MN Department of Labor and Industry,
Construction Codes and Licensing Division

2025 Residential Energy Code Technical Advisory Group

Code Change Proposal Compilation for the Review of the 2024 IRC - Chapter N11

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Amanda Spuckler

Email address: amanda.spuckler@state.mn.us

Telephone number: 651-284-5361

Date: 6-27-2023
Revised 4.9.25

Model Code: IRC Chapter 11

Code or Rule Section: 1322.0100 (N1101.1)

Firm/Association affiliation, if any: DLI

Code or rule section to be changed: 1322.0100 subp. 2 (N1101.1)

Intended for Technical Advisory Group ("TAG"): Residential Energy

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General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☐	☒
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☐	☒

Proposed Language

1. The proposed code change is meant to:

   ☐ change language contained the model code book? If so, list section(s).

   ☒ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s). Part 1322.0100, subp. 2

   ☐ delete language contained in the model code book? If so, list section(s).

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

   ☒ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.
   Replaces N1101.1 with the following:

   Subp. 2. Scope. This code applies to the following residential buildings and associated systems and equipment:

   a. IRC-1 single-family dwellings, IRC-2 Two-family dwellings, IRC-3 townhouses, and IRC-4 accessory structures; and

   b. Buildings or portions of buildings containing Group I-1, R-2, R-3, or R-4 occupancies where the entire composite building is three stories or less in height above grade plane ~~as defined in the Residential Provisions of the 2012 IECC~~.

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
   No

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
   The change provides users with the scope of the code in the scoping section. Currently, code users must refer to the definition of "residential" in chapter 11 of the IRC to determine which structures are considered residential for the purposes of the code. The proposal changes how scoping information is presented but not the scope of the code.

2. Why is the proposed code change a reasonable solution?
   The code change is reasonable because it provides a code user with scoping information without requiring them to refer to the definitions section. It is simply more convenient.

3. What other factors should the TAG consider?
   None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   N/A

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
   N/A

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   N/A

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.

N/A

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   N/A

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Building contractors, mechanical contractors, architects, engineers, municipal building officials, building inspectors, building managers and homeowner

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   An alternative would be to leave the existing scoping language and require code users to refer to definitions chapter to determine scoping. The proposed change eliminates the need to refer to the definitions and ensures code users are aware of the scoping based on information given in the scoping section.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   None

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   N/A

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Amanda Spuckler

Email address: amanda.spuckler@state.mn.us

Telephone number: 651-284-5361

Date: 6/27/2023 revised 4/9/2025

Model Code: IRC Ch 11

Code or Rule Section: N1101 (R301)

Firm/Association affiliation, if any: DLI

Code or rule section to be changed: N1101(R301), Figure 1101.7 (R301.1), and Table N1101.7 (R301.1)

Intended for Technical Advisory Group ("TAG"): Residential Energy

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General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☒	☐
B. Is the proposed change required due to climatic conditions of Minnesota?	☒	☐
C. Will the proposed change encourage more uniform enforcement?	☐	☒
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☐	☒

Proposed Language

1. The proposed code change is meant to:

☐ change language contained the model code book? If so, list section(s).

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☒ delete language contained in the model code book? If so, list section(s).
Delete N1101.7 (R301.1) and replace with list of MN counties and climate zones
Delete section N1101.7.1 (R301.2) warm humid climates
Delete section N1101.7.2 (R301.3) describing how to determine climate zone for locations not assigned to one
Delete Figure N1101.7 (R301.1) US Map Depicting Climate Zones
Delete Table N1101.7 (R301.1) Climate zones, moisture regimes, and warm humid designations by state, county, and territory

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☒ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   No

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

   IRC Section N1101.7 (R301.1) and all subsections are deleted in their entirety and replaced with the following:
   Section N1101.7 (R301) Climate Zones.
   The following counties are located in climate zone 7: Aitkin, Beltrami, Carlton, Cass, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Kittson, Koochiching, Lake, Lake of the Woods, Mahnomen, Marshall, Norman, Pennington, Pine, Polk, Red Lake, Roseau, St. Louis, Wadena. All other counties are located in climate zone 6A.

   Figure N1101.7 (R301.1) is deleted.
   Table N1101.7 (R301.1) is deleted.

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
   The proposed change is necessary to coordinate with changes to climate zones in adopted part 1323.0514 which modifies ASHRAE 90.1-2019 section 5.1.4 Climate.

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
   The change is needed to coordinate with changes and updates to climate zones in adopted chapter 1323, the Minnesota Commercial Energy Code. Chapter 11 of the 2024 IRC and ASHRAE 90.1-2019 use the climate zone data from ASHRAE Standard 169, which assigns Fillmore, Houston, and Winona counites to climate zone 5A. The adopted chapter 1323 assigned those 3 counties to climate zone 6A to maintain two climate zones in Minnesota.

   The proposed change also eliminates a lengthy table that provides climate zone information for each U.S. county as well as section N1101.7.2 (R301.3) which describes how to determine the climate zone for a location that is not assigned to one. The table and section are unnecessary because all MN counties are assigned to a climate zone by the proposed code change.

2. Why is the proposed code change a reasonable solution?
   The code change is a reasonable solution so both the commercial and residential energy codes assign counites to the same climate zones. The change will also eliminate a lengthy table and sections with climate zone information that is not applicable to Minnesota.

3. What other factors should the TAG consider?
   ASHRAE Standard 169 assigns the following counties that were previously in climate zone 7 to 6A: Becker, Clay, Grant, Kanabec, Mille Lacs, Otter Tail, and Wilkin. The updated chapter 1323 and the unamended chapter 11 of the 2024 IRC also assign those counties to climate zone 6A. The proposed code change also assigns those counties to climate zone 6A.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   No changes to costs, or minimal, because the chapter 11 of the 2024 IRC applies similar requires to climate zones 6A and 5A. Furthermore, Fillmore, Houston, and Winona counties currently comply with climate zone 6A requirements.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
   The benefits of the proposed code change are uniformity and consistency with the commercial energy code. The addition of a third climate zone in Minnesota could result in confusion without the benefit of improved energy efficiency or cost savings.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   Homeowners

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   N/A

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   N/A

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?

   Building contractors, mechanical contractors, architects, engineers, municipal building officials, building inspectors, building managers and homeowners

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   None. Not adopting the proposed code change will result in unnecessary confusion with the commercial energy code.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   The probable consequence is inconsistent application and enforcement of the code.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   No.

Referred to Residential Building TAG

Code Change Proposal RE-10.2 (Revised 3/4/25)

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Eric Fowler

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Firm/Association affiliation, if any: Fresh Energy

Date: 2/26/25

Model Code: 2024 IRC

Code or Rule Section: Residential Energy Code

Code or rule section to be changed: N1104.5

Intended for Technical Advisory Group ("TAG"):

General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☐	☒
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposed Language

1. The proposed code change is meant to:

☐ change language contained the model code book? If so, list section(s).

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ delete language contained in the model code book? If so, list section(s).

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☒ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.

   No, it is not, however, minimum requirements for EV ready and capable parking spaces in commercial and multifamily buildings passed during the 2023 legislative session.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Add new definitions as follows:

AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, EVSE, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.

Electric Vehicle Capable Space (EV Capable Space). A designated automobile parking space that is provided with electrical infrastructure necessary for the future installation of an EVSE load of 6.2 kVA or greater, including electrical panel capacity and space to support a circuit, and raceways, both underground and surface mounted.

Electric Vehicle Supply Equipment (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the Electric Vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the Electric Vehicle.

Electric Vehicle Ready Space (EV Ready Space). A designated automobile parking space that is provided with a branch circuit terminating in an outlet, junction box, or receptacle that will support an installed EVSE load of 6.2 kVA or greater.

Electric Vehicle Supply Equipment Installed Space (EVSE Space). An automobile parking space that is provided with a dedicated EVSE connection.

Add new text as follows:

N1104.5 (R404.5) Electric Vehicle Power Transfer Infrastructure.

New one- and two-family dwellings and townhouses with automobile parking spaces shall be provided in accordance with this section. All other new residential parking facilities shall be provided with electric vehicle power transfer infrastructure in accordance with Minnesota Rules Chapters 1323.

N1104.5.1 (R404.5.1) Quantity.

Each dwelling unit with a designated attached or detached garage or other onsite private parking provided adjacent to the dwelling unit shall be provided with one EV capable space, EV ready space, or EVSE space.

N1104.5.2 (R404.5.2) EV Capable Spaces.

Each EV capable space used to meet the requirements of R404.5 shall comply with all of the following:

1. A continuous raceway with a minimum of ¾ inch internal diameter or cable assembly shall be installed between a suitable panelboard or other on-site electrical distribution equipment and an enclosure or outlet located within 6 feet (1828 mm) of the EV capable space.
2. The installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section R404.5.5.
3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a two-pole circuit breaker or set of fuses.
4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: “For future electric vehicle supply equipment (EVSE).”

N1104.5.3 (R404.5.3) EV Ready Spaces.

Each branch circuit serving EV ready spaces shall comply with all of the following:

1. Termination at an outlet or enclosure, located within 6 feet (1828 mm) of each EV ready space it serves and marked “For electric vehicle supply equipment (EVSE).”
2. Service by an electrical distribution system and circuit capacity in accordance with Section R404.5.5.
3. Designation on the panelboard or other electrical distribution equipment directory as “For electric vehicle supply equipment (EVSE).”

N1104.5.4 (R404.5.4) EVSE Spaces.

An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE serving either a single EVSE space or multiple EVSE spaces shall comply with the following:

1. Be served by an electrical distribution system in accordance with Section R404.5.5.
2. Have a nameplate charging capacity of not less than 6.2 kVA per EVSE space served. Where an EVSE serves three or more EVSE spaces and is controlled by an energy management system in accordance with Section R404.5.5. the nameplate charging capacity shall be not less than 2.1 kVA per EVSE space served
3. Be located within 6 feet (1828 mm) of each EVSE space it serves.
4. Be installed in accordance with NFPA 70 and be listed and labeled in accordance with UL 2202 or UL 2594.

N1104.5.5 (R404.5.5) Electrical distribution system capacity.

The branch circuits and electrical distribution system serving each EV capable space, EV ready space and EVSE space used to comply with Section R404.5 shall comply with one of the following:

1. Sized for a calculated EV charging load of not less than 6.2 kVA per EVSE, EV ready or EV capable space. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.

2. The capacity of the electrical distribution system and each branch circuit serving multiple EVSE spaces, EV ready spaces or EV capable spaces designed to be controlled by an energy management system in accordance with NFPA 70 shall be sized for a calculated EV charging load of not less than 2.1 kVA per space. Where an energy management system is used to control EV charging loads for the purposes of this section, it shall not be configured to turn off electrical power to EVSE or EV ready spaces used to comply with Section R404.5.

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.

   Not necessarily, though EV charging provisions may be consolidated into the construction code.

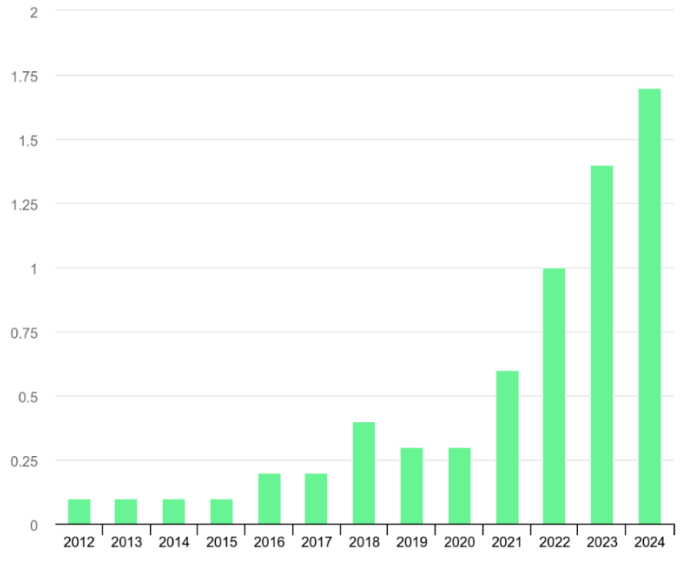
Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)

   This is an updated version of a code change proposal approved by this TAG during discussion of the 2021 IECC. Definitions have been updated to align with new language from the 2024 IECC Appendix RE. Similarly, minimum electrical capacity per space has been updated from 40 amps at 240 volts to 6.2 kVA, which slightly relaxes the requirement, and matches the new IECC appendix text.

