



# Minnesota Residential Cost Study Analysis for the 2024 IECC Energy Code Adoption

# ACKNOWLEDGEMENTS

Prepared by: John Kroll, Darren Port, Cynthia Segura, and Jeannette LeZaks

Prepared for: Minnesota's Efficient Technology Accelerator (ETA)

Minnesota's Efficient Technology Accelerator (ETA) is a statewide market transformation program that accelerates deployment and reduces the cost of emerging and innovative efficient technologies, bringing lower energy bills and environmental benefits to Minnesotans. ETA is a partnership funded by the state's participating investor-owned and consumer owned utilities (IOUs and COUs), administered by the Minnesota Department of Commerce, Division of Energy Resources (DER), and implemented by Center for Energy and Environment (CEE).

The report authors would like to express thanks for the input from Angela Peterson (CEE), Eric Flower (CEE), Anusha Burte (CEE).

The team would also like to thank the interviewees for their contributions to this research.

*This document was prepared as an account of work by Slipstream. Slipstream, any organization(s) named herein, or any person individually or on behalf of any organization(s) named herein:*

*(a) does not make any warranty, express or implied, with respect to the use of any information, apparatus, method, or process disclosed in this document, or represent that such use does not infringe upon privately owned rights;*

*(b) does not assume any liability incurred with respect to or damages arising out of the use of any information, apparatus, method, or process disclosed in this document.*

# TABLE OF CONTENTS

- Executive Summary .....4
- Introduction.....5
- Background on Minnesota CODE Energy Savings .....6
  - Normalized Net Energy and Energy Use Index .....7
- Methodology .....7
  - Interview methods .....7
  - Energy Codes Cost Methods.....8
- Interview Findings.....12
  - Exterior Walls will be the Biggest Change..... 12
  - Cost Projections Vary For New Code Elements ..... 12
  - Builders Are Already Installing ERV Systems..... 13
  - Unexpected Rising Costs ..... 13
  - Cost Saving Practices Emerge..... 14
  - Energy Raters Provide Valuable Resources ..... 14
- Cost of Compliance for 2024 MN Model Energy Code.....15
- Conclusions.....18
- Appendix A: Background on Energy Code Changes and Associated Energy Savings .....20
- Appendix B: Interview Guide .....25

# EXECUTIVE SUMMARY

This report evaluates the cost impacts and estimates the energy-performance of Minnesota's proposed residential energy code update, which adopts the 2024 International Energy Conservation Code (IECC) with state-specific amendments. Center for Energy and Environment (CEE), which implements Minnesota's Efficient Technology Accelerator (ETA) programs, contracted with Slipstream to conduct research to identify and summarize the cost impacts of the recently proposed code. Findings are intended to inform legislators, builders, and the public about the financial and efficiency effects of moving from the 2015 Minnesota code (based on the 2012 IECC with state amendments) to the 2024 IECC framework that is slated to go into effect in 2027 or 2028.

To inform the report's conclusions, the project team applied three research methods:

**Stakeholder Interviews:** Conducted 12 virtual interviews with a balanced mix of affordable, market-rate and custom builders plus design consultants across the Twin Cities metro and Greater Minnesota.

**Cost Modeling:** Collected primary cost data from RSMeans, an online construction estimation database (pricing from Q4 2025), for a two-story 3,750 sq. ft. home (2,500 sq. ft. of finished space) that includes an unfinished basement and 15% window-to-wall ratio, located in Minneapolis. Where RSMeans did not provide pricing for specific building materials, trend-based extrapolation was applied to calculate costs. Supplemental data using EPA ENERGY STAR window cost information and a local Energy Recovery Ventilator (ERV) supplier filled the remaining cost gaps for windows and ERVs, respectively.

**Energy Savings Estimation:** Using Department of Energy (DOE) data and reports, the Slipstream team provides an overview of the percentage reduction in energy use from the Minnesota 2012 IECC to the 2024 IECC.

Meeting the proposed exterior wall assembly energy code requirements poses the biggest compliance challenge for builders. Four new exterior wall prescriptive compliance options are available, with the most cost-effective being an R20 cavity insulation + R5 continuous exterior insulation (CEI). Accounting for the additional cost of the most affordable exterior wall upgrade, improved window U-values, and a mandatory ERV results in an increase of the defined homes total cost of \$7,720. Slab and foundation insulation energy code changes were considered cost neutral and therefore were omitted from the cost analysis.

Energy savings calculations based on U.S. Department of Energy (DOE) data show that Minnesota homes built to the model 2024 IECC will use approximately 20-21% less energy year after year than a comparable home built to the current 2015 Minnesota Residential Energy Code (based on the 2012 IECC with amendments).

# INTRODUCTION

The Center for Energy and Environment (CEE), which implements Minnesota’s Efficient Technology Accelerator (ETA) programs, contracted with Slipstream to conduct research to identify and summarize the cost impacts of the recently proposed code. The data presented in this report will inform legislators, builders, and the public about the cost implications of updating the current state residential energy code. The research comprises a series of stakeholder interviews and a cost analysis of building components.

The state of Minnesota’s current residential energy code requirements, adopted in 2015, are based on the 2012 IECC, with state-specific amendments<sup>1</sup>. In May 2024, the Minnesota state legislature approved a directive to adopt a new residential energy code every three years starting in 2026, aiming to set new efficiency goals of achieving a 70% improvement over the 2006 IECC by 2038.

As part of the code adoption process, the Minnesota Residential Energy Technical Advisory Group (TAG), a group of industry experts, is tasked with reviewing the most recent model code. In 2025, the TAG reviewed the 2024 IECC model code and made Minnesota-specific recommendations. Table 1 below outlines updates that are a direct result of changes between the 2012 and 2024 IECC model code as well as recommended amendments that were proposed and voted in favor of by the TAG, for the proposed statewide residential energy code anticipated to go in effect in 2027 or 2028. The 2024 IECC model code with amendments was then approved by the Construction Codes Advisory Council (CCAC) in November 2025, which passed the recommendation to adopt the code statewide to the Commissioner.

**Table 1. Current 2015 Minnesota Code (2012 IECC), Proposed 2024 IECC Model Code, and Residential TAG Amendments**

| Code Provision     | Climate Zone (CZ) | 2015 Minnesota Code (2012 IECC)     | 2024 IECC Model Code                     | Residential TAG Amendments |
|--------------------|-------------------|-------------------------------------|--|----------------------------|
| Compliance Pathway | NA                | Prescriptive, Simulated Performance | Prescriptive, Simulated Performance, ERI | No Change                  |
| Windows            | CZ 6              | 0.32 max U-Factor                   | 0.28 max U-Factor                        | 0.27 max U-Factor          |
|                    | CZ 7              | 0.32 max U-Factor                   | 0.27 max U-Factor                        | No Change                  |
| Wall Insulation    | CZ 6              | R20, R13+5                          | R30 or R20&5ci or R0&20ci or R13&10ci    | No Change                  |
|                    |                   |                                     |  |                            |

