



December 22, 2023

National Institute of Standards and Technology (NIST)
Standards Coordination Office
c/o Jennifer L. Marshall, Deputy Director
100 Bureau Drive, Mail Stop 2100
Gaithersburg, MD 20899-2100

Via regulations.gov

Re: “Request for Information on Implementation of the United States Government National Standards Strategy for Critical and Emerging Technology (USG NSSCET)”, Docket No. 2023-19245.

The International Code Council (“ICC” or “Code Council”) is a nonprofit organization of over 700 employees – driven by the engagement of its more than 60,000 members – dedicated to helping communities and the building industry provide safe, resilient, and sustainable construction through the development and use of model codes and standards used in design, construction, and compliance processes. Most U.S. states and communities, federal agencies, and many global markets choose the International Codes® (I-Codes®) to set the standards for regulating construction, building safety, and major renovations, plumbing and sanitation, fire prevention, and energy conservation in the built environment.

The Code Council appreciates the opportunity to submit the following comments in response to NIST on behalf of the U.S. Department of Commerce request for information on the development of an implementation plan for the United States Government National Standards Strategy for Critical and Emerging Technology (“USG NSSCET”, “CET”, or “implementation plan”).

The I-Codes® and ICC standards are developed through a World Trade Organization (WTO)-compliant consensus-based process that is supported and embraced by the federal government. The Code Council’s Family of Solutions support the United Nations Sustainable Development Goals.¹ As proud strategic partners of the International Trade Administration at the U.S. Department of Commerce, the Code Council actively supports the various federal government initiatives that enable harmonization, reduce technical barriers to trade, and open markets to U.S. manufacturers and service providers in the design and construction industry. The Code Council’s interests and recommendations primarily pertain to the CET list subcategories covered under “advanced engineering materials” and “renewable energy generation and storage.”

¹ International Code Council (ICC), [Supporting the Sustainable Development Goals](#).

In recent years, the I-Codes® have incorporated an extensive array of new technologies and best practices that enable and advance construction of tiny homes, reuse of shipping containers, the utilization of cross-laminated timber (CLT), and 3-D printed structures.² The Code Council also recently released a standalone publication of the *2021 International Tiny House Provisions: Code, Commentary and Standards for Design, Construction and Compliance* and has announced development of a standard for tiny homes intended for permanent occupancy. Both CLT and 3-D printing can speed construction and enable new building design options. CLT can also mitigate earthquake hazards for building occupants, while 3-D printing enables impressive precision. Current codes also integrate advancement in building sciences that work to safely enable energy storage.

As new and innovative products come to market, manufacturers can demonstrate code compliance through the ICC-Evaluation Service's (ICC-ES) product evaluation process. Through this process, manufacturers, designers, contractors, and those charged with enforcement gain confidence in the safety of innovative CET construction products. Where the model codes do not yet address properties for such a product, ICC-ES can develop Acceptance Criteria (ACs), which help ensure project safety. Similar to the code development process, ACs and changes to such criteria are vetted via a public input process and are approved by an Evaluation Panel made up of code officials. As new CET standards come out – such as those developed for low-carbon materials – ICC-ES SAVE (Sustainable Attributes Verification and Evaluation) Environmental Program provides manufacturers with independent and comprehensive evaluation and/or certification that their products meet specific sustainability targets.

Responses to Questions 1, 2, 3 – Benefits, challenges, risks, opportunities, and challenges of increasing and decreasing U.S. participation in standards development for CET.

The Code Council develops and maintains standards for recognized renewable energy generation and storage applications like solar thermal technologies, energy performance, and HVAC installation, as well as others not captured by the formal CET list. On a broader scale, the International Energy Conservation Code (IECC®) and the International Green Construction Code (IgCC®) are impactful tools to increase energy efficiency and reduce the GHG emissions directly associated with new buildings and major renovations. In addition, modern energy and green codes are a mechanism to deliver energy bill savings for consumers and enhance community resilience in the face of growing natural hazards like extreme heat and cold events. Modern energy codes, like the IECC®, have been identified as tool to curb soaring energy costs and reduce energy burdens for residents across the nation.³

Both ICC-ES and ICC NTA carry out third-party testing of materials to ensure they meet the current codes and standards for engineering materials, among other products and applications beyond those covered by the USG NSSCET scope. Additionally, as it relates to the built environment, many internationally developed standards for critical and emerging technologies – as defined by the National Science and

² The I-Codes® cover additional non-traditional building materials, including Light Straw-Clay Construction; Strawbale Construction; and Cob Construction.

