Proposed Solar PV Development

Byers Gill Solar
EN010139

6.4.2.5 Environmental Statement Appendix 2.5 Major Accidents and Disasters Assessment

Planning Act 2008

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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RWE
14 Bird Street
London
W1U 1BU
United Kingdom
www.rwe.com

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1. Introduction

1.1. Purpose of Document

1.1.1. This document provides an assessment of the major accidents & disasters issues as requested by the Planning Inspectorate (PINS) as part of the Environmental Impact Assessment (EIA) scoping process. This is recorded in Appendix 4.1 EIA Scoping Report (Document Reference 6.4.4.1); and Appendix 4.2 EIA Scoping Opinion Document Reference 6.4.4.2) of the Environmental Statement (ES).

1.1.2. PINS considered that "the risk of battery fire/explosion should be addressed in the ES, including details of how measures to minimise impacts on the environment in the event of such an occurrence are secured"[1] and that "the ES should explain any mitigation to avoid/reduce impacts to utility assets and assess significant effects where they are likely to occur. Consultation should be undertaken with the relevant utility companies to inform design/mitigation measures"[2].

1.1.3. The specific issues covered by this document are therefore:

- The potential for battery fire in the Battery Energy Storage Systems (BESS); and
- The potential for damage to existing utilities as a result of the construction and decommissioning of the Proposed Development.

1.1.4. This document sets out the potential impacts of the issues covered, and the mitigation measures included in the design of the Proposed Development. These measures are reflected in Appendix 2.13 Outline Battery Fire Safety Management Plan (oBFSMP) (Document Reference 6.4.2.13) which provides the management plan in respect of this topic.

1.2. The Proposed Development

1.2.1. The Proposed Development is a renewable energy scheme, covering an area of approximately 490 hectares (ha), and comprising solar photovoltaic (PV) panels, on-site Battery Energy Storage Systems (BESS), associated infrastructure as well as underground cable connections between panel areas and to connect to the existing National Grid Substation at Norton. The Proposed Development will have the capacity to generate over 50 Megawatts (MW) of electricity.

1.2.2. A full description of the Proposed Development and a detailed description of the design and environmental mitigation is provided in ES Chapter 2 The Proposed Development (Document Reference 6.2.2).

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[1] Item 3.7.13 from section 3.7 of ES Appendix 4.2 EIA Scoping Opinion Document Reference 6.4.4.2

[2] Item 3.7.16 from section 3.7 of ES Appendix 4.2 EIA Scoping Opinion Document Reference 6.4.4.2

1.3. Proposed Development Location

1.3.1. The majority of the Proposed Development, including the panel areas, substation and on-site BESS are located within the administrative area of Darlington Borough Council. The eastern part of the cable routes crosses into the administrative area of Stockton-on-Tees Borough Council. The northern extent of the planning boundary (the Order Limits) borders Durham County Council's administrative area.

1.3.2. The Order Limits for the Proposed Development are shown in ES Figure 1.1 Location Plan (Document Reference 6.3.1.1).

2. Scope and methodology of assessment

2.1. Scope

2.1.1. During the EIA scoping exercise, the following topics were scoped into the assessment:

- **Major accidents and disasters:** battery fire and/or flooding: PINS set out that the risk of battery fire/explosion should be addressed, including details of how measures to minimise impacts on the environment in the event of such an occurrence are secured. PINS also set out that fire or flooding from severe weather should be addressed.
- **Utiliti**es: the Health & Safety Executive, National Grid Electricity Transmission PLC and National Grid Gas PLC commented that risk to existing utilities should be assessed.

2.2. Assessment methodology

2.2.1. This assessment of major accidents and disasters follows the standard industry guidance set out in the IEMA document *Major Accidents and Disasters in EIA: A Primer*[3]. The guidance sets out that assessments should comprise of the following:

- Setting out the baseline, including
  - Identifying hazards (noting that hazards can be grouped into high-level 'risk events' which have the same potential consequence)
  - Identifying receptors relevant to the identified hazards/risk events,
- Identifying the reasonable worst-case impacts on receptors resulting from the hazards/risk events. This process includes:
  - Reviewing the hazards/risk events to establish how they could impact the receptors
  - noting where risk events are screened out on the basis that there is no source-to-receptor pathway, and/or the consequence of the hazard/risk events do not meet the criteria of a significant effect
- Describing the primary and tertiary (embedded and best practice) mitigation for the risk events, plus any secondary (additional) mitigation measures proposed, noting whether these mitigation measures eliminate, reduce, isolate and/or control the risk events
- Providing a residual assessment of risks

2.2.2. This assessment follows the above structure for each of the risk topics assessed to ensure that a robust assessment is presented.

