GUIDE BATTERY STORAGE · 6 MIN.

Fire protection in a new-build BESS: planning checklist from concept design to tender

This checklist sets out the fire protection decisions for a new battery energy storage system in twelve steps — from site selection and cell chemistry through to a tender-ready performance specification. You can see which document has to be available at which point.

1. Assess the site and its surroundings from a fire protection perspective

Responsible: Project developer, fire safety consultant · Timing: Concept design, before securing the site

First establish what surrounds the planned storage system: neighbouring buildings, operational buildings, traffic routes, watercourses and sensitive occupancies. This assessment determines the separation distances required and the question of whether you achieve the protection objective through distance or through physical separation. In parallel, check access for the fire service, hardstanding areas and firewater retention. A late change of site is the most expensive of all design changes.

2. Determine the permitting route and the responsible authorities early

Responsible: Project developer · Timing: Concept design

In Germany, stationary battery energy storage systems generally require building consent but are not subject to permitting under Annex 1 of the 4th BImSchV — what governs is the state building code and, depending on the use, the Industrial Building Directive. In an early meeting with the building authority and the fire service, clarify which evidence they expect. Ask explicitly about their position on test reports from the Anglo-American sphere, such as UL 9540A. Record what is agreed in writing; it will later be the basis of your argument.

3. Fix cell chemistry, capacity and system hierarchy as the planning basis

Responsible: Electrical engineering consultant, project developer · Timing: Concept design, before drafting the fire safety concept

Without a settled cell chemistry, energy content and breakdown into cell, module, rack and unit, no robust fire safety concept can be written. Require the system supplier to demonstrate conformity of the cells and battery systems to EN IEC 62619, which sets out the safety requirements for industrial lithium batteries including requirements for the battery management system. Document gas volume, gas composition and release behaviour as far as the manufacturer has substantiated them. Any later change of cell chemistry triggers a reassessment of the concept.

4. Request UL 9540A test reports and check their transferability

Responsible: Fire safety consultant · Timing: Concept design through to scheme design

UL 9540A is the test method for evaluating fire propagation during thermal runaway in battery energy storage systems, and the only test method that NFPA 855 explicitly draws on for large-scale fire testing. Ask for the reports at cell, module, unit and installation level, not merely a summary. Check whether the tested build-up matches your planned configuration — differing rack heights, spacings or enclosures make transferability questionable. The 2025 edition of the test method additionally introduces a time-based view of propagation, which you should compare with your intervention concept.

5. Set up a hazard analysis and derive the protection objectives from it

Responsible: Fire safety consultant · Timing: Scheme design

Carry out a structured analysis of the plausible failure cases: thermal runaway of a cell, propagation within the module, gas release, deflagration, residual energy remaining after the event. NFPA 855 knows this approach as the Hazard Mitigation Analysis; the 2026 edition makes it a standard requirement for most installations and calls for an assessment of the consequences in relation to the measures provided. For each failure case, derive which measure takes effect and what margin remains. Only then is it clear what fire resistance period the thermal barrier actually needs.

6. Choose the level of separation: cell, module, rack, unit or building

Responsible: Fire safety consultant, project developer · Timing: Scheme design

Decide deliberately at which level you want to stop propagation — each level means different components, different costs and different maintainability. NFPA 855 generally requires a separation of 3 ft (914 mm) between individual units unless smaller distances are substantiated by fire and explosion testing; where space is lacking, a thermal barrier takes the place of the distance. For walk-in storage rooms inside buildings, additionally check the requirement for fire-separating construction. Record the chosen level and the reasoning in writing; it shapes every decision that follows.

7. Incorporate the property insurer's requirements

Responsible: Project developer, operator · Timing: Scheme design, before the permit application design

Property insurers regularly impose requirements that go beyond building law. In German-speaking countries the usual reference point is VdS 3103 on lithium batteries; it distinguishes batteries by power class and, for the middle class, requires spatial separation or physical separation using fire-resisting components. Obtain these requirements before scheme design is complete. Separating walls demanded after the event can hardly be accommodated in a finished installation.

