

It Might Never Happen



lithium-ion battery energy storage system safety at Great Moulton, Norfolk, UK

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References, some annotated, are by end-notes signified by ⁿ
Purely supplementary information: may be safely ignored without loss of
understanding. All *italics* the author's

Summary

This paper about BESS unit safety and consequences comprises several parts:-

The scene is set by relating government guidance to the Examining Authority's duties.

The guidance makes it clear that both external as well as internal factors must be examined, together with their interdigitation.

The guidance also states credible worst cases should be taken into account.

Wildfires and lightning are cases examined in detail, and with wildfires some quantitative modelling conducted.

The internal nature of lithium-ion battery energy systems working under heat stress is explored.

It is demonstrated that these systems are under most duress at the same time wildfires are most likely. It is double-trouble, the worst-worst credible case.

Consequences takes the world forward to when BESS fire toxins are released. It follows a journey from Great Moulton to the sea, and into the South Norfolk aquifer system. Evidence is provided to demonstrate passage of toxins would be sluggish and slow but enduring – in contrast to the TASWAY Park and EDF Norwich nearby.

No attempt is made to quantify how much much pollution nor how far it might spread. The initiating factor is the sum of toxic discharge, which is governed by fire spread within a BESS compound.

Therefore the pattern of fire spread within a BESS compound is modelled. It compares the 4 BESS Summerside example with East Pye Solar 270. It demonstrated once one BESS unit fire becomes two it needs to be put under control immediately to prevent further and rapid spread. The closer each unit is to each other the quicker any fire will spread. Island Green Power operate on the mistaken belief BESS fires will be contained within one unit.

All the evidence provided here is from outside the applicant's order limits.

Government Policy and The Examining Authority

Since 2024 the enactment of Government Policy on BESS safety is driven by ‘Health and Safety Guidance for Grid Scale Electrical Energy Storage Systems’¹ [hereafter Frazer-Nash,] the consultancy commissioned by the Department of Energy Security and Net Zero [DESNZ]

As intended Fraser-Nash provide an excellent non-technical guide. However it is a guide, and nothing like an overarching regulatory framework. However it is directive about internal and external risks.

Site Risk and Environmental Assessment

There should be a full consideration of site/project risks including, but not limited to, accidental or intentional damage and natural phenomena such as *fire*, *weather* (including snow and ice and access during severe weather), flooding, land subsidence, flora, and fauna (including birds and mammals), and security. Note that risk assessments should be bidirectional – i.e. include *both* risks *to* the facility and *from* the facility. The *planning process* should assess the following risks and describe how the credible worst case has been mitigated. [p.20]

In other words, there are two type of risks:-

those which start from outside the BESS installation perimeter and find a way in.

and

those inside the perimeter which, if not controlled, find a way out.

It is important to make this clear because virtually throughout the UK the relevant BESS regulations, standards and debate etc. are currently *only* deployed to consider just the *containment* of a lithium fire before it burns itself out. They do *not* consider fires which enter or exit the zone of containment. This runs directly counter to specific Department of Energy Security and Net Zero Guidance already quoted above. The guidance can hardly be made clearer.

East Pye Solar is no different. They do not appear to have heeded Frazer-Nash.

The Examining Authority are also guided by Frazer-Nash:-

‘The planning process should assess the risks and describe how the credible worst case has been mitigated.’

In the light of Frazer-Nash will the Examining Authority request East Pye Solar, the applicant, revisit the underlying conceptual framework of their BESS safety plan to include mitigation measures to preclude the threat of risks from beyond the BESS perimeter entering within? Will they also acknowledge this may apply to Island Green Power's other twelve sites?

Here are two sets of examples to assist both the Examining Authority and the applicant in their thinking.

Outside In

This section provide two real world based credible worst cases entering from the outside past the doorstep of Great Moulton BESS installations.



Fire and Flint

On the left Dunwich Heath ablaze in Suffolk this summer, down the coast from Sizewell.
On the right are flints from a field two miles from the Great Moulton BESS complex....

Narrative

On Wednesday 17th August 2026 the Prime Minister called a COBRA meeting to discuss the recent spate of wild fires throughout the south of England. The sale of temporary disposable barbeques was banned and everyone's mobile went off with a warning signal and message. The next day there were fourteen such fires in Norfolk including one in Diss eight miles as smoke blows from the proposed Great Moulton BESS installation. On the Saturday we drove through Kenninghall. Later a wildfire reached the village to burn down two homes, again eight miles from the BESS installation.

Sixteen reported wildfires in all across Norfolk in five days *after* Cobra met....

Flints

Further afield at this time there were five wildfires around the village of Peakirk, north of Peterborough. The farming community in the locality suggested a possible perhaps probable cause of one or more were combine harvester blades, or straw harrow tines etc. creating sparks when they struck flint nodules. With five separate fires in such a tight area it seems unlikely all to be disposable barbeques, whereas straw harrows, for example, possess up to 240 tines each and move at relatively great speed. In this summer's hot arid conditions the arable growth and ground is exceptionally dry and hard, so blades and tines against flints are likely to cause countless sparks just one needed for ignition, like a flint-lock musket.

Beyond Peakirk flints in fields are common enough in the Fens and East Anglia north of the River Orwell. However the South Norfolk Claylands are notorious for the number and size of flint nodules in their fields – the saxon/early medieval round tower churches are constructed from the largest cleared from the fields.

Field Archaeology

Introduction

How likely could a wildfire be caused by a flint spark?

As a field archaeologist since 1969, expertise was put to the test.....

Method

A primary factor is the number of flints in any given area. Initial fieldwork was undertaken:-



This is a field where rapeseed was harvested around the 17th August and straw-harrowed about two weeks later. The yellow tape from the bucket to the white tape is 1 metre. The white tape stretches 10 metres. They mark a 1m x 10m transect two miles from the Great Moulton BESS installation. (A smallish flint fragment holds down the tape about four metres from the right hand lower corner of the transect)

The transect was traversed up and down twice.

Results

Four kilogrammes of flint were picked up. None were worked by hand in prehistoric times.

Smaller fragments were discarded on the assumption they were far less liable to create a significant spark, (less likely to be struck and if they were, more likely to bounce off harmlessly.)

This left nine larger pieces:-



Of particular note is the one in the centre – 13cm long. Its bright surface and sharp edges indicate it has been freshly struck and broken by a farm implement, presumably with sparks.

Its neighbour to the right possesses nicks on the ridge nearest the camera. These are not caused by humans making flint tools (a process called ‘retouch’ or ‘nibbling.’)

Rather they demonstrate reiterative striking by a sharp object such as a harrow, plough, harvester blade and straw harrow. From entire nodules, larger pieces are continually broken down into increasingly smaller pieces. Each strike is potentially capable of creating a spark.

Preliminary Statistical Analysis

The datum of nine large flints in a 10m x 1m rectangle means 0.9 flints per square metre or 9000 per hectare (1000m²)

All the land around the East Pye Solar BESS installation is similar to the original field. A circle around it with a two kilometre radius gives 12.5km² or 1250 hectares or an estimated 11,250,000 sparkable flints. Figures rounded down to 10,000,000 to allow for unploughable land.

Given that these figures only rely on a ten minute bi-directional sweep along a 10m x 1m metre transect, it is a cautious and conservative measure to halve the ten million to five million potential flint-fire sparks [pffs.]

