

# REDUCING GREENHOUSE GAS EMISSIONS IN HOUSING

AN INDUSTRY APPROACH

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## Executive Summary

In November of 2020, BILD Alberta identified the need to develop pro-active solutions to impact greenhouse gas emissions in the residential housing industry in Alberta that could be presented to the Government of Alberta. Perception from members involved in national meeting is that the code development process is being driven by Eastern Canada and British Columbia. There was concern this was creating an uneven playing field for Alberta housing, especially with the proposed tiered energy efficiency code proposals.

### ***A review of the national, provincial, and municipal climate policies and statistics revealed:***

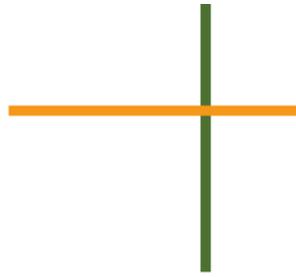
- The focus of regulation and policies have largely been on new housing yet 86% of Alberta's housing stock was built prior to 2011.
- Homes built to current code are incredibly energy efficient with further enhancements reaching a point of diminishing returns in terms of cost-benefit.
- The intended Federal approach of Net Zero ready by 2030 and carbon neutrality by 2050 enforced through tiered energy codes could have a substantial impact on housing affordability and business viability in the residential sector in Alberta.
- There is an eastern bias in climate planning and strong influence by British Columbia in the proposed tiered energy efficiency code requirements.
- With a vacuum in energy efficiency policy and programs at the provincial level in Alberta, the municipalities of Edmonton and Calgary are stepping into this space.
- New emphasis has emerged around retrofits, energy labeling and deep energy retrofits. Utilities want to step into this space and could be a good ally for the industry. Alberta renovators are in a good position to capitalize on this.

### ***A review of the current state of the industry revealed:***

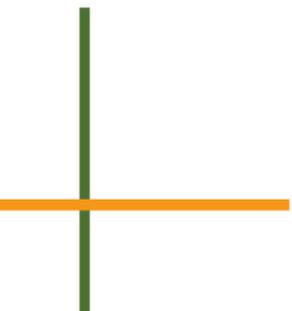
- The industry is on the cusp of a major shift in construction and development that brings strong risks that requires time and education mitigate. Market plays a key role in how quickly change can proceed.
- The goal of carbon neutrality will require solutions related to energy sources which requires strong partnerships outside of industry and with government.
- Renovations for deeper energy retrofits will require a whole house approach which will require education of the industry and consumers.

### ***Key Recommendations:***

- Develop an Alberta-based approach to evaluating tiered energy codes prior to adoption and consider opting out of auto-adoption.
- Work with all levels of government to establish a coordinated approach to reducing greenhouse gas emissions in housing with a focus on improving the existing housing stock.
- Work with the Government of Alberta, municipalities, utilities and stakeholders to design programs and incentives to help retrofit the existing housing stock.



## Part 1: Federal, Provincial and Municipal Climate Plans



## 1.1 Federal Government Climate Policies and Plans

### (a) Key Federal Plans and Legislation

#### I. Paris Agreement

In **2015** Canada signed on to the Paris Agreement. This agreement was focused on strengthening the effort to limit the global average temperature rise to less than 2 degrees Celsius.

##### **Measurement Matters:**

Energy use and greenhouse gas reduction are measured in several ways:

**Percentage reduction** from a baseline amount or date.

**Absolute reduction** in the total quantity of **greenhouse gas emissions** being emitted.

**Intensity** compares the amount of **emissions** to some **unit of economic output** or other metric. Most intensity measurements tend to show Canada and Alberta as poor performers <sup>1</sup>. This is due to a high standard of living, a dispersed population, a large industrial base, major energy producers, low cost of energy, a cold climate and electric generation by fossil fuels. Albertans have enjoyed a relatively long period of economic prosperity, which has been reflected in the number of single-family homes and greater average floor area of the housing stock which also reflects poorly in most GHG intensity measurements.

The federal government reports in all three ways, depending on the point they want to make.

#### II. The Pan Canadian Framework and the 2020 Update <sup>2</sup>

First released in 2016, the goal of the framework is to reduce Canada's greenhouse gas emissions by 30% of 2005 levels by 2030. Two key housing goals were stated in this document:

- Establishment of a nationwide net-zero energy building code by 2030
- Energy use labelling for buildings by 2019

In 2020, with the emergence of the COVID-19 pandemic, climate planning at the federal level slowed somewhat in the spring, but bold new goals were announced at the end of 2020.

To date the federal government is setting “soft” targets by using language such as “net zero” and “carbon neutral”. Municipalities are setting overarching goals such as a certain percent reduction by a certain time on a municipal basis.

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<sup>1</sup>[Canada's Energy Transition: Historical and Future Changes to Energy Systems – Update – An Energy Market Assessment, introduction](#). “Though Canada generates 1.7% of global GHG emissions, Canada is one of the most energy and emission-intensive nations in the world.” Emissions intensity is a measure of carbon dioxide emitted relative to production and is often expressed as units of emissions per unit of gross domestic product. “

<sup>2</sup> [A Healthy Environment and a Healthy Economy, Canada's Strengthened plan](#)

In December of 2020, Canada strengthened its climate plan with the publication of “**A Healthy Environment and a Healthy Economy**”. This plan has a new **Net-Zero by 2050**<sup>3</sup> goal and discusses **carbon neutrality**.

“Net-zero” GHG emissions, or “carbon neutrality”, refers to the balance of emitting and removing human-caused GHGs from the atmosphere. Reaching net-zero emissions does not necessarily require eliminating all emissions everywhere. Instead, residual emissions can be balanced by enhancing biological sinks and negative emission technologies<sup>4</sup>.

**This has implications for Alberta’s approach to GHG emissions in housing as our grid will be fossil fueled for at least the near future.**

The federal shift resulted in 64 strengthened and new federal policies, programs and investments. The five pillars of the framework center around:

- Carbon pollution pricing
- Cutting energy waste (buildings and transportation)
- Clean and affordable electricity and transportation
- Accelerating the development of low-carbon products, services and technology
- Building a Clean Industrial Advantage

Specific goals for buildings include:

- A net zero building code
- Energy efficiency programs for buildings through retrofits including existing homes
- Develop Canada’s capacity to manufacture low-emission building materials supply chain, targeting specifically cement, windows, insulation, space and water heating equipment
- Create a retrofit code by 2022
- A low-cost loan program paired with energy audits

### ***Climate Resiliency***

This is a relatively new addition to the climate portfolio brought about by extreme floods, fires and climate change in the north. It has become a key focus under this federal government and in turn is being transferred to the provinces and the municipalities. Alberta is in the spotlight regarding this, due to the Calgary floods and the Fort McMurray and Slave Lake Fires.

### **III. Infrastructure Assessment and Consultation**

This is scheduled to occur in 2021 to assess future needs for net zero emissions.

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<sup>3</sup> [A Healthy Environment and a Healthy Economy, Canada’s Strengthened plan](#)

<sup>4</sup> Hansard for the 2<sup>nd</sup> session of the 43 parliament

#### IV. Mandate letters to federal Ministers <sup>5</sup>

Letters issued in 2019 and January 2021, to the Ministries of Natural Resources and Environment & Climate Change, reinforced the new and existing climate goals.

#### V. The Canadian Net-Zero Emissions Accountability Act

In **November 2020**, the federal government introduced this Bill in Parliament. The bill received second reading November 26, 2020 **and** was debated on March 19, 2021. The intent of this Bill is to:

- Formalize Canada’s target to achieve net-zero emissions (a low carbon economy) by the year 2050;
- Establish a series of interim emissions reduction targets at 5-year milestones
- Require a series of plans and progress reports by the federal government
- Encourage Canadian-made green technology solutions; and manage, conserve and restore natural spaces.

As of March 10, 2021, the federal government has appointed a 14 member advisory panel.

The federal government is also committed to bringing forth a new 2030 target by the April 22, 2021 leaders’ climate summit, which will be hosted by the U.S. A plan to meet the new target will be put forward by the government 6 months after the summit <sup>6</sup>.

### (b) Other Initiatives Feeding into Federal Climate Planning

The federal government also engaged with several groups over the last 5 years that catalyzed other initiatives that impact residential housing.

#### I. The Energy and Mines Ministers' Conference, August 2018

The outcome of this conference was the Market Transformation Roadmap for Energy Efficient Equipment in the Buildings Sector <sup>7</sup>. This roadmap is focused on creating better windows, space heating and water heating appliances for buildings. Of note is a goal to increase the performance of space and water heating equipment to more than 100. The achievements will manifest in upgraded equipment standards and will likely be reflected in codes. This equipment target relates to heat pump technology.

#### II. The Generation Energy Council <sup>8</sup>, December 2017

This group was created with the mandate to advise on how Canada can transition to a reliable, affordable, low-carbon economy in the future. They settled on pathways of wasting less energy, clean power, renewable fuels and cleaner oil and gas.

<sup>5</sup> [Mandate letters Federal Ministers](#)

<sup>6</sup> Hansard for the 2<sup>nd</sup> session of the 43 parliament

<sup>7</sup> [Canada’s Market Transformation Roadmap, August 2018](#)

<sup>8</sup> [CANADA’S ENERGY TRANSITION, GENERATION ENERGY COUNCIL REPORT, June 2018](#)

- III. **The Federal, Provincial & Territorial Environment Ministers Meeting July 23, 2020**  
The Ministers discussed climate issues through a lens of post-COVID economic job recovery and released the **“Action Plan on Zero Plastic Waste”**<sup>9</sup>.
- IV. **Private Energy Efficiency Groups**  
There are many private groups encouraging energy efficiency. Efficiency Canada<sup>10</sup> publishes an Energy Efficiency Scorecard, curates a policy database, tracks energy efficiency programs and policy frameworks at the provincial level. They also have a buildings area that assesses codes, home and building energy rating, appliances and equipment. Efficiency Canada is housed at Carleton University’s Sustainable Energy Research Centre. They are linked to the Alberta Energy Efficiency Alliance, headed -up by Jesse Row who was a key advisor to the last Alberta NDP government. They recruit a diverse group of stakeholders and hold events. They have been key influencers in Alberta and federally.

### (c) Job Creation

#### I. Jobs Through Energy Efficiency Retrofit

The housing industry welcomes the shift in focus to existing homes. There are greater opportunities for significant reductions in energy use by focusing on the existing housing stock. The new housing sector, while continuing to reduce energy use, is having to spend many more dollars to produce small incremental changes.

The federal government has stated “Investments in home and building retrofits will spark a wave of new jobs and careers”. They have committed:

- \$2.6 billion for home retrofits through the **Energy-Efficiency Home Retrofit Program**. *The program may be retroactive to December 1st, 2020, Canadians will be able to apply for grants of up to \$5,000 for home upgrades and retrofits to improve energy efficiency.* There is also funding set aside for one million free EnerGuide home efficiency evaluations.
- \$3.46 billion for low-income retrofits.
- \$1.5 billion for municipal retrofits of affordable, social, market housing units and large community buildings.
- \$10 billion for existing large private and public real estate retrofits.

#### II. Jobs Through Products and Materials

The Federal government is looking to support innovation of low-carbon products, services and technologies developed in Canada. They are also looking to invest in Canada’s capacity to manufacture building materials and equipment. This includes the work of the Market Transformation Roadmap for improved technology in windows, heating and hot water equipment as well as innovation in the oil and gas sector.

<sup>9</sup> Canadian Council of Ministers of the Environment (CCME) [Plastic waste initiative](#)

<sup>10</sup> [Efficiency Canada](#)

## (d) Municipalities Seen as Key Change Agents for Climate

The key driver of both provincial and municipal climate planning are the federal government goals. The federal climate plan sees municipalities as strong partners to implement change. Most Albertans live in urban areas. Money flows from the Federal Green Municipal Fund <sup>11</sup> to the Federation of Canadian Municipalities and the Municipal Climate Change Action Centre in Alberta for programs and initiatives.

## (e) Key Impacts of the Federal Policies

Federal climate and environmental language and aspirational goals are shifting at a rapid pace and becoming broader in scope. The focus has shifted from greenhouse gas reductions to zero carbon which has drastically different implications on the built environment. Climate resiliency goals have also been added in recent years.

***As one member pointed out, governments are setting goals for transformation without considering the transition.***

***Several specific federal policy shifts will create significant challenges for the Alberta housing sector. In particular:***

### I. Low Carbon Goal

In residential housing in Alberta, the majority of heating uses natural gas. The Alberta electricity grid will be fueled by fossil fuels for the foreseeable future. This energy composition of the electricity supply affects housing directly as new homes are reaching the upper threshold for energy efficiency in current gas heating appliances. The next shift which is being demonstrated in Net Zero homes today is to heat pump technology. Along with reductions in efficiency of current heat pumps in a cold climate, energy advisors have noted that heat pumps are 3-5 times more expensive to operate for Alberta homeowners than gas heating. ***A shift to electric heating in Alberta has the potential to increase GHG in the housing sector.***

Space heating is weather-driven and hence very concentrated in the few coldest months of the year. Electrifying these loads has a disproportionately large impact on peak electric load, relative to its annual consumption, because a tremendous amount of energy is required to meet space heating requirements when it is very cold<sup>12</sup>. Shifting gas heating to electric in Alberta will increase peak load.

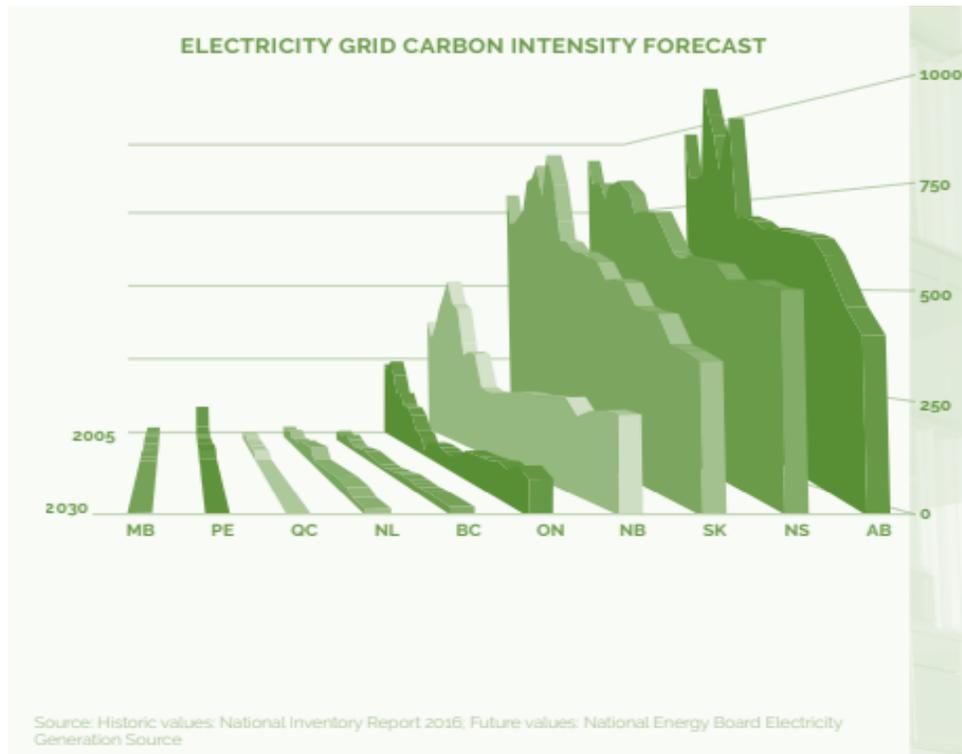
### II. Electrification

The federal goals are biased toward electrical generation as the preferred method of energy use. This is driven by the fact that much of the electricity generation in Canada is hydroelectricity, which is considered “low carbon”.

<sup>11</sup> [Federation of Canadian Municipalities Green fund](#)

<sup>12</sup> Implication of Policy-Driven Electrification in Canada, Canadian Gas Association Oct. 2019, pages 9, 12

There is a federal push to switch more heating systems, transportation and industrial processes to electricity, a process referred to as “clean electrification”<sup>13</sup>. This is particularly problematic for Alberta and the housing sector, as the Alberta electrical grid will be fossil fuel based for the foreseeable future and we have a cold climate subject to extreme swings. This same bias is seen in the Canadian Building and Energy Codes.



A report commissioned by the Canadian Gas Association, notes that the costs and benefits of electrification vary considerably by province. Shifting to a fully or largely electrified heating systems would require substantial government investments into Alberta’s existing electrical system and grid<sup>14</sup>.

### III. Net Zero Construction

***New homes remain in the Federal Government’s spotlight with the shift to zero carbon and Net Zero.***

***Existing Homes have been added to the federal net zero agenda.***

A clear timeline for meeting net zero has been set at 2050.

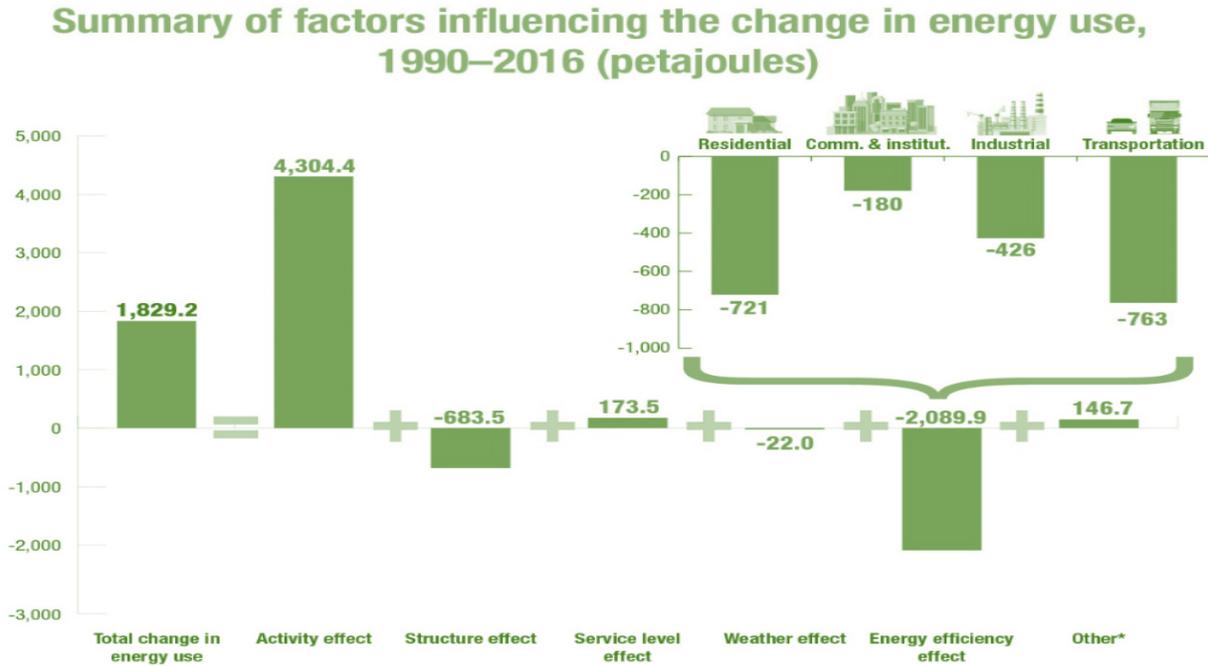
The primary federal government tool for implementing Net Zero in new residential buildings is Section 9.36 of the National Building Code. ***See Part 2 for a more in-depth discussion of this.***

<sup>13</sup> [Implication of Policy-Driven Electrification in Canada, Canadian Gas Association Oct. 2019](#)

<sup>14</sup> Canadian Gas Association Study: “Implications of Policy-Driven Electrification in Canada”, Oct. 2019

## (f) Where is the Housing Industry in Relation to Energy Efficiency?

This graph shows the progress residential housing has made in relation to other sectors and factors.



\*"Other" refers to street lighting, non-commercial airline aviation, off-road transportation and agriculture, which are included in the "Total change in energy use" column above, but are excluded from the factorization analysis.

## 1.2 Alberta Climate Policy

### (a) Overview

Under the United Conservative Party, there is currently no published Alberta Climate Plan. Greenhouse gas reductions are focused on large industry<sup>15</sup>, which is the largest contributor of greenhouse gases on a provincial basis.

Housing uses only 6% of Alberta’s energy and contributes only a part of the 6% of greenhouse gases generated by buildings. New housing is a small fraction of total housing<sup>16</sup>.

