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WALKING MOUNTAINS

ENERGY CODE IMPACT STUDY

3/19/2026

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TABLE OF CONTENTS

1 Glossary

A Regional Roadmap for a New Net Zero - The Net Zero New Construction Roadmap is a local government and utility staff-led effort to identify how the Eagle River and Roaring Fork Valleys can achieve zero carbon emissions for all new buildings by 2030. https://316756.fs1.hubspotusercontent-na1.net/hubfs/316756/ExecSummary_Lotus_RegionalNetZeroRoadmap_FINAL_111324.pdf

ASHRAE - American Society for Heating, Refrigeration, and Air-Conditioning Engineers.

DHW - Domestic hot water. Heating water for domestic or commercial purposes other than space heating and process requirements.

DOAS - Dedicated outdoor air system. A system that treats 100% outdoor air brought into a building for ventilation.

DX - Direct expansion. A type of air conditioning system that removes heat from a space through evaporation and condensation of a refrigerant.

ERV - Energy recovery ventilator. A system that improves indoor air quality by exchanging stale indoor air with fresh, filtered outdoor air while pre-conditioning it to save energy.

HSPF2 - Heating Seasonal Performance Factor 2. A measurement of the efficiency of air source heat pumps. The 2 value references an update to the testing policy to better reflect the actual operating conditions of the heat pumps.

HVAC - Heating, ventilating, and air conditioning. A system which provides outdoor and/or recirculated air that is heated and/or cooled to conditioned spaces within a building.

LECC - Low Energy and Carbon Code, created by the Colorado Energy Office Code Board in 2024 (https://docs.google.com/document/d/1NUxdKYUOqlXMWnjHa2qgv0HB2vNMIrDHWZPE63beIjs/edit?tab=t.0#heading=h.h12jicegyjwc)

MAU - Make up air unit. A system that introduces fresh, outdoor air into a building to replace exhausted air.

Net Zero - Any energy used by building systems is powered by 100% renewable energy, either through the electric grid or by onside renewable energy systems, such as photovoltaic arrays.

Performance Compliance - Energy code compliance pathway which requires compliance with the mandatory requirements within the energy code. An energy model is required to show a certain reduction in annual energy cost or use from a Standard Reference Design.

Prescriptive Compliance - Energy code compliance pathway which requires compliance with all requirements within the energy code (mandatory requirements as well as prescriptive requirements). Under the 2018 IECC and later, this pathway also requires compliance with Section C406 (Additional Energy Credits). Section C406 requires a certain number of credits to be achieved via numerous pathways.

Simple Payback - A calculation demonstrating the amount of time it takes to recoup the investment of an energy efficiency measure. The increase in initial cost is divided by the change in annual energy cost to determine the time it will take to recoup costs

2 Executive Summary

This report serves as a comprehensive analysis of the energy impacts of *A Regional Roadmap for a New Net Zero* (November 2024). As statewide climate changes warm our local climate, Colorado's mountain region is increasingly vulnerable to climate-related threats. To evaluate the impacts of the *Regional Roadmap* and help address growing climate risks specifically in the Eagle River and Roaring Fork Valleys, Group14 Engineering has modeled mixed-fuel and all-electric buildings that comply with the different steps from this roadmap for both commercial and residential new construction buildings. Our analysis shows that as the stringency of the *Regional Roadmap* increases, the energy use intensity and greenhouse gas emissions of new construction buildings will decrease. The *Regional Roadmap* also allows for optional additional upgrades, which will result in net zero new construction designs.

3 Energy Codes

A Regional Roadmap for a New Net Zero was developed in 2024 by a Cohort of building department staff, sustainability and building code experts, and local utility partners. This document aims to achieve new construction net zero buildings by 2030. The *Regional Roadmap* differentiates between residential and commercial new construction, with tailored requirements for each. To help these mountain towns achieve their climate action goals by 2030, the *Regional Roadmap* is divided into the following steps with suggested timelines:

A. Step A - Suggested time frame: 2024-2026
B. Step B - Suggested time frame: 2026-2029
C. Step C - Suggested time frame: 2030 and beyond

With each step, there are more stringent energy efficiency and electrification requirements to ensure net zero new construction by 2030. Table 1 highlights the major differences between each step with the full table located in the Appendix. These key differences are applicable to both residential and commercial new construction.

	Step A	**Step B**	**Step C**
Energy Efficiency	Adopt the 2021 or 2024 IECC base code and the required state Electric and Solar ready code, at a minimum	Adopt the State Minimum Code (HB22-1362): State Low Carbon and Energy Code based on the 2024 IECC or the 2027 IECC	Adopt the most recent IECC. Identify above code options to drive additional energy efficiency as necessary
Electrification	**Electric-preferred code** to encourage electrification of new buildings, along with, electric-readiness for all energy end uses in a building	**All-electric with exceptions** for gas supplemental heat, emergency generators, and other items as decided by AHJs or building officials	**All-electric with no OR rare exceptions** as decided by AHJs or building officials

Table 1

To understand the impacts of these policies, Group14 Engineering has developed pathways compliant with each of the steps for up to three different HVAC systems per occupancy. Step A pathways will use the current Town of Avon's energy code.

The current code enforced in the Town of Avon is the 2021 IECC with additional amendments. Per Ordinance 24-03, the Town of Avon has amended the 2021 IECC requiring all gas-fired boilers and furnaces to have a minimum efficiency of 92% AFUE. Additionally, the state mandated solar-ready, electric ready and EV ready codes are also included in all modeling pathways.

All building designs have been evaluated using the prescriptive pathway under the applicable energy codes for each step of the *Regional Roadmap*. For Step A, The 2021 IECC establishes energy efficiency requirements for building envelope performance, HVAC, service water heating, and power and lighting systems. Separate provisions are required for residential and commercial buildings. For prescriptive compliance, an additional 10 energy efficiency credits are required, which can be met through a variety of options - most commonly by reducing lighting power density above what is required by the base code and providing more efficient service water heating. Step A models include the Town of Avon's electric preferred code.

Step B of the *Regional Roadmap* requires compliance with Colorado's Low Energy and Carbon Code (LECC), which was developed by the Energy Code Board, a stakeholder group convened to align building codes with state energy efficiency and carbon reduction goals. The LECC uses the 2024 IECC as a base with amendments to clarify and simplify the code, while requiring additional energy efficiency to reduce on-site carbon emissions. Like the 2021 IECC, the residential portion of the LECC requires 10 credits for prescriptive compliance. The commercial portion of the code however, requires a much higher number of additional energy efficiency credits to show compliance. Additional major changes to the LECC as compared to the 2024 IECC for commercial buildings are:

- No mandatory on-site solar
- Removes mandatory compliance with Renewable and Load Management credits
- Increased prescriptive credit requirements:
    - 71-172 credits for buildings using heat pumps for space and water heating
    - 89-172 credits for buildings using natural gas systems
- The performance compliance method was updated to allow site energy use in lieu of cost
- Demand response controls required for HVAC, service water heating, and lighting systems (lighting only in commercial buildings)

Step B also has requirements for all-electric buildings that only allows exceptions for gas supplemental equipment, emergency generators, and other items as decided by AHJs or building officials.

Within Step C of the *Regional Roadmap*, jurisdictions are recommended to adopt the latest version of the IECC or LECC. To account for the expected increase in energy efficiency of the future code, annual energy use and cost have been reduced per PNNL's calculations of energy code advances in efficiency over the last 10 years (7% increase). Step C also has requirements for all-electric buildings similar to Step B; however, Step C only allows rare exceptions as decided by AHJs or building officials.

This report was developed prior to the final LECC publication date and so does not include potential credits in the residential and commercial sections of the code that currently do not have credit values assigned to them. These include:

- H06: Evaporative cooling
- H07: High efficiency heating credit alignment
- M01: Refrigerator doors
- R408.2.2(10): Federal minimum efficiency heat pump
- R408.2.2.2: Evaporative cooling
- R408.2.3(8): Federal minimum efficiency heat pump water heater
- R408.2.4.1: Duct leakage testing in all units
- R408.2.5.1: ERV or HRV preheating
- Rf08.2.12: Dark sky exterior lighting
- R408.2.13: Snow melt and deicing controls
- R408.2.15: Refrigerants

4 Typical Construction Practices

Eagle River and Roaring Fork Valleys are located in ASHRAE climate zones 5B, 6B, and 7. Because of cold temperatures in these climate zones, projects typically install cold climate heat pumps because they are able to maintain heating capacity and efficiency in temperatures well below freezing. While cold climate heat pumps are not required by the energy code, it is typical construction practice for all-electric buildings in these regions. To accurately represent typical new construction in these areas of Colorado, we have modeled cold climate heat pumps for Steps B and C and standard, code-compliant heat pumps for Step A.

Several rebate programs are available in the region, including Energy Smart Colorado rebates administered by Walking Mountains, rebates offered by the Community Office for Resource Efficiency (CORE), and Holy Cross Energy, the primary electric utility provider for most of the region, also provides rebates. CORE provides rebates to projects that install heat pumps that are rated down to -5 deg F and with HSPF2 ≥ 9.5 and COP at 5 deg F of 1.75 or higher (ductless) or HSPF2 ≥ 8.1 and COP at 5 deg F of 1.75 or higher (ducted). Walking Mountains and Holy Cross provide rebates to projects that install heat pumps that are rated down to 5 deg F with HSPF2 ≥ 10 (ductless) or HSPF2 ≥ 9 (ducted). To meet the requirements of all programs, the cold climate packaged terminal heat pumps have been modeled with a heat pump operation down to -5 deg F with a 9 HSPF2 and the cold climate split heat pumps with heat pump operation down to -5 deg F with a 10 HSPF2. While these heat pumps are eligible for rebates in the region, these rebates have not been factored into the first cost calculations.

The Step A split heat pumps have been modeled as a standard efficiency of 14.3 SEER2, 7.5 HSPF2, and heat pump operating temperature of 40 deg F. The Step A packaged terminal heat pumps have been modeled with a standard efficiency of 9.5 EER, 2.9 COP, and heat pump operating temperature of 40 deg F. The cold climate efficiency and heat pump operating temperature for Steps B and C is as detailed above. Modeling Step A with a standard operating temperature of 40 deg F and Steps B and C with a cold climate operation down to -5 deg F will help highlight the benefits of cold climate operation in these regions.

CORE, Walking Mountains, and Holy Cross Energy also provide rebates for heat pump water heaters. CORE requires Energy Star certification and Walking Mountains and Holy Cross require heat pump water heaters that have electric resistance backup (no propane or natural gas). There are almost 600 Energy Star[1] certified heat pump water heaters with a range of efficiencies and heat pump operating temperatures that qualify for rebates in this region. We have modeled a heat pump water heater with a 3.9 UEF and 23 deg F operating temperature as this appears to be an average between the highest efficient model and minimum code required efficiency and better represents typical model selection in the region. The cold climate split heat pumps and heat pump water heaters detailed above are included in all models Steps A through C of this analysis.

