

INFACTNI – Written evidence (BAT0001)

We represent a growing group of residents across Northern Ireland living in close proximity to very large BESS facilities (Battery Energy Storage Systems) either constructed, in construction or in planning, who have significant concerns regarding the roll out of this grid reinforcement programme without any regard to the safety of people living and working nearby or the environment in the event of a loss of control event such as a fire.

The drive for renewable energy has already placed strains on our Grid and these strains will increase as Northern Ireland strives to meet the higher renewable target. If large scale lithium-ion based BESS facilities are required to assist NI achieving that target, then the known dangers they present to both human health and the environment must be assessed. To date the chemicals inside the batteries of a BESS (and in a 50MWh BESS these number around 185,000) have not been included in any calculation for hazardous substances release under COMAH and therefore the subsequent dangers to human health and environmental damage have not been assessed. We have made these calculations and any such lithium-ion based BESS over 17.5MWh would be brought into the scope of COMAH and separately require Hazardous Substances Consent under Planning. All five BESS's in NI would reach the thresholds for COMAH and HSC. Yet, to date, no direction has been issued by DfI or HSENI that any chemicals inside the batteries of a BESS will be assessed going forward.

In this Submission we highlight for you the industry's Energy Storage Summit 2021 held 2nd March 2021 which reports on fire safety issues at BESS including a call to retrofit newly constructed BESSs:

Re-examining and retrofitting older, potentially hazardous battery storage systems should be an "essential" part of preventing harm, according to a panel of industry leaders.

At this conference, the Deputy Fire Safety Commissioner of the London Fire Brigade, Charlie Pugsley, asked why battery storage owners would "not want to apply a retrospective look" to their sites if they believe the older technology could carry a safety risk. He was very clear when he stated:

"If you've got foreseeable events or got systems with the potential to either harm people or harm the environment, why would you not want to apply a retrospective look to it, to actually see that it's safe, or anything can be done.

Energy Storage News reported that he went on to state that the London Fire Brigade has spent the past few years "reflecting on what was foreseeable" since the tragic Grenfell Tower fire at a high-rise housing unit in 2017, which was exacerbated by the building's flammable cladding:

"If we know some things could fail catastrophically or it could have those effects," he said, "it's going to be a difficult day if one of us is

standing there in court saying we knew about it but we didn't do anything."

<https://www.energy-storage.news/news/retrofitting-could-be-essential-for-battery-storage-system-safety>

Here we have a very clear message from the London Fire Brigade that it is incumbent on everyone with statutory consenting and approving positions, to not wilfully turn a blind eye but to investigate the issue of fire safety properly and then put in place processes so that people and the environment are not put at risk in delivering the intention of making our planet a safer place.

This requires all consenting authorities to be transparent and probe the issues diligently.

The Liverpool BESS fire in September 2020 (using the same NEC system as built in Northern Ireland at Mullavilly and Drumkee BESSs) resulted in fire, explosion and release of toxic gases was theoretically protected by a suppression system that failed to activate and would not have had any effect anyway, as the investigator states:

*Although there was a fire suppression system in the container, the speed of propagation indicated that **this hadn't activated. It was thought that activation would have had little or no effect on the resultant fire/explosion.***

An additional point to note from this Liverpool BESS report was that the fire water was collected in tanks on site. No such tanks have been included in any BESS constructed, approved or proposed in Northern Ireland. The large quantities of fire-water, which will be contaminated with heavy metals and other chemical residues, need to be prevented from release into the environment by collection on site followed by licensed removal.

The London Fire Brigade's Charlie Pugsley noted further that:

'There are still ongoing disputes over the best ways to handle some events.

There's still international debate for example about what to do about electric vehicles...how to fight fires if you get thermal runaway. There's no single clear picture.'

Thermal runaway is an inherent characteristic of all Lithium-ion battery systems. The issue with large scale BESS facilities is that we are talking about hundreds of thousands of battery cells, not just one car battery, and the implication of failure of one leading to failure across the facility. These concerns were confirmed by others on the panel discussion who are reported by Energy Storage news as stating:

'It was a sentiment shared by others in the panel discussion. Although actual fires are rare, fire safety is a great concern for the energy storage industry. In the town of Surprise, Arizona, two years ago, a grid-scale

battery system installed caught fire and [an explosion injured four fire service personnel](#). Nick Warner, the founding principal of Energy Storage Response Group (ESRG), told [Energy-Storage.news](#) last November that there is "nothing stopping what happened in Surprise from happening a dozen more times tomorrow.'

