



Energy Code Cost-Effectiveness Analysis Approaches: A Practical Resource for States and Jurisdictions Considering Code Updates

October 2026

Executive Summary

This resource helps states and jurisdictions understand how locally relevant cost-effectiveness analysis can support energy code adoption discussions. Drawing on a recent New Hampshire case study and research on other state approaches, it identifies recommended practices for selecting the correct code baseline, using local cost data and credible modeling, evaluating affordability beyond first cost, documenting assumptions, and beginning the analysis early enough to inform the decision-making process.

Introduction

States and local jurisdictions are considering building energy code updates including the 2024 International Energy Conservation Code (IECC),¹ American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1,² future 2027 IECC provisions, stretch codes, appendices, and strengthening amendments.³ In energy code adoption discussions, questions about cost, affordability, and implementation come up early and often.

Cost-effectiveness analysis is an important tool in helping states answer those questions. A transparent and locally relevant cost-effectiveness analysis can help prevent discussions from relying on incomplete, outdated, or non-local cost claims. This is especially important because national or out-of-state studies may not fully reflect a state's climate, construction practices, labor costs, material costs, fuel prices, current code baseline, current and proposed state amendments, or local housing market conditions. A national analysis can provide important context, but states may still need additional information to understand what a code update means for their own residents, builders, and communities.

¹ 2024 International Energy Conservation Code, available at <https://codes.iccsafe.org/content/IECC2024P1>.

² ANSI/ASHRAE/IES Standard 90.1, Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings, available at <https://www.ashrae.org/technical-resources/bookstore/standard-90-1>.

³ The IECC is a model energy code commonly used for residential buildings and some commercial provisions; ASHRAE 90.1 is commonly referenced for commercial buildings. Stretch codes, appendices, and amendments are additional or modified requirements that may go beyond or adjust the base model code.



Jurisdictions should use a complete and balanced analysis of affordability. Upfront construction cost is one factor for affordability. Other factors include operating costs, financing, monthly cash flow, energy burden, building durability, comfort, resilience, and long-term value. A code update may increase construction costs but reduce monthly energy costs and improve long-term performance and value. A complete and balanced analysis should clarify these tradeoffs.

Current national conversations about code affordability also make this resource timely. As future model code pathways, including the 2030 IECC/IECCS,⁴ are discussed, states may face new questions about how more advanced energy performance requirements affect construction costs, monthly energy savings, and long-term affordability. The U.S. Department of Energy's (DOE)⁵ review of its cost-effectiveness and affordability methodology also highlights the need for transparent analysis that can explain assumptions clearly and reflect local conditions. This resource is intended to help states and jurisdictions understand available approaches and consider how to develop or support their own cost-effectiveness analysis.

Why States May Need Local Analysis

Many states rely on national analyses from DOE and Pacific Northwest National Laboratory (PNNL) when considering energy code updates. These analyses are valuable and can help establish a common technical foundation. However, in some cases, PNNL analyses may not be available on a timeline that aligns with a state or jurisdiction code-adoption process. In addition, state-level discussions often turn on questions that are more local and specific, such as which building types are most relevant to the state, actual local labor and material costs, and relevant fuel types and energy prices. When these questions are not addressed, stakeholders may bring forward competing cost estimates that are difficult for policymakers to compare. A local analysis can help create a more grounded discussion by using transparent assumptions, professional modeling, local cost data, and metrics that connect first cost to long-term affordability.

Featured example: New Hampshire case study

New Hampshire provides a useful example of a state-specific⁶ cost-effectiveness analysis to support an energy code adoption discussion. During efforts to move the state from the 2018 IECC to a newer energy code, cost and affordability concerns became central to the debate.

⁴ Proposed Scope and Intent for 2030 IECC/IECCS, more at <https://www.iccsafe.org/building-safety-journal/bsj-hits/the-international-code-council-finalizes-titles-of-2030-international-energy-conservation-code/> and <https://www.iccsafe.org/building-safety-journal/bsj-hits/public-comments-requested-on-the-2030-international-energy-conservation-code/>.

⁵ DOE methodology accessible here: https://www.energycodes.gov/sites/default/files/2024-10/residential_methodology_2024.pdf. Also see DOE RFI, Updating and Improving the Methodology for Assessing Affordability and Cost-Effectiveness of Building Energy Codes, <https://www.federalregister.gov/documents/2026/05/04/2026-08646/updating-and-improving-the-methodology-for-assessing-affordability-and-cost-effectiveness-of>.

⁶ Quantifying the Cost and Benefits of Upgrading the NH IECC 2018 Building Energy Code to the IECC 2024 Code, available at https://neep.org/sites/default/files/media-files/nh_energy_building_code_analysis_9_15_2024.pdf.