   Additional specifications and definitions have been copied from appendix RE for clarity and flexibility. The effect of this proposal is still the same: to require at least one EV capable parking where parking is provided. However, where the requirement is exceeded through provision of an EV ready or an EVSE installed space, this language provides additional guidance for those installations.

   Electric vehicle adoption is on the rise in Minnesota, and across the country, as options expand, battery technology improves, and upfront prices come closer to gasoline-powered vehicles. This growth is exponential, not linear. By preparing new homes with consumer options in mind, the Department will reduce the burden of costly retrofits post-construction, and maintain a code that provides for the “use of modern methods, devices, materials and techniques,” as required by statute. Minnesota would also be following the lead of numerous other jurisdictions who have included EV ready or capable spaces as part of new residential construction, including California, Illinois, Maryland, and cities in Arizona, Colorado,

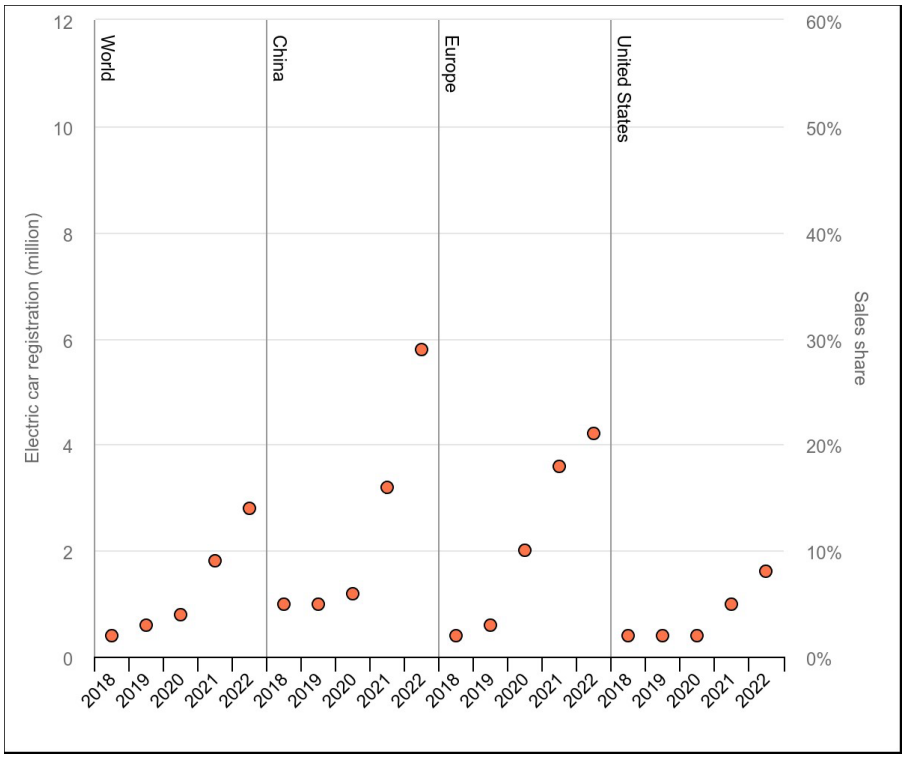


Millions of EV sales in the United States

Delaware, Georgia, and Missouri, as well as Vancouver.[1]

New EV sales in the United States hovered around a quarter million each year from 2016 to 2020, and has since grown to over 1.7 million new vehicles in 2024.[2]

EVs are on track to pass 10% of new vehicle sales soon in the United States, while globally they were almost 15% of sales in 2022.[3]



This trend holds true in Minnesota as well, where 65,679 light-duty EVs were registered as of November 2024, up from 13,015 in February 2020.[4] Additionally, about 7%[5] of all new light-duty vehicle sales in Minnesota were electric in 2024, compared to 1.7% of light-duty vehicle sales in 2020.[6] This trend is expected to continue as EV familiarity increases, EVs reach price parity with

[1] ICC, "2021 Electric Vehicles and Building Codes: A Strategy for Greenhouse Gas Reduction," published October 2021; see Table 1: Sample EV-Integrated Code Provisions, which lists the jurisdictions that require EV Ready Space(s) for new single-family construction. (https://codes.iccsafe.org/content/ICCEVBCSGGR2021P1/current-approaches-to-ev-integrated-codes).

MD Public Safety Code § 12-205 (2024)

Corinne Reichert, "Illinois Right to Charge Law Requires New Homes and Apartments to Support EV Charging," *CNET*, June 22, 2023, https://www.cnet.com/home/illinois-right-to-charge-law-requires-new-homes-and-apartments-to-support-ev-charging/; City of Atlanta, "City of Atlanta Passes 'EV Ready' Ordinance into Law," November 21, 2017, https://www.atlantaga.gov/Home/Components/News/News/10258/1338?backlist=/.

Rachel Sawicki, "New Castle County Amends Codes to Expand Electric Vehicle Charging," *Bay to Bay News*, October 27, 2021, https://baytobaynews.com/stories/new-castle-county-amends-codes-to-expand-electric-vehicle-charging,62104.

[2] IEA, Electric car sales, 2012-2024, IEA, Paris https://www.iea.org/data-and-statistics/charts/electric-car-sales-2012-2024, IEA. Licence: CC BY 4.0
[3] IEA, Electric car registrations and sales share in China, United States and Europe, 2018-2022, IEA, Paris https://www.iea.org/data-and-statistics/charts/electric-car-registrations-and-sales-share-in-china-united-states-and-europe-2018-2022, IEA. Licence: CC BY 4.0
[4] Current registration number from EvaluateMN, via MnDOT Electric Vehicle Dashboard: https://www.dot.state.mn.us/sustainability/electric-vehicle-dashboard.html.
[5] Alliance for Automotive Innovation, "Electric Vehicle Quarterly Report: Q3 2024", at page 8. Through Q3 2024.
[6] Sales number from 2020 retrieved from the Electric Vehicle Dashboard hosted by the Alliance for Automotive Innovation.: https://www.autosinnovate.org/EVDashboard

gasoline vehicles,[7] and purchase incentives from utilities and government continue over the next several years.[8]

Globally, sales projections range from 40% market share by 2030 to over 60% market share by 2030, according to analysis by IEA and RMI.[9]

This market share has been driven in part by lower prices and expanded options for EVs. In 2024, the average price for an EV cost only $5,800 more than the average price for a new gasoline-powered passenger vehicle, with options starting as low as $29,280.[10] Additionally, as more EVs have entered the new vehicle marketplace, a robust used EV market will continue to grow that offers access to EVs at a more affordable price for more consumers. Affordability will be further spurred by the availability of a used EV tax credit for up to $4,000 for vehicles costing $25,000 or less.[11]

Minnesota residents seeking to charge their electric vehicle at home may face a number of costs, including an electric service upgrade, wiring a 240 volt circuit to the charging location, and installing Electric Vehicle Supply Equipment (EVSE), commonly known as an EV charger. This proposal does not require installation of EVSE, or even wiring the circuit, but preserves consumer choice by requiring space in the electric panel for the circuit, and at minimum, conduit for easy installation of the circuit without digging or other costly, invasive work.

This cost is often unexpected for new EV owners, and spurred Xcel Energy to offer a "home wiring rebate"[12] to help defray the cost and support EV adoption in its service territory, while also supporting EVs in its service territories getting onto a time-varying electricity rate that optimizes use of the electric grid, to the benefit of both the EV owner and general grid customers. Level 2 charging enables EV owners to participate in utility pricing programs that offer lower electricity prices at times of the day when load is lowest on the electric grid (typically overnight, when wind power is also most prevalent), thereby optimizing use of the electric grid and renewable energy, while also saving the EV owner money. A Level 2 Charger is typically required to participate in these beneficial utility programs, as well as future developments that would enable EVs to power a home or return energy to the grid (vehicle-to-home and vehicle-to-grid applications, respectively)[13].

2. Why is the proposed code change a reasonable solution?

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[7] InsideEVs, "EVs May Get Cheaper Than Gas Cars As Early As Next Year. Here's Why", posted August 6, 2024: https://insideevs.com/news/729153/ev-price-parity-ice-2025-2026/

[8] Ibid. EV purchases incentives for new vehicles at the federal level range up to $7,500 in tax credits, while used EVs can quality for up to $4,000 of tax credits for their purchaser. Income limits apply to these purchase incentives, and not all models are eligible, but notably these incentives have added pressure to the broader EV market to bring down prices. *See:* https://money.com/ev-vs-gas-cars-price-difference-decreasing/. As of this submission, no final action removing the federal EV tax credits has occurred.

[9] "EVs to surpass two-thirds of global car sales by 2030, putting at risk nearly half of oil demand, new research finds," RMI, https://rmi.org/press-release/evs-to-surpass-two-thirds-of-global-car-sales-by-2030-putting-at-risk-nearly-half-of-oil-demand-new-research-finds/

[10] Kelly Blue Book, "How Much Are Electric Cars?" posted January 15, 2025. https://www.kbb.com/car-advice/how-much-electric-car-cost/

[11] U.S. Department of Energy, "Federal Tax Credits for Pre-owned Plug-in Electric and Fuel Cell Vehicles" (webpage),last updated 1/16/2024. (https://www.fueleconomy.gov/feg/taxused.shtml). As of this submission, no final action on removing federal tax credits for EVs has occurred.

[12] Xcel Energy's Home Wiring Rebate program approved by the Department of Commerce November 2024. *See* Decision in CIP-23-92

[13] Digitaltrends, "EV bidirectional charging: what it is and how to get it," published October 11,2024 (https://www.digitaltrends.com/cars/ev-bidirectional-charging-what-is-it-how-to-get)

This proposal will prepare residents for charging at home as a growing number of Minnesotans opt for electric vehicles. The proposal allows flexibility for builders to provide conduit or to pre-wire for a charger, without requiring the installation of Electric Vehicle Supply Equipment.

3. What other factors should the TAG consider?

   Economy wide, EVs advance efficiency significantly, wasting only about 11% of energy compared to the roughly 80% wasted by gasoline powered cars.[14] EVs eliminate a major source of air pollution, with health impacts both local and global. Finally, they give consumers the option to use local sources of energy, including utility scale renewable electricity or even power from a resident's own rooftop or community solar.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.

   This code will only nominally increase costs.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.