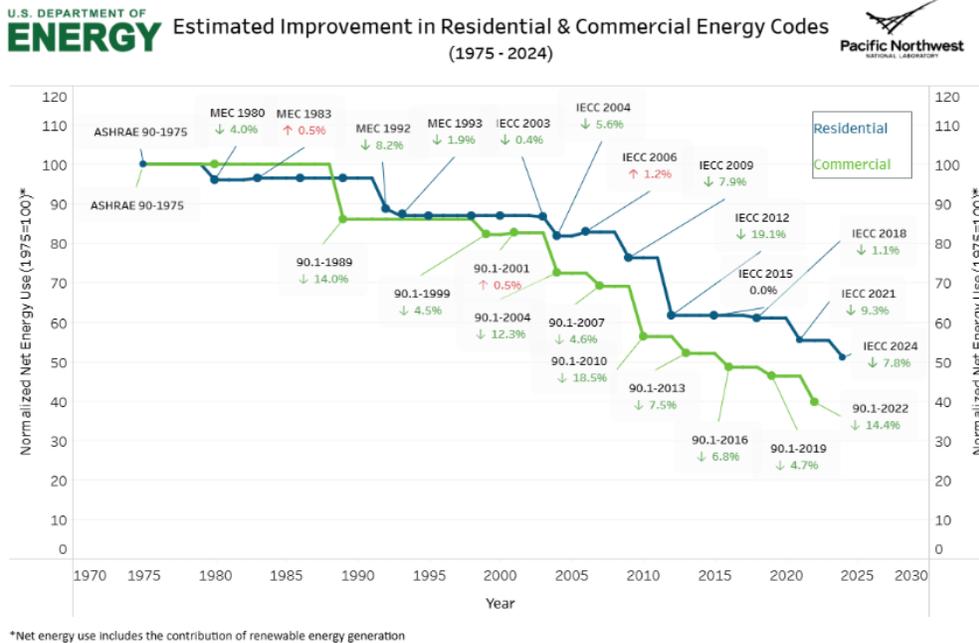
<sup>1</sup> DOE has determined that Minnesota’s current residential energy code aligns closest with the 2009 IECC. DOE’s national determinations can be found on their state portal map: <https://www.energycodes.gov/state-portal>

|                            |      |                |                                       |                |
|----------------------------|------|----------------|---------------------------------------|----------------|
|                            | CZ 7 | R21            | R30 or R20&5ci or R0&20ci or R13&10ci | No Change      |
| Foundation Wall            | NA   | R15            | R15ci or R19 or R13&5ci               | No Change      |
| Slab Perimeter             | CZ 6 | R10, 3.5 ft    | R10 ci, 4 ft                          | No Change      |
|                            | CZ7  | R10, 5 ft      | R10 ci, 4 ft                          | No Change      |
| ERV                        | NA   | NR             | Required                              | No Change      |
| ERV Efficiency Requirement | NA   | NR             | 65% SRE                               | No Change      |
| Max Air Leakage            | NA   | 3 ACH at 50 Pa | 2.5 ACH at 50 Pa                      | 0.20 cfm/sq ft |

# BACKGROUND ON MINNESOTA CODE ENERGY SAVINGS

The Department of Energy produces an Estimated Improvement in residential energy efficiency that calculates cumulative efficiency gains every code cycle. A code cycle is every three years. See Figure 1.

Figure 1: Estimated improvement in Residential and Commercial Energy Codes



# Normalized Net Energy and Energy Use Index

Using the national normalized net energy use scale, based on the model code, Minnesota would result in an 18.4% improvement when moving from the model 2012 IECC to the model 2024 IECC.

Minnesota’s current energy code (2015 MN Residential Energy Code) is based on the 2012 IECC, with weakening amendments, making it equivalent to the 2009 IECC. Using Minnesota-specific Energy Use Index, accounting for the 2015 MN code amendments, to calculate savings, a Minnesota home built to the model 2024 IECC will be 20-21% more efficient than the 2012 IECC version. These savings will result in homes requiring less heating and cooling due to tighter construction and better insulation, deliver lower utility bills, improved comfort, and produce fewer greenhouse gas emissions over the lifetime of the home. See Appendix A for additional information.

**Table 2: Improvement Relative to Minnesota’s Current Code**

| Code Edition                                   | Energy Index | Percent Reduction vs. MN Current Code |
|--|--------------|---------------------------------------|
| 2015 MN Current Code (2012 IECC w/ amendments) | 0.710        | —                                     |
| 2015 IECC                                      | 0.689        | 3%                                    |
| 2018 IECC                                      | 0.681        | 4%                                    |
| 2021 IECC                                      | 0.647        | 9%                                    |
| <b>2024 IECC</b>                               | <b>0.564</b> | <b>20–21%</b>                         |

Table 2 compares more current model IECC editions to Minnesota’s current, 2015 MN residential code 2012 IECC with amendments (Energy Use Index 0.710). It highlights the incremental efficiency gains from adopting the latest model codes. The 2015 and 2018 IECC have minor reductions, while the 2021 IECC provides more significant decreases in modeled energy use. The model 2024 IECC shows the greatest improvement in energy use, roughly 20–21 percent, compared to the current Minnesota code.

## METHODOLOGY

To identify and investigate the most impactful cost-related code elements, Slipstream designed this research into two parts. First, Slipstream conducted interviews with industry building professionals. Second, the team analyzed building costs associated with changes related to the adoption of a new residential energy code.

### Interview methods

Slipstream conducted stakeholder interviews with energy code-related professionals (for-profit and non-profit builders and developers) to help inform and guide the energy code cost data analysis. A preliminary stakeholder list of industry partners provided by CEE was used for recruiting interviewees. They were grouped into industry role types and given a priority contact grade based on their involvement and importance as users of the Minnesota energy code. The interview guide for the discussions is provided in Appendix B. All interviews were conducted virtually over Microsoft

Teams. Interview responses were used to identify trends in stakeholder feedback and to inform Slipstream’s approach to analyzing cost data for specific code components.

Slipstream conducted 12 interviews with industry professionals, each representing a different organization and role between October 2025 and January 2026, with half the interviews in the Twin Cities Metro and half in greater Minnesota (Table 3 and Table 4).

**Table 3. Interviewee Role Type**

| Industry Role Type      | Number of Interviews |
|-------------------------|----------------------|
| Affordable Builder      | 3                    |
| Market Rate Builder     | 4                    |
| Custom/High-End Builder | 2                    |
| Design Consultant       | 3                    |

**Table 4. Interviewee Location of Services**

| Location of Services | Number of Interviews |
|----------------------|----------------------|
| Twin Cities Metro    | 6                    |
| Greater Minnesota    | 6                    |

Interview responses and an assessment of the 2024 IECC model code, including amendments to the new code, led Slipstream to focus on three major construction components identified as having the greatest potential to increase residential construction costs required to meet the next Minnesota Residential Energy Code. The three major construction components include:

- Exterior Wall Insulation and Construction
- Window U-values
- Energy Recovery Ventilator (ERV) Installation

## Energy Codes Cost Methods

The research team considered several methods of assessing energy code costs ranging from online building cost databases, wholesaler and supplier costs, and actual builder cost data. While supplier and builder pricing were initially considered, we determined that those data sources would introduce significant variability based on builder construction volume, geographic location, and project type. To ensure consistency and comparability across measures, the team decided to use RSMMeans (Gordian) as the primary source of construction costs.

RSMMeans is a nationally recognized and respected source of information that is widely used for government contracts and cost validation. It is also cited by the Department of Energy (DOE) and the Pacific Northwest National Laboratory (PNNL) in federal energy code determinations. The residential dataset includes costs for over 92,000-line items and links them to nearly 1,000 locations across the United States, enabling regionally adjusted estimates for materials, labor, and equipment.

