

Stonestreet Green Solar ISH 4 BESS

Oral representation on behalf of Aldington and Mersham Support Group

Introduction

My name is Professor Sir David Melville, I am a professor of physics and over a 40-year career my expertise in solid state physics and chemistry has been internationally recognised. During the past four years I have taken an interest in Battery Energy Storage Systems and have co-authored two large scientific papers which have been downloaded thousands of times around the world. During this time I have been called upon to give advice on the safety considerations associated with many large-scale BESS proposals in the UK and overseas. It is in this context that I was approached to provide expert advice on BESS safety to the Aldington and Mersham Support Group (AMSG).

Summary

We have already provided a number of submissions which lay out our concerns regarding the safety of the proposed Stonestreet Green BESS but the essence of our submission today is that the applicant has dangerously failed to address these issues and so the Examiner does not have the security to make a properly informed decision on the Outline Battery Safety Management Plan and therefore on the draft DCO. In what follows we lay out the inadequacies in the information provided by the applicant.

BESS Size and Design

Whilst the generating output of the solar array has been clearly stated at 99.9 MW, the storage capacity of the BESS has never been revealed. In our Deadline 1 submission of December 2024 we estimate from flimsy information that it might be 232MWh in total. This figure has neither been denied nor confirmed by the applicant. It could be twice this size or more and so one of the largest in the world, which they deny. In the ISH4 the applicant was asked to state the size of the BESS in MWh. They were unable to answer but revealed that the BESS would deliver four hours of power. Taking this as the case suggests that the BESS is approximately 400MWh. The revelation of a BESS of 400MWh implies that it will indeed be larger than most in the world, larger than the Cleve Hill BESS at 300MWh and unusually large for a 99MW solar plant. This suggests that the main purpose of the BESS is not associated with energy balancing, smoothing etc for the local solar array, rather associated with energy trading and other purposes elsewhere. This energy level information is vitally important since the probability of a thermal runaway event increases in proportion to the number of individual batteries. Additionally, from direct experience of actual incidents the amount of cooling water and the time taken to burn out is dependent on the energy storage capacity of the BESS. In the circumstances of this particular application it is unreasonable and dangerous that a DCO should be granted without specifying the stored energy level in MWh.

Water Supplies, Explosion and KFRS Advice

It is important that we continue to learn from regular serious incident reports and that expert advice is sought on the first response needs in case of a thermal runaway or an explosion. It is concerning that the applicants appear to adopt a complacent starting point based on a view that Li-ion BESS are inherently safe, quoting only two UK incidents. BESS are almost all manufactured in China and it is important to learn from the global experience of more than 60 serious incidents of fire and explosion

[See Appendix]. It is the near universal view of the international scientific and expert community that Li-ion BESS are inherently dangerous and that all grid scale BESS are likely to have at least one incident during their lifetime. In our Deadline 1 submission we laid out the expert scientific explanation for why the LFP (Lithium Ferro Phosphate) cells chosen have a higher explosion risk on failure. The applicant has failed to acknowledge or respond to this point neither has it put in place any mitigation measures. The applicant also states that “Kent FRS has no objection to the Project provided that National Fire Chiefs’ Council (NFCC) Guidance is followed.” As we have pointed out before it is immediately obvious that it is not possible to apply the NFCC Guidance in detail since it does not cover the situation of a large number (26) BESS locations distributed over a significant area with the risks of simultaneous incidents and the problems of the adequacy of access roads and supply of emergency vehicles. The applicant relies heavily on the fact that it has consulted the KFRS and the Environment Agency (EA) on its plans and claims that they have given approval. This correspondence should be published since as indicated above KFRS have given no more than a “no objections” statement subject to future details. Additionally our understanding is that the EA, although accepting that they are a statutory consultee have replied by saying it is not their practice to respond. This is in keeping with their practice in all other UK BESS consultations that we are aware of and has been taken up with Government Ministers. It is regrettable that KFRS did not choose to attend this ISH despite being explicitly on the agenda. The paucity of reliable advice from any national organisation along with the lack of relevant National Planning Statements on BESS puts a heavy onus on the scrutiny of the local community and the conclusions of the ExA in this decision process.

We have also drawn attention to the inadequacy of the proposed water supplies. The applicant’s proposals rely on the NFCC generic fire-fighting guidance of 228,000 litres over two hours. We repeat again the fact that for the Liverpool BESS fire the Merseyside Fire and Rescue Service (2022) required over 6 million litres of water for 56 hours to limit the conflagration. This did not prevent an explosion which resulted in serious injury to first responders. Equally relevant is the planning application for a 50MWh BESS (Leeds Planning Application, 2023) which was withdrawn by the applicant when Yorkshire Fire and Rescue raised objections. Yorkshire Fire Brigade made a number of important points in their letter to the Planning Authority: “The risks of vapour cloud, thermal runaway and explosion are unfortunately very real and are becoming more common as we see an increase in the number of BESS installations.” They also expressed their opinion that 5.5 million litres of stored water would be required (Yorkshire Fire and Rescue, 2023). Hereford and Worcester FRS have given advice similar to that of Yorkshire (c5million litres). We have also presented consistent evidence of large water requirements measured at BESS incidents elsewhere in the world. The water supply problems of KFRS dealing with a single recent farmhouse fire in the village leading to intermittent cessation of water flow and loss of water pressure throughout the area is a further warning signal. How is the applicant proposing to respond to this new information?

The applicant has repeatedly failed to address or acknowledge this issue.