   Providing an EV Ready Space at a Level 2 capacity of 6.2 kVA (between 30 and 40 A on a 208 or 240V circuit) in new construction adds minimal cost. The Southwest Energy Efficiency Project (SWEEP) estimates the incremental cost at about $50 per space, depending on the distance between the electric panel and the parking space.[15] Research by NBI and NRDC estimates the cost at $115.[16]

   New construction with 200 amp service is typically more than enough to allow for Level 2 charging.[17] Many homeowners are even able to charge an EV with a 100 amp panel, making the need for more than the standard 200 amp service extremely unlikely, especially in small and modest sized homes.[18]

   Alternatively, retrofitting homes for Level 2 Charging is much costlier. Estimates vary widely from $300-$5,000.[19] In Xcel Energy's 2023 Transportation Electrification Plan, they estimated that

[14] "Electrifying transportation reduces emissions AND saves massive amounts of energy," Yale Climate Connections, 2022, https://yaleclimateconnections.org/2022/08/electrifying-transportation-reduces-emissions-and-saves-massive-amounts-of-energy/

[15] SWEEP, "SWEEP guide to EV infrastructure building codes,"(webpage), under section "Cost implications: EV building codes save people money." (https://www.swenergy.org/ev-infrastructure-building-codes/)

[16] Page 22, "Cost Study of the Building Decarbonization Code," NBI, 2022, https://newbuildings.org/resource/cost-study-of-the-building-decarbonization-code/

[17] Energy Star, https://www.energystar.gov/products/energy_star_home_upgrade/make_your_home_electric_ready

[18] "Yes, it's possible to electrify a home on just 100 amps," Canary Media, December 2023, https://www.canarymedia.com/articles/electrification/yes-its-possible-to-electrify-a-home-on-just-100-amps

[19] "An electric car charging station installation costs $750 to $2,600 for a Level 2 charger, 240-volt outlet, wiring, and wall mounting. Some EV charger installations cost $2,000 to $5,000 for extensive wiring or if the electrical panel needs upgrading." 2023 EV Charging Station Cost | Install Level 2 or Tesla (homeguide.com) updated September 2023
New 240v outlet: "totaling $300 or so" Cost To Install An Electrical Outlet: GFCI, 220v, 240v – Forbes Home
"if you need to mount the system from zero: do the wiring, and install a new service panel and 240 V outlet - add about $1000 - $1500 to your estimate" How Much Does It Cost To Install An EV Charger? (jdpower.com) December 2022

installing a dedicated 240 V circuit in their Minnesota service territory cost $880 on average, with costs varying by site but reaching a maximum of $5,000 for a single project.[20]

Assuming incremental EV ready costs of $115 compared to retrofit costs of $880, only 14% of residents would need to install EVSE in their EV ready parking space to realize overall cost savings of $820 per 100 homes.[21] If the (conservative) IEA estimates of 40% EV market share by 2030 are correct, then 20% of residents or more might install EVSE in their EV ready parking space, realizing cost savings of $6,100 per 100 homes.[22]

None of these estimates include savings from the lower operation costs of EVs compared to an internal combustion engine. According to AAA, an electric vehicle (EV) will save roughly $1,039 per year in total fuel and maintenance costs compared to a comparable gasoline vehicle.[23]

The estimates above also leave out the impact on human health and healthcare costs that EVs reduce by lowering fossil fuel combustion. Research lead by the Harvard Chan School of Public Health found that "more than 8 million people died in 2018 from fossil fuel pollution," equating to about 1 in 5 deaths worldwide.[24] Across the United States, research published in the journal *Environmental Research: Health* estimated that US oil and gas causes roughly $77 billion in health impacts every year. The health harms are also local and measurable. Researchers in Rochester, Minnesota studied almost 20,000 people over 11 years and found "significant relationships between asthma exacerbations and residential proximity to traffic."[25] By simply making it easier for residents to eliminate nearby sources of fossil fuel pollution, we can continue protecting the health and welfare of Minnesotans inside of buildings and out.

A small investment during new construction will save homeowners substantial future costs and give them more options. Given the market trends identified in the reason statement, it is not a question of whether homes will need EV charging infrastructure, but when. Failing to adopt this proposal would mean saddling future homeowners with substantially higher costs. Instead, the Department should ensure "use of modern methods, devices, materials and techniques" in new residences by adopting this proposal.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.

   Cost will be passed to homeowner and will save cost over retrofit.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.

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[20] Pg. 52, Xcel Energy, 2023 Integrated Distribution Plan - Appendix H: Transportation Electrification Plan (filed Nov 1, 2023) (link)

[21] In a 100 home universe: 100 x $115 = $11,500 for all EV ready compared to 14 x $880 = $12,320 for retrofit costs. Total saved: 12,320 - 11,500 = $820.

[22] In a 100 home universe: 100 x $115 = $11,500 for all EV ready compared to 20 x $880 = $17,600 for retrofit costs. Total saved: 17,600 – 11,500 = $ 6,100.

[23] "$709 in fuel savings assuming 15,000 miles, and $330 saved in maintenance, repair, and tires" according to "True Cost of Electric Vehicles," AAA, https://www.aaa.com/autorepair/articles/true-cost-of-ev

[24] "Fossil fuel air pollution responsible for 1 in 5 deaths worldwide," Harvard Chan School of Public Health, 2021, https://www.hsph.harvard.edu/c-change/news/fossil-fuel-air-pollution-responsible-for-1-in-5-deaths-worldwide/

[25] Lindgren P, Johnson J, Williams A, Yawn B, Pratt GC. Asthma exacerbations and traffic: examining relationships using link-based traffic metrics and a comprehensive patient database. Environ Health. 2016 Nov 3;15(1):102. doi: 10.1186/s12940-016-0184-2. PMID: 27809853; PMCID: PMC5094142.

This system can be inspected during normal electrical inspection and will increase the cost of compliance.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

   No, see cost estimates above.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?

   This proposed code change would require additional electrical and/or laborer work.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.

   There is no other clear policy tool to prepare Minnesota homes for EV charging and avoid steep retrofit costs.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

   This proposal will save homeowners the costly burden of upgrading their homes to provide electric vehicle charging.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.

   No, although legislation passed in the 2023 Minnesota legislative session requiring adding electric vehicle charging to the commercial budling code.

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Jonny Kocher

Email address: jkocher@rmi.org

Telephone number: 619-459-4267

Firm/Association affiliation, if any: RMI

Date: 4/3/25

Model Code: 2024 IRC

Code or Rule Section: Res Energy Code

Code or rule section to be changed: N1104 (R404)

Intended for Technical Advisory Group ("TAG"): *Residential Energy*

General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☐	☒
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☐	☒
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposer Context

This code proposal passed the Minnesota Residential Energy Code TAG process in 2024. Since Minnesota didn't publish those changes to the 2021 IRC code, I was asked to resubmit this code proposal for consideration and approval for the 2024 IRC update.

Proposed Language

1. The proposed code change is meant to:
   ☐ change language contained the model code book? If so, list section(s).
   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   ☐ delete language contained in the model code book? If so, list section(s).
   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   ☒ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   While this code change is not required by Minnesota Statute, it is aligned with the intent of Statute and other state policy. Statute 326B.106 Subdivision 1 Paragraph (g) requires that Minnesota's residential energy code must achieve a reduction in annual net energy consumption of 70% or more compared to the 2006 International Energy Conservation Code by 2038. Statute does not explicate whether this requirement applies to new buildings, existing buildings, or both. This code change

would improve the energy efficiency of future existing buildings by setting forward-looking new construction requirements. The electric appliances whose installation is facilitated by readiness requirements are generally more efficient and conserve energy compared to fuel-burning appliances for the same end uses. For example, heat pump equipment generally reduces space and water heating energy use by more than 50% compared to efficient fuel-burning equipment, and usually reduces energy used for cooling as well.

Additionally, acknowledging that the residential energy code's scope is conservation only, this proposal is incidentally compatible with state policy concerning clean and climate-friendly market transformation. Under the Smarter Buildings and Construction initiative of the Minnesota Climate Action Framework, one of the suggested state action steps included: "Develop clear options for building owners and families to make informed environmentally preferable selections for their building materials and products, including appliances such as furnaces, water heaters, and cooktops/ovens."[1] Creating readiness requirements will enable building owners to make these informed, energy-saving selections in the future without it being prohibitively expensive.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

N1104.5 Electrification-ready circuits. Water heaters, household clothes dryers, and cooking appliances that use fuel gas or liquid fuel shall comply with Sections N1104.5.1 through N1104.5.3. The main electrical panel shall include spare circuits and be sized to meet the future load required by this section. Each spare circuit shall be labeled with the word "spare." Space shall be reserved in the electrical panel for each reserved circuit for the installation of an overcurrent device. Capacity for the future circuits required in this section shall be included in the load calculations of the original installation.

N1104.5.1 Cooking appliances. A circuit capable of feeding a future 240-volts, 40-amperes load
Exception: Cooking appliances not installed in an individual dwelling unit.

N1104.5.2 Household clothes dryers. A circuit capable of feeding a future 240-volts, 30-amperes load.
Exception: Clothes dryers not installed in an individual dwelling unit.

N1104.5.3 Water heaters. A circuit capable of feeding a future 240-volts, 30-amperes load.
Exception: Water heaters serving multiple dwelling units in a R-2 occupancy

TABLE N1105.2
REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION	TITLE
N1104.5	Electrification-ready circuits

TABLE N1106.2
REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
N1104.5	Electrification-ready circuits

[1] https://climate.state.mn.us/sites/climate-action/files/Climate%20Action%20Framework.pdf, page 19

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
   No

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
   Currently it is very expensive for consumers to switch from gas water heaters, gas stoves and gas dryers to their electric alternatives due to inadequate electrical infrastructure. This expense is one of the primary barriers to consumer adoption of higher-efficiency electric appliances.

2. Why is the proposed code change a reasonable solution?
   This proposal enhances customer choice by making it easy for homeowners to choose either electric or gas appliances to meet their water heating, cooking or clothes drying demands. By ensuring that a home built with gas or propane can easily accommodate future electric appliances and equipment, this proposal preserves the option to transition to dramatically higher efficiency and potentially lower operating cost equipment without prohibitively high retrofit costs.

3. What other factors should the TAG consider?
   n/a

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   The cost will increase upfront costs. This proposal only requires that space be available on the building electrical panel to accommodate appropriate future circuits; this lean version of electric readiness will cost less than any provisions of which we are aware that have been subject to a cost study.
   Regarding the cost of full electric readiness, inclusive of appropriate branch circuits and receptacles as required by Appendix NK: A cost analysis from the New Buildings Institute estimated that the electrical infrastructure would cost between $0 and $710. Group14 Engineering and the California Energy Commission estimate that the upfront costs of full electric readiness ranges between $500 to $1,010.[2,3,4] We would expect the high end of these ranges to be approximately halved for this proposal, based on the methodology of these studies, such that the cost would range between $0 and $505.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
   The cost of meeting these electric-ready requirements when the house is being built is marginal. In comparison, the cost of retrofitting a building for these requirements can be an order of magnitude higher and act as a barrier for the homeowner to choose electric appliances.

   An electrification engineering study by Group 14 reports that the electrical modifications needed to install a HP heating system and a HPWH is $2,100 as a retrofit compared to $500 as an original install for a 3,000 sq ft single family home. The California Energy Commission cost study found that the retrofit cost to add electrical infrastructure for water heating, space heating, dryers and cooking appliances after construction is at least $2,560 (likely higher), compared to the upfront cost of around $1,010 to do

[2] NBI, Cost of Decarbonization Code, 2022, page 26
https://filesnewbuilding.s3.amazonaws.com/wp-content/uploads/2022/04/BuildingDecarbCostStudy.pdf
[3] California Energy Commission, 2022, page 2-3
https://efiling.energy.ca.gov/GetDocument.aspx?tn=238049&DocumentContentId=71300
[4] Group 14, 2020, page 12
https://www.communityenergyinc.com/wp-content/uploads/Building-Electrification-Study-Group14-2020-11.09.pdf

it during construction. These studies indicate that it is about 3-4 times less expensive to do this work during construction. Not making new buildings electric-ready would leave homeowners exposed to potentially high retrofit costs in the future and will greatly inhibit customer choice and, therefore, the future housing stock's energy efficiency.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   Construction contractors and developers will bear most of the costs. The substantial cost savings for reduced costs of future retrofits will benefit homeowners.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   There will be a negligible impact in inspection and enforcement cost when code inspectors ensure this portion of the code is complied with.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   No. This will not impact businesses or cities. This is a residential code proposal.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Electrical contractors will have slightly more work because of this proposal.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   This is a feasible option to cost-effectively prepare homes for future energy efficiency improvements via adoption of efficient electric appliances. The other two main options available are to move towards full electric readiness, as the original 2021 proposal recommended, or not require any electric readiness at all. The main argument against requiring any electric readiness is the upfront cost, which I have already addressed by showing that this will save thousands of dollars of future retrofit costs.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   If we continue to plan solely for fuel-burning appliances for multiple end uses in new buildings without preparing for the future energy transition, a huge amount of energy savings in the future housing stock - on the order of 30-50% - will be significantly more costly to achieve. Various co-benefits not under the jurisdiction of the energy code would also be more costly to achieve, including improved indoor and outdoor air quality and reduced greenhouse gas emissions.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   By preparing for electric ready homes, consumers whose appliances break between now and 2031 will be able to take advantage of local, state or utility incentives that could encourage installation of high-efficiency electric appliances.

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Date: 9/8/2023 (Updated 3/11/25)

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Model Code: 2024 IRC

Telephone number: 651-284-5312

Code or Rule Section: N1102.2.5

Firm/Association affiliation, if any: Dept of Labor & Industry

Code or rule section to be changed: N1102.2.5

Intended for Technical Advisory Group ("TAG"): Residential Energy

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General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☐	☒
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposed Language

1. The proposed code change is meant to:

☐ change language contained the model code book? If so, list section(s).

