Gate Burton Energy Park - Environmental & Safety Risk from Batteries

The limitation of 1500 words on Written Representations has changed the format of a single submission to individual subject specific submission on BESS.

Written Representation (WR1) Introduction and Bess Procurement and Testing

Introduction

Batteries can be said to be the beating heart of all large-scale solar farms and like all hearts require continuous monitoring and maintenance to ensure to functionality and reliability. At the very centre of this, is accountability, traceability, and transparency throughout a battery's life.

Gate Burton Solar Project is said to generate 500MW of energy and have a BESS of 500MW capable of supplying 160,000 homes with electricity, according to the developer's submission.

The UK power usage is approximately 300TWh per annum and the amount of energy produced by a large scale 500MW solar farm contributes only about 0.15% to this requirement and not as often stated "...large amounts of green power..."

While technically the capacity of the proposed development is above 50MW, the degree of intermittency effectively reduces this to between 9-11% in practice. With potential future curtailment foreseen by National Grid, this would be further reduced. The average output is likely to be lower than 50MW over the lifetime of the asset. Therefore, the proposals do not fall within the 50MW threshold to meet the NSIP criteria.

A clear understanding of the role the proposed development can play in the electricity supply system and beyond, and the amount of energy produced and associated impact has not been submitted by the developer. For example, intermittency of production, curtailment, the need for alternative supply, inability to store volume of power seasonally, the effect on the food supply chain and the need for using batteries have not been demonstrated and need to be included in the submission.

The Energy security secretary Grant Shapps will this week (10/07/2023) outline plans for Britain's atomic power's renaissance and 2050 emissions commitment.

The secretary of state for energy security and net zero, Grant Shapps, has chosen the London Science Museum as the venue to set out his ambitions for the UK's nuclear programme. He is expected to illuminate the path towards the government's existing commitment to build 24 gigawatts of nuclear power capacity – the equivalent of a quarter of Britain's total generating capacity – by 2050.

But mini reactors present an opportunity to harness the benefits of modular manufacturing techniques to cut the costs of full-scale construction and speed up building times. The government considers nuclear power a crucial part of its ambition to reach its 2050 net zero emissions target and its highly ambitious 2035 target to cut carbon emissions from the electricity system. A new nuclear dawn should also create highly skilled engineering and manufacturing jobs.

BESS Procurement and Testing

The Outline Battery Safety Management Plan Document Reference: EN010131/APP/7.1 states:

3.1.1 Gate Burton Energy Park Ltd is a subsidiary of Low Carbon, an experienced developer of electricity generation and storage projects across the UK, EU and the US at the forefront of the storage market, successfully deploying lithium-ion battery projects at scale.

And further announces at 3.1.2 is therefore experienced in conducting thorough tendering processes for procuring battery storage equipment and services, and in 3.1.3 gains access to the integrators' whole system testing labs, undergoing the full cycle of installation, commissioning, and operation.3.1.4 states the Applicant only considers and engages with suppliers and products that conform to ISO 9001, ISO 14001, OHAS 18001, CE, and local regulation, auditing both technical and financial aspects.

This high profile does not rest easily when looking at the submission of the project which is littered with missing and essential and vital information on which to make a comment or judgement.

Many examples are available so lets us start with the missing specification for the storage batteries to be used in the BESS, why is it so difficult to set down what the developer is proposing now?

Detailed Specification, Testing and Certification of batteries and approval by an independent body reveals so much knowledge and confirmation about a product or service, none of which have been submitted by the developer.

There is no information about the metal content in the batteries, type of wafer insulation and testing conditions, Manufacturers Warranties, specific failure rates or life expectancy of batteries.

Given the hesitancy in providing information this then begs the question "what are the seen as the supply chain problems facing the Developer, what is the risk to continuity of supply, and can these be overcome?

We are not able to satisfactorily comment on this item and the Examiner is requested to set aside and not make any decision, until the specifications are provided, and the opportunity to make further comments.

Written Representation (WR2) on Safety Risks, Regulations and Guidelines when using Lithium-ion Batteries

Safety Risks, Regulations and Guidelines when using Lithium-Ion Batteries

From the manufacturer to the dealer to the consumer, back to the manufacturer, or to the remanufacturer / recycler, Lithium-ion batteries have a long journey to make in their lifetime.

