

Addressing the Variability in Prescriptive Energy Codes through Enhanced Energy Credits

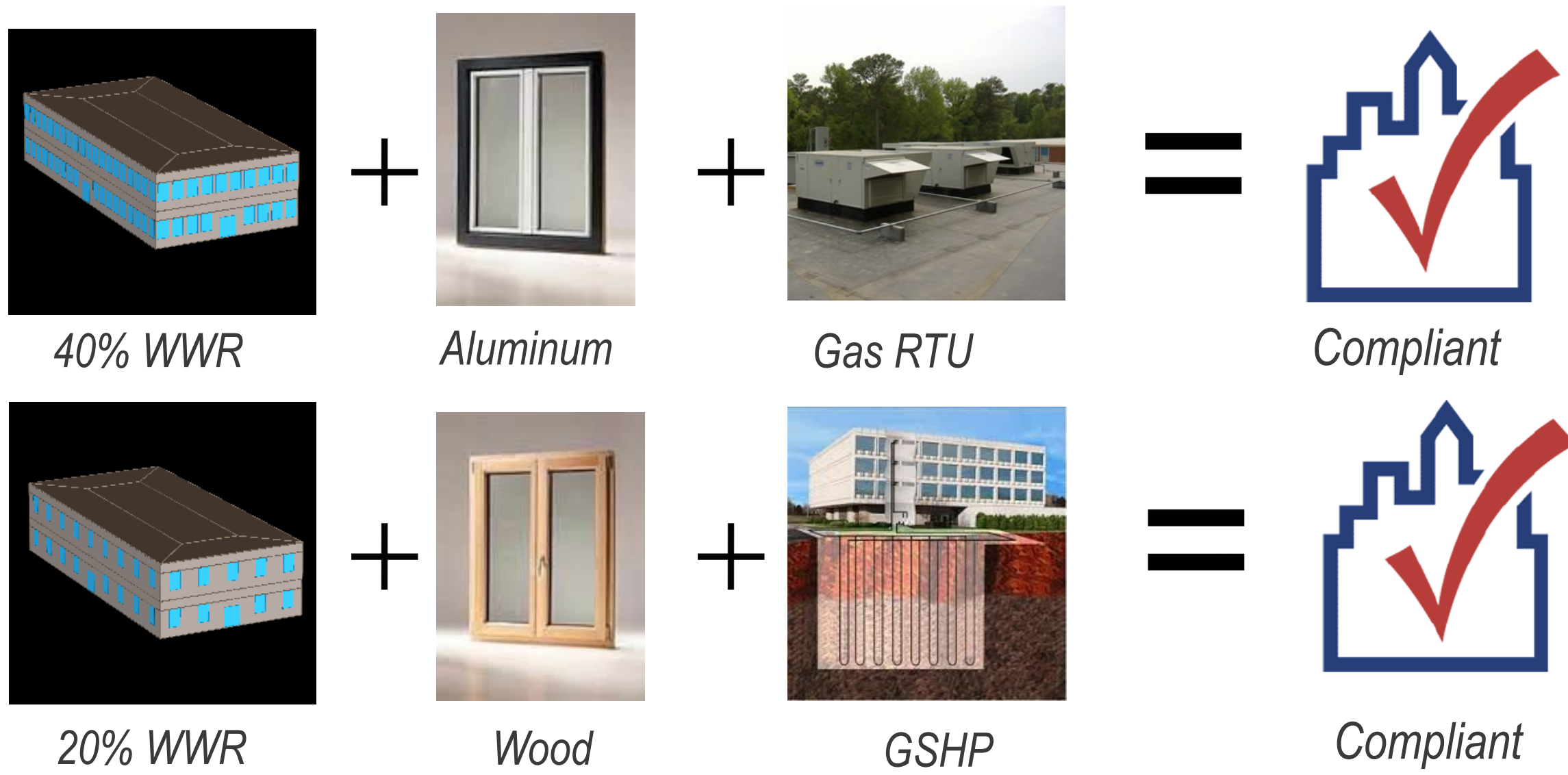
There are many ways to comply with the Energy Code, but not all of them are equal

Reducing Energy Code Variability Using Energy Credits

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BACKGROUND AND IMPACT

- Multiple compliance pathways exist within energy codes resulting in a range of performance outcomes
- How can a newly constructed building, compliant with the energy code, be confident that it will meet a future **Building Performance Standards (BPS)** target if the energy use intensity (EUI) can range from 25 to 54 kBtu/ft²-yr for 1 climate zone?