RSMMeans provides an itemized cost estimate for residential construction that allows modification of individual components to reflect specifications for a project. For example, a builder can choose to use higher-grade finishes or add additional bathrooms, and RSMMeans will calculate the associated cost differences. Additionally, RSMMeans allows for changes to individual components within a system, such as selecting different wood framing sizes for a roof truss or changing insulation types or values. Where RSMMeans did not provide a cost for a particular building component, we either extrapolated the missing cost using the RSMMeans data as a baseline source or we used an additional secondary supplemental source, such as ENERGY STAR data.

These building options within RSMMeans allowed Slipstream to select the following home parameters:

- Location: Minneapolis, Minnesota<sup>2</sup>
- 2025 4<sup>th</sup> quarter data prices
- Construction grade: “Average” (middle of three options)
- 150-foot perimeter
- Two-stories (8’ height each)
- Building Area per floor: 1,250 sq ft
- Unfinished basement
- Total floor area, including basement: 3,750 sq ft (2,500 sq. ft. finished)
- 16” OC exterior wall wood framing
- Wood siding
- 15% window-to-wall glazing ratio

**Figure 2: Image of the default building**



## *RSMMeans Limitations*

While the RSMMeans dataset is robust, it has limitations relevant to this analysis. RSMMeans primarily assesses costs in two ways: the Square Foot Estimator and the Assembly Tool. The Square Foot Estimator function integrates all aspects of the construction process, documents each line item, and produces a final cost estimate for the building. The Assembly Tool library disaggregates actual materials into material, labor, and overhead costs. Assemblies available in the Assembly Tool indicate which components can be incorporated into the Square Foot Estimator.

However, not all products and configurations for which RSMMeans provides cost data are represented within the Assembly Tool, which restricts their use in the Square Foot Estimator. Four key factors limited our ability to fully develop assemblies using RSMMeans:

1. Not all insulation values presented in RSMMeans were options that matched the new energy code requirements
2. Exterior foundation insulation is not an option to install

---

<sup>2</sup> Labor and material costs combined are 12% higher in Minneapolis than the RSMMeans national average.

3. The absence of 2x8 and 2x10 studs in the Assembly Tool
4. Windows in RSMeans are designed for build “quality”, or window material types, rather than U-value thermal performance

As a result, the analysis required supplemental cost estimation methods to address these gaps and ensure consistency with the construction specifications evaluated, described in more detail below.

## Exterior Wall Cost Analysis Methodology

Using RSMeans outputs, we analyzed individual cost data for each product affected by the adoption of the new energy code. Table 5 compares the known values provided in RSMeans and the associated calculated data.

**Table 5: Values provided in RSMeans and calculated values**

| Values Provided in RSMeans  | Calculated Values referencing RSMeans Data |
|---|--|
| 2x4 studs<br>2x6 studs  | 2x8 studs<br>2x10 studs                    |
| R13 FG Batts<br>R19 FG Batts<br>R30 FG Batts<br>R38 FG Batts          | R20 FG Batts                               |
| ¾-Inch Extruded Polystyrene Rigid Board<br>1 ½-Inch XPS<br>2-Inch XPS | 1-inch XPS<br>3-inch XPS<br>4-inch XPS     |

We used all known material and labor costs for each line item on the left and a trend-based extrapolation approach to estimate costs for components not explicitly listed in RSMeans. This approach extends observed cost relationships across comparable building elements to derive reasonable estimates where direct data was unavailable. For example, RSMeans provides material and labor costs for 2x4 and 2x6 studs, but not 2x8 or 2x10 studs. If a builder were to pursue the R30 exterior wall cavity insulation requirement, they would need to use 2x10 studs. Using the observed cost progression across available stud sizes, we estimated the material and labor costs for 2x10 studs based on the known values for smaller dimensions.

## Window Cost Analysis Methodology

The project team took additional steps to calculate window costs to reflect the U-Factor requirements as defined by the 2024 IECC including the TAG amendment which aligns the U-Factor in Climate Zone 6 with Climate Zone 7. Slipstream initially contacted regional window suppliers to obtain cost data on their window prices, but this effort yielded no results.

When considering the cost of windows related to energy performance, RSMeans has limited capabilities as its customization is focused primarily on window materials rather than the windows

energy performance. RSMMeans provides users with three options for window types: builder-quality wood, metal-clad wood, and plastic-clad wood. Each varies in price per square foot of glazing.

Due to the window limitations within RSMMeans, we chose to utilize the EPA Energy Star Window Consumer Cost Over Market Baseline<sup>3</sup> data shown in Figure 3 below. For the analysis, we determined the area of exterior wall using the RSMMeans calculated perimeter (150 ft), the story height (8' x 2 stories), and the assumed 15% window to wall ratio. We assumed typical window size is 3'x5' (which aligns with the window size represented by the Energy Star costs shown below) and determined that the number of windows in our model home is approximately 24 above grade windows. Finally, we applied the \$18 incremental cost shown below to go from the Market Baseline window with a U-factor of 0.32<sup>4</sup> to a window with a 0.27 U-factor in determining the total cost increase associated with the code change.

**Figure 3: EPA ENERGY STAR Window Consumer Cost Over Market Baseline**Error! Bookmark not defined.

| U-Factor       | Most Common Technical Pathways   | Incremental Consumer ('Retail') Cost Over the Market Baseline |             |
|----------------|--|---|-------------|
|                |  | SHGC > 0.25   | SHGC ≤ 0.25 |
| 0.32–0.35      | 1 Low-e coating, air-filled IGU and basic frames   | Market Baseline   | \$7.50      |
| 0.28–0.31      | 1 Low-e coating with argon-filled IGU  | \$6   | \$13.50     |
| 0.27           | 1 Low-e coating with argon-filled IGU and improved frames and spacers                                    | \$18  | \$25.50     |
| 0.24–0.26      | 2 Low-e coatings (room-side low-e) with argon-filled IGU   | \$29  | \$36.50     |
| 0.22–0.23      | Triple-pane with 2 low-e coatings and argon-filled IGU   | \$54  | \$61.50     |
| 0.21 and Below | Triple-pane with room-side low-e, argon-filled IGU, non-metal spacers, and improved and/or foamed frames | \$66  | \$73.50     |

## ERV Installation Requirements Methodology

A key component of the 2024 IECC model code is the requirement for ERV installation. While this requirement is not currently included in the Minnesota residential energy code, it is addressed through the state’s ventilation code.

The project team contacted local ventilation suppliers to obtain cost data on the price a builder might pay for an ERV. This outreach only yielded cost data from a single supplier, as most ventilation suppliers were unwilling to provide pricing without an established purchasing relationship. The

<sup>3</sup> ENERGY STAR, *Windows, Doors, and Skylights Version 7 Draft 1 Stakeholder Meeting (July 27, 2021)*.

[https://www.energystar.gov/sites/default/files/asset/document/V7\\_Stakeholder%20Meeting\\_7-27-2021\\_final.pdf](https://www.energystar.gov/sites/default/files/asset/document/V7_Stakeholder%20Meeting_7-27-2021_final.pdf)

<sup>4</sup> RSMMeans data is adapted to fit local standards, such as updating insulation, HVAC, and window requirements to meet specific state requirements.

available pricing data was used as a representative input for the ERV cost analysis. Builders who are already installing ERVs in their homes will not see this cost increase.