³ U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), [Determinations](#).

Technology Council (NSTC)⁴ for advanced engineering products and renewable energy, energy storage, and energy efficiency – are largely upstream products of the I-Codes®.

When new materials standards come to market, standards development organizations (SDOs), builders, manufacturers, or other interested stakeholders can participate in the code development process to submit a proposal for inclusion in the subsequent edition of the code(s).⁵ The CET standards are often proposed to be incorporated by reference for the products in which they apply rather than submitting brand-name building products that may be too exclusive to be economically feasible. As the FRN stresses the importance of an “open, consensus-based” system, consideration of the I-Codes® includes public comment and a consensus vote on code change proposals. The Code Council’s work with NIST, as well as other federal, state, local, tribal, territorial (SLTT), and even international partners acknowledge benefits of increased standards development participation and use of CET as it relates to:

- necessary reaction to a previously unaddressed risk or hazards, (e.g., addressing fire risk of lithium-ion batteries and energy storage concerns);^{6,7}
- meeting climate, decarbonization or greenhouse gas emissions reduction goals;⁸
- increasing innovation by sharing new studies, data, or related technologies;
- potential energy, water, and cost savings;⁹
- increasing sustainability and efficiency or reducing waste; or
- facilitating trade through confirmation and confidence in the international conformity assessment process.

Decreasing participation in the U.S. standards development process before incorporation by reference into the I-Codes® would be concerning as it relates to the benefits derived by participants from the code development process. As most codes and standards follow three- to six-year development cycles, each cycle offers an opportunity to provide improvements through the inclusion of new weather and risk hazard studies, and scientific developments as identified by the USG NSSCET. U.S. participation in these upstream efforts ensures the U.S. government’s expertise is brought to bear and that U.S. economic interests are protected, not just in the CET standard, but in downstream construction codes that follow.

Response to Question 8 – Recommendations on how can the U.S. Government increase the amount and consistency of private sector (i.e., industry, including start-ups and small- and medium-sized

⁴ Federal Register, U.S. Department of Commerce, National Institute of Standards and Technology (NIST) [Request for Information on Implementation of the United States Government National Standards Strategy for Critical and Emerging Technology \(USG NSSCET\)](#), Notice, 88 FR 61527.

⁵ International Code Council (ICC), [Code Development Process](#).

⁶ ICC, [International Code Council and Interstate Renewable Energy Council Release Energy Storage Systems Guide](#) (Dec. 7, 2022).

⁷ ICC, Building Safety Journal, [Call for Committee: Ad Hoc Committee on Batteries and Energy Storage, Building Safety Journal](#) (July 31, 2023) .

⁸ ICC, [Decarbonization of the Built Environment: Solutions from the International Code Council](#) (approved: Sept. 10, 2022).

⁹ National Institute of Building Sciences (NIBS), [Natural Hazard Mitigation Saves: 2019 Report](#) (Dec. 2019).

enterprises (SMEs), academic community, and civil society organizations) engagement in standards development activities for CET.

Currently, when U.S. industry desires to participate in international standardization activities through the International Organization for Standardization (ISO) or International Electrotechnical Commission (IEC), they are required to pay fees to the American National Standards Institute (ANSI), as the appointed representative of the U.S. in these forums. This is in addition to the commitment of time and technical expertise that they must lend to these activities. Participation in international standardization activities furthers the international recognition of U.S.-developed international standards and other high quality standards that enable the use of CET, many of which are developed in the U.S. If the cost barrier to participation was removed, it is likely that more U.S. industry would engage in international standardization activities. Likewise, federal government grants should be made available to U.S. private sector experts to invest their time in participating in expert committees that are developing the technical standards to ensure that they are written in a way that enables the use of U.S.-developed CET. These recommendations are even more relevant and influential to enable participation by representatives of academic institutions and SMEs.

Response to Question 12 – Recommendation for the U.S. Government to better support state, local, and tribal governments in participating in standards development activities for CET.