5 Modeling Protocol

For this analysis, the impacts of the *Regional Roadmap* are analyzed using the whole building energy modeling simulation program OpenStudio version 3.3 with an EnergyPlus 9.6 simulation engine. This simulation program is used to perform a detailed analysis of all energy flows within, into, and out of a building, doing a separate calculation for each hour of the year. The model includes details of architectural, mechanical, and lighting systems, as well as interior loads such as occupants and plug loads. Modeling outputs are extensive and include hourly monthly and annual energy use, energy cost, and details of HVAC performance.

[1]https://www.energystar.gov/productfinder/product/certified-heat-pump-water-heaters/

Modeling scenarios have been developed for the following building types:

1. Single family home (3,100 SF)
2. Multifamily building (42,000 SF, 3-stories)
3. Hotel with restaurant (50,000 SF)

Each building type is detailed below with additional model input information located in the Appendix. Each building design has been developed to achieve prescriptive compliance at the lowest first cost. With the exception of cold climate heat pumps and heat pump water heater efficiencies, compliance packages are selected from the options in Section R408 and C406 of the applicable energy code for each step within the *Regional Roadmap*. These options include measures such as increasing thermal envelope insulation, minimizing lighting energy use, and increasing HVAC system efficiency.

The models were all run using the Eagle County, CO TMY3 weather file which includes hourly data for dry bulb, wet bulb, precipitation, solar irradiation, cloud cover, wind, and more.

The models use Holy Cross electricity rates and Black Hills natural gas rates as this is the region's majority provider. The single family home uses the Holy Cross small residential rate structure, the multifamily building uses the Holy Cross large residential rate structure, and the hotel building uses the Holy Cross large commercial rate structure. The single family and multifamily building use Black Hills residential natural gas rate structure and the hotel building uses Black Hills small commercial natural gas rate structure. The blended rate, cost/kBtu, for all electricity and natural gas rates used in this analysis are shown in Table 2. Costs per kWh, kW, therms, and monthly charges can be found in the Appendix.

The cost of natural gas for single family homes per kBtu is significantly higher than the other occupancies because, for the systems specified, the natural gas use is very low. Despite this low usage, each customer is required to pay the same monthly customer charge for connection to the natural gas system. This drives up the estimated cost per kBtu.

	Single Family	Multifamily	Hotel
Electricity	$0.033/kBtu	$0.027/kBtu	$0.028/kBtu
Natural Gas	$0.061/kBtu	$0.039/kBtu	$0.012/kBtu

Table 2

Single Family

The single family analysis is a 3,100 SF single family home. This was selected because it is the rough average size of residential new construction in Eagle and Pitkin counties. The home has a garage on the ground level with two stories of living space above. The analysis assumes wood-framed construction. The HVAC and DHW systems analyzed are shown in Table 3. The blue color indicates natural gas heating, yellow indicates primarily electric heating with back-up natural gas, and green indicates all-electric designs.

Mixed-Fuel	**Step A**	**Step B**	**Step C**
HVAC	Gas boilers with split DX cooling	Split heat pump with back up gas heat (-5 deg F heat pump operating temp)	-
DHW	Natural gas storage water heater	Heat pump water heater with supplementary natural gas heat	-
System 1	**Step A**	**Step B**	**Step C**
HVAC	Split heat pump with back up electric heat (40 deg F heat pump operating temp)	Split heat pump with back up electric heat (-5 deg F heat pump operating temp)	2027 IECC - Split heat pump with back up electric heat (-5 deg F heat pump operating temp)
DHW	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat	2027 IECC - Heat pump water heater with supplementary electric heat

Table 3

For both energy codes used in this analysis, 10 additional efficiency credits are required to comply prescriptively under R408. To achieve the required credits, all options comply with 100 percent of the duct thermal distribution system located in conditioned space and increased water heater efficiency, requiring condensing gas water heaters or heat pump water heaters.

The suggested timeline for Step C is 2030 and beyond. In 2030, mountain town jurisdictions will likely be under the 2027 IECC or later. Because the 2027 IECC has not yet been finalized and changes are difficult to predict, Group14 Engineering has estimated the energy efficiency improvement from the LECC to the 2027 IECC to be about 7% using historical data: *Estimated Improvement in Residential & Commercial Energy Codes* located in the Appendix. A 7% reduction will be applied to Step C models to estimate energy use, energy cost, and carbon emissions at that stage.

Multifamily

The multifamily building is a 3-story building with 1 story of parking garage below grade. It has approximately 42,000 SF conditioned floor area and 22,500 SF of parking garage. There are 70 residential units in the building. The construction is wood framed with an attic. The HVAC and DHW systems analyzed are shown in Table 4. The blue color indicates natural gas heating, yellow indicates primarily electric heating with back-up natural gas, and green indicates all-electric designs.

Mixed-Fuel	**Step A**	**Step B**	**Step C**
HVAC	Split DX fan coil units with combined heating and domestic water heating with natural gas water heaters	Split DX fan coil units with combined heating and domestic water heating with heat pump water heater with supplementary natural gas heat	-
DHW	Natural gas storage water heater	Heat pump water heater with supplementary natural gas heat	-
System 1	**Step A**	**Step B**	**Step C**
HVAC	Packaged terminal heat pumps (40 deg F heat pump operating temp)	Packaged terminal heat pumps (-5 deg F heat pump operating temp)	2027 IECC - Packaged terminal heat pumps (-5 deg F heat pump operating temp)
DHW	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat	2027 IECC - Heat pump water heater with supplementary electric heat
System 2	**Step A**	**Step B**	**Step C**
HVAC	Split heat pump with back up electric heat (40 deg F heat pump operating temp)	Split heat pump with back up electric heat (-5 deg F heat pump operating temp)	2027 IECC - Split heat pump with back up electric heat (-5 deg F heat pump operating temp)
DHW	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat	2027 IECC - Heat pump water heater with supplementary electric heat

Table 4

Because the multifamily building is 3-stories, it is classified as a residential occupancy and falls under the residential energy code. Similar to the single family analysis, 10 additional efficiency credits are required to comply prescriptively under R408. To achieve the required credits, all options comply with 100 percent of the duct thermal distribution system located in conditioned space and increased water heater efficiency, requiring condensing gas water heaters or heat pump water heaters.

The suggested timeline for Step C is 2030 and beyond. In 2030, mountain town jurisdictions will likely be under the 2027 IECC or later. Because the 2027 IECC has not yet been finalized and changes are difficult to predict, Group14 Engineering has estimated the energy efficiency improvement from the LECC to the 2027 IECC to be about 7% using historical data: *Estimated Improvement in Residential & Commercial Energy Codes* located in the Appendix. A 7% reduction will be applied to Step C models to estimate energy use, energy cost, and carbon emissions at that stage.

Hotel

The hotel building is a 50,000 SF, 3-story building with metal-framed walls and is 40% glazed. The different HVAC and DHW options modeled are shown in Table 5. The blue color indicates natural gas heating, yellow indicates primarily electric heating with back-up natural gas, and green indicates all-electric designs.

Mixed-Fuel	Step A	Step B	Step C
HVAC	Split DX fan coil units with combined heating and domestic water heating with natural gas water heaters	Split DX fan coil units with combined heating and domestic water heating with heat pump water heater with supplementary natural gas heat	-
Ventilation	DOAS with DX cooling, gas heating, and ERV	DOAS with DX cooling, heat pump with back up natural gas heating, and ERV (40 deg F heat pump operating temp)	-
Kitchen Ventilation	MAU with DX cooling and gas heating	MAU with DX cooling, heat pump heating with back up natural gas heating (40 deg F heat pump operating temp)	-
DHW	Natural gas storage water heater	Heat pump water heater with supplementary natural gas heat	-
System 1	**Step A**	**Step B**	**Step C**
HVAC	Packaged terminal heat pumps (40 deg F heat pump operating temp)	Packaged terminal heat pumps (-5 deg F heat pump operating temp)	Packaged terminal heat pumps (-5 deg F heat pump operating temp)
Ventilation	DOAS with DX cooling, gas heating, and ERV	DOAS with DX cooling, heat pump with back up natural gas heating, and ERV (40 deg F heat pump operating temp)	DOAS with DX cooling, heat pump with back up electric heating, and ERV (40 deg F heat pump operating temp)
Kitchen Ventilation	MAU with DX cooling and gas heating	MAU with DX cooling, heat pump heating with back up natural gas heating (40 deg F heat pump operating temp)	MAU with DX cooling, heat pump heating with back up electric heating (40 deg F heat pump operating temp)
DHW	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat

Table 5, continued on next page

System 2	Step A	Step B	Step C
HVAC	Split heat pump with back up electric heat (40 deg F heat pump operating temp)	Split heat pump with back up electric heat (-5 deg F heat pump operating temp)	Split heat pump with back up electric heat (-5 deg F heat pump operating temp)
Ventilation	DOAS with DX cooling, gas heating, and ERV	DOAS with DX cooling, heat pump with back up natural gas heating, and ERV (40 deg F heat pump operating temp)	DOAS with DX cooling, heat pump with back up electric heating, and ERV (40 deg F heat pump operating temp)
Kitchen Ventilation	MAU with DX cooling, heat pump heating with back up electric heating (40 deg F heat pump operating temp)	MAU with DX cooling, heat pump heating with back up electric heating (40 deg F heat pump operating temp)	MAU with DX cooling, heat pump heating with back up electric heating (40 deg F heat pump operating temp)
DHW	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat	Heat pump water heater with supplementary electric heat

Table 5

The hotel is the only building in this analysis that falls under the commercial code, which is more complex than the residential code with additional efficiency credit requirements. The Step A 2021 IECC models are required to achieve 10 additional efficiency credits, similar to the residential provisions. The Step B and Step C LECC models are required to achieve different credit amounts depending on if they are mixed-fuel or all-electric. The mixed-fuel options are required to achieve 138 credits and the all-electric options only have to hit 116 credits given the occupancy type.

The 2021 IECC models comply with 10 additional energy efficiency credits through a dedicated outdoor air system and increased water heater efficiency, requiring condensing gas water heaters or heat pump water heaters. For compliance under the LECC and the 2027 IECC, the following credits were pursued to achieve 138 credits for the mixed fuel option and 116 for the all-electric options:

Mixed Fuel (138 credits)	Credits	All-Electric (116 credits)	Credits
Heat pump water heater	32	Heat pump water heater	32
SHW flow reduction	14	SHW flow reduction	14
DOAS/fan control	34	DOAS/fan control	34
Renewable energy	22	Renewable energy	24
Residential kitchen equipment	11	Residential kitchen equipment	11
Improve fenestration	11	Lighting power reduction	1
Add roof insulation	6		
Add wall insulation	8		
Total	**138**		**116**

Table 6

The suggested timeline for Step C is 2030 and beyond. In 2030, mountain town jurisdictions will likely be under the 2027 IECC or later. Because the 2027 IECC has not yet been finalized and changes are difficult to predict, Group14 Engineering has estimated the energy efficiency improvement from the LECC to the 2027 IECC to be about 7% using historical data: *Estimated Improvement in Residential & Commercial Energy Codes* located in the Appendix. A 7% reduction will be applied to Step C models to estimate energy use, energy cost, and carbon emissions at that stage.