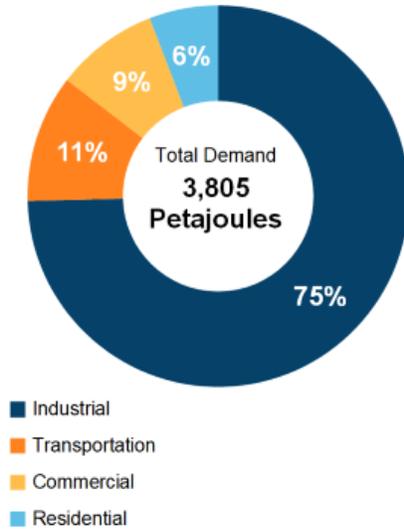
There is currently no universal definition of “new” housing versus “existing” housing.

<sup>15</sup> [Alberta Climate Change information](#)

<sup>16</sup> New Housing is not clearly defined in relation to retrofit and is typically taken as within one year of construction.

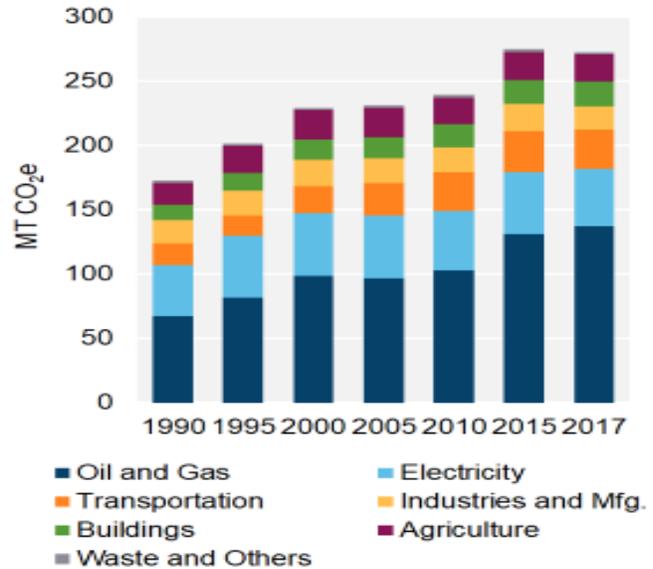
## Alberta Energy End Use by Sector

Source <sup>17</sup>: [CER – Canada's Energy Future 2019](#)



## Alberta GHG Emissions by Sector

Source: [Environment and Climate Change Canada – National Inventory Report 2020](#)



New housing will be a focus in Alberta as the province still intends to adopt National Building Codes within a year of their release. This means that any changes to Building Code resulting from the Federal plans outlined in Section 1.1 will be automatically adopted in Alberta unless there is intervention from the Provincial Government.

Under section 615.4 and 615.5. of the City Charter regulation, the province has asked Edmonton and Calgary to submit Climate Resiliency and Climate Adaptation Plans. These plans were originally slated for adoption by a resolution of Council on or before December 31, 2020.

### (b) Energy Efficiency at the Provincial Level

Energy efficiency is a key pillar of most environmental initiatives. The goal of energy efficiency is to reduce greenhouse gas emissions by fuel use. It is typically targeted at new buildings, existing buildings and transportation.

For new housing, the focus has generally been on reducing heating, hot water and electrical appliance energy consumption. The main mechanisms employed to achieve this are Building Code section 9.36., the Energy Code and, appliance and equipment standards.

In 2020 Energy Efficiency Alberta, which had retrofit and alternative energy programs related to buildings was dissolved with a few programs transferred to either Emissions Reduction Alberta, the Municipal Climate Change Action Centre or Alberta Environment and Parks.

<sup>17</sup> Canada Energy Regulator: Provincial and Territorial Energy Profiles, Alberta 2019

In the absence of a provincial plan around energy efficiency for buildings, the Federal Government has begun directly funding these types of programs through other groups or directly to the municipalities.

I. **PACE Financing Enabled**

In June 2018, the Provincial Government passed *An Act to Enable Clean Energy Improvements*. In January 2019, the *Clean Energy Improvements Regulation* came into force.

These pieces of Alberta legislation and regulation enable **Property Assessed Clean Energy (PACE)** financing and retrofit programs. The PACE financing legislation allows residential and commercial property owners **up finance up to 100% of the cost of an energy efficiency or renewable energy project**. The PACE mechanism allows property and building owners to pay for upgrades over time through an assessment added to their property tax bill (PACE Financing) through the municipality. The cities of Edmonton and Calgary are reviewing how to implement this.

In 2020, the **Municipal Climate Change Action Centre**, which is a partnership between the Alberta Urban Municipalities Association and the Rural Municipalities of Alberta, was transferred administrative responsibility for the “Clean Energy Improvement Program <sup>18</sup>”. They are currently working on the program design.

(c) **The Role of Industry in the Alberta Economy**

Housing, land development and renovation are major sources of employment in Alberta.

The new home building industry is essential part of Alberta’s economic strength and prosperity<sup>19</sup>:



**Renovation** is rapidly overtaking new construction in Alberta.



<sup>18</sup> [Municipal Climate Action Centre Clean Energy Improvement Program](#)

<sup>19</sup> Economic impacts calculated by Will Dunning Inc. Economic Research for the province. Estimates based on 2019 data from Canada Mortgage and Housing Corporation and Statistics Canada.

## (d) Housing and Renovation as a Major Incubator of Small Business

Many residential builders, renovators and developers in Alberta are family-based businesses. Most of these are now run by second generation or third generation family members.

Many of the large companies operating in Alberta today, such as Jayman, Morrison and the Tacada Group, were started by individuals after the housing market collapse in the early 1980's. Some companies were started by new Canadians with a dream. A few typical examples:

- **Melcor** is a publicly traded, diversified real estate development and asset management company that has family business roots in Edmonton that date back to **1923**<sup>20</sup>. Focused initially on retail properties, the company began to develop build to suit mixed-use industrial and business parks in 2013. Graeme Melton, a member of the founding family, is the Vice President Community Development Division – Calgary and has an MBA from the Haskayne School of business at the University of Calgary. In 2014, Melcor announced record breaking revenue of \$313 million.
- **Laebon Homes** was founded in 1976 by Gord Bontje and Peter Lacy with the construction of one home. Today Gord's son, Steve Bonjte presides over a home building and development company who has built over 4,000 homes in many Laebon designed communities all over central Alberta. The company is strong leaders in safety and community support.
- Jay Westman co-founded **Jayman MasterBUILT** in 1980 along with his late father Al<sup>21</sup>. The company is a 20 times winner of Canada's Best Managed Companies Platinum level. Jay was inducted into the Alberta Business Hall of Fame in 2019 and has also received the distinguished alumni award from the Southern Alberta Institute of Technology.
- **Rohit Communities** began in 1986 with a single home built by Radhe Gupta, who named the company after his small son. To date they have built over 5,000 homes. Rohit has been named 4 times as a top 100 small and medium employer in Canada<sup>22</sup>. The current President, Rohit Gupta, is the son of the founder.
- **Homes by Avi** began in 1978, after Avi Amir came to Canada and to Calgary<sup>23</sup>. Today, his son Charron heads the company. Homes By Avi has been awarded the Better Business Bureau Ethics Award and the Calgary Mayors Excellence Award. The company was named in the Top 50 Small & Medium Employers in Canada.
- **Ackard Contractors** was founded in 1982 and shifted their operations to renovation after 2000. Two generations are involved the company. They have received numerous awards of excellence.<sup>24</sup>

<sup>20</sup>[Melcor History](#)

<sup>21</sup>[Jayman History](#)

<sup>22</sup>[Rohit, Who we are](#)

<sup>23</sup>[Homes by Avi History](#)

<sup>24</sup>[Ackard Contracting](#)

- **All Weather Windows**<sup>25</sup>, was founded in Edmonton in 1978. The company is Canada's largest privately-owned window and door manufacturer with manufacturing capacity of over 300,000 square feet. Their main manufacturing plant is in Edmonton. All weather has been awarded one of Canada's best managed companies for 11 years in a row. In 2014, All Weather was awarded the Alberta Best Workplaces (over 750) award.

Most residential builders, developers and suppliers have a fierce pride in their part in building Alberta. This drives them to be the best they can be and to strive to keep a personal connection with their clients. As their companies grew, Alberta builders, developers and renovators have given back to community with many philanthropic deeds.

### (e) Alberta-Based Companies – What is lost if they are lost?

Currently most of the large home building and development companies operate mainly in Alberta. However, with declining economic climate and an increasing heavy layered regulatory reality, both in Alberta and Canada, several large builders are expanding operations outside of Alberta and Canada. Smaller companies are struggling more with strong regulatory and economic headwinds from many directions and are selling or amalgamating with larger companies or selling to interests outside of Alberta. For example, in 2011, Carma developers was bought by New York based Brookfield which amalgamated both their land and housing divisions. Genstar operates in Calgary, Winnipeg, Edmonton, California and Atlanta under the guidance of the San Diego, California corporate office.

## 1.3 Alberta Municipal Climate Plans

### (a) Overview

In Alberta, municipalities are being empowered around the environment by political goals, environmental policy and incentives at the federal, provincial and local level. Groups such as the Federation of Canadian Municipalities, Low Carbon Cities<sup>26 27</sup>, 100 Resilient Cities Network<sup>28</sup>, International Council for Local Environmental Initiatives<sup>29</sup> are actively working in partnership with Edmonton and/or Calgary. The Municipal Climate Action Centre is a key group working at the provincial level. Alberta Government policy such as City Charters is also empowering municipalities through broad and poorly defined policies that blur the environmental authorities between the two levels of government.

There is a wide variance in the degree and focus by municipalities on environment across the province, with the Cities of Edmonton and Calgary being very pro-active in this area.

<sup>25</sup> [All Weather Windows](#)

<sup>26</sup> [Low Carbon Cities Canada Website, Overview](#)

<sup>27</sup> [FCM, LC3 Summary](#)

<sup>28</sup> [Resilient Cities Network](#)

<sup>29</sup> [International Council for Local Environmental Initiatives \(ICLEI\)](#)

The municipalities of Edmonton and Calgary have produced plans with a tremendous amount of items that affect housing and are implementing them through their land use bylaws, development permits and building permits.

### I. Initiatives of Common Interest between Industry and the Municipalities

**With a vacuum in energy efficiency policy and programs provincially, Edmonton and Calgary are stepping into this space and have access to funding to create programs and the tools to regulate.**

Certain types of initiatives are becoming common across many municipalities and are supported by the industry. ***BILD Alberta could coordinate action on these common items.*** Cooperation between the industry and the municipalities on common initiatives may bring consistency to priorities without the involvement of the province and may foster a voluntary approach versus a regulatory approach.

Building labeling, building retrofits and electrical vehicle infrastructure are a focus for the municipalities of Edmonton and Calgary and some others. There is interest in making this a mandatory program, but this could be enabled locally or provincially. There is urgency around resolving this as programs in Edmonton and Calgary are targeted for implementation in 2021.

## (b) Climate Resiliency within Municipalities

Climate resiliency is beginning to be the catch-all for anything environmental. Actions for buildings, developments and transportation are being incorporated into this.

The Provincial government has asked the municipalities of Edmonton and Calgary to submit Climate Resiliency plans which were due at the end of 2020. COVID delayed this work in 2020 but it is ramping up in 2021.

In 2016 the Municipal Climate Change Action Centre (MCCAC) created the ***Climate Resiliency Express Program***. A key objective of the Climate Resilience Express project was to partner with communities across Alberta to complete a streamlined (“express”) process aimed at developing a community-specific climate resilience action plan, or an ‘Action Kit’ to support communities in working through the process.

In 2016, six communities from across Alberta were selected to pilot the workshop process and aspects of the toolkit. In 2017, an additional seven communities participated in the project. This program is no longer in operation through the MCCAC.

### I. Regulation at the Municipal Level

Municipalities, especially Edmonton and Calgary through City Charters, land use bylaws and municipal development plans, want the ability to mandate environmental actions such as mandatory building labeling and mandatory installation of electric vehicle charging stations. Solar installations are also top of mind.

## II. Buildings and Transportation

Many municipalities, especially Edmonton and Calgary do not have much industry within their boundaries so buildings and transportation are a high priority for zero carbon.

Figure 8 – 2018 City-wide Greenhouse Gas Emissions by Sector

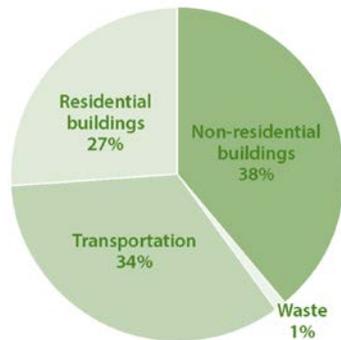
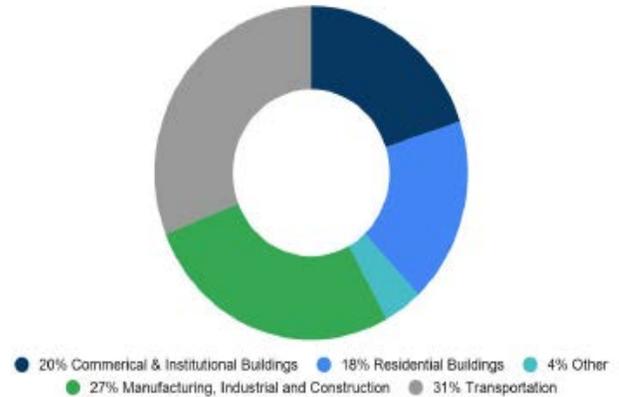


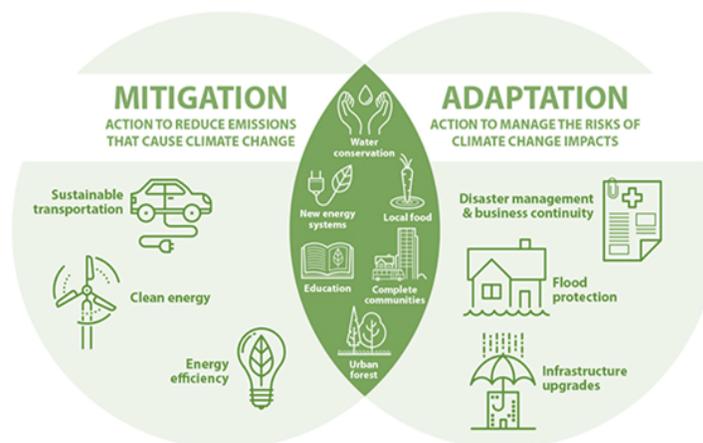
Figure 2 Edmonton's GHG Emissions by Sector



City of Calgary

### (c) City of Calgary Climate Plans

#### Building Climate Resilience



### I. Calgary Climate Resilience Plan

The City of Calgary's first climate plan was created in 2017. This led to the creation of their 2018 Climate Resiliency Strategy<sup>30</sup> A summary of the City of Calgary Climate Action Plans<sup>31</sup> on the City website identifies five focus areas and over 100 actions associated with these across many City departments. **Builders and developers are struggling with the number of actions and the number of departments these actions are flowing from.** Below are some examples of areas and actions that will affect residential planning and building:

<sup>30</sup> [Calgary Climate Resiliency Strategy 2018](#)

<sup>31</sup> [Calgary's Climate Change Mitigation Strategy](#)

### ***Building and Energy Systems***

- Improve building performance requirements beyond current building code
- Investigate incentives
- Implement building labelling and benchmarking for new and existing buildings
- Improve energy literacy and capacity building
- Enable the implementation of onsite renewable and low-carbon energy systems (solar PV, District Energy systems, combined heat and power systems)

### ***Transportation and Land Use***

- Support and enable the uptake of electric vehicles
- Enable increased walking and cycling
- Incorporate policies regarding climate risks and greenhouse gas reductions that may impact land use development and transportation infrastructure or services into the update of the Municipal Development Plan

### ***Waste***

Work with the province to move forward extended producer responsibility regulations.

### ***Residential Energy Labeling***

***The Calgary Climate Panel has identified labeling as a priority.*** BILD Calgary Region is tracking this initiative <sup>32</sup>. ***Energy labeling of new and existing homes is supported by BILD Alberta members,*** especially those that are building Net Zero or Passive house. There is debate over whether this program should be linked to permits at the municipal level or filed with Land Title transfer at time of sale.

The City of Calgary also has a ***Climate Advisory Panel*** <sup>33</sup> A BILD member sits as a member of this panel.

## **(d) City of Edmonton Climate Plans**

The City of Edmonton has one of the most advanced climate plans in Canada. Plans were first published as “The Way We Green” in 2014. In August 2019, City Council voted to declare a “climate emergency” following Halifax, Vancouver and Kingston. This led to a revision, renaming and aggressive update of their climate plans. Currently the City of Edmonton has two strategies:

1. Energy Transition Strategy <sup>34</sup>: This strategy focuses on **mitigation**
2. Climate Change Adaptation Strategy <sup>34</sup>: This strategy focuses on **adaptation**

<sup>32</sup> [Calgary Climate Panel Meeting notes, September 2020, page 4](#). Doug Owen, Brookfield sits on this committee

<sup>33</sup> [Calgary Climate Panel](#)

<sup>34</sup> [Energy Transition Strategy](#)

<sup>34</sup> [Climate Change Adaptation](#)

## I. Edmonton Energy Transition Strategy

In August of 2019, City of Edmonton Council initiated an update to the Community Energy Transition Strategy and a report with the updated strategy coming forward in late 2020 to Council. The goal of the Transition Strategy is to align with the international target of limiting global warming to 1.5 degrees Celsius. The four pathways identified are:

- Renewable and Resilient Energy Transition
- Emissions Neutral Buildings
- Low Carbon City and Transportation
- Carbon Capture and Nature Based Solutions

Other key initiatives planned or underway:

- **Energy Labeling:** Currently the City has a voluntary new and existing rebate program for home energy labeling. **There is interest in mandatory home labeling.** They are considering an energy labeling bylaw.
- **PACE Financing:** There is interest in PACE and other funding mechanisms.
- **Building Retrofits:** The City has already expanded their existing commercial and residential retrofit programs with a shift to deep green retrofits.
- **Electric Vehicles:** Introduced a rebate program for EV chargers in commercial and residential.
- **Clean Fuels:** They acknowledge solar, cogen and hydrogen projects underway in the Edmonton Region.
- **Residential Solar Rebates:** Funding is  $\frac{3}{4}$  utilized.

In 2020 The City focused first on Climate Shift 3 - **Emissions Neutral Building** (ENB) in 2020 with **a goal of all NEW building to be emissions neutral by 2030.**

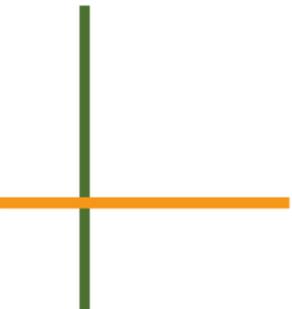
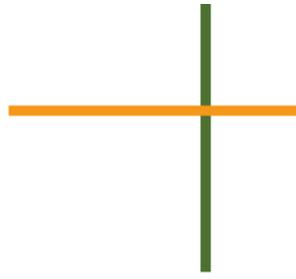
## II. Emissions Neutral Buildings Steering Committee<sup>35</sup>

The scope of this engagement was to achieve emissions neutral building construction in all new building developments in Edmonton by 2030. To help identify the actions needed to achieve this goal, an **Emissions Neutral Building Steering Committee** was established in fall 2019. **The plan will be presented to the Executive Committee in March 2021.**

*Potential actions identified are:*

- Establish an industry advisory group for ongoing advice and recommendations
- Develop emission neutral building best practice guidance
- Support programs and services such as incentives
- Evaluate the regulatory framework in 2025 based on the effectiveness of emission neutral building incentives and programs,
- Advocate for emission neutral building standards to other orders of government as required
- Lead by example by setting an emission neutral building standard for new City buildings

<sup>35</sup> Energy Neutral Bldg. Steering Committee Proposal, Draft Dec. 8, 2020



In November of 2020, the Executive Committee directed City of Edmonton staff to focus on ***non-prescriptive/performance-based regulatory requirements***. The City is utilizing the National Code tiered energy efficiency percentage reduction goals as their targets but looking to accelerating the goals in the code. They are looking at using GHG measurements aligned with the levels in the code as they feel these are not mandated in Codes. They are considering supporting measures in advance of regulatory requirements. There is recognition that existing buildings require improvements to “level the playing field”. They are considering incentives such as property tax reductions, fast-tracked permits, waived fees or emissions fines. They also want to do consumer education.

***Currently City of Edmonton permitting information shows that the energy performance of new Part 9 homes are, on average, 8% better than a home built to the minimum requirements of section 9.36 of the NBC(AE) and Part 3 buildings are 11% better than the NECB reference building.***

### III. City of Edmonton Climate Resiliency Plan

This plan looks at the effects of changing weather and identifies flooding, overheating and support for an updated building code. It will have impact on both community and building design.