8. Coordinate gas routing, venting and deflagration protection with the barrier

Responsible: Fire safety consultant, building services consultant · Timing: Scheme design

Gas venting and the thermal barrier are in conflict: every relief opening is an interruption of the barrier. Plan relief areas, duct routing and discharge direction together with the barrier concept, so that the openings are not improvised later on. NFPA 855 requires explosion protection by means of deflagration venting or explosion prevention in accordance with the relevant standards. Decide now how duct penetrations through classified components will be substantiated.

9. Anticipate penetrations and containment routes at design stage

Responsible: Electrical engineering consultant, building services consultant · Timing: Detailed design

Draw up a penetration schedule before the first cable tray is installed: position, service, nominal size, fill level and the intended penetration seal system. The test basis is EN 1366-3; the chosen system must be tested for the specific combination of construction element, penetration and fill level. Provide spare openings deliberately and seal them to the standard, rather than breaking through later. Group penetrations at a small number of

locations — this reduces both the testing effort and later sources of error.

10. Secure the proofs of fitness for use for the planned construction types

Responsible: Fire safety consultant · Timing: Detailed design, before tender

For each planned construction type, define which evidence will substantiate it: general construction type approval, general building authority test certificate, ETA or a classification report to EN 13501-2. Check the remaining validity of the approvals against the construction programme. Verify that the planned connection details fall within the scope of the approval, particularly for steel and container structures. Where they do not, you need an expert opinion or a project-specific construction type approval in good time.

11. Plan for maintainability, access and eventual removal

Responsible: Fire safety consultant, future operator · Timing: Detailed design

A barrier that cannot be seen once installed will never be inspected across twenty years of operation. Plan inspection openings, access panels and routes so that labels remain reachable and legible. Allow for module replacement and capacity expansion: which parts of the barrier have to be demountable for that, and how are they closed again to the standard afterwards? Decide now who is permitted to carry out this work.

12. Tender the performance specification, evidence obligations and acceptance regime

Responsible: Project developer, fire safety consultant · Timing: Tender

In the tender, describe not only areas and thicknesses but the required performance objective with classification, type of evidence and connection details. Explicitly require the declaration of conformity, the labelling of every penetration seal and a penetration seal register with position, photograph and drawing reference as part of the scope. Specify that sample areas are to be opened before closing up, or documented photographically. Finally, name who carries out the acceptance and which documents must be available for it — this spares you the usual arguments on the day of acceptance.

Frequently asked questions

By when must the fire safety concept be in place for a new-build BESS?

The concept must be available before the building application, because it is routinely part of the document package to be submitted alongside the drawings and structural calculations. Starting considerably earlier makes sense: site selection, level of separation and separation-distance decisions are already taken during concept design and can hardly be corrected later. So involve the fire safety consultant as early as the assessment of possible sites. A consultant brought in late can only document what others have decided.

Does NFPA 855 apply in Germany at all?

NFPA 855 is a US standard and has not been adopted into German building regulations. What governs is the state building code, where applicable the Industrial Building Directive, and the approved fire safety concept. In practice NFPA 855 is nevertheless frequently referred to, because it contains more specific provisions for battery energy storage than the German rules do, and because system suppliers design their products around it. Use the standard as technical justification within the concept, not as a legal basis — and agree that approach with the permitting authority.

Does a greater separation distance replace the thermal barrier?

Often yes, provided the distance is large enough and the space is available — this is why open-field installations frequently manage with less physical separation. As soon as space is limited, the thermal barrier takes the place of the distance, and its performance must then be substantiated. Settle this question during scheme design, because it feeds directly into land requirements and layout. A mixed solution of reduced distance plus a barrier is permissible, but must be justified and documented.

Let us talk about your project

Reply within 24 hours on working days.

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