Climatic Conditions

At the time of survey it was one of the most searing dry summers on record. Similar conditions applied in 2024. There seems general agreement amongst meteorologists and climatologists and acceptance elsewhere that these conditions will recur more frequently in future years. However in keeping with cautious and conservative measures, further calculations are made on the basis of one hot summer each decade.

Numerically Assessing The Overall Flint-spark Fire Risk at Great Moulton

The conservative estimate of 5,000,000 potential flint fire-sparks two kilometres from any given BESS installation is an annual total, where the date of the year is not specified. In twenty years till the the Net Zero 2035 Solar Target, there are an estimated two heatwave years though it is not known which ones they'll be. During one of those heatwave years they'll be 5,000,000 potential flint fire-sparks. By 2035 they'll be two heatwave years which entails 10,000,000 potential flint sparks two kilometres from say Great Moulton BESS installation. It requires just one of those 10,000,000 sparks to start a wildfire liable to encroach or engulf Great Moulton Bess.

Numerically Assessing The Overall Flint-spark Fire Risk in the East Anglia Flintlands

The potential of flint-caused wildfires threatening a BESS installation is not restricted to East Pye Solar at Great Moulton. In the East Anglia flint-lands, there are planned eleven other similar 'East Pye Solars.' Each possesses a similar flint spark wildfire capacity or potential in their vicinity. As said, there were sixteen reported wildfires across Norfolk

alone in five days *after* Cobra met this August. It will never be known how many may have been caused by flint sparks.

There are eleven similar sites planned across the East Anglia flintlands. 10,000,000 x 12 means in any given heatwave year there are 120,000,000 potential flint-fire sparks up to two kilometres from any given but unspecified BESS site. (In other words we are given twelve sites but not specifying any particular one.)

A single flint spark out of 120,000,000 is required to create a wildfire to significantly threaten a BESS installation.

Probability

One bull's eye in a hundred and twenty million random throws? Wouldn't bet against it.

Corroborative Evidence

There is corroborative evidence. This summer NFU Mutual Insurance are reporting a perceptible increase in fire insurance claims for agricultural machinery this summer. Not just stones getting stuck between tool blades etc. but also the machines themselves running hot to catch fire.²

Analysis of Results

The author is the first to admit as an experiment the results are rough and ready. An initial approximation of risk.

Leaving corroborative evidence to one side, stratified sampling field-walking techniques (around since the 1970s) would gain tighter data spreads, with population estimates, frequency testing, statistical modelling etc. from the data may provide a more detailed but not necessarily a significantly more accurate picture.

Equally all this would take time, effort and funding.

It would be unnecessary if this analysis bears sufficient weight to appear credible. (Bear in mind calculations halved both the estimated number of potential number of flint-fire sparks and number of heatwave summers over twenty years.)

To argue it is not a credible worse case entails believing 120,000,000 random throws at a dartboard or flint-strikes in a field wouldn't hit a bullseye or create a wildfire to threaten a BESS installation. That would seem incredible, though of course, possible.

Does the Examining Authority believe the scenario given here is credible?

Discussion

In summary over twenty years a wild fire through flint sparks may well encroach across, possibly engulf a BESS installation currently planned or in construction for the East Anglia flintlands. Were this to occur fire services will not be able to reach the installation because of the wildfire which will then be able to set alight the BESS installation unimpeded. The emergency services would have to fight a fire to reach a fire. Given the nature of lithium fires the implications of this may be spelled out.

Also we have not addressed *other* causes of wild-fires from disposable barbeques to a carelessly tossed cigarette-end from any one of the twelve sites workers' car windows driving on their way home.

It is most interesting to note that the National Fire Chiefs Council has modified their most recent guidelines to state:-

‘Vegetation Clearance Distance: The required clearance distance immediately around BESS cabinets/enclosures for combustible vegetation was significantly reduced from 10 metres to 3 metres.’³

Just three metres away from a credible wildfire risk? For public fireworks displays it is a minimum of twenty-five metres.⁴

Conclusion

What does this mean for the Planning Inspectorate with regards East Pye Solar?

1. *As per Frazer-Nash, the Examining Authority will have to decide at this juncture whether flint sparks, farm machinery and other causes of wild-fires are a sufficiently credible worst case to request East Pye Solar for measures to mitigate them. If they feel they do not have sufficient technical knowledge, expertise and understanding to make this judgement they may wish to approach Frazer-Nash consultancy, presumably via DESNZ.*
2. *Since these fire risks spread across the East Anglian flint-lands, it is further, possibly compelling evidence for the Examining Authority to consider adjacent schemes, namely TASWAY Energy Park⁵ and Eco Power Suffolk⁶, and those*

beyond, not just East Pye Solar in isolation. It also applies to EDF Norwich BESS park⁷ ready to go on line next year.

There is a more general point to be made. A field archaeologist may have a heightened awareness of flint characteristics and behaviour. However I'd not thought of them as a precipitative cause of wildfires until reported. Despite all the foresight in the world you can still be caught out. Frazer-Nash directs credible worst cases should be considered. *Will the Examining Authority heed Frazer-Nash?*

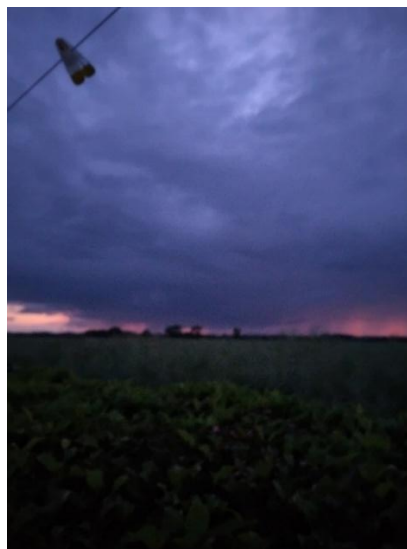
Finally it is human nature to play down the risk of calamities: who wants to think the unthinkable?

Equally cynics may argue nothing will be done until there is a major incident, like Grenfell.

It already has on Dunwich Heath less than three months ago. No one anticipated that one either.....

Next another external danger which East Pye appears not to have considered.

Lightning never strikes twice



These are views towards Great Moulton two miles away. On the left, 2nd June 2026, shows thunderclouds, classic washed out mottled pink underneath, about to unleash.

On the right is eight days later, the same pink bracketing the rain and lightning storm directly above East Pye's proposed Great Moulton BESS & National Grid Connection.

Earlier that day we had a power outage. Rang UK Powernet. Cause a cracked ceramic insulator plus a distribution line coming down Lightning? They couldn't say for sure since it'd happened before they got there, but their engineers worked their socks off that afternoon with plenty of similar lightning-related outages in the area.

The frequency and dangers of lightning strikes to electrical power installations are well known, including BESS⁸. And in particular Fraser-Nash.⁹ who state:¹ East Pye Solar does not appear to address them despite safety queries raised by Brooke, Hempnall, Shotesham and Shelton & Hardwick Parish Councils.

It appears East Pye Solar have failed to heed Fraser-Nash to look beyond the perimeter fence, this time for a danger which is well known about. *Will the Examining Authority take them to task?*

Other initiatives within Island Green Power's proposed sites' umbrella may also be as myopic, and potentially as dangerous. *Will the Examining Authority take note?*

¹ 'Whilst the arc flash risk is relatively well understood for AC systems, DC arc flash assessment is less standardised....' I'm not sure whether the power at the BESS plant is AC or DC. DC comes from solar panels, but suspect AC since it's via inverters, substations, and high-load cables.