## (e) Municipalities Outside of Edmonton and Calgary

Alberta Municipal Climate Plans vary in their complexity and goals across the province, but their themes pick up on federal themes. Many municipalities do not have a plan, but either a list of initiatives or high-level concepts they want to explore. Municipalities in sensitive ecological areas tend to have more comprehensive plans (Canmore, Strathcona County, Sylvan Lake). (See [Appendix 1](#) for a snapshot of some municipal plans).

Common themes from the smaller municipalities that impact new housing communities are:

- Compact communities, higher density or mixed density is a common theme. Larger roadways and transit access areas are impacting this.
- Energy efficiency in buildings, residential and municipal, both new and existing, are usually top of mind as many municipalities do not have a large commercial or industrial base. At the municipal level in many municipalities, there is little industry, so buildings produce a greater share of greenhouse gas emissions.
- Increasing solar power generation on buildings
- Green transportation, either more mass transit or encouraging electric vehicles or charging infrastructure.
- In the southern municipalities water conservation is top of mind (Okotoks<sup>36</sup> Airdrie<sup>37</sup>).
- Climate resiliency planning around drought, fire and flooding are a high priority in municipalities which have experienced these in the last few years (ex: Calgary, High River, Lethbridge, Fort McMurray, Slave Lake, Wood Buffalo.)

<sup>36</sup> [Okotoks Climate Resilience Express Action Plan](#)

<sup>37</sup> [Airdrie Sustainability Plan](#)

## 1.4 Key Findings and Recommendations

### (a) Key Findings

#### **Federal Climate Plans**

1. The Federal Climate goal has shifted from a 30% reduction in greenhouse gases by 2030 to Net Zero energy used by 2050 and carbon neutrality. Governments are setting goals for transformation without giving adequate consideration to transition needed along the way. Consultations on the federal plan will take place in 2021.
2. Sub goals that affect residential housing and development most are energy efficiency and electrification. Under the sub-goal of energy efficiency, energy labeling, PV charging, a net zero housing code by 2030 and a retrofit code by 2022 are key specific goals for residential housing.
3. The federal government has announced a retrofit program beginning in 2021.
4. The federal goals of electrification and zero carbon pose unique challenges for Alberta housing.
5. The federal government sees large municipalities as key leaders to achieve federal goals.

#### **Alberta Provincial Climate Plans**

6. The Province of Alberta does not currently have a specific climate strategy or goal for residential construction. This is an opportunity for industry.
7. **Property Assessed Clean Energy (PACE)** financing legislation has been passed by the provincial government. This enables a key tool municipalities can use for energy retrofits.
8. The Municipal Climate Change Action Centre (MCCAC) is a transfer point for funds from the federal government to the municipalities through programs. This group may be a good ally to engage to help coordinate programs that the housing industry could support and would apply across the province instead of each municipality creating their own.

#### **The Role of Industry in Alberta**

9. Housing, land development and renovation are major sources of employment in Alberta.
10. Housing construction and renovation are major incubators of small business.
11. Residential Housing has reduced energy use through energy efficiency significantly more than any other sector except transportation.
12. The Alberta Housing Industry has a wealth of experienced, locally vested, well capitalized, leadership minded companies, willing to innovate. Most are led by second generation, post-secondary educated leaders in tune with today's reality.
13. Housing Industry leaders feel their knowledge and experience is not valued by Provincial or Municipal Governments.
14. Without a favorable business climate or recognition of their expertise, Alberta based builders will disappear replaced with builders less vested in the people and economy of the Province.

15. Currently the Alberta government is empathetic to business. Now would be a good time to establish regular engagement with the provincial government at the highest levels.

### **Municipal Climate Plans**

16. Climate resiliency, which is aimed at protecting infrastructure from major climate events, is finding its way into municipal plans that are affecting housing and development.
17. Each municipality in Alberta is building on the federal government direction in their own way, sometimes with a huge variety of goals and initiatives that have no priority and exceed their authority to regulate. This fractured system is creating significant unpredictability for industry and adding costs to homes.
18. Certain types of initiatives are becoming common across many municipalities and are supported by the industry.

## **(b) Recommendations**

### **Federal Climate Plans**

1. ***Actively put forward The Alberta residential industry concerns with the federal climate plan:***
  - a. Work with CHBA National, discuss a strategy to bring Alberta housing industry concerns of the Federal Climate Plan to the attention of the federal government. The industry should stress support for the transition, not just the ultimate goal.
  - b. Engage with Alberta members of parliament on key concerns.
  - c. Engage with the provincial government on key challenges and opportunities of the revised Federal plan presents.
  - d. Track the federal initiatives and understand how the federal government will channel their initiatives and funding.

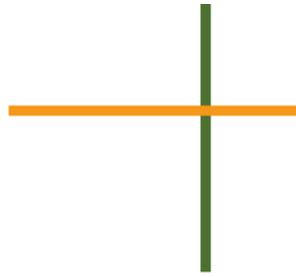
### **Alberta Provincial Climate Plans and The Role of Industry**

2. ***Establish a Residential Construction Climate Advisory Council to engage in high-level dialogue between industry and the provincial government by:***
  - a. Meeting with government on at least an annual basis.
  - b. Identifying and discussing respective climate goals and barriers.
  - c. Discussing regulation around climate change initiatives in residential construction at the municipal level.

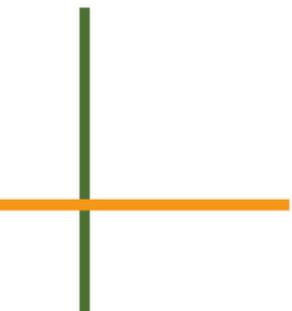
### **Municipal Climate Plans**

3. ***Identify common areas of support between industry and municipalities in the area of climate change for provincial advocacy:***
  - a. Through collaboration with local associations, compile a list of initiatives that are of interest to the municipalities, supported by the members and would benefit from a vertically integrated provincial approach and advocacy.

- b. Create a provincial industry environmental industry working group to determine common priorities around climate initiatives. The group should have representation from energy advisors, builders, developers, municipal representation and provincial representation.
- c. Open dialogue with MCCAC to understand their programs and sources of funding and explore opportunities to work together.

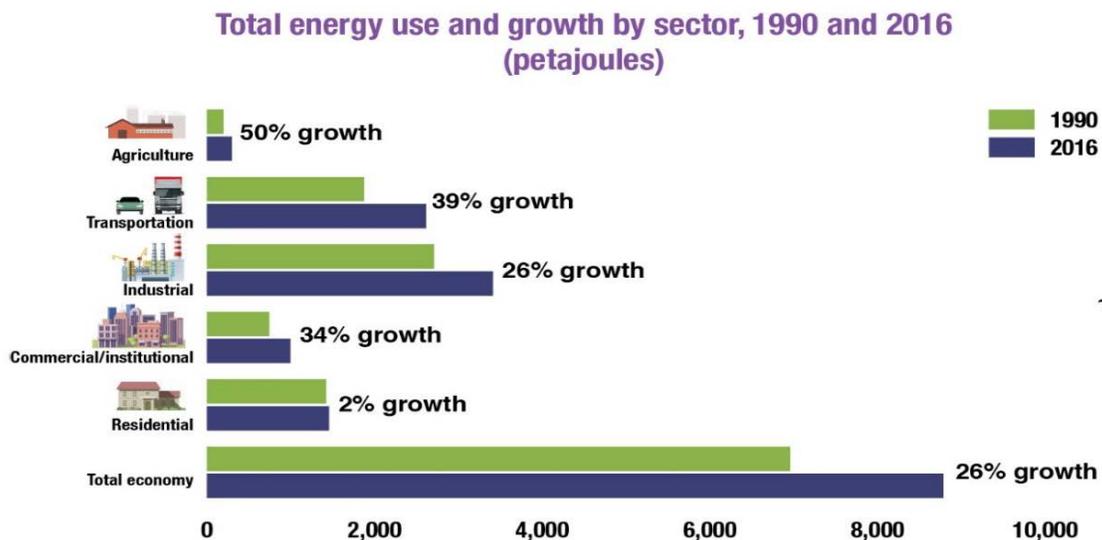


## Part 2: New Construction



## 2.1 Background

Since the 1980’s much effort has been focused on energy efficiency in new homes and has resulted in very large reductions in energy consumption and GHG emissions in this sector. Although the updated federal government’s climate plan published in December highlighted retrofit of existing buildings, the new federal goal of Net Zero by 2050 is still driving energy efficiency in new buildings.



Source: NRCan Energy Use Database 1990-2016

## 2.2 Government and Industry Initiatives in Energy Efficiency for New Housing

### (a) Federal Government Initiatives

Natural Resources Canada is the federal hub for programs, incentives, tools, and data related to energy efficiency <sup>38</sup> in products, buildings, industry and transportation. They developed the HOT 2000 program and software, the Local Energy Efficiency Partnerships program <sup>39</sup>, The Urban Archetypes Project <sup>40</sup>, The Integrated Community Energy Solutions Roadmap <sup>41</sup>, The National End Use Database, the EnerGuide Programs and the Energy Star programs. In 2013 work began toward Net Zero with the Net Zero Pilot <sup>42</sup>. Two builders from Alberta participated. Recently NRCan has created housing archetypes to determine cost effective energy efficiency measures and costs. Information from all of these is channeled into regulation via standards and codes. ***NRCan data tends to be from advanced housing as code HOT 2000 files are not submitted to NRCan.***

<sup>38</sup> [NRCan Energy Efficiency areas](#)

<sup>39</sup> [Overview of NRCan LEEP Program](#)

<sup>40</sup> [Overview of the NRCan Urban Archetypes project](#)

<sup>41</sup> [NRCan Integrated Community Energy Solutions Roadmap](#)

<sup>42</sup> [NRCan residential Net Zero Pilot](#)

## (b) Industry Work in Energy Efficiency

The Alberta residential construction industry has a long history of innovating ahead on the environment and other issues. Builders, developers and suppliers have always strongly participated in environmental housing programs from the R-2000 Program of the 1980's, to the Passive House Program today. They even created programs that work for Alberta. For more examples of how the Alberta housing industry innovates ahead. [Appendix 2](#)

The industry constantly tests new equipment, materials, and methods of construction for reliability, durability, buildability, cost effectiveness and customer acceptance.

They do it **without** government assistance in a heavily regulated environment that makes it frustrating to innovate.

Alberta builders, developers and trades have a track record of delivering world class housing at affordable prices while and responding to market needs. Governments who have stepped into this space are rarely as successful. The municipalities of Lethbridge, Calgary, Central Alberta, and Edmonton have all stepped into this space with poor results. See [Appendix 3](#) for examples.

***Although the industry is innovative, builders have noted they are poor at telling these stories.***

## (c) Industry Work Toward Net Zero

In 2016, CHBA National began work on voluntary Net Zero and Net Zero Ready homes by developing labeling, education, and builder qualifications. The CHBA Net Zero labeling program has labeled over 500 homes since the program began. Over 51 homes have been certified in Alberta. Currently CHBA National is working on a multi-family building net zero program.

Landmark Homes, Avalon Master Builder, Brookfield Residential, Mattamy Homes and Jayman have all been part of Net-Zero or Passive House demonstration projects in Edmonton or Calgary in the last 5 years. There are a few custom builders across the province such as Effect Homes and Habitat Design that built most of their homes in this market. Other builders and developers across the province have experimented with marketing various aspects of energy efficient construction.

SAIT, Red Deer College and NAIT have been involved in various aspects of training or incubating energy efficiency or solar in residential construction in Alberta. In 2010, 10 builders donated 1 million dollars each to support the construction of the Trades and Technology Complex at SAIT.

***The dominant trends in Net Zero construction in Alberta are:***

- i) A shift to air source heat pumps for heating, domestic hot water and air conditioning.
- ii) A resistance to increasing wall insulation due to concerns about wall durability, zero lot lines and property rights, fire protection and marketing issues.
- iii) Overheating issues due to abundant shoulder season sunlight and low sun angles.

Builders and developers have indicated they would like more information on Net Zero, especially outside of Edmonton and Calgary.

## (d) Climate Requirements in Development

Often environmental requirements are at odds with social and other priorities within Alberta cities. Calgary builders are currently experiencing a shortage of single-family lots, as the city has prioritized and bonused multifamily sites. The Complete Streets initiative in Calgary is increasing the land needed for subdivisions by requiring wider roads and roads with bicycle lanes. This is increasing the amount of paved areas, which increases city maintenance, increases heat but also reduces front footage for the house. This frontage provides land for green scaping, which has many benefits, one of which is rainwater absorption to replenish water aquifers.

## (e) Barriers to Net Zero Construction

***There is no technical barrier to constructing a net-zero home, in Alberta today, but there are unknown risks and issues with housing affordability.***

The barriers are lot orientation, lot service, affordability, current Alberta economic conditions and customer acceptance. There are also risks that come with new construction techniques, materials, and equipment.

Low financing rates are creating a favorable environment for net zero construction. However, cost is still an issue. Jayman Homes noted their net zero single family demonstration homes cost \$50,000 to \$60,000 more than a home built to current codes. Avalon and Landmark have built net zero townhouses that can compete with standard built townhomes on price, but it is a struggle to do this and have used extraordinary measures to accomplish this.

For net zero construction, lots and plans need to be carefully chosen for passive solar and roof orientation. Lots need to be serviced for 200 amps which is a significant additional cost. Adding this after the fact can cost \$25,000 or more<sup>43</sup>. Builders are adding various technologies to make the improvements visible and sexy, such as PV monitoring systems for the homeowners.

***The cost of photovoltaic panels is still the most expensive part of the system and the Alberta electricity market does not facilitate short payback.*** Builders feel it is the “sexy” component of net zero that attracts people’s attention and helps make net zero saleable.

***The severe economic downturn in Alberta is also affecting how quickly builders can introduce new advances in housing.*** One net zero builder noted “In a hot market a builder (who builds net zero) looks like a superstar. In a down market customers are not willing to pay for anything extra.”

Builders believe tax credits, incentives, labeling, public awareness campaigns and time for materials and equipment to evolve and come down in price are needed. Builders have also noted that the industry is not very good at communicating its successes.

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<sup>43</sup> See Appendix 3: Blatchford example.

## (f) The Next Challenge – Zero Carbon

Building to zero carbon is a whole different challenge with specific issues for Alberta. It will require solutions beyond the built environment as the industry is fast approaching limitations in this. Homes will always consume energy. Greening the energy homes use may be more feasible than going further down the path of energy efficiency. Credits and offsets are also possibilities.

***The housing industry can have a role in this by engaging in demonstration projects, supporting legislative changes, and creating consumer awareness.***

### I. Emerging Potential Solutions for Zero Carbon

Looking to new sources of energy for housing that reduce or eliminate carbon will be important. Housing energy use has traditionally been for heating and domestic hot water. But other electrical uses are beginning to overtake these in the form of consumer appliances. Electric vehicle charging may also increase home energy use. ***For home heating and domestic hot water use, it is too early to bet on whether this will be an electric evolution or a gas evolution.*** The challenges will be in affordability and timing.

### II. Zero Carbon Electricity

Currently the focus is on “greening the grid” and a push toward electrification of house heating and domestic hot water systems. Currently renewable sources generate 8% of Alberta’s electricity<sup>44</sup>, but these are an intermittent source of supply. On the horizon is potential for a stronger interconnection of Alberta’s electricity system with British Columbia, whose electrical generation by hydro is expanding with the Site C project. Alberta is also exploring nuclear power generation.

### III. Low Carbon Gas

Alberta has an abundance of oil, gas, solar, bio waste and is developing carbon capture expertise. This may make the production of blue (carbon capture) or green (renewables) hydrogen possible.

There are also petrochemical plants in Alberta that already produce hydrogen as a by-product of other chemical production. There are many groups exploring renewable natural gas (biogas) that can produce biomethane for use in heating or transportation<sup>45</sup>. ATCO is currently working on a pilot project in Fort Saskatchewan to blend hydrogen with natural gas for heating<sup>46</sup>.

### IV. Using Electricity or Gas More Prudently

Whether the grid is green or not, or gaseous fuels are green, there is still a push to reduce the use of all energy sources.

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<sup>44</sup> [Canadian Energy Regulator, Provincial and Territorial Energy Profiles, Alberta 2018](#)

<sup>45</sup> [Lethbridge Biogas Facility Expansion 2021](#)

<sup>46</sup> Conversations with ATCO, December 2020 and presentation by Graeme Feltham, Alberta Energy Efficiency Summit, February 26, 2019.

The residential construction industry has successfully demonstrated various types of geothermal projects. The coming building codes are looking to mandate heating and hot water systems with efficiencies above 100%. This assumes a shift to heat pump technology. Currently there is work underway on cold climate heat pumps powered by both gas and electricity. Combined heat and power systems are also under development and are being tested in Alberta.

## 2.3 Current State of the Industry

With the adoption of the National Building Code, 2019 Alberta Edition, the baseline of construction for non-custom housing has moved forward. Builders are close to a major shift in envelope construction, heating, and hot water equipment.

***A shift to different wall construction has been avoided by the industry as it poses the most significant challenge due to durability, buildability, land, and market issues.***

Energy Advisors believe builders still have room to improve airtightness, basement insulation, windows and HRV's before there is a need to shift to new envelope and mechanical systems. However, much of that room is being eroded ahead of the next National Code adoption as modeling criteria, code baselines and equipment standards change.

Builders range from experimental to leading edge and cost effective to those that are tracking change but will only do so when necessary. Some builders have gained experience with environmental housing because of land availability.

### (a) The Use of Energy Advisors

Approximately 80% of builders in Edmonton and Calgary and approximately 65% of builders outside those centers utilize an energy advisor. This could be for code compliance, Built Green Program registration, or product analysis<sup>47</sup>. This is likely more common than in other provinces and has distinct advantages for both the builders and for the industry as ***Alberta could generate significant data through these energy audits.***

### (b) Current Construction and Lot Development

#### I. House Construction

Gas for space heating has shifted from 92% or 93 % efficiency to 96% efficient appliances. Domestic hot water is either power vented, condensing, electric, or instantaneous. The use of heat recovery ventilators is becoming more widespread. Builders continue to work toward tighter homes, many below 2.5 air changes per hour and some below 1.0, although this remains a challenge in multi-family homes. Most windows are shifting from double low-e to triple low-e. Above grade walls, with 24"on-centre framing and R24 wall insulation is more common. Attic insulation is shifting to R50. Basement insulation has increasing to R-20. Many builders still exceed current code requirements.

<sup>47</sup> From interviews with Energy Advisors.

Builders want the ability to create their own upgrade packages depending on what makes sense for their market and on their supplier chains.

***Overwhelmingly the message from builders has been that the market and competition plays a huge role in how fast they can introduce innovation to the market.***

**II. Subdivision Development**

Lots are shrinking and the number of multifamily sites has grown. Site servicing is under pressure to include servicing for electric vehicles and many other environmental initiatives, often in conflict with one another.

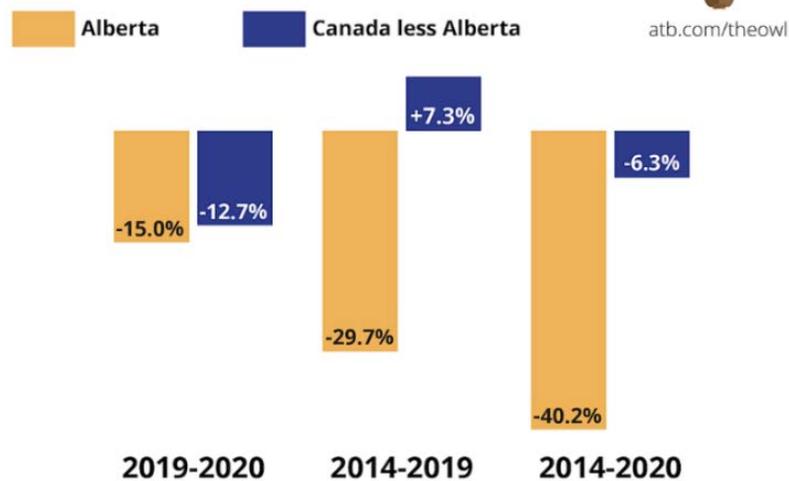
**(c) Impact of The Economic Downturn**

Compared to the peak reached in 2014, annual investment in building construction in Alberta in 2020 dropped 40.2% but is beginning to recover. This is compared to a 6.3% drop for the rest of Canada over the same period. Last year alone, residential construction investment was down by 9.7% <sup>48</sup>.

Residential Property Price Index data from Statistics Canada show that the average price of residential properties (both new builds and resales) in six major metro areas increased by 8.5% between the fourth quarter of 2019 and the same quarter in 2020. The situation in Calgary was very different with the index down by 0.9% over the same period—the only decline among the six markets. Although Calgary may be different from other parts of Alberta given the wide variation in local housing markets (prices in Canmore have, for example, spiked during COVID). Currently there is speculation that we are in a COVID purchasing bubble.