Yet, with many people's safety at stake, on every move and stop they need to be handled with the utmost care. That's why lithium-ion batteries come with many regulations the Inspector is asked to consider.

Even though their battery chemistry is considered one of the safest, lithium-ion batteries still pose significant risks when not handled carefully.

The high-voltage nature of a lithium-ion battery comes with electrical hazards, such as short circuit, electrocution, electric shock or burning, whereas the chemical component inside the battery (the electrolyte) could leak out and cause intoxication or corrosion.

Lithium-ion batteries are prone to thermal runaway.
If the temperature exceeds a certain threshold, the cells begin to vent hot gasses, which increases the temperature even further, and ultimately leads to ignition, explosion, and significantly dangerous fires.

The larger the battery storage, the greater the risk of a runaway fire.
In the event of a fire, lithium-ion batteries emit a cloud of highly toxic and dangerously high Hydrogen Fluoride, which can spread over distances of 1-2 miles, potentially causing death or permanent visual defects, blindness or chronic lung disease and long-term illnesses to residents.

Hydrogen fluoride goes easily and quickly through the skin and into the tissues in the body. There it damages the cells and causes them not to work properly. The gas, even at low levels, can irritate the eyes, nose, and respiratory tract. Breathing in hydrogen fluoride at high levels can cause death from an irregular heartbeat or from fluid build-up in the lungs. At lower levels breathing hydrogen fluoride can damage lung tissue and cause swelling and fluid accumulation in the lungs (pulmonary oedema). Eye exposure to hydrogen fluoride may cause prolonged or permanent visual defects, blindness, or destruction of the eye. People who do survive after being severely injured by breathing in hydrogen fluoride may suffer lingering chronic lung disease.

Will the Planning Inspector now decide against the proposals on the grounds of the significant and unacceptable dangers to health and indeed human life; as well as to farm animals and agricultural crops in the food chain?

Safety regulations in every phase of lithium-ion batteries' life cycle
There appears to be no updated information in respect of regulations and guidelines for lithium-ion batteries, but the following three documents appear to be those in use awaiting updates:

- Batteries Directive 2006/66/EC: This is an EU-Directive that provides guidelines to the member states concerning the manufacture and disposal of batteries in the EU. Its aim is to improve the environmental performance of batteries and accumulators. This directive will soon be replaced with a new Regulation, that will level the playing field for all EU member states.

- General Product Safety Directive (GPSD): The GPSD provides standards for product safety to protect consumers from potential hazards, by means of EN standards. The relevant EN standard for lithium-ion batteries is EN 60086-4. It serves as a reference point for specifications and technical solutions at the product design stage. Following EN standards is not mandatory but highly recommended.

- ADR (International Carriage of Dangerous Goods by Road) The ADR is a UN-document, adopted by the European Union, which regulates the transport of hazardous goods over land. Following ADR rules is mandatory for transportation of lithium-ion batteries. The specific requirements for this type of battery can be found under article 2.2.9.1.7. All lithium-ion batteries are Class 9 and get the UN number 3480.

Based on the above; depending on a battery's condition and the phase in its life cycle, the risks and thus the safety rules vary.

What type of battery are you transporting?
Let's look at the different options and their ADR requirements.

New lithium-ion batteries
New batteries at the beginning of their journey are in their most stable state (except for manufacturing defects), as they are charged up to 60 to 70% to ensure stability. The risks are relatively low, but caution is still required during transport and handling. Moving the batteries could pose minor thermal and mechanical risks, which is why all ADR requirements, including labelling and packing, are to be always taken seriously.
ADR labelling: • Class 9, • UN 3480, • "LI-ION BATTERY"
ADR packing: packing instructions P903 or LP903

Used lithium-ion batteries for reuse.
Battery Directive 2006/66/EC states that every battery producer has a take-back obligation. The most desirable options are re-use or remanufacturing, meaning that the battery maintains the status of 'product' (as opposed to 'waste'). However, in practice, recycling is currently still the most common option.
In case of reuse or remanufacturing, Li-ion batteries on their way to their new purpose are labelled and packed the same way as new Li-ion batteries.
ADR labelling: • Class 9, • UN 3480, • "LITHIUM-ION BATTERY"
ADR packing: • packing instructions P903 or LP903