[3] Major Accidents and Disasters in EIA: a Primer, September 2020, IEMA

3. Assessment of battery fire and/or flooding

3.1.1. This section sets out an assessment of major accidents and disasters related to battery fire within, and flooding of, the BESS containers, following the methodology set out in section 2.

3.1.2. In order to provide necessary context, a description of the proposed BESS system for Byers Gill is given first, along with an explanation of the concept of thermal runaway which is key to understanding the worst-case hazards addressed in this assessment.

3.2. Description of the BESS

3.2.1. The Proposed Development will include up to 53 BESS containers as described in ES Chapter 2 The Proposed Development (Document Reference 6.2.2). Each BESS container will contain multiple battery racks made up of multiple battery modules stacked vertically. Each module contains multiple battery lithium ion phosphate cells.

3.2.2. The containers also house Heating, Ventilation and Air Conditioning (HVAC), Battery Management Systems (BMS), temperature and smoke alarms, fire detection and suppression systems and deflagration venting as seen in Figure 3-1Figure 3-1.

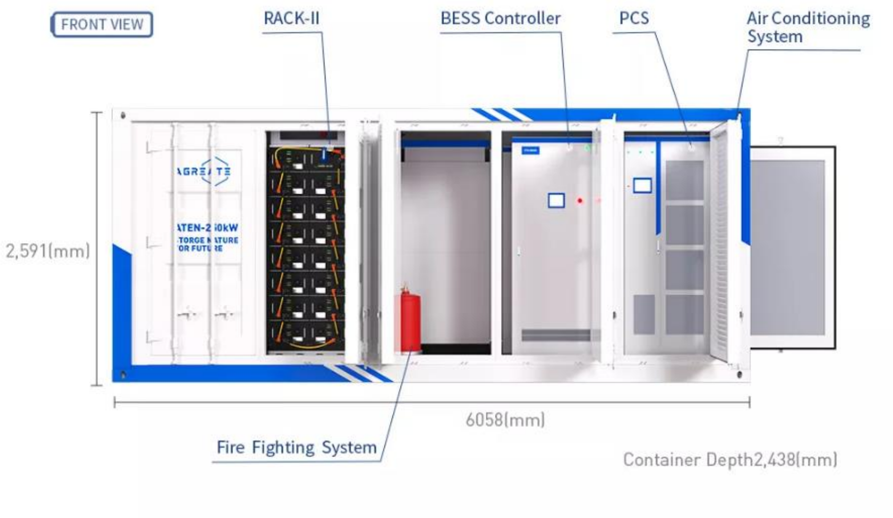

Figure 3-1 Sample of a BESS container (Source: Agreate)

3.3. Baseline

Identified hazards/risk events

3.3.1. The following hazards relating to the BESS have been identified for assessment:

1. Lightning strike (a result of severe weather) leading to a thermal runaway fire event in a BESS container.

2. An electrical or battery fault during the operation of the BESS leading to a thermal runaway fire event in a BESS container.
3. A conventional fire caused by arson, design fault, or design error leading to a thermal runaway fire event in a BESS container.
4. Flooding of BESS containers as the result of severe weather leading to polluted runoff water.

Receptors relevant to the identified hazards

3.3.2. For hazards leading to a fire in a BESS container, the relevant receptors are:

- Ecological receptors: habitats local to the BESS containers: key receptors are:
  - Species including birds, mice, hedgehogs and reptiles in field margins in the vicinity of the BESS containers.
  - Species including birds, bats, mice and hedgehogs in woodland areas including Byers Gill Wood and Square Wood.
- Human receptors: those residential dwellings closest to the BESS containers including the communities of Bishopton (600m from the closest BESS container), Little Stainton (1800m from the closest proposed BESS container), and Great Stainton (700m from the closest BESS container), Brafferton (500m from the closest proposed BESS container) and other isolated dwellings (all are >300m from any containers).
- Emergency responders (including fire service staff).