**Investment in building construction**

% change between periods, constant dollars



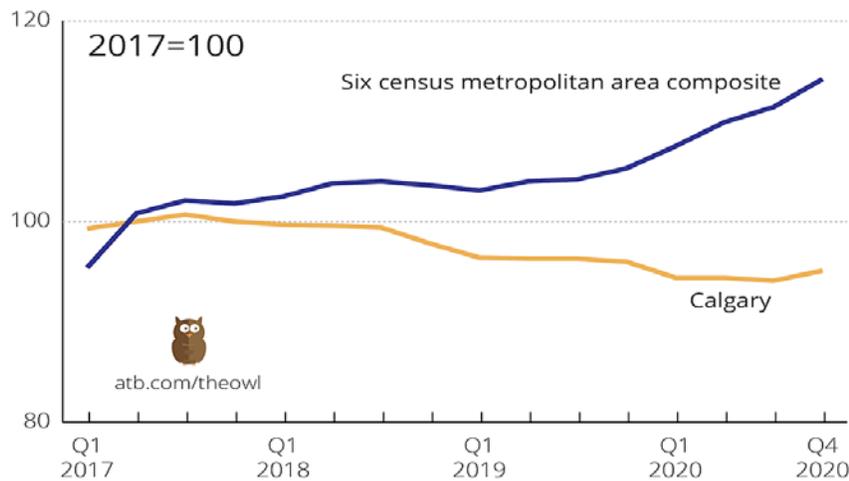
Source: Statistics Canada Table 34-10-0175-01 Graph by ATB Economics

<sup>48</sup> [ATB Economics, OWL, February 10, 2021, “Construction Spending in Alberta Down for Sixth Year in a Row.](#)

Nonetheless, it points to factors that set the province’s overall housing price trajectory apart from places like Toronto and Vancouver <sup>49</sup>.

Although there is speculation that the upswing being seen across Canada in the early part of 2021, Alberta’s market may not recover as quickly as other areas.

## Two different tracks: Residential property prices, Quarterly index of new build and resale prices



Source: Statistics Canada Table 18-10-0169-01 Graph by ATB Economics

In this environment, **builders cannot absorb additional costs** and are moving away from using energy advisors, shifting back to more conventional modes of wall construction, abandoning advanced building techniques (such as ICF construction); and moving from HRV’s back to traditional ventilation systems. Builders that did well in 2020, reported that the market activity is in the lower end, houses, and condominiums under \$400,000. There has also been a steady increase in construction in duplex, townhouse, and rental homes, partly due to the relative affordability of this type of dwelling, but also due to a shortage of lots for single family development due to municipal requirements.

The effect is more severe in the north and Red Deer, areas more deeply affected by the downturn in the oil and gas sector.

### (d) Regulatory Constraints

Builders and developers in Edmonton and Calgary are being overwhelmed with the pace of change and the volume of climate change initiatives being asked of them. There is little prioritization of these initiatives. Of concern in development is the cost associated with servicing land for an electric vehicle shift that may be many years in the future in Alberta. **The regulatory burden continues to grow in scope and detail.** The constraints imposed by the safety codes and development groups within municipalities are severely limiting the industry’s ability to innovate in many municipalities in Alberta.

<sup>49</sup> [ATB Economics, OWL, February 9, 2021 “Housing More Affordable in Alberta](#)

## (e) Industry Dynamics in Innovation

(More information on industry innovation can be found in [Appendix 2](#))

The residential housing industry is closer to a retail market than the commercial building industry. It is marketing one-on-one to a buyer and has a broader and more responsive market. Their market is very cost-sensitive and competitive. Commercial buildings are often investment vehicles, less constrained by first cost.

Housing and development companies work on innovation to achieve a market advantage. Innovation in the housing industry is interactive and has different dynamics and risks for larger versus smaller companies.

Small, extreme leading edge custom builders typically work with forward thinking clients who will accept more risk. This affords them the ability to try more extreme options. If they encounter a failure in components or construction, it is less of a warranty cost and or a reputational risk for them.

Large companies usually watch the small innovators. When they judge market conditions to be close to favorable for a particular innovation and if it is reasonably available in the supply chain, they may offer it to their clients.

But when a large company adopts an innovation for most of their product line, they are also exposed to much larger risk if that innovation has issues. The issue is magnified by hundreds of homes. The impact of a failure affects their costs for warranty and their reputation, which is very, very important to them.

Large companies can better absorb project costs for experiments in innovation through demonstration homes. These companies can often reduce the cost of innovation by utilizing purchasing power of scale that a small company cannot. Large companies create considerable marketing around innovations they adopt.

Some small companies, especially in areas outside Edmonton and Calgary, will follow large companies, if they feel that their market will respond favorably to the innovation.

***Innovation in the industry is messy and takes time. Collaboration is challenging as there are different approaches by different companies and strong competition. The industry struggles with sharing their experiences, which could speed up the innovation cycle.***

This is a challenge if the industry wants to collaborate on a pro-active strategy to take to government on climate change. Industry could assist in this by acting as the funnel to collect experience and spin it back out internally and to government.

## 2.4 Energy Efficiency Through Codes

The National Research Council develops codes. Energy efficiency in buildings is dealt with in two areas – the National Energy Code for (large) Buildings and Part 9.36 (small buildings) in the Building Code. To date there does not appear to be as much concern by members in the Energy Code for (large) Buildings.

***There is strong support for codes as the primary regulatory tool to move new construction toward zero carbon from the municipalities of Edmonton and Calgary. Energy Advisors also support the use of codes.***

The code system at the National level is very complex, with strong political policy influences and an eastern bias. The Alberta Provincial political voice and Alberta industry voice are one of many on the federal stage. Alberta BILD member involvement in the code system nationally and provincially is minimal and spread across a wide area. Currently there is no builder representation on the Task Groups related to the Standing Committee on Energy Efficiency and from Alberta.

To understand the challenges with the code systems Nationally and in Alberta in more detail please see a summary of challenges in the National and Alberta Code systems in [Appendix 4](#).

### (a) Industry Angst Around Not Adopting National Codes

While the national code is increasingly complex and biased against Alberta, ***members are reluctant to lose track of the national code process or abandon the national code completely, especially the Part 9 changes.*** Reasons for this are:

- A fear of a political shift and being asked to catch up quickly
- Skepticism in the ability and will of the provincial government to work with industry to create a workable alternative
- Lagging the municipalities in knowledge of codes
- Having a known goal that they can prepare for

### (b) Specific Alberta Industry Concerns with Tiered Energy Efficiency Codes

A brief history of the Tiered Energy Efficiency Codes and policy decisions made by CCBFC can be found in [Appendix 5](#). The appendix also includes a snapshot of current issues with the tiered energy efficiency requirements.

There are several specific concerns with how the new tiered energy efficiency codes are being structured.

#### I. A Shift From Following to Leading

Tiers mark a shift in codes from following best practices, to codes setting a path forward. Tiers also move away from one of the key principles of codes which focused on establishing minimum requirements.

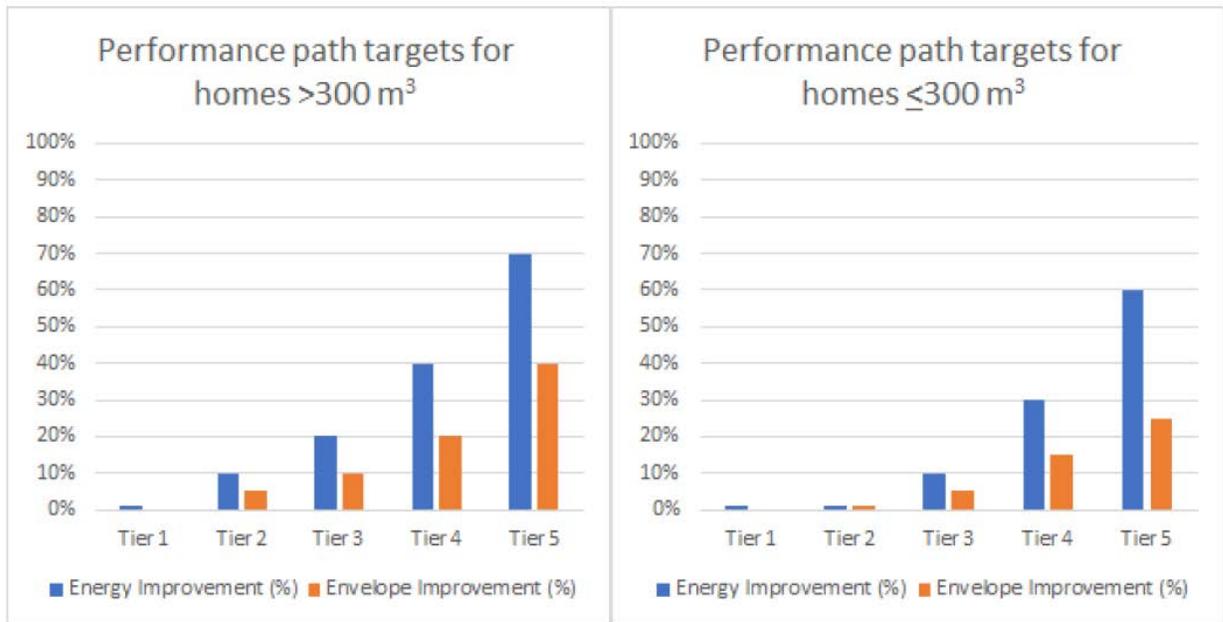
## II. Municipalities Choosing Tiers for Code Compliance

Builders are concerned about different municipalities being allowed to enforce different levels of the Tiers. In B.C., the Step codes were created to bring all municipalities to a common agreement. In Alberta this could create a problem we have not had to date. If adoption is fractured, builders lose the ability to create savings on scale, when builders must meet different construction criteria in different and often adjacent jurisdictions. This also removes the time needed for educating and affects affordability and reliability as builders are forced to use leading edge, equipment that is more expensive equipment and/or materials and methods without a performance record in Alberta.

The CCBFC and NRC are very bound to this approach. However, it is still within the power of the provinces to choose to enable all some or none of the tiers in their own timeframe.

## III. Arbitrary Percentage Increases of the Tiers

The targets at the upper levels take a large jump in energy reduction and appear to be arbitrary. The proposed percentage increases in the tiers are:



Source CHBA Summary of Tiered Energy Efficiency 2020

## IV. Increased Complexity

The tiered codes are much more complex than the current code and will exert more influence on how builders meet energy reduction targets. Increasingly they require another level of professional to be involved in construction (energy advisors).

V. Durability and Buildability

Currently it is difficult to reach Tier 4 and 5 without new products and systems that do not have a track record for performance in Alberta. Of greatest concern is changing wall systems. This affects building durability, property rights, warranty risk and fire considerations. If new techniques and equipment are forced before adequate experience is gained, the reputation of the builder and the industry can be harmed.

VI. Shifting Baseline of Code

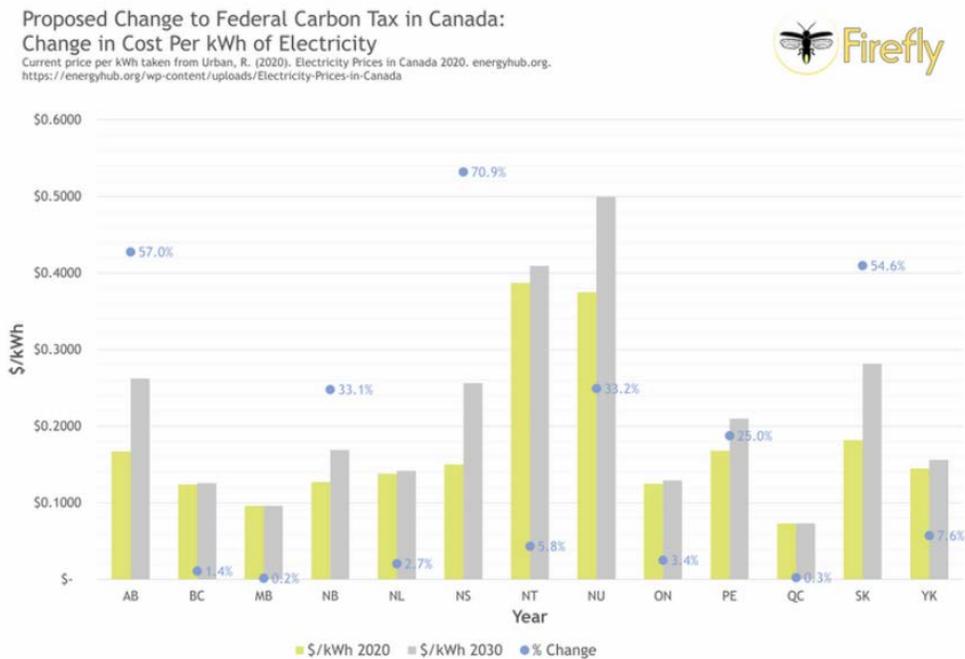
Certain changes will raise the baseline above the 2015 National Code for Alberta significantly and force airtightness testing for optimization.

VII. Disproportionate Impact in Colder Climate

The impact of a percent change becomes greater in colder climates, where builders are already building to a higher standard and may hit a technology barrier, or a major construction change sooner.

VIII. Increased GHG Emissions

In the higher tiers, demonstration has shown that space and water heating will shift to electric equipment for space heating, water heating and cooling. An increase in electricity use by shifting from natural gas heating will increase greenhouse gas emissions for the residential sector in Alberta. Because Alberta’s grid will be fossil fuel dependent in the near future, carbon taxes on electricity will continue to rise <sup>50 51</sup>.



<sup>50</sup> [Direct Energy noted that currently the federal carbon tax is \\$1576/GJ or approximately \\$160/yr for a family of 4](#)

<sup>51</sup> [Fire Fly Engineering, What Does a \\$170/tonne CO2e carbon price mean for electricity prices across Canada? Dec. 14, 2020](#)

## IX. Additional Operating Costs for Homeowners

Tiers 4 and 5 currently force a shift to heat pump heating and hot water systems in most of Alberta. The equipment is more expensive, additional lot servicing is needed to accommodate the increased power demand and the cost to operate these systems is 5 times more expensive than gas heat <sup>52</sup>. These systems can be paired with a solar array, at extra cost. All these costs compound over the life of a mortgage. ***The shift to electric equipment combined with the push for electric vehicles has expensive consequences for land servicing and will add costs to housing.***

## X. The Effect on Housing Affordability

Although NRC broadly estimates costs of each tier, there was no discussion of the impact on housing affordability. Energy advisors and builders have said the costing and cost benefit model is NOT accurate for Alberta <sup>53</sup>. ***The industry in Alberta has never pulled together this data on a provincial basis in a thorough, supportable manner.***

A preliminary look at current construction in climate zone 7A <sup>54</sup>, which encompasses most large cities in Alberta shows most builders are building to Tier 2 (10% above the 2015 National Building Code). Preliminary costing shows a median cost of approximately \$1,000 to reach Tier 3 (20% above the 2015 National Building Code). The costs for Tier 4 (40% above the 2015 National Building Code) are approximately \$7,500. In Tier 5, which may be net zero, costs jump to \$50,000 to \$100,000 depending on site servicing, whether solar is used, and lot orientation. Tier 5 marks a radical shift in every aspect of the building, it's systems and site design.

## XI. Net Zero Marketability

A house is first and foremost a product built by people operating a business. A product must be sold at a cost that buyers are willing to pay, or the builder does not stay in business.

The buyer must value what is being sold. Currently the buying public largely does not value energy improvements, because it does not add value in any currently perceived way - Is it pretty? Does it make my life easier? Does it enhance my status? Is it something I can brag about that other people care about? Will I get more for it when I sell it?

The housing market in Alberta is currently in a cost-conscious mode. <sup>55</sup>

Energy savings realized by reducing heating and hot water energy does not show a significant savings in Alberta today because of utility billing practices. This lack of value in energy upgrades is also ignored by the real estate, appraisal and financing industries.

<sup>52</sup> ATCO Presentation Graeme Feltham, Alberta Energy Efficiency Summit, February 26, 2019. The delivered price of natural gas is < \$0.02/kwh and electricity is > \$0.10/kwh

<sup>53</sup> Correspondence with Energy advisors and builders in Dec. 2020

<sup>54</sup> See Appendix 6, costing examples

<sup>55</sup> From interviews with builders across Alberta, some who mentioned they were changing materials and going to simpler ventilation systems to reduce costs. See appendix ATB financial housing starts in Alberta.

## (c) Opportunities to Affect Change in Codes and Code Process

There are opportunities at the provincial and federal level for BILD Alberta to affect federal codes.

***Given the challenges of the industry voice at the national level, priority should be given to provincial work.***

### I. The Municipalities and Codes

The municipalities of Edmonton and Calgary still want the ability to regulate climate issues. (See Part 1). NRC has is focused on embedding the tiered energy efficiency requirements in the body of the code which make them a requirement. This means the municipalities control the choice of tiers unless the provincial government enables only part of the requirements. If municipalities implement higher tiers of the codes before other regions in the province and before the industry is ready, this will lead to an uneven playing field and additional costs for Albertans as well as disproportionate risk.

### II. The Province and Codes

The Province of Alberta can do these things:

- Choose ***what*** to include in codes
- Choose ***when*** to implement codes
  - Raise Alberta concerns in the National Code process
  - Raise Alberta concerns politically at the National level
  - Enact alternative solutions within the province after codes have been adopted

Deciding when to adopt various tiers of the code, requires some type of assessment. ***An assessment matrix should be created and agreed upon by the industry and the province.*** This “readiness matrix” could include parameters such as training for builders, safety codes officers, warranty inspectors and trades; thresholds for cost increases, equipment availability and reliability; level of risk associated with new shifts. (See summary of the code process, [Appendix 4](#))

The province is moving to less assessment and consultation with industry on the impacts of National codes on Alberta construction (See Part 1). This is weakening the province’s ability to pro-actively deal with issues at the national level that may be Alberta-specific and reacting to them too late in the code process. Codes are more challenging to meet with the colder climate in Alberta and carbon-based energy grids.

***The province could be a powerful ally at the national level*** through their influence on the Provincial Territorial Policy Advisory Committee on Codes (PTPACC).

The agreement between the federal government and the provinces will affect how much review and interaction the provinces have in code creation. With this agreement, there will be minimal code process review in Alberta. See Part 1, Code process.

### III. National Codes

For a more in-depth discussion of the code process see [Appendix 4](#). The Task Group for Energy Efficiency in Small Buildings (TG EEHSB), working on the tiered codes, was disbanded in May of 2021. Its work will now be shared between several task groups which may focus on both Part 9 of the National Building Code and the National Energy Code B.

Currently there is little prairie builder representation on the national task groups related to the Standing Committee on Energy Efficiency. The province is providing little opportunity for input or review of proposed changes. The BILD Alberta Provincial Technical Committee is occupied with many other issues.

### IV. CHBA National and Codes

CHBA National can also put regional concerns in front of national politicians as can BILD Alberta. ***There are also opportunities to place observers on task groups working on tiered code items under the Standing Committee for Energy Efficiency.***

At the National level CHBA has staff participating in the Standing Committee on Energy Efficiency, and various task groups of that committee. BILD Alberta could support their work and in turn they can raise Alberta issues.

## 2.5 Current Industry Status on Climate Change Issues

New home builders and developers have been working on energy efficiency and environmental issues in new housing in Alberta for many years. To renovators this is relatively new. However, the current goals of the federal government are much broader and will impact all groups in the industry in different and multiple ways. With the commissioning of this report, BILD Alberta is just beginning to grapple with the larger goals of government and what is being asked of the industry.

Although industry works to communicate with the Alberta government, they typically do so in response to a specific issue and with a particular department. The ***climate issue requires a pro-active, broader, high level connection with the Alberta government on a regular basis.***

Initiatives are appearing randomly at the municipal level. There is no vertical integration of action by the industry or municipalities.

***Regardless of whether industry can reach the current Alberta government, the industry should still work ahead on climate policy goals, demonstrating they are meeting or exceeding current government policy.***

Industry needs to track government goals, have a strategy, have the information and data to back the strategy and the resources to initiate and communicate the strategy. Industry should work with government to demonstrate they do not need to regulate but could be a partner and collaborate on industry success.

The goal of the strategy could be to move the Alberta housing industry toward a cost-effective, zero-carbon future in a way that balances forward movement with durability, buildability, and market acceptance.

This strategy could be packaged in a specific entity that could be more visible.

Currently there is a will to accelerate climate change innovation by government.

The City of Edmonton has picked up on the notion of acceleration with the Building Energy Retrofit Accelerator Program and the Home Energy Retrofit Accelerator Program <sup>56</sup>. Smart Sustainable Resilient Infrastructure Association is also doing something similar. The Alberta Municipal Climate Change Action Centre is similar.