Undamaged waste lithium-ion batteries
When a used battery can't be remanufactured or reused for a different purpose, it gets the 'waste' status and its ADR specifications change. An undamaged waste battery will be taken to the recycler, following these labelling and packing rules:
ADR labelling: • Class 9, • UN 3480. • "LITHIUM-ION BATTERY FOR RECYCLING"
ADR packing: • packing instructions P909, •SP 377

Damaged and defective lithium-ion batteries
Damaged lithium-ion batteries pose the biggest risk, as they are transported in a potentially highly unstable state. For packing, there is a distinction to be made between critical and non-critical damaged batteries. Damaged batteries in a critical state need to be packed in the safest way possible, to avoid accidents.
ADR labelling: • Class 9, • UN 3480, •"DAMAGED/DEFECTIVE LITHIUM-ION BATTERIES"
ADR packing: • Packing instructions P908 or LP904 if not critical, • Packing instructions P911 or LP906 if critical, • SP 376

Safe storage of lithium-ion batteries
After the batteries have safely arrived at their destination, sometimes they need to be stored for a while. Some countries have specific regulations concerning storage, others don't.
There appears to be no up to-date requirements in the form of Standards for use of lithium batteries, no guidelines for the manufacture and disposal, and no regulations for the transport of batteries in the UK.

Given this situation it would seem reasonable to expect the proposed solar farm developers to have included Risk Assessments and Method Statements for dealing with every phase of a battery's life.

Will the Planning inspector recognise these missing significant elements in the developer's submissions?
How long will a battery last? 3 years, 10 years or 15 years? specification what will the effect be on supply to the grid, how long will it take to replace the batteries and what will happen to the spent batteries?

This is the main question that everyone wants to know. Unfortunately, it is not easy to give a definitive answer. There are many variables involved.

Items such as the temperature under which they are used, whether they have been stored, how quickly they have been charged and discharged, whether they have been left discharged for any period, and a whole number of other factors.

Another big variable is the question of what counts as a charge / discharge cycle. Sometimes the battery will have undergone a deeper charge cycle than others, sometimes it may be a 20% to 80%, other times it may only be a top up, say 30% to 60% and whether this counts as a cycle.

The Environmental Statement, Volume 3, Appendix 2-A Bess and Substation states at 1.2.5. Batteries and inverters would be replaced approximately every 15 years suggesting that the batteries will last much longer.

The proposed specification for a LFP 280Ah cell type battery, from 1.2.4., taken from many sources on the internet suggest a Cycle life of 2,000 which at best would be 1000 charges and discharges per day, or just under 3 years.

Written Representation (WR3) on Fire Risks in Large Scale BESS

Fire Risks in Large Scale BESS

A BESS carries a risk of "thermal runaway", more commonly known as "battery fire", where overheating in a single cell can spread to neighbours within a container leading to further energy release. These are not strictly fires in that no oxygen is required, which of course means that conventional methods of fire control are unlikely to succeed.

"They represent an electrochemical discharge between chemical components that are self-reactive. They do not require air or oxygen at all to proceed."

A BESS fire can result in the release of toxic and inflammable gases and chemicals:

"They evolve toxic gases such as Hydrogen Fluoride (HF) and highly inflammable gases including Hydrogen (H2), Methane (CH4), Ethylene (C2H4) and Carbon Monoxide (CO). These in turn may cause further explosions or fires upon ignition. The chemical energy then released can be up to 20 times the stored electrochemical energy."

But once a fire is underway in a container the only possible response is to allow it to continue to burn, continually apply water to stop it spreading and wait for it to burn out.

Risk of Critical Event and Fire.

Whilst this is new technology the effect of a critical event and fire is becoming understood. With a handful of sites in the UK there has been one BESS fire in Liverpool and many fires worldwide it is leading to the conclusion that the probability of a BESS Critical Event is significant and real.

Despite the experience of BESS fires and known toxins, the current legislation to control the choice and operation of BESS in the UK can best be described as "light touch".

