



Uskmouth AW2 249MW BESS

Planning Application 25/0407– Technical Response

INTRODUCTION

The following report has been produced in response to Severn Power Limited's letter dated 26th June 2025 objecting to the planning application for the proposed BESS project on land at the former Uskmouth Power Station, Newport.

As the letter raises many concerns it has been deemed worthwhile to address each concern individually. Therefore, the methodology employed has been to respond at the point of the issue raised. The original issues are within the text boxes and individual responses immediately following them.

Unfortunately, there is a great deal of alarmist, emotionally charged language and false information out on the world wide web and it is possible some of this information has formed some of the concerns and opinions we wish to dispel by delivering answers based on irrefutable fact and safety engineering best practice. Much of the detail online regrettably aims to influence and exploit fear and insecurity in others. By making sweeping statements that *all* BESS units and sites have a propensity to set alight and/or explode simply isn't true. To use an example in Severn Power Limited's area of expertise it would be akin to stating that all gas turbines have that same propensity for fire and explosion – again simply not true.

The examples and some of the rhetoric used in the letter refer to deaths and injuries which – in one single case in China *is* lamentably true. In this case two firefighters reportedly fell through a roof housing photovoltaic panels of a shopping mall that had BESS units in the grounds of the largest public car charging station in the country (the world's first user-side DC new energy incremental distribution network)¹ To also help put this into context it is one of a series of fires in public places in China (not BESS related) that have rose 40 per cent and that the most common causes were malfunctioning in electrical or gas lines and carelessness.

Having searched reports of the other examples listed and indeed the EPRI² (Electrical Power Research Industry) BESS Failure Database list no other fatalities were found relating to fires/explosions.

¹ DC switches are more complicated and the arc spark within the DC switches is harder to be extinguished than that of the AC switches. The switch off time of DC switches is longer and the DC switches are more expensive. In some projects, expensive DC switches were occasionally replaced by cheap AC switches. When AC switches were used in DC systems, these AC switches may not be switched off in case of overload accident, leading to a safety risk.

² EPRI are an independent not for profit organisation that conduct research related to the generation, delivery and use of electricity, worldwide.



If one delves far enough it is always possible to turn headlines from tragic events to support an argument. The old Usk Power Station itself suffered a devastating explosion in 1956 (including fatalities and several injuries) and another in 2017 where the explosion caused extensive damage to the station's switch house. These examples are being highlighted to show that *any* industry has unfortunate incidents in their history. The Usk examples happened when times and procedures were different, and unlikely to happen again in the future, this can be equally applied to BESS technology that has moved on since some of the incidents quoted in Severn Power's letter.

With new strictly regulated battery technology in use, combined with very stringent safety standards now implemented, BESS units and projects, particularly in the UK are *exceptionally* safe. Both industries can argue that with modern design, exceptional maintenance regimes and world-leading staff training, risks in either industry have been *dramatically* reduced in recent years.

The following points have been deduced from The Department for Energy Security and Net Zero's (DESNZ) data:

As of Oct 2024. There were approximately 117 operational BESS sites in the UK and up to that point only one operational BESS fire (Orsted BESS, Liverpool, 2020). This incident involved outdated safety technology and predated current safety regulations and guidance

- 1. Since 2006, BESS have accumulated ~741 years of operation (~6.5 million hours).*
- 2. There has been one operational BESS fire in the UK during their 6.5 million hours of operation. This extrapolates to ~ 0.0000003 failures (3 failures per every 10 million hours) per hour which is multiples times better than the Health and Safety Executive's R2P2 Guidance for the 'societally acceptable' safety rate for the public of 1 failure per million hours of operation.*

Further detail regarding the Carnegie Road, Liverpool is in the main body of this report.

For the sake of transparency there has been one BESS fire in the UK since the above information at Tilbury, Essex when a site was under construction. No report findings are currently available.



RESPONSES TO THE LETTER

Fire and Explosion Risk

BESS facilities, and especially those storing lithium-ion batteries are at a known risk of thermal runaway.

There are many types of Lithium-ion batteries. Lithium-ion battery technology has advanced significantly in recent years, now very much focusing on safety after previous incidents and lack of formalised standards. As will be seen below, the industry has now put these issues behind them with new technology batteries and support systems as well as the tightening of management controls, procedures and staff training.

Projects quoted in the letter (with the exception of Beijing)³ predate current safety regulations and guidance, including the National Fire Prevention Agency 855 Standard for the Installation of Stationary Energy Storage Systems (2023), as such they were not certified to UL9540A standards⁴.

UK Projects are now required to adhere to the following legislation. This list is not exhaustive and focuses primarily on legislation particular to BESS projects.

- Construction Design and Management (CDM) Regulations 2015
- Control of Substances Hazardous to Health Regulations 2002 – UKSI 2002/2677
- Electrical Equipment (Safety) Regulations SI 1994/3260
- Electro-magnetic Compatibility Regulations SI 2006/3418
- Fire Safety (Employees' Capabilities) (England) Regulations SI 2010/471
- Regulatory Reform (Fire Safety) Order 2005
- Dangerous Substances and Explosive Atmosphere Regulations 2002 (DSEAR)
- Health and Safety (Safety Signs and Signals Regulations 1996)
- Waste Batteries and Accumulators Regulations 2009.

