

# **Outdoor Energy Storage Implementation Standards**





## Overview

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For the past decade, industry, utilities, regulators, and the U.S. Department of Energy (DOE) have viewed energy storage as an important element of future power grids, and that as technology matures and costs decline, adoption will increase. For the past decade, industry, utilities, regulators, and the U.S. Department of Energy (DOE) have viewed energy storage as an important element of future power grids, and that as technology matures and costs decline, adoption will increase. This future was identified in the DOE Office of Electricity Energy Storage (DOE OE ES) Program Planning report.

**Purpose of Review** This article summarizes key codes and standards (C&S) that apply to grid energy storage systems. The article also gives several examples of industry efforts to update or create new standards to remove gaps in energy storage C&S and to accommodate new and emerging energy storage technologies. **Recent Findings** While modern battery technology

Segments of C&S development activities can be grouped broadly under the areas of Performance, Reliability, and Safety. These activity areas map to the major stakeholder groups as represented by their respective Standards Developing Organizations (SDOs), shown in Fig. 2. Key energy storage C&S and their respective locations within the built environment.

Gaps in C&S development can lead to a variety of impacts. & Poorly written requirements can lead to unenforceable code. For example, a technical requirement written to say, Shall have thermal runaway mitigation could appear in an installation or fire code. This puts the jurisdictional authority in the difficult situation of understanding the.

Filling gaps in energy storage C&S presents several challenges, including (1) the variety of technologies that are used for creating ESSs, and (2) the rapid pace of advances in storage technology and applications, e.g., battery technologies are making significant breakthroughs relative to more established resources including photovoltaic and traditional.

Does industry need standards for energy storage?

As cited in the DOE OE ES Program Plan, “Industry requires specifications of standards for characterizing the performance of energy storage under grid



conditions and for modeling behavior. Discussions with industry professionals indicate a significant need for standards . " [1, p. 30].

What is the implementation plan for the development of new energy storage?

In January 2022, the National Development and Reform Commission and the National Energy Administration jointly issued the Implementation Plan for the Development of New Energy Storage during the 14th Five-Year Plan Period, emphasizing the fundamental role of new energy storage technologies in a new power system.

What safety standards affect the design and installation of ESS?

As shown in Fig. 3, many safety C&S affect the design and installation of ESS. One of the key product standards that covers the full system is the UL9540 Standard for Safety: Energy Storage Systems and Equipment . Here, we discuss this standard in detail; some of the remaining challenges are discussed in the next section.

How to promote the implementation of independent energy storage stations?

To promote the implementation of independent energy storage stations, it is necessary to further optimise the electricity market mechanism. segments and targets. Investor participation is beneficial for the development of the energy storage industry.



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### VPC Verification and Safety Specifications

With the development of grid-level energy storage systems, the capacity of devices is increasing daily. In addition to the performance of equipment ...

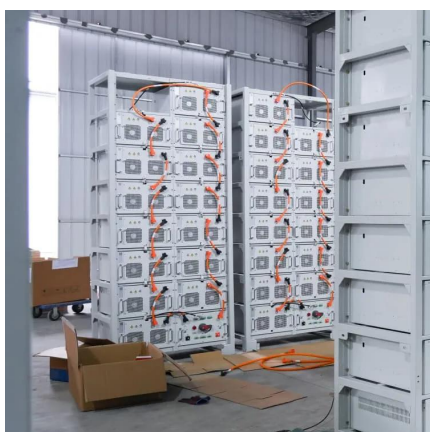
### VPC Verification and Safety Specifications. Billion Watts

With the development of grid-level energy storage systems, the capacity of devices is increasing daily. In addition to the performance of equipment and systems, in order to ensure the safety ...



### U.S. Codes and Standards for Battery Energy Storage ...

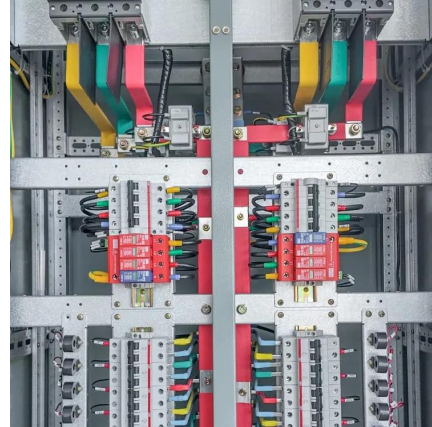
Qualification Standards The relevant codes for energy storage systems require systems to comply with and be listed to UL 9540 [B19], which presents a safety standard for energy storage ...



### Codes & Standards - Energy Storage Safety

The goal of the Codes and Standards (C/S) task in support of the Energy Storage Safety Roadmap and Energy Storage Safety Collaborative is to apply research and development to ...





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