

7 critical fire safety considerations for battery energy storage projects

Meet tomorrow prepared.

## BESS fire safety

### How to protect your assets, people and project viability

Battery Energy Storage Systems (BESS) are revolutionising energy infrastructure, but fire safety remains a critical challenge. A fire incident can cause devastating financial losses and disrupt operations. But have you considered the hidden costs of inadequate fire safety planning?

### What are the implications?

Getting fire safety planning wrong isn't just costly — it can jeopardise project viability. Poor upfront planning can lead to rejected planning applications and project delays, resulting in significant unforeseen expenses. In the longer term, you could face retrofitting expenses, higher operating costs, reduced asset value, business interruption losses and reputational damage.

These are all risks that could be avoided with the right BESS expertise. This is why specialist knowledge is essential to solve risk and protect your project.

## Identify the challenges and keep your BESS project on track

With BESS technology evolving faster than regulations, developers, investors and operators must take a proactive approach to fire risk management. This guide outlines seven key considerations to help you navigate fire safety, regulatory compliance and insurability ensuring your BESS project is built for long-term success.

Fire Management Strategy (FMS) – a must-have, not a nice-to-have

A Fire Management Strategy (FMS) should be embedded from the earliest planning stages of a project - not treated as an afterthought. However, many organisations lack in-depth BESS knowledge, making it easy to overlook or underestimate critical aspects of fire safety. You need technical expertise to create an effective, comprehensive plan and demonstrate that the fire risks have been adequately assessed by a competent person.

### A FMS ensures:

- $\checkmark$  Compliance with local & global regulations (NFPA & UL standards)
- $\overrightarrow{}$  Mitigation of fire risks across the project lifecycle
- Alignment with insurers' expectations, reducing barriers to coverage
- Protection against retrofit costs
  - **Tip:** Work with a fire safety specialist to develop a strategy aligned with RIBA Work Stages, ensuring fire safety considerations evolve as your project progresses.

  - (()) Insight Projects with comprehensive FMS documentation will achieve planning approval faster than those without.

2. Compliance & Regulations – avoid planning rejections

Fire safety is increasingly being raised as an issue for local councils considering BESS developments. This means planning authorities are scrutinising fire risk and safety planning closely when assessing BESS applications. Rejections can cost you time, money and investor confidence, so it's essential that your application provides the required level of detail.



### To strengthen your application:

- Ensure fire detection, suppression and emergency access are addressed
- ✓ Align with international best practices (NFPA 855, NFPA 850, UL9540 & UL 9540A)
- Provide a comprehensive Battery Safety Management Plan
  - Tip: Partnering with an expert ensures you meet regulatory expectations

     giving decision-makers confidence in your fire safety measures.
  - Insight Between 2015 and 2023, 23% of BESS planning applications were either refused, withdrawn, or abandoned.

Source: researchbriefings.files.parliament.uk

Insurability and
 risk assessments
 what insurers
 expect



BESS technology is fast evolving and subject to change, with risks that are unique to these systems. The high-risk nature of lithium-ion batteries means insurers require a comprehensive fire management strategy. It must demonstrate your understanding and mitigation of potential risks. Without this, securing insurance can be a challenge.

### To improve insurability:

- Conduct an independent fire strategy that considers:
  - Fire detection and suppression effectiveness
  - Effective site layout and design
  - Explosion risk and mitigation measures
  - Business continuity impact
  - Effective inspection, test and maintenance plans
- Benchmark risk factors against industry standards



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**Tip:** A structured risk report empowers insurance brokers to negotiate better insurance terms by demonstrating proactive fire safety planning.  Fire protection and detection selecting the right suppression methods



Thermal runaway is one of the main concerns of BESS incidents. This can be triggered by many different factors, including thermal, mechanical, electrical and water damage. The uncontrollable temperature increase in the cell can lead to the generation of combustible gases (known as off gassing) leading to fire and explosion. Not all fire protection systems are suitable for BESS projects. Selecting the wrong suppression method can result in ineffective fire control — or worse, exacerbate the situation.

If the challenges are not fully recognised, the protection measures in place may not provide the return on investment that's expected. Also, if the level of protection isn't adequate to protect the risk, there may be a false sense of security on the project.