6 Modeling Results

Single Family

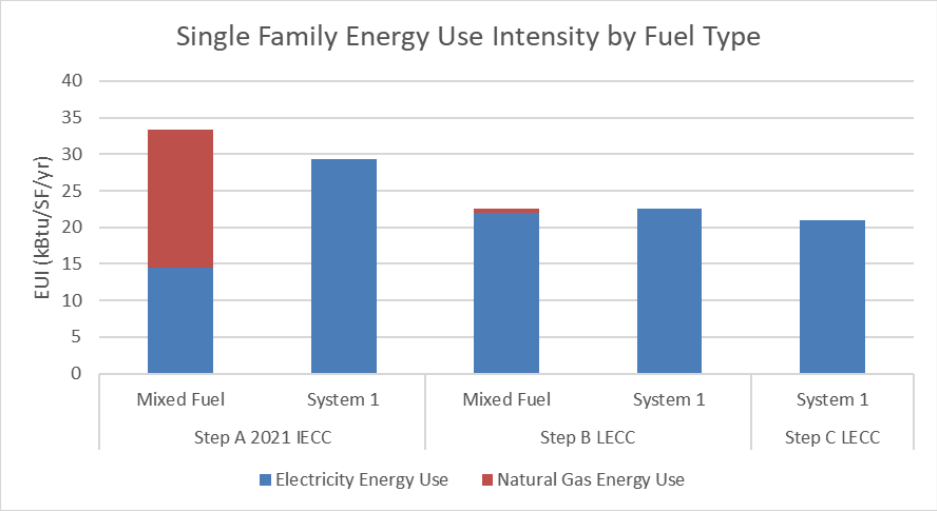


Figure 1

The single family home analysis shows that following the roadmap's guidelines results in homes with lower energy use intensities, which is anticipated. Step C shows the lowest energy use intensity of 21.0 kBtu/SF/yr demonstrating that this roadmap will guide new construction projects closer to net zero as the timeline moves closer to 2030. There is minimal natural gas use for the mixed-fuel design option in Step B. This is due to the cold climate heat pump specified in the design. This heat pump minimizes the operating hours of the natural gas back-up heat.

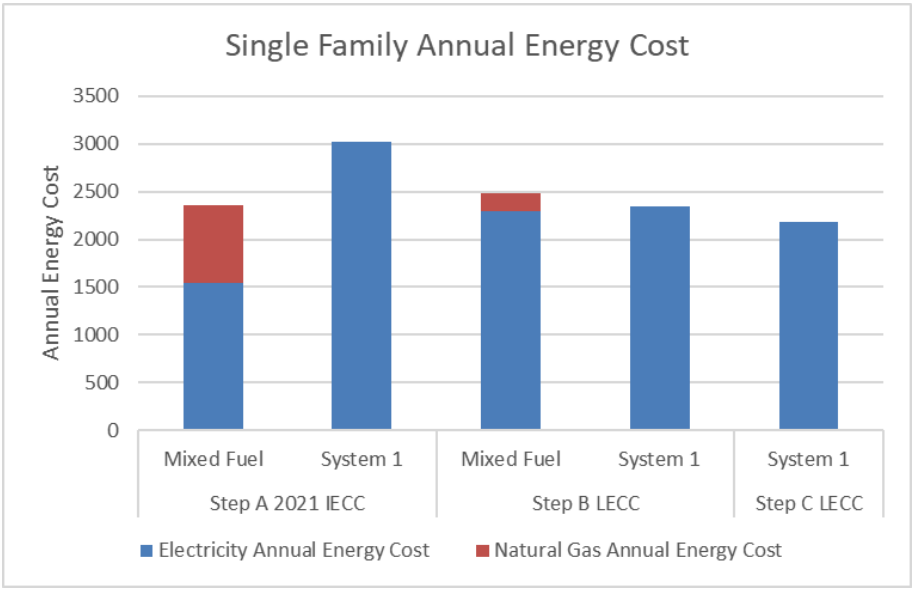


Figure 2

Moving from Step A to Step C shows an overall reduction in annual energy costs with the Step A Mixed-Fuel system being the anomaly. The Step A System 1 has the highest annual energy cost because it includes a standard efficiency split pump. In general, electricity is more expensive than natural gas. Based on a study on energy prices by sector and source conducted by the U.S. Energy Information Administration (EIA)[2], natural gas is projected to be about a third of the price of electricity through 2050. The Step B LECC Mixed-Fuel system has an inflated annual energy cost because the monthly customer charge is dominating the natural gas cost making up over 90% of it. Step C System 1 has the lowest annual energy cost of $2,181.

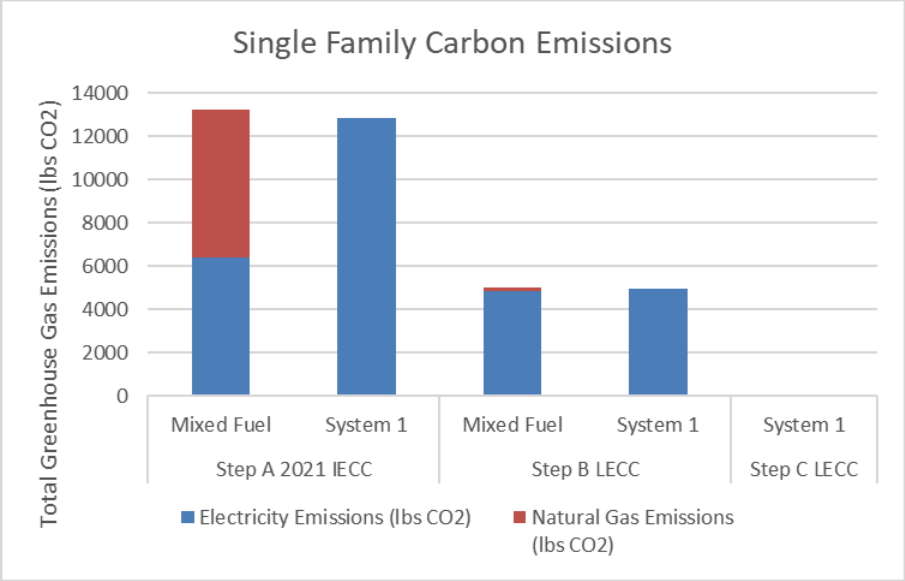


Figure 3

The goal of the *Regional Roadmap* is to help new construction buildings achieve net zero by 2030. Approaching Step C of the *Regional Roadmap* results in lower greenhouse gas emissions showing that this roadmap provides the foundation for buildings aiming to achieve net zero new construction. Step A uses the 2024 Holy Cross emissions factor of 0.484 lbs of CO2 per kWh which is the most current reported value. Holy Cross Energy[3] has goals to provide 100% clean energy by 2030. Because Step B is planned to be from 2026-2029, this analysis uses an emissions factor of 0.242 lbs of CO2 per kWh to align with this goal. Step C is anticipated to be in 2030 and later when Holy Cross is projected to provide 100% clean energy to its members.

[2]https://www.eia.gov/outlooks/aeo/tables_side_xls.php
[3]https://www.holycross.com/wp-content/uploads/2025/07/HCE-Strategic-Plan-January-2025.pdf

Multifamily

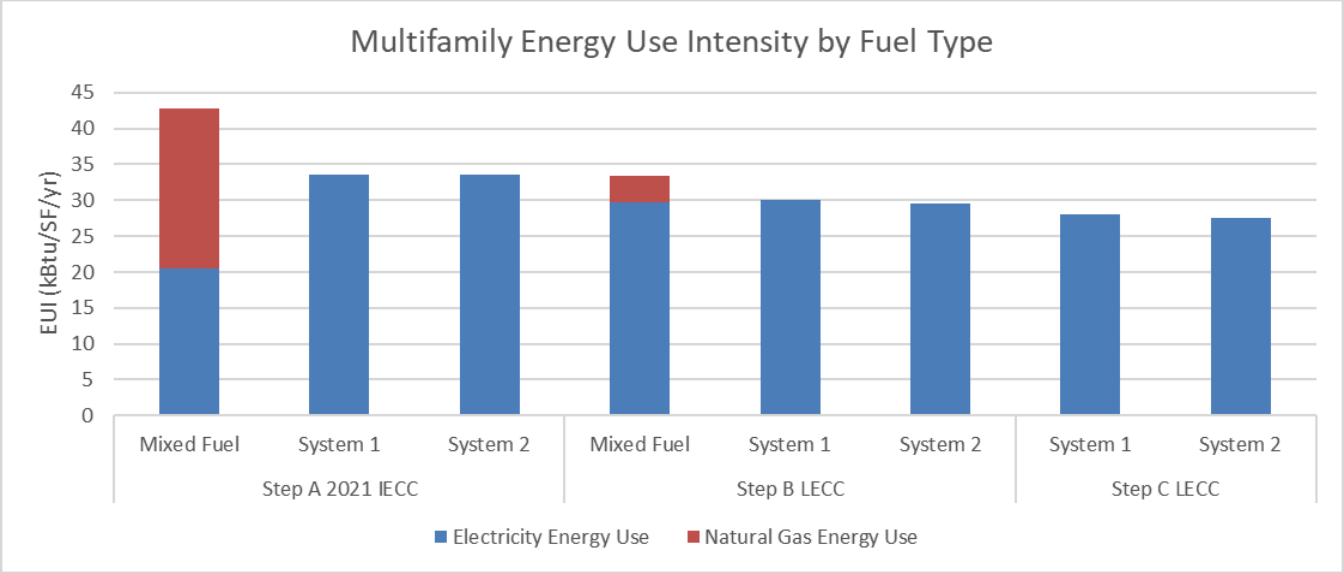


Figure 4

The multifamily analysis shows similar trends to the single family home analysis. Moving from Step A to Step C of the roadmap results in approximately 36% lower energy use intensities, with the Step C System 2 model's anticipated EUI of 27.5 kBtu/SF/yr.