Inside Out

From Outside in we turn to Inside Out. In other words suppose a fire escapes through the gates of the compound?

To return to Frazer-Nash, they are very insistent that risks which go outside-to-in, and those which go inside-to-out are not mutually exclusive. They repeat the message twice, virtually word for word, on pages 15 and 20.

In order to conduct a full and proper risk assessment it means you cannot say, for example 'there are wild-fires, how do we mitigate against them?' And then 'there are BESS fires, how do we mitigate them,' without linking the two.

In other words it entails these risks of threats are bi-directional.....

Double-headed arrows

<----->

not single headed

----->

<-----

Threats which goes *into* a complex may in turn create threat which travel *out from* the complex, and vice-versa: a threat emanating *from a* complex may in turn worsen safety conditions *within* the complex itself (fire services unable to reach the fire) as well of course everything else outside the complex.

In terms of interdigitation, how the five digits of each hand interlock together must be the basis of investigation, not each hand considered separately and divorced from each other.

Unsafe At Any Wattage¹⁰



This is a lithium-ion heart pace-maker battery. There is no example of one catching fire or exploding since their 1972 inception. (The author is reassured: as you read this he has one pacing at a dull but regular 60bpm.) However they only become dangerous once you die. If not removed beforehand something half the size of a digestive biscuit can blow a hole in a crematorium furnace wall and harm its operatives.¹¹ That is how dangerous a lithium-ion battery can become. Rechargeable lithium-ion batteries are inherently *unstable*, which leads to an inherent fire-risk (Dobson et al. ¹²)

With the wild-fires example the time of maximal wild-fire risk co-incides with the time of maximal lithium-ion battery fire risk.

The author freely admits he is by no means an expert on the innate nature of lithium-ion battery fires, yet wonders if his readers aren't too – and this is critical:-

‘Battery chemistry is a highly specialised area of materials science. As such, National Fire Chiefs Council (NFCC) is not an authoritative body on the subject matter and can only comment on the broad and generally accepted principles of battery chemistry.’¹³

The NFCC refer to Frazer-Nash, where there are no principles of battery chemistry, just which type might be safer than others.

Therefore based on ‘Remarks on the Safety of Lithium -Ion Batteries for Large-Scale Battery Energy Storage Systems (BESS) in the UK’ (Dobson & Edwards (2024) ¹⁴ and ‘An assessment of fire and explosion hazards at seven BESS installations in Norway’ (Risholt et al 2026)¹⁵ here is an outline guide why increases in ambient temperatures raises the risk of these fires.²

² Dobson & Edwards are Emeritus Professors in Engineering Science and Inorganic Chemistry, at the University of Oxford.

Risholt et al is a detailed empiric analysis of BESS fire and explosion risks within confined spaces. It was submitted for publication March 2026, same date as East Pye Solar Outline Safety Plan.

‘There is no set temperature at which lithium-ion batteries explode. The precursors to thermal runaway can start from around 60°C (140°F), but thermal runaway generally begins at temperatures exceeding 100°C (212°F). In some scenarios, batteries can reach more than 1,000°C during thermal runaway, posing a serious threat to life and property.’¹⁶

Happy to stand corrected but as best I can, here are a possibly incomplete list of factors behind lithium-ion fire risks through the interdigitations between conditions outside a BESS container to those conditions within. Working from the individual lithium-ion battery cells outwards:-

- The chemistry of lithium-ion batteries is fundamentally unstable.
- Consequently lithium-ion rechargeable batteries do not like heat at all, hence their cooling systems and fall-back devices are similar in principle to your phone switching itself in the sun to preserve its lithium-ion rechargeable battery. Fall-back devices are never 100% reliable, and the more complex they are, the more things to go wrong. Your phone switching itself off in the sun is pretty simple.
- Maximal solar panel input plus rapid shuttling charge~discharge patterns oscillate the full extent twixt safe upper and lower limits - commonly 20% to 80%. This will hold battery cells repetitively close to or on the edges of their designated performance envelopes. (A bit like repeatedly accelerating and braking while hard-driving a car at speed – doesn’t do the internals much good.) It also puts fall-back and ‘fail-safe’ devices under continual rather than intermittent pressure.
- Other electrical systems under greatest load and stress.
- Mechanical components of the cooling system – coolant liquid and pumps, gaskets etc. – under greatest and constant load.
- The heat the cooling system generates from cooling the batteries heats up the ambient temperature around the lithium-ion battery system as a whole. (This is why your car heater doesn’t ‘work’ until the engine is warmed-up) Something of a positive feed-back loop, if not quite a vicious circle.
- Harsh day-time radiant heat maximises epidermal and dermal temperatures. Infrastructure from concrete bases to container panels become increasingly hot. During the recent heatwave it became impossible to walk bare-feet on paving slabs, if not fry the proverbial egg. However it also affects the interiors, not just exteriors. You know how hot your steering wheel or driver’s seat is when you return to your car on a baking sunny day. Think how hot it may become *inside* a BESS container. (Imagine you were sitting under your bonnet not behind a steering wheel.)
- Still air not allowing significant cooling by convection.
- High night-time temperatures do not allow the BESS installation to cool significantly.

Increased Risk over Time

Furthermore just as heatwaves are likely to increase in frequency and intensity over the ten to twenty year life-expectancy of BESS lithium-ion batteries, the latent liability for any lithium-ion battery cell to precipitate a runaway fire increases too. Generally batteries are replaced once output falls below 80% of designed maximum. Very roughly speaking some of the missing 20% is heat, caused through lithium dendritic growth, like whiskers, inside the battery. A good mobile phone technician can tell straight away you definitely need a new phone battery by looking at it side-on. It bulges, and the bulges are ultimately formed through dendritic whiskers. Intrinsically the older BESS batteries get the more liable, at least theoretically, to runaway fires. Like everything they wear out.

In a heatwave all these factors described act on a reiterative basis with as increasing frequency and intensity as the energy of the heatwave gathers and builds. The Met Office maximum 2026 Norfolk summer temperature was 38.0°C. This is ambient temperature, measured in the shade; radiant temperatures under direct sun are far greater and they radiate heat, into your car, into a BESS container. As said 60°C is when matters become risky within a BESS. For example.....

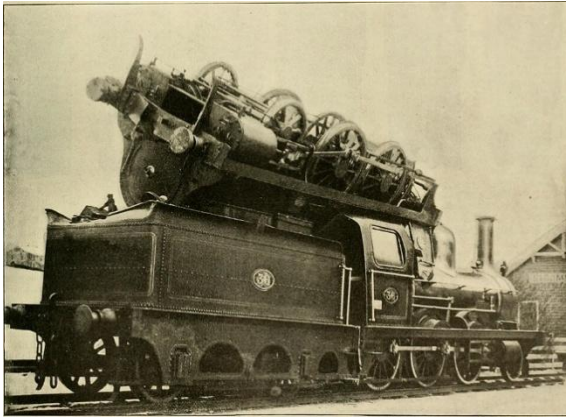
... the fire prevention gas emission detectors will shut down batteries before fire seconds later. These switches have to work in seconds to achieve their designed purpose. If a switch sticks in the latent heat, perhaps even momentarily, it may seem a BESS fire starts spontaneously. Lithium fires can reach 1000°C in moments and keep burning till the lithium is burnt out. Batteries may explode. All through microscopic dendritic growth in any given cell. There are thousands within a BESS container. The risks keep coming, and East Pye Solar is unstaffed.

