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# TIERED ENERGY CODE ROADMAP

*August 2022*



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# 1. INTRODUCTION & RECOMMENDATIONS

## *Introduction*

The 2020 National Building and Energy Codes have introduced Tiered Energy Codes as a pathway to eventually requiring all new homes to be built to a Net Zero standard. The Government of Alberta continues to assess the implementation of these changes in collaboration with industry and the Safety Codes Council. BILD Alberta has undertaken a detailed analysis to help form a set of recommendations for the consideration of the Government of Alberta.

BILD Alberta's goal is to work with the province to establish a pragmatic framework that enables the construction of safe and affordable Net Zero homes in the future. We are committed to the significant work and partnerships between industry and the provincial government that are required to make this a reality.

Based on the new National Energy and Building Codes, we have undertaken detailed modelling and analysis to better understand:

- Impacts of each Tier from a cost, resource, education and building science perspective
- Barriers that need to be addressed before it is feasible to move to individual tiers.
- Recommended timelines to progress through each of the tiers considering the above factors.

The details provided are based on modelling a typical detached single-family home through each Tier to identify specific required changes. Resources were not immediately available to undertake a similar exercise for other archetypes (i.e. semi-detached, row, multi-family).

Beyond the impacts upper tiers will have on building science and costs, there will be considerable impacts on electric utility infrastructure. Tiers 4 and 5 require a shift to electrified home heating. This will require, at a minimum, 200-amp servicing on each single-family lot which is presently not accounted for in the Maximum Investment Levels for all utilities. The upgrade results in an additional cost of approximately \$1,500 per lot. The Alberta Electric System Operator has also begun raising concerns about the ability of the province's infrastructure to handle and accommodate an increasing shift to electrified home heating and vehicles. These will be important issues that need to be addressed before we move to the upper tiers.

The final portion of this report provides a recommended action plan for industry and government to undertake in the months and years to come. Recommendations are centred on the following criteria:

1. Creating a pragmatic framework that is predictable and allows the industry to build capacity in technologies, materials and education.
2. Minimizing impacts on housing affordability.
3. Providing the time and resources that allow all builders to adapt, preserving competitiveness.
4. Addressing building science challenges to avoid unintended consequences for builders and homeowners.

## ***Preliminary Recommendations***

The following provides a high-level summary of BILD Alberta's preliminary recommendation for Tiered Code adoption in Alberta:

### **1. Ensure a uniform and consistent application of energy Tiers province-wide.**

- Some Alberta municipalities have expressed interest in fast-forwarding or expediting the implementation of Tiers which presents significant risks to housing affordability and the orderly transition to a Net Zero standard.
- Fractured application of Tiers between municipalities leads to significant confusion and additional costs. The application of Step Codes in British Columbia has shown evidence of this.

### **2. Tier 1 becomes the minimum standard province-wide in mid-2023.**

- Minimal industry education is required prior to implementation.

### **3. Tier 2 becomes the minimum standard in mid-2025.**

- Builders are penalized for utilizing the prescriptive compliance pathway and we anticipate this will result in an increasing shift to the performance pathway. This will require education for builders and municipal building code authorities.
- A two-year timeframe will allow more builders to transition to the performance compliance pathway while building Energy Advisor and airtightness (blower door) testing capacity across Alberta.

### **4. Tier 3's implementation depends on industry capacity and clarity surrounding the prescriptive compliance pathway.**

- It is anticipated that the majority of new builds will follow the performance compliance pathway, utilizing Energy Advisors and airtightness testing.
- If sufficient capacity/education has been built during Tier 2, a transition to Tier 3 may be possible by mid-2026 / 2027.

### **5. Until questions surrounding electric home heat technologies and utility infrastructure have been addressed, a timeline for implementation of Tier 4 cannot be provided.**

- Tier 4 requires a shift to electrified home heat with a backup heating source at a significant additional cost. For this shift to occur safely and affordably, heat pump technology must advance. Existing air source heat pumps do not reliably work in temperatures below -25°C. Ground source heat pumps may be a technical alternative, but those systems can cost upwards of \$50,000 per home.
- Current Maximum Investment Levels from many electric utilities do not compensate for the 200-amp services required to meet electricity demands.
- It remains unclear if Alberta's broader electric system and infrastructure can accommodate a rapid shift to electrified home heat in addition to electric vehicle charging.