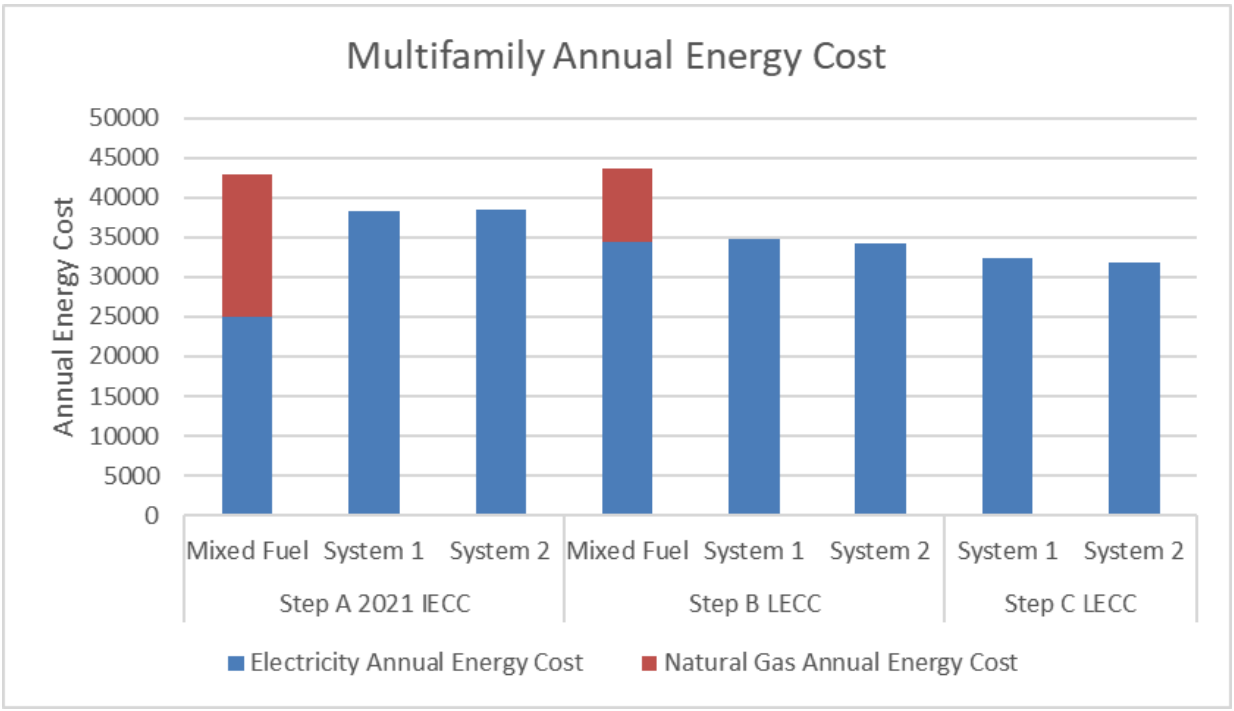


Figure 5

The Step C System 2 model not only has the lowest energy use intensity and greenhouse gas emissions, but it also has the lowest annual energy cost of approximately $31,877.

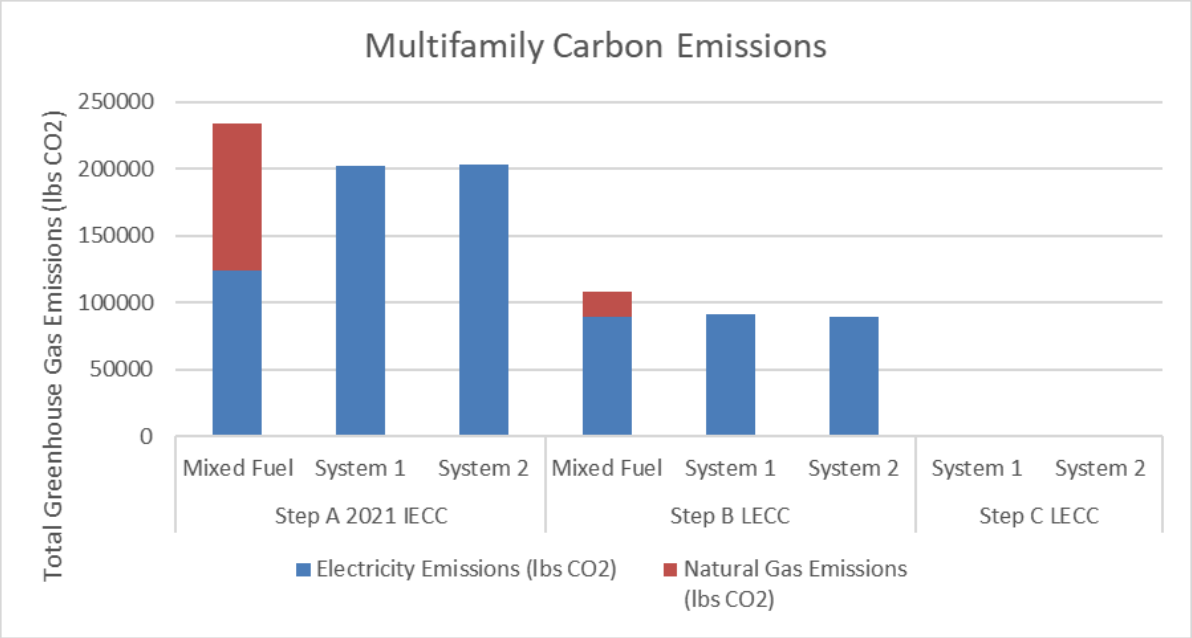


Figure 6

Step A uses the 2024 Holy Cross emissions factor of 0.484 lbs of CO2 per kWh which is the most current reported value. Holy Cross Energy[4] has goals to provide 100% clean energy by 2030. Because Step B is planned to be from 2026-2029, this analysis uses an emissions factor of 0.242 lbs of CO2 per kWh to align with this goal. Step C is anticipated to be in 2030 and later when Holy Cross is projected to provide 100% clean energy to its members.

[4]https://www.holycross.com/wp-content/uploads/2025/07/HCE-Strategic-Plan-January-2025.pdf

Hotel

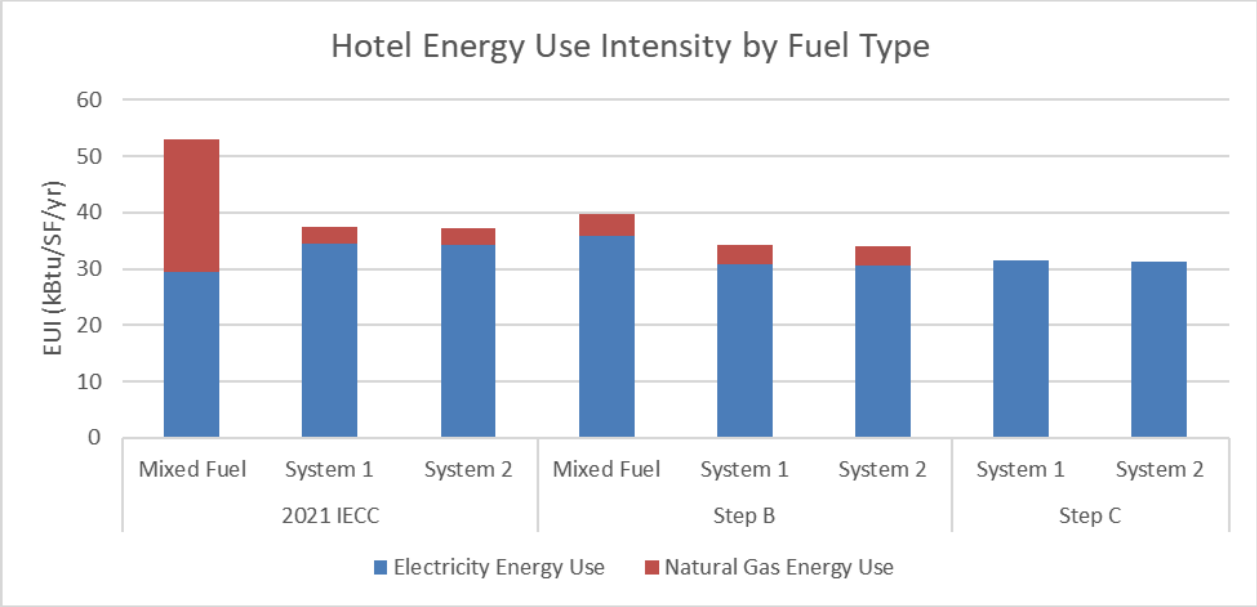


Figure 7

The hotel analysis shows that adhering to the roadmap's guidelines results in lower energy use intensities. As anticipated, the Step C System 2 results in the lowest energy use intensity at 31.3 kBtu/SF/yr. Additionally, because this model is all-electric, it is required to achieve less points than Step B models. Step C models only require six different energy credits to comply with the LECC, while the Step C models require eight, including improved fenestration and additional roof and wall insulation which have high first cost implications.

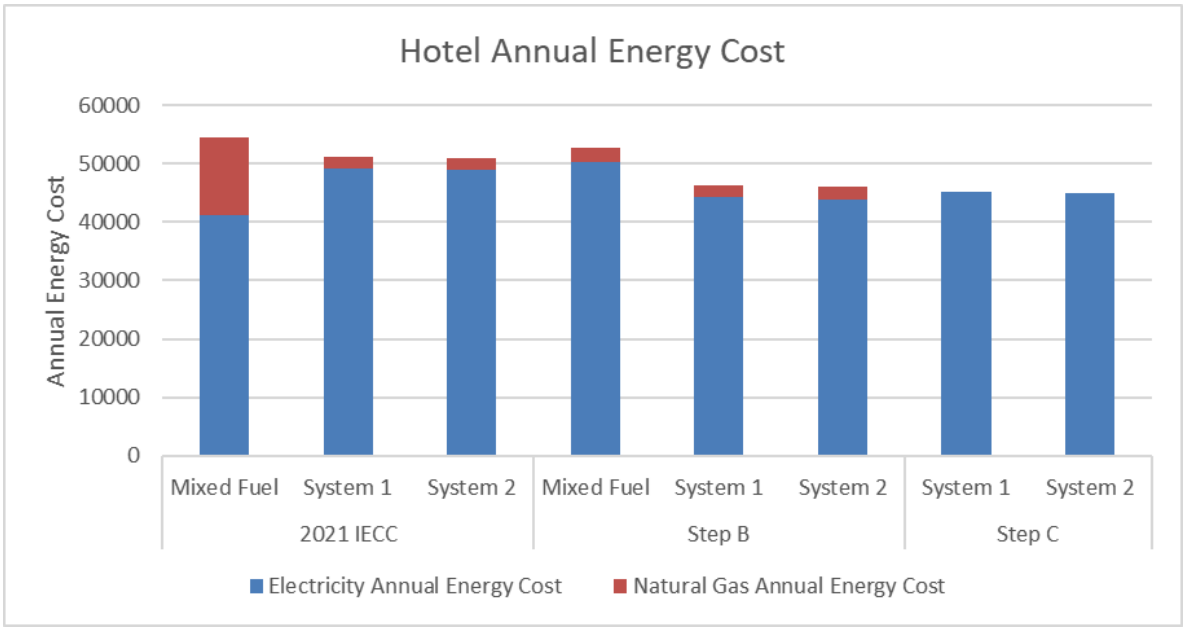


Figure 8

While the hotel analysis has more complexities than the single family and multifamily analyses, it overall shows a downward trend in annual energy cost as systems approach the requirements included in Step C of the Regional Roadmap. Despite natural gas being less expensive than electricity, the Mixed-Fuel options have the highest annual energy cost as these options have the least efficient space heating and domestic hot water heating solutions.