At the root of these issues is that BESS are huge chemical energy production plants with significant variables that can lead to failure. The discussion was very clear on that. The failure at 'Surprise' was for just a 2MW facility. The failure at Liverpool was part of a 20MW facility where one of three containers exploded. The built and planned facilities in Northern Ireland are 50MW and indeed a proposed facility in the middle of suburban Newtownards exceeds 100MW.

Catalina Roza, chair of the UK Electricity Storage Network association's working group on sustainability safety and supply chains, stated that:

'helping stakeholders to all understand "the different chemistries" and how different fire hazards interact with the systems can also help to mitigate harm. For example, she notes that uncharged batteries and those close to fully charged are "not the same" in their chemistries and how they should be dealt with, so it is "important to have an O&M (Operations and Management) team that is easily reachable.'

All the built and approved BESS facilities in NI are unmanned, thereby leaving it to local fire departments and local residents to deal with the outfall of a loss of control event.

We do not think the warning from the London Fire Brigade, which we take very seriously, should be ignored by any consenting, licensing or approving body.

We reiterate our collective community position which is that if BESS are to be employed:

- the facilities should be located well away from residences
- the number of batteries should be limited to reduce the fire risk of spread between racks
- the containers should be two hour fire rated to contain the fire spread
- the containers should be spaced at significant distances apart
- containment on site for contaminated fire-water run-off to prevent its uncontrolled release to protect human health and the environment.

We repeat the large scale battery safety statement made by the Deputy Fire Safety Commissioner of the London Fire Brigade, Charlie Pugsley, that:

'If we know some things could fail catastrophically or it could have those effects," he said, "it's going to be a difficult day if one of us is standing there in court saying we knew about it but we didn't do anything.'

We respectfully ask that the risks associated with the deployment of large scale BESS, in order to achieve net zero greenhouse gas emissions by 2050, must be addressed in parallel in order to avoid the issues clearly highlighted by the Deputy Fire Safety Commissioner of the London Fire Brigade.

10 March 2021

ADDENDUM added on 28 March 2021

As an addendum please find the attached from INFACTNI a group arguing for a halt to the unsafe deployment of large scale Lithium-ion battery energy storage systems close to residential neighbourhoods.

We referred in our submission above to the Energy Storage Summit UK, to concerns in the interest of public health and safety surrounding large scale battery storage in a loss of control event.

The Energy Storage Summit USA has just been held and it provides further useful insights into the fact that the energy storage industry is now citing the Liverpool BESS Orsted fire and explosion in September 2020 as one of the key incidents at BESS around the world causing serious concern in relation to large lithium-ion battery safety.

<https://www.energy-storage.news/news/very-rapid-removal-of-gases-vital-to-explosion-prevention-during-battery-fi>

We would draw attention to the following summary from the event.

Speaking at the event, hosted by our publisher Solar Media, Matthew Paiss, technical advisor, battery materials & systems at Pacific Northwest National Laboratory (PNNL), referenced the two most recent high-profile battery fires, with one at utility Arizona Public Service's (APS) energy storage facility in 2019 and one at Ørsted's 20MW project in Liverpool, England in 2020.

Both explosions caused a "significant pressure wave", with the APS incident resulting in the injuries of four firefighters and the Liverpool incident causing debris to be thrown between six and 20 meters away according to the fire department's response report.

Paiss explained that there are "many similar battery enclosures operating today that could experience the exact same kind of failure".

We would respectfully ask that in their report the Committee acknowledges that safety should be given priority, particularly in the large scale rollout of battery technologies where there is a foreseeable risk of failure as with Lithium-ion batteries

At the Summit, leading scientist, Dr Per Onnerud (Engineering Physics and a Ph. D. in Inorganic Chemistry from Uppsala University, Sweden, Post-Doctoral Fellow in Materials Science and Engineering at MIT, Cambridge, MA) is recorded to have stated that:

Everything from transparency on testing, developing the best safety devices possible, engagement with fire departments and other agencies are equally crucial to that pathway. Additionally, codes and standards such as the US National Fire Protection Association NFPA 855 need to be implemented across the country to ensure uniformity of safe best practices.

Appendix

Background information related to the safety of BESS systems:

1. In September 2020, the three container, 20MW Liverpool BESS caught fire and exploded with release of toxic gases, as they had anticipated in April and as recorded by the Liverpool Echo people said their houses were 'rocked by the explosion' and they were told to keep their doors and windows shut. One out of the 3 containers caught fire and exploded. The fire report stated that the fire suppression system failed to activate and that even if it had, it would have had little effect.

Lithium-ion fires are notoriously difficult to extinguish. Lithium does not need oxygen to burn. Often they are just left to burn out, as dosing them for several days with water causes toxic fire-water runoff which contaminates land and water ways. However, leaving them to burn out means that huge clouds of toxic gas are released into the air damaging human health and soil.