East Pye Solar and UL 9540A

For safety East Pye Solar relies upon 'UL 9540A: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage System.'¹⁷ It is a test method, *not* a certification standard.¹⁸ It tests that any given BESS *type* will not vent flammable or toxic gases, fire or explode. Type-tests are made at manufacture only, and not *individual* BESS unit. In other words, variations in manufacturing standards, local environmental conditions, external factors and wear over time are not accounted for. The tests are not repeated, nor certificated, unlike say an MOT test and certificate.

UL 9540A basically puts everything inside a box designed to be strong enough to withstand any fire or explosion. If it fails results will be serious to cataclysmic. Steam locomotive boilers are stripped to their bones every number of steaming miles to gain full certification: safety legislation was introduced after boiler explosions led to the

regular occurrence of major accidents – 1888, Norway, one loco nearly leap-frogs another after a boiler explosion:-



(Both sets of crew escaped injury)¹⁹

Steam in itself is not explosive, unless confined to a limited space. It is the confined space of a boiler which makes steam dangerous. As indicated lithium-ion rechargeable batteries are innately or potentially explosive Outside ideal test conditions of a 'perfect' BESS unit, in the real world the confined space of UL 9540A may well render a BESS more not less dangerous.

Discussion

A heatwave at Great Moulton brings a credible worst case *outside* the BESS installation crashing into a credible worst case *inside* the BESS installation. A doubly or worst worst credible case.

The Examining Authority must consider any combination of risk factors in the round and all together, both internal and external, not just one at a time.

With regards Nationally Significant Infrastructure Projects as a whole, the Examining Authority may also consider the safety or otherwise of BESS installations is a regional or national matter, and should be treated as such.

It is not difficult to visualise smouldering debris and fragments (peeling paint, burnt insulation etc.) leaving the compound to set off a wildfire in the fields beyond. This would again mean fire-services would not be able to reach the BESS installation. It does not require a flint spark, a cigarette end or a lightning strike to create a wildfire. A BESS fire can do it too.....



Smoke and flames are seen from Castroville as a fire at the Vistra battery storage plant burns in Moss Landing, Calif., on Thursday, Jan. 16, 2025. (Doug Duran/Bay Area News Group)

Conclusion

As with wild-fires outside the BESS complex perimeter, the Examining Authority will have to determine whether the safety measures the applicant has submitted to prevent fires within are sufficient to cope with heat-wave extremes. If they are not, then the BESS installation itself is liable to create a wildfire.

*The Examining Authority should note that there must be **no** fire, not just a controllable fire. A BESS fire could spark off a wildfire right next to the BESS installation and not permit the fire services to reach an otherwise controllable fire.*

The Examining Authority should also note East Pye Solar talks of ‘typical’ lithium-ion battery fires. It is not the typical, aka controllable, fires which should demand attention. It is the atypical, beyond control parameters, which most require examination preferably *before* they occur.

The Examining Authority may wish to request the applicant re-examine measures to define then reduce the risks of an atypical fire compared to those of a typical or safe lithium-ion fire, assuming such an entity exists. To do otherwise is to permit the applicant not to consider the dangers to emergency service staff and more generally public and environment were the fire, fire-water and fumes travel beyond the immediate and safe vicinity.

The Examining Authority must feel reassured at this juncture there can only be negligible risk to both life and the environment from the BESS installation at Great Moulton.

Breaking News

Here is a current real-world example to help the Examining Authority appreciate the arguments so far.

Summerside, Prince Edward Island, Nova Scotia September 6th to 16th 2026

‘Summerside solar farm fire contained to single battery cell as burn-out enters 7th day’²⁰



Emergency crews continue round-the-clock monitoring as a battery fire at the 30-hectare Sunbank solar farm burns out. (Tony Davis/CBC)

Public Health Warning

‘If the fire restarts in earnest, residents with existing lung conditions are being asked to be extra cautious and to limit their time outdoors if needed. The city has said that an announcement will be made if that becomes an immediate concern.

‘WASH GARDEN PRODUCE’

‘Also, for the first time since the fire started, it is being recommended that residents with a garden should wash their produce before consumption. Particles from the fire’s smoke may remain present on stationary vegetables, but a thorough washing will make them safe for eating, says the Chief Public Health Officer. For produce that cannot be easily washed, removing outer layers, such as the outer leaves of lettuce or cabbage, is also recommended.’

Earlier during the Summerside incident, homes were evacuated, while a long-term programme of air and soil monitoring for toxicity levels is already underway.

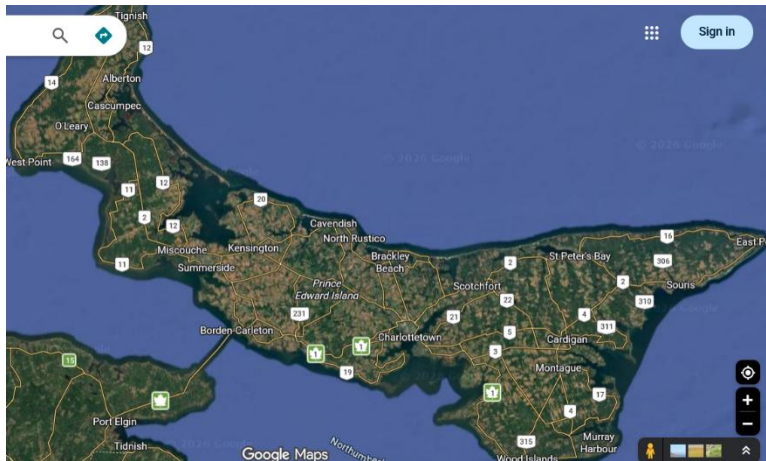
Were the Summerside incident to recur at Great Moulton then the village, the Tivetshalls and possibly further afield would have to be evacuated. Also the land, water courses and air for an unknown extent around the site would have to be monitored for toxicity for an unknown length of time.

For the safety of all, the Examination Authority may, arguably should request from the applicant a prepared programme of safety procedures and monitoring to ensure the continued well-being of the local community in the event of toxic pollutants escaping their BESS installation.

This is standard practice under Control of Major Accident Hazards (COMAH) regulation. (Dobson et al)

Consequences

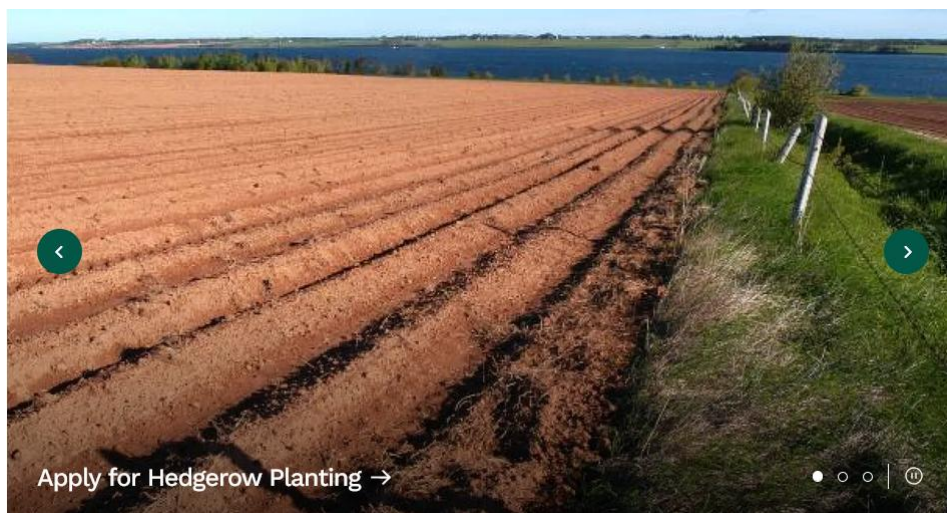
Field work – Nova Scotia and Norfolk



21

Prince Edward Island is the smallest province in Canada by both size and population - smaller than the East Anglia Flintlands, about a third to a half-the-size of Suffolk.²² In terms of settlement patterns, land-use and economy, broadly similar.

