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U.S. Department of Energy
1000 Independence Ave. SW
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Via email: rticstorage@hq.doe.gov

Re: Comments of the International Code Council on the U.S. Department of Energy's (DOE) Energy Storage Grand Challenge and Roadmap

The International Code Council (ICC) is a member-focused association dedicated to helping the building community and the construction industry provide safe, resilient, and sustainable construction through the development and use of model codes (I-Codes) and standards used in the design, construction, and compliance processes. Most U.S. states and communities, federal agencies, and many global markets choose the I-Codes to set the standards for regulating construction, plumbing and sanitation, fire prevention, and energy conservation in the built environment. Relevant I-Codes for energy storage include the International Building Code (IBC), International Residential Code (IRC), International Fire Code (IFC), International Energy Conservation Code (IECC).

As interest in energy storage grows to address energy resilience and sustainability, the Code Council and its stakeholders are focused on assuring these technologies can be applied safely. Further, as the Department recognized in its recent FOA on Education Materials for Professional Organizations Working on Efficiency and Renewable Energy Developments (EMPOWERED), building and fire safety professionals are key to the widespread deployment of distributed energy resources (DERs). ICC appreciates the opportunity to submit the following responses to DOE's RFI in the above-named matter.

I. Energy Storage in the I-Codes

Chapter 12 of the IFC addresses a wide range of systems that generate and store energy in, on, and adjacent to buildings and facilities. Ensuring appropriate criteria to address the safety of such systems in building and fire codes is an important part of protecting the public at large, building occupants, and emergency responders. The chapter addresses the rapidly evolving landscape of technologies including standby and emergency power, photovoltaic systems, fuel cell energy systems, and energy storage systems. The safety and ongoing operation of such systems can assure they are available when needed in a disaster or for grid stability.

IFC Chapter 12 requires a failure modes and effects analysis (FMEA) or other approved hazard mitigation analysis for new battery technology types, where multiple battery technologies are utilized in the same vicinity, or where quantities exceed certain thresholds to help guard against thermal runaway and fire propagation. Such an analysis must demonstrate that toxic gases during fires or other fault conditions do not reach concentrations in excess of Immediately Dangerous to Life or Health (IDLH) levels in the building or egress routes during the time necessary for evacuation. Stationary storage battery systems are also required to comply with IBC seismic design requirements and not exceed the floor-loading limitation of the building.

Recognizing the changing nature of energy storage systems (ESS), the soon to be released 2021 IFC ESS requirements are more reflective of the various types of installations and battery technologies that exist. As an example, the provisions now recognize the difference between ESS installed within a building versus standalone installations. There is also more guidance as to how to address commissioning and decommissioning that are critical to the safety of these systems.

Section R327 of the IRC addresses the safe installation and use of ESS in one-and two-family dwellings. Provisions include requirements for product listing and labeling, installation, ventilation, and impact protection.

The comments that follow provide important considerations in addressing the goals outlined in the Energy Storage Grand Challenge Roadmap.

II. General Comments on the Draft Roadmap

We commend the Department for identifying the need for a strategic and coordinated approach to furthering the development and use of energy storage. However, as currently formulated in the roadmap, the Department focuses almost exclusively on the development of technologies and a manufacturing base with little focus on assuring these technologies can be deployed safely. As these technologies are developed, safety should be included as an essential performance factor to be considered as part of system design. If safety is considered as an afterthought during the deployment process, significant resources may be expended on a technology that doesn't meet the requirements of building and fire safety professionals and is therefore not compliant with building codes. Or worse, a solution could be deployed in the marketplace and experience a failure that results in property damage or loss of life, slowing or even halting further deployment of energy storage solutions. The roadmap also fails to recognize the important role of building codes and building and fire safety professionals in determining whether a specific technology or practice is accepted.

Safety along with building codes and building and fire safety professionals should be featured prominently in all five identified tracks. In addition to protecting public safety, building codes provide consistency in application of requirements which brings efficiency to the manufacturing, designing and deployment of systems.

To assure that building code-related considerations are included, we strongly urge DOE to include the Building Energy Codes Program within the Office of Energy Efficiency and Renewable Energy (EERE) as part of the intra-agency group leading this effort. Specific comments for each of the roadmap sections are included below.