The U.S. Government could allow flexibility to also facilitate state, local, tribal, and territorial (SLTT) governments participation in code/standards development activities through existing grant programs that fund the adoption and implementation of codes/standards. Whole-of-government approaches, such as the White House National Initiative to Advance Building Codes (NIABC), could be leveraged to encourage this participation.¹⁰

The federal government has increasingly moved towards incentivizing the adoption and implementation of current codes and standards due to their hazard resistance and resource conservation measures. This approach was advanced during the Trump Administration within the federal government’s National Mitigation Investment Strategy— developed by the Mitigation Federal Leadership Group (MitFLG)—and continued by the Biden Administration through the NIABC.¹¹ The White House, in support of the NIABC, just released the National Climate Resilience Framework, which further highlights the role of model building codes and standards in advancing hazard risk reduction and calls for the expanded adoption of the latest consensus-based building and energy codes.¹² Efforts to improve subsequent editions should be recognized as an eligible grant activity across all related programs as a result.

¹⁰ The White House, [FACT SHEET: Biden-Harris Administration Launches Initiative to Modernize Building Codes, Improve Climate Resilience, and Reduce Energy Costs](#) (June 1, 2022).

¹¹ DHS Mitigation Framework Leadership Group (MitFLG), [National Mitigation Investment Strategy](#) (Aug. 2019).

¹² The White House, [National Climate Resilience Framework](#) (Sept. 2023).

The Department of Energy’s (DOE) *Bipartisan Infrastructure Law: Resilient and Efficient Codes Implementation* (RECI) Funding Opportunity Announcement (FOA) highlights participation in code and standards development processes as an eligible example that would also achieve “Equity, Energy, and Environmental Justice (EEEJ)” goals set by the Biden-Harris Administration. DOE justifies encouraging use of RECI funds for code and standards development activities as an opportunity to educate communities on the value of codes. The FOA explains that broader community participation results in more equity-focused code language and better understanding of needs and barriers faced by specific communities (e.g., population of unhoused people, climate zones, aging existing infrastructure, energy burdens, etc.).¹³ Following DOE’s RECI as an example for other grant programs could extend capability and capacity building activities explicitly for CET code and standards development activities.

Greater participation improves the socioeconomic, regional, political, and climate perspectives necessary to initiate changes between code and standard editions. Facilitating an avenue for broader participation by underserved communities which would otherwise not have the capacity or capability to request change, can inspire innovation, new solutions, and new CET standards. This diversity in viewpoint not only improves the perspective reflected in the standards developed but increases adoption through the buy-in generated by the newer participants.

FEMA’s *Fire Prevention and Safety* (FP&S) grant program offers an example of an existing program that should be further leveraged to support energy-storage standards development activities. The Code Council’s is actively creating an Ad Hoc Committee on Batteries and Energy Storage as it relates to nexus of building and fire safety resulting from battery explosions. With the advancement of and increased consumer access to electric vehicles, new risks to the built environment are also developing as it related to the battery systems. Lithium-ion batteries in mobility devices (scooters, e-bikes) as well as phones, tablets, and computers have raised concern over the last decade as well. As a result, there is an increasing need from the perspective of those who have encountered building and infrastructure damage and critical failure due to battery fires and explosions (e.g., first responders, forensic fire investigators) to ensure developing CET codes and standards adequately address the risk of the products already on the market.

The Federal Emergency Management Agency’s (FEMA) *Building Resilient Infrastructure in Communities* (BRIC) recognizes all model building codes as a “low-cost, high impact” resilient hazard mitigation investments. This is just one reason the adoption and implementation of the most recent edition of model building codes and standards is highly incentivized by FEMA. Expressly allowing BRIC grants to be used for participation in development activities would aid SLTT code officials—who are highly trained and certified on the previous editions of the codes and standards—to make necessary improvements in the next cycle without putting additional strain on their jurisdiction’s budget.

¹³ DOE, [Bipartisan Infrastructure Law: Resilient and Efficient Codes Implementation, Funding Opportunity Announcement, DE-FOA-0002813](#), pg. 25 (Dec. 16, 2023).

Officials charged with enforcing building and fire codes and standards, by design, are exposed to design, construction, and technology failures and are trained to identify technological gaps that could improve the end products. Due to the private-sector nature of the U.S. standards development market, participation by those representing SLTT governments is limited due to shared time and resources. Many participants in code and standards development are doing so on a voluntary basis and their participation requires approved leave from a full-time public service job. As existing federal investment in codes and standards through FEMA's BRIC program or DOE's RECI program recognizes the capability and capacity building strains on SLTT governments, those who are encouraged to improve their SLTT enforcement regimes should also be federally supported in seeking to improve forthcoming editions of the model codes and standards.

Response to Question 14 – Recommendation for the U.S. Government to incentivize the modification of existing curricula and/or the creation of new curricula, to include faculty professional development, by educational institutions for pedagogy to support standards development activities for CET.