Regulations include:

- National Fire Protection Association 855 – Standard for the Installation of Stationary Energy Storage Systems (2023)
- UL9540A – BESS Test Methods
- UL1973 – Standard for Batteries for Use in Stationary Applications
- FM Global Property Loss Datasheet 5-33 – Lithium-Ion BESS (Jan 2024)



Additional Guidance now includes:

- National Fire Chiefs Council (NFCC) Grid Scale Battery Energy Storage System planning – Guidance for FRS (Nov 2022) and emerging guidance
- Department for Energy Security and Net Zero Health - Safety Guidance for Grid Scale Electrical Energy Storage Systems (2024)

The battery cells spontaneously overheat in storage leading to fires and potential explosive events.

This statement suggests that all battery cells spontaneously overheat. This simply isn't true. Battery cells *can* overheat, but alongside the improved battery technology, improvements have been made in Battery Management Systems (BMS) by monitoring individual battery cell rather than module level,

SCADA systems send real-time information to 24-hour manned response stations and the tightening of Emergency Response Procedures (ERP) have all combined to effectively nullify this statement that primarily relates to outdated technology and oversight.

Globally there have been documented catastrophic fires at BESS sites, and in the UK the most recent explosion at Ørsted's Battery Energy Storage System site in Carnegie Road, Liverpool, Merseyside in 2020 caused toxic vapours to be released into the air and fires so large they were difficult to extinguish.

The following is a synopsis taken from the EPRI white paper report on the Carnegie Road system failure.

The battery type was again older technology LG Chem JP3 Lithium Iron Nickel-Manganese-Cobalt (NMC).

"The dynamics of the failure event itself highlighted the increased knowledge within the industry since the system was commissioned and the limited pre-planning and expectations that were the historic industry norm."

Upon arrival, the fire service was unaware what the Carnegie Road BESS facility was. The watch manager initially communicated that a "large refrigeration unit" was on fire. Several minutes later, the watch manager informed crews that the site was a large grid battery system. The fire was later declared a "fire containing hazardous materials" because of the presence of the lithium-ion batteries.



The Carnegie Road BESS was designed to meet the requirements of the initial 2017 National Fire Protection Association (NFPA) 855 Standard for the Installation of Stationary Energy Storage Systems draft. NFPA 855 has since been revised and was published in 2020.

The Significant Incident Report from the Orsted BESS states:

- Run-off was periodically checked for contamination, which was low and run-off was mainly contained to the site
- Bureau Veritas (BV) scientific advisers identified the potential for the smoke plume to contain HF and Hydrochloric Acids (HCl), however, the dilution rate within the plume deemed the concentration as negligible.

There were no deaths or injuries reported.

Other international examples include: McMicken, Arizona;

This event occurred in 2019 but it is worth noting that the battery technology was again of the older Lithium Ion, Nickel-Manganese-Cobalt (NMC) batteries provided by LG Chem.

Four firefighters were injured but these injuries were proved to be directly attributable to insufficient knowledge and preparedness specific to battery-related incidents.

Findings of the post-fire investigation included:

- The thermal management systems at McMicken were not sufficient to handle the heat produced by the batteries
- There were inadequate safety protocols, lack of emergency response drills specific to BESS incidents, and limited knowledge among first responders
- Moreover, the facility's maintenance practices and monitoring systems may have been insufficient to detect early warning signs of thermal runaway

The McMicken explosion had a profound impact on the energy storage industry, leading to changes in regulations and safety standards. The National Fire Protection Association (NFPA) and other regulatory bodies have since updated their guidelines on the design, operation, and response to energy storage incidents. These updates are helping to ensure that BESS facilities are built with more robust safety features, including better thermal management, fire suppression systems, and emergency protocols.

APS hired both AECOM and Wood to conduct an evaluation of any possible residual on-site and off-site environmental and human-health impacts. These investigations evaluated potential mechanisms for environmental exposures to contaminants of concern (COCs) **and did not identify evidence of any on-site or off-site impacts or risks to human health or the environment.**



AECOM collected both surficial soil samples from the area around the BESS and wipe samples from within the BESS structure. Exterior soil sampling was collected in a grid pattern from the area surrounding the BESS structure. Along with the facility wipe sampling, nearby-area background samples were also collected as a way to “fingerprint” a range of COCs for further analysis.

Based upon subsequent laboratory analysis conducted in May and June 2019, AECOM found:

- Of the COCs evaluated for analysis, the sampling data exhibited either consistently low COC concentrations or non-detect values; samples generally revealed concentrations indistinguishable from background sampling data
- In comparison with applicable state and federal environmental, health and safety standards, none of the samples exhibited COC concentrations in excess of levels that would require site remediation or other response actions
- Additional sampling of other environmental media, such as groundwater or soil, was deemed unnecessary.

Additional off-site analysis involved air dispersion modelling to develop a conservative quantification of likely off-site deposition of COC particulates moving through the air in the plume. Wood’s analysis relied upon conservative emission rates. Satellite imagery and site-specific meteorological data were also utilised, along with an evaluation of the on-site soil and structure wipe sampling data. As a result of this analysis, Wood found:

- COC particulate matter deposition through the air was minimal and primarily confined to on-site locations near the BESS structure
- Modelled off-site concentrations of COCs were lower than applicable state and federal standards governing environmental, health, and safety protection from hazardous substance releases.