### **Best practices include:**

- Deflagration prevention
   venting and explosion
   protection
- Early warning detection using off-gas detection and automatic fire detection
  - **Tip:** An on-site hazard assessment can determine the best fixed fire suppression solution for your specific battery technology and site layout.
  - Insight 26% of inspected BESS units had defects in the fire suppression system, while 18% had thermal management system defects.

Source: BESS Quality Report. February 2024. Clean Energy Associates Insights.

### 5. Emergency planning and response – prepare for worst-case scenarios

Every BESS site must have a comprehensive emergency response plan (ERP) that outlines clear procedures, responsibilities and contingencies. A well-prepared, site-specific ERP can limit damage, minimise downtime and, most importantly, protect your personnel.

### Key elements include:

- ✓ Fire and explosion response procedures tailored to battery fires
- Evacuation strategies
   based on fire spread
   modelling
- Fire brigade access
   & water supply planning

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**Tip:** Simulating fire scenarios in advance helps validate response strategies and refine safety measures before a real incident occurs.  Environmental and business continuity risks – minimising broader impacts

Beyond physical fire damage, BESS incidents pose serious environmental and business continuity risks. BESS fires can release toxic gases, posing risks to human health and firefighting runoff can contaminate land and water sources with hazardous chemicals, requiring costly cleanup procedures.

This can lead to regulatory penalties and reputational damage. Organisations may find themselves facing legal exposure and opposition to future projects. Recovery may involve long lead times for battery replacements and system repairs, impacting profitability.

### Key mitigations:

- Secondary containment systems for fire suppression water
- Environmental impact assessments included in fire planning
- Business continuity planning — backup energy solutions and disaster recovery plans

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**Tip:** Integrate fire risk management with environmental impact planning to ensure full regulatory compliance.

# 7. Expert guidance – why specialist support is essential

BESS fire safety is too complex to navigate alone. You need specialist guidance from a BESS expert to ensure your project remains safe, compliant and resilient against fire risks.

By working with a consultancy that has specialist experience across multiple BESS projects, you benefit from deep insight into potential risks and project pitfalls, helping you get upstream of challenges. Where you lack in-house skills, they can provide fire competency and technical standards expertise, guiding you with best practices at every stage.

With a structured approach to fire risk planning, you can be confident that all safety aspects are professionally managed end to end, giving your BESS project the best outlook.

## Partnering with a specialist ensures:

- Hidden risks are recognised and mitigated
- Compliance with the latest safety and regulatory requirements
- A stronger case for planning approvals and insurance coverage
- Reduced financial, operational and reputational risks

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Tip: Zurich Resilience
Solutions (ZRS) brings
over 75 years of risk
expertise, with dedicated
Fire Protection Engineers
and specialist Power
Generation teams
to support BESS
projects worldwide.
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## Need expert fire risk support for your BESS project?

ZRS has the breadth and depth of specialist knowledge needed to minimise risk in BESS projects. As your partner, we provide a comprehensive service, supporting your projects with expertise, insight and actionable advice.

We make it simple to assure fire safety standards at every stage of your BESS project with Fire Management Strategy (FMS) development aligned with RIBA Work Stages.

No matter the scale and complexity, we have the technical understanding and hands-on experience to help your project succeed.



## 5 reasons to choose ZRS

Unmatched expertise across industries
 Our multi-skilled team brings deep BESS and fire safety knowledge, complemented by real-world experience in Fire Engineering, Powergen, Chemical, Wind, and Solar sectors.

### ) Future-focused

We uniquely connect fire safety planning to insurability market guidance across all project milestones, offering a framework to demonstrate adequate fire precautions. We draw on Zurich's insurance data to address critical project risks that are often overlooked.

### A holistic approach

Our solutions go beyond fire safety, addressing business continuity, reputational risk and environmental sustainability. With our real-world experience, fire competency and technical standards expertise, we deliver a well-rounded approach to life, property and operational protection.

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### Global reach and local knowledge

Our expertise spans the world. With our global team of specialist risk engineers, we can visit your sites during construction to address fire risks, ensure compliance and give real-time advice.

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### Your partner at every stage

The need to prove fire safety for your BESS project doesn't stop at handover. In the operational stage, there is an ongoing requirement to undertake testing. We can partner with you to provide one-off or annual risk assessments, giving you a roadmap of improvements to help you mitigate risk.



## Speak to our experts today

We're already a trusted partner on a number of high profile BESS projects across the world. Ensure your BESS project is built for safety and success.

### Get in touch with us. zrs.enquiries@uk.zurich.com

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