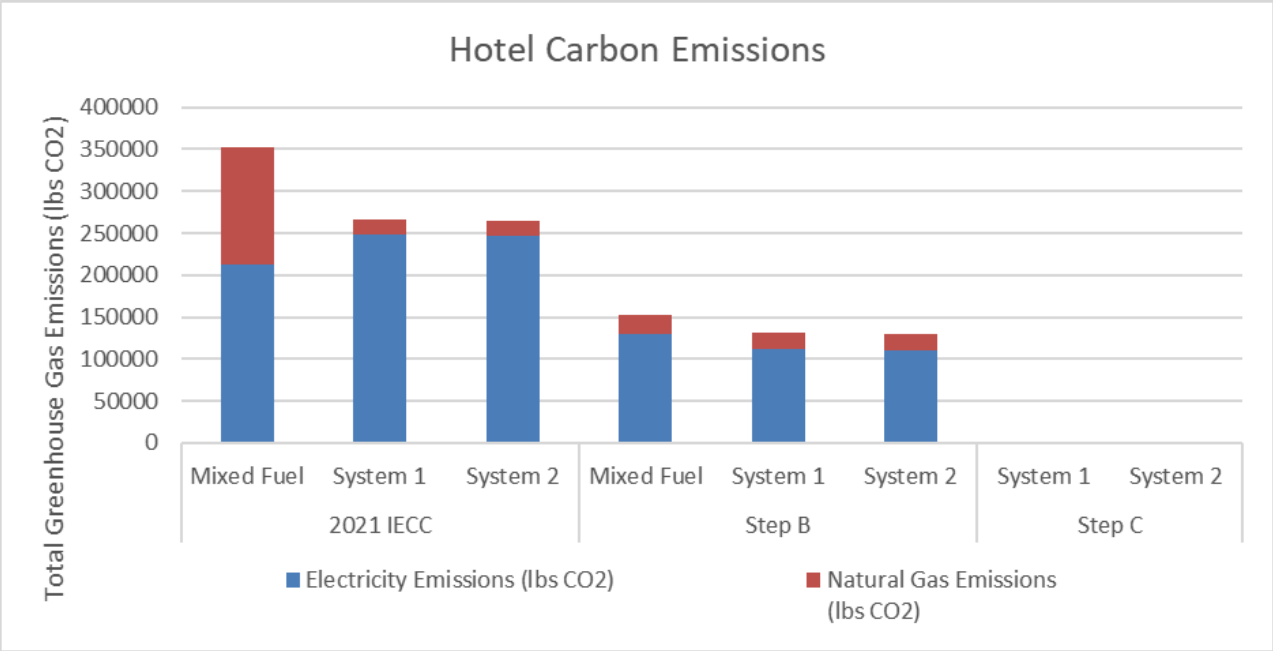


Figure 9

The greenhouse gas emissions follow the same trend as the energy use intensity. The two mixed-fuel systems have the highest greenhouse gas emissions due to the largest amount of natural gas. Step A uses the 2024 Holy Cross emissions factor of 0.484 lbs of CO2 per kWh which is the most current reported value. Holy Cross Energy[5] has goals to provide 100% clean energy by 2030. Because Step B is planned to be from 2026-2029, this analysis uses an emissions factor of 0.242 lbs of CO2 per kWh to align with this goal. Step C is anticipated to be in 2030 and later when Holy Cross is projected to provide 100% clean energy to its members.

[5]https://www.holycross.com/wp-content/uploads/2025/07/HCE-Strategic-Plan-January-2025.pdf

7 First Cost Analysis

To establish the first cost premiums for Steps B and C of the *Regional Roadmap* compared to Step A (2021 IECC), CORE and Group14 Engineering worked with local contractors including Shaeffer Hyde Construction, Full Circle Construction Services, and Hendrickson Construction, Inc. to estimate first costs. The cost estimates provided by contractors were supplemented with pricing information from the front range as well as Group14 Engineering's knowledge of the current market to help round out the analysis. A factor of ~1.7 was applied to cost information supplied from the Denver metro area to more accurately represent the mountain town economic climate[6].

Additionally, all Step C first costs account for inflation at an average rate of 2.5% to calculate the estimated future first cost in 2030, when Step C should be implemented.

Single Family

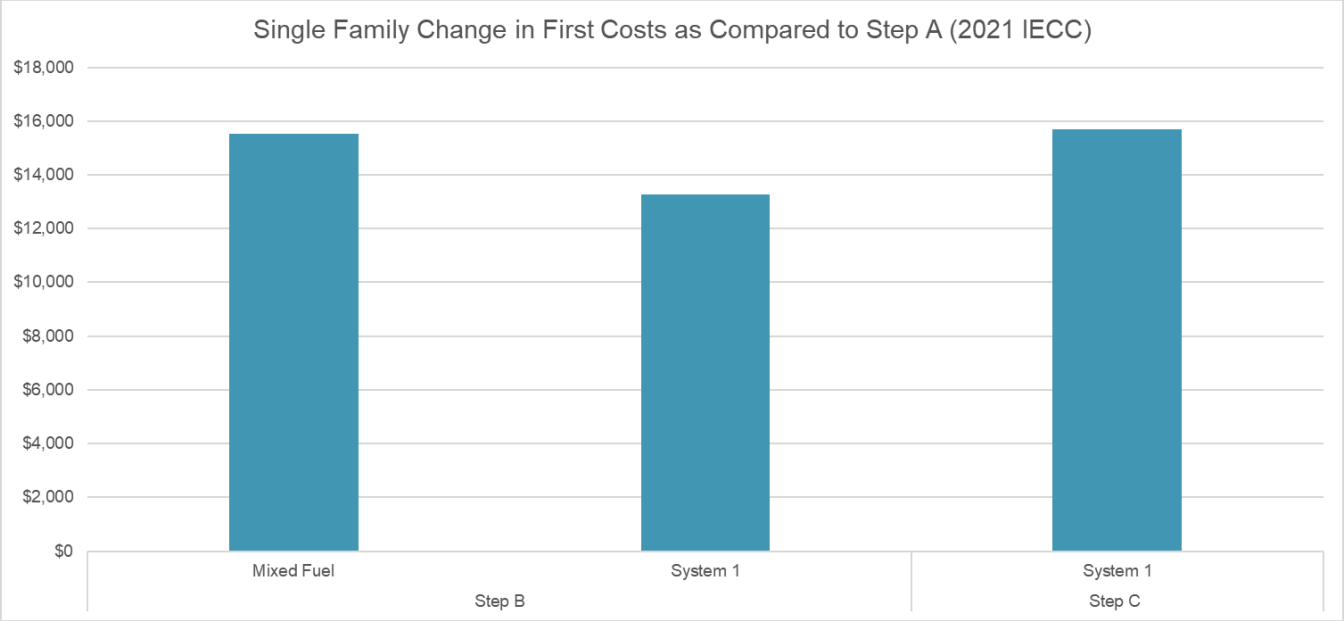


Figure 10

As shown in Figure 4, Step C has the highest first costs. The increase in first cost is primarily due to the heating and domestic hot water equipment. Electrification of equipment as well as higher efficiency equipment results in higher first costs. Another component contributing to increased first costs is higher performance windows and a large reduction in allowable air infiltration. Both of these envelope aspects are typically very costly. Additionally, the Step C run also accounts for inflation increasing the predicted first cost for the system in 2030.

[6] https://www.sidneyauldsbuildingstudio.com/blogs/colorado-construction-costs

	Regional Roadmap Step	Design Option	Annual Energy Cost/SF	Increase in First Cost as Compared to Step A	Simple Payback (Years) as Compared to Step A
Single Family	Step A	Mixed Fuel	$0.76	-	-
		System 1	$0.97	-	-
	Step B	Mixed Fuel	$0.80	$15,514	-
		System 1	$0.76	$13,286	20
	Step C	System 1	$0.70	$15,691	19

Table 7

Multifamily

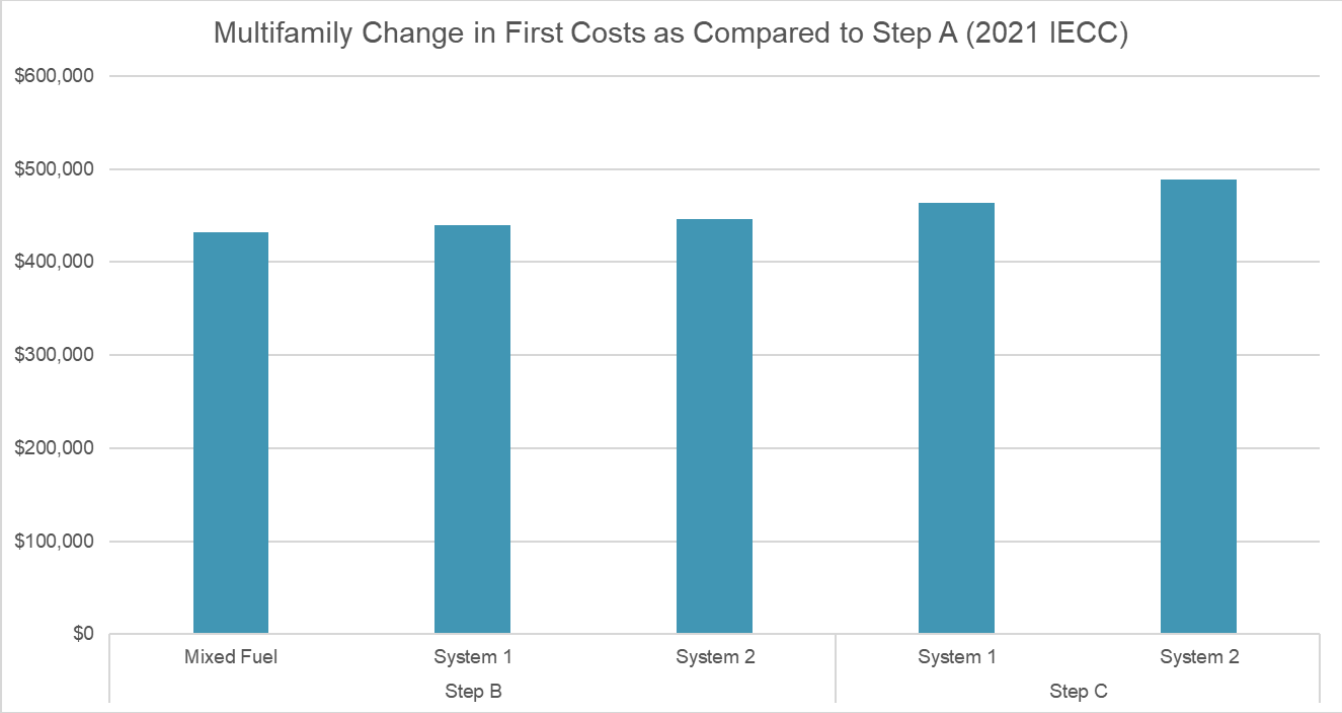


Figure 11

As shown in Figure 5, the first cost of the multifamily upgrades increase moving from Step A to Step C. Because the multifamily building is 3-stories, it falls under the residential code which has a lot fewer requirements compared to the commercial code. The increases in first cost for the multifamily analysis are similar to the single family analysis which are mainly attributed to the heating and domestic hot water systems and enhanced envelope requirements.