**6. Tier 5 does not presently work in Alberta and will require modifications prior to identifying a feasible timeline.**

- Requirements go beyond what is needed to build Net Zero Homes.
- Costs associated with Tier 5 are \$70,000 - \$77,000, which will significantly impact housing affordability across the province.

### Summary Findings

The following table summarizes preliminary findings based on modelling and analysis of each proposed Tier. A detailed breakdown of the impacts at each Tier is provided in Section 2. **It is important to note that the cost impact of each Tier represents present-day, hard costs. If industry capacity and technological barriers are not addressed in advance of moving up to certain Tiers, costs could increase considerably.**

SUMMARY TABLE				
Tier	Increase to Construction Costs	* Cost Impact Per Home	Barriers Prior to Implementation	Timing
1	0% to 0.34%	\$0 - \$1,072	<ul style="list-style-type: none"> <li>• None</li> </ul>	Mid-2023
2	0.35% to 1.05%	\$1,100 - \$3,300	<ul style="list-style-type: none"> <li>• Energy Advisor/airtightness testing capacity.</li> <li>• Multi-family airtightness testing requirements.</li> <li>• Managing peak cooling loads.</li> <li>• Education of builders, building officials and homeowners.</li> </ul>	Mid-2025
3	1.05% to 1.40%	\$3,300 - \$4,400	<ul style="list-style-type: none"> <li>• Clarify the prescriptive pathway.</li> <li>• Energy Advisor/airtightness testing capacity.</li> <li>• Building envelope training with trades.</li> </ul>	TBD
4	7.0%	\$20,000 - \$22,000	<ul style="list-style-type: none"> <li>• Housing affordability.</li> <li>• Air source heat pump technology.</li> <li>• Electric infrastructure to support electrified home heating.</li> <li>• Envelope improvements.</li> <li>• Clarify the prescriptive pathway.</li> </ul>	TBD
5	25%	\$70,000 - \$77,000	<ul style="list-style-type: none"> <li>• Revisions to Tier 5 requirements to reflect actual Net Zero construction.</li> <li>• Impact on housing affordability.</li> <li>• Diminishing returns on insulation.</li> <li>• Designing for solar panels.</li> <li>• Embodied carbons analysis.</li> <li>• Electric infrastructure to support electrified home heating.</li> <li>• Clarify the prescriptive pathway.</li> </ul>	TBD

\* The cost impact per home is based on modelling a 2000 ft<sup>2</sup> detached home with a 264 ft<sup>2</sup> garage.

## 2. DETAILS ON TIER PROGRESSION

### TIER 1

**Timing:** Mid-2023

Implementation of Tier 1 should represent minimal disruption and cost impact. The main technical challenge will be for builders to manage peak cooling and heating loads under the performance compliance pathway. To manage solar heat gain in the summer months, some homes will lose the benefit of passive solar heating in the winter months. This challenge will persist through each of the Tiers.

<b>TIER 1</b>	
<b>Overview</b>	
<b>Estimated Cost Impact</b>	0% to 0.34% increase in construction costs  \$0 - \$1,072 on a 2000 ft <sup>2</sup> detached home with 264 ft <sup>2</sup> garage  <i>* The estimated cost impact represents present-day, hard costs.</i>
<b>Items Impacting Cost</b>	Requirements for R50 ceiling insulation and R20 foundation wall insulation.
<b>Building Envelope Improvement</b>	N/A
<b>Energy Improvement (excludes lighting and appliances)</b>	≥ 0%
<b>Peak Cooling Load</b>	Cannot be greater than the reference house
<b>Key Changes</b>	
Tier 1 does not align with the current 9.36 because energy efficiency performance rating for water and space heating equipment has changed (minimum 95% efficient furnace required).	
<b>Barriers Prior to Implementation</b>	
<p><b>Peak Cooling Load</b></p> <ul style="list-style-type: none"> <li>The impact of window and lot orientation on cooling loads is a difficult cost to quantify and will vary from lot to lot.</li> <li>This will challenge performance builders, as it requires a test to ensure that solar heat gain in the summer is not higher than the reference house. In addition, if overheating occurs, the builder may have to use different windows in the home, resulting in a loss of solar heat gain (passive heating) in the winter.</li> </ul>	
<b>Education / Training Required</b>	
<ul style="list-style-type: none"> <li>General education of the Tiered Energy Codes for builders, trades, suppliers and building code officials.</li> </ul>	