## *Foundation Insulation Considerations*

Slipstream determined the two foundation components updated in the Minnesota 2024 model energy code - slab perimeter insulation and foundation insulation – do not result in incremental cost increases and therefore were not included in the cost impact analysis. The current prescriptive Minnesota energy code divides slab insulation R-value requirements by climate zone: R10 at 3 ½ feet in climate zone 6 and R10 at 5 feet in climate zone 7. The 2024 model energy code standardizes this insulation requirement to R10 at 4 feet, effectively establishing a midpoint between the two requirements. This new requirement also makes purchasing rigid board insulation for the slab more cost-effective, since rigid board sheets are typically 4 x 8 feet.

The foundation insulation changes also showed that the prescriptive version of the 2012 Minnesota energy code of R15 matches a 2024 foundation insulation option of R15 CEI and did not warrant further cost analysis.

## **INTERVIEW FINDINGS**

The project team identified the following seven key takeaways from the interviewees' responses.

### **Exterior Walls will be the Biggest Change**

All interview participants identified the new exterior wall R-value requirements as the most significant and technically challenging change associated with the adoption of the new code. The current Minnesota energy code allows an R20 cavity insulation or R13 cavity + R5 CEI in climate zone 6 or R21 in climate zone 7 to comply with the code. Most builders interviewed follow the cavity-only insulation requirements. The new code requires CEI unless a builder chooses an R30 cavity insulation option which would require the exterior walls to be constructed with 2x10 framing.

All builders that were interviewed for this study who indicated they have not switched to CEI wall insulation were market-rate builders. Some of these builders have said that they will push back on proposed CEI recommendations. Their past building experience raises concerns about installing CEI, as it may cause moisture issues and be challenging to install effectively, resulting in a lower-quality product for customers. Other affordable housing and high end/custom builders that were interviewed mentioned that installing exterior wall insulation is a requirement for the building performance certifications they need to complete and has become a general part of their building design.

### **Cost Projections Vary For New Code Elements**

We asked interviewees how much their typical new homes might increase under the new code. Many of these builders offered their best estimates based on their own pricing and market trends, which for all interviewees, was not based on a cost analysis they had conducted. No consensus on projected home cost increases emerged (Table 6).

One metro area affordable housing builder projected a \$10,000 to \$15,000 increase in additional costs for one of their homes if it were required to meet the base 2024 Minnesota residential energy code minimum requirements. Another affordable builder estimated a \$20,000 to \$30,000 increase. A custom metro builder assumed a flat 10% increase relative to the new code, whereas another custom builder projected only a 2–5% increase (it was unclear whether this builder meant from their building standard or from the 2012 Minnesota energy code baseline). One larger Minnesota market-rate builder indicated they could see build costs rise by \$8,000 to \$10,000 for one of their standard homes. Another major Minnesota market builder estimated a \$10,000 to \$15,000 cost increase for homes in the \$500,000 price range.

**Table 6: Builder Type and Anticipated Cost Increase to Build to 2024 IECC with Amendments**

| Builder Type                      | Estimated Cost Increase to Minnesota 2024 IECC w/ TAG Recommendations |
|-----------------------------------|---|
| Affordable Housing Developer 1    | \$10,000-\$15,000   |
| Affordable Housing Developer 2    | \$20,000-\$30,000   |
| Custom Builder                    | 2-5 %   |
| Market Rate Builder               | \$8,000-\$10,000  |
| Market Rater Builder (Production) | \$10,000-15,000   |

## Builders Are Already Installing ERV Systems

All builders interviewed already install ERVs as part of their building practice. Interviewees often cited the ventilation code or a specific certification as the reason for installing an ERV. One market-rate builder in the Twin Cities metro area mentioned they kept installing ERVs to stay ahead of potential energy code changes. Another market-rate builder from greater Minnesota said ERVs are not only standard for them but also the best ventilation solution for human health and comfort.

Since interviewees were already installing ERVs in their homes, we asked them whether they were seeing any HVAC sizing reductions due to an ERV's ability to recover heat from exhaust air. All respondents could not confirm that they were reducing HVAC system sizing solely due to the presence of an ERV and their intuition said that it was most likely not affecting system sizing. Most interviewees used an HVAC contractor or energy rater for equipment sizing and deferred to their professional judgment in almost all cases.

## Unexpected Rising Costs

The year 2025 brought uncertainty to the new-home construction market, and builders are acutely aware of potential increases in building costs due to higher tariffs. Builders speculated that lumber is the material most likely to be affected by tariffs, since most of the lumber used in Minnesota construction comes from Canada. Most interviewees reported seeing slight increases in lumber costs but did not directly observe a tariff on their invoices. However, one metro-area market-rate builder confirmed they have begun to feel the impact of tariffs. The builder reported receiving invoices from two different subcontractors that included minor tariff line items for gas inset

fireplaces and garage doors. Another affordable housing developer in greater Minnesota noted that many builders in the area had heavily stocked up on lumber before tariffs took effect and anticipated higher lumber costs as pre-tariff stock was depleted. Finally, a metro-affordable developer commented that they've observed cost increases, along with product delivery charges, for products from Asia (particularly fasteners).

Additional costs for new energy code compliance may come from new equipment or specialized material purchases. One Twin Cities metro area custom builder noted they needed to purchase a specific lift to help them move newer triple-pane window models due to their increased weight and that crew members could not lift them anymore. Another metro area market-rate builder mentioned the need for new tools and fasteners to install continuous insulation on exterior walls. Finally, one metro area market-rate builder lamented trying the ZIP wall system because of the specialized tapes required for seams. They did not trust the tapes and have moved back to their traditional framing details.

## Cost Saving Practices Emerge

Builders are already implementing measures to reduce their construction costs. Many interviewees consistently negotiated costs with their suppliers or price-shopped at various wholesalers. A couple of builders mentioned purchasing in bulk for discounts when applicable. An affordable builder in a metro area has enough warehouse space to stock inventory for four builds, making bulk buying feasible and reducing costs associated with change orders or on-site product damage. An area market rate builder uses modular designs, which standardizes construction in a controlled environment, reducing on-site costs, especially heating costs. One high-volume production builder also mentioned they keep labor costs low by really driving standardized construction practices for their crews and subcontractors, which keeps construction costs efficient. A design consultant made a similar comment regarding labor costs reducing when builders learn new building design details - their experience and research showed that it took builders three projects to fully learn and standardize high-performance new-construction details into their standard workflow.

Builders were split on including project contingency funds in project budgets, which is the practice of setting aside a certain amount of money for each project for unforeseen costs that may arise. Half the builders responded that they set aside 5-20% of the project cost for emergency or change order costs. One builder in greater Minnesota used a flat \$10,000 fund for each project. The other half of the builders do not create a contingency fund for their projects due to market competitiveness or their confidence in their price points.

## Energy Raters Provide Valuable Resources

Almost half of the interviewees brought up the benefits of hiring an energy rater or having one on their staff. Builders who use raters appreciate being able to discuss project ideas with a third party, collect feedback on potential design choices, have someone dedicated to filling out the utility rebate paperwork, keep them updated on potential statewide code changes, and verify their buildings would meet certain certification criteria before the home is even built.

