Staffordshire Fire and Rescue Service
preventing • protecting • responding

Please reply to:
Staffordshire Fire and Rescue Service
Headquarters
Pirehill
Stone
Staffordshire
ST15 0BS

Contact: 0300 330 1000
Direct Line: 01785 898 664

Staffordshire Moorlands Council – Planning Department
Moorlands House
Stockwell Street
Leek
Staffordshire Moorlands
ST13 6HQ

SMD/2024/0019 Newfields BESS Ltd Newfields Farm Rownall Road Wetley Rocks

Dear Sir / Madam

Ref: BESS Site Planning Application & Guidance

Grid scale Battery Energy Storage Systems (BESS) are a fundamental part of the UK's move toward a sustainable energy system. In support of this Staffordshire Fire and Rescue Service (SFRS) will work with both the Local Authority Planning departments and the site operators to ensure that safety is prioritised.

There have already been a number of high-profile incidents involving BESS sites and learning from these incidents continues to emerge.

SFRS's expectation is that a comprehensive risk management process must be undertaken by operators to identify hazards and risks specific to the facility and develop, implement, maintain and review risk controls. From this process a robust Emergency Response Plan should be developed.

Through the planning application process SFRS will consider the below areas before commenting on specific planning applications.

1. Siting of renewable energy infrastructure so as to eliminate or reduce hazards to emergency responders.
2. Safe access for emergency responders in and around the facility, including to energy storage infrastructure and firefighting infrastructure.
3. Provision of adequate water supply and firefighting infrastructure to allow safe and effective emergency response.
4. Effective emergency planning and management, specific to the site, infrastructure and operations.
5. Owner to have a comprehensive Emergency Response Plan, showing full understanding of hazards, risks, and consequences.
6. Effective identification and management of hazards and risks specific to the siting, infrastructure, layout, and operations at the facility.
7. Impact on surrounding communities, buildings, and infrastructure.
8. Vegetation sited and managed so as to avoid increased wildfire and grassfire risk.
9. Prevention of fire ignition on-site.
10. Prevention of fire spread between site infrastructure (solar panel banks, wind turbines, battery containers/enclosures).
11. Prevention of external fire impacting and igniting site infrastructure.
12. Provision of accurate and current information for emergency responders during emergencies.

Following guidance produced by the National Fire Chiefs Council (NFCC) Grid scale Battery Energy Storage System Planning, SFRS require detailed evidence regarding:

System design and construction

Information required:

1. The battery chemistries being proposed (e.g. Lithium-ion Phosphate (LFP), Lithium Nickel Manganese Cobalt Oxide (NMC)).
   Because:
   a. Battery chemistries will directly affect the heat released when a cell goes into thermal runaway.
   b. Battery chemistries will influence vapour cloud formation.
   c. An understanding of the battery chemistry is useful when requesting scientific advice during an incident.
2. The battery form factor (e.g. cylindrical, pouch, prismatic)
3. Type of BESS e.g. container or cabinet
4. Number of BESS containers/cabinets
5. Size/capacity of each BESS unit (typically in MWh)
6. How the BESS units will be laid out relative to one another.
7. A diagram / plan of the site.
8. Evidence that site geography has been considered (e.g. prevailing wind conditions).
9. Access to, and within, the site for FRS assets
10. Details of any fire-resisting design features
11. Details of any:
    a. Fire suppression systems
    b. On site water supplies (e.g. hydrants, EWS etc)
    c. Smoke or fire detection systems (including how these are communicated)
    d. Gas and/or specific electrolyte vapour detection systems
    e. Temperature management systems
    f. Ventilation systems
    g. Exhaust systems
    h. Deflagration venting systems
12. Identification of any surrounding communities, sites, and infrastructure that may be impacted as a result of an incident.

Testing
Details of any evidence-based testing of the system design should be provided, for example, results of UL 9540A testing.

Design
Design features should be made clear. These may include:

- Rack layout and setup
- Thermal barriers and insulation
- Container layout and access arrangements

Detection and monitoring
An effective and appropriate method of early detection of a fault within the batteries should be in place, with immediate disconnection of the affected battery/batteries. This may be achieved automatically through the provision of an effective Battery Management System (BMS) and/or a specific electrolyte vapour detection system.