	Regional Roadmap Step	Design Option	Annual Energy Cost/SF	Increase in First Cost as Compared to Step A	Simple Payback (Years) as Compared to Step A
Multifamily	Step A	Mixed Fuel - **NG**	$1.02	-	-
		System 1	$0.91	-	-
		System 2	$0.91	-	-
	Step B	Mixed Fuel - **NG**	$1.04	$432,415	-
		System 1	$0.83	$439,135	>50
		System 2	$0.82	$445,855	>50
	Step C	System 1	$0.77	$463,095	>50
		System 2	$0.76	$488,493	>50

Table 8

Hotel

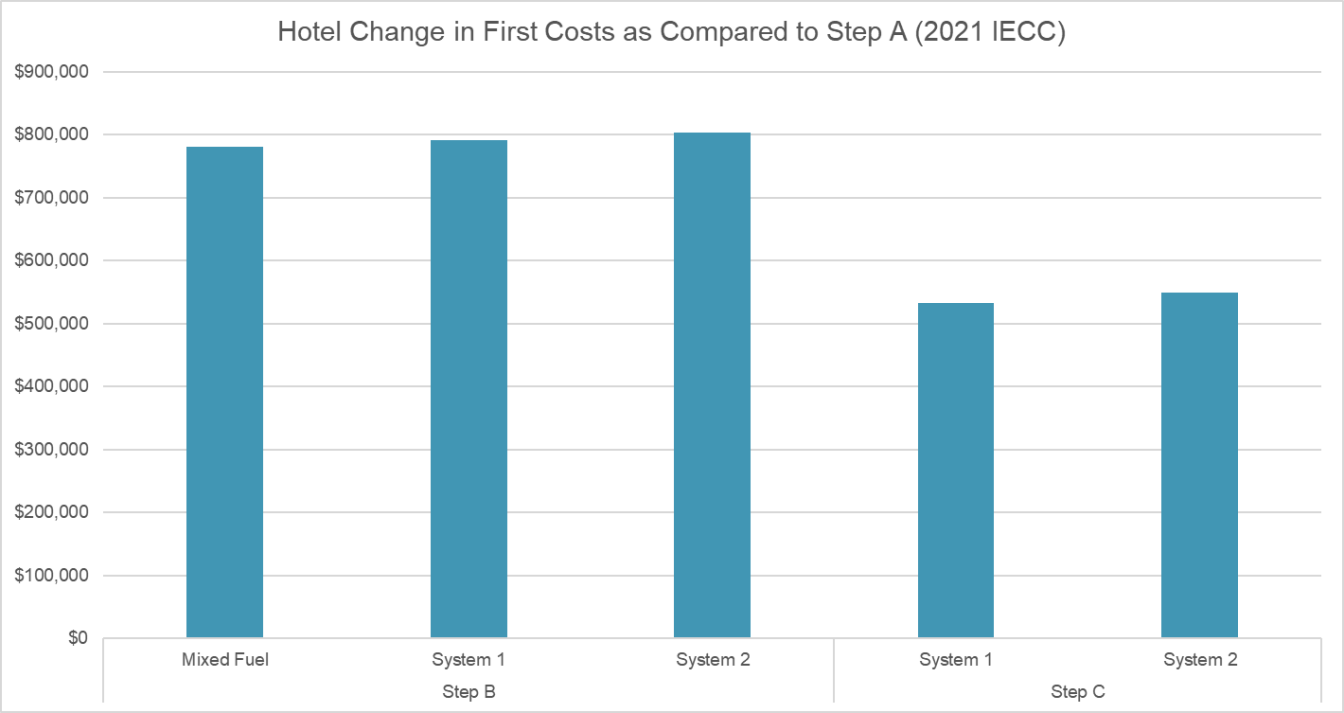


Figure 12

As shown in Figure 6, the all-electric designs (Step C) require fewer first cost upgrades to show code compliance, as both designs are all-electric. To comply with the LECC, all-electric designs are required to achieve 116 energy credits compared to the mixed-fuel designs which are required to achieve 138 credits. For the Step B models to be code compliant, a number of energy credits were required. The following credits were used to reach compliance:

1. Heat pump water heater
2. SHW flow reduction
3. DOAS/fan control
4. Residential kitchen equipment
5. Renewable energy
6. Improve fenestration
7. Add roof insulation
8. Add wall insulation

While the Step C designs still require credits 1-5 above and an additional lighting power reduction credit worth 1 point, the envelope upgrades 6-8 are very costly and have significant impacts to overall first costs.

	Regional Roadmap Step	Design Option	Annual Energy Cost/SF	Increase in First Cost as Compared to Step A	Simple Payback (Years) as Compared to Step A
Hotel	Step A	Mixed Fuel - **NG**	$1.07	-	-
		System 1 - **NG**	$1.01	-	-
		System 2 - **NG**	$1.00	-	-
	Step B	Mixed Fuel - **NG Back up**	$1.04	$781,080	-
		System 1 - **NG Back up**	$0.91	$792,076	>50
		System 2 - **NG Back up**	$0.91	$803,073	>50
	Step C	System 1	$0.89	$532,724	>50
		System 2	$0.88	$549,268	>50

Table 9

8 Conclusions

This analysis demonstrates that *A Regional Roadmap for a New Net Zero* provides an effective pathway for reducing energy use intensity and greenhouse gas emissions in new construction across the Eagle River and Roaring Fork Valley. Across all modeled building types, progression from Step A to Step C consistently results in improved energy performance and emissions reductions, supporting the Roadmap's goal of achieving net zero new construction by 2030.

The modeling results show that all-electric designs (Step C) achieve the lowest energy use intensities and greenhouse gas emissions. In many cases, these designs also approach or outperform mixed-fuel options from an annual energy cost perspective, despite higher electricity rates. For the multifamily and hotel building types, Step C all-electric systems deliver significant performance benefits with competitive or lower annual energy costs compared to Step A mixed-fuel designs.

For the single family and multifamily analysis, first cost impacts increase with each step in the Roadmap, driven primarily by electrification of heating and domestic hot water systems, higher-efficiency equipment, and enhanced envelope requirements such as high-performance windows and reduced air infiltration. While these measures result in higher upfront costs, the long-term benefits include reduced energy consumption, lower emissions, and alignment with anticipated future code requirements. In the case of the hotel analysis, the reduced credit requirements for all-electric buildings under the LECC partially offset the first cost increases, resulting in lower overall Step C premiums compared to Step B mixed-fuel options.

Overall, the *Regional Roadmap* represents a balanced and forward-looking approach to climate action in Colorado's mountain communities. While cost premiums are associated with higher performance standards, the energy and emissions benefits increase substantially as jurisdictions move toward Step C. This analysis confirms that adoption of the Roadmap can help local governments, developers, and designers better manage the transition to future energy codes while meaningfully advancing regional climate and sustainability goals.

9 Appendix

COMMERCIAL UTILITY RATES	
Electricity (Holy Cross Energy Small Residential)	
Customer Charge per Month	$62.00
Cost per kWh	$0.078
Demand Charge per kW	$6.11
Natural Gas (Black Hills Small Commercial Gas)	
Customer Charge per Month	$25.81
Cost per Therm	$1.07

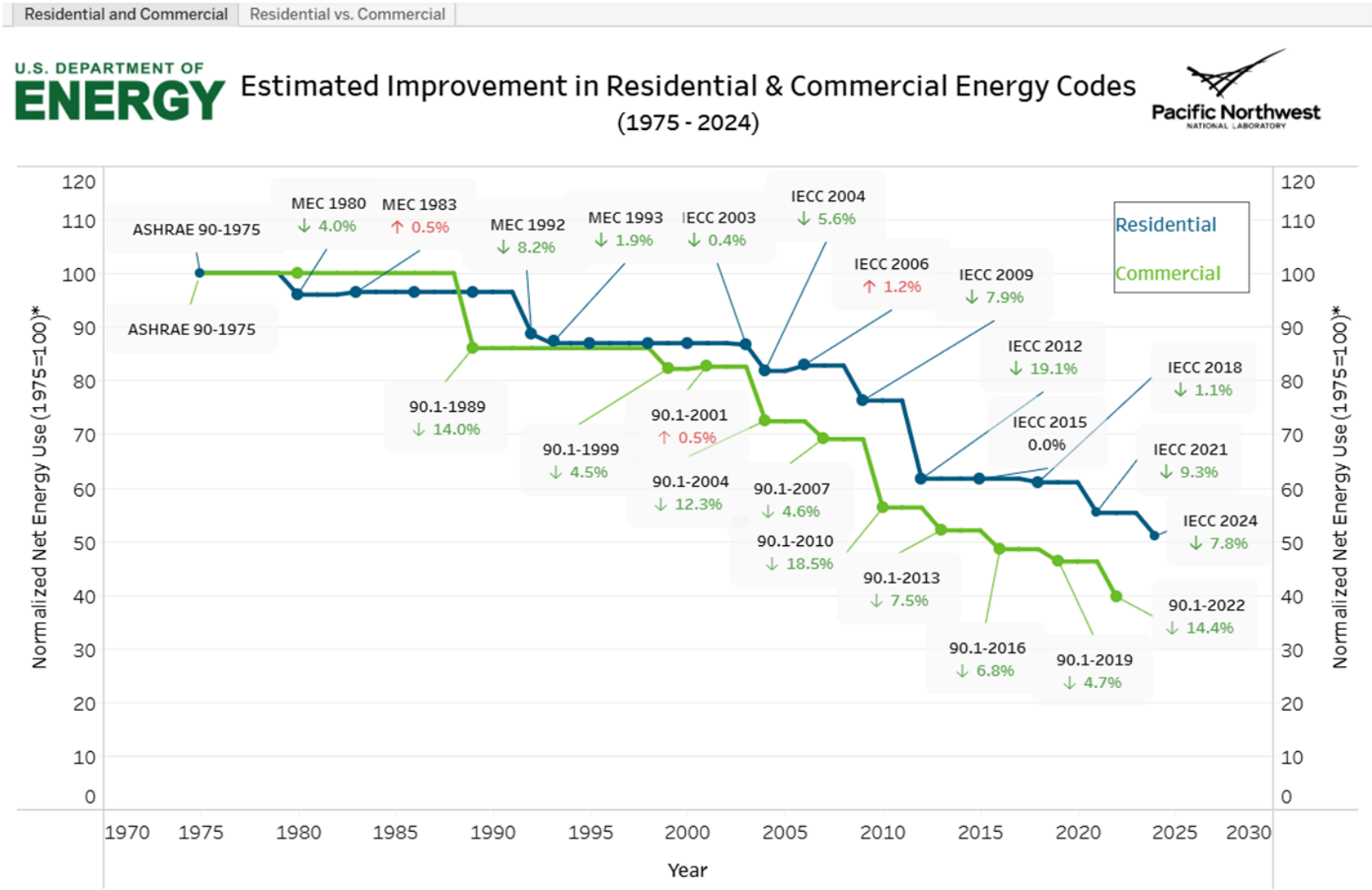
Electricity rates are effective April 22, 2025.