The New Hampshire Home Builders Association (NHHBA) opposed the update⁷ and showed higher incremental construction costs than the national estimate from PNNL. The NHHBA analysis estimated the cost for compliance with the 2021 IECC at around \$22,000 for a typical home,⁸ while the PNNL estimate was closer to \$2,300.⁹ Legislators were left with two very different numbers and were unsure which one to trust.

PNNL's analysis provided an important technical reference, but some legislators questioned whether it was specific to New Hampshire. Concerns were raised about whether the analysis reflected New Hampshire's climate, costs, and energy context.

To better understand how the local analysis was developed and carried out, NEEP interviewed Paul Bemis, the president of the New Hampshire State Chapter of ASHRAE. Bemis holds degrees in mechanical and electrical engineering and has more than 30 years of experience in engineering design and simulation. He coordinated the ASHRAE led effort, which brought together professionals with expertise in energy codes, energy modeling, construction cost estimating, and financial analysis.

How the effort came together

The New Hampshire effort was supported by the New Hampshire ASHRAE chapter. Bemis helped organize the team, coordinate the work, secure financial and in-kind support from local partners, and communicate findings to different stakeholders. NEEP provided code expertise and technical input. The team was intentionally small and focused, but it included the core expertise needed to produce a credible analysis including:

- Energy code expertise
- Professional energy modeling
- Local cost estimating and building trade experience
- Financial analysis
- Project coordination and communication

The Home Builders Association was invited to participate in the study but declined. To help address the need for construction cost expertise, the team relied on a professional cost estimator with building trade experience.¹⁰ Bemis emphasized that credibility was essential. The team needed professionals who could explain their assumptions and sources and defend the analysis if questioned. Professionals with relevant experience completed the modeling and cost analysis.¹¹ The financial analysis also helped shift the conversation beyond simple payback and toward life-cycle cost and monthly cash flow.

⁷ National Association of Home Builders, 2024 IECC Cost Analysis for Single-Family Homes, January 2025, available at <https://www.homeinnovation.com/documents/reports/2024-IECC-Cost-Analysis-for-Single-Family-Homes.pdf>.

⁸ National Association of Home Builders, Eliminating Excessive Regulations Will Ease the Nation's Housing Affordability Crisis, April 2025, available at <https://www.nahb.org/news-and-economics/press-releases/2025/04/eliminating-excessive-regulations-will-ease-the-nations-housing-affordability-crisis>.

⁹ Pacific Northwest National Laboratory, National Cost Effectiveness of the Residential Provisions of the 2021 IECC, June 2021, available at https://sbcc.wa.gov/sites/default/files/2022-04/045_2021IECC_CostEffectiveness_Final_Residential.pdf.

¹⁰ See more about PRG Project Resources Group: <https://www.prgus.com/about/>.

¹¹ See more about Design Day Mechanical: <https://designdaymech.com/>.



The effort was relatively low-cost compared with other studies at about \$6,000, in part because several team members provided services at reduced cost or in-kind. Funding and support came from the local American Institute of Architects (AIA) chapter and other local donors, while the state ASHRAE chapter and other partners provided technical and in-kind support.

What the analysis evaluated

The New Hampshire analysis¹² compared the current effective code in the state, the 2018 IECC, with state-specific amendments in the 2024 IECC. The team focused on the largest differences between the two codes being compared and modeled the changes most likely to affect energy use and cost. The analysis focused primarily on heating and cooling impacts. Domestic hot water was excluded from the analysis because the team did not identify major differences between the codes for that end use. Building envelope improvements and air leakage were the focus of the analysis. Air leakage was the most sensitive parameter in the modeling, with the change from five air changes per hour (ACH) to 2.5 ACH producing significant energy savings. Slab insulation was also important because of its role in thermal mass and overall building performance. The team modeled one single-family residential building and one 30-unit multifamily building constructed in New Hampshire, which helped show impacts across both a typical residential case and a larger multifamily case. Including both types helped strengthen the analysis by showing impacts across more than one building type and by recognizing that code updates for single-family and multifamily buildings can result in significant energy and cost impacts.

Local cost estimating

Local cost estimating was crucial to the New Hampshire study. The team used local suppliers and their local pricing where possible. For insulation, they consulted a New Hampshire insulation firm familiar to local builders. For windows, they averaged costs from several local suppliers. For air sealing, they factored in additional labor time. Being conservative with cost estimates supported the goal of using credible, defensible, locally based assumptions.

Financial analysis and affordability metrics

The New Hampshire analysis looked beyond upfront cost by using life-cycle cost rather than relying only on simple payback. Simple payback can be useful, but it does not capture the full value of energy savings over the life of a building. A key finding was that the modeled code update produced positive monthly cash flow from the first month of operation in both residential and multifamily cases. In other words, the update was not presented as zero cost, but the modeled monthly energy savings were expected to outweigh the incremental monthly financing cost from the energy improvements. This finding was important because it connected cost-effectiveness directly to affordability, monthly household or owner costs, and long-term ownership costs.

