Byers Gill Solar Farm- Hazards associated with Solar energy production, its storage and the lack of design controls. N Melaney, ID Reference number 20047679 Rev 3

I wish to raise on behalf of all residents who live within the area covered by the Byers Gill Solar Farm project the hazards associated with Solar energy production and its storage and the lack of design controls relative to the dangers imposed by poor design.

We all have major safety concerns in relation to lithium-ion battery energy storage sites (BESS) proposed use and locations.

Although solar energy is considered safer, more efficient, and cleaner than that obtained through traditional generators and power plants, the production and operation of a solar energy collector panel is neither wholly safe nor ecological.

A BESS is a highly complex unit within which there are racks of an undisclosed compound of Lithium and other salts in constant reaction when charging and discharging, requiring complex electronics, monitoring air flow, temperature and electrical power and relating that to control the reactions to maintain a safe temperature below about 60-degrees C.

In the event of a fire, an extremely toxic gas, hydrogen fluoride is released into the atmosphere and in a system of that proposed at Byers Gill Solar Farm, potentially in enormous quantities.

In addition to the fact that they depend on environmental conditions and that they represent potential health risks, due to the toxic chemical products and by products associated with their operation, these systems are also prone to electrical failures and to generate fires that could result in loss of property, injuries and even death.

Although much is said that solar energy is completely safe for the environment, the truth is that each solar panel is made of chemical materials such as arsenic and cadmium, in a process that generates many toxic byproducts such as hexafluoride, sulphur and silicon tetrachloride.

These products are not only dangerous for the environment, but also for humans and domestic and wild animals.

The details on BESS are supported by eminent experts in Energetics Research, Pure & Applied Electrochemical Studies and Chemical Engineering.

You will be aware that there is an increasing number of battery energy storage sites (BESS) across the country and the world. These are susceptible to thermal runaway, where the energy stored is released in an uncontrolled fashion as heat, leading to major “fires” or Vapour Cloud Explosions.

Lithium-ion battery incidents can be catastrophic, resulting in the combustion of nearby structures, and, most alarmingly, the emissions of enormous quantities of highly toxic, life-threatening gases, such as Hydrogen Fluoride. Anyone within a 5-mile radius of an occurrence will suffer lung damage and within ½ miles irreversible lung damage and possible fatalities.

Some of the gases produced include Carbon Monoxide, Hydrogen, Nitrogen, Carbon Dioxide, Methane, Oxygen, Ethyne, Ethylene, Ethane, and other hydrocarbons.

In addition Diethyl Carbonate, Methyl Ethyl Carbonate, Dimethyl Carbonate, Hydrogen Chloride, Ethylene Carbonate, Hydrogen Fluoride may also be present. (Items underlined are highly flammable.)

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The toxicity of Hydrogen Fluoride goes easily and quickly through the skin and into the tissues of the body. There it damages the cells and causes them to malfunction. The gas, even at low levels, can irritate the eyes, nose and respiratory tract. Breathing in hydrogen fluoride at elevated levels can cause death from irregular heartbeat or from fluid build-up in the lungs.

At lower levels breathing the gas can damage lung tissue. Eye exposure can cause prolonged or permanent defects, blindness, or destruction of the eye. People who survive may suffer ongoing chronic illness.

The Parish Council and Action Group are extremely concerned that the potential hazards of such a large BESS pose an unacceptable risk of death or long-term illness to the residents of the areas covered by the proposed development that is Byers Gill Solar Farm.

With the above in mind, it is not acceptable that developers are being allowed to install BESS units throughout the UK without measured safety or engineering guidelines. The paltry guidelines that exist have been devised by consultants working for developers and the developers themselves. Guidelines should also be introduced that directs culpability towards those who fail to provide safe and well-engineered facilities.

All is well if everything works. Sometimes it does not. The problem, if there is one, could be in a failure of a single cell in the scores of racks of reagents (Lithium compounds undergoing reaction). It could also be in one of all the thousands of cable joints connecting monitoring equipment to each other or a failing sub-standard cable or device.

The cabling in a BESS resembles a telephone exchange. However, if the safety monitoring cannot cope when asked to shut the process down and the temperature rises a further 20 degree C to 80 degree C the whole container is affected and will be out of control.

At this point the Fire Service must spray 2,000 litres per minute of water onto the BESS containers, probably for 24 hrs to try to cool it down. This would apply to all containers located opposite to or adjacent to the unit on fire.

2,000 litres are 2 tonnes. That is 120 tonnes per hour or 3000 tonnes of water or 150 articulated tanker loads.

RWE, the fire service does not have access to these quantities of water, nor do they have dual entry points for the emergency services.

The Fires are chemically driven, require no external oxygen, and therefore cannot be extinguished by traditional methods. Vast amounts of water are needed over many days due to the risk of reignition.

BESS thermal runaway events are not “fires” in the traditional sense of the word, but self-sustaining chemical reactions that are out of control. They pose a unique threat to firefighters, and I believe the measures as indicated by RWE to deal with this highly dangerous catastrophe are not developed sufficiently to remove the danger to the residents within a 5-mile radius.