Should thermal runaway conditions be detected then there should be the facility in place for the early alerting of emergency services.

Detection systems should also be in place for alerting to other fires that do not involve thermal runaway (for example, fires involving electrical wiring).

Continuous combustible gas monitoring within units should be provided. Gas detectors should alarm at the presence of flammable gas, shut down the ESS, and cause the switchover to full exhaust of the ventilation system. Sensor location should be appropriate for the type of gas detected e.g. hydrogen, carbon monoxide, volatile organic compounds. External audible and visual warning devices (such as cabinet level strobing lights), as well as addressable identification at control and indicating equipment, should be to linked to:

1. Battery Management System (when a thermal runaway event is identified)
2. Detection and suppression system activation

Suppression systems
Suitable fixed suppression systems should be installed in units in order to help prevent or limit propagation between modules.

Where it is suggested that suppression systems are not required in the design, this choice should be supported by an evidence-based justification and Emergency Response Plan that is designed with this approach in mind (for example, risk assessed controlled burn strategies, and external sprinkler systems).

Deflagration Prevention and Venting
BESS containers should be fitted with deflagration venting and explosion protection appropriate to the hazard. Designs should be developed by competent persons, with design suitability able to be evidenced. Exhaust systems designed to prevent deflagration should keep the environment below 25% of Lower Explosive Limit (LEL).

Flames and materials discharged as a result of any venting should be directed outside to a safe location and should not contribute to any further fire propagation beyond the unit involved or present further risk to persons. The likely path of any vented gasses or materials should be identified in Emergency Response Plans to reduce risk to responders.

Explosion/deflagration strategies should be built into the emergency plan such that responders are aware of their presence and the impact of their actions on these strategies. Where emergency ventilation is used to mitigate an explosion hazard, the disconnect for the ventilation system should be clearly marked to notify personnel or first responders to not disconnect the power supply to the ventilation system during an evolving incident.

Site access
Suitable facilities for safely accessing and egressing the site should be provided. Designs should be developed in close liaison with the local FRS as specific requirements may apply due to variations in vehicles and equipment.

This should include:

- At least 2 separate access points to the site to account for opposite wind conditions/direction.
- Roads/hard standing capable of accommodating fire service vehicles in all weather conditions. As such there should be no extremes of grade.
- A perimeter road or roads with passing places suitable for fire service vehicles.
- Road networks on sites must enable unobstructed access to all areas of the facility.
- Turning circles, passing places etc size to be advised by FRS depending on fleet.

Access between BESS units and unit spacing
In the event of a fire involving a BESS unit, one of the primary tactics employed will be to prevent further unit to unit fire spread. Suitable access for firefighters to operate unimpeded between units will therefore be required. This should allow for the laying and movement of hose lines and, as such, access should be free of restrictions and obstacles. The presence of High Voltage DC Electrical Systems is a risk and their location should be identified. Exclusion zones should be identified.

A standard minimum spacing between units of 6m is suggested unless suitable design features can be introduced to reduce that spacing. If reducing distances, a clear, evidence based, case for the reduction should be shown.

Any reduction in this separation distance should be design based by a competent fire engineer. There should be consideration for the fire separation internally and the total realistic load of fire. Proposed distances should be based on radiant heat flux (output) as an ignition source.

SFRS does not support the stacking of containers/units on top of one another on the basis of the level of risk in relation to fire loading, potential fire spread, and restrictions on access.

Distance from BESS units to occupied buildings & site boundaries
Individual site designs will mean that distances between BESS units and occupied buildings/site boundaries will vary. Proposed distances should consider risk and mitigation factors. However, an initial minimum distance of 25m is proposed prior to any mitigation such as blast walls. Reduction of distances may be possible in areas of lower risk (e.g. rural settings). Where possible buildings should be located upwind.