¹² Quantifying the Cost and Benefits of Upgrading the NH IECC 2018 Building Energy Code to the IECC 2024 Code, February 2026, available at https://neep.org/sites/default/files/media-files/nh_energy_building_code_analysis_9_15_2024.pdf.



Communication and lessons learned

The New Hampshire team prepared a professional report and presentation materials summarizing the analysis. The analysis helped educate policymakers and reframed the discussion from upfront construction cost alone to monthly cash flow, life-cycle cost, and long-term energy savings. However, the report was not complete before the state body with authority to adopt the energy code voted, which limited its immediate impact. The analysis would have been more useful if it had been completed earlier in the process. This is one of the clearest lessons for other states: Cost-effectiveness analysis should begin early enough to inform the code adoption process before positions harden or key votes occur. This is particularly important if competing analyses are presented using a different baseline or proposed code than the one under consideration.

Bemis also emphasized that some benefits are real and important even if they are not always quantified in a traditional cost-effectiveness analysis. These include improved indoor air quality, comfort, building durability, resilience during outages, reduced grid demand, reduced carbon emissions, and long-term building value. Recent research identifies emerging methods for quantifying some of these benefits, including safe indoor conditions during outages, avoided outage-related losses, peak-demand reduction, and avoided emissions.¹³ These benefits should be communicated clearly, even when they are not assigned a dollar value in the analysis.

Practical steps for states considering local analysis

States and jurisdictions can take lessons from the New Hampshire model, as the approach offers a useful framework. Here are several practical steps for states considering such an analysis.

1. Define the purpose of the analysis

Start by identifying the purpose of the analysis. Is the state evaluating a base code update, a stretch code, an appendix, a package of amendments, or a response to specific cost claims? A clear purpose will help determine the scope, audience, timeline, and level of technical detail needed.

2. Identify the baseline

The baseline should reflect the code currently in effect, including state amendments. This is essential because the incremental cost and savings of a code update depend on what is already required. For example, a state moving from an amended 2018 IECC to the 2024 IECC may see different impacts than a state moving from the unamended 2021 IECC to the 2024 IECC.

¹³ Tristan Grant, Mariel Wolfson, Ariel Brenner, Rhys Davis, Tom Phillips, Dude, Where's My Resilience? The Case for Energy Resilience Benefit Valuation in Building Energy Code, Policy, and Program Cost-Effectiveness, 2026, available at <https://www.aceee.org/proceedings/dude-wheres-my-resilience-the-case-for-energy-resilience-benefit-valuation-in-building-energy-code-policy-and-program-cost-effectiveness/>.



3. Build the right team

A credible analysis usually requires several types of expertise. States should consider including:

- A code expert who understands the current code and proposed changes
- A professional energy modeler
- A cost estimator or construction professional familiar with local costs
- A financial analyst
- A project coordinator
- A communications lead who can translate the findings for non-technical audiences

States may also consider involving local ASHRAE chapters, universities, non-profit partners, utilities, consultants, or other organizations with technical expertise. Organizations such as NEEP can provide code expertise or technical input, depending on the needs of the state or jurisdiction.

4. Select representative building models

The analysis should use building models that reflect the state's policy priorities and typical housing stock. A state may choose to model single-family homes, multifamily buildings, commercial buildings, or a combination. Model selection is not just a technical choice, it shapes which costs, savings, and affordability impacts are visible in the analysis. Including more than one building type can strengthen the analysis, but it may also increase cost and complexity. If project-specific data is not available or cannot be shared, states can use anonymized building information, prototype models, or representative building types.

5. Use credible energy modeling

Energy modeling should be completed by qualified professionals using accepted tools and transparent assumptions. States should use the energy modeling process to identify and evaluate the code changes most likely to affect energy use, cost, and affordability. Those measures will vary depending on the current code, proposed code, climate zone, building type, and local construction practices. They may include envelope requirements, air leakage, windows, insulation, HVAC systems, water heating, lighting, controls, or other measures that differ between the baseline and proposed code. For New Hampshire, the most important modeled differences were building envelope improvements and air leakage.

6. Localize cost data

States should consider using local contractors, suppliers, cost estimators, builders, or construction professionals to estimate incremental costs. Where possible, the analysis should distinguish between material costs, labor costs, and any assumptions about market availability or volume pricing. Conservative cost assumptions may make the analysis more defensible, especially when cost claims are contested.