METHODS

- Modeled 4 climate zones
- Envelope: 3 options (glazing, fixed vs. operable windows, opaque walls)
- HVAC: 16 systems
- Service Hot Water: 3 systems
- Lighting: 2 additional allowances
- Mixture of existing energy credits
- N = 16,992 different permutations
- Histograms below show the EUI results of the permutations, not the typical buildings in operation or construction

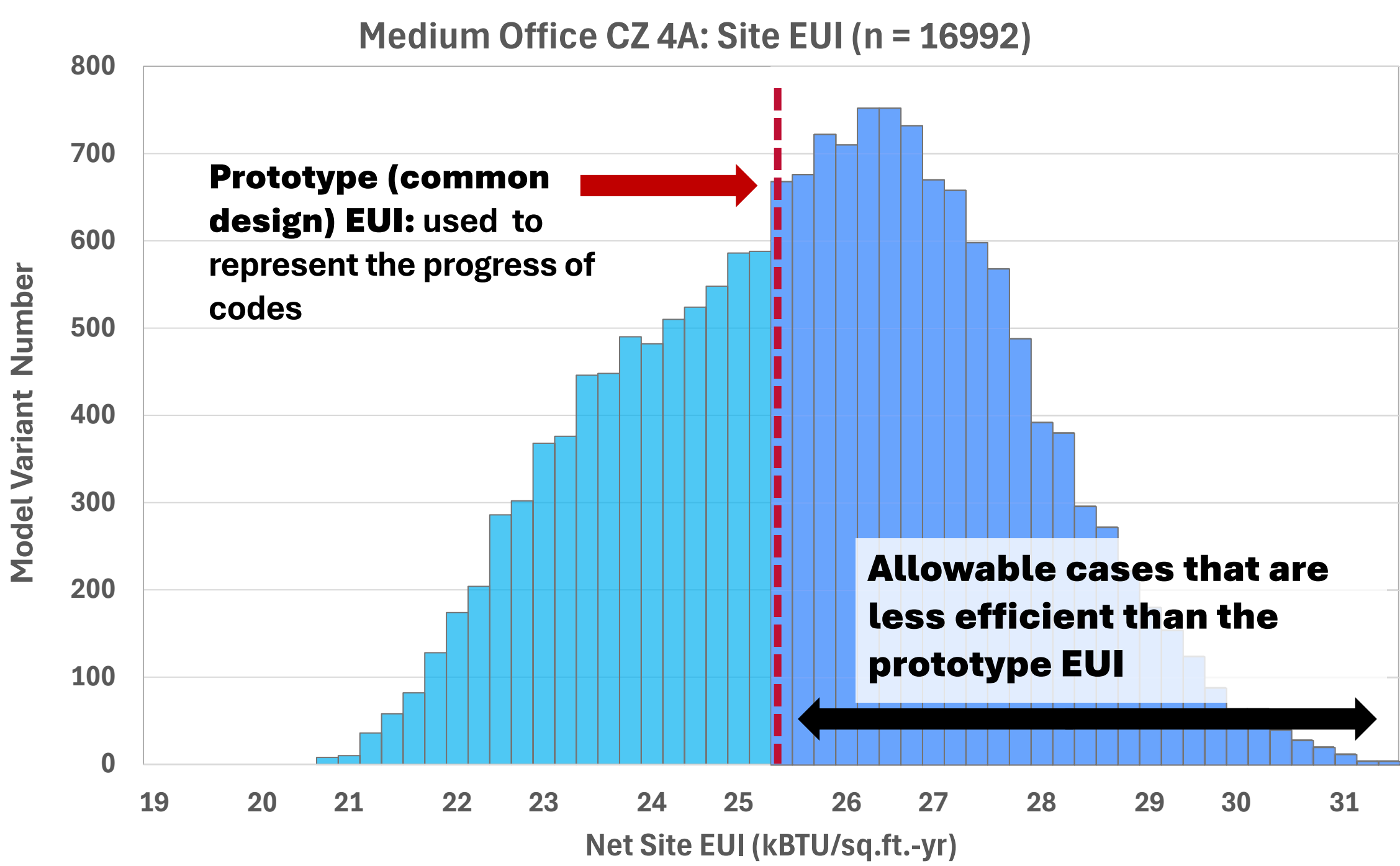
KEY PRODUCTS

- Variability of the permutations for multiple building types in multiple climate locations
- Over 1 million simulations
- Cost effectiveness methodology of different technologies
- Revised energy credit language and methods for enhanced energy credits for energy codes