Site Conditions
Sites should be maintained in order that, in the event of fire, the risk of propagation between units is reduced. This will include ensuring that combustibles are not stored adjacent to units and access is clear and maintained. Areas within 10 metres of BESS units should be cleared of combustible vegetation and any other vegetation on site should be kept in a condition such that they do not increase the risk of fire on site. Areas with wildfire risk or vegetation that would result in significant size fires should be factored into this assessment and additional cleared distances maintained as required.

Water Supplies
Water supplies will depend on the size of the installation. In the majority of cases, initial firefighting intervention will focus on defensive firefighting measures to prevent fire spread to adjacent containers. As a result, proposals for water supplies on site should be developed following liaison with the local fire and rescue service. This should also take account of the ability of/anticipated time for the fire and rescue service to bring larger volumes of water to site.

As a minimum, it is recommended that hydrant supplies for boundary cooling purposes should be located close to BESS containers (but considering safe access in the event of a fire) and should be capable of delivering no less than 1,900 litres per minute for at least 2 hours. SFRS may wish to increase this requirement dependant on location and our ability to bring supplementary supplies to site in a timely fashion.

Water supply for any automatic suppression system will be covered by the relevant standard/design depending on which system chosen as appropriate for the risk.

Any static water storage tanks designed to be used for firefighting must be located at least 10m away from any BESS container/cabinet. They must be clearly marked with appropriate signage. They must be easily accessible to SFRS vehicles and their siting should be considered as part of a risk assessed approach that considers potential fire development / impacts. Outlets and connections should be agreed with SFRS. Any outlets and hard suction points should be protected from mechanical damage (e.g. through use of bollards). Consideration should be given, within the site design, to the management of water run-off (e.g. drainage systems, interceptors, bunded lagoons etc).

Signage
Signage should be installed in a suitable and visible location on the outside of BESS units identifying the presence of a BESS system. Signage should also include details of:

- Relevant hazards posed
- The type of technology associated with the BESS
- Any suppression system fitted
- 24/7 Emergency Contact Information

Signs on the exterior of a building or enclosure should be sized such that at least one sign is legible at night at a distance of 30m or from the site boundary, whichever is closer.

Adherence to the Dangerous Substances (Notification and Marking of Sites) Regulations 1990 (NAMOS) should be considered where the total quantity of dangerous substances exceeded 25 tonnes.

Emergency Plans
Site operators should develop emergency plans and share these with the Fire and Rescue Service. These include:

A Risk Management Plan should be developed by the operator, which provides advice in relation to potential emergency response implications including:

- The hazards and risks at and to the facility and their proposed management.
- Any safety issues for firefighters responding to emergencies at the facility.
- Safe access to and within the facility for emergency vehicles and responders, including to key site infrastructure and fire protection systems.
- The adequacy of proposed fire detection and suppression systems (eg., water supply) on-site.
- Natural and built infrastructure and on-site processes that may impact or delay effective emergency response.

An Emergency Response Plan should be developed to facilitate effective and safe emergency response and should include:

- How the fire service will be alerted.
- A facility description, including infrastructure details, operations, number of personnel, and operating hours.
- A site plan depicting key infrastructure: site access points and internal roads; firefighting facilities (water tanks, pumps, booster systems, fire hydrants, fire hose reels etc); drainage; and neighbouring properties.

Details of emergency resources, including fire detection and suppression systems and equipment; gas detection; emergency eye-wash and shower facilities; spill containment systems and equipment; emergency warning systems; communication systems; personal protective equipment; first aid.

- Up-to-date contact details for facility personnel, and any relevant off-site personnel that could provide technical support during an emergency.
- A list of dangerous goods stored on site.
- Site evacuation procedures.
- Emergency procedures for all credible hazards and risks, including building, infrastructure and vehicle fire, grassfire and wildfire.

Environmental impacts
Suitable environmental protection measures should be provided. This should include systems for containing and managing water runoff. System capability/capacity should be based on anticipated water application rates, including the impact of water based fixed suppression systems.

Sites located in flood zones should have details of flood protection or mitigation measures.

Recovery
The operator should develop a post-incident recovery plan that addresses the potential for reignition of ESS and de-energizing the system, as well as removal and disposal of damaged equipment.

Yours faithfully

Paul Marrow

Fire Safety Inspecting Officer
Staffordshire Fire & Rescue Service