## TIER 2

**Timing:** Mid-2025

In a vacuum, the cost impacts associated with Tier 2 are manageable. Tier 2 is where there will likely be an increasing shift to the performance compliance pathway, representing a cost savings of around \$2,000/home. A shift to increasing use of energy advisors and airtightness testing represents both a challenge and opportunity at Tier 2. The increased demand for these skills and technologies through Tiers 1 and 2 should allow the industry to build the capacity required in advance of Tier 3, where the prescriptive path may no longer be feasible. Clarity surrounding airtightness testing of multi-family buildings is required before the move to Tier 2.

<b>TIER 2</b>	
<b>Overview</b>	
<b>Estimated Cost Impact</b>	<p>0.35% -1.05% increase in construction costs.</p> <ul style="list-style-type: none"> <li>- Performance Compliance Path – 0.35%</li> <li>- Prescriptive Compliance Path – 1.05%</li> </ul> <p>\$1,100 - \$3,300 of additional costs on a 2000 ft<sup>2</sup> detached home with 264 ft<sup>2</sup> garage</p> <ul style="list-style-type: none"> <li>- Performance Compliance Path: \$1,100</li> <li>- Prescriptive Compliance Path: \$3,300</li> </ul> <p><i>* The estimated cost impact represents present-day, hard costs. If industry capacity is not developed in key areas in advance of moving to Tier 2, costs could increase considerably.</i></p>
<b>Items Impacting Cost</b>	<ul style="list-style-type: none"> <li>• Dependent on performance versus prescriptive build, lot orientation, cooling requirements, solar heat gain, style of home and airtightness testing.</li> <li>• Additional costs associated with the prescriptive compliance path are related to increased insulation and more work required for airtightness.</li> </ul>
<b>Building Envelope Improvement</b>	≥ 5%
<b>Energy Improvement (excludes lighting and appliances)</b>	≥ 10% improvement from the reference house under the 2020 building code
<b>Peak Cooling Load</b>	Cannot be greater than the reference house
<b>Key Changes</b>	
<ul style="list-style-type: none"> <li>• Airtightness testing required for performance compliance path - 2.5 ACH requirement.</li> <li>• The requirement to use 3.2 ACH for modelling unless airtightness testing is completed. This results in a penalty for those who cannot prove their testing or do not have access to testing equipment or Energy Advisors (remote communities).</li> <li>• For prescriptive compliance, builders must comply with Tier 1 and receive 10 energy conservation points.</li> <li>• For performance compliance, builders must make up for performance loss through additional insulation if airtightness testing is not completed.</li> </ul>	

## **Barriers to Address Prior to Implementation**

### **Capacity for Airtightness Testing and Education on Performance Path**

- Many builders still use the prescriptive compliance path and need time and education to shift practices and designs to meet the performance path.
- Additional capacity and access to Energy Advisors/equipment required to perform airtightness testing on a broader scale and in remote communities.
- Not using airtightness testing penalizes the builder since more insulation is required (the cost of additional insulation is \$1,000 - \$1,500).

### **Peak Cooling Load / Window Orientation**

- The impact of window and lot orientation on cooling loads is a difficult cost to quantify.
- This will challenge performance builders, as it requires a test to ensure that solar heat gain in the summer is not higher than the reference house. In addition, if overheating occurs, the builder may have to use different windows in the home, resulting in a loss of solar heat gain (passive heating) in the winter.

### **Homeowner Education**

- Homeowners need additional education on systems that impact the performance of the home. This has implications for new home warranty and overall safe home operation (homeowners are turning off HVAC, changing HRV filters, etc.).

### **Multi-family Airtightness Testing**

- Testing multi-family homes requires a guarded test to be completed, and not all Energy Advisors have been educated on how to perform this test as they are relatively new. In addition, airtightness testing on multi-family homes is complex as the common walls are prone to air leaks and there needs to be clarity on the testing and procedure requirements.
- Should airtightness requirements be the same for single-family homes and multi-family homes?

### **Building Official's Capacity and Education**

- Building official's education and skills capacity need to be increased on the performance compliance path requirements, especially in smaller communities.