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☒ delete language contained in the model code book? If so, list section(s).
N1102.2.5 Exception #2.

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

N1102.2.5 (R402.2.5) Access hatches and doors.
Access hatches and doors from conditioned to unconditioned spaces such as attics and crawl spaces shall be insulated to the same R-value required by Table N1102.1.3 for the wall or ceiling in which they are installed.

Exceptions:

1. Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table N1102.1.3 based on the applicable climate zone specified in Chapter 3.
2. ~~Horizontal pull-down, stair-type access hatches in ceiling assemblies that provide access from conditioned to unconditioned spaces in Climate Zones 0 through 4 shall not be required to comply with the insulation level of the surrounding surfaces provided the hatch meets all of the following:~~
    a. ~~2.1. The average U-factor of the hatch shall be less than or equal to U-0.10 or have an average insulation R-value of R-10 or greater.~~
    b. ~~2.2. Not less than 75 percent of the panel area shall have an insulation R-value of R-13 or greater.~~
    c. ~~2.3. The net area of the framed opening shall be less than or equal to 13.5 square feet (1.25 m2).~~
    d. ~~2.4. The perimeter of the hatch edge shall be weatherstripped.~~

The reduction shall not apply to the component performance alternative in Section N1102.1.5.

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
    No.

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
    The content in the second exception applies to climate zones 0 through 4 which are not located in Minnesota.

2. Why is the proposed code change a reasonable solution?
    As noted above, it does not have application to Minnesota.

3. What other factors should the TAG consider?
    1. An unlimited quantity of exterior doors and windows complying with the fenestration requirements in Table N1102.1.3 can be installed within the thermal envelope.
    2. Section N1102.4.4 allows one side-hinged opaque door assembly not greater than 24sf to be exempted from the U-factor requirement in in Section N1102.1.2.
    3. Section N1102.4.1 permits an area-weighted average of fenestration products to satisfy the U-factor requirements.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   No.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
   No.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   N/A

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   No.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   N/A

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Building contractors, designers, municipal building inspectors, and homeowners.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   Since the change removes content that would not have had an impact on Minnesota anyway, the only alternate would be to leave the language as written in model code. However, including items that have zero application leads to confusion and complication with application and enforcement.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   None.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   N/A.

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Chris Rosival

Date: 03/12/2025

Email address: chris.rosival@state.mn.us

Model Code: 2024 IRC

Telephone number: 651-284-5510

Code or Rule Section: N1102.1.6

Firm/Association affiliation, if any: DLI

Code or rule section to be changed: N1102.1.6

Intended for Technical Advisory Group ("TAG"): Residential Energy Code

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General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☒	☐
B. Is the proposed change required due to climatic conditions of Minnesota?	☒	☐
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposed Language

1. The proposed code change is meant to:

   ☐ change language contained the model code book? If so, list section(s).

   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

   ☐ delete language contained in the model code book? If so, list section(s).

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

   ☒ add new language that is not found in the model code book or in Minnesota Rule. N1106.1.6

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

N1102.1.6 (R402.1.6) Rooms containing fuel-burning appliances. In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room that is isolated from inside the building thermal envelope. Such rooms shall be sealed and insulated in accordance with the building thermal envelope requirements of Table N1102.1.3, where the walls, floors and ceilings shall meet a minimum of the basement wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section N1103. The combustion air duct shall be insulated where it passes through conditioned space to an R-value of not less than R-8.
Exceptions:
1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Sections N1102.5.2 and R1006.
3. Fuel burning appliances installed in conjunction with automatically controlled combustion air openings. Openings shall contain dampers interlocked with the appliance to fully open when the appliance is in operation, and prohibit operation when damper is closed. Operation shall be verified.

(alternate)
3. Combustion air openings serving fuel-burning appliances, with dampers interlocked with the main burner to prevent operation when the combustion air supply damper is not open. Operation shall be verified.

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)

   The model code language creates a problem in Minnesota. Our climate would cause freezing issues to water pipes in the room.

2. Why is the proposed code change a reasonable solution?

   This would allow a reasonable alternative that could save energy. Restricting combustion air into the building and regulating how it is introduced will reduce energy loss.

3. What other factors should the TAG consider?

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.

   This proposed code change will save money as construction of a thermally isolated room, or basement, will not be needed. If the basement is unfinished, and the fuel-burning appliance is in the basement, the entire basement would have to be thermally isolated.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Installers, builders and homeowners

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

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Model Code: 2024 IRC

Telephone number: 612-335-3483

Code or Rule Section: N1105

Firm/Association affiliation, if any: Center for Energy and Environment (CEE)

Topic of proposal: *Simulated Building Performance*

Code or rule section to be changed: N1105 (R405)

Intended for Technical Advisory Group ("TAG"): *Residential Energy Code*

General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☒	☐
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☒	☐
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposed Language

1. The proposed code change is meant to:

☐ change language contained the model code book? If so, list section(s).

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☒ delete language contained in the model code book? If so, list section(s).
N1105 (R405) Simulated Building Performance

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ add new language that is not found in the model code book or in Minnesota Rule.

Summary:
This proposal removes the Simulated Building Performance compliance pathway to allow for a simplified residential energy code, reduced burden on code officials, reduced complexity in the code development process and increased confidence in the equity of the code.

The Simulated Building Performance compliance pathway utilizes whole-building energy modeling to compare a proposed building's energy use to a reference building that meets the prescriptive requirements. Builders use approved software to model the proposed design, allowing for trade-offs between different building components, and to demonstrate that the proposed design will use at least 20% less energy than the reference building. On-site verification by a certified rater is part of this process to ensure the construction practices and modeled inputs match as well as testing for certain key performance metrics, such as air leakage.

Since the Simulated Building Performance pathway and ERI pathway use the same software and raters, it is common practice to receive results for each pathway and submit whichever is better. This demonstrates a bias between the two approaches, which we feel is not necessary for Minnesota to introduce during a time of significant change and advancement.

As Minnesota continues to adopt new model codes and code advancement amendments to meet the statutory requirements in Minnesota Statute 326B.106, it will become increasingly difficult to ensure alignment between the prescriptive code and the performance pathways. This is especially true for the Simulated Building Performance pathway, compared to the ERI Pathway, due to the complexity and nuances of this pathway. Keeping the Simulated Building Performance pathway will slow down the code adoption process, increase the complexity of the code, and increase training needs for building officials, while providing little benefit to builders because the benefit of increased flexibility can be offered with the ERI pathway.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   The Simulated Building Performance pathway would have to be adjusted in line with the other compliance pathways to achieve the statutory requirements in Minnesota Statute 326B.106. This is a complex and nuanced process.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.
   N1105 (R405) Simulated Building Performance

   This section has been removed as a compliance option.

   [delete all other text in this section, but keep section heading to avoid renumbering the following sections]

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
   No.

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
   Minnesota is working to adopt a residential energy code at least as efficient as the 2024 IRC Ch. 11 requirements. When in effect, this will be the first new residential energy code in Minnesota since 2015, which was based on the 2012 IECC. The 2024 code introduces new building practices, such as advances in insulation, that will mark a significant step forward for the building industry in Minnesota. Furthermore, the 2024 code introduces a new compliance pathway in the ERI Pathway, which code officials will be working to familiarize themselves with. Considering minimal practical

differences between the compliance process for the Simulated Building Performance pathway and the more commonly used HERS Index used in the ERI Pathway, we do not believe this layer of complexity is advantageous for Minnesota.

Furthermore, analysis and evaluation would be required on behalf of the Residential Energy Code TAG to ensure that the final prescriptive pathway and the simulated building performance pathways align to ensure fairness and equity in the code. With the numerous additional factors accounted for within both the reference home and the modeled new construction home, this is a challenging and unnecessary feat that provides little benefit to Minnesota.

2. Why is the proposed code change a reasonable solution?
   We believe removing the Simulated Building Performance pathway is a reasonable solution because it allows builders to have the flexibility of a performance pathway with the ERI option, while reducing the complexity of the code.

3. What other factors should the TAG consider?
   The Simulated Building Performance pathway is available in Minnesota's current energy code (total building performance), but is very rarely used.

   There is a shortage of certified raters in Minnesota to conduct these tests, especially in rural areas, making this pathway inaccessible to those builders.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   No change – potential to lower education needs for builders and code officials

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
   There is no anticipated cost increase related to this proposal.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   There is no anticipated cost increase related to this proposal.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   A potential compliance cost decrease due to reducing the complexity of the code and therefore the training required to enforce it

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Builders and designers

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the

alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
The more popular performance pathway, the ERI Pathway, could be removed instead with similar benefits.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   None recognized

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   N/A

***Note: The information you provide in this code change proposal form is considered Public Data and used by the TAG to consider your proposed modification to the code. Any code change proposal form submitted to DLI may be reviewed at public TAG meetings and used by department staff and the Office of Administrative Hearings to justify the need and reasonableness of any proposed rule draft subject to administrative review and is available to the public.

****Note: Incomplete forms will be returned to the submitter with instruction to complete the form. Only completed forms will be accepted and considered by the TAG. The submitter may be asked to provide additional information in support of the proposed code change.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Isaac Smith

Date: 3/24/2025

Email address: ismith@mncee.org

Model Code: 2024 IRC

Telephone number: 612-335-3483

Code or Rule Section: N1106

Firm/Association affiliation, if any: Center for Energy and Environment (CEE)

Topic of proposal: *ERI Performance Pathway*

Code or rule section to be changed: N1106.5 (R406.5)

Intended for Technical Advisory Group ("TAG"): *Residential Energy Code*

General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☒	☐
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposed Language

1. The proposed code change is meant to:

☒ change language contained the model code book? If so, list section(s).
N1106.5 (R406.5) ERI-based compliance

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ delete language contained in the model code book? If so, list section(s).

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ add new language that is not found in the model code book or in Minnesota Rule.

Summary:
This proposal decreases the maximum ERI in the ERI compliance path to 48 for Climate Zone 6 and 47 for climate zone 7 and eliminates the onsite power production (OPP) option, which is out of scope of Minnesota energy code. Here is an overview of the reasons for this change:

- Performance pathways are intended to be equal to or more stringent than the prescriptive pathway, but a comparison of the 2021 and 2024 model codes plus ERI modeling results of standard MN housing types following industry standard practice show that this is not the case in the 2024 model code. The proposed max ERIs better aligns the ERI pathway with the prescriptive requirements.
- An evaluation of current and past residential construction in Minnesota shows that the model code ERI targets are already easily being achieved by the majority of builders. The prescriptive code is an incremental improvement in energy savings and the pathway should also show an incremental improvement.
- Lowering the max ERI sets the state up for a uniform improvement of 6 points in max ERI each code cycle between now and the 326B.106 state statutory requirement deadline of 2038, with a target of a max ERI of 30. This would allow for transparency and forward planning for builders and building officials.
- Minnesota energy code regulates energy conservation, not energy source or fuel type. While some jurisdictions may use the ERI pathway as established in the model code, eliminating credit for OPP brings the pathway in line with Minnesota law and practice.
- Further details are provided in Appendix A at the end of this code change proposal.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
Minnesota Statute 326B.106, states “Beginning in 2026, the commissioner shall act on the new model residential energy code by adopting each new published edition of the International Energy Conservation Code or a more efficient standard. The residential energy code in effect in 2038 and thereafter must achieve a 70 percent reduction in annual net energy consumption or greater, using the 2006 International Energy Conservation Code State Level Residential Codes Energy Use Index for Minnesota, as published by the United States Department of Energy's Building Energy Codes Program, as a baseline. The commissioner shall adopt residential energy codes from 2026 to 2038 that incrementally move toward achieving the 70 percent reduction in annual net energy consumption. By January 15 of the year following each new code adoption, the commissioner shall submit a report on progress under this section to the legislative committees with jurisdiction over the energy code.”