Dahongmen, Beijing, 2021;

There has been some difficulty in gaining full, open information about this event as it occurred in a country where news and reports are heavily censored by the government.

However, it is known that the project was first-of-a-kind integrated solar energy storage station above a shopping mall, differing from a traditional centralised energy storage system with respect to electrical structures and the configuration required to deliver energy to car charging stations on a monumental level.

The Dahongmen incident is notable as the first to result in fatalities in a BESS fire. It is thought the firefighters died falling through the roof of the building housing the photovoltaic panels. One other employee is presumed dead.



The batteries in this case were Lithium Iron Phosphate (LFP) provided by Guoxuan High-Tech Co., Ltd (3.2 V 10.5 Ah lithium iron phosphate square shell)

Although the batteries were of a LFP design investigation states on-site debugging was underway prior to the accident and the presence of these activities suggests potential human error or equipment malfunction as a possible trigger.

A study identified system-level defects in BESS integration processes, potentially due to quality control shortcomings and inadequate safety checks during integration.

It is also possible environmental factors were a cause. On April 15th, Beijing issued a yellow warning for gale, blue warning for sand dust, and orange warning for forest fires. The meteorological environment of strong wind and sand dust may cause dust accumulation in the energy storage system.

On the one hand, it is not conducive to the heat dissipation of the energy storage system and increase the operating temperature of the system. On the other hand, the presence of sand and dust will adversely affect the insulation of the system. Insulation failure can easily cause electrical breakdown of electrical equipment and local exceptionally high temperatures, which will induce thermal failure of energy storage batteries.

The report is ultimately unsure of the exact reason for the sudden explosion, but is leaning towards the possibility of environmental wear and tear destroying the insulation of the battery by dust and sand having accumulated, combined with human error during debugging: "The sudden explosion of the power station in the north area could be explained by the safety accident induction mechanism of lithium batteries, which is the thermal failure of the batteries in the extreme conditions when they were significantly affected by internal and external sources.

Unfortunately, no detail was able to be found on any environmental impact.

Once again old technology Nickel-Manganese-Cobalt batteries were used in the units.

Warwick, New York State, 2023;

The event occurred shortly after installation and was linked to a manufacturing defect that allowed water to enter the units thus leading to failure of the Powin Centipede unit, a specific method of stacking batteries within an enclosure.

The failure occurred during a large storm and the failed element appeared to emanate from the balance of plant controls.

There were no deaths or injuries



No harmful levels of toxins detected off-site and no significant off-site migration of contaminants and no water was used by emergency responders at the site, therefore no water runoff or soil samples were taken.

Moss Landing, California, 2025;

Once again, older technology, Lithium Ion, Nickel-Manganese-Cobalt (NMC) batteries provided by LG Energy Solution (LG ES) were involved in this incident.

There were no deaths or injuries

As with other examples; The overall construction of MOSS300 was not like any other energy storage project, even other dedicated use [building] projects. ESRG one of the world's leading recruiters in renewables were quoted to say: "that it is perhaps the most important lesson for the industry to learn that what happened last week at Moss Landing is not indicative of what can or will happen at any other storage project."

Indoor BESS projects are rarely built today, partially because of the fear that fire can spread throughout the system unchecked. Instead, most new installations are outdoor, pad-mounted systems which make fires less likely to spread.

There was indeed a precautionary evacuation of 1,200 to 1,500 local residents but local first responders and police reported that this proved to be unnecessary.

Yet again, the facility was built before fire codes (in this case California's) were updated to encompass large-scale battery storage and today's product standards and certifications were in place for BESS equipment and installation. The industry today has already largely moved away from NMC chemistry batteries to lithium iron phosphate (LFP) for stationary BESS applications

The US Environmental Protection Agency (EPA) air quality monitoring report has not shown "sufficient release of hydrogen fluoride gas or particulate matter to cause risk to the public".

Each of these were associated with thermal runaway, and common features included the existence of fire and explosion risk, dangerous vapours, loss of power supply and environmental contamination.

As can be seen from each individual piece of evidence above this comment is a dramatic over representation.



Thermal runaway was not the *root cause* of each of these incidents although it is accepted that it is of higher risk within historic BESS battery units. This is now mitigated by the following:

- New technology batteries
- New standards led by the National Fire Protection Agency (NFPA) and Underwriters Laboratory (UL)
- Upgraded Battery Management Systems (BMS) that immediately close down operations within the enclosure, inform the monitoring station, instigate the operations of fire suppression systems, and close vents to prevent any gas escape
- Deflagration panels have been added to prevent the container explosion

To say environmental contamination occurred at each incident simply isn't true as can be seen above and in the full reports regarding these incidents.

In the most recent California example, the evacuation of up to 1500 residents and the closure of nearby roads and infrastructure was necessary.

The example quoted is the fire at Moss Landing, California, one of the largest sites in the world at the time, and a facility that was one of a kind, conceived and designed before modern safety standards were adopted for large grid batteries. Battery safety standards have been updated multiple times since it was built. Moss Landing's design was "unique, globally, as a facility," given its vintage and the qualities of the 1950s-era building-turned-battery-vault.

Although approximately 1500 'residents' were indeed evacuated the facility was based on a university campus, thus creating such a high number of residents in close proximity. The US Environmental Protection Agency deployed a total of nine air monitors around the site and did not detect any risk to public health.