CONCLUSION

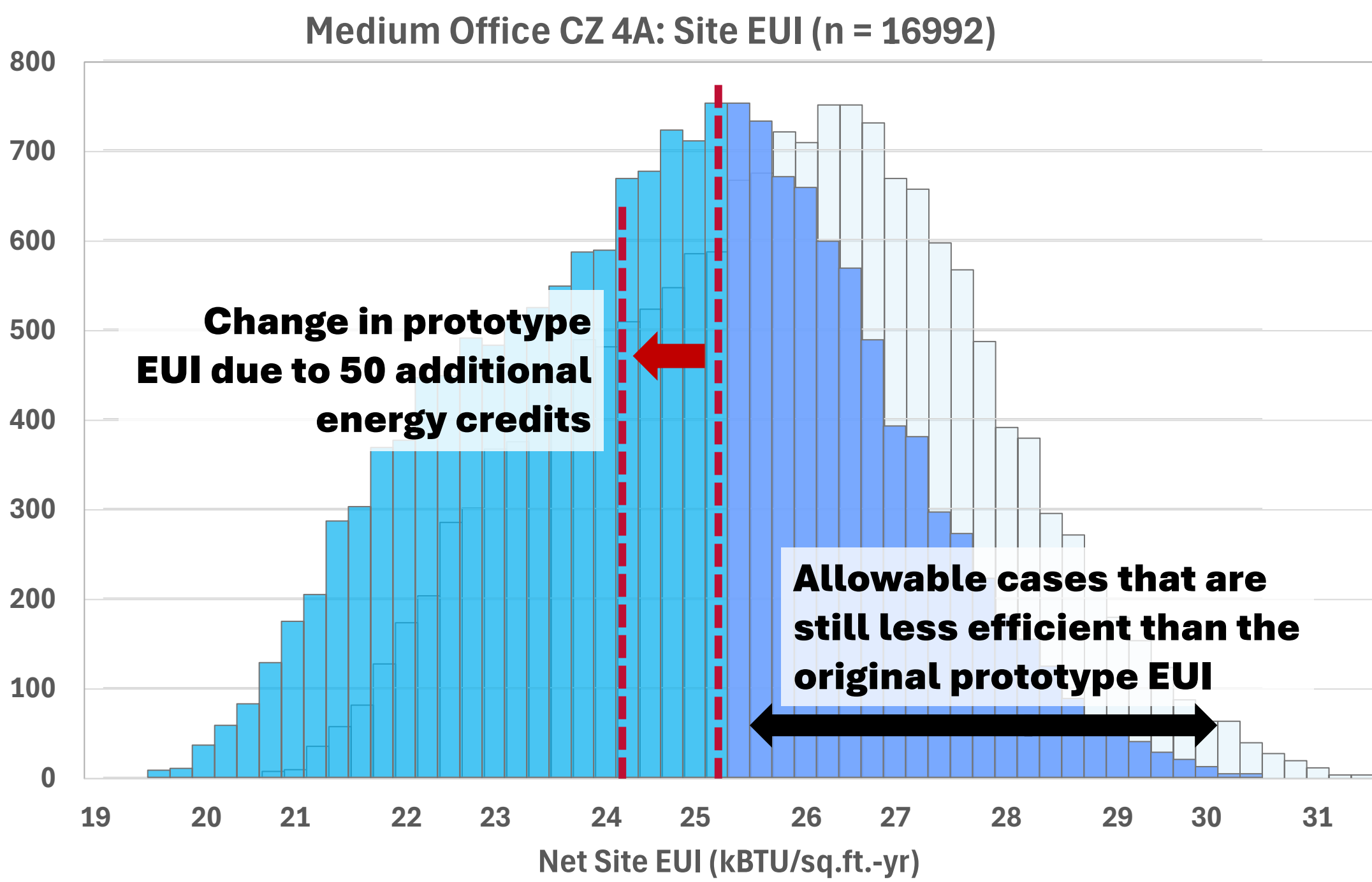
- Re-establish the prescriptive target EUI based on a building representing “good, standard practice” as defined by SSPC 90.1
- Revise code language that new buildings must achieve a design with EUI equal or better than the median prototype EUI.
- Eliminates prescriptive building permutations with higher EUIs reducing prescriptive variability by as much as 50%