***A residential industry carbon neutrality “accelerator” program could be a way for industry to create a tangible entity that could plan, initiate, and report on various pro-active GHG initiatives. This entity could be funded from sources outside of members (including government) and could be held up to government as the focus for industry efforts on GHG reductions.***

## 2.6 Key Findings and Recommendations – New Housing

### (a) Key Findings

1. New housing is very efficient compared to other sectors. Further modifications would result in diminishing returns while increasing housing costs. The new federal goal of Net Zero by 2050 is still driving energy efficiency in new buildings.

#### **The Alberta Housing Industry and Work on Energy Efficiency**

2. The Alberta housing industry is constantly innovating ahead of government climate policy but doing a poor job of quantifying what they do and communicating it to the provincial and municipal governments.
3. Although there is good experience with advanced housing and net zero by CHBA National, Alberta builders and energy advisors, there is little knowledge transfer within the provincial or local associations of this work to the members or the public. This is especially true outside of Edmonton and Calgary.
4. Alberta builders have demonstrated that challenges to net zero construction are market not technical challenges. Builders and developers feel consumer education and monetary incentives are needed for further penetration into the market. Government may not understand the market dynamics of this.
5. The shift to zero carbon will bring more costs for consumers and more GHG for the industry at least in the short term.
6. The goal of zero carbon may require moving housing innovation beyond the envelope and systems and toward new and innovative means of generating energy and beyond to areas such as emissions trading. Partnerships with utilities and others are needed to move this forward.

<sup>56</sup> [City of Edmonton Building Retrofit Accelerator](#)

### **Current State of the Industry in Alberta**

7. Alberta builders are close to a major shift in construction that brings risks in durability and challenges with buildability. This shift also brings potentially more regulatory oversight.
8. Energy advisors are used by a majority of builders. This is unusual in Canada and has distinct advantages for the industry.
9. Advanced builders and energy advisors want to see mandatory energy labeling for existing and new homes. Many builders support this.
10. The Alberta economy has experienced a more severe downturn than the rest of the country and this is affecting how builders approach energy efficiency in construction, housing choices by consumers and housing affordability.
11. Innovation in development and construction is being constrained by regulation.
12. In Edmonton and Calgary, the housing industry is struggling under the volume and lack of prioritization of climate initiatives.
13. Competition around innovation within the industry is a challenge for collaboration.

### **Energy Efficiency and Codes**

14. Although a key focus for the industry should be to encourage governments to pursue retrofit first, building codes will continue to affect new housing.
15. The tiered energy efficiency codes will force higher degrees of change, sooner for cold climates at greater costs. This brings with it risks that the industry needs time to mitigate.
16. The tiered energy efficiency codes could increase GHG emission for the residential sector in Alberta. There are issues with these requirements and the process that is creating them.
17. Although the national code process is complex and the builder voice is one of many, Alberta builders are reluctant to abandon it. There is opportunity to influence the tiered energy code municipally, provincially, and nationally. The Alberta housing industry should be more engaged in this.
18. The province has moved to less assessment and consultation with industry of the national codes for the Alberta context. The industry needs a renewed collaborative consultation process on codes and with multiple provincial government departments on climate issues.
19. There are potential issues with implementation of the energy codes that the province could address. A more direct relationship is needed with Municipal Affairs, specifically on creating a decision matrix on when to adopt tiers in the proposed code.
20. The adoption of the tiered energy efficiency requirements in the national code is the responsibility of the province. Allowing municipalities to choose the tier level could bring unacceptable risks for the industry. A specific decision matrix should be put in place for Alberta to ensure adoption occurs in Alberta when industry and regulatory bodies are prepared, and the changes are cost-effective.

21. Industry requires a strategy, that they can share with government, to move the Alberta housing industry toward a zero-carbon future in a way that balances forward movement with durability, buildability, and market acceptance.
22. National codes are not regionally sensitive. Alberta has specific climatic and fuel challenges that are not adequately addressed in codes. The provincial government and industry can be allies in getting this message to the federal government and into the code process.
23. Federal assumptions used for decisions in codes may not be accurate in relation to Alberta. The Alberta housing industry does not generate its own data, so cannot adequately respond to federal or provincial or municipal initiatives.

## (b) Recommendations

### *The Provincial Government – Codes and Zero Carbon*

1. ***Create new and strengthen existing relationships between industry and several key ministries at the ministerial and the bureaucratic level:***
  - a. Meet with key provincial departments dealing with climate on a regular basis to share the current state of industry innovation and challenges around energy efficiency in residential construction.
  - b. Discuss the specific impacts of the City Charters on the tiered energy efficiency codes with the Provincial Government and request that the abilities around code-like requirements be struck from the Charters.
  - c. Educate the Alberta government on why it is necessary to move away from automatic adoption of the tiered energy efficiency requirements in Alberta. Encourage the government to replace auto adoption with a “**readiness matrix**” that should be reached before the next tier of the codes can be adopted.
  - d. Discuss the impact that the national code funding and adoption agreement will have on provincial consultation.
2. ***Establish an Alberta-based assessment process of the tiered energy codes prior to adoption:***
  - a. Create an **Energy Efficiency Task Group** under Municipal Affairs, dedicated to ensuring the proposed tiered energy efficiency codes will deal with challenges specific to the Alberta housing industry.
    - i. A builder group with a membership matrix agreed upon by industry and government.
    - ii. Tracking the meetings of the TGEHHSB through an observer on the TGEHHSB and reacting pro-actively to issues that adversely affect Alberta as they arise and before they go to public consultation.
    - iii. Industry and the Province to collaborate on the creation of an independent assessment or “**readiness matrix**” of proposed energy tiers relative to cost implications, industry/municipal readiness to implement, technological advancement, existing energy infrastructure and other matters. Outcomes of this

assessment would determine which elements of the National Code make sense for Alberta immediately, and which may require more time before adoption.

- iv. Creating an Alberta-based, industry driven review process of the energy items released in the yearly NRC code public review, with National Code with a specific focus on the 9.36 changes.

### **National Tiered Energy Codes**

#### **3. *Become more active on the Tiered Energy Efficiency Codes at the National level:***

- a. Place Alberta builder observers on the national task groups related to tiered codes operating under the Standing Committee on Energy Efficiency. The observers should provide recommendations for action by BILD Alberta to the Executive Director and the Chair of PRTC on 9.36 Tiered changes, who should consider and act on those recommendations.
- b. Pro-actively identify and respond to issues that affect Alberta before they go to public consultation.
- c. Understand and support the work being carried out by CHBA National staff specialists in relation to energy codes and net zero. Work with CHBA to speak to the federal government on Alberta concerns.

### **Alberta Housing Industry Work on Energy Efficiency and Beyond**

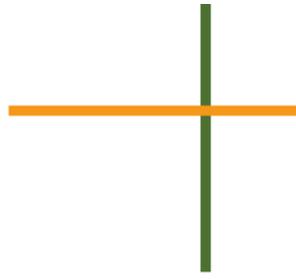
#### **4. *Provide funding and resources to:***

- a. Identify how to move forward on emerging industry innovations and challenges in energy efficiency.
- b. Identify policy, technology transfer, funding, data generation and communication opportunities around climate and energy in housing for the industry in Alberta.
- c. Track the climate change policies and initiatives by the federal, provincial, and municipal governments and the private sector in Alberta.
- d. Contract an experienced energy advisor to create and update, a set of Alberta housing archetypes and a costing spreadsheet. This should identify Alberta solutions to the climate issue and respond to proposed national, provincial, and municipal policies, including tiered codes. Consider a partnership with ATCO on this.
- e. Create a zero-carbon action plan and report for the BILD Board and the Province of Alberta outlining what industry is working on, the barriers (technical, policy, regulation, educational etc.) encountered and actions needed to resolve the barriers. Update this action plan on a yearly basis.
- f. Support volunteers working on various groups related to climate provincially and nationally.
- g. Seek partnerships with other groups that will help achieve GHG reduction in the housing sector.

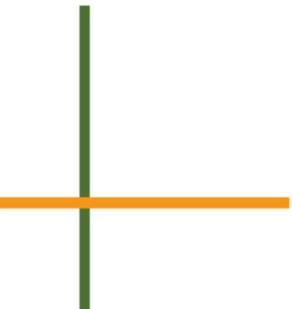
- h. Work with the local associations to identify opportunities to vertically integrate initiatives of common interest desired by the industry and the municipalities and that will assist the industry to move further down the path to zero carbon. The first initiative could be a provincial energy labeling program for new and existing homes. The second could be an Alberta branch of the National Net Zero Initiative.
- i. Work with BILD Alberta Provincial Residential Technical Committee and the local Associations to structure a list of topics, speakers and a schedule of advanced housing technical transfer opportunities for the industry members. Sessions may need to be regionally tailored. Explore partnerships with others such as the municipalities of Edmonton and Calgary, ATCO and CHBA National for delivering these sessions.
- j. Consider a wider communication strategy to the public on industry progress.

**5. Package industry efforts in a Residential Industry Zero Carbon Accelerator Program:**

- a. The goal will be to move the industry toward cost-effective zero carbon construction, development, and renovation.
- b. The program creates a repeatable process and visible focal point for the industry for planning, initiating, communicating, and tracking solutions and barriers.
- c. It could engage in partnerships with post-secondary institutions, research bodies, municipalities, and other levels of government.
- d. As a tangible entity, it could be held up to government as the focus for industry efforts and commitment on GHG reduction.
- e. It could solicit external funding from government and others.
- f. If it is funded by government, it would be obligated to report to government.



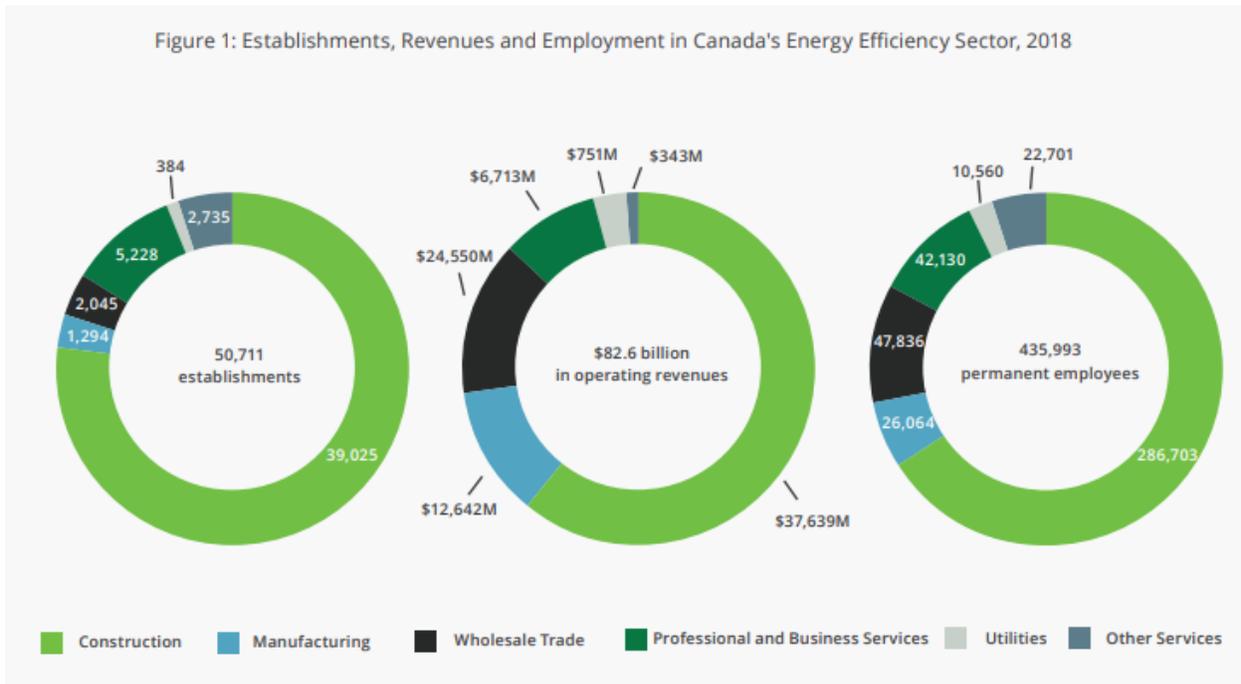
## Part 3: Existing Homes



### 3.1 Renovation and Job Creation

The Canada 2020 Revised Climate Plan notes that the goal for building retrofits is to “spark a wave of new jobs and careers.” The government also said, “Accelerating action on home retrofits will create new demand for jobs — for energy auditors, retrofit contractors and the next generation of skilled workers — and the associated increased demand for energy efficient equipment and low-carbon materials will grow the green building product supply chain in Canada”.

A 2018 survey conducted by Eco Canada found that energy efficiency in construction generated 286,703 permanent jobs and \$37.6 million dollars in operating revenue in Canada<sup>57</sup>. An estimated \$14.9 billion in employment income was generated by all direct and permanent energy efficiency workers across the six industries in 2018. Energy efficiency workers in the construction industry generated 66% of this total employment income. Construction jobs are estimated to grow by 8.3 % in energy efficient construction.



Source: ECO Canada, Energy Efficiency Employment in Canada, April 2019. Page 8

<sup>57</sup> [Eco-Canada, Energy Efficiency Employment in Canada April 2019, page 8](#)

According to CHBA National residential building renovations contributed these estimates to the Alberta economy:



**57,116**  
JOBS



**\$4.0 B**  
WAGES



**\$6.4 B**  
INVESTMENT

### 3.2 The Impact of COVID

A poll conducted by ABACUS Data in early 2021 suggests that almost 1 in 2 Canadians have or are planning to undertake a renovation during the pandemic. ***This is an opportunity for energy retrofits as well*** if they can be combined with this work.

### 3.3 The Potential for Energy and Greenhouse Gas Reduction in Residential Buildings

Statistics show that Alberta <sup>58</sup> has 11.1 % of the of the residential buildings in Canada. Alberta residential housing uses 13.7 % of the total energy <sup>59</sup> used in residences in Canada and emits 19.6% of greenhouse gas emissions <sup>60</sup>.

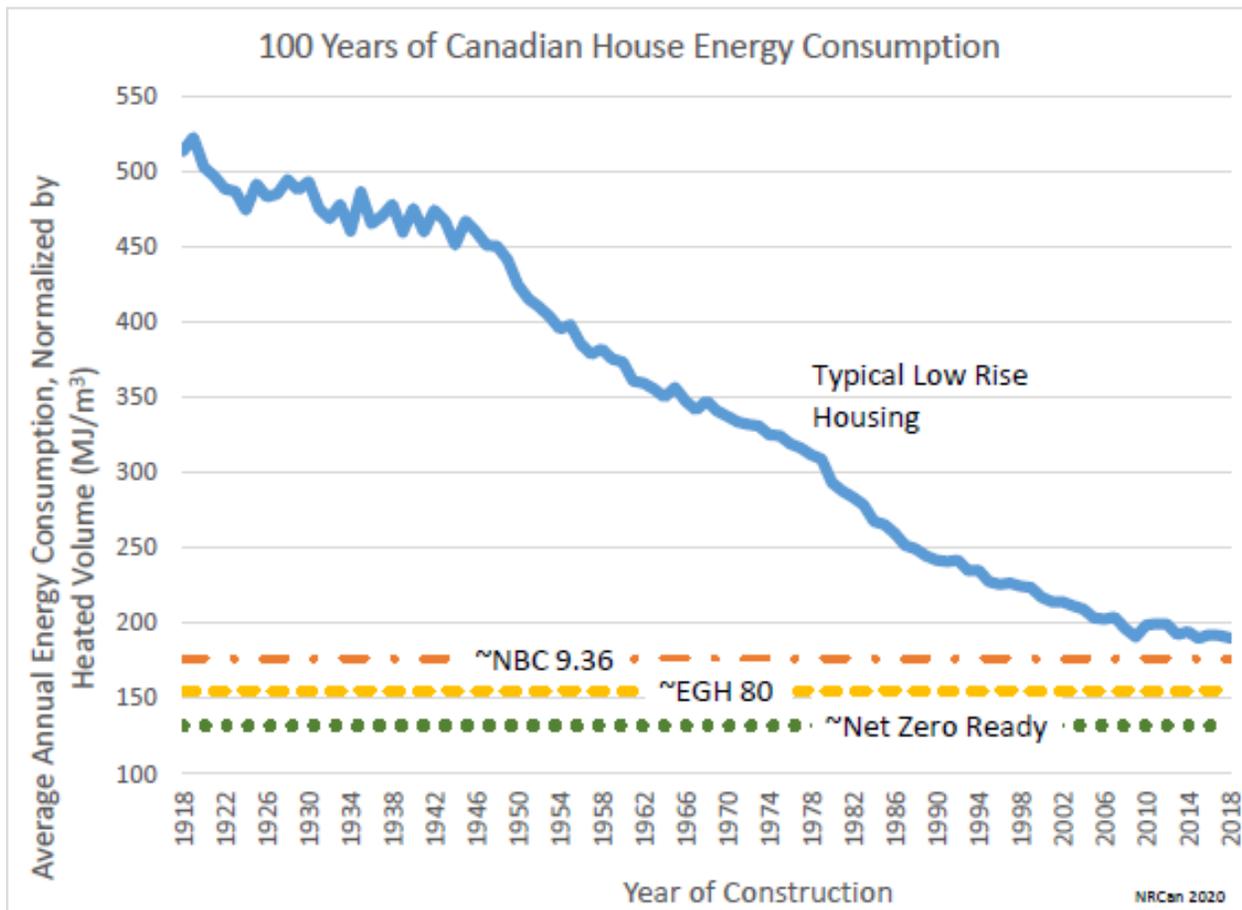
There is no definition of “existing” buildings that is agreed upon for energy retrofitting, but the number of residential dwellings in the Canadian database shows that energy use in residential housing plateaus across Canada in approximately 2011. Of Alberta’s existing residential buildings, 86.2% were built prior to 2011. Data from 2018 and 2011, shows residences in Alberta used the same amount of energy despite an increase of 10% in the number of dwellings.

<sup>58</sup> NEUD, Table21, 2018 Total residential housing stock (thousands) 15,802; Table 15, Alberta 2018, (thousands) 1,759.6

<sup>59</sup> NRC NEUD Table2: Residential Sector, Canada Total Energy Use 2018 (PJ) 1,616.5/Residential sector, Alberta Table 1, 2018 (PJ) 222.2

<sup>60</sup> NRC NEUD Tables: Total GHG Emissions, excluding electricity, 2018, Residential, (Mt of CO2 e), Canada 45.9 /Alberta 9.0

The graph below shows the great potential for energy reduction in the older housing stock:



### 3.4 Energy Efficient Retrofit Programs

#### (a) Delivery Agents in Alberta

The federal government, provincial governments, municipalities and utility companies have all been key delivery agents in retrofit programs in Alberta.

In 2020 Energy Efficiency Alberta, which had retrofit, and alternative energy programs related to buildings was dismantled with a few programs transferred to either Emissions Reduction Alberta, the Municipal Climate Change Action Centre or Alberta Environment and Parks.

ATCO has expressed interest in working on energy retrofitting, but current legislation in Alberta prevents utility companies from offering retrofit programs.

In the absence of a provincial plan around energy efficiency for buildings, the Federal Government has begun directly funding programs through other groups or directly to the municipalities.

## (b) Effective Program Design

Information on program design to ensure significant energy savings is scarce, but the City of Vancouver<sup>61</sup> and NRCan have both evaluated this to some degree.

A more in-depth study would be needed to identify the most effective incentives. A very good resource would be Monica Curtis, the former CEO of Efficiency Alberta, as has vast experience with program design in Canada and the U.S.

The groups contributing money typically have goals attached to funding, but the actual program design may be done by the provincial government, municipal government, or utility.

## (c) Current Goals for Retrofits

The goals for energy retrofits have shifted from component replacement programs (furnaces, insulation, windows) to an optimized, customized, whole house energy approach. A retrofit which aims for net-zero performance is called a **deep energy retrofit**.

Energy retrofits can be whole house or staged renovations paired with energy assessments and EnerGuide labeling. **Energy retrofitting for existing homes has different technical challenges than energy reduction in new homes.**

Deep energy retrofits align with the federal government goals for a retrofit building code and building labeling<sup>62</sup>. The City of Edmonton has already picked up on this theme and is directing its incentive monies toward providing bonuses for multiple retrofit items<sup>63</sup>.

**Renovators would like to be more involved in retrofit program planning as they often end up tracking down the detail of a program for their clients.**

*Typical Energy Retrofit Process; Source City of Edmonton Residential Energy Accelerator*



<sup>61</sup> [CALP Integral Group report for The City of Vancouver Building Energy Retrofit Building Programs](#)

<sup>62</sup> [Canadian Climate Plan Update Dec. 2020 Pages 11- Home Retrofits](#)

<sup>63</sup> [City of Edmonton Home Energy Retrofit Accelerator](#)

## (d) Incentives As a Path to Energy Efficiency

Energy efficiency in existing buildings has traditionally been encouraged through incentive programs. The federal Energy Efficiency Retrofit programs announced in December continue this approach by promising up to 700,000 grants of up to \$5,000 to help homeowners make energy-efficient improvements to their homes. Many members, especially energy advisors, are interested in this program.