In particular:-



Geomorphologically not as level as South Norfolk nor any clay but agriculturally it has similar large fields as the South Norfolk Claylands. The field-side drainage morphology appears to be broadly similar, but there is a rich sub-soil profile, as indicated by the deep v-ed ploughing for Canada wheat.

Like the South Norfolk claylands arable predominates but there similarities more or less end.

South Norfolk two miles from Great Moulton BESS installation



This is the same field as the cover, a week on and the day after first fertiliser dressing. They never go deeper with the plough than a foot or so, it'd just churn up pure clay.

Therefore Prince Edward Island red sandstone loam will drain much more quickly than in South Norfolk. In South Norfolk rain or surface water-borne toxin particulates will settle to rest alongside the flints at the sharp top-soil/clay interface:-



< topsoil/subsoil line indicated by row of flints in section edge

The photo above is of a ditch cut through a small field about 15 metres from its edge. The topsoil/subsoil boundary is sharp with virtually no gradation between surface soil and underlying structure. The depth of the plough is indicated by the line of flints. Relatively little water will go below this line.

Climatology

Prince Edward Island has double the precipitation as Norfolk so there is twice as much natural water to wash away toxins.

Site Location

The Summerside installation is less than a mile from the Atlantic Ocean. Any toxic effluent is far more likely to jeopardise marine life than animals, including humans.

Great Moulton is twice as dry, with impermeable subsoils, and thirty times further from the coast along very torpid watercourses. With regards their natural environments in what might be termed informal toxic waste disposal, Summerside holds all the aces.

The Dynamic

The comparative picture made so far is static. It does not enter the realm of dynamic processes, namely the journeys toxins would make from the Great Moulton lithium-ion battery energy storage complex to the beyond.

Great Moulton and Beyond

Atmosphere

For the potential spread of toxins in the air the Examining Authority should refer to 'Air Pollution Modelling from a BESS Fire at Lime Down' (Skeffington & Dobson)²³ which rebuts Island Green Power's assessment of airbourne risk at their Lime Down²⁴ project, which seems virtually identical in design to East Pye Solar. As the reference shows, it is held in the Planning Inspectorate's libraries.

East Pye Solar and Lime Down are to all intents and purposes identical. Will the Examining Authority include this area of airbourne toxins during their examination of safety issues and counter-measures if they have not already done so?

Ground-level and Below

What happens to the toxins at surface-level?

Unlike Summerside, from Great Moulton water, toxic or not, takes its time to even reach a stream. As previously explained in The Scepter'd Isle the ditches of the South Norfolk claylands are not drains²⁵ but ways to keep the land moist and neither hard nor waterlogged. They are parts of the fields, not a part divorced from the fields.³

Ditches retain the water. It will take a long time for water to reach even a stream bed.

Ditch water is by no means pure. When there is too much for a ditch to absorb it will push along broken bits of twigs, leaves, other foliage, moss but not the earth itself. As it travels, when it slows or the ditch dries, the decaying vegetation drops towards the bottom of the ditch to maintain or enhance the goodness of the soil. The water may be deepish at times but never seems to be moving. Even after rain the ditch is rarely more than a series of puddles which never seem to join up. Eventually some of this water may reach the sea, but it may take years, decades. Any toxins will have a similar sluggish journey.

³ The South Norfolk clayland landscape took millennia in its making.

Its character, its features, its flora, its habitats, its creatures, including humans have worked together to create something living, and to enjoy. The East Pye Solar scheme will not harm a few features here and there, they will desecrate the entirety.

Field Work

From the East Pye BESS site at Great Moulton, through ditches polluted water would eventually reach an unnamed water course gradually turning into a small but recognisable stream/stream-bed in about a mile's time, depending on the seasons and overall weather. The broken-down vegetation slows the passage of water even further. The pollution will settle with the crumbled twigs and leaves where a significant factor will remain till it becomes part of the sub-soil in and around the stream sides. It doesn't flow fast enough to do anything else....

Two miles further on the stream is recognisably one which rarely dries out



There's scarcely a ripple, just a shivering of the surface over the washed-up twigs and half-branches in the bottom right hand corner.

Shiverings left behind, between Pulham Market and Pulham St Mary the stream runs alongside Dirty Lane



The stream is the other side of the road with a bank between the two which keeps the road passable. The road is in fact a widened field ditch – how Dirty Lane got its name.²⁶



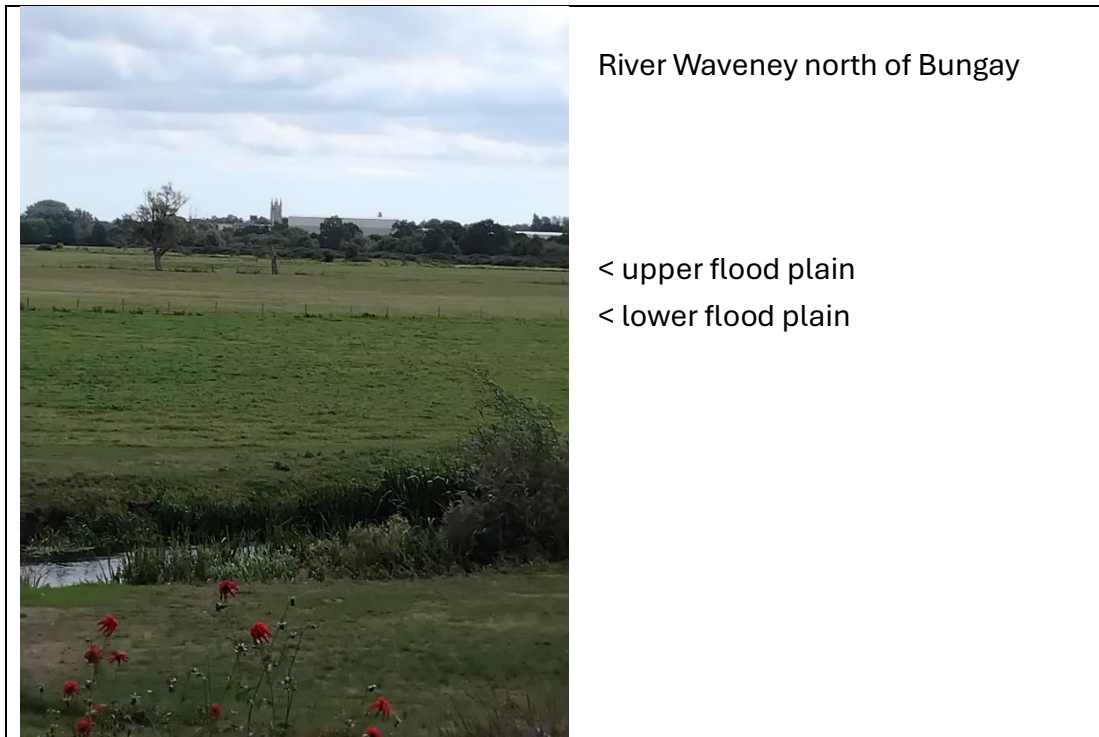
The rich swath of grass, turf almost, indicates Dirty Lane is grassmac not tarmac. Water seeps through its surface. Pollution would settle there too. And concentrate then return to the surface when it rains to be spread by passing vehicles, feet, and dogs paws.