One affordable housing developer in the Twin Cities metro area noted that energy raters have the potential to fill a knowledge gap in the residential construction industry. More recent energy code

standards continue to increase the demands for energy efficiency, and energy raters may be able to provide training and guidance to builders and their staff on topics such as building science fundamentals, high-performance building design, mid-construction decision making and tradeoffs, and performance pathway compliance.

**Builders' Current Practices Dictate Acceptance of Energy Code Changes** Builders who build to higher certification standards such as ENERGY STAR or Minnesota's GreenPath generally felt comfortable with the proposed updates to the energy code, since they were already meeting most, if not all, of the changes on their current new-construction projects. One custom builder in the Twin Cities metro area commented that once they were comfortable building above minimum code requirements, it freed up their design thinking and product choices to truly meet their clients' goals. The same builder favored Minnesota pursuing three-year energy code cycle updates. Their rationale was that this continuous cycle would keep current builds up to date with products and building trends, whereas a stagnant energy code model would degrade home performance over time.

Builders who traditionally decide to not incorporate design choices beyond prescriptive provisions were more concerned about the potential energy code changes, primarily the exterior walls requirements. These builders voiced their concerns about installing CEI, particularly the additional material costs, the potential training required, and the homeowners' understanding of benefits of installing CEI. One market-rate builder from Greater Minnesota noted that homeowners expect any new home to perform well, regardless of code requirements. Homeowners don't really know why it's better, but it's just better. There may be diminishing returns on new energy code requirements that homeowners won't be aware of.

## **COST OF COMPLIANCE FOR 2024 MN MODEL ENERGY CODE**

Table 7 shows the incremental cost of compliance with the provisional changes between the current 2012 IECC, with amendments, and the compliance options for the proposed 2024 IECC, with MN amendments. The provisions in the table and the methodology for obtaining the costs are explained in the sections above. It illustrates the potential prescriptive code options and their respective cost increases in moving from the current Minnesota energy code to the proposed Minnesota Energy Code by using RSMeans construction data. While the analysis produces the cost estimates presented, actual costs may vary based on several factors not captured in RSMeans and the supplementary analysis, including builder experience, familiarity with specific products or systems, different housing sizes, and project-specific efficiencies. Additionally, advance purchasing, bulk purchasing, geopolitical occurrences, or other local or state circumstances may affect pricing, labor availability, and labor costs. Builder insights in these areas are included in the interview findings section.

**Table 7: Incremental Cost of 2015 Minnesota Code (IECC 2012) to Proposed Code (2024 IECC) with Amendments**

| Code Provision   | Base Home<br>IECC 2012<br>w/amend.<br>2x6 R20 | Option One<br>IECC 2024<br>2x6 R20 + R5 | Option Two<br>IECC 2024<br>2x4 R13 + R10 | Option Three<br>IECC 2024<br>2x10 R30 | Option Four<br>IECC 2024<br>2x4 R0 + R20 |
|--|---|---|--|---------------------------------------|--|
| Wall Studs   | 2x6 studs                                     | \$0                                     | (\$3,077)                                | \$6,154                               | (\$3,077)                                |
| Exterior Wall Insulation   | None  | \$6,130                                 | \$10,693                                 | \$0                                   | \$18,429                                 |
| Cavity Insulation  | R20 FG Batts                                  | \$0                                     | (\$761)                                  | \$888                                 | (\$3,984)                                |
| Windows  | 0.32 U-Factor                                 | \$432                                   | \$432                                    | \$432                                 | \$432                                    |
| ERV  | Not required                                  | \$1,158                                 | \$1,158                                  | \$1,158                               | \$1,158                                  |
| <b>Cost Difference<br/>Minnesota 2012 to<br/>Minnesota 2024<br/>Proposed</b> | --  | <b>\$7,720</b>                          | <b>\$8,445</b>                           | <b>\$8,632</b>                        | <b>\$12,958</b>                          |

Of the five components shown in Table 7, those associated with the exterior walls have the largest variability in cost and the most flexibility towards achieving compliance since builders can select from several material, framing, and insulation options. Conversely, windows and ERVs show less variability in cost. The results from Table 8 show that the most cost-efficient code compliance option would be to use 2x6 studs with R20 cavity insulation and an R5 CEI rigid board. The most expensive option would be to use a 2x4 stud construction with R20 CEI rigid board.

## Wall Assembly Breakdown

The assumed 2012 wall assembly used in this study consists of 2x6 wood studs with R-20 fiberglass batt insulation. That assembly was compared to the following 2024 IECC wall assembly options:

- 2x6 wood studs with R20 fiberglass batts (interior) and R5 Continuous (CRI) rigid polystyrene (EPS) insulation (exterior)
- 2x10 wood studs with R30 fiberglass batts (interior),
- 2x4 wood studs, no interior insulation, R20 or 4" of EPS CRI,
- 2x4 wood studs, R13 fiberglass batts and R10 or 2" of EPS CRI.

The three components that were varied when considering exterior wall assembly changes are the framing, cavity insulation, and continuous exterior insulation. Table 8 focuses solely on the exterior wall component cost comparisons.

**Table 8: Wall Assembly Comparison of 2015 Minnesota Code (IECC 2012) to 2024 IECC Code with Amendments**

| Code Provision  | Base Home<br>IECC 2012<br>2x6 R20 | Option One<br>IECC 2024<br>2x6 R20 + R5 | Option Two<br>IECC 2024<br>2x4 R13 + R10 | Option Three<br>IECC 2024<br>2x10 R30 | Option Four<br>IECC 2024<br>2x4 R0 + R20 |
|---|-----------------------------------|---|--|---------------------------------------|--|
| Wall Studs  | 2x6 studs                         | \$0                                     | (\$3,077)                                | \$6,154                               | (\$3,077)                                |
| Exterior Wall Insulation                                  | None                              | \$6,130                                 | \$10,693                                 | \$0                                   | \$18,429                                 |
| Cavity Insulation   | R20 FG Batts                      | \$0                                     | (\$761)                                  | \$888                                 | (\$3,984)                                |
| Cost Difference Minnesota 2012 to Minnesota 2024 Proposed | --                                | \$6,130                                 | \$6,855                                  | \$7,041                               | \$11,368                                 |

The RSMean data analysis shows that continuous exterior insulation and the framing stud choice can significantly influence costs. This can be seen by looking at option 4 where reducing to 2x4 studs and removing all interior cavity insulation to install R20 CEI is still the most expensive to implement.

## Windows Breakdown

Windows are a straight conversion from the previous 0.32 U-value requirement to the updated 0.27 U-value. Table 9 shows the cost increase for a builder to upgrade all windows of the home to meet the 0.27 U-value requirement. Most builders agreed this cost is primarily in materials only, but there may be some additional costs not reflected in this cost like additional tools or window bucks that need to be tailored to their specific build.