There is no minimum distance from homes for the location of a BESS which in theory could be placed next to accommodation.

A fire, near a residential area in a Liverpool suburb in September 2020, threatened to engulf the area in a toxic plume of gas, while debris was blasted up to 75ft away. Efforts to put out the blaze were hampered after water hydrants proved 'inadequate', the report by Merseyside Fire & Rescue Service found. The fire 59 hours to extinguish was caused by an explosion at the controversial mega-battery site.

The Liverpool BESS fire, using the same NEC system as built in Northern Ireland at Mullavilly and Drumkee BESS's 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 of the suppression system would have had little or no effect on the resultant fire/explosion.

In the town of Suprise, Arizona, a recent grid-scale battery system installed caught fire and an explosion injured four fire service personnel. Large flames were reported flames of 50-75 feet being fed by flammable liquids coming from the cabinets.

Professor Sir David Melville CBE, BSc, PhD, CPhys, FInstP, Sen Mem IEEE(USA) of The Faversham Society and recognised as one of the leading experts on Solar Farms and BESS notes that:

There is however guidance for the Insurance industry in the form of a Technical Guidance from Allianz Risk Consultancy entitled Battery Energy Storage Systems (BESS) Using Liion Batteries and quoted extensively from this detailed publication which concluding that ‘BESS using lithium-ion batteries are susceptible to thermal runaway and have been involved in several serious fires in the last few years. The document recognises the lack of guidelines and highlights current knowledge gaps; describes the loss experience due to BESS fires in Hawaii, Arizona, Wisconsin and Belgium; describes the hazards; and makes detailed recommendation for the planning of BESS in relation to: Fire and Rescue Services; Construction and Location; Material, Equipment and Design; Ventilation and Temperature Control; Gas and Smoke Detection; Fire Protection and Water Supply; and Maintenance.

We respectively ask that the risks associated with the deployment of large-scale BESS, must be addressed in order to avoid the issues clearly highlighted by the Deputy Fire Safety Commissioner of the London Fire Brigade when he said:

“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.”

Written Representation (WR4) on Water Environment

5: Water Environment

Some of the key issues of BESS incidents involve management of toxic and flammable gases and containment of contaminated fire water run off – none of which can be contained within a building or security fence.

Thermal runaway cannot be controlled like a regular (air-fuel) fire. The only way to mitigate "reignition" (a regular report of eyewitnesses) is by thorough cooling. Water is the only fire-fighting material with the necessary thermal capacity. Sprinkler systems, though with good records in conventional building fires, are likely to be completely inadequate. The purpose of the water is absorbing a colossal release of energy. The Hill/DNV report [8] called for so-called "dry pipe" systems allowing first responders to connect very large water sources to the interior without having to access the interior.

It is critical to appreciate that all parts of the battery system must be cooled down. Playing water on a battery "fire" may cool the surface, but so long as Li-ion cells deep inside the battery remain above about 150°C,"re-ignition" events will continue. It is not sufficient to estimate water requirements based on calculations assuming water reaches everywhere, uniformly. For example, in the recent Tesla car fire [2] the BEV battery kept re-igniting, took 4 hours to bring under control and used 30,000 (US) gallons of water (115 m3). This was for a 100 kWh BEV battery, designed with inter-cell thermal isolation barriers.

In the case of Sunnica, the Local Authorities have suggested that water supplies of 1900 litres per minute for 2 hours (228 m3) will be needed. But this is grossly inadequate.

Using the above in the Tesla BEV fire experience, this amount of water would suffice for just two Tesla Model S car fires.

Scaling this up to even the smallest 2 MWh BESS such as that in McMicken, which contains thermal runaway cannot be controlled like a regular (air-fuel) fire. The only way to mitigate "re-ignition" (a regular report of eyewitnesses) is by thorough cooling.

A liquid coolant leak caused thermal runaway in battery cells which started a fire at the 300MW/450MWh Victorian Big Battery in Australia in which 900,000 litres of water was disposed of from the site.

Water is the only fire-fighting material with the necessary thermal capacity. Sprinkler systems, though with good records in conventional building fires, are likely to be completely inadequate. The purpose of the water is absorbing a colossal release of energy. The Hill/DNV report, called for so-called "dry pipe" systems allowing first responders to connect very large water sources to the interior without having to access the interior.