The ERI Pathway is an index-based scale with a 2006 home (as defined in ANSI 301-2019) achieving a score of 100 and a net-zero home achieving a score of 0. Therefore, the ERI Pathway maximum score will need to be at or below 30 by 2038 to meet statutory requirements. Taking incremental steps toward this level starting with this code cycle will make this easier for the market to achieve the statutory requirements.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

N1106.5 (R406.5) ERI-based compliance.
Compliance based on an ERI analysis requires that the rated design and each confirmed as-built dwelling unit be shown to have an ERI less than or equal to the applicable value indicated in Table N1106.5. Onsite power production (OPP) shall not be factored into the ERI for code compliance. ~~where compared to the ERI reference design, as follows:~~

~~1. 1.Where on-site renewables are not installed, the values under ENERGY RATING INDEX NOT INCLUDING OPP apply.~~
~~2. 2.Where on-site renewables are installed, the values under ENERGY RATING INDEX WITH OPP apply.~~

~~Exception: Where the ERI analysis excludes on-site power production (OPP), the values under ENERGY RATING INDEX NOT INCLUDING OPP shall be permitted to be applied.~~

TABLE N1106.5 (R406.5)
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX NOT INCLUDING OPP	~~ENERGY RATING INDEX WITH OPP~~
~~0 and 1~~	~~51~~	~~35~~
~~2~~	~~51~~	~~34~~
~~3~~	~~50~~	~~33~~
~~4~~	~~53~~	~~40~~
~~5~~	~~54~~	~~43~~
6	~~53~~ 48	~~43~~
7	~~52~~ 47	~~46~~
~~8~~	~~52~~	~~46~~

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
   No.

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
   In 2024, Minnesota state statute 326B.106 was passed, stating that the Minnesota Residential Energy Code shall achieve a 70% improvement in efficiency by 2038 over a 2006 baseline. The statute also stipulates that the energy code must incrementally improve each cycle and that each new model code must be reviewed during this time. In order to achieve the 2038 efficiency requirement, past trajectory has shown that relying on minimum requirements in the model code will not be sufficient. Furthermore, it is best for the market to make incremental improvements towards the requirement in each code cycle to smooth the transition to the required 70% improvement. Therefore, adopting strengthening amendments to the model code each code cycle is the most effective way to meet these requirements. Based on a thorough analysis of market readiness, cost, data and stakeholder engagement, the proposed amendment was selected as an effective step toward meeting these requirements.

   The proposed amendment, designed primarily to align the prescriptive and ERI pathways in the code, is critical to achieving equity in the code. In the 2024 IECC model code, the ERI pathway is easier to achieve than the prescriptive pathway. This is evident when comparing the max ERI in the 2021 and the 2024 model codes. In the 2021 model code, the max ERI is 51.3 for climate zone 6 and 53 in the 2024 model code (50.35 and 52, respectively, for climate zone 7). This does not align with changes to prescriptive path when comparing these model codes. The 2024 prescriptive path improved efficiency requirements for air-leakage, windows, and energy recovery ventilation, but these efficiency improvements were not carried over to the ERI pathway. Pacific Northwest National Lab's (PNNL) analysis of the prescriptive paths found a 13% reduction in site energy use intensity (EUI) when comparing 2021 to 2024 (for climate zones 6 and 7). Therefore, you would expect the max ERI to reduce in a similar fashion (51.3 *0.87 = 44.6 ERI), yet the 2024 max ERI increases, allowing for less efficient homes compared to the 2021 model code. This makes the ERI pathway easier to achieve than the prescriptive in the 2024 IECC model code. This must be addressed. If not addressed, builders who have limited access and familiarity with the ERI pathway would have an undue burden.

   Modeling homes built to the prescriptive path consistently leads to ERI numbers below the model code levels of 53 and 52 (see Appendix A). Reducing the max ERI to 48 and 47 better aligns the ERI pathway with the prescriptive pathway. This change will ensure that the ERI pathway is not easier than the prescriptive pathway, while still allowing builders flexibility with how this performance level is achieved.

2. Why is the proposed code change a reasonable solution?

The MN Advanced Energy Codes Partnership is an initiative focused on achieving Minnesota's statutory requirements around energy code efficiency in new construction. As part of this work, the Partnership has identified key guiding principles for developing new efficiency requirements, to ensure these requirements have the highest impact with least possible burden on the market. These guiding principles include:

- Ease of market adoption
  - Requirements should be as easy as possible for designers and builders to implement, including products that are currently easily available and implementable by the existing workforce
- Least cost
  - Requirements should have the lowest lifetime cost to implement, accounting for the initial cost as well as energy savings over the lifetime of the measure.
- Collaborative approach
  - Engage stakeholders and listen to their feedback
  - Inclusive of all voices and experiences
- Data-driven decisions
  - Decisions should be guided by data, including the best possible information on cost, market readiness, and energy savings.

The proposed amendment aligns with these guiding principles:

- Ease of Market Adoption:
  - While Minnesota does not currently have a ERI pathway for residential energy code compliance, over half the new homes built in Minnesota in 2024 received an ERI. ERI data from 2024 shows that the average ERI was 47, indicating that the proposed max ERIs are largely in line with current building practices and would not cause undue burden on the industry.
  - The proposed values also ensure equity between the prescriptive pathway and the ERI pathway, ensuring rural market areas do not have more stringent compliance requirements than urban market areas that have easier access to the ERI path.
- Least Cost:
  - As most new residential homes are achieving the proposed ERI values today, and the prescriptive pathway already requires similar performance levels, we do not anticipate any immediate cost impact
  - Adopting the proposed values puts Minnesota on track to reduce ERI values by 6 each cycle to achieve statutory efficiency requirements. This allows builders to have a clear line of sight to what's ahead and plan for this. This will inherently reduce the costs of compliance throughout the following code cycles as builders are able to be planful.
- Collaborative Approach:
  - We have presented this plan to the AECP Advisory Committee, soliciting feedback both in the meeting and with a follow-up survey, and have presented these values to TAG members and stakeholders ahead of the TAG meetings. These meetings have introduced new factors to be considered and data to be analyzed, which we have followed up on.
  - We met with Jason Toves and Stella Carr from International Code Council (ICC), who confirmed that the max ERI values are not derived from the prescriptive pathway and recommended that we do our own ERI baselining to determine the correct value, which we have outlined in Appendix A
- Data-Driven Decisions:
  - We have used significant data, including current and historic RESNET data, which covers more than 50% of new residential construction in Minnesota, and modeling exercises, to determine the proposed values.

3. What other factors should the TAG consider?

Lowering the max ERI is a clear and easy way to ensure alignment between the prescriptive and ERI pathways. A quantitative modeling process was completed to evaluate the ERI for homes that meet the 2024 model code's prescriptive path (see Appendix A for more details on the modeling process). This process involved modeling eight different house types that represent the variety of construction seen in Minnesota. The ERI for these homes ranges from 48-50 in climate zone 6 (climate Zone 7 typically results in an ERI that is 1 point lower, 47-49). Setting the max ERI to 48 for climate zone 6 and 47 for climate zone 7 will ensure that the ERI pathway produces a home that is at least as efficient as the prescriptive path. Furthermore, these ERI results do not incorporate the prescriptive path's N1108 (R408) Additional Energy Efficiency Requirements as it was difficult to incorporate the credit table into the modeled homes given the variety of options. This means a prescriptive path home would actually achieve an even lower ERI than our model predicts, and, if anything, this proposal to reduce max ERI to 48 and 47 is conservative.

Not only do the proposed values align with modeling outputs and put Minnesota on a linear path to achieving statutory requirements, the proposed values are sympathetic to current market conditions. For the last 5 years, between 2019 and 2023, the average HERS Index (ERI equivalent) in Minnesota has been between 50-51. In 2024, data from RESNET shows the average ERI dropping to 47, indicating the proposed values are largely meeting builders where they are at today.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   Given current ERI scores in MN, this change should not increase costs for most builders. In fact, performance pathways can often be a lower-cost compliance pathway for builders compared to the prescriptive pathway due to the flexibility they offer.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
   Lower ERI equates to lower energy use and therefore energy savings. However, this change is not expected to increase costs when compared to current construction practices.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   There is no anticipated cost increase related to this proposal.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   No. This is simply a change to a compliance option that is already being considered with the adoption of the 2024 model code.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Builders and designers

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the

alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
With a commitment to equity in the code, the ERI Pathway will have to achieve a score of 30 by 2038 to align with a prescriptive pathway that meets statutory requirements. Alternatives would include making larger jumps in the ERI Pathway in future cycles (not recommended due to market impacts) or eliminating the ERI Pathway (not recommended due to loss of flexibility; impact on builders).

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   If a change is not made to the max ERI in the model code, there will be a large inequity in the code requirements between homes built to the prescriptive vs. the ERI pathway. In other words, builders that use the ERI pathway as it appears in the model code can build a lower performing home when compared to a home built following the prescriptive pathway.

   While there are a variety of reasons a builder may choose to use the prescriptive pathway over the performance pathways, a large reason is a shortage of qualified raters in large areas of rural Minnesota, making this pathway less accessible to builders in those areas. It would also be unfair to builders not familiar with the ERI pathway, who may not realize they are held to a stricter standard by following the prescriptive pathway.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   ASHRAE 90.2 2024, ASHRAE's residential energy standard, sets the max ERI for climate zones 6 and 7 at 46. This code was approved by ASHRAE, IES and ANSI in the summer of 2024.

Energy Rating Index Compliance Alternative (N1106)

Lowering the Max Allowable ERI is needed to create equity in the code

Overview

What is the ERI?

The Energy Rating Index (ERI) is analogous to the Home Energy Rating System (HERS) Index, where a certified HERS rater visits a home, enters information about the home into software, which models the home and generates a rating. These ratings are on a scale from 100 to 0, where 100 represents a home built to the 2006 IECC model code with market average appliances for that time[1], and 0 represents a home that is net zero, so a lower rating represents a home that uses less energy.

It is important to note that this pathway (and the simulated building performance pathway) uses modeling to determine code compliance, and the information required to generate these models includes home appliances that are not covered by code. This includes - furnaces, air-conditioners, refrigerators and freezers, clothes washer and dryers, and dishwashers, all of which impact the rating/model and therefore code compliance.

Recent ERI Code Changes

When comparing the 2021 and 2024 model code you can see the max allowable ERI goes up between 2021 and 2024 (see table below). This is counterintuitive, because the prescriptive path in the 2024 model code improved the efficiency requirements for windows, air-leakage, and energy recovery ventilation. Pacific Northwest National Lab's (PNNL) analysis of the prescriptive paths found a 13% reduction in site energy use intensity (EUI) when comparing 2021 to 2024 (for climate zones 6 and 7). Therefore, you would expect the max ERI to reduce in a similar fashion (51.3 *0.87 = 44.6 ERI), yet the 2024 max ERI increases, allowing for less efficient homes compared to the 2021 model code.

This indicates that the ERI pathway is not aligning with the prescriptive path, and therefore it must be addressed to ensure equity in the code.