## **Education / Training Required**

- Build capacity and knowledge on airtightness testing for industry and building officials.
- Homeowner education on operating equipment in their home.
- Building Code Official Training on performance compliance pathway and airtightness testing.
- Builder and trade education will be required to build increasing airtight homes efficiently and cost-effectively.

## **TIER 3**

**Timing of Implementation:** *TBD (dependent on the capacity for airtightness testing and clarity surrounding the prescriptive compliance path)*

Cost impacts associated with Tier 3 become more difficult to manage and are associated mainly with increased insulation required to meet the mandated building envelopment improvement. Prior to moving to Tier 3, sufficient capacity in Energy Advisors and airtightness testing must be built province-wide. Presently, there are no details surrounding a prescriptive pathway and the cost impacts could be

prohibitive. Provided the issues mentioned above are addressed, a transition to Tier 3 could potentially occur in 1-2 years following the adoption of Tier 2.

<b>TIER 3</b>	
<b>Overview</b>	
<b>Estimated Cost Impact</b>	<p>1.05% -1.40% increase in construction costs.</p> <p>\$3,300 - \$4,400 of additional costs on a 2000 ft<sup>2</sup> detached home with 264 ft<sup>2</sup> garage</p> <p>* <i>The estimated cost impact represents present-day, hard costs. If industry capacity is not developed in key areas in advance of moving to Tier 3, costs could increase considerably.</i></p>
<b>Items Impacting Cost</b>	<ul style="list-style-type: none"> <li>• Costing is based on the performance compliance path, utilizing air tightness testing, as the prescriptive compliance path has not been completed.</li> <li>• Costs will considerably increase if builders do not undertake airtightness testing and are required to meet 3.2 ACH.</li> <li>• The scale of the cost impact will depend on airtightness, insulation, use of triple pane windows, home style, and orientation.</li> </ul>
<b>Building Envelope Improvement</b>	≥ 10%
<b>Energy Improvement (excludes lighting and appliances)</b>	≥ 20%
<b>Peak Cooling Load</b>	Cannot be greater than the reference house
<b>Key Changes</b>	
<ul style="list-style-type: none"> <li>• Airtightness testing required for performance compliance path - 2.0 ACH requirement. The associated cost will change with the amount of insulation required.</li> <li>• Requirement to use 3.2 ACH for modelling unless airtightness testing is completed. This causes a penalty to those who cannot prove their testing or do not have access to testing equipment or Energy Advisors (remote communities).</li> <li>• Air source heat pumps are not used in the reference house modelling; the modelling only uses back up and secondary heating.</li> <li>• The prescriptive requirements still need to be outlined. At this stage, the prescriptive path is not an option at Tier 3.</li> </ul>	
<b>Barriers to Address Prior to Implementation</b>	
<p><b>Capacity for Airtightness Testing and Education on Performance Path</b></p> <ul style="list-style-type: none"> <li>• The use of Energy Advisors, airtightness testing and the performance pathway will likely become the dominant, if not mandatory, pathway in Tier 3. Building substantial capacity in this sector across Alberta will be critical before moving to Tier 3. If substantial capacity is not built prior to Tier 3, approvals could be significantly delayed and additional costs in remote communities would be substantial.</li> <li>• Requirement to use 3.2 ACH for modelling unless airtightness testing is completed. This causes a penalty to those who cannot prove their testing or do not have access to testing equipment or Energy Advisors (remote communities). The cost increase could be substantial and is difficult to quantify at this stage. Associated costs are due to increased airtightness, including increased</li> </ul>	

insulation, more energy efficient windows, furnaces and HRVs.

#### **Building Envelope Improvements**

- A 10% envelope improvement will require increased airtightness, insulation and more energy efficient windows. This will result in additional costs and will require additional training for builders and trades.

#### **Clarify Prescriptive Pathway**

- There needs to be clarity on if there will be a prescriptive path at Tier 3 prior to implementation. If there is a prescriptive path, details surrounding energy conservation points will be required.

#### **Education / Training Required**

- Continued builder and trade education on building envelope improvements.
- Homeowner education on operating equipment in their home.
- Building officials' education and skills capacity need to be increased on the performance compliance path requirements, especially in smaller communities.