3.3.3. For flooding hazards, the relevant receptors are ecological and include the ecological receptors listed above, plus local watercourses including Byers Gill and Bishopton Beck.

3.4. Reasonable worst-case impacts

3.4.1. This section discusses potential pathways from the hazards to receptors, and the nature of possible effects on receptors, and whether these could constitute a significant effect in relation to major accidents and disasters.

3.4.2. Each potential effect comprises a hazard source, a sensitive receptor and a pathway between the two.

Hazards resulting in potential battery fire

3.4.3. For a lightning strike, the potential risk is that energy from the lightning could directly causes a thermal runaway event in a BESS container, or cause a conventional fire which then could cause a thermal runaway event: both could lead to a battery fire within a BESS container.

3.4.4. For an electrical or battery fault during the operation of the BESS, the potential risk is that the fault directly results in a thermal runaway event, which could lead to a battery fire within a BESS container.

3.4.5. For conventional fire caused by arson, design fault, or design error, the potential risk is that a conventional fire could heat one or more of the BESS battery cells to a temperature which causes thermal runaway, which could lead to a battery fire within a BESS container.

Potential significant effects resulting from a battery fire

3.4.6. For a fire successfully contained and controlled within a closed BESS container, whilst damage may occur to equipment within the BESS container there is no pathway from the risk event source (a fire in a BESS container) to the receptors identified and so no impacts would occur to any receptors.

3.4.7. For an uncontrolled fire within a BESS container, the reasonable worst-case event is a pressure build-up or explosion within the containers leading to vent panels on the container roof opening and smoke and contaminants venting to atmosphere for the duration of the fire. The pathways to receptors are as follows:

- Smoke could be carried on the wind to local ecological and residential receptors, with the magnitude of smoke concentration at those receptors being dependent on meteorological conditions and wind direction.
- Fire may also propagate locally around the BESS container to affect adjoining ecological habitats

3.4.8. For ecological receptors, the nature of any potential adverse effects would be temporary displacement of species - including mice, hedgehogs, reptiles and birds - caused by any smoke, with some potential abandonment of bird nests resulting in chick mortalities if a fire occurred during nesting season. However, large-scale mortality or morbidity is unlikely. As such, this risk event is unlikely to constitute a significant effect in relation to major accidents and disasters upon ecological receptors.

3.4.9. The buffer zones surrounding the BESS containers mean that there is no pathway for a fire to propagate to hedgerows or nearby woods and so no direct impacts due to fire are likely and as such, this risk event is unlikely to constitute a significant effect in relation to major accidents and disasters upon ecological receptors.

3.4.10. For human residential receptors, whilst smoke from an uncontrolled fire event would disperse to some extent over the >300m distances from BESS container to the receptors, there would still be odour impacts and potential minor health impacts on residents such as aggravation of pre-existing respiratory conditions. However, given that serious injuries or fatalities are unlikely to residents due to the large separation distances involved, this risk event (i.e. an uncontrolled fire in one BESS container) is unlikely to constitute a significant effect in relation to major accidents and disasters upon residential receptors.

3.4.11. For emergency response personnel, there is the possibility of loss of life and/or permanent injury from an uncontrolled fire in the event of an explosion whilst they are in close proximity to the BESS container: however, as the BESS containers are designed to release such explosive pressure upwards via roof vent panels instead of horizontally, the possibility of loss of life and/or permanent injury to emergency responders is low. Again, due to the low risk of loss of life and/or permanent injury, an uncontrolled fire is unlikely to constitute a significant effect in relation to major accidents and disasters upon emergency responders.

Hazards resulting in potential flooding of BESS containers

3.4.12. The potential event in respect of severe weather and flooding is that heavy rain could result in surface water and/or fluvial flooding resulting in the partial or full submersion of a BESS container in flood water. This may damage the BESS equipment but may also result in the pathway of contaminated flood water running off to nearby ecological receptors and/or local watercourses. The nature of any potential adverse effects at receptors would be morbidity or mortality of flora and fauna.