		2021 IECC	2024 IECC
Max ERI	Climate Zone 6	54*0.95 = 51.3[2]	53
	Climate Zone 7	53*0.95 = 50.35	52

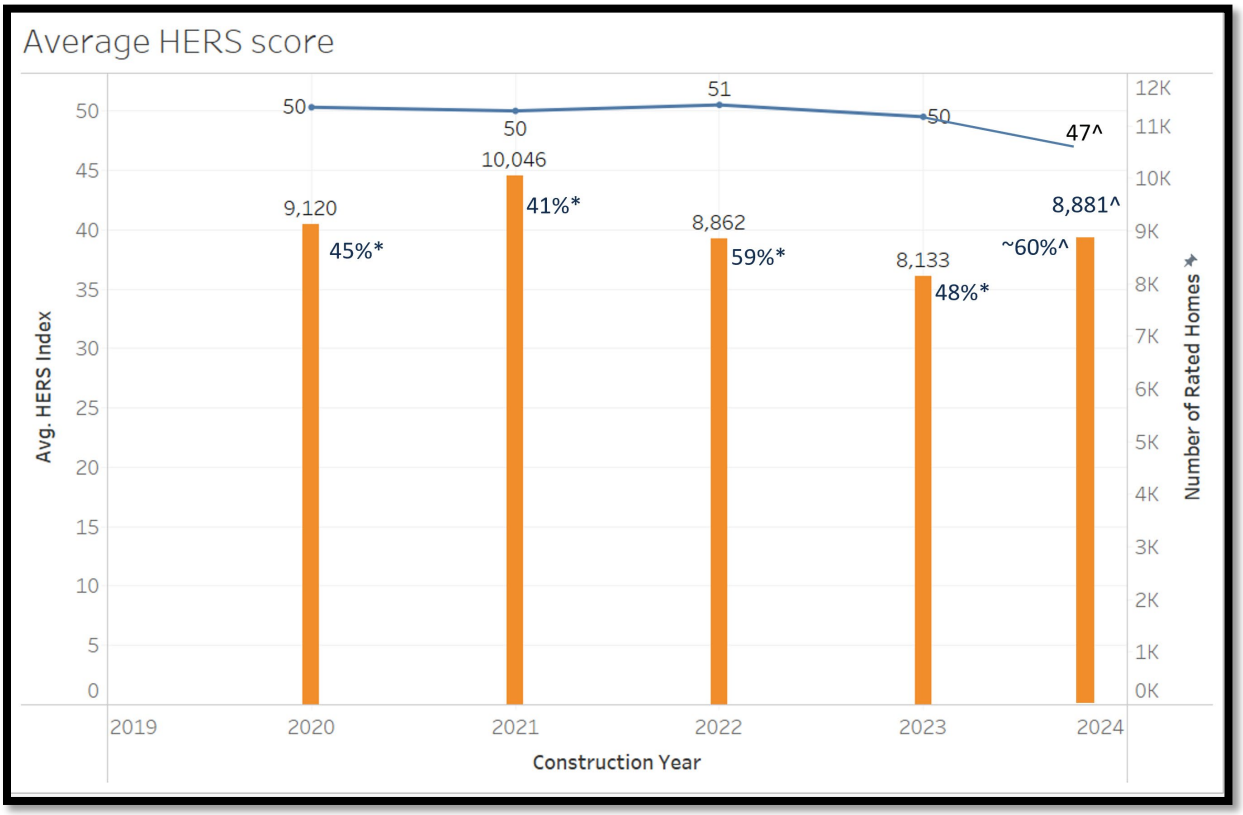
HERS/ERI Participation

Since 2020 over 45,000 homes built in MN have received a HERS index, which represents roughly half of the homes built in the state. Builders are primarily pursuing this rating to qualify for utility programs, but given the volume of participation it has become a robust data set that represents current new construction practices. These are also the builders that are most likely to use the ERI compliance path. The average rating from 2020 to 2023 was between 50 and 51, with an average rating of 47 in 2024. This indicates how

[1] 4 ENERGY RATING CALCULATION PROCEDURES - 2019 ANSI/RESNET/ICC 301 STANDARD FOR THE CALCULATION AND LABELING OF THE ENERGY

[2] 2021 IECC max ERI values are multiplied by 0.95 as required by the code and discussed further in section N1108 below.

popular this code compliance pathway will be with builders, as many are familiar with this rating and know that they can use the ERI pathway to meet code. It also shows that builders are easily meeting the 2024 ERI requirements with current building practices, even though we know that <5% of these homes would meet the 2024 prescriptive path based on the wall insulation requirements alone.



* % of MN homes that received a rating that year (# of rated homes / # of homes built) from annual RESNET report
^ preliminary 2024 data

Code Change Proposal

The goal of the code change proposal is to ensure that no compliance path is significantly easier for a builder to achieve compared to another. The simplest way to do this is to lower the maximum allowable ERI to a value that is equivalent to the prescriptive path. Making this change will promote fairness, equity and strengthen confidence in the code process.

ERI Modeling Exercise

We completed a modeling exercise to understand the ERI a home would achieve if it met the 2024 prescriptive path. To do this, we generated 8 different house types that represent a variety of construction that exists in Minnesota today, with house type 4 representing the typical home in terms of size and type.

Prescriptive Path Inputs

- Wall insulation – R-20 +5
- Attic insulation – R-49
- Foundation Walls – R-15
- Slab Perimeter – R-10
- Air leakage – 2.5 ACH50
- Window: U-0.28; SHGC 0.30
- Doors: R-5

- ERV - 65% SRE
- Duct leakage to outside– 4cfm/100sq.ft.
- Pipe insulation – R-3

Home Appliance Inputs – not covered by code

The ERI and Simulated Building Performance pathways are modeling pathways that include appliances that are not covered by code. To determine what values to enter in the model for these appliances we evaluated data from RESNET for over 35,000 homes built in MN between 2020 and 2023. For each of these inputs, we used a conservative approach, typically selecting values that were less efficient than the market average for that appliance. Details on the inputs selected for these appliances are outlined below.

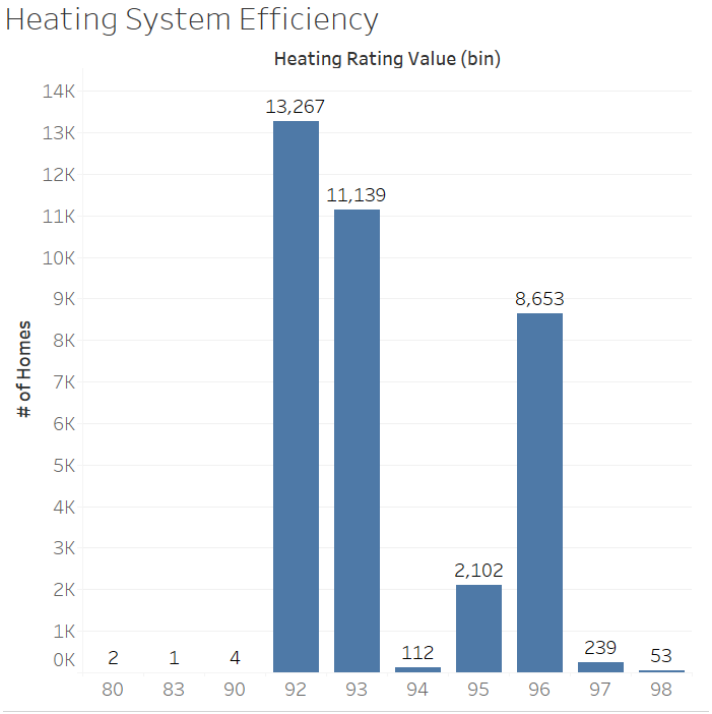
Furnace Efficiency Input – 92 AFUE

Market average – 93.6 AFUE

The average furnace efficiency from 35,590 HERS ratings from 2020-2023 was 93.6.

Market Distribution

To be conservative, 92 AFUE was used in the modeling exercise. For reference, adjusting the furnace efficiency from 92 to 95 AFUE would lower the ERI by 1.1 for house type 4.



Air-Conditioning Efficiency Input – 14 SEER

Market average – 13.94

The average cooling efficiency from 36,149 HERS ratings from 2020-2023 was 13.94.

Starting January 1, 2023, the federal minimum standard requires a 14 SEER AC or higher, so 14 SEER was selected.

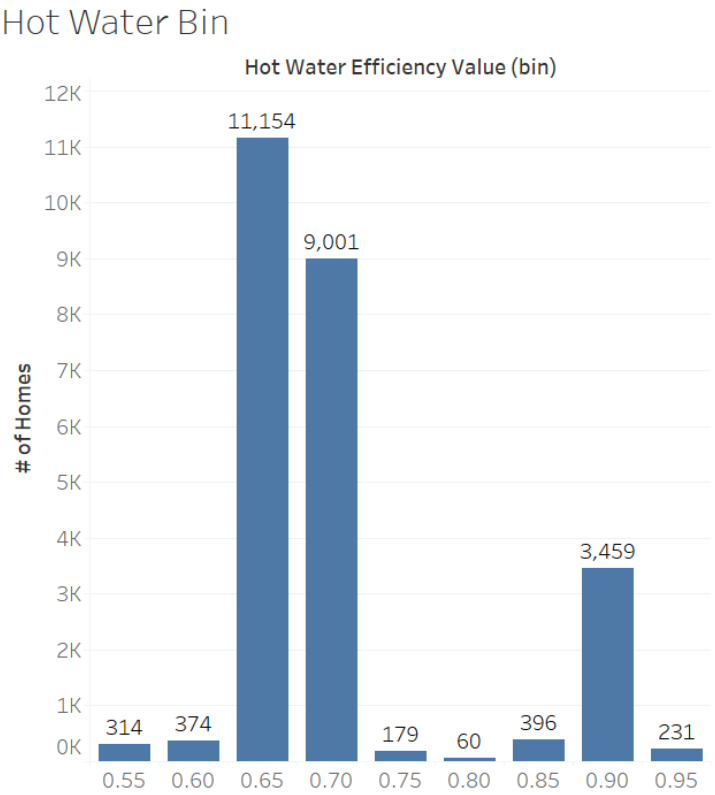
Water Heating Efficiency Input – 0.70 UEF

Market average – 0.74 UEF

The average gas water heater efficiency from 25,168 HERS ratings from 2020-2023 was 0.74 UEF.

Market Distribution

The vast majority of water heaters are 50-gallon gas water heaters. A 0.70 unit is slightly below market average but is representative of the market. For house type 4, upgrading a water heater from 0.70 to 0.92 would lower the ERI by 2.7.



HERS Reference Appliances

Clothes Washer, Dryer and Dishwasher

The clothes washer, dryer, and dishwasher were all input into the software using the 'HERS Reference' option. This option is used when no appliance is in place and represents higher energy use compared to the other options a rater can select (Standard, ENERGY STAR, etc.). This is a conservative approach as most appliances use less energy than the HERS Reference. Energy use details for these options can be found here - https://ekotrope.freshdesk.com/support/solutions/articles/17000106467-appliance-default-values

Gas Oven and Dryer

A gas oven and gas dryer were selected. Choosing an electric oven or electric dryer results in a slightly lower ERI (<0.5), so selecting gas options represents a worst-case scenario for these appliances.

Refrigerator and Freezer

The software requires HERS Raters to enter the total energy consumption of every refrigerator and freezer in the home as a kWh/year value. For this modeling exercise a value of 691 kWh/yr was used for each home type.

For reference, the large refrigerator on the left (pictured below) from a recent new construction site visit uses 670 kWh per year and refrigerator on the right is a smaller refrigerator that uses 370 kWh/yr.

Again, a fair value was selected, which represents larger refrigerators often seen in new construction homes, as to not skew the data to lower ERI outcomes.

Lighting – 100% LEDs

LED lighting has become ubiquitous and is required by federal standards for most lights.

Section N1108 (R408) – Additional Efficiency Requirements

The 2021 model code requires the max ERI to be multiplied by 0.95 to account for the prescriptive path requirements outlined in section N1108. This section outlines a series of credits that are equivalent to 5% energy savings and are required for the prescriptive path. This section includes a variety of options that were not considered in this modeling exercise. Therefore, the results outlined below are a conservative representation of what a prescriptive home would achieve using the ERI pathway.

Modeling Results

House #	House Type	Foundation Type	Number of Bedrooms	Size of the House (sq.ft.)	ERI
1	Townhome	Slab on grade	3	1900	50
2	Townhome	Basement	3	2500	50
3	Single Family	Basement	3	2500	50
4	Single Family	Basement	4	3699	50
5	Single Family	Slab on grade	3	1500	50

6	Single Family	Basement	4	4490	50
7	Single Family	Slab on grade	4	2500	48
8	Single Family	Slab on grade	4	3500	49

Conclusion

The modeling results show a range of ERIs from 48 to 50, with the majority of homes achieving a 50. If you apply a 5% savings factor to account for section N1107, this results in an ERI of 47.5 (50*0.95 = 47.5). Again, in an effort to be conservative and recommend an achievable max ERI, we are recommending a maximum allowable ERI of 48 for climate zone 6. This ERI is also sympathetic to current market conditions where the average ERI of over 8,000 rated homes in MN in 2024 was 47.

All of these homes were modeled in climate zone 6 (St. Paul, MN). Modeling house type 4 in climate zone 7 (Duluth, MN) reduced the ERI by 1. This aligns with the 2021 and 2024 model code requirements, where the maximum allowable ERI's for climate zone 7 are 1 point lower than climate zone 6. Therefore, our code change proposal is recommending a maximum allowable ERI of 47 for climate zone 7.

***Note: The information you provide in this code change proposal form is considered Public Data and used by the TAG to consider your proposed modification to the code. Any code change proposal form submitted to DLI may be reviewed at public TAG meetings and used by department staff and the Office of Administrative Hearings to justify the need and reasonableness of any proposed rule draft subject to administrative review and is available to the public.