The City of Edmonton has a retrofit with a core of rebates that increase depending on the number of energy improvement made. An EnerGuide analysis is a component of the program.

CMHC is currently offering a mortgage insurance rebate as well <sup>64</sup>.

Renovators note that incentives and programs do spur people's interest, but it often falls to the renovator to determine how a program works. **Renovators also noted that people will sometimes spend more money on a retrofit if an incentive is present.**

### I. The Risk of Incentives

Incentive programs often create a flood of new companies who pop up to take advantage of the work generated by the incentive. This is a risk to the people having the work done, as poorly done work can cause unintended consequences, which could shorten the life of the home and jeopardize the health of the occupants. Poor work also damages the industry reputation as the public paints all builders and renovators with the same brush.

## (e) The Gap Between Improving EE and Consumer Demand

Education is a key component of any retrofit program. **Finding relevant reasons for people to upgrade in energy versus other measures is a particular challenge in Alberta.** Affordable energy and the structure of energy billing in Alberta are often reported as the main reasons that energy retrofitting is not seen as a priority for homeowners.

Currently, **Alberta BILD and CHBA renovator members report that energy retrofitting is not being asked for by clients in Alberta** and most renovators do not raise the issue with clients. Renovators note that current client interest in energy in renovation is generally limited to inquiries about windows and heating/ventilation equipment.

## 3.5 The Changing Complexity of Renovations

A retrofit which replaces a component such as a furnace or windows, has little risk of causing issues for the home. At some point on the spectrum of renovation the health of the structure and the occupants comes into play.

<sup>64</sup> [CMHC mortgage insurance rebate](#)

Energy retrofitting is too advanced to be carried out by a homeowner. Although programs often go to the extent of registering contractors, this is also no guarantee of knowledge.

### (a) Renovators and Professionalism

BILD and CHBA members tend to be proficient in building science and advanced construction techniques. They are in a good position to take advantage of energy retrofitting. But there are still many renovators where this may not be the case.

***Bringing expertise around energy retrofits to renovators and advertising this to the public could be a pro-active approach that could increase membership, protect industry reputation, and build credibility with government.***

The CHBA and BILD Associations have tools that can be used to improve the knowledge and professionalism of renovators such as the Renomark Program and the Renovators manual.

## 3.6 Member Interest in Energy Retrofitting

CHBA Edmonton renovators are discussing becoming more active in energy retrofits, as the City of Edmonton is very active and has reached out to CHBA Edmonton Renovation Council.

### (a) Information and Training Desired

Renovator members have said they would like more information on the technical aspect of energy renovations as well as examples. Many mentioned the need for some type of standard approach.

Resources for energy retrofits are available.

Funding is available through the NRCan energy efficiency buildings program until 2026. Four deep energy retrofits were conducted under this program in 2018.

Although a National renovation code is still in the future<sup>65</sup>, CHBA National has started a Net Zero Homes Through Renovations Program<sup>66</sup>. This Net Zero program has training and has hosted “ask the expert” sessions. They are pursuing demonstration projects, with staged renovations, items that need to be done simultaneously and a Net Zero Renovator qualification program. Leading edge renovators, builders and energy advisors from Alberta were strongly involved in this program<sup>67</sup>.

CHBA National is also developing a Renovation Manual.

The federal government has published “Keeping the Heat In”, which is a primer on energy renovation. CHMC has a series called “Renovating Distinctive Homes” that provide templates for the retrofit of certain types of homes. This series is out of print and needs updating for energy efficiency but has good potential to serve as the templates requested by members.

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<sup>65</sup> CHBA Update, Renovation codes, Feb. 8, 2021

<sup>66</sup> [CHBA National Net Zero Homes through Renovations](#)

<sup>67</sup> [See Program summary in Appendix and CHBA website](#)

### 3.7 EnerGuide Labeling in Renovation

EnerGuide labeling is a key component of federal and municipal retrofit programs. The federal government has promised up to one million free EnerGuide energy assessments and recruitment and training of EnerGuide energy auditors to meet increased demand. Renovators support energy labeling but note it could be tricky to apply anything other than a whole-house retrofit.

### 3.8 The Role of Energy Advisors

Energy advisors are becoming a pivotal group in both renovation and new home building. Renovators are beginning to work with energy advisors.

An energy retrofit should include an energy advisor and new programs tend to acknowledge this. However, there is no guarantee that an energy advisor understands the house-as-a-system concept. Most energy advisors are avid supporters of the green movement but understand market realities. ***The coming federal retrofit program could shift energy advisors away from new buildings.***

### 3.9 Acceleration Through Demonstration

Currently much more knowledge needs to be gained before net zero retrofits and a renovation code can become a common reality.

The federal government has allocated \$2.6 billion over 7 years to accelerate action on home retrofit. Others have picked up on the “acceleration” theme. The City of Edmonton has created the Building Energy Retrofit Accelerator Program and the Home Energy Retrofit Accelerator Program <sup>68</sup>.

Another example of ***innovation acceleration*** is the Smart Sustainable Resilient Infrastructure Association (SSRIA) <sup>69</sup>. This Alberta based group, garnered funding in 2020 from Western Economic Diversification Canada, to establish a network of test buildings where firms can test new products, technologies and practices that improve the energy efficiency of buildings and reduce greenhouse gas emissions. Several deep energy residential retrofit projects are underway with funding from this group. ***There is no plan to gather information from these retrofits.***

***Industry could create a similar entity that utilized demonstration projects to focus efforts around zero carbon construction in both new and existing homes. This entity could be offered to government as the industry’s method of helping government meet their environmental goals.***

(See recommendations in Part 2)

<sup>68</sup> [City of Edmonton Building Retrofit Accelerator](#)

<sup>69</sup> [SSRIA Project Summaries](#)

## 3.10 Proposed Renovation Code

When the Canadian Commission on Building and Fire Codes was assessing retrofit, they noted “Achieving even small energy use reductions in existing houses and buildings may however create overall savings that are orders of magnitude larger than energy use reductions in new houses and buildings.” <sup>70</sup>

At NRC, a joint CCBFC/PTPACC Task Group on Alterations to Existing Buildings (JTG AEB) has been holding meetings since 2016. They have been working on scope, guiding principles and priority goals of the renovation code. The first principle is closing the performance gap between the current code and the existing housing stock. The final report of this group was released in April of 2020 <sup>71</sup>.

***BILD Alberta should engage now with CHBA to understand the proposed code and consider it in the Alberta context.***

## 3.11 Key Findings and Recommendations

### (a) Key Findings

1. Residential sector renovation has a far greater potential to impact energy, greenhouse gas reduction and job creation in existing homes rather than new housing.
2. The Federal Energy Efficiency Home Retrofit Program is of special interest to industry. Renovators, supplier, trades, and energy advisors could benefit from the coming federal retrofit push. However, consumer demand is a concern.
3. Energy labeling is a key piece of the federal retrofit initiatives. There is support for a provincial labeling program among renovators.
4. Energy retrofits are more complex with higher risk than other renovations and require more knowledgeable contractors.
5. Program goals tend to be outlined by the funding agency, but actual program delivery is created by the delivery agent. Program design requires previous experience, which is available in Alberta.
6. Incentives and rebates spur public interest in retrofit and people will sometimes spend more on a retrofit with an incentive than without. Incentives bring risks as new contractors come into the market.
7. ATCO Energy is interested in working with industry on retrofit initiatives.
8. More knowledge is needed on deep energy retrofits in the Alberta climate.
9. Energy retrofits and deep energy retrofits are a niche that could be capitalized on by qualified Alberta renovators.

<sup>70</sup> NRC/CCBFC Long Term Strategy for Developing and Implementing More Ambitious Energy Codes 2016, page 5.

<sup>71</sup> [Canadian Commission on Building and Fire Codes Final Report, Alterations to Existing Buildings April 2020](#)

10. Renovators require and desire more information and training to undertake energy retrofits and especially deep energy retrofits.
11. The proposed National Renovation Code has the potential to radically affect the renovation industry and should be followed closely. By working ahead and gaining experience, Alberta could help defer or modify a renovation code.
12. Industry needs a visible, marketable means to demonstrate it is proactively working on zero carbon, especially in retrofit. A Residential Industry Zero Carbon Accelerator Program could accomplish this. (See recommendations in Part 2)

## (b) Recommendations

### Government

#### **1. Demonstrate to government the potential in retrofit versus new construction:**

- a. Engage an energy advisor to create archetypes and retrofit scenarios to show potential savings in key ages of homes through various retrofits.

### Retrofit Programs

#### **2. Government and industry partner to identify specific programs and credits for renovations that would have the greatest impact on reducing GHG Emissions:**

- a. Preliminary discussions could be between BILD Alberta, ATCO and the former CEO of Efficiency Alberta to create a set of preliminary recommendations for government around specific programs and credits.
- b. Understand how the Federal Energy Efficiency Home Retrofit Program could benefit industry and specifically how it could stimulate consumer demand.

#### **3. Explore mandatory energy labeling for new and existing homes:**

- a. BILD Alberta and local associations to initially partner with AUMA, Calgary, Edmonton to establish a joint approach to mandatory energy labeling for new and existing buildings for presentation to the provincial government.

#### **4. Industry should partner with NRCan, post-secondary institutions and potentially the Government of Alberta or others to engage in a series of demonstration projects on whole-house deep energy retrofits in Alberta:**

- a. Target distinctive ages/styles of homes
- b. Begin with energy simulations and advance to demonstration projects.
- c. Document and disseminate successes and challenges as well as energy and GHG savings.
- d. Approach NRCan to update the “Renovating Distinctive Homes” series first published by CMHC with information from deep energy retrofits, including Alberta examples. These books could act as retrofit guides for renovators that want to embark on energy retrofits.

- e. Make all projects, research, demonstrations, and information transfers on energy retrofitting part of the Building Industry Zero Energy Accelerator. This could position Alberta to become the centre of expertise on cold climate retrofit in Canada.

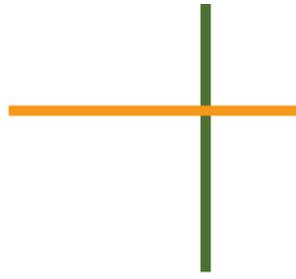
**Renovator Member Preparation.**

**5. *Vertically integrate work on energy retrofitting between the local, provincial, and national arms of BILD and CHBA:***

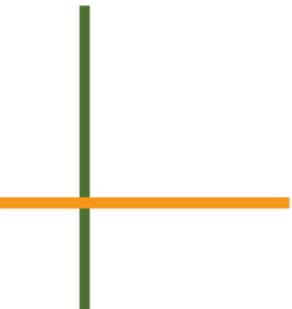
- a. BILD Alberta to become more involved in National renovation efforts, particularly when discussions surrounding the new renovation / retrofit code begin.
- b. Market BILD Alberta renovator expertise on energy retrofitting through the website, social media etc.

**6. *Structure a set of learning opportunities that will prepare renovators to undertake energy retrofits. Partner with the Government of Alberta, municipalities and other stakeholders to facilitate the learning sessions. This could include:***

- a. Information session on the CHBA Retrofit Manual
- b. Building Science sessions on house as a system
- c. EnerGuide sessions
- d. Workshop sessions on different housing types using “Keeping the Heat In”
- e. An information Session on the NRCan Deep Energy Retrofit Pilot
- f. Information session on the CHBA Net Zero retrofit pilot and the Net Zero retrofit training program
- g. Roundtable chats on energy retrofits completed by Alberta renovators and their experience with these.



## APPENDICES



## Appendix 1: Summary of Selected Municipal Environment Plans

**Medicine Hat**, produces and distributes its own natural gas. “Hat Smart” is their set of environmental initiatives. It includes incentives for EnerGuide ratings for new homes and existing homes; consumer conservation education, wind and solar initiatives on municipal buildings. In 2019, it discontinued a Solar Thermal power project initiated in 2014.

**Lethbridge** combine their Municipal Development Plan with a Sustainability Plan <sup>72</sup> and have an arms-length group, Environment Lethbridge, that works on their climate initiatives forward.

**Canmore’s** 2020 Update to their 2018 action plan <sup>73</sup> looks at exploring solar and electric vehicle ready for new homes. They also highlight advocating for timely adoption of the National Model Code “Step Codes” through the Alberta Urban Municipalities Association. Existing homes are a focus as well, with exploration of PACE financing and requirements for energy efficiency renovations.

**Red Deer’s** Environmental Master Plan <sup>74</sup> focuses on water conservation, reducing landfill waste, reducing energy use, increasing renewable and alternative electricity and connecting communities, Initiatives identified related to housing and development are to integrate stormwater best practices (bioswales, constructed wetland, rain gardens); develop an electric and low emissions vehicle strategy; and to develop a sustainable buildings strategy.

**The Regional Municipality of Wood Buffalo.** The Wood Buffalo development plan which includes their environmental goals was set for a revision in 2020. Originally sustainable buildings and communities were a goal. Their goals are directed at densification of the City core and promoting targeted densification and compact development in new communities.

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<sup>72</sup> [City of Lethbridge Integrated Community Sustainability Plan/Municipal Development Plan](#)

<sup>73</sup> Canmore Updated Climate Action Priorities for 2020

<sup>74</sup> [City of Red Deer Environmental Master Plan 2019](#)

## Appendix 2: History of the Residential Industry and Innovation

### Industry Associations Incubate Industry Action

Industry initiatives are created by industry members through their associations. They generally arise out of an industry need and are created by a group of committed individuals assisted by the housing associations (CHBA or BILD).

### Residential Developers, Builders and Renovators Innovate Ahead of Regulation

Leaders in the residential industry have a history of major initiatives for the good of the industry and the buying public, without government regulation or funding. Some examples are:

- 1974 – Alberta builders started the Alberta New Home Warranty Program, to protect the buying public from losing their deposits and their dream homes if a builder becomes insolvent.
- 1993 – Alberta Builders Initiated the Professional Home Builders’ Institute to ensure new builders received a sound grounding in business and technical skills.

### Alberta Builders Explore and Adopt Energy Efficiency Ahead of Codes

Alberta Builders Have Always Explored and adopted Energy Innovation Ahead of Codes.

- **Wall insulation and airtightness:** Alberta builders adopted better air sealing and higher insulation levels in homes in the 1980’s. Attic insulation levels changed in the mid to late 1980’s, wall insulation moved from R-12 to R-20 in the mid 1980’s and basement insulation moved to R-12 in the mid 1990’s. These changes did not appear in codes until the 1990’s or early 2000’s in Code.
- In the late 1980’s Alberta Municipal Affairs established the *Innovative Housing Grants Program*. Builders utilized this program to explore key fundamental of energy efficiency and healthy housing. One example is the project on the Energy Performance of Three Airtight Drywall Approach Homes<sup>75</sup>.
- In 2015 BILD Calgary Region Initiated the *Smart Growth Initiative*<sup>76</sup> with the City of Calgary to look at a wide range of innovative environmental items.
- Current estimates by energy advisors is that that many production builders are performing 8-10% above code<sup>77</sup>.

### Alberta Builders and Developers Demonstrate Environmental Leadership

Builders and developers are entrepreneurs. By nature that makes them innovative.

Competition spurs them to demonstrate and explore new technologies, designs and innovations. The ability of the market drives them to seek cost- effective solutions.

Most often they do this at their own cost, to test the buildability, technical challenges, supply challenges, trade knowledge, financial barriers, warranty acceptance and market acceptance of new innovations. Builders always explore and implement new practices and materials ahead of regulation seeking the most cost-effective, reliable solutions.

<sup>75</sup> March 1987, Innovative Housing Grants Program “Energy Performance of Three Airtight Drywall Approach Houses” ISBN 0-88654-175-1

<sup>76</sup> [BILD Calgary Region Smart Growth Initiative](#)

<sup>77</sup> Enerspec e-mail, Fb. 01, 2021

Builders and developers tend to move environmental improvement forward in three ways:

- a) **One-off, custom homes or small subdivisions:** A builder or developer with a strong environmental mandate will partner with a client to build an advanced homes or small subdivisions. These tend to push the bounds of current knowledge the most, use the newest technology and design ideas, but happen on the smallest scale. These homes are typically very expensive and not scalable to large production. The percentage of the market that will engage with this type of builder or developer is very small - typically less than 100 houses a year in Alberta.

*Municipalities have attempted to create environmental communities in Alberta.* Most have taken a very long time to see construction, have higher development costs and tend to have poor uptake by homebuyers. Blatchford in Edmonton and The beltline development in Calgary are examples.

*The Private Sector has been successful with Advanced communities.* Drake Landing In Okotoks built by Sterling Homes is an active solar, geothermal community and has a track record of good performance to this day <sup>78</sup>

- b) **Showhomes:** Minor shifts in design, materials and equipment are highlighted in show homes. These are items that builders have tested in the field prior to offering for mass consumption. The items will be readily available, cost effective to incorporate, have a track record for reliability and will be accepted by insurers and will be saleable to their clients.
- c) **Demonstration homes:** Leading edge design, materials and equipment are demonstrated in these homes. Alberta Builders and developers often build these projects as participants in housing initiatives, sponsored by government or not for profit groups. Alberta builders have created homes for and learned from these programs:
  - i. 1981 – NRCan R-2000 program Joint industry and federal government initiative; introduced computer modeling of energy use, airtightness, ventilation and the house as a system concept to housing. It laid the foundation of the performance path for building codes and the EnerGuide rating system. The modeling is incorporated in many other housing programs.
  - ii. 1991 – Advanced Houses Program; Added the concepts of recycled materials and water conservation.
  - iii. 1996 EnerGuide Rating Program: First program to rate homes in Canada. Many Alberta Builders use EnerGuide to rate all of the homes they build.
  - iv. 2007 CHMC Equilibrium Energy Efficiency Competition: first major reduction in space heating and credits for electricity reduction. Solar demonstration.
  - v. 2007 Sterling Homes and other partners create Drake Landing Solar/Geothermal subdivision In Okotoks. This is the best tracked Fourteen years later the project is working well.
  - vi. 2010 to 2017 Avalon Homes works with SAIT Green Building Technologies (GBT) Lab and Demonstration Centre
  - vii. 2013 NRCan Net Zero Pilot Program
  - viii. 2017 – Landmark opens the first “affordable” Net Zero demonstration home.
  - ix. 2017 CHBA Net Zero Home Program – currently 51 homes built by 11 Alberta builders

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<sup>78</sup> [Drake Landing Animation](#)

- x. 2018 Passive House Program- Brookfield completed a Passive House demonstration home in 2018.

### **Alberta Builders Create and Participate in Voluntary Conservation Programs**

Alberta Builders have always participated and sometimes created environmental housing programs.

- In 1983, Homes by Avi built one of the first R-2000 homes in Alberta.
- Working ahead to reduce the impact of housing on the environment did not begin recently. The roots of pro-active environmental housing development go back to the **R-2000 Program** that was developed in partnership with the Canadian Home Builders' Association. The program was a voluntary program that first introduced housing modeling, airtightness testing and certification of homes. Although not many homes were certified in Alberta, the program increased air tightness, insulation levels, window technology,
- 1994, the Canadian Home Builders' Association, Alberta took over the R-2000 Conservation Housing program as the federal government removes the program offices from Alberta.
- 2003 The Jayman homes, through the Calgary Region Home Builders' Association begins the Built Green Program.

### **Alberta Builders Support Environmental Education and Research**

- 2010: 10 builders donated 1 million dollars each to support the construction of the Trades and Technology Complex at SAIT.
- Landmark Contribution to U of A.

## Appendix 3: Examples of Sustainable Demonstration Communities

### Example 1: Blatchford, Edmonton

#### Overview

Blatchford is a City of Edmonton geothermal sustainable subdivision planned prior to 2013, adjacent to the downtown core. The City of Edmonton was the developer. Built on 536 acres (2.17 sq. km) with a density of 30,000 residents (13,825/km<sup>2</sup>). (compared to Ambleside with a density of 703/km<sup>2</sup><sup>79</sup>) Construction began in 2015. Blatchford is aiming to be a community that uses 100% renewable energy, is carbon neutral and that makes it easy for residents to live green. It is currently just beginning to sell homes.



#### Construction

This was Chandos' first sustainable community. Solar PV and diesel generator back-up during construction. Chandos also diverted more than 94 percent of construction waste from the landfill.

#### Design

Higher density; multifamily, street-oriented ground floor entrances; small scale retail in mixed use buildings; underground and rear parking only; double amount of bicycle parking; secondary and garage suites are allowed in townhomes; solar panels, rooftop decks and gardens.