"Clean agent" fire suppression systems are a common fire suppression system in BESS but are totally ineffective to stop "thermal runaway" accidents. The McMicken explosion was an object lesson in this. The installed "clean agent" system operated correctly, as designed, on detection of a hot fault in the cabin. There was no malfunction in the fire suppression system, but it was completely useless because the fire was not a conventional fuel-air fire, it was a thermal runaway event. Only water will serve in thermal runaway.

Indeed, in the McMicken explosion the “Novec 1230” clean agent arguably contributed to the explosion by creating a stratified atmosphere with an air/Novec 1230 mixture at the bottom and inflammable gases accumulating at the cabin top.

A significant volume of water will be required to cool a BESS fire. It will be contaminated with highly corrosive hydrofluoric acid and other hazardous chemicals.

It is suggested that those responsible for Fire Services, study the Hill/DNV report and the related Underwriters Labs report, act upon their recommendations. Then make realistic, physics-based, calculations of the water quantities required and be available at every single BESS cabin.

Water Contamination

It is important to recognise that the rivers Trent and Till run through the proposed site raising significant questions about the amount of water required and contamination control that a critical event of a fire would result in environmental damage from toxic run-off.

In addition, the field adjacent to the site is an area of flooding which will potentially further increases toxic run-off risk and critical event control.

The following statements from the Developers Submission are noted for reference:

9.4.13 Should there be a fire in the BESS Compound, then water would be obtained from a mains connection at the A4156. **It has been determined** that a supply of 1,900 litres per minute of water would be required. Given that this supply would be for an emergency event for which the probability of occurrence would be low given best practice management of the Scheme, it is assumed that this would not have a significant impact on Anglian Water’s potable water resource. At the time of writing (January 2023), a Point of Connection (PoC) application is being progressed with Anglian Water for this connection and to confirm the availability of supply. Should this approach not be suitable, then tanks of water would be located within the Solar and Energy Storage Park to store the necessary volume needed for firefighting purposes within the BESS Compound.

9.9.54 The BESS Compound will require fire water tanks to supress a fire, in the unlikely event that one breaks out in the BESS containers. Fire water runoff may contain particles from a fire. In the unlikely event of fire water being discharged, the runoff must be contained and tested/treated before being allowed to discharge to the proposed SuDS and then infiltrating to ground.

9.9.55 It is proposed to contain the fire water runoff within a bunded lagoon structure where it can be held and tested before either being released into the SuDS system or taken off site by a tanker for treatment elsewhere. The lagoon will then be cleaned of all contaminants.

9.9.56 The lagoon will be controlled by a penstock valve that can be automatically closed during a fire, i.e., under normal circumstances rainfall will be allowed to drain through the lagoon into the SuDS system.

9.10.67 In the instance there is a small fire within the BESS area which cannot be directly contained, there may be potential for contaminated firewater runoff into the SuDS system. To mitigate this, the Outline Drainage Strategy (ES Volume 3: Appendix 9-C [EN010131/APP/3.3]) indicates that firewater would be contained in a bunded lagoon structure with a penstock The penstock will then enable potentially contaminated suppression waters to be isolated and extracted in order to be suitably tested and disposed of offsite without entering the surrounding hydrological network. Following a fire event, the drainage network will require an assessment to confirm the absence of any contaminants prior to the penstock being released. The Scheme operator will be responsible for conducting a controlled flushing of the drainage network prior to the release of the penstock. This approach to mitigation is secured within the Outline Drainage Strategy (ES Volume 3: Appendix 9-C [EN010131/APP/3.3]).

9.10.68 Should there be any other spillages on the BESS Compound such as battery leakage or spillage of fuel from the transformers then any contaminated runoff would be managed and intercepted by the penstock system, as with the firewater outlined above. **This is not So!!**

9.10.69 During operation, the Solar and Energy Storage Park would operate using best practice and comply with environmental legislation through the application of an Outline Landscape and Ecological Management Plan (OLEMP) [EN010131/APP/7.10], including appropriate maintenance of SuDS and other drainage infrastructure.