****Note: Incomplete forms will be returned to the submitter with instruction to complete the form. Only completed forms will be accepted and considered by the TAG. The submitter may be asked to provide additional information in support of the proposed code change.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Erin Sherman

Date: March 24, 2025 (Revised April 10, 2025)

Email address: esherman@rmi.org

Model Code: 2024 IECC-R

Telephone number: 518 364 3763

Code or Rule Section: Multiple

Firm/Association affiliation, if any: RMI

Topic of proposal: Energy efficiency metrics, credits, & goals

Code or rule section to be changed: IRC N1101.1 (R101.2), N1101.6 (R202), N1101.13 (R401.2), N1105.3.2 (R405.4.2), N1108.2 (R408.2), Not explicitly adopted but informing approach: Appendix NG (Appendix RG)

Intended for Technical Advisory Group ("TAG"): Residential energy efficiency

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General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☐	☒
B. Is the proposed change required due to climatic conditions of Minnesota?	☐	☒
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☒	☐

Proposed Language

1. The proposed code change is meant to:

☒ change language contained the model code book? If so, list section(s).
N1101.1 (R101.2), N1101.6 (R202), N1101.13 (R401.2), N1105.3.2 (R405.4.2), N1108.2 (R408.2), Appendix NG (Appendix RG).

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ delete language contained in the model code book? If so, list section(s).

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ add new language that is not found in the model code book or in Minnesota Rule.

Summary

Why? This proposal would require a dwelling unit's compliance with the energy code to be judged in relation to a single conservation objective regardless of fuels used in the dwelling unit. This change would recognize situations in which some appliance types are categorically more efficient than others and allow builders to select more efficient appliance categories to earn credit toward code compliance. By adding these new options within compliance pathways, this proposal would improve the feasibility and affordability of implementing Minnesota Statute 326B.106 Subdivision 1 Paragraph (g), which requires a 70% reduction in annual net energy consumption from 2006 model code levels for new dwelling unit permits by 2038.

How are conservation objectives unequal in the model code?

- **Code structure:** In the model code, every compliance pathway works by setting a baseline or standard reference design and requiring a home to exceed that baseline's efficiency by a certain amount to comply. While the details differ between compliance pathways, they all set baselines that are specific to the appliance types proposed in the home. In other words, a home with gas-burning space and water heating equipment is compared to a baseline model with gas-burning space and water heating equipment, and a home with all-electric equipment is compared to an all-electric baseline model.
- **Unequal baselines and goals:** Due to inherent qualities of different home energy technologies, however, baselines using different equipment types vary widely in energy efficiency. The code generally sets equal requirements for percent improvement relative to the baseline regardless of equipment types used, such that code-compliant homes must meet highly divergent effective conservation objectives depending on equipment type.
- **Results and lost opportunity:** Pacific Northwest National Laboratory energy models for the 2024 IECC suggest that in Climate Zone 6A (specifically in Rochester, MN), a single-family home using gas equipment for space and water heating uses over 40% more energy than an otherwise similar home that uses electric heat pumps for those end uses. If builders were able to earn credit toward compliance for the higher efficiency of electric heat pumps, it would create lower-cost compliance options to reach the annual net energy consumption levels required by Minnesota Statute.

How does this proposal equalize conservation objectives? This proposal makes four structural changes to achieve equal conservation objectives regardless of fuels used in the dwelling unit:

1. Set equal reference models for dwelling units, regardless of fuels used. (To use an analogy: This is like having every runner start at the same starting line in a race.)
2. Set equal conservation objectives relative to those reference models. (To continue the analogy: This is like setting the same finish line for every runner in the race.)
3. Offer options to earn due credit toward compliance through selecting efficient appliance types.
4. Use site energy efficiency as the conservation objective metric.

Each of these changes affect all compliance pathways. This proposal would also adopt conservation objectives consistent with Appendix NG, the 10%-higher-efficiency stretch code appendix, and make select additional adjustments to offset the reduced baseline efficiency from using a natural gas baseline for all new dwelling units.

Note: This proposal specifies that certain conservation objectives and credits be recalculated to reflect site energy savings to align with Minnesota statute. Should the TAG and/or CCAC be interested in adopting this proposal, they should seek technical assistance from an organization with appropriate energy modeling experience, such as MN CEE or PNNL, to recalculate figures appropriately. RMI can assist in the identification or provision of an appropriate technical assistance resource if requested.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   This change would assist Minnesota to cost-efficiently comply with statute: 326B.106 Subdivision 1 Paragraph (g). It is not strictly required by the statute.

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Prescriptive Compliance
Amend as follows.

> **N1108.2 (R408.2) Additional energy efficiency credit requirements.** *Residential buildings* shall earn not less than ~~10~~ 20 credits from not less than two measures specified in Table N1108.2. Five additional credits shall be earned for *dwelling units* with more than 5,000 square feet (465 m2) of *living space* located above *grade plane*. To earn credit as specified in Table N1108.2 for the applicable *climate zone,* each measure selected for compliance shall comply with the applicable subsections of Section N1108. Each *dwelling unit* of *sleeping unit* shall comply with the selected measure to earn credit. Interpolation of credits between measures shall not be permitted.

*Amend **Table N1108.2** so that all credit values are "TBD." Credit values for existing measures shall be recalculated to reflect site energy improvements compared to a standard reference design that uses a natural gas furnace and natural gas tank water heater, neither of which may exceed the Department of Energy's currently effective minimum efficiency standard for those products.*

*Add rows to **Table N1108.2** as follows. The "TBD" credit values for these new measures shall be calculated to reflect site energy improvements compared to a standard reference design that uses a natural gas furnace and a natural gas tank water heater, neither of which may exceed the Department of Energy's currently effective minimum efficiency standard for those products.*

MEASURE NUMBER	MEASURE DESCRIPTION	CREDIT VALUE
N1108.2.2(15)	Federal Minimum Efficiency Heat pump	TBD
N1108.2.3(8)	Federal Minimum Efficiency Heat pump water heater	TBD

*Add option under **N1108.2.2** as follows:*

> 15. Federal Minimum Efficiency Heat pump: Air source heat pump having an efficiency rating equal to or exceeding the minimum required by federal law for the geographic location where the equipment is installed.

*Add a row in **Table N1108.2.3** as follows:*

MEASURE NUMBER	WATER HEATER	SIZE AND DRAW PATTERN	TYPE	EFFICIENCY
N1108.2.3(8)	Federal Minimum Efficiency Heat pump water heater	Any	HPWH with or without hybrid electric resistance element	Any efficiency equal to or exceeding currently effective US Department of Energy minimum energy efficiency standards

Simulated Building Performance Compliance

*Add a definition to **Section N1101.6** as follows:*

SITE ENERGY USE. The metric indicating the total amount of energy consumed by a *building* in 1 year.

Amend as follows:

N1105.2 (R405.2) Simulated building performance compliance. Compliance based on *simulated building performance* requires that a *building* comply with the following:

1. The requirements of the sections indicated within **Table N1105.2.**
2. The proposed total *building thermal envelope* thermal conductance, TC, shall be less than or equal to the *building thermal envelope* TC using the prescriptive *U*-factors and *F*-factors from **Table N1102.1.2** multiplied by ~~1.08~~ 1.05 ~~in Climate Zones 0, 1 and 2, and 1.15 in Climate Zones 3 through 8~~ in accordance with **Equation 11-1** and **Section N1102.1.5**. ~~The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.~~
3. ~~For each *dwelling unit* with one or more fuel-burning appliances for space heating, water heating, or both, the~~ The annual ~~*energy cost*~~ *site energy use* of ~~the~~ each *dwelling unit* shall be less than or equal to ~~80~~ 70 percent of the annual ~~*energy cost*~~ *site energy use* of the *standard reference design*. ~~For all other *dwelling units*, the annual *energy cost* of the *dwelling unit* shall be less than or equal to 85 percent of the annual *energy cost* of the *standard reference design*.~~ For each *dwelling unit* with greater than 5,000 square feet (465 m^2) of *living space* located above *grade plane*, the annual ~~*energy cost*~~ *site energy use* of the *dwelling unit* shall be reduced by an additional 5 percent of annual ~~*energy cost*~~ *site energy use* of the *standard reference design*. ~~Energy prices shall be taken from an *approved source*, such as the US Energy Information Administration's state energy data system prices and expenditures reports. *Code officials* shall be permitted to require time-of-use pricing in *energy cost* calculations.~~

~~**Exceptions:**~~

~~1. The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost*. The source energy multiplier for electricity shall be 2.51. The source energy multiplier for fuels other than electricity shall be 1.09.~~
2. ~~The energy use based on site energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost*.~~

*Amend **Table N1105.4.2(1)** to require a standard reference design that uses minimum-efficiency natural gas equipment for space and water heating as follows. Rows not depicted, including sub-rows, are unchanged.*

TABLE N1105.4.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems[d, e, ~~j, k~~]	Fuel type/capacity: natural gas, with capacity the same as proposed design.	As proposed.
	Product class: if the proposed design uses only natural gas heating systems, same as proposed design. For any proposed heating systems that do not use natural gas, the *standard reference design* shall include a heating system of a product class that uses natural gas. For *proposed designs* with forced air or electric resistance radiative heating systems,	As proposed.

	substitute a furnace. For *proposed designs* with hydronic heating systems, substitute a boiler.	
	Efficiencies:	
	~~Heat pump: complying with 10 CFR §430.32.~~	~~As proposed.~~
	Fuel gas and liquid fuel furnaces: complying with and having efficiency ratings equal to the minimum requirements of 10 CFR §430.32.	Forced air and electric resistance heating systems as proposed.
	Fuel gas and liquid fuel boilers: complying with and having efficiency ratings equal to the minimum requirements of 10 CFR §430.32.	Hydronic heating systems as proposed.
Service water heating[d, g, ~~k~~]	Fuel type and product class: ~~same as proposed design~~ natural gas tank water heater complying with and having efficiency ratings equal to the minimum requirements of 10 CFR §430.32.	As proposed.
Thermal distribution systems	Duct insulation: in accordance with **Section N1103.3.3**.	Duct insulation: as proposed.[~~m~~k]
	Duct location:	Duct location: as proposed.[~~l~~j]

SI unit information and footnotes a, b, and c are unchanged. Amend footnote d as follows:

d. For a proposed design with multiple heating, cooling or water heating systems using different ~~fuel types~~ product classes, the applicable standard reference design system capacities and ~~fuel types~~ product classes shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each ~~equipment and fuel type~~ product class present.

Footnotes e and f are unchanged. Amend footnote g as follows:

g. For a proposed design without a proposed water heater, the following assumptions shall be made for ~~both~~ the proposed design and the standard reference design. ~~For a proposed design with a heat pump water heater, the following assumptions shall be made for the standard reference design, except the fuel type shall be electric.~~
Fuel type: for the standard reference design, natural gas. For the proposed design, the same as the predominant heating fuel type in the proposed design.
Rated storage volume: 40 gallons
Draw pattern: medium
Efficiency: Uniform Energy Factor complying with and not exceeding the minimum efficiency requirements of **10 CFR** § 430.32

Footnotes h and i are unchanged. Delete footnotes j and k. Renumber footnote l as footnote j. Renumber footnote m as footnote k.

ERI Compliance
*Amend as follows. The to-be-determined ERI values in the new **Table N1106.5** columns shall be calculated such that they result in equivalent site energy outcomes for a building that uses natural gas for space and*

*water heating and attains the ERI indicated in the model code's **Table N1106.5** and a building that meets the enumerated requirements and attains the increased, electric-heat-building ERI.*

N1106.5 (R406.5) ERI-based compliance. Compliance based on an *Energy Rating Index* (ERI) analysis requires that the *rated design* and each confirmed as-built *dwelling unit* be shown to have an *ERI* less than or equal to the applicable value indicated in **Table N1106.5** where compared to the *ERI reference design* as follows:

1. Where the building uses *purchased energy* that is not electricity for space heating or *service water heating* ~~on-site renewables are not installed~~, the maximum ENERGY RATING INDEX NOT INCLUDING OPP, MIXED-FUEL BUILDING applies.
2. Where the building does not use *purchased energy* that is not electricity for space heating or *service water heating*, the maximum ENERGY RATING INDEX NOT INCLUDING OPP, ELECTRIC HEAT BUILDING applies.