3.4.13. However, the ES Chapter 10 Hydrology and Flood Risk (Document Reference 6.2.10) details the assessment of different flood risk sources and concludes that:

- All critical infrastructure (electrical infrastructure excluding solar PV panels) has been sited outside of the Environment Agency's fluvial flood zones 2 and 3 and thus the flood extents associated with main rivers for return periods up to and including the 1 in 1000 year return period.
- All critical infrastructure has been sited outside of the Environment Agency's surface water flood risk zones, associated with overland flow routes and minor watercourse flood risk, for flood events up to and including the 1 in 1000 year return period.
- The Flood Risk Assessment provided in ES Appendix 10.1 (Document Reference 6.4.10.1) has assessed various data sources to understand the risk of groundwater flooding. All critical infrastructure has been placed in areas identified as having a negligible risk.

3.4.14. The likelihood of a flooding event at the BESS containers is therefore sufficiently low that it is unlikely to constitute a significant effect in relation to major accidents and disasters.

3.5. Mitigation Measures

3.5.1. Latest system design best practice and mitigation measures will be included in the Proposed Development's BESS. These are all defined as primary and tertiary mitigation measures in terms of a major accidents & disasters assessment framework – that is, they are all embedded measures incorporated into the design of the BESS.

3.5.2. Some of the key mitigation measures to reduce the risk of a battery fire are set out in this document: in addition, the ES Appendix 2.13 Outline Battery Fire Safety Management Plan (oBFSMP) (Document Reference: 6.4.2.13) sets out an outline plan which incorporates and expands on these mitigation measures. This plan will be implemented in the design and operation of the Proposed Development and is secured via requirement of the draft DCO (Document Reference 3.1).

Context: Thermal Runaway

3.5.3. Figure 3-2 shows the typical thermal runaway cycle for Lithium-Ion based batteries. The figure has a preventative (green) and a containment (red) zone. Once the system enters the red zone of the cycle, a series of cascading events follows that will result in a chemical fire. At that point, it can only extinguish by cooling down the faulty module and flammable gases venting. The mitigation measures set out in this section include measures to prevent the BESS systems from entering the containment (red) zone.

Figure 3-2 Thermal runaway cycle

3.5.4. Li-Ion based batteries do not spontaneously combust but have to be subjected to battery abuse to enter the cycle set out above. The causes of thermal runaway are either mechanical or electrical abuse, i.e., physical damage (like a puncture to the casing) or overstressing during operation (like overcharging the system with energy). Even when the BESS enters that cycle, it should have enough safety measures to allow sufficient time to act and prevent the cascading event.

Summary of main approaches for fire risk mitigation

3.5.5. The four main types of measures for fire risk mitigation for BESS developments include:

- Site design & layout measures
- Preventative measures
- Monitoring measures; and

- Suppression and containment measures.

3.5.6. Site design and layout measures relate to measures incorporated into the site design and layout to minimise the extent and impact of any fire event and to facilitate any required site response from emergency services.

3.5.7. Preventive and monitoring measures are those designed to avoid a thermal runaway event occurring in the first place – that is, to prevent an event entering the ‘red zone’ shown in **Error! Reference source not found.**.

3.5.8. Suppression and containment measures are those taken when a fire has been detected.

3.5.9. These measures are explained further in the following section.

Site design & layout measures

3.5.10. Suitable separation distances are included in the BESS container layout design to prevent fire spread from one container to another.

3.5.11. In order to allow fire vehicles to remain in forward gear and not need to undertake a three point turn within the site, a number of turning circles have been provided. The location of these will be on maps at the site entrance so that fire and rescue services can understand how to navigate the site.

