

# Executive Summary of the Underwriters Laboratories and UL Responses on Battery Energy Storage System Incidents and Safety

## ***Executive Summary***

On July 18, 2020, a report was published by DNV GL titled “*McMicken Battery Energy Storage System Event – Technical Analysis and Recommendations*”. The report presented an analysis conducted by DNV GL on behalf of Arizona Public Service (APS) regarding the investigation into a thermal event and subsequent explosion that occurred at the APS McMicken Battery Energy Storage facility.

The DNV GL report contains some inaccuracies with respect to Underwriters Laboratories’ standards development process as well as the scopes and test methodologies of the referenced UL Standards. The response presented by Underwriters Laboratories provides clarifications to the DNV GL report along with an overview of the standards development process. The response presented by UL provides an overview of energy storage safety regarding the scope of the testing of energy storage products and systems.

Please refer to the respective links below for the full detailed responses from Underwriters Laboratories and UL:

- [Battery Energy Storage System Incidents and Safety: Underwriters Laboratories Standards Overview](#)
- [Battery Energy Storage System Incidents and Safety: A Technical Analysis by UL](#)

## ***Summary of Underwriters Laboratories Response - Standards Development Process***

UL Standards are research and science-based standards that are developed through a standards development process that is accredited by both the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC).

UL Standards are consensus standards that are developed and maintained through a balanced group of individuals called Standards Technical Panels (STPs). These panels serve as the consensus bodies for developing, reviewing and maintaining UL Standards. STPs vote on proposals for UL Standards, thereby determining the content that will be published.

The DNV GL report states that the STP for UL 9540 and UL 9540A, STP 9540, did not include LG Chem LTD or AES. Although LG Chem LTD was not a member of STP 9540 when it was first established, LG Chem LTD has since become a member of STP 9540. In addition to STP 9540, LG Chem LTD is also a member of STP 1973. Underwriters Laboratories has no record of AES applying to either STP 9540 or STP 1973. However, AES is encouraged to participate in the Underwriters Laboratories Standards development process and if interested, apply to these STPs.



Underwriters Laboratories notes that STP membership is not required to take an active role in the standards development process. Proposals to revise UL Standards can be submitted to the UL Standards division at any time, by anyone and proposals are sent to the STP and all interested parties for review and comment. To date, the UL Standards division has not received any proposals to revise UL 1973, UL 9540, and/or UL 9540A from either AES, LG, or DNV GL. If these entities believe these UL Standards are insufficient, they can submit proposals to revise the Standards.

### ***Summary of UL Response - Scope of UL Energy Storage Standards and Test Methodology***

UL has been a global leader in advancing safety of batteries and battery-operated products since the 1970's through research, testing, development of requirements, certifications, failure analysis and public education. As batteries have become increasingly more important parts of our lives and of the electrical infrastructure, UL's work to support safe deployment of batteries has also become increasingly important. UL has been able to stay at the cutting edge of battery safety through applying many years of experience with evaluating batteries and battery applications for safety and advancing that experience through comprehensive safety research. UL certification is based on rigorous investigations built on a foundation of strong safety science. The UL Mark on a product is a powerful identification that the product has been independently assessed.

Unfortunately, there have been a number of safety incidents involving energy storage systems that have not been certified by UL, including incidents in Korea and the incident in McMicken, Arizona. There are three publicly available reports published thus far on the Arizona incident, from Underwriters Laboratories' Firefighter Safety Research Institute (FSRI), DNV GL and Exponent, with recommendations provided by two of them. There was concurrence in the reports that the incident that injured the first responders was due to ignition of a combustible concentration of gas from the batteries. However, there are also some different findings that highlight disagreement (for example on root cause) and UL notes some issues that justify a response to correct inaccuracies or misinformation. The DNV GL report contained information that needs to be corrected with respect to UL Standards used for certification and testing of energy storage products and systems (e.g., UL 1973, UL 9540 and UL 9540A). Specifically, the report indicated these Standards do not evaluate (1) cell-to-cell thermal runaway, and (2) combustible off gassing.

Regardless of the quality of safety standards available, they are of no use if they are not actually utilized to evaluate the safety of the battery energy storage systems (BESS). There is no indication that the BESS in McMicken was certified to UL 9540 or subjected to UL 9540A testing. Similarly, there was no indication that the LG Chem battery systems were evaluated to UL 1973. After our review of the incidents, UL believes that if the systems involved in these incidents had been evaluated to safety standards, including UL 9540 and UL 9540A, the potential for hazardous propagation due to cell thermal runaway would have been identified and mitigated. This underscores the importance of using the established safety standards as a basis for safe deployment of technology. UL believes that it is critical that BESS undergo independent third-party evaluation to the appropriate safety standards. The current codes used to regulate BESS



installations also require that BESS undergo third-party certification, which can help promote safe energy storage infrastructure.

UL has been, and remains, focused on advancing safety science to support the safe and sustainable deployment of battery technologies and energy storage systems. The established requirements and Standards provide a sound foundation for diligently addressing safety of these technologies, and UL encourages the use of the national standards for safety as a proactive measure of diligence and establishing confidence in compliant products brought to market. While UL continues to actively support further development of safety requirements, all interested parties are encouraged to make specific proposals for practical advancement of energy storage safety. The safety incidents that have occurred are unfortunate but can catalyze the energy storage community to collaborate toward finding new solutions leveraging lessons from incidents, application of technology and innovative approaches. This effort is needed to accomplish the full promise of energy storage technology, and UL will continue our work to support that imperative.

### **Conclusion**

The battery and energy storage system industry is dynamic with many new developments underway and there have been, and continue to be, multiple revisions of the UL Standards affecting this industry. UL Standards will continue to evolve as technology advances, safety concerns are identified, and additional research, testing and data become available. Underwriters Laboratories' standards development process is open to all and anyone interested is encouraged to participate and can propose changes to UL Standards at any time. Any complete proposal submitted for a UL Standard will be sent for public review and to the STP for vote. Again, STP membership is not required to participate in the development of UL Standards. Collaboration and participation in the standards development process is critical to the effectiveness, acceptance and sustainability of UL Standards in the global marketplace. Working together, we can help make a safer, more secure and sustainable world.

### **About Underwriters Laboratories**

Underwriters Laboratories is a nonprofit organization dedicated to advancing the UL public safety mission through the discovery and application of scientific knowledge. We conduct rigorous independent research and analyze safety data, convene experts worldwide to address risks, share knowledge through safety education and public outreach initiatives, and develop standards to guide safe commercialization of evolving technologies. We foster communities of safety, from grassroots initiatives for neighborhoods to summits of world leaders. Our organization employs collaborative and scientific approaches with partners and stakeholders to drive innovation and progress toward improving safety, security, and sustainability, ultimately enhancing societal well-being. To learn more, visit [UL.org](https://www.ul.org).

### **About UL**

UL helps create a better world by applying science to solve safety, security and sustainability challenges. We empower trust by enabling the safe adoption of innovative new products and technologies. Everyone at UL shares a passion to make the world a safer place. All of our work,



from independent research and standards development, to testing and certification, to providing analytical and digital solutions, helps improve global well-being. Businesses, industries, governments, regulatory authorities and the public put their trust in us so they can make smarter decisions. To learn more, visit [UL.com](https://www.ul.com).

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