Gas rates are effective December 1, 2025.

RESIDENTIAL UTILITY RATES		
Electricity	**Holy Cross Small Residential**	**Holy Cross Large Residential**
Customer Charge per Month	$16.00	$45.00
Cost per kWh	$0.110	$0.082
Demand Charge per kW	-	$5.32
Natural Gas (Black Hills Small Residential Gas)		
Customer Charge per Month	$13.99	
Cost per Therm	$1.08	

Electricity rates are effective April 22, 2025.

Gas rates are effective December 1, 2025.


Residential and Commercial
Residential vs. Commercial
U.S. DEPARTMENT OF ENERGY
Estimated Improvement in Residential & Commercial Energy Codes
(1975 - 2024)
Pacific Northwest NATIONAL LABORATORY
Residential
Commercial
ASHRAE 90-1975
ASHRAE 90-1975
MEC 1980 ↓ 4.0%
MEC 1983 ↑ 0.5%
MEC 1992 ↓ 8.2%
MEC 1993 ↓ 1.9%
IECC 2003 ↓ 0.4%
IECC 2004 ↓ 5.6%
IECC 2006 ↑ 1.2%
IECC 2009 ↓ 7.9%
IECC 2012 ↓ 19.1%
IECC 2015 0.0%
IECC 2018 ↓ 1.1%
IECC 2021 ↓ 9.3%
IECC 2024 ↓ 7.8%
90.1-1989 ↓ 14.0%
90.1-1999 ↓ 4.5%
90.1-2001 ↑ 0.5%
90.1-2004 ↓ 12.3%
90.1-2007 ↓ 4.6%
90.1-2010 ↓ 18.5%
90.1-2013 ↓ 7.5%
90.1-2016 ↓ 6.8%
90.1-2019 ↓ 4.7%
90.1-2022 ↓ 14.4%
Normalized Net Energy Use (1975=100)*
Year
0
10
20
30
40
50
60
70
80
90
100
110
120
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030

Energy model inputs

Single Family Model Inputs

	2021 IECC + Town of Avon Amendments	2021 IECC + Town of Avon Amendments	Step B: LECC	Step B/C: LECC
Wall Insulation	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)
Roof Insulation	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)
Floor Insulation	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)
Glazing	U-0.30, SHGC-0.40	U-0.30, SHGC-0.40	U-0.28, SHGC-0.40	U-0.28, SHGC-0.40
HVAC system	Split DX fan coil units with combined heating and domestic water heating (13.4 SEER2, 92% efficient)	Split heat pump with back up electric resistance heat with 40 deg F heat pump operation temperature (14.3 SEER2, 7.5 HSPF2)	Split heat pump with back up gas heat with -5 deg F heat pump operation temperature (20 SEER2, 10 HSPF2, 94% AFUE)	Split heat pump with back up electric resistance heat with -5 deg F heat pump operation temperature (20 SEER2, 10 HSPF2)
Ventilation system	Mechanical	Mechanical	Mechanical	Mechanical
DHW system	Gas storage water heater (92%)	Heat pump water heater (3.9 EF with 23 deg F heat pump operation temperature)	Heat pump water heater (3.9 UEF, 0.81 UEF with 23 deg F heat pump operation temperature)	Heat pump water heater (3.9 UEF with 23 deg F heat pump operation temperature)
Blower Door Test	3 ACH @ 0.2 IWG	3 ACH @ 0.2 IWG	2.5 ACH @ 0.2 IWG	2.5 ACH @ 0.2 IWG
Lighting	0.4 W/SF	0.4 W/SF	0.4 W/SF	0.4 W/SF
Appliances	ENERGY STAR appliances	ENERGY STAR appliances	ENERGY STAR appliances	ENERGY STAR appliances
EV Spaces	EV ready space	EV ready space	EV ready space	EV ready space
Electric Ready	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump
PV	Solar ready zone - 300 SF	Solar ready zone - 300 SF	Solar ready zone - 300 SF	Solar ready zone - 300 SF

Multifamily Model Inputs

	2021 IECC + Town of Avon Amendments	2021 IECC + Town of Avon Amendments	2021 IECC + Town of Avon Amendments
Wall Insulation	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)
Roof Insulation	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)
Floor Insulation	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)
Glazing	U-0.30, SHGC-0.40	U-0.30, SHGC-0.40	U-0.30, SHGC-0.40
HVAC system	Split DX fan coil units with combined heating and domestic water heating (13.4 SEER2, 92% efficient)	Packaged terminal heat pumps with 40 deg F heat pump operation temperature (9.5 EER, 2.9 COP)	Split heat pump with back up electric resistance heat with 40 deg F heat pump operation temperature (14.3 SEER2, 7.5 HSPF2)
Ventilation system	Mechanical	Mechanical	Mechanical
DHW system	Gas storage water heater (92%)	Heat pump water heater (3.9 UEF)	Heat pump water heater (3.9 UEF)
Blower Door Test	3 ACH @ 0.2 IWG	3 ACH @ 0.2 IWG	3 ACH @ 0.2 IWG
Lighting	0.4 W/SF	0.4 W/SF	0.4 W/SF
Appliances	ENERGY STAR appliances	ENERGY STAR appliances	ENERGY STAR appliances
EV Spaces	EVSE Installed: 5% EV Ready spaces: 15% EV Capable spaces: 10% EV Capable Light spaces: 30% Total: 60%	EVSE Installed: 5% EV Ready spaces: 15% EV Capable spaces: 10% EV Capable Light spaces: 30% Total: 60%	EVSE Installed: 5% EV Ready spaces: 15% EV Capable spaces: 10% EV Capable Light spaces: 30% Total: 60%
Electric Ready	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump
PV	Solar ready zone - 6,100 SF	Solar ready zone - 6,100 SF	Solar ready zone - 6,100 SF

Multifamily Model Inputs

	Step B/C: LECC	Step B/C: LECC	Step B/C: LECC
Wall Insulation	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)	Wood framed, R-13+10 ci (U-0.045)
Roof Insulation	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)	Wood Joist Attic, R-60 (U-0.016)
Floor Insulation	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)	Wood joist, R-30 (U-0.033)
Glazing	U-0.28, SHGC-0.40	U-0.28, SHGC-0.40	U-0.28, SHGC-0.40
HVAC system	Split DX fan coil units with combined heating and domestic water heating (13.4 SEER2, 3.9 UEF, 80% efficient)	Packaged terminal heat pumps with -5 deg F heat pump operation temperature (10.6 EER, 9 HSPF2)	Split heat pump with back up electric resistance heat with -5 deg F heat pump operation temperature (20 SEER2, 10 HSPF2)
Ventilation system	Mechanical	Mechanical	Mechanical
DHW system	Heat pump water heater (3.9 UEF)	Heat pump water heater (3.9 UEF)	Heat pump water heater (3.9 UEF)
Blower Door Test	2.5 ACH @ 0.2 IWG	2.5 ACH @ 0.2 IWG	2.5 ACH @ 0.2 IWG
Lighting	0.4 W/SF	0.4 W/SF	0.4 W/SF
Appliances	ENERGY STAR appliances	ENERGY STAR appliances	ENERGY STAR appliances
EV Spaces	EVSE Installed: 5% EV Ready spaces: 15% EV Capable spaces: 10% EV Capable Light spaces: 30% Total: 60%	EVSE Installed: 5% EV Ready spaces: 15% EV Capable spaces: 10% EV Capable Light spaces: 30% Total: 60%	EVSE Installed: 5% EV Ready spaces: 15% EV Capable spaces: 10% EV Capable Light spaces: 30% Total: 60%
Electric Ready	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump	Electric panel space and receptacles for future electric water heater and heat pump
PV	Solar ready zone - 6,100 SF	Solar ready zone - 6,100 SF	Solar ready zone - 6,100 SF

Hotel Model Inputs

	2021 IECC + Town of Avon Amendments	2021 IECC + Town of Avon Amendments	2021 IECC + Town of Avon Amendments	Step B: LECC
Wall Insulation	Metal-framed with R-13 cavity + R-12.5 continuous (U-0.049)	Metal-framed with R-13 cavity + R-12.5 continuous (U-0.049)	Metal-framed with R-13 cavity + R-12.5 continuous (U-0.049)	Metal-framed with R-13 cavity + R-17.5 continuous (U-0.040)
Roof Insulation	R-30 insulation above deck (U-0.032)	R-30 insulation above deck (U-0.032)	R-30 insulation above deck (U-0.032)	R-40 insulation above deck (U-0.025)
Slab on grade insulation	R-20 for 48" (F-0.434)	R-20 for 48" (F-0.434)	R-20 for 48" (F-0.434)	R-20 for 48" (F-0.434)
Glazing system	U-0.42, SHGC-0.34	U-0.42, SHGC-0.34	U-0.42, SHGC-0.34	U-0.32, SHGC-0.38
HVAC system	Split DX fan coil units with combined heating and domestic water heating (13.4 SEER2, 95% efficient)	Packaged terminal heat pumps (9.5 EER, 2.9 COP, 40 deg F operating temperature)	Split heat pumps (14.3 SEER2, 7.5 HSPF2, 40 deg F operating temperature)	Split DX fan coil units with combined heating and domestic water heating (13.4 SEER2, 3.9 UEF, 80% efficient)
Ventilation system	DOAS + ERV (14.6 IEER, 92% efficient, 50% heating effectiveness)	DOAS + ERV (14.6 IEER, 92% efficient, 50% heating effectiveness)	DOAS + ERV (14.6 IEER, 92% efficient, 50% heating effectiveness)	DOAS + ERV (14.6 IEER, 3.4 COP, 80% efficient, 50% heating effectiveness)
DHW system	Individual gas storage heater (95% efficient)	Heat pump water heater with supplementary electric heat (3.9 UEF, 23 deg F operating temperature)	Heat pump water heater with supplementary electric heat (3.9 UEF, 23 deg F operating temperature)	Heat pump water heater with supplementary gas heat (3.9 EF, 80% efficient, 23 deg F operating temperature)
Plumbing fixture	Standard	Standard	Standard	Low Flow (Lavatories - 0.35 GPM, Showers - 2.0 GPM, Sinks - 1.5 GPM)
Blower Door Test	0.40 CFM/SF @ 0.3 IWG	0.40 CFM/SF @ 0.3 IWG	0.40 CFM/SF @ 0.3 IWG	0.45 CFM/SF @ 0.3 IWG
Lighting	Hotel: 0.56 W/SF Parking garage: 0.15 W/SF	Hotel: 0.56 W/SF Parking garage: 0.15 W/SF	Hotel: 0.56 W/SF Parking garage: 0.15 W/SF	Hotel: 0.53 W/SF Parking garage: 0.11 W/SF
Appliances	Standard	Standard	Standard	ENERGY STAR appliances