**Table 9: Windows Comparison of 2015 Minnesota Code (IECC 2012) to 2024 IECC Code with Amendments**

| Code Provision | Base Home<br>IECC 2012<br>2x6 R20 | Option One<br>IECC 2024<br>2x6 R20 + R5 | Option Two<br>IECC 2024<br>2x4 R13 + R10 | Option Three<br>IECC 2024<br>2x10 R30 | Option Four<br>IECC 2024<br>2x4 R0 + R20 |
|----------------|-----------------------------------|---|--|---------------------------------------|--|
| Windows        | 0.32 U-Factor                     | \$432                                   | \$432                                    | \$432                                 | \$432                                    |

## ERV Breakdown

We collected cost data on three Broan brand ERV models from a local ventilation supplier in the Twin Cities metro in December 2025. Broan was the only ERV brand provided by the supplier that had multiple designed cubic feet per minute (CFM) ratings that could meet the needs of a newly built home and still have the required efficiency ratings. Table 10 shows the equipment costs of each ERV and its designed supply air volume measured in CFM. These are only unit costs and do not include labor or supplemental materials like ducting or strapping.

Additional suppliers were contacted: however, comparable pricing information was not made available. As highlighted in the builder interviews, many may already be meeting the installed ERV requirement due to the mechanical code. As a result, some builders may not experience a cost increase for this energy code requirement.

**Table 10: ERV Supplier Cost**

| ERV Model       | Designed CFM | Sensible Recovery Efficiency | Cost from Supplier | Average ERV Cost |
|-----------------|--------------|------------------------------|--------------------|------------------|
| Broan B130E65RT | 130          | 65%                          | \$991.83           | \$1,157.66       |
| Broan B180E75RT | 180          | 75%                          | \$1,218.85         |                  |
| Broan B210E75RT | 210          | 75%                          | \$1,262.30         |                  |

## CONCLUSIONS

Minnesota’s energy code has not been updated in over a decade, and builders are starting to take notice of the proposed upcoming changes. Through our interviews with Minnesota builders we identified three building components (exterior walls, windows, and ERVs) as the primary drivers of additional costs required to meet new code. Using RSMeans cost data and additional research, we found that a builder moving from the current 2x6 R20 cavity insulation to 2x6 R20 + R5 exterior continuous insulation, including compliance with the updated window and ERV requirements, is the most cost-effective option with an incremental cost of \$7,720 to meet the new prescriptive path requirements. Additionally, all builders we interviewed are already installing ERVs and will not have to change current practices to comply with this new requirement. Furthermore, most Minnesota builders are installing at a minimum R10 CEI foundation insulation, with some already installing R15 CEI, and will not have to account for this additional cost.

It’s important to highlight that material and labor costs are based on Q4 2025 pricing and may vary due to inflation and other market fluctuations. This report covers only a small portion of housing construction materials. Electrical and mechanical equipment are not included; their costs could continue to increase, ultimately impacting housing construction expenses. The new 2024 IECC requirements, such as the Additional Efficiency Options and the TAG recommendation of 2.5 ACH to 0.20 cfm/sq ft, may also influence material and labor costs.

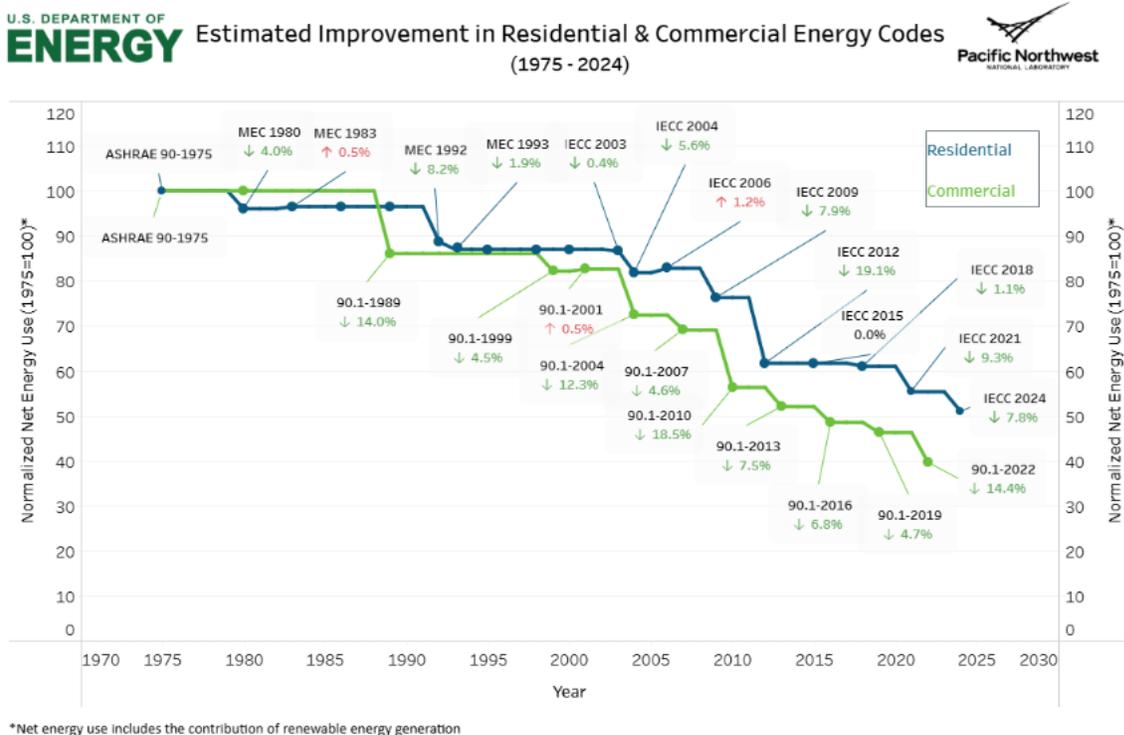
Based on readily available DOE data, a Minnesota single-family home built to the 2024 IECC is expected to use approximately 20-21 percent less energy than a comparable home built to the Minnesota 2012 IECC. While actual performance will depend on factors such as heating fuel, system type, foundation design, and compliance pathway, research clearly shows that each update to the IECC has led to significant, measurable reductions in energy use for Minnesota homes. With the 2024 IECC residential strengthening provisions recommended by the Minnesota Residential Energy TAG, building occupants and owners will experience additional energy-efficiency and emissions reductions.

# APPENDIX A: BACKGROUND ON ENERGY CODE CHANGES AND ASSOCIATED ENERGY SAVINGS

## Residential 2012 IECC Efficiency Compared to the Residential Efficiency of the 2024 IECC

Based on DOE's residential efficiency analysis of the model codes, homes built to the 2024 IECC are expected to use approximately 18.4 percent less net energy than homes built to the 2012 IECC, after accounting for climate and other normalized factors.

Figure 4: Estimated improvement in Residential and Commercial Energy Codes



This reduction results from over a decade of incremental improvements across the 2012, 2015, 2018, 2021, and 2024 code cycles (Figure 1). The 2012 IECC provided a substantial 19.1 percent one-time efficiency increase compared to the 2009 IECC. Later editions aimed to tighten performance standards and improve building practices. Collectively, these updates deliver significant additional savings.

<sup>5</sup> U.S. Department of Energy, *Infographics*, Building Energy Codes Program, EnergyCodes.gov, accessed February 25, 2026, <https://www.energycodes.gov/infographics>

**Table 11: Percent Energy Savings Reduction Code to Code**

| Residential Code to Code Comparison | Percent Energy Savings Reduction Code to Code (Blue Line in Figure 3) |
|-------------------------------------|---|
| 2009 to 2012                        | 19.1%   |
| 2012 to 2015                        | No percentage savings   |
| 2015 to 2018                        | 1.1%  |
| 2018 to 2021                        | 9.3%  |
| 2021 to 2024                        | 7.8%  |

The 18.4 percent reduction in energy use from the 2012 IECC to the 2024 IECC is presented as normalized residential net energy use values on the DOE graph (above).

