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ESRG Acton-Boxborough Battery Energy Storage System Review and Analysis

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Summary

ESRG has been asked by the Acton-Boxborough Regional School District to conduct a site and system review on a proposed battery energy storage system installation to supplement power to a new elementary school located at 75 Spruce St, Acton, MA 01720. This battery system will be utilized in conjunction with a solar array to produce an energy efficient and sustainably powered educational facility for the surrounding communities. This report is a summary of ESRG's findings and professional evaluation of the project.

Review and Analysis

The system being utilized is a Tesla Megapack 2 XL. This system has been thoroughly tested and certified through the *NFPA 855 Standard for the Installation of Stationary Energy Storage Systems, UL 9540 Energy Storage System (ESS) Requirements, UL 9540a Battery Energy Storage System (ESS) Test Method and UL 1973 Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications* standards. These tests include cell level, module level, and full unit level burn testing to observe safety element designs and failure events. The enclosures that house the battery systems are purpose built to withstand numerous weather conditions and other external factors which will provide longevity and safety over the life of the system. The Tesla Megapack 2 XL system has been shown to be a reliable battery storage system with very few incidents during its extensive time in service in numerous locations, climates, and operational profiles across the world. Design elements have been incorporated into the battery system to both prevent and minimize effects of a battery failure event. The Tesla Megapack 2 XL is equipped with a multi-faceted battery management system (BMS) that constantly monitors and controls various conditions in the system including cell temperatures, voltages, and level of charge. Multiple layers of BMS are incorporated into the control scheme to provide redundancy and ensure optimal battery conditions are maintained. During a failure, these systems can electrically isolate cells and modules to prevent cascading events. The Tesla Megapack 2 XL also comes equipped with a sparker system as an additional safety measure that will ignite potential off gassing in a controlled manner to prevent a deflagration event. In the unlikely event of a deflagration incident, overpressure

vents are mounted on the top of the unit to direct pressure upward in a safe direction. These overpressure vents are designed to provide an escape path for high pressure gases, so the structural integrity of the enclosure is maintained and prevents any hazardous pressure build-up within. Each Megapack 2 XL enclosure is divided into multiple internal bays. These bays provide a barrier within the system that isolates any problem cells from the other bays, preventing a cascading event or damage to the rest of the system.

In addition to the design and engineering considerations that have been put in place to ensure a safe and reliable system, first responders will also be trained and familiarized in case of the unlikely event of a system failure. An emergency response plan will be provided for all public safety personnel with guides on how to manage and mitigate an event safely and effectively. Protocols will be put in place and routinely reviewed and updated for both first responders, occupants of the nearby facilities, and the surrounding community.

The location of the BESS installation was chosen with due regard for practicality and safety. The system has sufficient spacing between other structures and features to allow easy access for maintenance, and in the unlikely event of a battery failure, first responders. Property access is maintained through multiple roads and pathways which are not probable to be affected during a failure event. Protection in the form of bollards will be placed around the system to shield against vehicles and a security barrier will be placed to protect against unauthorized access to the system.

During the numerous tests conducted on the Tesla Megapack 2 XL system (as well as Li-Ion battery technology storage systems as a whole) water and air sampling has taken place to research the effect of a battery failure on the surrounding environment. During these tests, no hazardous elements have been found in any dangerous levels. Even so, water runoff produced during failure mitigation can be contained and directed using commonly found runoff barriers and devices utilized by the fire department. During large scale failure events involving batteries across the world, air and water sampling has been conducted and proven to contain no harmful levels of any hazardous material. These results come not only from labs testing the systems in a controlled environment, but also from fire departments and environmental agencies such as the EPA. Training will also be provided to the fire department for information on the effects of water runoff and gas production in order to keep community members and the surrounding environment protected.

Conclusion

Upon review and analysis of the proposed Acton-Boxborough Regional School District proposed battery storage installation, ESRG finds that proper planning and care has been taken to safely and effectively utilize this system to supplement powering their new elementary school building. The Tesla Megapack 2 XL battery system comes equipped with numerous design and control elements to ensure proper operation. Procedures and training will be implemented for first responders regarding the installation and its safe operation. Environmental concerns were addressed, and the installation location was chosen to allow proper spacing and access to the system.