At Starston Bridge the stream feeds the Harleston sewage works. Exactly how it would cope with lithium toxics is a mute question.

Onwards to the area's river systems.

A River Runs Through It

The River Waveney itself regularly floods farmland half-a-mile or more from each bank:-



Virtually all mature rivers in temperate zones possess flood plains (It is a distinguishing characteristic between streams and rivers: streams may flood, they do not have flood plains.) Flooding leaves behind particles, toxic or otherwise.

The Waveney is the water between the flowers and its far bank. Its lower flood plain is marked by the wooden post-and-wire fence. Bankside is rough pasture. It floods too regularly to be arable.

The upper flood plain is between the fence and the trees. This floods on a less regular basis. This is a classic hay-meadow, which was probably cropped about two months before this photo was taken.

Abnormal floods often stretch beyond the trees towards the church tower. They did so in 2024/5, during an extended period of exceptionally heavy rainfall. This marks the probable maximal extent of river-borne toxin-spread across the Waveney's fields at this point.

The entire fifteen miles stretch from Harleston to Geldleston locks was also flooded, at times nearly to the main road. The water went half-way up or submerged post-and-wire fences. (It recalls the medieval landscapes before drainage improvements.) It marks the potential extent of agricultural land directly affected by any fluvial toxins.

Beyond Bungay the Waveney also enters the Broads National Park. Here the river becomes more managed. The ditch pattern progressively devolves to drainage channels dug and maintained which run in and out of the river to prevent fields becoming marshes. This grazing marshland is at and sometimes just below the level of the river and most liable to retain toxins. Cattle will consume any toxins within or on the surface of the grass to be retained and concentrated either in meat or dairy products via a ruminant's compartmentalised digestive system.

At Geldeston Lock river meets tide.

The lock itself prevents the tide progressing further upstream. It is currently in disrepair, though under restoration.²⁷ Water runs through it, but there is virtually nil likelihood it could be deployed to control flow up or downstream to manage effluent - it ceased to operate in 1934. With the tides coming one way and the Waveney coming in the other direction toxin polluted water will tend to coalesce at this point

The lock itself was part of an inland port system where the north bank of the river was restrained by canal-type banks. These ports are now marinas. Their pleasure boats would be in contact with any toxic pollution below their water-line. Boats tend to be damp inside however well they are dry-docked and maintained. Ducks can only swim on the water nearby.

The canal-type banks of the Waveney run three miles downstream to Beccles (population 10,000+) where there is another inland port. The town runs right down to the edge of its south bank. On the north side the land up to the A146 is regularly and repeatedly under water: the mile-long road from Gillingham to Beccles is a causeway named The Dam, which indicates its purpose in drainage management.

Beccles itself is termed the gateway to the Broads. Toxic pollution would reach into the South Broads, and also the North Broads as the tides swirl the Waveney and the River Yar into each other as they share the same estuarine system to concentrate as well as disperse contamination: the same phenomenon as at Geldeston locks but writ immeasurably larger. The Waveney goes through Lowestoft, (population 72,000) then the sea, its beaches, marine life along the Norfolk and Suffolk coastlines, and possibly beyond. Reach and intensity of any pollution would at first sight largely depend on the scale of the inciting incident: the more particles there are, the further more will go....

..... All from a lithium-iron battery energy storage system fire seemingly in the middle of nowhere which went beyond a planned fire safety zone.

Sub-surface Water

Surface water has been covered. Sub-surface is analysed below.

Drinking Water

At the Open Hearing on 15th the Examining Authority heard from an individual who lived near the proposed Great Moulton BESS installation. His only source of water was by borehole. This also true for many others living within the applicant's order limits and their greater vicinity. The gentleman's source was a private one. Certainly Anglia Water customers living south of Hempnall will be supplied by:-



copyright Keith Evans

Two of Anglia Water's 425 borehole water towers off the A140 south of Long Stratton. Borehole reservoirs go into the aquifer, which is a geological phenomenon formed by permeable rock lying on top of a dome of impermeable clay. Downward pressure onto the dome forces the water trapped inbetween towards the top of the dome where it is tapped by the borehole. Water held by the aquifer has been percolated from its origin in the sky, soil or stream. Any effects of toxic pollution are unlikely to be immediate but could be long-lasting. A fair if alarmist analogy is the Washington Works chemical factory, West Virginia, USA²⁸. In 1984 high levels of toxins were registered in the local river whereupon discharge ceased. No consequent symptoms were observed before 2005. A similar time-line might be expected were lithium toxins to reach into an aquifer.

The Examining Authority should also take heed that around Island Green Power's Lime Down²⁹ proposal more than 80% of drinking water comes from aquifers too.³⁰ It is within their powers to inform their Lime Down colleagues.

The underlying geology at Lime Down is the Cotswold limestone series whose scarp slope stretches south from Tewksbury alongside the Severn Valley then towards Bath and Wiltshire Downs. The dip slope runs just beyond Witney towards Oxford. The Cotswold series is part of the greater Jurassic oolitic formations from Lyme Bay, Dorset to the Lincolnshire Wolds.³¹ *The Examining Authority will also note the dangers posed by BESS installations to aquifer-sourced drinking water throughout this region with a view to inform colleagues in the Inspectorate with similar applications to examine.*

Returning to East Pye Solar it is more than interesting to note the subject of potential pollution of aquifers through fire effluent is not raised in the Applicant's Environmental Statement³². These contain a dialogue between the Applicant and Anglia Water, who presumably were not aware of lithium toxin dangers, or if the matter was raised East Pye Solar reassured them there weren't any. Regarding drainage and river patterns the applicant's discussions with Anglia Water did not go beyond the project's order limits rather than towards the sea.³³

With regards the impact of a toxic pollution threat from Great Moulton which may extend into the north sea, will the Examining Authority restrict its examination to only within the applicant's order limits?

The River Tas, TASWAY Energy Park and EDF Norwich

These are two other BESS schemes abutting East Pye Solar, so it is important to highlight potential water-born dangers.

The situation with the River Tas is quite different to the River Waveney . It flows virtually parallel and west of A140 crossing under two bridges which split Saxlingham Thorpe from Newton Flotman to run just below the grounds of Dunston Hall into the River Yar.

The Tas is one the fastest flowing rivers in Norfolk. Were there to be a BESS fire which went out of bounds at either the proposed TASWAY Energy Park or EDF Norwich due to go live next year, then effluent would enter the Yar in a matter of hours if that. Six miles along the Yar downstream is the main sewage works for Norwich. A northerly wind would direct toxic particles into the centre of Norwich eight miles away. An east-south-easterly would blow the smoke into a Hemphall surrounded by solar panels were both schemes accepted.

TASWAY Energy Park abuts East Pye Solar so of logical necessity lies outside the East Pye Solar's Order Limits. However water and winds do not heed order limits on a map.