7. Evaluate affordability beyond first cost

First cost should not be the only metric in affordability analysis. States should consider metrics such as:

- Life-cycle cost
- Monthly cash flow
- Annual energy cost savings
- Simple payback
- Incremental mortgage or financing impacts
- Energy burden, where data allows
- Long-term operating cost impacts

Life-cycle cost and monthly cash flow can be especially useful because they connect code updates to long-term affordability and monthly household or owner costs.

8. Build in review and credibility

The analysis should be transparent and reviewable. States may consider a technical review process, stakeholder review, or peer review before releasing results. A transparent and inclusive review process can increase trust by giving stakeholders an opportunity to understand the assumptions, ask questions, and see how the analysis was developed. The team should be prepared to explain assumptions and respond to questions.

9. Communicate the results in plain language

The final product should be understandable to non-technical audiences. Policymakers and stakeholders may not need every modeling detail, but they do need to understand the core assumptions, results, and implications.

Helpful communication approaches may include:

- A short executive summary
- Clear comparison of upfront cost and monthly savings
- Graphics showing first cost, energy savings, and cash flow
- Explanation of what is and is not included
- Discussion of non-energy benefits such as comfort, health, resilience, and durability

10. Start early

Timing matters. In the New Hampshire example, the full study took approximately four to six months, so states should plan backward from key hearings, board votes, or legislative decisions. A local analysis is most useful when it is completed before major hearings, board votes, or legislative decisions. If the analysis comes too late, it may still help educate stakeholders, but it may not arrive in time for an immediate adoption decision.



Planning the Time and Level of Effort

Based on the New Hampshire experience, states may want to allow approximately four to six months for a focused cost-effectiveness study. The effort involved about 250 total hours across the project team, including approximately:

- 60 hours for project coordination, communications, and report development
- 20 hours for energy code expertise and technical review
- 30 hours for construction cost estimating
- 80 hours for energy modeling
- 60 hours for financial analysis and report support

These figures are general planning estimates only. The actual timeline and level of effort will depend on the study's scope, number of building types, available data, team capacity, and review needs.

States with available funding may also choose to hire consultants to complete some or all of the modeling, cost estimating, financial analysis, or stakeholder-facing materials. This can be useful when state staff have limited technical capacity or need an independent analysis that can be reviewed and shared publicly. Even when consultants lead the work, states should still review the assumptions carefully and make sure the analysis reflects local code requirements, construction practices, and policy questions.

Partnering With Academic Institutions and Other Organizations

States do not always need to conduct this work alone. Academic institutions, non-profit organizations, utilities, and state energy partners can help provide research capacity, modeling expertise, stakeholder engagement, or technical support.

Examples include:

- Rutgers Center for Urban Policy Research has supported New Jersey's energy code work by developing state-specific cost-effectiveness analysis for IECC appendices and proposed amendments for consideration by the New Jersey Department of Community Affairs.
- Texas/Texas A&M: Texas' State Energy Conservation Office works with the Energy Systems Laboratory at Texas A&M to analyze potential code adoption impacts, including construction cost, housing attainability, and energy savings.
- Washington State University Energy Program: WSU supports building efficiency through technical assistance, training, and research.

Continued next page >



Continued: *Partnering With Academic Institutions and Other Organizations*

- Massachusetts: Consultants such as NMR Group and Cadmus have supported code-related research and analysis.
- Vermont: Vermont Energy Investment Corporation (VEIC) and Energy Futures Group have supported energy code implementation and administration planning.
- Minnesota: The Center for Energy and Environment supports advanced energy code work in coordination with state and utility partners.

These approaches can be especially useful when a state needs technical capacity but does not have the staff, time, or expertise to complete all modeling and cost analysis internally.

DOE/PNNL Tools and Future Addendum

DOE and PNNL have provided national and state-level resources to help states understand energy code impacts, including methodology documents, prototype building models, national cost-effectiveness analysis, and the State Savings Calculator. The calculator is intended to help users tailor state-level analysis by adjusting assumptions that can vary by state, such as local cost adjustments, energy prices, escalation rates, inflation, taxes, loan terms, and study period. NEEP intends to provide more guidance on using the calculator in a future addendum to this resource when an updated or available version of the State Savings Calculator can be reviewed.

Conclusion

Cost-effectiveness analysis can improve the quality of code adoption discussions. The New Hampshire experience shows that local analysis can be especially valuable when stakeholders are presenting competing cost claims or when policymakers question whether national studies apply to local conditions. A strong analysis should combine code expertise, professional energy modeling, local cost data, clear financial assumptions, and transparent communication. States should evaluate upfront cost together with operating costs, financing, monthly cash flow, and long-term affordability. Timing is critical. Analysis should begin early enough to inform the adoption process before key decisions are made. The goal is not to prescribe one method for every state, but to help states and jurisdictions choose a credible approach that fits their policy question, technical capacity, timeline, and audience.