About an hour into the fire, "conditions changed drastically" and a fire suppression system in the facility that has worked well in past incidents was not proving to be helpful.

Hydrogen fluoride, the primary toxic gas released when lithium batteries burn, was not detected by monitors used to track air quality on the scene. In an update shared shortly after the fire, the Santa Cruz County Office of Response, Recovery and Resilience said the fire poses no imminent significant threat and that people can resume normal activities.

We are concerned that the proximity to the CCGT power station, which also must be considered cumulatively with the two BESS facilities already approved, presents an unacceptable risk to human life and endangering the surrounding environment.



NFPA 855 and other grid-scale industry standards prescribe distances that are variable upon BESS Enclosure type, presence of fire-resistance walls, and proximity to other structures and equipment, all of which are met in this case. As far as the cumulative effect is concerned, there is no risk of propagation between BESS units over the significant distances between each individual site.

As to there being an unacceptable risk to human life and endangering the surrounding environment, evidence provided in the above incident examples shows that loss of life is thankfully exceptionally rare. Indeed, there are no reported deaths in the UK, USA, Europe, Australasia, Africa, or South America, with the 'only' fatalities quoted in the Beijing shopping Mall example.

This site would run parallel to the gas pipes coming in from under the river Usk and feeding into the power station. These pipes carry high pressure gas to fuel the power station. The devastation caused by a fire at the BESS storage site next to this gas line is unimaginable. Considering also, that any major incident event at the power station itself would also cause a knock-on event at the BESS facility.

From plans submitted the BESS units themselves would not run parallel to the gas pipeline - although the existing and attenuation pond and substation may do so.

The HSE have already specified in their consultee response:

"The proposed development site which you have identified does not currently lie within the consultation distance (CD) of a major hazard site or major accident hazard pipeline; therefore, at present HSE does not need to be consulted on any developments on this site. However, should there be a delay submitting a planning application for the proposed development on this site, you may wish to approach HSE again to ensure that there have been no changes to CDs in this area in the intervening period."

It is difficult to give a definitive response to the proximity of the gas pipeline from a desk-top study. Consideration would have to be given to exact distances between the pipeline and the nearest BESS unit. However, this is eminently possible to undertake. It is also useful to note that Wales and West Utilities have responded by stating that no excavations should take place within 10m of their >2barg pipelines, which the application clearly accedes to.

It would also be difficult to confirm as to how a major incident at the power station itself would affect the project without knowing details from the station itself if their emergency plans.

The immediate proximity of the CCGT power station, less than 40 metres to the north, presents an unacceptable risk in the event that such thermal runaway or overheating occurs.



This is something of a repeat issue and already been covered two points above, although again, depending upon risk-assessment and various conditions 30 metres is a generally accepted minimal norm between BESS units and *occupied* buildings.

Toxic Chemicals

When the location for the BESS facility is properly assessed alongside the above considerations, and taking into account that the CCGT power station has an output of almost a gigawatt, it could result in a catastrophic scenario should significant thermal runaway or overheating occur.

Although thermal runaway and overheating mentioned above has already been covered extensively in this report, as indeed has the testing mechanisms of UL9540 additional information is below to assuage both thermal runaway and toxic chemical concerns,

Thermal runaway refers to a self-sustaining exothermic chain reaction in lithium-ion batteries, triggered by internal short circuits, overcharging, mechanical damage, etc. It is characterized by a rapid rise in temperature (exceeding 800°C), gas ejection (including flammable and explosive gases), and potential chain reactions in adjacent cells, ultimately resulting in system-level fires.

Limitations of Traditional Testing

Earlier standards mainly focused on the safety testing of individual cells or small modules. However, energy storage systems typically consist of thousands or even tens of thousands of cells, with complex structural designs and thermal conditions, making fire propagation pathways hard to predict. Traditional methods fail to adequately reflect the real-world risks of fire spread.

Breakthroughs in UL9540A:2025

The 2025 edition introduces, for the first time, a “**full-scale, system-level thermal runaway fire propagation evaluation framework**,” emphasizing multi-tiered, progressive testing from cell → module → cabinet → full system. It constructs risk models using quantifiable data to support design optimization.

Core Upgrades in UL9540A:2025 Testing Methods

Refined Testing Levels

The new version defines four progressive test levels, each with clear objectives:

- **Level 1 (Cell Level):** Determine the thermal runaway trigger conditions (e.g., nail penetration, heating plate temperature threshold), ejected materials, and combustion characteristics.



- **Level 2 (Module Level):** Evaluate the propagation speed, temperature distribution, and gas diffusion path when a single cell enters thermal runaway.
- **Level 3 (Unit Level - Cabinet/Sub-system):** Simulate real heat dissipation conditions and structural designs, analyse flame spread extent, smoke concentration, and toxicity.
- **Level 4 (Installation Level - Full System):** Integrate fire suppression and ventilation systems to verify system-level mitigation effectiveness.

Key Requirement: Tests must use production-equivalent BMS (Battery Management Systems) and thermal management designs to ensure data authenticity.

