

MEMORANDUM



Date: **June 16, 2023**

To: **Bridget Herring, Chair North Carolina Building Code Council** Project No.: **PNNL-180509**

From: **Salcido, Victor R**

Subject: **PNNL North Carolina Residential Energy Code Analysis**

We are contacting you regarding the ongoing energy code update process in North Carolina, and to confirm the previously requested impact estimates based on adopting the 2024 North Carolina Energy Conservation Code (NCECC). We have received recent inquiries regarding the previous technical analysis and related savings estimates conducted by Pacific Northwest National Laboratory (PNNL). We offer our continued technical assistance in supporting your code update, and hope this correspondence addresses any misconceptions regarding the previous analysis.

In summary, PNNL stands by the technical analysis and impact estimates previously provided to the Council (PNNL-180509 dated March 2023), which indicate that the proposed code will result in significant savings for homeowners and renters in North Carolina. That analysis evaluated the costs and benefits expected under the proposed 2024 NCECC, which represents an amended version of the 2021 International Energy Conservation Code (IECC), compared to the previous 2018 NCECC. This analysis was customized to account for North Carolina's state-specific amendments in both the base code and as proposed. This analysis was requested by the North Carolina Building Code Council, noting that the State is statutorily required to procure an analysis which is independent of any proponents.

This analysis, conducted by PNNL and provided to the Council in March 2023, demonstrated that the adoption of the 2024 NCECC is cost-effective in both single-family and low-rise multifamily residential buildings in North Carolina (compared to the 2018 NCECC). The updated code is expected to result in 18.7 percent energy cost savings, equating to approximately \$400 in annual utility bill savings for the average homeowner in North Carolina. Although updating to the 2024 NCECC will incrementally increase the upfront costs of construction (i.e., often referenced as "first" costs) – ranging from approximately \$4,700 to \$6,500 for single-family homes and \$1,500 to \$2,100 for multifamily units – when amortizing these costs and benefits over a typical mortgage, homeowners will see a positive cashflow in the first two to four years, depending on building type and climate zone. Over the course of 30 years, homeowners

will net between \$1,800 and \$4,500 in life-cycle cost savings. During the first year alone, collectively, North Carolina residents could expect to save over \$15,372,000 in energy costs and 130,700 metric tons in avoided emissions¹. Adopting the 2024 NCECC in North Carolina is expected to result in homes that are energy efficient, more affordable to own and operate, and which are designed and constructed to modern standards for health, comfort, and resilience.

To reiterate, PNNL stands behind these findings, which are consistent with those provided to the Council in March 2023.

Was there an error in the previous PNNL analysis?

No. PNNL has received questions as to whether there was an error in the previously provided technical analysis. Our understanding is that this misconception has been raised by stakeholders in North Carolina during the public engagement process. PNNL provides various types of technical analyses; however, this does not constitute an error or inaccuracy. This is further explained below. PNNL stands behind its previous analysis and has clarified this point to inquiring entities.

Why does PNNL conduct different types of analysis?

PNNL conducts many different types of technical analysis to accurately estimate national, state and localized impacts associated with updated building energy codes. Early versions of our analysis, such as those soon following an updated edition of the IECC, evaluate the updated IECC, as published, compared to previous editions of the code, with impacts typically reported nationally and by climate zone. Other versions of the analysis evaluate the updated model code, such as the 2021 IECC, compared to state codes, tailored to take into account various parameters and customized characteristics and economic parameters. This type of analysis can then be further customized, often through a state technical assistance request, to adjust the standard suite of parameters and assumptions for a given state, and to take into account proposed state-specific amendments being considered.

In July 2021, PNNL evaluated the impacts of adopting the 2021 IECC in North Carolina². PNNL regularly conducts this type of analysis in order to assist states in understanding the potential impacts of updating to the latest editions of the national model energy codes, the IECC for low-rise residential buildings. This analysis compared the 2021 IECC, as published, to the 2018 NCECC, including state amendments. This analysis was conducted proactively, and *before* the 2024 NCECC was developed or technical analysis requested by the Building Code Council.

¹ Calculated as equivalent tonnage of avoided carbon dioxide, or CO₂e

² <https://www.energycodes.gov/national-and-state-analysis>

In March 2023, PNNL performed a second technical analysis at the request of the North Carolina Building Code Council, to determine the impacts of the proposed 2024 NCECC, including amendments (PNNL-180509). PNNL customized the analysis, as requested by Council, based on state-specific construction types (e.g., typical home foundation types, heating systems, etc.), utility rates, tax rates, and other energy and economic parameters representing low-rise building design and construction in North Carolina. This analysis also estimated the incremental costs associated with the 2024 NCECC, reported in 2023 dollars, and adjusting for the effects of recent inflation.

What's the basis for the methodology used in the technical analysis?

PNNL conducts its building energy codes technical analysis based on an accepted methodology established by the U.S. Department of Energy³. The methodology represents a standard approach for evaluating the impacts of building energy codes, including both published codes and proposed changes. It is developed and regularly updated through a rigorous public process, published in the *Federal Register* and subject to multiple public comment and input periods. To evaluate the cost effectiveness of energy codes, the methodology employs a life-cycle cost perspective, which is the accepted means of balancing incremental costs of construction against resulting benefits (e.g., consumer cost savings). This accounts for the value of future savings and costs over a multi-year study period (in this case a typical 30-year consumer mortgage period), discounted to a present value, and accounting for the benefits of energy efficiency and other economic impacts (e.g., operational costs as well as replacement and maintenance costs). The methodology is adaptable to accommodate national, state and localized perspectives, and represents the standard approach used to evaluate energy codes across the U.S. This methodology and analytical approach is the basis for state technical analysis performed by PNNL and provided to every U.S. state, including the analysis provided to the North Carolina Building Code Council in March 2023.

Additional background on the DOE methodology for evaluating building energy codes is available from the Building Energy Codes Program⁴.

We hope this information is useful and provides additional clarity on the topic. Should you have any other questions, please contact us to discuss further.

Sincerely,

Robert Salcido
Senior Research Engineer
Pacific Northwest National Laboratory

³ <https://www.energycodes.gov/methodology>

⁴ <https://www.energycodes.gov/>

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Attached:
Cost-Effectiveness Analysis of the 2024 NCECC (PNNL-180509, March 2023)