

BESS Consequence Assessment



CHALLENGE

The key challenge was to demonstrate that the proposed BESS development would not increase major accident risk at a Lower Tier COMAH site, while navigating an evolving, complex regulatory landscape and addressing emerging scrutiny of battery energy storage systems.

SOLUTION

AWN delivered a structured Significant Modifications Assessment, applying HSA guidance, consequence modelling and expert judgement to evaluate credible accident scenarios and demonstrate that the proposed BESS would not increase risk.

RESULT

The assessment concluded that the proposed BESS development did not constitute a significant modification, allowing the site to remain Lower Tier COMAH and enabling the project to progress without further detailed analysis.

AWN Consulting, part of the Trinity Consultants group, was commissioned by a national grid operator to undertake a Significant Modifications Assessment for a proposed Battery Energy Storage System at an operational power station, supporting the client's programme to expand grid-scale energy storage in line with Ireland's energy transition goals.

The Power Station is a Lower Tier COMAH establishment, requiring rigorous assessment of any changes that could affect major accident hazards. The regulatory landscape for large-scale battery energy storage is still evolving, and existing standards such as NFPA 855 and UL 9540A, while valuable, were not designed for a COMAH context. Translating their requirements into a defensible major accident hazard assessment requires a level of specialist interpretation that goes beyond standard compliance.

AWN brought together COMAH, process safety, and battery hazard expertise to deliver a structured, evidence-led assessment aligned with Health and Safety Authority guidance. The scope covered the existing site, the proposed BESS technology, and on-site, off-site, and environmental risk, giving the client the regulatory confidence to progress the project.

CHALLENGE

The main challenge was evaluating a large-scale BESS at an operating Lower Tier COMAH site. Although BESS is not directly regulated under COMAH, the Health and Safety Authority requires operators to demonstrate that new developments do not increase the risk or consequences of major accidents.

Battery energy storage poses specific hazards including fire from thermal runaway, explosion, toxic gas release and contaminated firewater. Cell chemistry materially influences these hazards. Lithium iron phosphate (LFP) is often presented as inherently safer than nickel-based chemistries, but it is not a closed book: LFP cells still vent flammable and toxic off-gas under thermal runaway, can propagate cell-to-cell, and present credible deflagration and toxic dispersion scenarios that must be assessed on their own terms.

For the Power Station, the challenge was compounded by existing generation assets, previous BESS developments, and proximity to sensitive environmental designations. The client needed a robust, defensible consequence assessment to support regulatory engagement and planning progression.

SOLUTION

AWN used a structured assessment approach, following the Health and Safety Authority's guidance on Significant Modifications under COMAH regulations. Due to the unique challenges of battery energy storage systems, the team developed a clear methodology for each assessment step:

- Preliminary scoping: A detailed preliminary analysis was undertaken to set the assessment basis and determine whether the proposed BESS development could increase major accident hazards or consequences.
- Hazard identification and consequence modelling: All credible accident scenarios were identified, including fire following thermal runaway, explosion, toxic gas dispersion and firewater run-off. Recognised modelling methodologies assessed radiation, overpressure, and toxic dispersion, using reasonable assumptions where data were limited.
- Standards and design review: Design features were reviewed against NFPA 855, and available UL 9540A unit- and installation-level test data were used to inform source terms for fire, off-gas and deflagration modelling.
- Separation distance and receptor assessment: Separation distances, elevation, and locations of receptors were checked to confirm consequences stayed within limits.
- Client collaboration and documentation: AWN worked closely with the client throughout to ensure the assessment was proportionate, technically robust and clearly documented, providing a transparent basis for engagement with the Central Competent Authority.

RESULT

The Significant Modifications Assessment concluded that the proposed BESS development would not increase risk to personnel, the public, or the environment. The consequences of all credible major accident scenarios were shown to be confined to the immediate vicinity of the BESS units, with no impact on occupied areas within the Power Station or beyond the site boundary.

The development was determined not to constitute a significant modification under the COMAH Regulations, and no detailed quantified risk assessment was required. The Power Station's classification as a Lower Tier COMAH establishment remained unchanged.

The clear, evidence-based conclusions provided the client with regulatory certainty and supported timely engagement with the Central Competent Authority. By navigating a complex, evolving regulatory landscape in a structured, transparent manner, AWN helped deliver critical energy infrastructure without compromising safety or compliance. The project demonstrates AWN's capability to apply major accident risk assessment discipline to battery energy storage, where established frameworks do not yet provide a clear path.

If your BESS installations require hazard assessment, consequence modelling, or safety case support, and the regulatory framework leaves you without a clear path, we can help. Get in touch to discuss your project.