Energy Monitoring	Electrical end uses	Electrical end uses	Electrical end uses	NA
EV Spaces	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%
Electric Ready	Electric panel space and receptacles for future electric water heaters and HVAC	Electric panel space and receptacles for future electric HVAC	Electric panel space and receptacles for future electric HVAC	Electric panel space and receptacles for future electric water heaters and HVAC
PV	Solar ready zone - 9,500 SF	Solar ready zone - 9,500 SF	Solar ready zone - 9,500 SF	18 kW solar array installed

Hotel Model Inputs

	Step B: LECC	Step B: LECC	Step C: LECC	Step C: LECC
Wall Insulation	Metal-framed with R-13 cavity + R-17.5 continuous (U-0.040)	Metal-framed with R-13 cavity + R-17.5 continuous (U-0.040)	Metal-framed with R-13 cavity + R-12.5 continuous (U-0.049)	Metal-framed with R-13 cavity + R-12.5 continuous (U-0.049)
Roof Insulation	R-40 insulation above deck (U-0.025)	R-40 insulation above deck (U-0.025)	R-30 insulation above deck (U-0.032)	R-30 insulation above deck (U-0.032)
Slab on grade insulation	R-20 for 48" (F-0.434)	R-20 for 48" (F-0.434)	R-20 for 48" (F-0.434)	R-20 for 48" (F-0.434)
Glazing system	U-0.32, SHGC-0.38	U-0.32, SHGC-0.38	U-0.42, SHGC-0.34	U-0.42, SHGC-0.34
HVAC system	Packaged terminal heat pumps (10.6 EER, 9 HSPF2, -5 deg F operating temperature)	Split heat pumps (20 SEER2, 10 HSPF2, -5 deg F operating temperature)	Packaged terminal heat pumps (10.6 EER, 9 HSPF2, -5 deg F operating temperature)	Split heat pumps (20 SEER2, 10 HSPF2, -5 deg F operating temperature)
Ventilation system	DOAS + ERV (14.6 IEER, 3.4 COP, 40 deg F operating temperature, 80% efficient gas back up, 50% heating effectiveness)	DOAS + ERV (14.6 IEER, 3.4 COP, 40 deg F operating temperature, 80% efficient gas back up, 50% heating effectiveness)	DOAS + ERV (14.6 IEER, 3.4 COP, 40 deg F operating temperature, Electric resistance back up, 50% heating effectiveness)	DOAS + ERV (14.6 IEER, 3.4 COP, 40 deg F operating temperature, Electric resistance back up, 50% heating effectiveness)
DHW system	Heat pump water heater with supplementary electric heat (3.9 EF, 23 deg F operating temperature)	Heat pump water heater with supplementary electric heat (3.9 EF, 23 deg F operating temperature)	Heat pump water heater with supplementary electric heat (3.9 EF, 23 deg F operating temperature)	Heat pump water heater with supplementary electric heat (3.9 EF, 23 deg F operating temperature)
Plumbing fixture	Low Flow (Lavatories - 0.35 GPM, Showers - 2.0 GPM, Sinks - 1.5 GPM)	Low Flow (Lavatories - 0.35 GPM, Showers - 2.0 GPM, Sinks - 1.5 GPM)	Low Flow (Lavatories - 0.35 GPM, Showers - 2.0 GPM, Sinks - 1.5 GPM)	Low Flow (Lavatories - 0.35 GPM, Showers - 2.0 GPM, Sinks - 1.5 GPM)
Blower Door Test	0.45 CFM/SF @ 0.3 IWG	0.45 CFM/SF @ 0.3 IWG	0.45 CFM/SF @ 0.3 IWG	0.45 CFM/SF @ 0.3 IWG
Lighting	Hotel: 0.53 W/SF Parking garage: 0.11 W/SF	Hotel: 0.53 W/SF Parking garage: 0.11 W/SF	Hotel: 0.50 W/SF Parking garage: 0.11 W/SF	Hotel: 0.50 W/SF Parking garage: 0.11 W/SF

Appliances	ENERGY STAR appliances	ENERGY STAR appliances	ENERGY STAR appliances	ENERGY STAR appliances
Energy Monitoring	NA	NA	NA	NA
EV Spaces	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%	EVSE Installed: 2% EV Ready spaces: 8% EV Capable spaces: 10% EV Capable Light spaces: 10% Total: 30%
Electric Ready	Electric panel space and receptacles for future electric HVAC	Electric panel space and receptacles for future electric HVAC	NA	NA
PV	18 kW solar array installed	18 kW solar array installed	20 kW solar array installed	20 kW solar array installed

RESIDENTIAL New Construction Roadmap

	Step A Suggested time frame: 2024-2026	**Step B*** Suggested time frame: 2026-2029	**Step C*** Suggested time frame: 2030 and beyond
Energy Efficiency	Adopt the 2021 or 2024 IECC base code and the required state Electric and Solar Ready Code, at a minimum.	Adopt the State Minimum Code (HB22-1362): State Low Carbon and Energy Code based on the 2024 IECC or the 2027 IECC. *Note: The new state minimum is required for jurisdictions updating building codes starting July 1, 2026.*	Adopt the most recent IECC. Identify above code options to drive additional residential energy efficiency as necessary.
Home Size Threshold	Higher energy efficiency must be demonstrated in homes over a certain size.		
Electrification	**Electric-preferred code** to encourage electrification of new buildings, along with, electric-readiness for all energy end uses in a building.	**All-electric with exceptions** for gas supplemental heat, emergency generators, and other items as decided by AHJs or building officials.	**All-electric with no OR rare exceptions** as decided by AHJs or building officials.
Energy Storage	Utilize the REMP or EEOP Programs to incentivize battery storage. For AHJs requiring PV for new buildings, energy storage is strongly encouraged or incentivized to be installed with the PV system.	Utilize the REMP or EEOP to incentivize battery storage. Energy storage is required if a new PV system is installed.	Utilize the REMP or EEOP to incentivize battery storage. Energy storage is required if a new PV system is installed.
Renewable Energy Pathway 1: For jurisdictions with existing Solar Requirements	Solar is required. If solar is installed, energy storage is required to be installed with the PV system.	Solar is required to offset remaining "non-renewable" energy being consumed from the electric grid. If solar is installed, energy storage is required with the PV system.	Solar-readiness is required. Solar installation is optional, as long as utilities have accomplished 100% renewably powered grid. If solar is installed, energy storage is required to be installed with the PV system.
Renewable Energy Pathway 2: For jurisdictions with existing Solar-Ready Requirements	Solar-readiness is required.	Solar-readiness is required. If solar is installed, energy storage is required with the PV system.	
Demand Response	None.	Demand response controls for electric water heaters are required (per state law CRS 6-7.5-101-110, effective Jan 1, 2026)	Demand response controls for electric water heaters and for thermostats are required.

*See 2027 & 2030 Re-evaluation

COMMERCIAL New Construction Roadmap

	Step A Suggested time frame: 2024-2026	**Step B*** Suggested time frame: 2026-2029	**Step C*** Suggested time frame: 2030 and beyond
Energy Efficiency	Adopt the 2021 or 2024 IECC base code and the required state Electric and Solar Ready Code, at a minimum.	Adopt the State Minimum Code (HB22-1362): Low Carbon and Energy Code based on the 2024 IECC or the 2027 IECC. *Note: The new state minimum is required for jurisdictions updating building codes starting July 1, 2026.*	Adopt the most recent IECC. Identify *above code options to* drive additional commercial energy efficiency.
Electrification	**Electric-preferred code** to encourage electrification of new buildings, along with electric-readiness for all energy end uses in a building.	**All-electric with some exceptions** as decided by AHJs or building officials **OR** Adopt a stronger electric-preferred standard with increased efficiency requirements.	**All-electric with rare exceptions** as decided by AHJs or building officials. *Note: Evaluate all rare exceptions prior to adoption to ensure they are relevant, based on how electrification technology has evolved.*
Energy Storage	Utilize the REMP or EEOP to incentivize battery storage. For AHJs requiring PV for new buildings, energy storage is required to be installed with the PV system.	Utilize the REMP or EEOP to incentivize battery storage. Energy storage is required if a new PV system is installed.	Utilize the REMP or EEOP to incentivize battery storage. Energy storage is required if a new PV system is installed.
Renewable Energy Pathway 1: For jurisdictions with existing Solar Requirements	Solar is required on commercial buildings over 5,000 sq ft. If solar is installed, energy storage is required to be installed with the PV system.	Solar is required to offset remaining "non-renewable" energy being consumed from the electric grid for commercial buildings over 5,000 sq ft. If solar is installed, energy storage is required to be installed with the PV system.	Solar-readiness is required. Solar installation is optional, as long as utilities have accomplished 100% renewably powered grid. If solar is installed, energy storage is required to be installed with the PV system.
Renewable Energy Pathway 2: For jurisdictions with existing Solar-Ready Requirements	Solar-readiness is required.	Solar-readiness is required. If solar is installed, energy storage is required to be installed with the PV system.	
Demand Response	None.	Demand response controls for some electric water heaters are required (per state law CRS 6-7.5-101-110, effective Jan 1, 2026 for small commercial applications 40-120 gallons).	Demand response controls for all electric water heaters and for thermostats are required.

*See 2027 & 2030 Re-evaluation

Single Family Energy Modeling Results

Energy Code	*Regional Roadmap* Step	Annual Energy Cost	Energy Use Intensity (kBtu/sf/yr)	Greenhouse Gas Emissions (lbs/sf/yr)
2021 IECC + Town of Avon Amendments	Step A: System 1	$2,353	33.4	4.3
	Step A: System 2	$3,016	29.3	4.1
LECC	Step B: System 1	$2,483	22.6	1.6
	Step B: System 2	$2,346	22.5	1.6
	Step C: System 2	$2,181	21.0	0.0

Multifamily Energy Modeling Results

Energy Code	*Regional Roadmap* Step	Annual Energy Cost	Energy Use Intensity (kBtu/sf/yr)	Greenhouse Gas Emissions (lbs/sf/yr)
2021 IECC + Town of Avon Amendments	Step A: Mixed Fuel	$42,891	42.8	5.5
	Step A: System 1	$38,382	33.6	4.8
	Step A: System 2	$38,436	33.6	4.8
LECC	Step B: Mixed Fuel	$43,759	33.4	2.5
	Step B: System 1	$34,860	30.1	2.1
	Step B: System 2	$34,276	29.6	2.1
	Step C: System 1	$32,419	28.0	0.0
	Step C: System 2	$31,877	27.5	0.0

Hotel Modeling Results

Energy Code	*Regional Roadmap* Step	Annual Energy Cost	Energy Use Intensity (kBtu/sf/yr)	Greenhouse Gas Emissions (lbs/sf/yr)
2021 IECC + Town of Avon Amendments	Step A: Mixed Fuel	$54,403	53.0	6.9
	Step A: System 1	$51,157	37.4	5.2
	Step A: System 2	$50,947	37.2	5.2
LECC	Step B: Mixed Fuel	$52,770	39.8	3.0
	Step B: System 1	$46,391	34.3	2.6
	Step B: System 2	$46,078	34.0	2.6
	Step C: System 1	$45,178	31.5	0.0
	Step C: System 2	$44,941	31.3	0.0