~~2. Where on-site renewables are installed, the maximum ENERGY RATING INDEX WITH OPP applies.~~

Amend table as follows.

TABLE N1106.5
MAXIMUM ENERGY RATING INDEX

~~CLIMATE ZONE~~	ENERGY RATING INDEX NOT INCLUDING OPP		~~ENERGY RATING INDEX WITH OPP~~
	MIXED-FUEL BUILDING	ELECTRIC HEAT BUILDING	
~~0 and 1~~	~~51~~	~~-~~	~~35~~ ~~-~~
~~2~~	~~51~~	~~-~~	~~34~~ ~~-~~
~~3~~	~~50~~	~~-~~	~~33~~ ~~-~~
~~4~~	~~53~~	~~-~~	~~40~~ ~~-~~
~~5~~	~~54~~	~~-~~	~~43~~ ~~-~~
6	~~53~~ 48	TBD	~~43~~
7	~~52~~ 47	TBD	~~46~~
~~8~~	~~52~~	~~-~~	~~46~~ ~~-~~

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
   No.

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)

- Statute 326B.106 requires that Minnesota must update its energy code to achieve a 70 percent reduction from baseline in annual net energy consumption or greater by 2038. The baseline is the 2006 International Energy Conservation Code State Level Residential Codes Energy Use Index. This baseline is based on site energy use index. Reaching 70% reduction from each baseline without rewarding more efficient appliance types will require expensive, restrictive measures.
- The structure of the IECC has historically prevented designers from complying by selecting efficient product classes. While efficiency within a product class could count toward compliance, minimum-efficiency products could not - even if they use far less energy than a high-efficiency product of another class. This structural decision means that a building that uses efficient product classes, such as heat pumps and heat pump water heaters, must reach a much more stringent conservation objective in order to comply with the code than a building that uses less efficient product classes, such as combustion-fueled space and water heaters. This disincentivizes efficient product classes to the detriment of building energy efficiency and financial outcomes for both the builder and the occupant.
- The lack of a single conservation objective limits the extent to which the code can increase in efficiency over time while providing builders with the maximum flexibility to choose how to comply. Because space and water heating comprise such a large share of total dwelling unit energy use - around 50%, depending on the climate zone - a major reduction to the energy use for those end uses can lead to a commensurately large drop in total dwelling unit energy. This drop is roughly equivalent to the total energy savings from code modeled by PNNL between the 2006 IECC and the 2021 IECC, as well as approximately half the energy savings needed to reach Minnesota's statutory goal of a 70% net energy savings by 2038. If that efficiency cannot be encouraged by the code due to its structure, and builders cannot claim it toward compliance, each successive edition of the code will be drastically more limited in the means available to achieve efficiency improvements.

2. Why is the proposed code change a reasonable solution?
   This code change makes minimal changes to the process to comply with and enforce the code, while still creating a level playing field between fuel types and doing so in a manner that is highly conservative with regard to federal energy conservation law.

3. What other factors should the TAG consider?
   1. While this code proposal includes modifications to N1105, the proponent also supports other proposals that would remove this section entirely to simplify compliance and enforcement.
   2. While this code proposal includes modifications to N1106, the proponent also supports other proposals that would reduce maximum ERI scores to better align with the prescriptive pathway's efficiency outcomes.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.

   Three scenarios for cost changes in homes complying via the prescriptive pathway are described below. The US Department of Energy's 2024 IECC cost-effectiveness analysis was used as a reference for likely builder decisions within the prescriptive pathway, and the National Residential Efficiency Measures Database was used as a cost reference, with cost adjustments informed by RSMeans and Federal Reserve price indices for single-family home construction. All scenarios have the following characteristics, which were selected based on their relative prevalence in Minnesota according to US Department of Energy Building Energy Codes Program publications:
   - Single-family home
   - Heated basement
   - Climate zone 6A
   - Under 5000 sq ft in size

Scenario 1: Typical Heat Pump Appliances
Of our three scenarios, this scenario includes high-efficiency appliance types that would receive credit toward compliance proportionate to their energy savings in comparison to less efficient appliance types.

The DOE prototype home that matches this scenario adopts the following credits in R408 to earn 10 total credits:

- Integrated heat pump water heater: UEF = 3.30, worth 3 credits
- 80% of Ducts in Conditioned Space, worth 7 credits

PNNL residential energy modeling for the 2024 IECC prototype corresponding to this scenario and an otherwise similar prototype using gas appliances shows the below differences in energy use. Using these differences, we infer the approximate percentage energy use reduction attributable to the efficient appliance types. As N1108 credit values are intended to correspond to 1% total annual energy use reduction each, we assign estimated point values to each measure based on the energy reductions with which they are associated. We assume that the "TBD" credit values to be calculated by PNNL or a similarly qualified entity will approach, if not equal, these estimates. This informs our analysis of builders' credit options, their potential decisions and, therefore, total construction costs.

Space and water heating equipment:	**Annual space heating energy use (kBtu)**	**Annual water heating energy use (kBtu)***	**Total annual energy use (kBtu)**
Heat pump	43,446.70	3,438.94	103,680
Gas	60,463.40	14,859.50	138,889
% reduction between gas and heat pump: single end use	28.14% (kBtu: 17,016.7)	76.86% (kBtu: 11,420.56)	25.35% (kBtu: 35,209)
% reduction from total gas prototype energy use, and estimated R408 point value of end use change	12%	8%	n/a

*Both the heat pump water heater and gas water heater modeled exceed federal minimum standards.

The above comparison suggests that the entire credit requirement for a heat pump building might be satisfied through the selection of efficient heat pump equipment. However, to account for potential error given the high efficiency of both water heating systems considered, this analysis assumes that this home will not receive any additional credit for water heating efficiency. It only considers that a 12-point credit for a typical air-source heat pump may be made available.

A homebuilder intending to use heat pump equipment presented with a code that requires 20, rather than 10, N1108 credits, and offers 12 credits for the selection of a typical heat pump, would not need to alter course from their decisions under the model code. Their building would earn at least 22 total credits. However, if that homebuilder wished to reduce their costs, they could consider various approaches to earn 2 fewer credits. We will consider a relatively likely decision to minimize first costs: Instead of installing a high-efficiency water heater (3 credits), the homebuilder could install a demand-responsive thermostat (1 credit). Based on home center retail prices for the relevant equipment, this would have the following first-cost impacts:

- Instead of installing a UEF >3.0 water heater ($1700), the builder would install a UEF 0.93 water heater ($500), saving $1200.
- Instead of installing a basic thermostat ($20), the builder would install a demand-responsive thermostat ($90), spending an additional $70.
- Overall, the builder would save $1130.

Scenario 2: High Efficiency Gas Appliances
Homes using gas appliances and not pursuing efficiency opportunities through selection of higher-efficiency appliance categories would not have additional credits available under this code proposal, but would need to earn 20 credits instead of 10.

The DOE prototype home that most closely matches this scenario adopts the following credits in N1108 to earn 10 total credits:

- Gas-Fired Instant WH, UEF 0.95, worth 6 credits
- Compact Hot Water Distribution, worth 2 credits
- HRV installed, worth 2 credits (note that in Minnesota, balanced ventilation is required in new dwelling units, so this credit may not be appropriate or available)

Notably, this prototype does not claim credits associated with a high-efficiency air conditioner or furnace. Considering anecdotes from state and national code development processes, new homes are relatively unlikely to be equipped with 80% AFUE furnaces. If this prototype claimed the existing credit for a furnace with 95% AFUE ($2180), it would earn an additional 6 credits. Making the conservative assumption that the home otherwise would have been sold with minimum-efficiency heating equipment ($1520), the homebuilder would spend $660 on these credits.

Additionally, this prototype does not claim the 7-9 credits associated with ducts in conditioned space. For new homes with heated basements in Minnesota, again anecdotally, it is relatively unlikely that more than 20% of ducts would not be located in conditioned space. (Note that US DOE and PNNL's 2024 prototypes locate ducts in conditioned space for homes with conditioned basements by default, meaning this incremental cost would be zero – see PDF page 32-33.) Making the conservative assumption that all ducts otherwise would have been located in unconditioned space, the homebuilder could locate 100% of ducts in conditioned space at a cost of about $800 ($1800 additional for the shift in duct location, $1000 less due to savings from duct insulation).

The sum of existing credits (10), minus the HRV credit (2), plus efficient furnace (6) and duct location (9) credits would exceed the 20-credit requirement (23 credits total) at an incremental cost of $1460. If desired, the builder could drop the Compact Hot Water Distribution measure (2 credits) though US DOE and PNNL estimate that this credit reduces single-family home construction costs by $1590 (Table 3.2.4).

Scenario 3: Minimum Efficiency Gas Appliances

While it is uncommon for new homes to be sold with minimum-efficiency appliances as home buyers expect high performance, and efficient equipment is a cost-effective method to reduce energy use, demonstrating the feasibility of such an approach to construction is important under some interpretations of federal energy law. Considering the same prototype from Scenario 2:

- Gas-Fired Instant WH, UEF 0.95, worth 6 credits
- Compact Hot Water Distribution, worth 2 credits
- HRV installed, worth 2 credits (note that in Minnesota, balanced ventilation is required in new dwelling units, so this credit may not be appropriate or available)

A new home with all-minimum-efficiency gas appliances could not earn the Gas-Fired Instant WH credit and would need to earn 16 total credits to meet the 20-credit requirement. Among possible approaches, a builder could select a boiler to claim the 10-point Ductless or Hydronic Thermal Distribution credit and achieve a 15% reduction in total TC (6 credits). Alternatively, a builder could select a higher TC reduction and renewable energy credits to reach 16 total credits. These are relatively cost-intensive, but technically feasible, pathways; note, however, that in some cases attainment of "reduction in total TC" credits may result in opportunities to downsize or eliminate certain HVAC equipment and partially offset construction cost increases.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.

   There is no estimated cost increase for all-electric buildings that include heat pump equipment. The increased cost for mixed-fuel buildings would be associated with an approximate 10% reduction in energy use. US DOE and PNNL estimate that, in climate zone 6 (using a Minnesota exemplar city), the unamended 2024 IECC saves typical households $191 annually (Table 4.2) compared to the unamended 2021 IECC by saving 5.64% of total energy costs (Table ES.1). Assuming a proportionate savings increase, this code change would save households in new mixed-fuel homes an additional $338 per year.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   Cost savings and cost increases will both be borne by builders and homebuyers, depending on the different potential effects described above.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   No. The structure and options to comply with the code as amended by this proposal are unchanged from the base code. There are also no changes to prescriptive path envelope requirements that would require a specialized version of REScheck to be developed.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
   If any small businesses obtain permits and construct more than 17 new mixed fuel homes in the year following the code change, experience circumstances aligned with the conservative assumptions in the above analysis, do not increase home selling price at least proportionately and/or build on spec, and do not alter their construction practices to use more efficient appliance types, this rule could cost such a small business over $25,000. This scenario does not seem likely, though given the contractor-heavy employment structure of some general contractors, it is hypothetically possible.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?

The new home construction industry and manufacturers that supply energy-related products for home construction (e.g., insulation, HVAC equipment, air sealing, etc.) will be affected.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.

The alternative to this proposed change is to maintain the status quo, which does not credit heat pumps or heat pump water heaters for their higher energy performance. The proposed changes are preferable because they credit efficiency improvements that are ignored by the model code. These will enable a more realistic and affordable pathway to achieving Minnesota's statutory residential new construction energy efficiency requirements.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

This code proposal helps credit the higher energy performance of heat pumps and heat pump water heaters by adding a credit for those appliances in the prescriptive pathway, by setting less aggressive ERI scores for electric buildings and by measuring the performance pathway against a common standard reference design using natural gas appliances. The model code does not credit the higher energy savings of these measures, which will would result in an increased cost of compliance to attain the energy efficiency goals required by statute. This increases costs of complying with the code for homebuilders, and in turn for homebuyers.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.

Statute 326B.106 requires that Minnesota must update its energy code to achieve a 70 percent or greater reduction from baseline in annual net energy consumption by 2038. The baseline is the 2006 International Energy Conservation Code State Level Residential Codes Energy Use Index. This baseline is based on site energy use index. This proposal aligns credits and pathways to align with baseline.

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