3.5.12. The road perimeter will be of a grade suitable of accommodating the weight of a fire and rescue service vehicle

Preventative measures

3.5.13. Preventative measures are the first set of fire risk mitigation. These include:

- Adequate system maintenance;
- Replacement of out of warranty/faulty/recalled modules;
- Battery management system (BMS) monitoring of a whole host of cell health indicators and can automatically make decisions as per manufacturer and integrator specifications to avoid abnormal loading of cells and hence minimise the risk of thermal runaway; and
- Establishing an efficient system cooling process i.e., enlarging the space between the battery cell racks and the containers facilitates thermal dissipation thus reducing the large-scale fire risk.

3.5.14. Temperature and humidity within each BESS enclosure will be carefully controlled, both to avoid excessive degradation of the energy capacity and to remove excess heat that can cause breakdowns or lead to fires. BESS manufacturers typically provide specific limits for the maximum and average yearly enclosure temperature and average hourly temperatures. Temperature will be monitored at various points across the enclosure to ensure the air (if the solution is using air cooling) or the liquid medium (if the solution is using liquid cooling) is circulating properly and there are no hotspots in certain parts of the enclosure.

3.5.15. A suitable BESS with the appropriate HVAC will be installed and it will be operated and maintained as per recommendations of the manufacturer and as per good industry practice. JBM, as part of RWE, will have its own operating procedures for all its assets, and will be continuously monitoring the data from BESS assets.

3.5.16. A lightning protection system will be included for all BESS assets, ensuring that any lightning strike does not affect the BESS systems within the containers.

Monitoring measures

3.5.17. All BESS units will be equipped with a Battery Management System (BMS), which is typically provided by the BESS supplier. The BMS is designed as a three-level system which monitors and manages operational and safety parameters at the cell, module and rack level. This will ensure that quick and effective remedial action can be taken automatically if an issue is identified even at the individual cell level.

3.5.18. The BMS will monitor all essential data associated with each sub-component of the BESS, including current, voltage and temperature.

3.5.19. Thermal runaway is always seen to start at a certain temperature range and continues as temperature rapidly increases, which the BMS will detect. When thermal runaway or the potential for thermal runaway is detected, the BMS will disconnect the relevant cell, module or rack and thus limits the progression of thermal runaway. Most BMSs begin disconnection of the respective component significantly before thermal runaway commencement temperatures are reached.

3.5.20. Along with this disconnection, alarms are automatically activated as soon as any concerns are observed.

3.5.21. A key step in BESS fire risk management is to ensure that the BESS is equipped with a robust fire detection system. In addition to monitoring temperatures, not just at enclosure level but also at rack, module and cell level, this also includes detecting off-gassing and smoke, or any other sudden changes in battery operating parameters that could be indicative of a fire or thermal runaway. Emergency-stop functionality is automatically triggered by the BESS' control system when fire risk is detected, and in most cases, ensures that the BESS can be shut down far before thermal runaway occurs.

3.5.22. The fire detection system will be provided by the BESS supplier and will be certified to the relevant industry standards. The fire detection system and monitoring of alarms will be managed by the site's operators.

3.5.23. Other monitoring measures to help with early detection of events leading to thermal runaway will include:

- Off-Gas monitoring to allow for the detection of gases emitted during the early stages of the thermal runaway cycle and can be used to safely power down the system before this occurs. The sensitivity of the relevant sensors is down to 1 part per million;
- direct connection of the BESS to a 24/7/365 control centre that can dispatch engineers if and when the need arises, as well as notify/coordinate emergency services, in the extremely rare event that their intervention is needed;
- smoke detection to avoid traditional electrical fires causing thermal runaway;
- flammable gas detection;
- flame detection;
- heat detection; and
- thermal imaging.

Suppression and containment measures

3.5.24. If a fire occurs within an enclosure, an automated fire suppression system will be triggered. Depending on the asset, this can be based on water sprinklers, a clean agent (aerosol), or a combination of both. RWE's intention is to use an automatic clean agent rather than water-based system as this regarded as good practice for a number of reasons:

- Flooding an enclosure with water will almost certainly destroy the electrical equipment within it and is not considered an appropriate solution for combatting electrical fires.
- While the application of water is a straightforward way to reduce temperatures, this does not essentially remove the issue of thermal runaway and is not always a practicable solution as large volumes of water are required to suppress a thermal runaway fire, requiring large on-site water storage or fire hydrants.
- If an enclosure is flooded, there is a risk for contaminated water to leak into the surrounding area and cause contamination, this requires specific fire water containment to be installed and leads to increased costs and design complexities.