Expanded Data Collection Dimensions

The 2025 edition adds several critical metrics:

- **Thermodynamic Parameters:** Cell surface temperature rise rate, internal pressure variation curves;
- **Gas Analysis:** Real-time monitoring of harmful gases like hydrogen, CO, and hydrogen fluoride (HF);
- **Flame Propagation Speed:** Quantified using high-speed cameras and infrared thermal imaging;
- **Fire Suppressant Effectiveness:** Evaluation of agents like FK-5-1-12 and water mist in suppressing thermal runaway.

Insight: The multi-dimensional data enables the construction of a "thermal runaway propagation map" that can guide optimization in cell spacing, insulation materials, and firefighting strategies.

Mandatory Multi-Cell Failure Scenarios

To address industry pain points, the new standard mandates testing of two extreme scenarios:

- **Worst-Case Cell Position:** Choose the cell with the poorest heat dissipation as the trigger point;
- **Simultaneous Multi-Cell Failure:** Simulate the effect of multiple concurrent thermal runaway events under severe failures (e.g., BMS malfunction).

Case Study: A manufacturer discovered during testing that when an edge cell entered thermal runaway, the metal cabinet frame conducted heat, accelerating the heating of adjacent modules—leading to a design upgrade with thermal barrier coatings.



Three Major Innovations in the Evaluation Process

1. Risk-Based Safety Threshold Design

UL9540A:2025 introduces the concept of "**Thermal Runaway Propagation Time (TRPT)**", requiring that system designs must satisfy: **TRPT $\geq$ T (T = fire response time + personnel evacuation time)**.

Fire response time should be tailored to specific applications (e.g., residential vs. grid-side). For grid-side systems, **TRPT $\geq$ 30 minutes** is typically required to ensure fire systems can activate in time.

2. Coupled Simulation and Real-World Validation

The standard encourages the use of **digital twin technology**, where CFD (Computational Fluid Dynamics) simulations are used to predict propagation paths before physical testing, and actual test data is used to calibrate the model. This approach significantly reduces testing costs, especially for large-scale systems.

3. Mandatory Dynamic Evaluation Reports

The 2025 version requires test reports to include:

- Sensitivity analysis of thermal runaway trigger conditions;
- Propagation differences at varying ambient temperatures (20°C to 50°C);
- The impact of aging (e.g., after 5,000 cycles) on safety.

Significance: Shifts the focus from simply "passing the test" to "lifetime safety design."

Overview of Key Impacts

1. **Improved Flexibility:** Optional FTIR and ramp heating methods provide testing flexibility.
2. **Wider Applicability:** Adds test coverage for lead-acid, nickel-cadmium, and high-temperature batteries.
3. **Enhanced Safety:** Revised flame spread criteria and new deflagration analysis reduce fire spread risks.
4. **Simplified Testing:** Residential testing now allows for test wall setups, potentially reducing test complexity.

This version emphasises **clarity, safety, and technical inclusivity**, aligning with battery technology development and evolving regulatory needs.



Industry Impact and Recommended Responses

1. Higher Technical Barriers Driving Innovation

- **Cell Level:** High-stability electrolytes (e.g., semi-solid-state), high-temperature-resistant separators become essential;
- **System Level:** Phase change materials, aerogel insulation, directional venting designs gain popularity;
- **Fire Protection Systems:** Multi-tiered suppression (e.g., cell-level inhibitors + cabinet-level water mist) becomes mainstream.

2. Testing Cost and Time Challenges

Full four-level testing may take over six months and cost over a million USD. Recommendations:

- Collaborate early with certification bodies to develop pre-testing plans;
- Use modular designs to minimize repeated testing;
- Join industry alliances to share some test data.

3. A “Passport” for Global Market Access

UL 9540A is not only a mandatory standard in the U.S. and Canada, but is also widely adopted internationally—referenced in installation regulations for energy storage systems in Singapore, Malaysia, and Victoria, Australia. The 2025 version aligns further with China’s GB/T36276, helping Chinese companies expand abroad.

The issue raised in this section also allude to a fire causing an outage.

This is the exact opposite of the design intention of BESS...

One example of BESS strengthening grid resilience, lowering energy costs (see cost issue to the public below), providing back-up energy source and improving efficiency and reliability is the Hitachi Energy Project, Fairbanks, Alaska.

[Battery Power Moves a Remote and Resilient Alaska Fishing Town Closer to Energy Independence | Hitachi Energy](#)



Hydrofluoric acid vapours and associated debris could cause a significant contaminant risk to the river Usk, the various ponds in close proximity on the power station peninsula, and indeed to the wider environment around Newport. There would be a very real risk to human life both at the CCGT power station and in the near environment given the presence of the Newport Uskmouth Sailing Club only a couple of hundred metres away.

Evidence regarding environmental impact is difficult to find in the UK due to the dearth of particularly bad fires and explosions. However, some evidence is available in the USA. The following is taken directly from a document entitled “Assessment of Potential Impacts of Fires at BESS Facilities” written in April 25, 2025.

The environmental consequences of BESS fires have been a subject of increasing scrutiny. However, data from real-world incidents, experimental studies, and environmental monitoring efforts indicate that BESS fires have a minimal long-term environmental impact compared to other large industrial and structural fires.