We require RWE to provide a robust methodology that will remove or reduce the obvious risks to the residents/population for our consideration and approval.

RWE intend to install Lithium-ion battery storage facilities planned and included in their DCO submission to be constructed in close proximity to established communities, homes, businesses, busy roads, schools, natural water courses, and areas considered within the Conservation area as being of outstanding natural beauty.

The chemical fire effectively generates its own heat. There is no 'off' button once it ignites.

It would be an enormous problem if the Fire Service are unable to immediately attend the site fire. The only option if the fire is out of control is to let it burn out. This will result in toxic gases being distributed throughout the area of the development, villages, and parishes.

Battery Energy Storage System (BESS) dangers and defects include Thermal Runaway, Fires, and Explosions. If thermal runaway propagates through a module, flammable gases may build up within the BESS, creating the conditions for an explosion to occur.

Thermal runaway can also be caused by exposure to be overheating from traditional fires. The most common electrical hazards are over-charge, over-discharge, and external and internal short circuits.

Of the environmental hazards, off-nominal conditions such as toxic and the leaching of hazardous materials such as cadmium and Teflon into aquifers and water courses. Radiation exposure from inverters as well as potential EMF, are two possible further issues.

Substances known to be generated in Li-ion BESS failures are listed as “hazardous” in Parts 1 or 2 of the Planning (Hazardous Substances) Regulations 2015. Hence by the “loss of control” provisions in Part 3 Column 1 of Schedule 1 to the P(HS)Regs 2015, all the functional chemicals in the battery cells should be considered “Hazardous Substances” for Planning purposes.

Moreover, where substances have “major accident potential”, Part 4 Note 6 of Schedule 1 requires even those substances “not covered by the CLP Regulation” to be “provisionally assigned” to the “most analogous” hazard category in Part 1 or named substance in Part 2.

At the operational stage, the closely related Control of Major Accident Hazards Regulations (COMAH) 2015 regulations, intended to safeguard public health, property, and the environment, have an essentially identical Schedule 1 of “dangerous” substances.

The “loss of control” provisions of Part 3 P(HS)Regs 2015 are in the case of the COMAH Regs 2015 included at the level of the definition of “presence of a dangerous substance”. The requirements of Part 4 Note 6 P(HS)Regs 2015 are also included in the COMAH Regs 2015 as Part 3 Note 5.

The Health and Safety Executive (HSE) has stated to Parliament (UIN 29036, July 2021) that “Li-ion batteries are … outside the scope of (the) COMAH”. However, the legal authority for this has not been satisfactorily explained and is divergent from the Health and Safety Executive for Northern Ireland (HSENI, a different agency) which does regard Li-ion BESS as subject to COMAH. Not more than one of two contradictory positions can be legally correct.

Once alight, lithium-ion battery fires are extremely hard to extinguish. Common fire suppressants do not work, and the fire can burn very fiercely. In some circumstances, the battery can explode. If you have a problem with one cell, it’s going to start spreading, this unstoppable fire is called “thermal runaway”.

Water may assist with absorbing heat from some small fires, but it reacts dramatically with lithium – ion making it a wrong decision to go directly on fires.

Lithium-ion fires also do not burn cleanly, batteries can vent toxic gases into the surrounding area. It is not always clear what these gases will be the battery chemistry is a closely guarded commercial secret.

The electrolyte in most of the current and future generation of batteries contain a fluorinated compound and in the event of a fire hydrofluoric acid fumes are formed and this is extremely dangerous. (Lithium iron phosphate is a new development and of lower storage density and more expensive, so is unlikely to be used, but there will still be a lot of lithium metal in those batteries.

Furthermore, some of the fire extinguishers used also use a fluorinated compound with comparable results.

It is also likely that the above lead to an increase in cancer cases, a problem experienced elsewhere in the world. Is there a possibility of a risk of fire, increased heat around the panels, and a humming noise from inverters.

Will concerns regarding hazardous waste grow as the panels age, and if so, how they will be disposed of when the leases end.

It is estimated that, worldwide, over seventy-eight million metric tons of solar panels will reach the end of their lifespan by 2050.

Overcharging of lead battery in an enclosed area causes toxic fumes. lithium-ion batteries are extremely sensitive to elevated temperatures and inherently flammable.

These battery packs tend to degrade much faster than they normally would, due to heat. If a lithium-ion battery pack fails, it will burst into flames and can cause widespread damage.

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Water run off from the panels and BESS fires if used will pollute the Ground Water source rivers and Aquifers.

There is a need for Government departments to recognise the potential dangers of Li-ion battery storage facilities and make Fire and Rescue Services statutory consultees for BESS planning applications,

Ensure full enforcement of the law governing major accident hazards is part of any proposed use of Solar developments and ensure that all regulatory bodies have appropriate legislation in place to protect fire fighters and local communities/residents.

Generally, is obvious that this element of the project should not be sanctioned until more is known regarding safe and non-hazardous design and protections are available.