<sup>79</sup> Ambleside has an area of 3.3.km and a population of 2,328



**Stage One**

- 1 Pedestrian Gateway
- 2 Custom Sidewalks
- 3 Skating Area and Summer Lawn / Event Area
- 4 Control Tower
- 5 Garden Rainwater Collector
- 6 Community Fire Pit and Warming Hut
- 7 Rain Gardens and Bioswales
- 8 Fruit Orchard
- 9 Community Gardens
- 10 Garden Art
- 11 Playground
- 12 Twelve-Thirty Plaza
- 13 Roundabout Feature
- 14 Mixed-Use Buildings
- 15 Pedestrian Walkways
- 16 Walk and Cycle Path to the LRT



**Heating System**

The system is designed to provide renewable energy for heating, cooling and domestic hot water to all the buildings in Blatchford stage one. The system consists of a geo exchange field of 570 boreholes, 150 metre deep, built underneath the first stormwater pond.

In the winter months, the energy harnessed from the geo exchange field is sent to the community's Energy Centre where it is upgraded to a higher temperature using an energy-efficient heat pump. This energy is then sent via a network of underground pipes to the homes and buildings in the community, where the heat is further upgraded by a heat pump in each home.



*Blatchford Energy Centre Heat Pump*

In the summer months, the excess heat energy from the system is sent down into the geo exchange field where it can be stored until it is needed again in the winter. The system also allows for energy to be 'shared'. Using heat pumps, excess heat energy can be removed from one building and put back into the system to be used in another building. There is no solar PV panels in this system.

See a video on how this system works [here](#).

### Utility Costs

The City created a utility company for Blatchford. City Council set a fiscal policy that determines a customer in Blatchford will be paying *at most* a comparable fee to what they would elsewhere in the City of Edmonton through their utility bills and annual maintenance costs.

thermal energy rates are comprised of a variable rate and a fixed monthly charge. The 2021 rates for fee-simple townhouses (not part of a condo corporation) are:

- Fixed monthly charge of \$1.51 per unit per day
- Variable charge for heating & cooling of \$0.0262 per kWh

Water Conservation and Treatment: bioswales, rain gardens, stormwater ponds to slow down, capture and improve water quality before it enters the drainage system. Water cisterns in the parks will collect rainwater for use in community gardens.

#### *Housing and Costs:*

##### Townhouses:

- Mutti 1,460 – 1,669 sq. ft.
- Encore 1,568 – 1,164 sq. ft.



Mutti Modern Farmhouse



Encore The Soho

Townhomes listed on the property in September 2020 ranged from \$543,000 to \$699,000.

The purchase and installation of future systems of this kind in Canada will qualify for accelerated depreciation under Canadian income tax regulations.

## Challenges

### Development Cost overruns <sup>80</sup>

- Original budget: \$561.4 million
- Final Budget: \$660 million

### Utility Cost and Overruns <sup>81</sup>

- Original Cost: 19.4 million
- Additional funding 2016 52.8 million

### Long Payback Periods <sup>82</sup>

A 2016 report to the City noted that the City may only start to see some returns on investments in the district energy systems in 2027-28.

### Electrical Lot Servicing Inadequate

Initial electrical servicing to the fee simple lots was a standard 100 amp service in the majority of cases. This service is inadequate to run the mechanical systems required to run multiple heat pumps along with a fully electrified home. Servicing moving forward will be brought up to 200 amp per serviced lot. Retrofitting power service to increase the amperage to 200 amp per lot would cost between \$30,000 and \$90,000 per lot depending on the distance from the transformer, this is an added cost to the builder and ultimately the consumer.

<sup>80</sup> [Webpage, Edmonton City Councilor Mike Nickel](#)

<sup>81</sup> [CBC News Edmonton, on line article Oct 26, 2018 2:29 PM MT "councilors raise questions about Blatchford utility spending proposal.](#)

<sup>82</sup> See above reference

### Extreme Change in Plumbing Costs

The heat pumps and required radiant underfloor heating had 5 times the plumbing costs of a standard home.

### Challenges with Moisture

The homes are extremely airtight, at 1.6 to 1.8 ACH. Even with a high efficiency, fully ducted HRV, the homes are experiencing high moisture issues, with families who want to run high humidity in the house. This results in very difficult service challenges, warranty risk for the builder and potential health issues for the homeowner.

## Example 2: Drake Landing, Okotoks

### Overview

Drake Landing was the first central solar heated community in North America <sup>83</sup>. It was completed in 2007 in Okotoks. The community system was fully monitored for 10 years. The project was a demonstration project in partnership between NRCan, the City of Okotoks and Sterling Homes. A review of operation was completed after 10 years in 2017. The project was very successful technically and in the market, but as with most demonstration projects, expensive.

### Design

The community consists of 52 single detached, 2-storey homes, 1,492 to 1,664 square feet, with rear garages. The homes were constructed to R-2000 and Built Green Gold, which was 30% more efficient than typical construction at that time. The garages and solar collectors were built first, with a standard design and connected by a breezeway to the homes. This allowed for 6 house designs and allowed the homes to be built and marketed in a conventional manner.



Fig. 2: Aerial view of Drake Landing Solar Community

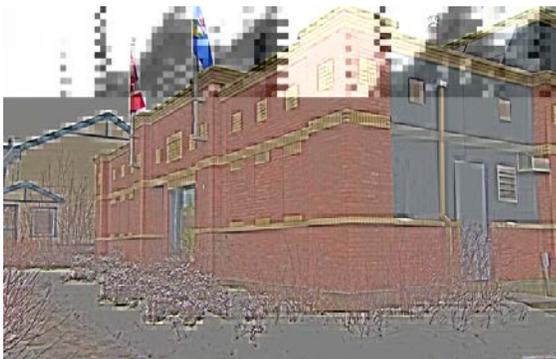
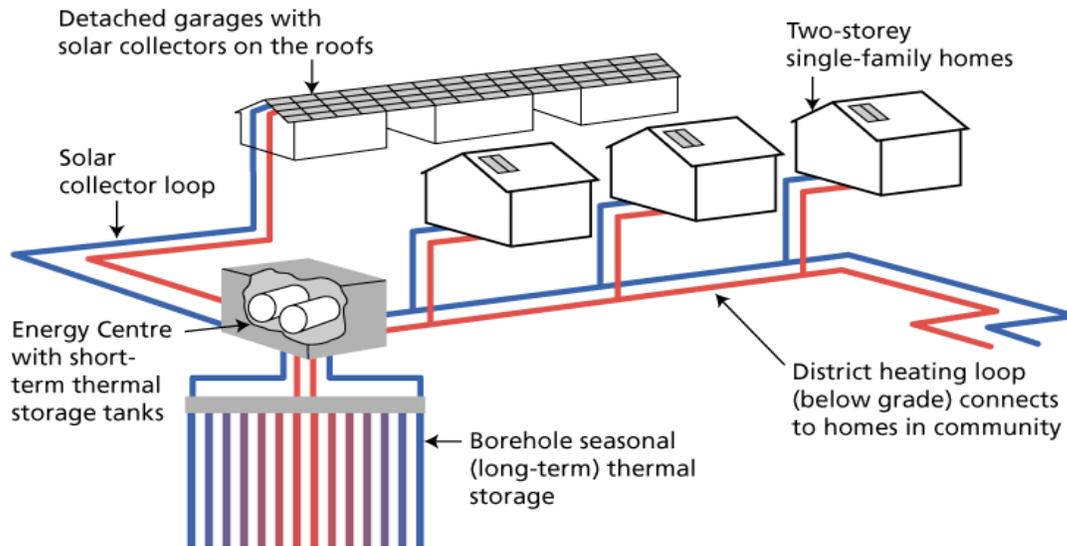


Fifty-two garages equipped with 800 thermal glycol solar collectors (2293m<sup>2</sup> total gross area) collect heat and transfer it to exchangers and a short term water storage tank in the communities' Energy Centre. In the warmer months, the heated water is taken from the short-term storage tank to the Borehole Thermal Energy Storage Unit. This is a large volume of earth, cylindrical in shape, approximately 115 ft in diameter and 115 feet deep, with 144 holes through which water circulates. The underground heating storage is located under a public park that is maintained by the Town of Okotoks. Auxiliary gas heaters are used when required to provide heat to the district loop. A high efficiency gas hot water heater backs up the solar system.

<sup>83</sup> Drake Landing Solar Community website <http://www.dlsc.ca/how.htm#>

<sup>84</sup>ASHRAE, High Performance Buildings Magazine, Summer 2015, Groundbreaking Solar

The water returns to the short-term storage tanks in the Energy Centre to be heated again. During colder months, the water from the energy storage boreholes passes back to the short-term storage tank and is then directed to each home. In the house, the heated water goes to a specially designed low-temperature fan coil and is distributed via ductwork. When the house temperature is reached, an automatic valve shuts off the heat transfer unit.



*Drake Landing Energy Centre*



*Solar collectors on garages*

**Homeowner Costs**

Homeowners pay a monthly fixed rate, about \$70 to maintain the infrastructure. The community is revenue neutral. The space heating system cuts about four to five tonnes of greenhouse gas, per household, every year.

**Performance**

In the first year of operation, 2007, the ground loops only returned 6% of the input energy for heating homes. But this grew as the bore hole thermal energy storage field slowly warmed. By year five fairly steady performance was achieved. Modeling predicted a steady state of supply and removal would be achieved in year 10.

In 2012 the installation achieved a world record by providing 97% of the community's heating requirements with solar energy over a one-year time span <sup>85</sup>. In the 2015-2016 season, the installation achieved 100%. This was achieved by the borehole thermal storage system (BTES) finally reaching high temperature after years of charging, as well as improving control methods, operating pumps at lower speed, reducing extra energy need as well using weather forecasts to optimize transfer of heat between different storage tanks and loops.

### Utility Costs

Homeowners pay a monthly fixed rate, about \$70 to maintain the infrastructure. The community is revenue neutral.

### Positive Collaboration

The ten-year review of the project noted the essential nature of a collaborative, market approach. The builder, land developer and municipality were included in the project planning process from the beginning. The authors of the review noted: "Understanding of the home buyer's perspective had a significant positive influence on important design decisions throughout the process. It was also valuable in building confidence in the project regarding the market acceptance of the unfamiliar technologies being applied."

### Challenges

#### Project Cost <sup>86</sup>

- Houses: \$14 million
- Energy Centre: \$560,000
- Total cost: \$14.6 million: \$3.4 million in funding from the Canadian Government, Alberta government and the Federation of Canadian Municipalities

#### Project Scale

The Drake Landing system is too small to be economically competitive with the current very low price of natural gas in North America, subsequent feasibility studies show that larger systems of similar design can deliver solar energy at about half the cost compared to Drake Landing <sup>87</sup>.

#### Time for the System to Stabilize

It was 5 years before the heat storage system stabilized, which meant back-up systems needed to be in place and utilized, increasing the cost of the system.

#### Overheating

A significant fraction of the homeowners have added central air conditioners. This points to common overheating issues experienced in a hot prairie climate in the summer and shoulder seasons in well insulated homes.

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<sup>85</sup> ["Canadian Solar Community Sets New World Record for Energy Efficiency and Innovation"](#). *Natural Resources Canada*. 5 October 2012.

<sup>86</sup>ASHRAE, *High Performance Buildings Magazine*, Summer 2015, Groundbreaking Solar

<sup>87</sup> [Drake Landing Solar Community: 10 Years of Operation - 2017](#)

### **Correcting Issues and Improving Performance**

The paper of 2017 notes that due to monitoring, construction and design issues were identified early and corrected. Other issues were encountered such as lower than expected reliability for some conventional equipment and some components that did not perform to specification. Adjustments were made to several of the base assumptions. This underscores the need for time when new methods, materials and equipment are used to understand actual versus theoretical performance.

## Appendix 4: The National and Alberta Code Systems

### 1) Codes are The Primary Regulatory Tools for Construction and Energy

Building and Energy Codes are the primary regulatory tools for buildings. Large buildings are dealt with in the National Energy Code for Buildings. Most residential buildings fall under Part 9.36 of the National Building Code. There has been movement in the last few years to eliminate 9.36 and shift all requirements to the Energy Code for Buildings.

The federal government is also working on a new retrofit code.

Provinces and territories adopt the codes through legislation.

*Currently Alberta Legislation calls for automatic adoption of national codes.*

### 2) Code Input Structure

The National Research Council of Canada (NRC) oversees the work on codes done by the Canadian Commission on Building and Fire Codes (CCBFC). (CCBFC) is the industry policy advisory group at the top of the code process. Members are appointed by NRC from across Canada for their individual interests and expertise rather than as delegates of any association or group. They are selected with a view to providing broad technical and geographical representation. The CEO of CHBA National sits at this table as a non-voting member.

The Provincial/Territorial Policy Advisory Committee on Codes (PTPACC) is the second group at the top of the code process. It is a committee made up of senior bureaucrats appointed by provincial and territorial deputy ministers that provides policy advice to (CCBFC) <sup>88</sup>. In Alberta, the representative to this group resides within Municipal Affairs and has held the Chair position in recent years.

Input to codes by industry in Alberta is through an arms-length group to government, The Safety Codes Council. The safety codes sub-councils can advise Municipal Affairs, but their advice is not binding on M.A.

### 3) Expanding Complexity of the National Code Process

Codes were first created to make *it easier* for designers, product manufacturers and contractors to conduct business in more than one region <sup>89</sup>. Although codes are not meant to be a manual for construction, they have evolved in that direction, with a tendency to adopt the best solutions, not the minimum solutions. A good example is the current influence on the baseline of the tiered energy efficiency codes <sup>90</sup>.

Codes were initially created around a model building regulation with the intent that houses and small buildings would not need to be designed by architects and engineers. This is no longer true especially with energy efficiency in the codes. Engineers and energy advisors are engaged on 65-80% of homes built in Alberta.

Codes originally dealt with structural sufficiency and fire safety but have grown to encompass the broad objectives of Safety, Health, Accessibility, the Environment, Fire and Structural Protection of Buildings.

One code has evolved to four codes - Building, Plumbing, Fire and Energy. Each is composed of a patchwork of prescriptive and performance requirements created in response to Code Change requests submitted by the public over the last 80 years. It includes references to standards developed by organizations outside of NRC.

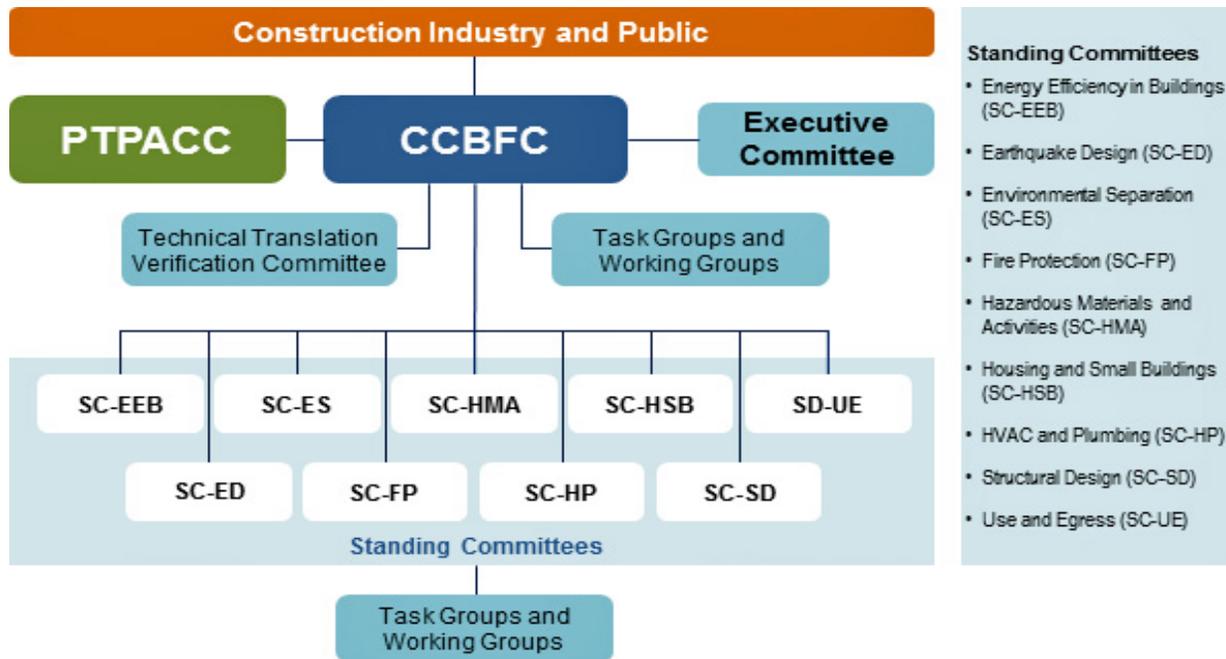
<sup>88</sup> [Provincial Territorial Advisory Committee on Codes NRC website, 2019-12-03](#)

<sup>89</sup> [Historical Background](#)

<sup>90</sup> See Appendix 5 on Tiered Energy Efficiency Codes

The code current process <sup>91</sup> has at least eleven committees and dozens of working groups and task groups. Hundreds of code change requests can be considered in a 5-year code review cycle.

**Structure of the Canadian Commission on Building and Fire Codes**



**4) Burden on Volunteers in the National Code Process is Unrealistic**

One of the BILD members who sits on a key code committee reported that in 2020, the committees was meeting weekly on 4-5 hour conference calls, with pre-meeting packages in the hundreds of pages, distributed to committee members only days in advance of the meetings. The same people tend to be asked to serve on other committees and task groups.

**5) Alberta Voices and Builder Voices are Under-Represented in the National Code Processes, Especially in Energy**

Although there are 4 members of 31 that have Alberta affiliation on the CCBFC <sup>92</sup>, 2 are past employees of Municipal Affairs, one is a current employee of Municipal Affairs who also sits on PTPACC. One is formerly from the City of Calgary. The Canadian Home Builders’ Association does have a presence on this group, but it is a non-voting position.

The Alberta government holds one seat of 17 on PTPACC <sup>93</sup> and has held the Chair position in recent years.

Each of the committees, task groups and working groups has a stakeholder matrix decided upon NRC. The matrix is spilt between the regulatory sector and other interest groups. Although builders are primary users of the code, they are considered as one of many potential stakeholder groups. This leads to under representation. Regulatory representation is typically from Safety Codes Officers but can be provincial authorities.

<sup>91</sup> [“Canada’s National Model Codes Development System” NRC March 2013](#)

<sup>92</sup> [Canadian Commission on Building and Fire Codes \(CCBFC members, NRC website, 2020-02-19](#)

<sup>93</sup> [Provincial /Territorial Policy Advisory Committee on Codes, Gvt of Canada website, Jan. 2021](#)

Alberta has *one* builder member who sits on Standing Committees for Housing and Small Buildings and only 2 other members on other task groups. struggling to keep up. Coming up to speed with the process and the issues takes a significant amount of time and must be supported by their employer which is not often done. Due to the economic downturn, companies have less people they can spare to work on voluntary initiatives. Many people who used to serve on NRC groups are no longer in the industry.

## 6) Volunteers Need Support

Staff support is key to effective members interaction on committees. Staff can do background work, create summaries of complex issues, bring resources together to resolve concerns, help members with formal communication and priority setting, ensure an industry view is being presented, provide a second set of ears in meetings to capture key items.

CHBA National has done a very good job in recent years to provide staff support in key code areas. Jack Mantyla, and Liz Wynder monitor codes with Liz active currently on the energy efficiency codes. Frank Lohman, who was involved in the code system at NRC, also works at CHBA National. Liz has done some wonderful analysis on the effects of proposed items in the tiered energy issue.

## 7) Code Requirements Are Overwhelming Safety Codes Resources

In Alberta even safety codes officers struggle to keep up with code requirements both in knowledge and enforcement. An example of this in Edmonton involves the fire safety codes officers. They do not have the resources to inspect the details required by the High Intensity Fire Regulations, so they rely on the safety codes officers to check this.

## 8) National Codes Have Become Strong Federal Policy Tools

The federal government has always had some political influence, but this influence was markedly ramped up with the adoption of energy as an objective and the advent to power of the Liberal government with their strong climate approach. The mandates of the Minister of Natural Resources<sup>94</sup> and the Minister of Environment and Climate Change<sup>95 96</sup> are being reflected in the support provided to NRC and NRCan.

NRC's role in code coordination has expanded exponentially.

With the 2022 goal of a national labeling program, growth of the EnerGuide Program and the use of HOT 2000 for code compliance, NRCan's role has shifted from mainly demonstration to active data gathering and data analysis.