Will the pair of Examining Authorities enter dialogue about shared concerns on the ground?

(These concerns would also include other important concerns such as double congestion were each scheme constructed simultaneously. Interestingly East Pye Solar considered the TASWAY land but rejected it because the lanes were too narrow for construction traffic. The author is baffled to make sense of it all. He wonders if the Examining Authorities share his bemusement.)

Extent

Although BESS fire by-products are toxic there has been little research into their spread. It is vital to acknowledge that the absence of evidence is not the same as evidence of absence of any harmful effects. To argue otherwise is to take a gamble with other people's lives and welfare.

The journey of potential lithium pollution from Great Moulton to the North Sea is perhaps the first attempt anywhere to examine this type of phenomenon in relation to BESS complexes ⁴.

No attempt has been made whatsoever to quantify any spread of toxicity. Instead on the assumption the more BESS units are consumed by fire, the greater the intensity, concentration and dispersal of pollution from the atmosphere to the sub-surface:-

Credible Worst Cases and Significance

‘Fluorinated compounds in the fumes and the firewater are toxic - even in small amounts - and have a long lifetime in the environment, which could last for decades. Firewater run-off is toxic and needs to be contained and properly disposed. If this contaminated firewater was to get into aquifers, farming irrigation, crops or local streams or rivers it could have detrimental environmental impacts for decades.’ (Dobson *et al* ref:⁶)

Frazer-Nash provides the yard-stick of a credible worse case. The BESS fires at Summerside are definitely credible, since they are happening. Is it the worst case?

Skeffington and Dobson in assessing Lime Down considers the worst case is all 270 BESS units destroying themselves, which is clearly true since there are no more to burn themselves out.

On the other hand, in assessing Lime Down, Island Green Power considers the worst case is 1.

Where does the answer lie? How many BESS units burn-outs make a credible worst case a significant environmental threat? Between the two but some very simple modelling from the Summerside situation to the East Pye situation will provide some pointers.

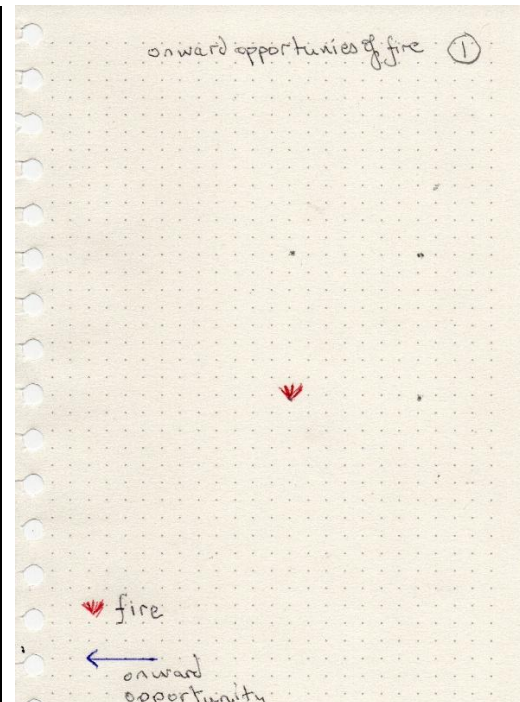
⁴ UEA's School of Environmental Sciences may well be interested. They possess an excellent research rating and a track record of work in Norfolk estuarine systems in particular.

Summerside BESS fire transmission

There were four BESS units at Summerfield, each represented by a dot.

One of them catches fire, represented by flames.

What happens next?



With four BESS the originating fire had three onward opportunities to set alight its nearest neighbour.

These are represented by the blue arrows and the second red fire indicates one opportunity has succeeded.

What are the onward opportunities to set the remaining two BESS alight?

The third is four opportunities

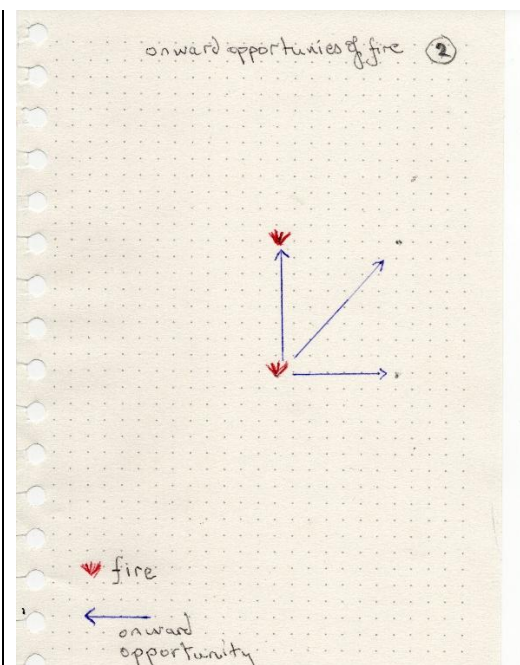
The last is three

Suppose there weren't just four BESS, like Summerside, but 270 like East Pye Solar?

At Summerside once four BESS burn out, there are none left

East Pye Solar starts with 270.

Fire safety becomes unconstrained by the number of units.



East Pye Solar BESS fire transmission

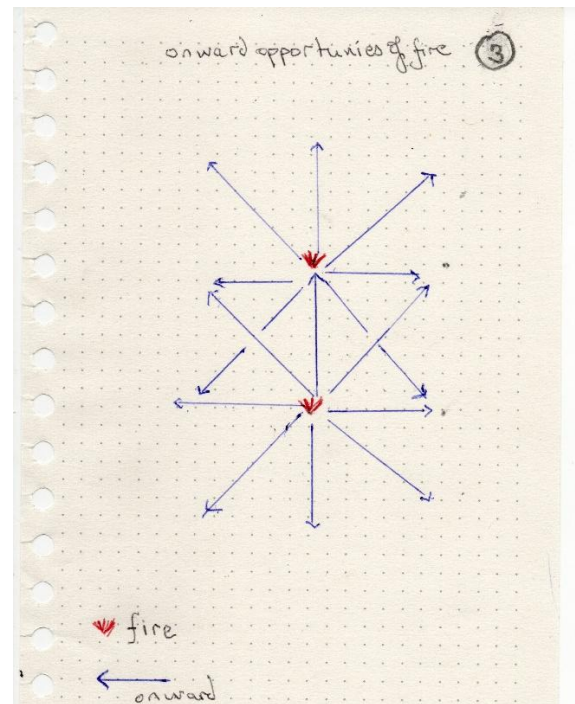
This is exactly the same as at Summerside, except there are indefinitely more than four BESS

Two are ablaze, just like Summerside, and exactly the same positions

The difference is the number of onward transmission opportunities.

There are *fourteen* onward opportunities to create a third blaze.

At Summerside, just four, then three for the last BESS standing.



At East Pye Solar BESS Blaze 3 itself possesses seven onward opportunities⁵ to create BESS Blaze 4.

There remain fourteen onward opportunities which means there are a total of 21 further onward opportunities to create Blaze 4.

If any one of these 27 ignites, it adds 7 further onward opportunities to create Blaze 5 to the total of 21, which means 28 onwards opportunities to create BESS Blaze 6.

It is not just one row of dominos on end, it is an interlocking series from one knocking into another. At Summerside there were just four dominos, at East Pye Solar 270.

The author's mathematical prowess is insufficient to find a formula to calculate beyond BESS Blaze 6 at this point.