## **TIER 4**

**Timing of Implementation:** *TBD (dependent on electric heat technologies for cold climates and clarity surrounding the prescriptive compliance path)*

The changes at Tier 4 represent a substantial shift in terms of costs, technologies, and overall feasibility. This largely relates to a requirement for electric home heat to become mandatory. Two items will need to be addressed before Tier 4 makes economic and environmental sense:

1. Air source heat pumps have the most potential as a viable alternative on a broad scale. Unfortunately, current air source heat pumps do not reliably function at -25°C and below and will require a secondary heat source (electric or gas furnace) in every home at considerable additional cost. Likewise, more reliable electric heating alternatives (ground source heat pumps) come with substantial additional cost. Prior to moving to Tier 4, this challenge will need to be addressed.
2. Alberta's electrical grid may not be ready to accommodate a broad shift to electrified home heating in addition to the growing use of electric vehicles. At a minimum, this will require increased investments in electrical utilities for each new building lot. In addition, it is unclear if more substantial investments and upgrades to the electrical grid will also be required to address this shift. Beyond the feasibility, unless Alberta shifts to less carbon-intensive electrical generation sources, electrified home heating will generate more greenhouse gas emissions than the continued use of energy efficient gas furnaces.

<b>TIER 4</b>	
<b>Overview</b>	
<b>Estimated Cost Impact</b>	<p>7.0% increase in construction costs.</p> <p>\$20,000 - \$22,000 of additional costs on a 2000 ft<sup>2</sup> detached home with 264 ft<sup>2</sup> garage</p> <p>* <i>The estimated cost impact represents present-day, hard costs. If industry capacity and technological barriers are not addressed in advance of moving to Tier 4, costs could increase considerably.</i></p>
<b>Items Impacting Cost</b>	<ul style="list-style-type: none"> <li>• Costs will depend on windows, air source heat pump technology, secondary heating (electric/gas furnace) requirements, drain heat recovery systems, HRV, style of the home and exterior insulation.</li> <li>• Costs assume the use of an air source heat pump and secondary heat source (electric/gas furnace). Use of ground source heat pump systems could cost upwards of \$50,000 / home.</li> </ul>
<b>Building Envelope Improvement</b>	≥ 20%
<b>Energy Improvement (excludes lighting and appliances)</b>	≥ 40%
<b>Peak Cooling Load</b>	Cannot be greater than the reference house
<b>Key Changes</b>	
<ul style="list-style-type: none"> <li>• Airtightness testing is required - 1.5 ACH requirement.</li> <li>• Electrified home heating is required – this could include air source heat pumps (~\$15,000) plus a secondary heat source (electric/gas furnace) or potentially a ground source heat pump system (~\$50,000).</li> <li>• Air source heat pumps are not used in the reference house modelling; the modelling only uses backup and secondary heating.</li> <li>• The prescriptive requirements still need to be outlined, resulting in the prescriptive path not presently being an option at Tier 4.</li> </ul>	
<b>Barriers to Address Prior to Implementation</b>	
<p><b>Affordability</b></p> <ul style="list-style-type: none"> <li>• Cost impacts result from increased insulation, which will require more lumber, and more resources overall. These resources are finite and regulated. The costs of some materials and systems (i.e. windows) may become more cost-effective over time with broad adoption and use.</li> <li>• Increased home heating costs could also impact consumers due to the shift to electric heat.</li> </ul> <p><b>Air Source Heat Pump Technology</b></p> <ul style="list-style-type: none"> <li>• Air source heat pumps do not reliably function in temperatures below -25°C. As a result, homes would require a secondary heat source, likely in the form of an electric/gas furnace.</li> <li>• While a ground source heat pump system is an alternative (geo-exchange, geothermal loop and ground source heat pump), the cost will increase substantially (~\$50,000). Capital costs will vary based on the size of the home and yard. Not all homes may be a candidate for a ground source</li> </ul>	

heat pump.

- Additional advancements in air source heat pumps or other alternatives will be required to allow for affordable housing construction at Tier 4.

### ***Subdivision Design and Achieving Net Zero Ready***

- While it is possible to achieve Net Zero Ready at Tier 4, it will be largely dependent on lot/home orientation and solar heat gain. Therefore, consideration of subdivision design will be critical in maximizing the potential of Net Zero Ready at Tier 4 while minimizing the impacts on housing affordability.

