

Battery Energy Storage Systems - As Safe As Houses? Write-up

Introduction

As the UK moves to decarbonise its electricity system, BESS will be critical to this energy transition, enabling ramp-up of renewable electricity usage, and managing the supply/demand balance across the macro scale of the national grid and the micro scale of domestic properties. This emerging and fast-moving area of the energy transition needs careful management to ensure the safety of national and commercial infrastructure and domestic homes.

On December 13th, 2023, the Institution of Chemical Engineers convened a cross-sector roundtable discussion focusing on Battery Energy Storage Systems (BESS) safety, with a focus on static storage systems. A hybrid in-person/virtual discussion was chaired by IChemE Deputy President, Mark Apsey MBE, UK Managing Director for renewable energy firm Ameresco. The discussion brought in experts from professional engineering institutions, industry, academia, and regulatory bodies. This document summarises some of the key themes from the discussion that took place.

Standards and regulations

- Given the lack of regulation in this area in the UK, insurance companies act as a significant driver of compliance, by requiring that regulations are met before they insure a project.
- It takes a long time to produce standards and regulations, compared to the fast-changing nature of the BESS industry and technology.
- There is a danger of regulations being ‘backwards looking’, and only responding to issues after incidents have occurred.
- There is a trade-off between producing detailed standards for a particular battery technology, and producing something less specific but more widely applicable.
- There is a distinction between approaching the risks of battery energy storage systems as a product safety issue (involving product standards and associated mechanisms) as opposed to approaching it through a systems and processes lens. Large battery installations are best treated in a bespoke way, and chemical engineers, with their grounding in systems thinking, are particularly well-placed to do this.

Stakeholders and understanding of BESS

- There is a need for a better understanding of the risks of battery energy storage systems across all stakeholders.
- Firefighters have received specific attention and made particular progress in this area.

The need for a fundamentally different response to fires in domestic and critical infrastructure contexts

- The dominant safety approach to responding to a battery fire – to let it burn and keep people away from the area – is not applicable in a domestic setting or for systems near critical infrastructure, where we could expect to see many more batteries in future.

The variety of battery chemistries and types

- Our understanding of alternative battery chemistries is still developing.
- Flammable organic solvents are involved across the different types of battery chemistries. Many of them contain components that are insufficiently well understood.

End of life batteries: reusing, recycling and repurposing

- Eventually all batteries are no-longer re-usable, and they ultimately all need to be recycled.
- The widespread contemporary approach of effectively offloading the problem of end-of-life batteries to developing nations is concerning.
- There are strong economic incentives to recycle batteries which could encourage significant additional activity in this area.

Gaps in the evidence base

- The secrecy surrounding many safety incidents involving BESS internationally holds back our understanding of the issues in this area.
- There are many components inside batteries that are insufficiently understood, and a lack of knowledge regarding the circumstances under which a battery will re-ignite.

Other items discussed

- The suggestion that the biggest risks connected to battery energy storage systems come from data control philosophies and issues connected to the internet of things.
- Concerns that many fire suppression systems being sold are not fit for purpose.
- The lack of funding for academic research on this topic.

Next steps for IChemE

- 1 Discuss within IChemE how to carry forwards the themes emerging from the roundtable.
- 2 Share write-up on IChemE website.
- 3 Consider what education and training materials can be provided both for IChemE members and non- members on the understanding of BESS safety basics
- 4 Reach out to the Dept for Energy Security and Net Zero to explore how IChemE could feed in to ongoing and upcoming work developing BESS safety standards.
- 5 Explore partnerships with other organisations such as IET and the Energy Institute on this topic.



About IChemE

The Institution of Chemical Engineers (IChemE) advances chemical engineering's contribution for the benefit of society. We facilitate the development of chemical engineering professionals and provide connections to a powerful network of around 30,000 members in more than 100 countries. We support our members in applying their expertise and experience to make an influential contribution to solving major global challenges, and are the only organisation permitted to award Chartered Chemical Engineer status and [Professional Process Safety Engineer](#) registration.

Find out more about IChemE and our strategic vision of Engineering a Sustainable World at icheme.org