

## **Executive Summary**

In an effort to provide guidance to standards developers, authorities having jurisdiction (AHJs), emergency responders, and the energy storage system (ESS) industry, Exponent, in conjunction with FPRF, the Project Technical Panel, and industry sponsors, performed a fire hazard assessment of Li-ion battery ESSs. Currently, these entities do not have a clear direction regarding the fire hazards of ESS installations and have few, if any, technical studies, reports, or scientific literature to rely upon when making decisions regarding the safe installation of these systems. This report summarizes a literature review and gap analysis related to Li-ion battery ESSs, as well as full-scale fire testing of a 100 kWh Li-ion battery ESS.

The scope of work included, but was not limited to, the following four primary tasks:

1. A literature review and gap analysis related to Li-ion battery ESSs;
2. Development of a detailed full-scale fire testing plan to perform an assessment of Li-ion battery ESS fire hazards;
3. Witnessing the implementation of the fire test plan through full-scale fire testing; and
4. A report of final results and a fire hazard assessment.

The overall project research objective was to develop a technical basis through a fire hazard assessment of Li-ion battery ESSs. This project is the first phase of an overall initiative with the goal to develop safe installation practices, fire protection guidance, and appropriate emergency response tactics for Li-ion battery ESSs based on the literature review and full-scale test results, as applicable. This project did not include an analysis or testing of fire detection systems, fire suppression systems, or emergency response tactics related to Li-ion battery ESS fire scenarios. A full listing of project observations/key findings as they relate to ESS fire hazards is provided in Section 7 of this report.