Too Much Variability



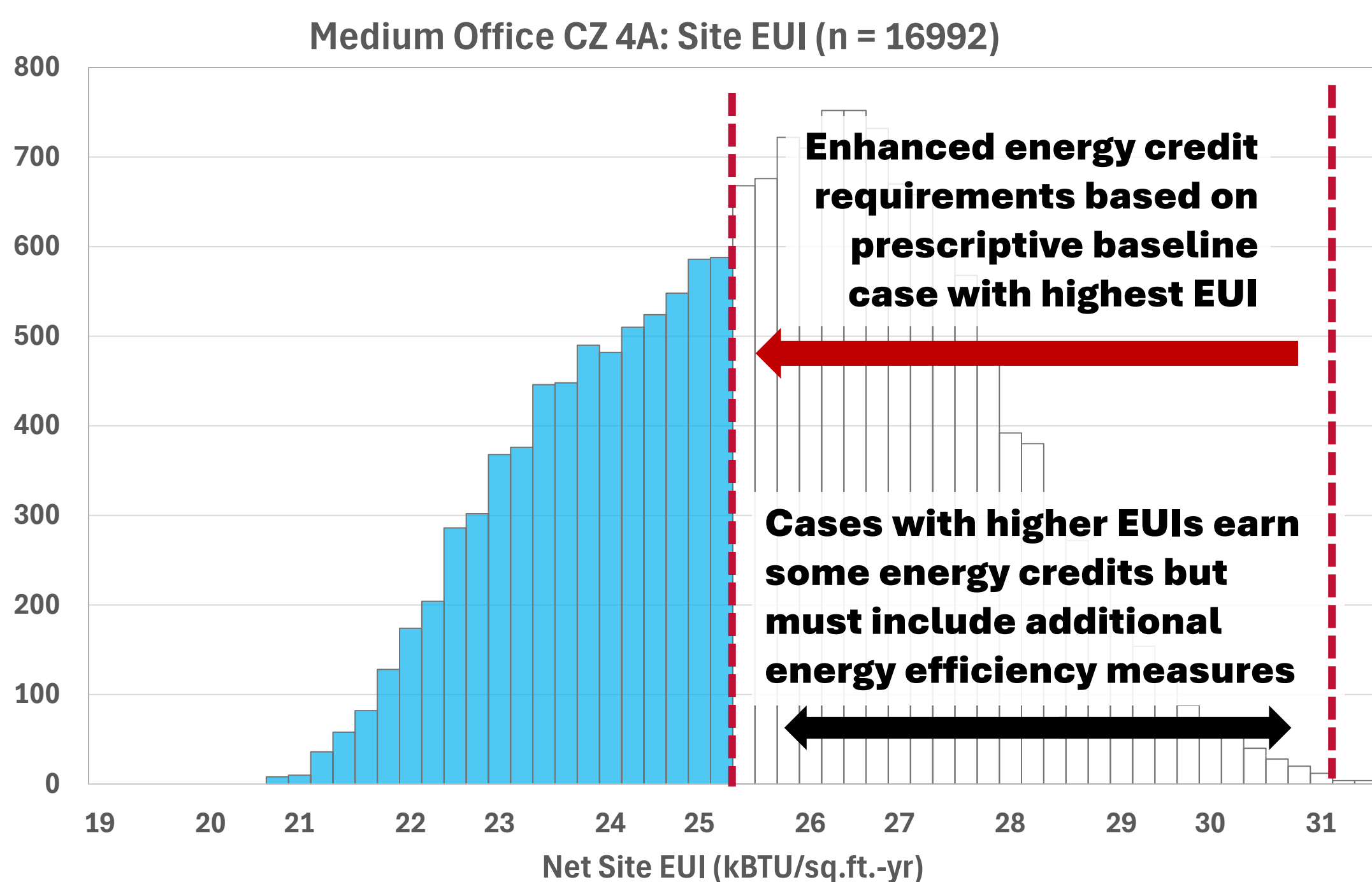
17,000 simulations for the medium office in climate zone 4A. EUI ranged from 20 – 31 kBtu / ft²-yr. Majority of the minimally compliant prescriptive cases (dark blue) are less efficient (higher EUI) than the prototype EUI. The current prescriptive path has whole building EUI variability of -20% to +25% relative to the prototype EUI.

Increasing the Required Credits Only Shifts the Problem



Requiring projects to earn more energy credits shifts the EUI distribution but does address the problem of prescriptive variability. A majority of the minimally compliant prescriptive cases (dark blue) are still less efficient (higher EUI) than both the new prototype EUI target and the original prototype EUI.

Enhanced Credits → Reduce prescriptive variability by 50%



- Enhanced energy credit requirement set at a level of performance equal to the prototype EUI. In this example the credit requirement would be set at 180 energy credits = 18% difference between the baseline and prototype EUIs.
- Ensures all projects meet the same level of energy performance without eliminating prescriptive choices.
- Prescriptive requirements are assigned energy credits to encourage more efficient prescriptive design choices.
- Prescriptive designs with lower EUIs than the prototype will meet enhanced energy credit requirements without needing additional energy efficiency measures.
- Prescriptive cases with higher EUIs than the prototype will earn some energy credits but will need to include additional efficiency measures for compliance.

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