A key concern in BESS fire events is the release of toxic gases, but studies indicate that emissions are largely confined to the immediate vicinity of the fire, with rapid dissipation and concentration reduction in open-air scenarios. It has also been shown that fires involving BESS share many similarities with conventional fires, particularly those involving plastics, in terms of combustion byproducts. This is because the materials that make up lithium-ion batteries—such as polymer-based separators, electrolytes, and enclosures—contain hydrocarbons and other organic compounds that produce similar combustion emissions when the materials are exposed to high temperatures.

Key findings on airborne contaminants include:

- **Common Gases Released:** BESS fires primarily emit CO, CO₂, and volatile organic compounds (VOCs), and may emit other trace gases such as HF, HCN, or others depending on the battery chemistry and overall materials of construction of the BESS unit.
- **Limited Off-Site Impact:** Air sampling from past incidents has found that contaminant concentrations beyond the immediate fire scene do not pose a public health risk. For example, monitoring at the Escondido, CA and NY incidents showed no detectable hazardous concentrations in nearby communities and initial shelter in place and evacuation orders were generally lifted shortly after the measurements were taken.
- **Flammability and Gas Dispersion:** The rapid dispersion of gases in outdoor BESS fires limits the potential for widespread toxic exposure. Studies show that the local concentration of gases rarely reaches flammability limits in well-ventilated environments and toxic gases are rapidly diluted.



Soil and Water Contamination Concerns about soil and water contamination primarily arise from firefighting suppression efforts, particularly when large volumes of water are used. However, available data from real-world incidents and testing does not support the notion of widespread contamination risks. Key findings include:

- **Firefighting Water Runoff:** The consensus best practice for response to a BESS fire is to allow the BESS to consume itself and provide cooling water to targets if needed. Unless there is direct suppression water applied to the BESS on fire, any cooling water applied will be similar to rain and no potential contaminants will be included in any runoff. While lithium-ion battery fires produce chemical byproducts, studies show that their solubility in water is low, limiting the potential for groundwater contamination if direct suppression efforts are performed. Additionally, standard stormwater management practices help prevent runoff from reaching natural water sources in the event that the fire department determines that suppression efforts are required.
- **Environmental sampling results;** in the past BESS fire incidents where environmental sampling was conducted, water and soil samples did not reveal hazardous contamination levels requiring remediation.

Such an occurrence would also cause very significant issues with the power supply. Damage to the switch area could potentially lead to the majority of Wales losing power, an entirely unacceptable scenario. In the event of an explosion or similar serious incident, the power station would likely be closed, or at worst, destroyed. The high-pressure gas pipes run directly next to the switch yard which would be affected should a major incident occur. The introduced risk of damaging and disabling the power station itself resulting in widespread power outage for homes, hospitals, and businesses which would jeopardise lives, but also the local economy and undermine public trust at a time when energy bills are at their highest. Power outages would also place a higher risk on people if this should this occur in bad weather, a time when reliable energy is most required

In 2020 Calon Energy the then owner of the Severn Power site went into administration with another site in Lincolnshire.

Natural Gas World reported:

The recent price spikes in the GB power market cannot be blamed on low wind levels alone. Cold weather in Britain and in northwest Europe as well as unplanned maintenance works on the 1 GW BritNed power interconnector with the Netherlands – thus limiting cross-border electricity supply – also played a role. The situation was exacerbated by the fact that two CCGT power stations – the 850-MW Severn Power Station in South Wales and the 850-MW Sutton Bridge plant in Lincolnshire were unavailable as its owner Calon Energy went into administration last summer and the plants were closed down in August, too early to enjoy a moment in the sun

[UK shows value of CCGTs \[NGW Magazine\]](#)



Whilst the report shows the Severn Power Site in a **good** light it also highlights the fact that despite their comments an outage would leave Wales without power, although they were missed, Wales was able to be powered without them.

In fact, the assertion that BESS plants *cause* power outages is the direct opposite of their design intention. Battery energy storage systems (BESS) are highly effective in preventing power outages and enhancing grid reliability during extreme weather events by providing several critical functions:

- **Uninterrupted Backup Power:** BESS can supply electricity immediately during grid outages, ensuring continuous power to critical services such as hospitals and emergency responders, which is life-saving during extreme weather disruptions.
- **Grid Stability and Resiliency:** By storing and releasing energy, BESS smooths out fluctuations in supply and demand, reducing stress on the grid especially under the strain of extreme weather. This helps prevent brownouts and blackouts caused by sudden generation loss or demand spikes.
- **Load Levelling:** BESS reduces peak demand by discharging stored energy during times of high electricity use, which eases grid congestion and minimizes the likelihood of outages triggered by overloaded infrastructure.

Summary Table of BESS Effectiveness in Extreme Weather

Benefit	Description
Uninterrupted Power Supply	Provides immediate backup power during outages, critical for life-saving services
Grid Stability & Resiliency	Balances supply and demand to prevent outages from grid stress
Peak Demand Reduction	Discharges stored energy during peak periods to alleviate grid overload
Renewable Integration	Stores renewable energy for use when generation is low or disrupted by weather
High Efficiency	Typically, >90% round-trip efficiency ensures effective energy use
Fast Response	Rapid reaction to grid disturbances, faster than conventional power plants
Economic & Environmental Benefits	Saves consumers money, reduces emissions, and supports local economies



In order to better understand these concerns, we have reviewed the Online Battery Safety Management Plan to be submitted with the proposed application. In our view it fails to consider the proximity of the above features to the proposed BESS facility and as such is only a generic assessment of battery safety development. It is therefore not adequate to address our safety concerns.