Provinces have held some sway over policies through PTPACC but provincial influence has diminished as can *be seen in the example of airtightness* in the Tiered Energy Efficiency Requirements. ([Appendix 5](#))

## 9) National Codes Have An Eastern Bias

Of the 31 positions on CCBFC, 16 are from Ontario. Most members on committees and task groups are from the east. Due to a history of in-person meetings in Ottawa, it has been more challenging for Alberta builders to participate as companies or individuals bear the cost in time and travel expenses. With the current downturn in the industry, Alberta representation has declined. The City of Calgary has been active in the code process for many years. Currently BILD Alberta has 3 members involved in codes at the national level and two involved at the provincial level.

<sup>94</sup> [Mandate letter, Minister of Natural Resources, Dec. 13, 2019](#)

<sup>91</sup> [Mandate letter, Minister of Environment and Climate Change, Dec. 13, 2019](#)

<sup>96</sup> [Supplementary mandate letter, January 15, 2021, Minister of Environment and Climate Change](#)

## 10) Energy Efficiency For Small Buildings in the National Code Process

There has been a move for several years to combine energy efficiency for small buildings into the National Energy Code for Buildings, which deals with large buildings. The materials, energy loss paths, economics, trades, cost sensitivities and permit approvals are very different in large and small buildings so this is not a good fit. For a time, a shared task group between energy efficiency and buildings existed, but it was dismantled in 2018 and the work shifted into a task group under the Standing Committee for Energy Efficiency (SCEE). There is a disproportionate amount of work in this task group versus other task groups in SCEE, so it is possible the Chair may want to shift some of the tasks from TG-EEHSB to the broader subject TGs, so that they cover both the NECB and 9.36<sup>97</sup>. This will put residential buildings at a further disadvantage as the membership in these other task groups tend to be commercial in focus.

## 11) B.C. Influence in National Energy Code

The influence of B.C in the areas of energy in codes has grown in recent years. B.C is putting vast provincial resources toward the B.C. Step Codes and this is acting as a proving ground for the National Code Tiered Energy Efficiency Changes. The Chair of the Task Group on Energy Efficiency in Housing and Small Buildings, now disbanded, is the past Director of B.C. Building Codes and Standards and one of the key architects of the B.C. Step Codes. He bills himself on Linked In as a “change agent”.

## 12) Codes, Standards and Tools Tend to Lag Behind Industry Innovation or Issue Emergence

As builders adopt new designs, materials and equipment to meet environmental requirements, current codes may lag, causing approval issues for builders, limiting innovation and causing comfort and durability issues for homeowners. A recent example is the bias of the HOT 2000 simulation software toward solar gain and the current mandatory labeling requirements on windows. Solar gain is emerging as an overheating issue in well insulated homes and following current mandatory window labeling can make this worse.

## 13) The Role of the Alberta in Code Adaptation is Changing

The complexity of codes and the immense amount of manpower that it takes to coordinate the committees has made it more and more difficult for provinces to create or adapt these “model” codes. Ontario and Vancouver are the only jurisdictions who currently significantly alter the national codes. Alberta has been steadily moving away from this in the last 15 – 20 years.

The Federal government and the Provinces fund the development of model code. NRC has asked the provinces to enter into a code reconciliation agreement. This agreement asks for:

- Eliminations of variation in codes
- Automatic adoption of national codes by the provinces
- Integration of the provincial code development process into the national process (this is a problem, because Alberta does not have a good provincial process)

Municipal Affairs has been working to eliminate variations in the Alberta codes from the National Codes.

## 14) Alberta Code Process

Code’s responsibility is split between The Safety Codes Council and Municipal Affairs.

The Safety Codes Council is an agency at arms length from the Alberta Government that has several code sub-councils that can make **recommendations only** on code items to Municipal Affairs.

<sup>97</sup> Conversation with CHBA National Jan. 25, 2021

*The housing industry has 1 official seat* of 15 on the Council. Warranty holds a second, which is a builder. Municipalities hold 4 seats; safety codes officials hold 2. The group meets 4 -5 times per year.

The Building Sub-Council discusses and strikes working groups on issues that affect industrial, commercial, institutional and residential buildings. These groups are reactive, not pro-active and deal with issues that have arisen with code changes already in effect.

The Building Sub-Council does review proposed code changes that come out from the National Process once a year. The onus is on members to raise issues. The knowledge and level of support of the members from industry is key to the quality of input on proposed code issues.

### **15) Energy Codes in Alberta**

Engagement with industry on the energy code changes has been minimal. The vehicles for review are the Safety Codes Building sub-council. There was a review of proposed changes to the National Code in February of 2020<sup>98</sup>, with the proposed change for the prescriptive path of 9.36 reviewed, but there is no public record of actions taken from the review by the Council or Municipal Affairs or record of comments. There is also a note of the extreme volume of work Municipal Affairs was undertaking on the national code in January of 2019<sup>99</sup>, but no detail.

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<sup>98</sup> [Safety Codes Council Minutes of the third Building sub-Council meeting of 2020](#)

<sup>99</sup> [Safety Codes Council Buildings sub-Council January 17, 2019. Page 9](#)

## Appendix 5: Background on Tiered Energy Efficiency in Codes

A process to establish new objectives for the National Codes was put in place in 2009. An environmental objective and the sub-objective of energy efficiency were added to the codes in 2010 with the support of industry and the provinces.

The journey to tiered energy codes began in 2014 in B.C. to serve local governments that desired much greater efficiency in the construction of new buildings. This created a patchwork of local requirements which builders found challenging. The province was also looking for a mechanism to reduce greenhouse gas emissions in the buildings sector.

### 1) Original NRC Policy Discussion on Tiered Energy Codes

In September of 2016, NRC created a very good discussion paper titled “Long Term Strategy for Developing and Implementing More Ambitious Energy Codes <sup>100</sup>”. Several policy decisions playing out in B.C and the 2020 National Code are based on this document:

#### a) Tiers Radically Shift the Purpose of Codes

Tiers marked a shift in codes from following good practices, to setting a path forward. This shift encourages adoption of higher tiers by individual jurisdictions to move the entire industry forward.

***This shifted the meaning of “harmonization” from between jurisdictions to within a concept <sup>101</sup>.***

#### b) Carbon Intensity Deferred

Intensity is used to measure carbon neutrality. In the 2016 paper, NRC recognized that even Net -Zero homes could not be carbon neutral if they were connected to an electrical grid whose energy is supplied by fossil fuels. They noted the goal of carbon neutrality must be agreed upon by all levels of government for NRC to consider implementing it in codes. It was proposed that the performance goal for buildings should focus on energy - not carbon.

***This is at odds with the current federal and municipal political goals and what has evolved in B.C.***

Energy Use Intensity for occupancy type was developed for the 2015 National Energy Code for Buildings but was not implemented.

#### c) Releasing All Tiers Simultaneously

NRC recognized the benefits of a phased in approach, for industry to have time to adapt, but there was also the will to allow jurisdictions to adopt more stringent steps earlier.

***These two are mutually exclusive. Increasing industry liability for the sake of leadership is irresponsible.***

<sup>100</sup> [Long-Term Strategy for Developing and Implementing More Ambitious Energy Codes, 14 September 2016, NRC/CCBFC](#)

<sup>101</sup> Long-Term Strategy for Developing and Implementing More Ambitious Energy Codes, 14 September 2016, page 4, paragraph 1

#### d) Implementation Challenges

The paper recognized the need for extensive training of a broader group to meet tiered codes. Historically, codes have been implemented before training is available, which is a huge risk for the industry. The knowledge level of safety codes officers has traditionally lagged far behind implementation. Other critical tools, such as HOT 2000 need to be ready and tested before a code changes such as these can be implemented.

## 2) Current State of National Tiered Energy Efficiency Codes

The tiered sections to Part 9 were originally conceived in British Columbia to provide a common set of goals that all municipalities could follow to remove uncertainty for the industry.

If adopted, each of the tiers will prescribe performance requirements relative to the 2020 NBC.

#### a) The Demise of “Net Zero Ready”

The technical Committees of NRC concluded that net-zero-ready was not a sufficiently well-defined term for code use since the ease of achieving it depends on how much roof or land is available. Instead, a performance level considered to be equivalent to the improvement achieved by ‘net-zero-ready’ was adopted by the Standing Committee on Energy Efficiency <sup>102</sup>.

*This may affect the CHBA National position on energy efficiency in new homes.*

#### b) Release of Tiers in the Body of the Code

CCBFC has stated they want all tiers of the codes released at once and placed in the body of the code. Presently, tiered energy requirements are voluntary, **until individual AHJs adopt the tier requirements as mandatory** <sup>103</sup>. At this time requirements have not been developed past Tier 2.

**Once a requirement is put in the body of the code it becomes enforceable, versus being in the appendix. This could cause confusion in Alberta.**

*The tiered energy efficiency requirements could be useful in aligning goals from the provincial to the municipal level with the municipalities of Edmonton and Calgary.*

#### c) Increased Complexity

The prescriptive path has become very complex and will be very difficult for small builders to figure out, driving them to the performance path <sup>104</sup>, with additional costs for the services of energy advisors. Training for builders, regulators, warranty inspectors and trades will also be needed.

Increased complexity and a more technical house means homeowners will need to understand how to operate their homes – something that is not on their radar now. This brings huge warranty risks for builders.

<sup>102</sup> CHBA National Draft Backgrounder on Tiered Energy Efficiency December 2020

<sup>103</sup> Impact Analysis, Proposed Code Change request 1617, 2017 - 03

<sup>104</sup> Review by Dave Turnbull, EnerSpec Consulting Feb. 1, 2021

**d) Emphasis on Reducing Energy Through the Building Envelope**

The simple approach of a percentage improvement over a baseline for overall energy has changed to a percent (overall) improvement in house energy **and** envelope improvement, placing more emphasis on building envelope and less flexibility between equipment and structures.

There is a relaxation for smaller homes in the targets. The committee chose the small home target that allow more homes to qualify for the small home credit. This is designed reduce costs for smaller homes<sup>105</sup>, but may also shift some construction to smaller homes.

	Volume	Target Metrics	Applicable Energy Performance Tier				
			1	2	3	4	5
Performance Path	> 300 m <sup>2</sup> and where volume is not used	Envelope Improvement	N/A	≥ 5%	≥ 10%	≥ 20%	≥ 40%
		Energy Improvement	≥ 0%	≥ 10%	≥ 20%	≥ 40%	≥ 70%
	≤ 300 m <sup>2</sup>	Envelope Improvement	N/A	≥ 0%	≥ 5%	≥ 15%	≥ 25%
		Energy Improvement	≥ 0%	≥ 0%	≥ 10%	≥ 30%	≥ 60%
Prescriptive Path	Comply with 9.36.2-4 and in addition	Points	0	10	20?	40?	70?

Source: CHBA National Summary Report on Tiered EE Requirements, draft, December 2020

**e) Percentage Increases of the Tiers**

Tiered changes are in addition to regional climate zone requirements already embedded in the code.

The Tiers 2-5 approximate the energy savings targets of the Energy Star, R-2000, Net Zero Ready and Passive House programs as there was a desire to align with the labels for these programs. Discussions with CHBA and energy advisors seem to indicate the targets are mainly arbitrary. CHBA National does not feel that the upper-level goals are set in stone yet. B.C. has different goals expressed in different metrics.

Evidence is emerging that Tiers 4 and 5 will be difficult to meet. The proposed change form PCF 1617 acknowledges that “Homes located in colder climate zones and homes heated with natural gas are less likely to meet the Tier 5 requirements.”

The NRC Standing Committee on Energy Efficiency (SCEE) originally described Tier 5 as equivalent to Net Zero ready. CHBA does not agree with that assessment since it appears to be based on arbitrary numbers. They also have data from the CHBA Net Zero projects that show many builders are not meeting Tier 5 requirements. Alberta energy advisors and builders agree that steps from Tier 3 to 4 and 5 will be extremely challenging for the industry<sup>106</sup>. Builders in the north feel the challenges will begin with tier 3. The downturn in the economy, over-regulation and market apathy makes the upper tiers more challenge in Alberta.

<sup>105</sup> Canmet Energy Supplement to PCF-16-17 Impact Analysis, March 2020, page 9

<sup>106</sup> Interviews with builders and energy advisors in December 2020.

**f) A New Points System for Compliance in the Prescriptive Path**

Points are prescribed for various energy conservation measures and are intended to approximate a percentage improvement. The points available for each measure depend on the climate zone and are not always intuitive <sup>107</sup>. There are specific credits for items that direct housing down a particular development path. The credit for small houses and the treatment of heat pumps are two specific examples.

**g) Peak Cooling Requirement**

This is intended to ensure energy efficiency measures do not make the overheating risk in higher insulated homes worse. Overheating has been recognized as an issue with net zero demonstration homes and passive homes and is more severe in areas with a high degree of shoulder season sun (much of Alberta).

**h) Increased Airtightness Requirements <sup>108</sup>**

The executive committee originally provided guidance to the Standing Committee on Energy Efficiency (SCEE) that mandatory airtightness testing was not acceptable in the tiered performance path. SCEE originally intended to make airtightness testing mandatory in the performance tier path. This went out for public review in 2020 and received significant opposition from Alberta. The executive committee clarified that airtightness testing could not be mandatory in any path. They requested the proposed changes be revised to reflect this.

In response to this a SCEE working group proposed an arrangement where you did not have to test to comply, but by not testing, your proposed building would be restricted to 3.5 Air changes per hour (ACH) while the reference house used 2.5 ACH. CHBA National presented against this. SCEE agreed to relax their solution slightly to the new default of 3.2 ACH. The Task Group also removed the requirement to meet a specific airtightness level. A value of 2.5 ACH could be used with testing and all the prescriptive measures.

The Executive committee wrote again to SCEE to indicate that the solution proposed is not acceptable. SCEE disagreed.

Within the National Energy Code for (large) Buildings NECB, air testing has always been voluntary. There is no indication why this is being imposed on residential buildings.

This requirement punishes builders who do not test. Builders in Alberta, have been building consistently below this for years <sup>109</sup> and it will remove a cost-effective path for compliance strongly utilized by Alberta builders.

**An Anticipated Shift to Electric Heating**

In the proposed change for the performance path, NRCan confirmed that a shift to electric heat was anticipated by saying “AHJ’s mandating compliance with Tier 5 should anticipate more electrically heated homes <sup>110</sup>”.

<sup>107</sup> CHBA National Tiered Energy Codes Primer, draft Dec. 2020

<sup>108</sup> Correspondence with CHBA National, January 25, 2021

<sup>109</sup> Comments by multiple energy advisors in Alberta

<sup>110</sup> Proposed Change 1617 Performance compliance Other, Impact analysis NRC 2017 -03 8.15

**i) Cost/Benefit Analysis**

NRCAN has developed a database of 240 new housing archetypes and a costing platform. From this, a set of code reference buildings were created. For Tier 2, the calculated median annual reduction of energy loads is between 6% and 10% with an incremental cost of \$790 to \$1840 over climatic zones 4 to 8<sup>111</sup>.

CHBA National has noted that there was very little in the way of a cost/benefit analysis. NRCAN is using archetypes to determine only costs and measures that work in various tiers.

These tables were included in the Impact Assessment of the performance code change (PCF 1617):

**Estimated incremental costs (\$/dwelling unit), averaged for climate zones 4-8**

	Electrically-heated homes (\$/unit)					Gas-heated homes (\$/unit)				
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Single Attached	-400	200	2,600	5,600	20,200	-200	1,500	2,000	5,100	18,000
Detached	-800	1,200	3,900	10,200	30,100	-600	2,100	3,600	8,900	30,800
MURB Quad-plex	-500	1,200	3,900	5,400	23,000	-600	2,800	3,500	5,400	14,500
10-unit	-1,900	1,600	2,100	3,500	14,700	-2,000	900	2,400	3,200	13,900

Natural Resources Canada, CanmetENERGY  
PCF-1617 Impact Assessment

4

Energy advisors in Alberta have noted the numbers do not appear weighted according to the cost benefit for the measures, from an energy perspective.

Energy Advisors are of the opinion that the cost saving analysis is not at all accurate for Alberta.

**Table 12: Average per unit fuel savings relative to as-designed house, (gas-heated scenario).**

	Per-unit reduction in electrical consumption (kWh/yr)					Per-unit reduction in gas consumption (m <sup>3</sup> /yr)				
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Single Attached	0	40	0	-1,250	-1,600	0	200	420	870	1,280
Detached	0	50	-380	-1,560	-1,790	10	370	700	1,280	1,930
MURB Quad-plex	0	40	-210	-2,170	-2,050	40	200	410	960	1,030
10-unit	0	40	-260	-920	-850	30	190	420	690	840

Natural Resources Canada, CanmetENERGY PCF-1617 Impact Assessment

**3) The 2020 Baseline Versus the 2015 Baseline**

Tier 1 was originally set as 9.36 of the 2015 National Building Code. However, the baseline of the 2020 code is stricter than the 2015 code. By documenting and calculating the effects of these shifts BILD Alberta may be able to influence the outcomes.

<sup>111</sup> Impact analysis, Proposed code change 1611, Prescriptive Requirements, 2017-03

This in turn affects the set points in the HOT 2000 energy modeling software for the code minimum house that builders compare against though the computer energy simulation when they are trying to meet an energy budget.

**a) Minimums for the Reference House**

There has been discussion in the Task Group Energy Efficiency round raising the requirements of the reference house to add additional increases to the tiers.

**b) Shifting Equipment Efficiencies**

As standards change, the code will change to reflect these changes. Equipment requirements are found in section 9.36.2.4, which make up the prescriptive minimums and define the reference house properties. The reference house is used as the basis for performance modeling.

**Example: Furnace Efficiencies:** Heating is the largest contributor to housing energy use, so a small increase in heating appliance efficiency can have a significant effect on the energy budget of a home in the computer modeling.

The current allowable minimum for energy modeling is a furnace with an efficiency of 92%. With the advent of 9.36 into code, Alberta builders shifted to using furnaces with efficiencies of 95% or 96% which gave them significant savings in the energy budget and was more cost effective than other measures.

In 2020, furnaces with efficiencies of 92% were no longer available due to regulation by NRCan.

The 2020 code will change to recognize the new minimum efficiency 95%, which is a 3-7% loss in the energy budget, as space heating is the largest component of energy use in a house. This means that a house originally model with a 92% efficient furnace would no longer meet the current code. It also means that the builder must do more, to meet the baseline in some other area at greater cost. The colder the climate, the more a builder must do and the more expensive the changes are.

**c) Airtightness**

Through a letter to PTPACC, the Province of Alberta has already opposed this increased measure, but it is still included in the proposals.

The current setting in Hot 2000 for the reference house is 2.5 Air changes at 50 Pascals. The Task Group Energy Efficiency Housing and Small Buildings (TG EEHSB) originally wanted a change to mandatory airtightness testing in the prescriptive path. The task group decided that instead of mandatory testing, the prescriptive air change default would be set at 3.5 air changes. This is a 6-8% in the energy used by the house and potentially a large penalty to the energy budget in a cold climate. To realize the credit of a lesser air tightness value, a builder must air test. In Alberta, most builders know their air test numbers are falling below 2.0.

After a letter from the Province of Alberta, the SCHSB reviewed this proposed change and the value was set back to 3.2 air changes. When this was objected to again, the Chair of SCEE rejected the objection.

**d) Peak Cooling Load**

Builders will no longer be able to use large percentages of windows for gain solar, even if the overall energy budget can be meet by other means.

## Appendix 6: CHBA Zero Renovation Program

CHBA is developing tools and resources through a 3-year project so that some homes could achieve a Net Zero label through deep energy retrofits. Recognizing this is a significant cost, this project is exploring pathways to Net Zero energy over time with staged renovations, recognizing the best in building science indicates some changes will need to occur simultaneously. Some homes can more easily pursue a Net Zero energy renovation than others. The program recognizes renovators may need more or different choices for energy retrofits.

A working group composed of renovators, energy advisors, utilities and NRCan came together with staff from CHBA National to plan the program. Four renovation projects were chosen to validate the technical and administrative program requirements.

This program will be linked to Renomark and CHBA membership and will have an education component. It will look at financial incentives and marketing.

CHBA worked with the Appraisal Institute of Canada to bring best practices from the US Appraisal Institute's Green and Energy Efficient Addendum to Canada. Pilot participants will receive pre-renovation and post-renovation appraisals of their homes.

The program recognizes that energy renovations must not place the owner at risk, by either creating a building durability or safety issue with a deep retrofit.

*Alberta renovators and energy advisors participants:*

Dale Rott, Effect Home Builders – Edmonton

Ryan Scott, Avalon Master Builder - Calgary

Dave Butterwick, Butterwick Construction & Carpentry - Edmonton

Peter Darlington, Solar Homes Inc - Calgary

Tyler Hermanson, Cooper Le, 4 Elements Integrated Design - Calgary