In the diagrams the distances between dots was not specified. In the real world the closer each BESS is to its neighbour the quicker and more fiercely a fire will spread. At Great Moulton the planned 270 units are a metre or doorway's width apart.

⁵ In modelling, the distribution mesh should be rhomboidal (diamond-shaped) not squares. This is because the initial starting point of no fire must lie between the closest four BESS units, wherever they are, hence a rhomboid with the initial zero point of no fire at its centre. Once a fire starts the zero point transfers from between the closest four BESS to the BESS on fire, and so on. Using squares is easier to visualise since we don't see the lines of BESS units on the ground as rhomboids.

Discussion

It can be seen immediately once there are two BESS units ablaze, unless they are brought under control directly, the potential for onward transmission is alarming.

For safety issues Island Green Power, at Lime Down, East Pye Solar, and doubtless elsewhere work under the assumption that BESS fires cannot spread from one unit to another. This is demonstrably untrue. Furthermore the dangers escalate rapidly after two BESS units ignite.

Outside the world of modelling the inescapable conclusion is that *any* safety plan that presumes *all* BESS fires will be restricted to a *single* unit is *in itself* perilous in the extreme - not simply hazardous, but perilous. You may fully acknowledge a hazard but proceed at your own peril. Bystanders to the proposed Great Moulton BESS may well not be aware that it will place their lives, homes and environment at peril.

The modelling above is directly derived from a real-world Summerside data-set. Will the Examining Authority request the applicant to start afresh their safety planning on the basis of two or more BESS units catching fire, not only one ever doing so?

Beyond East Pye Solar

DESNZ 2035 solar target³⁴ is 47mw. East Pye Solar will produce around 0.5mw.

This entail 94 x 270 BESS complexes = 24,840 BESS units.

It requires one BESS unit fire to spread to another of any 270 units at any of 94 sites to create a major situation of peril.

The results here are ubiquitous:

Will the Examining Authority go beyond this particular examination to refer the matter to their colleagues within the Planning Inspectorate if not beyond?

Conclusion

With BESS units seven key safety issues have been identified and explored:-

- no account taken of external factors such as wild-fires or lightning
- no account taken of environmental conditions around any units
- no account taken that external and internal factors may act together
- no account taken how a fire may spread beyond one or two units
- no account taken that each BESS unit's safety may degrade through time
- no account taken that individual BESS units will not be certificated through time
- assumption that fires cannot spread from one BESS unit to another
- assumption that one metre gap between BESS units is safe

In terms of credible worst cases, with 24,840 BESS units at 94 sites over at least twenty years, it is not so much *if* a major incident will occur but *when*.

Together with significant environmental consequences this paper poses the Examining Authority a series of questions to determine whether within expected operating conditions the proposed Great Moulton BESS complex is safe or not.

How they may wish to determine this question of safety is their responsibility to decide.

If they cannot reassure themselves that the Great Moulton BESS complex will be safe, it is their responsibility to declare a moratorium on its future development.

References

¹ <https://assets.publishing.service.gov.uk/media/661feca73771f5b3ee757fac/grid-scale-storage-health-safety-guidance.pdf>

- ² [REDACTED]
- ³ [REDACTED]
- ⁴ [REDACTED]
- ⁵ [REDACTED]
- ⁶ [REDACTED]
- ⁷ [REDACTED]
- ⁸ [REDACTED]

⁹ Arc Flash:-

Arc Flash – battery systems present a potential source of arc flash energy. The electrical characteristics of batteries is such that their energy is readily discharged. When coupled to suitable high voltage and 4AS/NZS 5139:2019 [38] defines arc flash as an “electrical explosion or discharge, which occurs between electrified conductors during a fault or short circuit condition”. It further states that “Arc flash occurs when electrical current capacity levels they can supply high magnitude and high rate of change of fault current. This rapidly developing fault current can quickly contribute energy to a fault, risking an arc flash event. Whilst the arc flash risk is relatively well understood for AC systems, DC arc flash assessment is less standardised. Reference [11] introduces two methods through which arc flash risk can be assessed being on size and scale of the storage facility. Effective electrical protection is key to mitigating arc flash risk as well as appropriate PPE for operators and maintainers of equipment. p19

¹⁰ A direct reference to ‘Unsafe at Any Speed: The Designed-In Dangers of the American Automobile’ Ralph Nader, 1965. Through US Senate Hearings it led to amongst other things the US Department of Transportation the following year. https://en.wikipedia.org/wiki/Unsafe_at_Any_Speed

¹¹ Pacemaker explosions in crematoria: problems and possible solutions

- [REDACTED]
- [REDACTED]
- ¹³ [REDACTED]

¹⁴ Remarks on the Safety of Lithium -Ion Batteries for Large-Scale Battery Energy Storage Systems (BESS) in the UK

https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN010142-001170-7000%20Acres%20-%20Supporting%20Document%20-%20Fire%20Technology%20journal%20BESS%20Safety_Edwards%20and%20Dobson%202024.pdf

Th Planning Inspectorate reference is to the Tillbridge Project currently under a 26th April 2026 Secretary of State Correction Order. In view of their seriousness the East Pye Solar Examining Authority may be of a mind to raise the more general issues of BESS safety with the Secretary of State while the Tillbridge Correction is still in place.

¹⁵ An assessment of fire and explosion hazards at seven BESS installations in Norway

- [REDACTED]
- [REDACTED]

¹⁷ UL 9540A: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage System.

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21 Google Map Screenshot. If you want to zoom in and for yourself, hyperlink

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23 https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN010168-001396-SLD_Appendix%20I2%20Air%20Pollution%20Modelling%20from%20BESS%20Fire%20at%20Lime%20Down%20COMBINED.pdf

25 The Ordnance Survey Explorer Series (4cm to 1cm: 2½”to 1mile) makes this quite clear. Only drainage ditches field boundaries are marked by blue lines.

26 Due to gravity any ditch system must bottom out, hence ‘Dirty Lane.’ Perhaps incidental to this paper, its sinuous reversed-S curve is a mirror or kaleidoscope which may be traced back to the top of a pattern of farms and farming, created and bounded by headlands between ridge and furrow formed by bullock teams having to swing out then back in ready to plough the next part of a field. Regardless of the applicant’s order limits, this saxon and medieval landscape covers the entire South Norfolk claylands and is its defining historical characteristic. It is hard to conceive how this world created since the time of Alfred The Great would survive the onslaught of East Pye Solar, not least construction traffic obliterating all that has come before. It would be an irredeemable loss, bereft of mitigation. Back to the matter at hand.

28 [‘Dark Waters’ is a film which tells the story including a twenty year legal battle over a cover-up by Du Pont. Decent watch, especially if you like Mark Ruffalo.]

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32 <https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN0110014-000109-6.1.9%20Environmental%20Statement%20Volume%201%20Chapter%209%20Water%20Environment.pdf>

33 <https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN0110014-000257-6.3.9.1%20Environmental%20Statement%20Volume%203%20Appendix%209.1%20Flood%20Risk%20Assessment%20&%20Outline%20Surface%20Water%20Drainage%20Strategy.pdf>

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https://assets.publishing.service.gov.uk/media/685d6e483e6b7941f4e00afb/35.87_DESNZ_UK_Solar_Roadmap_final.pdfhttps://assets.publishing.service.gov.uk/media/685d6e483e6b7941f4e00afb/35.87_DESNZ_UK_Solar_Roadmap_final.pdf