2. There have been over thirty BESS fires around the world since 2017. In 2019, a small 2MWh BESS in Arizona resulted in a fire and explosion in which two fire officers suffered traumatic brain injuries, one of whom was blown 75ft in the air.

The Arizona State Commissioner's letter of August 2nd 2019 cited her concerns following two Lithium-ion battery fires in 2012 and 2019 where 8 fire officers were injured, four seriously. She states:

...what has become apparent is that utility scale Lithium-ion batteries using the chemistries in those types of lithium-ion batteries are not prudent and create unacceptable risks, particularly those with chemistries that include compounds that can release hydrogen fluoride in the event of a fire and/or explosion.

The Flagstaff Fire Department Report for the 2012 incident also states concerns about 'a serious risk of a large scale explosion' and 'the cabinets involved are full of lithium batteries that are extremely volatile if they come into contact with water'.

Knowing how easily a fire and/or explosion can evidently occur at these types of relatively small (2MW) lithium-ion battery facilities, it appears that a similar fire event at a very large lithium-ion battery facility (250MW+) would have very severe and potentially catastrophic consequences, and that responders would have a very difficult time trying to handle such an incident.

To appropriately plan for such a catastrophic event, the large scale lithium-ion battery facility using the same chemistries as the APS Elden Substation (Flagstaff) Facility fire and the McMicken Facility would need to be built in isolation far from anything else, because an explosion could potentially level buildings at some distance from the battery facility site. The energy stored at a 2MW battery facility is equivalent to 1.72 tonnes of TNT. The energy stored at a 250MW battery facility is equivalent to 215 tons of TNT. Also, large amounts of hydrogen fluoride could be released and dispersed that would affect and harm the public at a substantial distance downwind.

There would be concerns also about lingering hydrogen fluoride contamination in the affected areas.

Arizona Corporation Commissioner Sandra Kennedy, State Correspondence
August 2nd, 2019.

3. The insurance industry is now showing concern about BESS safety. An interesting recent article on BESS fire risks from this perspective can be found at <https://ihsmarkit.com/research-analysis/aggressive-loadshifting-could-increase-battery-fire-risk-inves.html>
4. Further concerns are outlined by the Insurance Journal report highlighting concerns
<https://www.insurancejournal.com/news/national/2020/01/29/556855.htm>
5. What the broader UK industry thinks in relation to the fire authorities.
<https://www.energy-storage.news/blogs/what-the-fire-service-wants-you-to-know-about-your-battery>
6. It is important to review what the UK Energy Institute is advising in its publication Battery Storage Guidance Note 2: Battery energy storage system fire planning and response. 2020, because they clearly state the known fire risks of BESS.
7. Even the battery storage industry itself is issuing statements of fire risks with their own equipment. NEC, who was one of the largest battery storage manufacturers and installers and operators in the world, confirmed in a 2020 'white paper' entitled Early Detection of Hazardous Conditions in Energy Storage Systems that there were serious issues for H&S with BESS around the world:

'the industry is seeing a greater number of accidents including a fire and explosion in Arizona in April 2019 with a major utility company, an incident in Belgium in 2017, as well as dozens of fires in South Korea in 2018 and 2019, all related to stationary battery systems.

In addition to bringing to the fore NEC's concern about the number of BESS fires around the world, it documents NEC's discovery in 2019 that there had been noticeable bulging of their battery cells in an installation, which as they state is a strong indicator of cell failure, potentially in a hazardous manner. NEC goes on to state that:

If left to operate, these bulging cells may have resulted in a catastrophic failure and possibly a thermal runaway event that could have led to a fire and damage to the surrounding battery system inside that container.

In June 2020 a global business of NEC stated they were 'winding down' their battery division but they would maintain those facilities they have built until 2030.

8. The following link is a video of a fire in a warehouse in Germany with a small store of lithium-ion batteries. There is a modest fire, some smoke... and then after 5 minutes.... a massive fireball explosion. Four fire officers were injured in this fire, one was in a coma for a month. You can watch the video here: <https://www.youtube.com/watch?v=vQ1cabt3jXc>. There were 13 tonnes of lithium-ion batteries on this site – in the Kells BESS there will 462 tonnes of lithium-ion batteries with an explosive power of around 50 tonnes of TNT. The Kells Bess is located just 30m from the nearest dwelling. In the Newtownards BESS, which is 100.8MWh Capacity, there will likely be around 924 tonnes of lithium-ion batteries with a potential explosive power of 100 tonnes of TNT – this BESS has dense suburban housing and warehousing within 50m of the BESS.