The U.S. government should not limit consideration to traditional post-secondary curricula structures when incorporating codes and standards into their educational offerings. Certifications applying to codes and standards do not fit a traditional semester or classroom training structure but do require substantial studying and understanding of field applications to pass the examinations. By encouraging the broader inclusion and credit eligibility of codes within the curricula, shorter seminar programs or conferences hosted by SDOs -- which usually provide continuing education units (CEU) for other certifications or professional licensure -- could draw in new participants.

Educational institutes should also accept as faculty non-post-doctoral instructors that hold specific code and/or standard certifications. The Code Council's highest certification achievement, the Master Code Professional (MCP™), requires more than 30 training courses and an average of at least 15 certifications; many of the certifications require passing multiple examinations. The Code Council's certification and exam development committees are developed closer to the standardized testing process college applicants face rather than theoretical or document-based styles found more traditionally in higher-education settings.

Given the advancements within the I-Codes® across recent code cycles to incorporate relevant CETs – such as energy conservation and storage, innovative construction materials, and embedded carbon measurement technologies—as well as the existing and desired efforts of the federal government to advance the use of U.S.-developed codes internationally and the importance of the U.S. in sustaining itself as a world leader in these areas—meaningful federal support for associated curricula, professional development, and other educational links to these CETs should be a pillar of the government's investment.

Response to Question 19 – Recommendations of standards information and tools the U.S. government can develop and promote to ensure U.S. exporters can compete in global markets for CET.

Beyond trade agreements, the federal government should support the use of U.S.-developed consensus standards abroad through grantmaking at the U.S. Agency for International Development (USAID) and the Department of Commerce to support outreach by U.S. SDOs, country-specific customization of U.S. developed consensus standards, adoption of the resulting standards abroad, and the implementation of those standards. Given participation, engagement, and adoption abroad is limited due to lack of awareness to the opportunity or benefits that U.S. developed standards provide, the U.S. government should develop policies to better support the wholistic approach of exporting of the U.S.'s construction industry, through consulting services, training, and conformity assessments to ensure the "right-sizing" of the U.S. code or standard to match the market. Financial support for the export of these services by U.S. experts would provide a more level playing field as compared to international competitors with government-led SDO regimes that do not benefit from the consistent consensus development process in the U.S. that encourages new CET inclusions with each edition.

In the construction arena, greater international adoption or reference of U.S. building safety resources, including building codes, standards, and capacity building tools for their effective implementation and enforcement would promote resilience and minimize the greenhouse gas impacts of future construction, especially in lower- and middle-income countries that do not currently enforce modern building codes. Existing U.S. Government initiatives such as the USAID-led President's Emergency Plan for Adaptation and Resilience (PREPARE) should prioritize preparing global markets for effective use of U.S.-developed international building codes and standards.

Building codes and standards have long served as the main tool of governments in introducing new technologies and innovation across the building stock, often driven by the latest in building sciences or unfortunate lessons learned from tragic events. Building energy codes, specifically, which often require the use of innovative technologies designed to robust standards, can both promote the export of U.S. goods and services as well as aid countries around the world to achieve more sustainable and energy efficient buildings aligned with global climate goals. The 2021 IECC[®] represents a roughly 40 percent improvement in energy efficiency for buildings compared to the 2006 edition, along with corresponding improvements in building, mechanical and material science, and technology. Globally, just focusing on minimum performance requirements for building equipment, which are often referenced in building codes, according to the International Energy Agency, could save between €280 and €410 billion in energy spending and create 1.7 to 2.5 million jobs.¹⁴ The 2021 IECC[®], and subsequent editions, also includes appendices that define requirements to achieve zero energy residential and commercial buildings that can be harnessed by all nations towards a decarbonized building stock. Implementation of modern energy codes, like the IECC[®], and building science is foundational to achieving energy savings and GHG emissions reductions across the global building stock.

DOE has also found that modern building energy codes play an important role in community resilience, both in grid resilience as well as passive survivability of structures built to the latest editions of the

¹⁴ International Energy Agency (IEA), [Modernising Building Energy Codes to Secure our Global Energy Future](#) (2013).

IECC®.¹⁵ A recent report by DOE and three national labs¹⁶ found that the 2021 IECC® can reduce deaths during a disaster-induced power outage coupled with extreme heat by 80% and extreme cold by 30%. Benefit-cost ratios for these resilience benefits ranged from 2 to 6 to 1. These benefits are additive to the energy bill savings the IECC® provides. Given the trend that extreme weather events are growing in severity and frequency, the resilience benefits associated with modern energy codes represent a meaningful piece of resilience to hazard events experienced around the world.