This huge discrepancy suggests that the NFCC guidance is inconsistent at best and dangerous at worst if relied upon to make a judgement on the ability to deal with a thermal runaway incident at Stonestreet Green. Further evidence of the inadequacy of the NFCC guidance was provided in the 2023 Swale Borough Council Planning Committee where it was made clear that Kent Fire and Rescue Service had without a convincing reason waived the requirement for two separate emergency access routes to the 300MWh BESS enclosure.

Toxic Fumes

The evidence that BESS fires have taken many hours, if not days to burn out illustrates the longevity of the toxic plume hazards associated with thermal runaway incidents. Evacuation of nearby properties has been required in many other cases. We have drawn attention to the risks for at least 25 households within 300m of at least one battery enclosure where authoritative independent modelling for HSE(NI) has shown imminent danger to life and health in the event of a fire. Once again the NFCC guidance of at least 25m spacing to occupied buildings fails to take this evidence into account as does the applicant's commitment to 150m.

The applicant has not addressed the issue of modelling of lethal plumes and chooses to ignore it.

The Rochdale Envelope and Conclusion

We accept that the Rochdale Envelope is applicable to such a complex and rapidly evolving technical area such as BESS and foresee the possibility that in the event that the solar project goes ahead, completely new and safe energy storage technology might be available. Indeed we ardently hope that might be the case. However notwithstanding that possibility, it is important that this Examination is provided with enough detail to enable a judgement to be made as to whether a BESS of this design in this location can be made sufficiently safe, since it is currently the only proposal.

Our firm view is that because of the cumulative effect of: the almost unprecedented distributed BESS layout; the proximity of dwellings in a village setting; the difficulty of narrow lanes with inadequate emergency access and the difficulty (impossibility?) of ensuring an adequate flow rate and volume of water at possibly more than one BESS compound simultaneously, it is extremely unlikely that the proposed design can possibly be made safe.

As we have illustrated above the BESS design information provides a broad concept for the proposal but lacks key details as well as detailed information on essential points relevant to the actual location.

In particular the applicants fail to comply with PA 2008 Advice Notice Nine, which states:

- *"the level of information required should be "sufficient to enable 'the main,' or the 'likely significant' effects on the environment to be assessed [...] and the mitigation measures to be described"" and*
- *"the need for 'flexibility' should not be abused: "This does not give developers an excuse to provide inadequate descriptions of their projects."*
- *"the DCO application documents should explain the need for and the timescales associated with the flexibility sought and this should be established within clearly defined parameters;"*

The current dDCO and dBSMP clearly fail these tests and do not provide either a sufficient or a safe basis for approving the inclusion of the dBSMP and BESS design in the approved DCO. Unless these concerns can be adequately addressed the BESS element of the proposal makes the application as a whole unsafe and it should be recommended for refusal.

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On behalf of AMMSG

APPENDIX

In the ISH4 reference was made to a small number of BESS incidents, chiefly in the UK, perhaps giving the impression that they were few in number and not very serious. The list below, compiled in August 2023 gives an indication of the major BESS incidents up to that date.

There have been c65 fires and explosions reported in grid-scale BESS across the world to date (Aug 2023), primarily in installations that were 2 years old or less. Of these, 38 have been in the last 3 years. Overall, these incidents may have represented up to c6% of global installed capacity, suggesting a significant probability of incidents. As well as fires, confirmed vapour cloud explosions (VCE) have taken place in Belgium, Arizona and Liverpool. The list below summarises some of the recent grid-scale lithium-ion BESS fires and explosions to date,

2012 Arizona, USA

Aug 2016 Wisconsin, USA Nov 2017, Drogenbos Belgium. VCE. 50 reports of eye and chest irritation downwind of the site.

2018 - 2019 South Korea: around 30 Different BESS caught fire and/or exploded. All completely destroyed. (Reflects very large numbers of BESS in the Country).

April 2019 Arizona, USA. The McMicken BESS explodes badly injuring 2 fire fighters and severely injuring 2 more. All first responders contaminated with hydrogen cyanide. VCE. Analysed in detail and reported.

March 2020 Nathan Campus of Griffith University, Brisbane. LFP BESS explodes. VCE.

Sep 2020 Carnegie Road, Merseyside: BESS explodes. VCE. Detailed report by Merseyside FRS.

Dec 2020 Perles-et-Castelet, Ariège France. On-top BESS configuration.

March 2021 SBG-2 OVH cloud data centre in Strasbourg, France.

March 2021 South Korea, North Kyungsan Province, Yeongcheon

April 2021 Hongseong, S Korea

July 2021 Tesla Megapack BESS, ignited during testing at the newly registered Victoria Big Battery at Moorabool, Geelong Australia. Fire in one cabinet spread to a second 4MWh.

July 2021 Invenergy storage facility, LaSalle County, USA .

July 2021 Märkisch-Oderland, Neuhardenberg airfield, Germany

4 Sep 2021 Moss Landing, California “world’s biggest battery storage facility” cells go into thermal runaway, still offline. Since that date two further incidents have been recorded at Moss Landing.

12 Jan 2022 South Korea, Nam-gu, Ulsan 50 MWh.

17 Jan 2022 South Korea, Gunwi-gun, Gyeongsangbuk-do. VCE

April 2022 Two firefighters were killed and a third injured in the explosion of a 1.5 MW BESS on the roof of the Jimei Home Dahongmen shopping Mall in Beijing. Besides being the first to result in fatalities, this incident is notable for two reasons:

(1) the BESS batteries employed were Lithium Ferro Phosphate (LFP) which are widely perceived to be the safest. LFP batteries are planned for the Stonestreet Green BESS

(2) the scale of the firefighting operation required 235 fire fighters and 47 fire engines.