Outline Battery Storage Safety Management Plans are exactly that. They are early-stage developmental documents that form the basis of the later BSSMP Battery Storage Safety Management Plan.

Further detail will be added as designs develop, input from the likes of the local Fire and Rescue Service will be added and results from tests such as UL9540 specific to batteries and enclosures added.

Infrastructure at Severn Power Station

At any given time, there are 34 full time employees working at the CCGT power station. From 1 October to 31 December staff presence on site increases to approximately 180 persons on site with 60 persons working during the night. This is to deliver major maintenance to the power station, and this takes place every 3-5 years depending on the generation load factor. The number of persons present means that safety has to be paramount.

It is assumed this section alludes to the safety of personnel on site. As can be seen from all of the above evidence, injuries are very few and far between. Injuries have significantly been down to issues that the technology of the storage units are not responsible for, such as lack of firefighter awareness/training.

Given the number of persons on site, we are concerned that the proposed BESS facility would interfere with safety precautions in the case of an emergency event. There is only one access and egress to the CCGT power station (being West Nash Road). The presence of this proposed BESS facility will mean the power station becomes surrounded by BESS facilities on all accessible sides. This severely limits accessibility and escape routes for both employees and for emergency services.

This section states there is only one access and egress to the power station (West Nash Road) and the BESS units severely limit accessibility and escape routes. The BESS sites don't impinge up on the roads either during construction (with planned deliveries) or even if there were other activities ongoing.



It is assumed that Severn Power employees do not use the PFA storage area as well as the West Nash Road. Personnel would neither escape across wasteland, a PFA storage area or BESS site.

The compact nature of the Uskmouth peninsular also is a cause for concern, as even now there are limited escape routes available in the event of emergency.

The high-pressure gas pipeline which runs underground from the river Usk in the west to the western side of the CCGT power station. This pipe then turns and abuts the boundary where the proposed BESS facility is to be situated. It also runs next to a 10-metre sheeted cladded wall which separates the CCGT power station from the BESS facility. If the BESS facility is delivered as proposed, there will not be anything to separate it from the gas pipe, which we regard as a considerable risk in the event of overheating and thermal runaway.

All of these concerns raised are repeat issues already been addressed.

In addition to this, there are transformers adjacent to the proposed application site which have underground cables that run to the switch area to the west of the CCGT power station (the switch area is marked as 'substation' on the proposed Planning Statement'). This also includes the presence of 275kV overhead cables, and pylons. We understand that hydrofluoric acid and associated vapours can be produced as a result of lithium-ion batteries overheating or experiencing thermal runaway, with the resultant risk that it encounters both the CCGT power station and the switch area equipment.

There is also a large diesel generator adjacent to the proposed BESS facility and is located at the southernmost point of the CCGT power station and where the transformers for the site are housed.

Repeat issues previously responded to.

Construction risks associated with the BESS facility

A currently disused railway line runs between the CCGT power station and the proposed BESS facility location. This could potentially be used to bring in hardcore and associated materials for the purposes of construction. The proposed BESS site would separate this railway line from the land owned by the power station and would hinder its own development of that land. If the power station required the railway line to be utilised in the future there needs to be consideration given to an adequate distance between the railway line and the BESS site to minimise noise, vibration and risk of fire and explosion.



A question has to be raised as to how much hardcore and materials the power station would need to bring in via rail in the future.

The statement insinuates it would be ok for development for the power station to take place but not for any alternative project.

Once again, the risk of fire and explosion is mentioned as if to reinforce the **perceived** dangers.

There are a number of ponds in the peninsula area. To the west of the CCGT power station a pond collects rainwater which is pumped through the power station and discharged at a northerly point into the river Usk. Construction of the BESS facility could result in dust and contamination of this pond and others, with potentially wider harmful effects, especially as they run off into the river Usk.

For the removal of the PFA from the site the application will be accompanied by a Removal Method Statement and the contractor will take measures to prevent pollution in terms of noise and dust. Notwithstanding that the power plant was subject to active operations until 2017 with large vehicles moving coal, and daily human activity within the site, passing by the attenuation pond, mitigation measures will be incorporated into the design and layout of the development to minimise noise and light to nearby noise sensitive receptors, including ecological receptors. Methods to reduce impacts during the construction period will be detailed within the CEMP, likely including visual and acoustic screening along the southern boundary.

The pulverised fuel ash also presents an environmental risk. The proposed site of the BESS facility is presently a fuel ash yard from the time when the Uskmouth power station was coal-fired, with the fuel ash being a by-product. If this land is to be dug out, as the fuel ash is interfered with and removed, this presents a risk that the underlying ground and groundwater beneath could become contaminated.

The statement that the PFA poses an environmental risk taken in isolation is once again alarmist. Under Environment Agency requirements ash such as this is should be stored on impermeable concrete slabs. These slabs normally have expansion joints between them; over time these expansion joints disintegrate and/or are damaged with the load or movement. Rainwater leaches from the ash and can escape through these joints. Thus, it is possible contamination has already occurred and will continue to do so if the PFA is not safely removed.



Careful removal of the ash under a safe system of work that incorporates all environmental risk management aspects will actually *benefit* the site. Multiple sites such as this across the UK carry out operations such as this day in and day out without any damage to the environment be it via the soil or the air.