**Table 12: Normalized Residential Net Energy Use (Blue Line to Y Axis DOE Graph)**

| Code Edition              | Approximate Normalized Net Energy Use | Percent Reduction Compared to the 2012 IECC |
|---------------------------|---------------------------------------|---|
| 2012 IECC                 | 62                                    | N/A   |
| 2024 IECC (low estimate)  | 50                                    | 19.4% reduction                             |
| 2024 IECC (high estimate) | 51                                    | 17.7% reduction                             |
| Midpoint Estimate         | 50.5                                  | 18.4% reduction                             |

The 2012 IECC has an approximate index value of 62, while the 2024 IECC ranges between 50 and 51 on the same scale. Since the index indicates relative energy use (lower values mean better efficiency), the percentage reduction is calculated by dividing the difference between the two values by the 2012 baseline.

2024 value is read as 50, the reduction equals 19.4 percent.

2024 value is read as 51, the reduction equals 17.7 percent.

Since the graph does not provide exact numeric data points and must be visually interpreted, using a midpoint estimate of 50.5 yields an 18.4 percent reduction. This number reflects cumulative efficiency improvements adopted across the 2015, 2018, 2021, and 2024 code cycles, outlined below.

Key drivers of the code energy reduction include:

- Enhanced building envelope standards, including better insulation, minimized thermal bridging, and high-performance windows.
- Improved air sealing, reducing uncontrolled air leakage and related heating and cooling losses.
- More efficient mechanical systems, including heating, cooling, and water heating equipment
- Enhanced duct sealing and distribution efficiency
- Expanded high-efficacy lighting requirements

- Additional performance pathways and electrification readiness provisions in recent editions

In addition to energy savings, life-cycle cost impacts are expected to be positive. While the 2024 IECC introduces moderate additional construction costs, these are generally offset by long-term reductions in energy costs. Payback periods for homes built to the 2024 IECC versus the 2012 IECC are expected to be within or below typical mortgage durations, as ongoing energy savings accrue over time while initial costs remain manageable.

Actual energy savings, costs, and payback periods will vary depending on fuel type, energy prices, heating system selection, and compliance pathway. However, the overall trend indicates that the 2024 IECC for residential buildings delivers notably better energy performance and cost savings than the 2012 IECC, particularly in Minnesota's cold climate.

## **Energy Use Index Analysis for Minnesota Single-Family Homes - Current Minnesota Code 2012 IECC with weakening Amendments (equivalent to 2009 IECC) Compared to the 2024 IECC**

The following overview of the Residential Energy Use Index for the 2006 to 2024 IECC is informed by the U.S. Department of Energy's Residential State-Level analysis results, published December 9, 2025. Minnesota's current residential energy code is based on the 2012 International Energy Conservation Code (IECC) with state-specific weakening amendments and has an Energy Use Index of 0.710 using the U.S. Department of Energy's standardized benchmarking framework (2006 IECC = 1.000). This means a typical<sup>6</sup> new home built under the current code is modeled to use about 71 percent of the energy of a comparable home built to the 2006 IECC baseline.

The 2024 IECC model code has an Energy Use Index of 0.564, indicating that homes built to this standard would use approximately 56 percent of the energy of a 2006-code home. When compared directly to Minnesota's current code (2012 with weakening amendments, equivalent to the 2009 IECC), adoption of the 2024 IECC is projected to reduce modeled energy use in new homes by roughly 20 to 21 percent.<sup>7</sup>

---

<sup>6</sup> DOE's typical home prototype used to evaluate building energy codes is a new single-family home, with a defined size, layout, insulation level, equipment, etc. Using this consistent model allows DOE to compare energy performance across different codes, states, and climates.

<sup>7</sup> V. Robert Salcido et al., *Methodology for Evaluating Residential Energy Code Updates*, PNNL-37098 (Richland, WA: Pacific Northwest National Laboratory, December 2024), PDF file, U.S. Department of Energy, EnergyCodes.gov, [https://www.energycodes.gov/sites/default/files/2024-10/residential\\_methodology\\_2024.pdf](https://www.energycodes.gov/sites/default/files/2024-10/residential_methodology_2024.pdf)

**Table 13: Residential Energy Use Index by Code with Minnesota Comparison**

| Code Edition                              | Energy Use Index | Energy Use vs. 2006 IECC |
|---|------------------|--------------------------|
| 2006 IECC                                 | 1.000            | Baseline (100%)          |
| 2009 IECC                                 | 0.932            | 7% less                  |
| MN Current Code (2012 IECC w/ amendments) | 0.710            | 29% less                 |
| 2015 IECC                                 | 0.689            | 31% less                 |
| 2018 IECC                                 | 0.681            | 32% less                 |
| 2021 IECC                                 | 0.647            | 35% less                 |
| 2024 IECC                                 | 0.564            | 44% less                 |

Table 13 shows the U.S. Department of Energy (DOE) Residential Energy Use Index values for various editions of the International Energy Conservation Code (IECC), with the 2006 IECC used as the baseline (1.000). It shows that Minnesota’s current residential code, based on the 2012 IECC with weakening amendments, results in lower energy use than older codes but is less efficient than newer IECC editions. The table also shows the trend of improving residential energy performance, with the 2024 IECC exhibiting the lowest modeled energy consumption.

**Table 14: Improvement Relative to Minnesota’s Current Code**

| Code Edition                              | Energy Use Index | Percent Reduction vs. MN Current Code |
|---|------------------|---------------------------------------|
| MN Current Code (2012 IECC w/ amendments) | 0.710            | –                                     |
| 2015 IECC                                 | 0.689            | 3%                                    |
| 2018 IECC                                 | 0.681            | 4%                                    |
| 2021 IECC                                 | 0.647            | 9%                                    |
| <b>2024 IECC</b>                          | <b>0.564</b>     | <b>20–21%<sup>8</sup></b>             |

Table 14 compares newer IECC editions to Minnesota’s current residential code (Energy Use Index 0.710). It highlights the incremental efficiency gains from adopting the latest model codes. The 2015 and 2018 IECC have minor reductions, while the 2021 IECC provides more significant decreases in energy use. The 2024 IECC shows the greatest improvement in energy use, roughly 20–21 percent, compared to the current Minnesota code.

The improvements in energy efficiency above reflect over a decade of incremental efficiency gains across successive IECC editions. Earlier updates from 2015 to 2018 brought modest improvements, while the 2021 and 2024 editions introduced more significant changes, including enhanced building envelope performance, stricter air-sealing standards, improved mechanical system efficiency, and broader performance-based compliance options. These improvements are especially important in Minnesota’s heating-focused climate, where heating accounts for the largest share of residential energy use.

<sup>8</sup> U.S. Department of Energy, *State Portal*, Building Energy Codes Program, EnergyCodes.gov, accessed February 25, 2026, <https://www.energycodes.gov/state-portal>

Lower energy use in new homes leads to long-term benefits for families, including lower utility bills, better affordability over the home's lifespan, and increased resilience to future energy price fluctuations. Since residential buildings typically last for many decades, efficiency upgrades during construction provide lasting economic and environmental advantages.