### ***Infrastructure to Support Electrified Home Heating***

- The shift to electrified home heat will require expanded electrical infrastructure for all new lots and potential enhancements to the broader electrical grid. Therefore, detailed discussions are necessary with Alberta's electrical utility providers and the Alberta Electric System Operator (AESO) to assess the readiness of infrastructure and supporting investments to support electrified home heat on a broad scale.
- At a minimum, 200-amp servicing will be required as a standard for new single-family lots. Presently, the maximum investment levels for Alberta's electrical utility providers vary, with a number not providing for an industry rebate for this upgraded infrastructure. If the maximum investment levels are not updated, the cost of new homes in many parts of Alberta will increase an additional \$1,500 on top of the \$20,000 - \$22,000 highlighted above.
- A shift to electrified home heating without a shift to less carbon-intensive electric energy sources will lead to a net increase in greenhouse gas emissions versus energy efficient gas furnaces.

### ***Envelope Improvement of 20%***

- Additional training/education of trades and builders will be important in achieving this degree of envelope improvement correctly and cost-effectively. Without the proper skills and oversight, this could lead to a growth in failures and potential issues with the new home warranty. It will also be important to monitor for potential unintended consequences with the inboard/outboard ratio of insulation and the use of vapour barriers. This has the potential to create issues with moisture control if not considered in the design and construction.

### ***Clarify Prescriptive Pathway***

- There needs to be clarity on if there will be a prescriptive path at Tier 3 prior to implementation. If there is a prescriptive path, details surrounding energy conservation points will be required.

### ***Education / Training Required***

- HVAC training and education on installing air source heat pump technology and secondary heat sources.
- Homeowner education on operating equipment in their home.
- Trades and municipality education.

## TIER 5

**Timing:** TBD (dependent on revisions to the Tier 5 Requirements)

It is understood that Tier 5 presently exceeds the requirements needed to build Net Zero homes and will be modified as part of the next Building Code cycle. Presently, costs associated with Tier 5 are exceedingly high and would substantially impact housing affordability across the province. Beyond the cost impact, required improvements to the building envelope will necessitate external insulation, with diminishing returns.

<b>TIER 5</b>	
<b>Overview</b>	
<b>Estimated Cost Impact</b>	<p>25% increase in construction costs.</p> <p>\$70,000 - \$77,000 of additional costs on a 2000 ft<sup>2</sup> attached home with 264 ft<sup>2</sup> garage</p> <p>* The estimated cost impact represents present-day, hard costs. If industry capacity and technological barriers are not addressed in advance of moving to Tier 5, costs could increase considerably.</p>
<b>Items Impacting Cost</b>	The majority of costs result from increased insulation, solar panels and the use of air source heat pumps and secondary heat sources.
<b>Building Envelope Improvement</b>	≥ 40%
<b>Energy Improvement (excludes lighting and appliances)</b>	≥ 70%
<b>Peak Cooling Load</b>	Cannot be greater than the reference house
<b>Key Changes</b>	
<ul style="list-style-type: none"> <li>• Airtightness testing required - 1.0 ACH requirement.</li> <li>• Significantly increased requirements for building envelope and home energy improvements.</li> <li>• Solar panels or other offsite renewable energy sources (i.e. district energy systems) are required.</li> <li>• Combination of air source heat pump and backup electric heater required. It would be challenging to offset the use of a secondary gas furnace.</li> <li>• Air source heat pumps are not used in the reference house modelling; the modelling only uses the backup and secondary heating.</li> <li>• The prescriptive requirements still need to be outlined, resulting in the prescriptive path not being an option at Tier 5.</li> </ul>	
<b>Barriers Prior to Implementation</b>	
<p><b>Housing Affordability</b></p> <ul style="list-style-type: none"> <li>• Homeowners will need to have an appetite for the associated upgrades and increased costs.</li> <li>• Certain archetypes of housing (single-family homes) will no longer be in reach for most consumers.</li> <li>• Marketing to consumers – Consumers need to be interested and willing to buy these homes.</li> </ul> <p><b>Refinement of Tier 5</b></p> <ul style="list-style-type: none"> <li>• Current Tier 5 requirements go beyond Net Zero and require refinement and further assessment prior to implementation.</li> </ul>	

### ***Changes to Insulation to Achieve $\geq$ 40% Building Envelope Improvement***

- Education on external insulation will be required.
- Will require substantial changes in housing design, carefully considering municipal requirements for setbacks and side yards.
- There will be diminishing returns with the additional insulation added to the home – the cost is considerable, with the energy savings being minimal at this stage.
- There is currently no opportunity for other forms of energy (i.e. hydrogen, district energy).