9.10.92 There are no residual significant effects (this suggests that some effects have been identified but not revealed in the submission) on the water environment expected following the implementation of mitigation.

9.10.93 non-significant effects are listed in ES Volume 3: Appendix 9-E [EN010131/APP/3.3].

9.10.94 As there are no significant effects following the implementation of the embedded mitigation measures. On this basis, no additional mitigation measures are identified. See above!!

The above statements leave unanswered questions:

Will the penstock valve be able to automatically detect contaminated fire runoff water and rainwater and then divert either to an appropriate channel?

How will the runoff water be contained, tested /treated and discharged to the SuDS?

If the lagoon is already full of rainwater how will the contaminated fire water, be disposed of?

If a fire occurs in a battery, it is likely that there will be a closure of the solar farm and will remain closed until such time as the contaminated water has been filtered and disposed of to ensure that a further fire can be satisfactorily and safely dealt with?

In the event of a fire and shut down of the solar farm will the developer be confident of continuing and is there a risk of failure and closure of the solar farm permanently?

It will be useful at this stage to consider the comments from Professor Sir David Melville CBE a global leading expert, on the document: Grid Scale BESS - Guidance for FRS which gives useful information requirements in terms of system design and construction (pp3,4) as well as Detection and Monitoring (pp4,5)

On Suppression Systems (pp5,6) it provides clarity that copious levels of water cooling is the only means of limiting the spread of fire and rules out alternative approaches.

A recommended standard minimum spacing of 6m between units (containers) is an improvement on much current practice but is lower than the flames recorded in the Arizona fire of over 16m.

On the issue of Water Supplies the guidance is substantially inadequate. The suggestion of a water-cooling system capable of delivering 'no less than 1,900 litres per minute for at least two hours' would deliver a total of only 228,000 litres. There is limited data on the measurement of water volumes deployed in previous BESS fires; the best comparison being the report quoted on the July 2021 Victoria Big Battery (VBB) fire where 900,000 litres were required over six hours to extinguish it. The fire was in two units, spreading from the first to the second after 2 hours and involved an estimated BESS size of 4.25 MWh.

Moreover, the volume of water required will be proportional to the size of the BESS on fire, so it is not possible or helpful to suggest a single figure for total water requirement as stated in the NFCC Guidance.

It is suggested that the total water requirement should be expressed as X litres per MWh of energy storage. From the VBB experience, X= 900,000/4.25 = 211,765 litres per MWh.

It is more difficult to specify the rate of delivery required since larger fires will certainly take much longer to extinguish.

It is suggested that a rounded figure for guidance might be:

'at least 200,000 litres per MWh of storage delivered over up to 12 hours. Very large BESS fires will require longer to extinguish and will need longer-term surveillance to monitor any signs of re-ignition’.

Finally, the fact that water run-off is highlighted on p6, but there should be greater emphasis on the toxicity of very large volumes of fire run-off water and the need for its storage and treatment., linking also to the Environmental Impacts section.

Using the recommended figure above, a 20 MWh BESS fire such as that at Basing Fen would require the delivery and storage of 4 million litres of water whilst a complete fire at the proposed 700MWh BESS at Cleve Hill, Kent would involve 140 million litres of cooling water.

Written Representation (WR6) on Risks to Human Life, Animal Life, and the Food Supply Chain

6. Risks to Human Life, Animal Life, and the Food Supply Chain

In this age of Net Zero, any solar scheme over 50 MW counts as a National Significant Infrastructure Project, or NSIP. This means the final decision is made, not by local people, but those in Whitehall. The worries of residents, who don't fancy living in an energy factory, count for little. The same goes for farmers who prefer the idea of potatoes under their land to solar panels above it.

Such cases matter since they are not isolated events. Sunnica is by no means the only organisation seeking to get the green light for plonking its profitable panels on to farmland.

There are similar schemes at Longfield near Chelmsford, and another at Mallard Pass near Stamford in Lincolnshire. Both schemes are opposed by locals. So why the push to put panels on farmland? To the argument that brownfield sites would work just as well, the response put forward is usually the same: that land is too dear, and the scheme might struggle to break even unless developers are empowered forcibly to buy up virgin fields at agricultural prices.