It is important to recognize that the Energy Use Index reflects estimated site energy use based on standardized assumptions and does not directly correspond to utility bills for any specific home.

Actual savings can vary depending on factors such as heating fuel, home size, construction practices, occupant behavior, and local energy costs. However, the Energy Use Index provides a consistent, nationally accepted metric for comparing building energy codes across states and across different code cycles.

Transitioning from Minnesota's current residential energy code to the 2024 IECC would significantly enhance energy efficiency for new homes, reducing modeled energy consumption by about 20-21% while providing long-term cost savings and increased resilience for residents.

# APPENDIX B: INTERVIEW GUIDE

## Introduction

Script:

*Thank you for taking the time to speak with us today. Our research examines how upcoming advanced energy codes in the state of Minnesota may affect construction costs for single family homes, duplexes, and townhouses. Your insights will help us understand real world cost drivers and identify practical solutions to keeping reducing code compliance costs.*

*The interview is expected to take between 45-60 minutes. For note-taking purposes, we would like to record our conversations today. Only team members on the project will have access to the recordings; they will be deleted following transcription. Reports we create will include aggregated data and quotations from interviews but will not attribute those quotations to specific respondents. Data will be anonymized, and participants will not be listed. Do you agree with proceeding with the interview?*

## Interviewee Background (5 mins)

Goal: Understand Interviewee's professional background that will guide interview questions and prompt tailored follow up questions.

- Tell us about your professional background and how you interact with the residential building sector:
  - How long have you been in your current role?
    - Probe for full responsibility and/or true role
  - What are your primary responsibilities in your current position?
- Can you tell me a bit about your work or experience related to building energy codes specifically?
- Where are you based in Minnesota, and what areas of Minnesota do you serve?
  - Directional (Southeast, Southwest, Central, Northeast - arrowhead, Northwest, West)
  - Twin Cities Metro or near a major city? Rural?
- What is your primary building typology?
  - Single Family, Townhouses, Duplexes, Multifamily
- Production or custom builder?
  - Type of housing – market rate, affordable, custom

## Interviewee Energy Codes Knowledge (5 mins)

Goal: Understand interviewee's current Minnesota code adoption knowledge and find out how they are learning about working with the Minnesota energy code as well as where they are getting any training (if needed).

- How familiar are you with the latest state or local energy code (2012 IECC)?
- Where do you get your energy code information in Minnesota?
  - Probe: what is your familiarity with the current residential energy code updates process in Minnesota?
- How do you get your information on the code update process?
  - Follow up (if warranted): How familiar are you with that process and do you participate? Are you familiar with the national code process?
- What types of training do you receive for energy codes?
- What training is needed to help the workforce understand energy codes in Minnesota?

## Costs Associated with Increased Energy Codes (30-35 mins)

Goal: Understand interviewee’s perspective on building costs as relates to residential construction and how current and future Minnesota energy codes affect the overall building cost. Find any hard cost data to be used for future data points and/or analysis.

Statement: This is what’s going to be changing, there will be multiple pathways, commercial builders might understand better.

“We’ve divided the questions into specific sections to help guide the conversation.”

### General

- What pathway do you use for code compliance?
  - Prescriptive
  - Performance/UA
  - Simulated
  - Other
  - Don’t really know.
- Do you pursue HERS ratings or any beyond code certifications (if applicable)?
- Are you using RESCheck software (if applicable)
- What parts of the code have had the greatest impact—positive or negative—on your projects’ cost and timeline?

### Design and Construction Impacts

- Have the current code requirements influenced your choice of materials, systems, or subcontractors?
- Which code provisions are most challenging to implement in the field?

- Are there code provisions that have simplified construction or improved building quality or comfort?
- How do you coordinate with design teams and code officials to ensure compliance efficiently?

## New Code Ramifications

*Note: questions dependent upon interviewee role*

- **Material Costs** – After reviewing the code comparison table. How do you expect the new code to affect material purchases (insulation, windows, HVAC units)? Quantify any anticipated percentage change or dollar amount per unit.
  - Which specific energy code requirements (ex. insulation, windows, HVAC, lighting controls) lead to the highest upfront cost increases?
- **Overall Project Budget** – Based on the code comparison table, what is your rough estimate of total cost increase per same build? (percentage, \$/sq ft, total \$) for each housing type?
  - Record general thoughts as needed
  - Offer CEE as follow up if they want more information
- How do you typically track or estimate the cost implications of code changes?

## First Costs vs. Long-Term Value

- **Cost Offsets** – In the past, have you made changes to your building practices due to code updates? If yes, what cost savings measures have you adopted to mitigate any additional costs increases? (ex. bulk purchasing, prefabricated assemblies, integrated design tools)
- Have energy-efficient features ever helped you secure financing, attract tenants, or expedite sales?
  - Ex. Do you see these measures leading to measurable operational savings or added property value?
  - Does the integration energy efficiency features distinguish your business from others in the marketplace?

## Labor and Installation

- How will installation methods change due to potential code changes?
  - Only based on required materials?
    - Any training needed?
    - Estimate added labor hours or crew size?
- What do you typically experience with labor costs over time as new construction practices become standard?

## Supply Chain and Market Dynamics

- Economies of Scale – From your experience, do larger projects or community wide implementations reduce per unit costs?
  - What about single family homes? Is it cheaper to build smaller homes per sq ft?
  - What is the median size (sq ft) single family home that drives the best affordability?

## Scheduling/Planning

- Risk Allocation – Who typically bears the additional compliance cost (owner, contractor, developer)?
- Contingency Planning – What contingency percentages do you now include in budgets for code related uncertainties?

## Perceived Benefits and Value

- Energy Savings – Is operational savings considered when thinking about homeowner satisfaction?
- Market Differentiation – Do you think meeting the advanced code will give a competitive advantage (ex. marketing “high performance home” badge)?
- Incentives – Are there rebates, tax credits, or financing programs that you are familiar with that are linked to the current code new code and if they would offset cost future code upgrade costs?

## Technical/TAG Questions (7-10 mins)

Goal: Understand interviewee’s reading of the perceived TAG recommendations provided by CEE.

- Will the potential recommended TAG code changes drive any additional training needs? at training do you think would be necessary if Minnesota were to upgrade the energy code from 2012 to 2024 (four code cycles)?
- What skill sets would you or the trades need to comply with increased energy codes?
  - How should this be delivered?
- Are you already installing ERVs in SF, MF, and duplexes?
  - If not, what ventilation strategy are you using?
  - Commissioning cost considerations?
  - What % of projects have ERVs installed?
  - Are you downsizing heating/cooling equipment due to ERV capabilities?
- How are you using, if at all, REScheck software?
- Are you creating a load calculation for sizing heating and cooling equipment?

- If so, how does it affect your system selection process?

## Data and Incentives

- Do you collect or analyze data on energy use or operational costs post-construction?
- What incentives (utility rebates, tax credits, financing programs) have helped offset compliance costs?
- Would clearer cost-benefit data from state or local agencies help with adoption and compliance?
- What data or pilot projects would help demonstrate the real-world costs and savings of newer codes?

## Closing

- What role do you see energy codes in advancing building innovation?
- Was there anything we missed that you would like to add?
- Is there anyone else we should be contacting?