### ***Designing for Solar Panels***

- Substantial architectural and design changes will be required to accommodate solar panels. Many current home designs may not have the roof space for required solar panels.
- Lot orientations need to be considered for maximum solar exposure.
- There is difficulty in finding aesthetically pleasing solar panels.
- Additional skills, capacity and knowledge are required to properly install solar panels on a broader scale.

### ***Electric Infrastructure Grid Electrified Home Heating***

- The concerns highlighted in Tier 4 persist for Tier 5.

### ***Clarify Prescriptive Pathway***

- There needs to be clarity on if / what the prescriptive path will look like at Tier 5 prior to implementation. There are currently no energy conservation points which forces builders to build using a performance path.

### ***Education / Training Required***

- External insulation education for trades and builders.
- Education on net zero and what it means.
- Homeowner education on operating equipment in their home.
- Trades and municipality education – Education requirements of the compliance paths and how to build homes to reach the outlined requirements.

### 3. RECOMMENDED ACTION PLAN

There are numerous challenges to implementing Tiered Energy Codes in a manner that preserves housing affordability, maintains competitiveness and ensures safe homes. Many of these challenges and barriers can be addressed through a thoughtful Tier progression and partnerships between industry and government.

BILD Alberta recommends the creation of a working group with representation from industry, the Safety Codes Council, Municipal Affairs and other key stakeholders to proactively develop and implement strategies aimed at a smooth and affordable implementation of the Tiered Energy Codes.

The focus of this Working Group would be to provide high-level advice and resources to the barriers and challenges that have been identified. This would include but is not limited to:

#### ***Capacity Building***

The major barrier to Tiers 2 and 3 will be a shift to performance-built homes, utilizing energy advisors and airtightness testing. Broad use of these tools requires additional capacity within the sector and innovative solutions for more remote communities.

##### *Preliminary Action:*

- Coordinate preliminary discussions with the Canadian Association of Consulting Energy Advisors (CACEA) to better understand barriers and challenges to expanding capacity.

#### ***Proactively Identify Unintended Consequences***

With a shift in requirements, there will likely be unintended consequences on other building design and operation elements. For example, the requirements for increasing airtightness could create issues with moisture control during freeze-thaw cycles. The earlier this and other potential issues can be identified, the sooner they can be mitigated.

##### *Preliminary Action:*

- Engage with existing energy efficiency experts to identify any technical issues encountered when building increasingly airtight homes.

#### ***Industry Education***

Ongoing education from Tiers 1 through 5 will be critical to building the skills and knowledge needed to build safe homes under the new standards. Specifically, skills surrounding the building envelope will be critical as we progress through the Tiers. Additional education for safety code officers will also be required through this process.

##### *Preliminary Action:*

- Identify knowledge or skills gaps that must be addressed at each Tier.
- Collaborate with relevant stakeholder groups to design and plan the necessary education for trades, builders and safety codes officers.

## ***Consumer Education***

The increasing complexity of new homes and their mechanical systems has been a growing issue that will continue as we progress through the energy Tiers. A lack of proper operation and maintenance of these systems leads to issues with homes, consumer complaints, and warranty claims when builders have done nothing wrong. Consumer education has been flagged as a key action under the review of the *New Home Buyer Protection Act* and will need to be expanded upon as homes get increasingly complex.

### *Preliminary Action:*

- Collaborate with the Residential Protection Program and other stakeholders to design and establish a plan for consumer education.

## ***Technological Advancements***

As detailed in this report, Tier 4 will require a shift to electrified home heat. Current technologies are not adequate for Alberta's climate, which will need to be addressed in advance of Tier 4 becoming viable.

### *Preliminary Action:*

- Engage experts in British Columbia to better understand the current state of air source heat pump technologies and potential solutions for colder climate regions.

## ***Electrical Grid / Infrastructure Capacity***

The capacity and readiness of Alberta's grid to incorporate broad use of electrified home heating remains unclear. Even if the grid can support this shift, greenhouse gas emissions could increase until the energy sources become less carbon intensive.

### *Preliminary Action:*

- Engage the Alberta Electrical System Operator, Alberta Utilities Commission and electrical utility providers to discuss identifying barriers and any solutions associated with a shift to electric home heating on a broad scale.