In addition to the pending Education Materials for Professional Organizations Working on Efficiency and Renewable Energy Developments (EMPOWERED) grants, the Department does have ongoing activities that help address some of the shortcomings identified in these comments—these activities should be fully integrated with the roadmap and efforts to support its implementation. These activities include:

- Activities at Pacific Northwest National Laboratory (PNNL) and Sandia National Laboratories that have produced documents including:
    - *Energy Storage System Safety: Plan Review and Inspection Checklist*

    - *Energy Storage System Guide for Compliance with Safety Codes and Standards*
    - *DOE OE Energy Storage Systems Safety Roadmap: Focus on Proposed Changes to the ICC International Codes*
- Developing Consensus Recommendations to Address Challenges with Solar and Solar + Storage Code Enforcement and Permitting Approvals
- Solar Automated Permitting Process

a. Technology Development

This track identifies the importance of considering energy storage uses, benefits and functional requirements in advancing energy storage development. However, most of the functions identified focus on the beneficial characteristics of energy storage solutions and not the essential considerations around their safe use. All developed use cases and the technologies to be pursued to address them should include safety considerations for the specific application. These requirements are based in public safety and should apply regardless of the entity installing or operating the ESS. Many safety considerations such as the following are currently addressed by IFC Chapter 12 and should be referenced during technology development. Is the storage solution likely to be installed in a building or in close proximity to people?

- What types of fire suppression systems would be required?
- Is the material used hazardous or toxic?
- What signage would need to accompany an installation to communicate potential risks?
- Is special training for fire departments and other first responders required?
- Does the solution present specific characteristics that need to be addressed including heat generation and combustibility?

b. Manufacturing and Supply Chain

Many of the concerns identified during the R&D process must also be addressed when deployed in public applications. Solving these upfront and assuring building codes contain these safety measures before widespread deployment will help reduce safety concerns while hopefully avoiding potential incidents that can slow (or even halt) deployment.

As DOE forms a Federal Consortium for Advanced Batteries (FCAB) we strongly recommend including agencies with public safety missions to assure that all potential challenges to deployment are considered. These agencies include the Consumer Product Safety Commission, National Institute of Standards and Technology, U.S. Fire Administration, and Environmental Protection Agency. Federal agencies responsible for the design, construction and operation of buildings like the General Services Administration and Department of Defense should also be included to assure that the users of energy storage products are represented.

c. Technology Transition

While safety should be a key performance requirement in the technology development stage, the technology transition track should include a strong focus on building codes and standards and

conformity assessment as an early requirement in the commercialization process. The roadmap identifies the need for technology and interconnection standards. Some of these standards will be incorporated into building codes. These standards should include requirements on the installation and operation of systems to protect both property and life-safety.

d. Policy and Valuation Track

As this track looks to support decision makers in the effective implementation of policies that address community needs, building codes are an important mechanism. DOE and other stakeholders in the deployment of energy storage technologies should both participate in the code development process and support the adoption and enforcement of up-to-date codes. Codes are updated on a three-year cycle to capture the latest technologies and practices. DOE should rely on the expertise of the BECP to leverage building codes as part of the policy drivers for energy storage—noting that involvement will need to go beyond the International Energy Conservation Code (IECC) to include the International Fire Code (IFC), the International Building Code (IBC), the International Residential Code (IRC), the National Electrical Code (NEC) and others.

Table 3 in the roadmap identifies key audiences in supporting deployment of energy storage. While consumer protections, codes and standards are mentioned for some stakeholders, building and fire safety professionals are not specifically mentioned despite their responsibilities for these areas. Building and fire safety professionals often have significant influence on what can and cannot be built within a jurisdiction. DOE should explicitly recognize this role and develop policy tools that address their specific needs. The Code Council would be pleased to work with the Department to meet the needs of these stakeholders.

Table 4 provides examples of products that could be developed under the policy and valuation track. We strongly encourage DOE to include tools and policies to support the safe deployment of energy storage products through strategies like model building codes, product evaluations, and building and fire safety professional education.

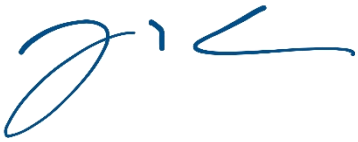
e. Workforce Development Track

Developing a workforce to support research, development, design, manufacture, operation, and installation and regulation of energy storage system will be essential to widespread deployment. DOE should deploy a workforce strategy that engages workers from all these segments. Building and fire safety professional training will support smoother deployment. DOE recently launched the EMPOWERED program to address some of these needs. Additional opportunities to support code official training on energy storage would be valuable.

At the same time, researchers, designers, installers and operators should receive training on the relevant codes and standards to reduce potential deployment challenges and assure that products are being designed, installed and operated safely.

Thank you for the opportunity to provide comments. If you have any questions concerning ICC's recommendations, please do not hesitate to contact me.

Sincerely,



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