Canada to conduct deep parametric cost and energy analysis. This analysis can help readers to determine the retrofit potential of these houses, and the practical renovation sequencing for a deep energy retrofit.

Each case study has an accompanying parametric dashboard that readers can access to explore the various renovation opportunities, their potential impacts, and their relative cost effectiveness in different types of homes in different climate zones.

This series currently includes:

- 16 Interactive renovation dashboards for homes across Canada, including BC, Alberta, Manitoba, Ontario, Quebec, and Atlantic Canada that each include ~60,000 energy simulations.
- 8 Case studies that mine the dashboards for insights on the most cost-effective approaches to improve the energy and carbon performance of homes in these regions.
- Insights on renovation sequencing for homeowners looking to create a roadmap towards high performance renovations.
- Brief descriptions of renovation approaches and technologies needed, and their individual impacts.

Link:

https://public.tableau.com/app/profile/austin.selvig/vizzes

LEEP High Performance Housing Guide for Southern Manitoba

Audience:

Builder And Energy Advisors

Description:

A group of leading Manitoba Builders used the Local Energy Efficiency Partnerships (LEEP) process to explore, select and apply a number of new energy efficient technologies. Many builders each selected the same technologies to trial as they aimed to improve the energy performance of their homes. This guide was developed to summarize some of the lessons learned from their field trial.

This guide includes:

- Examples and images of Manitoba LEEP field trial homes in 2014/15.
- Lookup tables based on energy simulation and optimization for typical homes in Manitoba to achieve ERS 82.
- Question and answer with manufacturers and builders who participated in the LEEP field trials in Manitoba on technology application in their homes.

Note: Builders have used LEEP to find the technologies they wanted to apply, and the local stakeholders who could best help them get there in different regions across the country. Builders have built homes that were CHBA Net Zero Energy Ready labelled, ENERGY STAR labelled, Passive House, and BC Step Code 3, 4, and 5. The LEEP field trial video series profiles some of these builds that took place in BC.

Link:

https://natural-resources.canada.ca/sites/nrcan/files/energy/pdf/16-149_HighPerformanceHousing_E_indd.pdf

Field Trial Videos

Audience:

Builders, Trades, Energy Advisors, Energy Utilities, Home Building Associations, Municipal and Provincial Governments, Conservation Authorities, Academic Institutions

Description:

These videos show how builders, consultants, trades and supply chains used the Local Energy Efficiency Partnerships (LEEP) initiative to accelerate affordable construction practices for energy-efficient homes. This series of videos was developed by BC Housing to focus on the experiences of builders as they worked to meet the requirements of the BC Energy Step Code. Areas of focus range from envelope systems, mechanical systems, and whole home approaches to achieving high levels of energy performance. LEEP is program agnostic. BC builders used LEEP to help them deliver homes that were part of programs such as Built Green, Energy Star, Net Zero Ready, and Passive House. They also used LEEP to support building to BC Step Code 3, 4 and 5 levels.

This video series includes:

- Videos that focus on how builders addressed a range of challenges related to envelope systems, mechanical system sizing and design, to whole home energy performance.
- Videos provide case studies located in a range of climate zones and housing types across British Columbia.

Videos in the series: 11

Link:

https://natural-resources.canada.ca/energy-efficiency/homes/local-energy-efficiency-partnerships-leep/leep-videos/leep-field-trial-video-series/20619