In one example, the CARICOM Secretariat Energy Unit and the CARICOM Regional Organisation for Standards and Quality (CROSQ) licensed content from ICC and ASHRAE to develop the 2018 CARICOM Regional Energy Efficiency Building Code (CREEBC) to address energy efficient buildings for its Member States. The CREEBC, based on the IECC® and ASHRAE 90.1, was developed to meet the specific needs of nations in the Caribbean, and it is also relevant for use in other countries with tropical climates. It establishes minimum energy efficiency requirements for buildings, including the building envelope, cooling system, ventilation, pumping, lighting and the service water-heating systems. The CREEBC reflects the unique energy requirements of tropical environments and promotes increased adoption rates of more effectual technologies for renewable energy and energy conservation. The CREEBC is accepted as a regional code by CARICOM members and is now used to design energy efficient buildings in those markets.

Approaches are also beginning to solidify around whole-life carbon assessment standards. ASHRAE and the International Code Council are developing ASHRAE/ICC Standard 240P: Quantification of Life Cycle Greenhouse Gas Emissions of Buildings as an international standard that can be incorporated into building codes and regulations, and can be used to support other programs. The standard should be completed by early 2025.

The IgCC® currently provides a holistic approach to addressing sustainability—including through innovative material use, energy efficiency and water conservation. The IgCC® already includes measures in Chapter 9 on the carbon impacts of materials and the use of EPDs and life cycle analysis. EPDs have been identified as a primary tool for transparency communication of the environmental impacts of products and materials. Chapter 9 includes prescriptive code requirements for both recycled content and salvaged materials and biobased materials, which provides pathways to incorporating innovative materials and building science to reduce the environmental impacts of buildings. The IgCC® also includes material and resource requirements related to resource conservation, impacts on the atmosphere, product transparency, and waste management in addition to reduced life cycle impacts of building materials while also achieving the required level of structural performance that promotes structural resilience and safety.

In another example, the Pakistan Engineering Council (PEC) released the Green Building Code of Pakistan-2023 based on the 2021 edition of the IgCC®. The Green Building Code is the second building

¹⁵ DOE, EERE, [Energy Resilience](#).

¹⁶ DOE, [Enhancing Resilience in Buildings Through Energy Efficiency](#) (July 2023).

code to be created by the PEC based on the I-Codes[®], following the publication of the 2019 Building Code of Pakistan, based on the 2021 International Building Code[®] (IBC[®]). The IgCC[®] and the suite of I-Codes[®], supported by U.S.-delivered capacity building services can provide the basis for countries around the world to integrate modern building science and materials into the fabric of their built environment to meet their resilience and sustainability needs.

Whether through trade agreements or grantmaking, encouraging governments to consider U.S.-developed standards will also lead to increased market opportunity for U.S. manufacturers whose products are designed to meet these high standards as well as service providers who are already familiar with the standards and therefore have a competitive advantage over service providers promoting less stringent standards. Additionally – as the Code Council has noted in recent comments responsive to both NIST¹⁷ and the Office of the U.S. Trade Representative¹⁸ – wider international usage of U.S.-developed codes and standards would also help counterbalance the global adoption of Chinese national construction standards, which is often an implicit or explicit requirement for countries that accept funding through China’s Belt and Road Initiative.

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The Code Council appreciates the work of NIST’s dedicated professionals, test facilities, and its work to support the development of CET and testing standards. We look forward to the publication of the draft implementation plan in hopes that it advances U.S. participation in code and standards development. Thank you for the opportunity to provide comments. If you have any questions concerning the Code Council’s recommendations, please do not hesitate to contact me.

Sincerely,

Lisa Berger
Government Relations Manager

¹⁷ [Comments submitted by ICC](#) in response to [FR-211026-0219, National Institute of Standards and Technology Study on Chinese Policies and Influence in the Development of International Standards for Emerging Technologies \(Docket NIST-2021-0006\)](#) (Dec. 6, 2021).

¹⁸ [Comments submitted by ICC](#) in response to [FR-2022-05044, Office of the U.S. Trade Representative Request for Comments on the Proposed Fair and Resilient Trade Pillar of an Indo-Pacific Economic Framework \(Docket USTR-2022-0002\)](#) (Apr. 11, 2022).