All this should worry anyone, wherever they live. For one thing, food security is a problem in an increasingly overcrowded country. Just how are we going to be able to satisfy the population expansion from 67,508,936 in 2022 to projected 70.49 million in 2030 and increase further to 74.08 million in 2050. These exclude the influx of migrants!

The decommissioned Cottam Power Station, a recognised industrial site has not been considered as a suitable site for locating the BESS, which begs the question, Why Not?

The report on Cleve Hill solar farm report says that based on hydrogen fluoride being released from a fire for an hour concentration in the air 4.5km away could be 2,444 times higher than the derived domestic exposure limits and even 10km away, data modelling predicted readings 55 times higher.

The highly toxic potential emissions will significantly affect not just human life but also wildlife and farm animals and crops in the food supply chain. These effects have not been fully reported on by the developer.

The developer has a duty under Advice Notice Seventeen, requiring applicant to take account of the cumulative effects of other aspects which may influence the Examiner, and this something which is lacking. Again, this appears to be missing in the developer's submission.

There also appears to be little or no recognition of the impact of the project on Net Zero and the very nature of the project this should have been highlighted by the developer.

In the event of a fire and shut down of the solar farm will the developer be confident of continuing? and is there a risk of failure and closure of the solar farm permanently?

The Nationally Significant Infrastructure Project procedures leave LPA's and their communities with little or no meaningful say in the decision-making process. It also leaves LPA's with the extremely difficult task of controlling and being responsible for almost all tasks, should a project be approved.

This is a total imbalance in planning and control of events, with LPA's carrying a heavy burden of control especially in the significant Solar Farms currently being proposed.

To ease the heavy burden of control on West Lindsey District Council and Lincolnshire County Council, we would suggest that in the event of a Solar Project be approved, and the project being subsequently decommissioned or failing for any reason, the incumbent landowners be made responsible for returning the land to its previous state.

Will the Examiner and the Secretary of State agree that the approval of this Solar Project be subject to a condition that the incumbent landowner be responsible for returning the land used in a Solar Project to its original state?

This will assist WLDC overcome the burden and any possible financial risk should the project fail for any reason during its lifetime.

Written Representation (WR7) on COMAH

7. COMAH

The Health and Safety Executive (HSE) do not place BESS under the auspices of the Control of Major Accident Hazards Regulations (COMAH) 2015. Instead, they define them as “articles” which means that safety issues are essentially a matter for the local Fire Service.

There is no requirement for Hazardous Substances Consent (HSC) from the Local Planning Authority (LPA)

In the past and for the previous BESS application at Southfield Farm, Wiltshire County Council planning have concluded that the application does not need an Environment Impact Assessment (EIA)

a paper published in March 2022 by Professors Melville, and Doctor Fordham argues that in any BESS at 50MWh or above, the level of toxic chemicals is such that they do fall within COMAH. They show that any BESS at 25MWh or above using Lithium-ion (LFP) technology is calculated as needing a Hazardous Substances Consent (HSC) from the local Planning Authority before installing the plant and that it would come under COMAH.

“The central conclusion of Table 13 is that a 50 MWh BESS is almost certain to require a HSC assessment, regardless of electrode type or the assumptions made regarding CO. LFP cells are widely promoted as “safer” than other chemistries because of their “slower” behaviour in thermal runaway, but generate larger quantities of toxic fluorides. At 25 MWh, they are likely to require HSC on the basis of HF generation alone, irrespective of assumptions regarding CO. NMC or other mixed oxide cathodes may generate smaller quantities of toxic fluorides but including CO may still trigger the Aggregation Rule on Health Hazards and are almost certain to trigger the Aggregation Rule on Physical Hazards, derived from anoxic conditions, similarly requiring no assumptions regarding completeness of combustion.”

The proposed BESS at Gate Burton Energy Park is 500Mwh Lithium-ion (LFP) which would, this paper argues, require Hazardous Substance Consent (HSC) from the Local Planning Authority and fall under COMAH regulations:

The known dangers they present to both human health and the environment must be assessed. To date the chemicals inside the 500MWh BESS. numbering about 2,000,000 battery cells 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. Calculations show that 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.