Furthermore, the removal of fuel ash and site construction generally, will push the fuel ash into the air with a detrimental effect on air quality. The turbine units, one at the southernmost area of the CCGT power station also contain two filters fitted to the site – these are approximately £150,000 to change each time, with new filters being installed in October 2025. The presence of fuel ash in the air will be sucked into the filters, necessitating their replacement. General construction dust will also have the same effect. Should the filters become blocked and require unplanned replacement, this would result in forced outage time and loss of income to the power station. The lost generation costs could run into millions of pounds.

Once again issues raised by Severn Power apparently only affect dust issues concern if this site is developed by anyone else.

The insinuation that dust would cause issues to them if the land were developed by a third-party but not by them if they were to use it in future for unknown development, if even possible as they are not the landowner, underscores multiple contradictions in their arguments.

Well tried and tested strategies to minimise dust include surface wetting, airborne capture, and proper handling procedures. Surface wetting, often with water or water/surfactant mixes, helps prevent dust from becoming airborne by keeping the material moist. For airborne dust, capture methods like dust collectors and baghouses are employed. Additionally, careful handling and storage practices, such as using covered stockpiles and sealed containers, are crucial. All of these would be incorporated into any plan to remove the PFA.

The construction period would also cause excessive traffic movements. The Transport Assessment estimates up to 18 movements a day Monday – Friday, with additional movements on Saturdays. The single route in and out along West Nash Road means an emergency event would potentially be exacerbated were construction traffic in place at any given time.

A dedicated site traffic management plan will be implemented with strict delivery times and permissions required to arrive at site. This means traffic is effectively managed and does not prevent the arrival of emergency vehicles or any evacuation initiated at the power station. If the 18 deliveries are extrapolated over the period of the working day (which they have to be to accommodate off-loading) it amounts to less than two per hour.



The traffic management plan will not allow parking or waiting on the West Nash Road.

Operational effect on CCGT power station

If the BESS facility were to be granted planning permission, it would have a significant operational effect on the CCGT power station.

Our protocol for major accidents would need to be entirely reassessed and re-implemented, at significant cost. All of the above issues would need to be considered, with new emergency plans put in place to protect employees at the site and other persons in the vicinity. By way of example, we currently lease the land to the south of the proposed BESS facility, adjacent to the semicircular area of tree line. The presence of the BESS facility would restrict direct access to that area, resulting instead in a one kilometre walk from the CCGT power station, effectively cutting it off as a safe assembly point in the case of an emergency.

It is not understood how this “significant operational effect on the CCGT power station” would impact as all of the issues within the letter have been addressed.

The statement that the protocol for major accidents would have to be entirely reassessed is not true. The existing hazards addressed within that document would still be the same. The station may wish to develop some of their procedures *in conjunction* with the BESS project to work together as would normally be the case. The term ‘significant cost’ is also overly dramatic, if the station does not have in-house staff that could amend their procedures it would be greatly disturbing.

The statement insinuates they would have to develop new emergency plans for their staff and **other persons in the vicinity** – ‘other persons’ in the vicinity already should already be included in their procedures, relating to their hazards.

Any emergency plan regarding the BESS site would include a wider risk assessment specific to any hazards relating to the BESS site and any other persons. It is not the responsibility of Severn Power to include consideration for anyone else’s safety from another project.

It would also constrain our ability to deliver future development on the Uskmouth peninsula associated with the CCGT power station. This could range from development of the power station itself, to other more routine needs such as providing additional parking areas for the proposed increase in employees. The proposed BESS facility will constrain any such activities if it is delivered in the proposed location.



The argument put forward here is in direct contradiction to a previous argument that removal of the PFA would and we quite “presents a risk that the underlying ground and groundwater beneath could become contaminated”.

As previously responded to these statements strongly suggest it would be acceptable for Severn Power to carry out this work if it needs it, but not acceptable for anyone else to utilise the land in a beneficial way.

It also refers to expansion of the power station itself or providing parking to proposed increase in staff.

It would not be unreasonable to enquire as to what development the power station would need? All of the main generating equipment and balance of plant is in place already. If the station wishes to increase staff and thereby traffic it flies directly in their argument that any increase in traffic along the West Nash Road and would prevent the emergency services reaching the station and personnel escaping an incident at the station itself.

Added to this there appears to be significant (safe) land within the station perimeter to accommodate any additional parking.

Due to the high level of risk incurred should the BESS facility be constructed, Severn Power Limited would, through no fault of their own, be expected to pay increased insurance premiums. The power station would need new evacuation plans and procedures in place, and to readdress its Major Accident and Prevention documents. This would be at vast expense to the Company.

Any site development has to ensure and provide safe and secure operations for its staff, neighbours, the wider area and the environment in general.

It is incumbent upon that site to prove these accommodations meet legislation, guidance and best practice. Yet again, the letter refers to the ‘high-level of risk’ without actual evidence other than salacious, inflammatory headlines from an industry that has a vested interest in defending the use of carbon fuels against any development of new (and tried and tested) carbon friendly developments.

Author. Michael Carr
M.I.E.T. Tech IOSH
Consultant

Pearl Safety Solutions Ltd
1st Floor, Halifax House
Falcon Court
Stockton-on-Tees
TS18 3TU