Document Reference	Appendix No.	Title
4.01.14	14.1	Battery Storage Fire Safety Statement

OAKLANDS BATTERY STORAGE DEVELOPMENT: FIRE SAFETY STATEMENT

Developments in Battery Technology Safety

There have been significant and material safety improvements in the battery storage technologies in recent times, including different chemistry and individual fire suppressant systems.

As a multimillion-pound investment, it is essential that insurance and protection is in place for the development. Inherently, any form of built development e.g. residential, commercial or industrial buildings can be at risk from catching fire. This risk also exists for battery energy storage facilities, but advancements in technology and protocols have resulted in the adoption of an integrated 3 stage fire prevention and suppression system, built into the design to ensure this risk is managed out. A typical system comprises:

1. Early warning of any battery cells failing with gas detectors (in each enclosure) - this triggers automatic power disconnection and an alarm to the remote monitoring station;

2. Automatic inert gas discharge is triggered if heat is detected, together with an automatic disconnect of the battery and an alarm signal to the remote monitoring station. This inert gas displaces all oxygen in the battery area and stops any fire developing; and

3. Internal water mist deluge system activation (requiring low water volumes) that can be supported by fire services. Primarily to address heat build-up, and alleviating/preventing potential damage to adjacent enclosures.

General Safety Measures

Safety management is a fundamental feature of all lithium-ion energy storage systems. Everything is done to prevent, mitigate and protect against potential hazards. Safety incidents are, on the whole, rare.

Prevention

The safety systems for a battery storage project operate on multiple layers from the individual battery cell right up to the whole storage system.

The first layer is monitoring. Every individual cell is being constantly monitored by automated systems that track current, voltage, temperature and other critical information. These systems are generally known as Battery Management Systems (BMS) and are designed to ensure that the batteries are continually monitored and protected to prevent hazards occurring and to maintain the reliability of the batteries, so they are ready to deliver power to the grid when needed.

As soon as the BMS detects that a specific battery cell, or group of cells, is acting in a way that it should not, it can reduce the flow of electricity through the cell, switch it off or disconnect it completely from the power supply. The BMS also works to identify problems before they occur. It allows the operators to know the state of health of the individual battery cells so that any deterioration or fault can be detected, and appropriate maintenance carried out.

It is important that batteries are kept cool. This is to ensure they are operating safely, and it also improves the performance and operating life of the battery. Energy storage systems contain cooling and ventilation systems. These maintain the batteries at a stable operating

temperature and remove excess heat in the event of potential overheating. These systems may use ventilation, air conditioning or liquid cooling to help prevent batteries from overheating.

It must also be noted that all grid-scale energy storage systems must meet the relevant safety assessment standards prior to commissioning and energisation.

Mitigation

In the unlikely event of a problem occurring and the BMS failing to prevent it, energy storage systems have additional design measures such as alarms, fire detection and suppression systems. These suppression systems use techniques such as inert gas, foam suppression, fire sprinklers or water mist etc. to control fires.

The European Advanced Rechargeable and Lithium Batteries Association (RECHARGE) provides technical and legislative expertise on lithium batteries and works to ensure best practices and standards for the use of this technology. This guidance is incorporated into the design mitigation strategies for the BESS units.

Protection

To provide an additional layer of protection, batteries for energy storage systems are also generally housed in separate containers or casing unit. This reduces the risk of a problem in one container spreading to the rest of the facility.

Safety Standards

Lithium-ion batteries are used safely and securely in countries and on countless sites across the world. Properly designed lithium-ion batteries can and are operated safely every day. A key part of ensuring any technology is used safely is to identify any potential risk, no matter how small and ensure it is guarded against. Potential hazards are mitigated to safe levels with careful and thoughtful management and design.

There are many established international standards which lithium-ion battery manufacturers systems must comply with to ensure products are designed, manufactured and tested for safety, quality and reliability. Testing to these standards is conducted by the Original Equipment Manufacturer (OEM) of the batteries. International codes and standards are regularly updated using real world experience and tests to ensure advancement in overall industry efficacy and safety.

Installation of the battery storage system at the site is finalised via site acceptance testing. The purpose of this testing is to ensure that the system is installed properly, and that battery management and protection systems are working correctly. This testing is carried out in cooperation between the battery system operator and the supplier.

Examples of existing UK guidance include:

- The Energy Operators Forum “Good Practice Guide” (December 2014);
- Institute of Engineering and Technology - Code of Practice for Electrical Energy Storage Systems (August 2017)6; and
- The Energy Institute: Battery Storage Guidance Note 1 - Battery Storage Planning (August 2019).