To support this argument on the 7th September 2022 a Bill was presented in Parliament that would define a BESS as a “Hazardous” industrial site that would require them to come under the corresponding existing safety legislation. This would include the Planning Hazardous Substances Regulations 2015 and the Control of Major Accidents Hazards Regulations 2015 and involvement of the Environment Agency, the Health and Safety Executive and the Fire and Rescue Services.

The Bill is awaiting its second reading but "The evidence shows that the current regulations for lithium-ion battery storage facilities do not reflect the true risk."

"The Bill would ensure that industrial lithium-ion battery storage facilities are correctly categorised as hazardous," "Battery storage facilities must be seen correctly for what they are: highly complex, with the potential to create dangerous events and hazardous substances. The good news is that we do not need new regulations; we simply need to better use the regulations we have. We already have robust legislation, the Planning (Hazardous Substances) Regulations 2015 and the Control of Major Accident Hazards Regulations 2015. The Bill would correctly apply those regulations to battery storage sites."

The BESS in this project would reach the thresholds for COMAH and, to date, no direction has been issued that any chemicals inside the batteries of a BESS will be assessed going forward.
The Examiner correctly apply the regulations as identified above in respect of COMAH the significant considerations his report?

Written Representation (WR8) Summary

8. Summary

The UK power usage is 300TWh about per annum and the amount of energy produced by a large scale 500MW solar farm contributes only about 0.15% to this requirement and not as often stated "...large amounts of green power..."

The high profile of the developer does not rest easily when looking at the submission of the project which is littered with missing and essential and vital information on which to make a comment or judgement.

We are not able to satisfactorily comment on the use of Lithium Batteries and the ExA is requested to set aside and not make any decision, until the specifications are provided, and the opportunity to make further comments.

From the manufacturer to the dealer to the consumer, back to the manufacturer, or to the remanufacturer / recycler, Lithium-ion batteries have a long journey to make in their lifetime.

Yet, with many people's safety at stake, on every move and stop they need to be handled with the utmost care. That's why lithium-ion batteries come with many regulations the Inspector is asked to consider.

Will the Planning Inspector now decide against the proposals on the grounds of the significant and unacceptable dangers to health and indeed life; as well as to farm animals and agricultural crops in the food chain?

A BESS carries a risk of "thermal runaway", more commonly known as "battery fire", where overheating in a single cell can spread to neighbours within a container leading to further energy release. These are not strictly fires in that no oxygen is required, which of course means that conventional methods of fire control are unlikely to succeed.

A BESS fire can result in the release of toxic and inflammable gases and chemicals:

The activation of a suppression system would have had little or no effect on the resultant fire/explosion in a BESS fire.

We respectively ask that the risks associated with the deployment of large-scale BESS, must be addressed in order to avoid the issues clearly highlighted by the Deputy Fire Safety Commissioner of the London Fire Brigade when he said:

"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."

Some of the key issues of BESS incidents involve management of toxic and flammable gases and containment of contaminated fire water run off – none of which can be contained within a building or security fence.

Thermal runaway cannot be controlled like a regular (air-fuel) fire. A significant volume of water will be required to cool a BESS fire. It will be contaminated with highly corrosive hydrofluoric acid and other hazardous chemicals.

It is important to recognise that the rivers Trent and Till run through the proposed site raising significant questions about the amount of water required and contamination control that a critical event of a fire would result in environmental damage from toxic run-off.

In addition, the field adjacent to the site is an area of flooding which will potentially further increases toxic run-off risk and critical event control.

Will the penstock valve be able to automatically detect contaminated fire runoff water and rainwater and then divert either to an appropriate channel?

How will the runoff water be contained, tested /treated and discharged to the SuDS?

If the lagoon is already full of rainwater how will the contaminated fire water, be disposed of?

Final Comment: The fundamental failure mode of Li-ion batteries presenting major hazard is thermal runaway. This paper is far from the first to identify the risk which is now well-known.

However, the BESS industry has still not agreed or implemented adequate engineering standards to address basic Prevention measures to pre-empt thermal runaway accidents.

The developer has not proved their submission to be sound, and contains significant weakness and a lack of depth in their submission should not be approved.