3.5.25. Due to these reasons, most BESS suppliers now provide clean agent fire suppression rather than water-based solutions and the majority of BESS projects in the UK are being designed and installed on this basis. Insurance providers and first responders are generally comfortable with these systems provided appropriate certification and testing is in place.

3.5.26. Clean agent systems interrupt the chemical chain reaction of fire, deplete oxygen and reduce temperatures below what is required for combustion. Unlike water-based fire suppression, clean agents do not cause damage to electronic equipment and have found long-standing use across a wide range of sectors to combat electrical fires. In the case of clean agent fire suppression being triggered, the risk of pollution or impact on human health in the wider project surroundings can be considered negligible as the (relatively small) amounts of gas will disperse in the atmosphere. Emergency response personnel will be appropriately trained to handle enclosures that use this suppression type, and modern BESS enclosures can be fully accessed from the outside which minimises any potential exposure.

3.5.27. Early engagement with local fire safety personnel has been carried out to ensure that all relevant stakeholders are clear on the proposed system and the fire response strategy. RWE also proposes that at the entrance to the site there is an Information Box which contains details of each battery on site, its chemical make up, the exact location, and any details from the manufacturer about how to tackle a fire from the unit, as well as informing them of any inbuilt suppression system. Moreover, a FFE 1 box or similar variant will be placed at the entrance to ensure that the fire service have convenient access to the site.

3.5.28. It should be noted that clean agents will not stop thermal runaway. For AC-coupled systems, where there are large numbers of BESS enclosures located in close proximity to each other, emergency response services may seek to spray water onto adjacent enclosures to prevent a thermal runaway-related fire from spreading between enclosures. This risk is much less relevant to this project due to the BESS enclosures being distributed across the solar farm site in a DC coupled arrangement.

3.6. Summary of residual significant effects

3.6.1. The preventative measures included in the design of the BESS and associated systems are such that an uncontrolled battery fire event is highly unlikely, and as such a significant effect upon the identified receptor from such is unlikely in relation to major accidents and disasters.

3.7. Hazard identification record – battery fire

3.7.1. Hazard identification records are included below for the risks and hazards identified in the assessment.

Table 3-1 Hazard identification record – battery fire

Grouped risk event	Source and/or pathways	Receptor	Reasonable worst consequence if event did occur	Primary/tertiary mitigation	Could this lead to a major accident and/or natural disaster with existing mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with proposed mitigation in place?
Controlled fire in a BESS container	Battery fire contained within BESS container. No pathway to receptors as fire contained	Local ecological and residential receptors	None as no source-pathway-receptor linkage.	• Mitigation via preventative measures: battery management plus battery temperature and off gassing monitoring to keep BESS system in safe operating region. • Clean agent suppression system to limit risk of any initial fire developing into conflagration.	No	Yes

Grouped risk event	Source and/or pathways	Receptor	Reasonable worst consequence if event did occur	Primary/tertiary mitigation	Could this lead to a major accident and/or natural disaster with existing mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with proposed mitigation in place?
Uncontrolled fire in a BESS container	Battery fire venting to atmosphere	Residential dwellings >300m away; local ecological receptors; first responders	Airborne smoke/pollutants propagating to residential dwellings resulting in exacerbation of any existing respiratory conditions; disturbance to ecological species; injury to first responders	• Mitigation via preventative measures: battery management plus battery temperature and off-gas monitoring to keep BESS system in safe operating region. • Clean agent suppression system to limit risk of any initial fire developing into conflagration. • Roof vent panels to direct explosion/flames upwards in the event of an uncontrolled conflagration and fire protocol guidance for emergency services.	No major accident / disaster identified due to serious injuries / fatalities being unlikely	Yes

4. Damage to existing utilities during construction and decommissioning

4.1. Context and risk

4.1.1. As part of the construction and decommissioning of the Proposed Development, work will take place near multiple utility assets. The primary risk is that of unplanned impacts to utilities or a "utility strike" where damage occurs to a utility during construction, with associated risk to the health and safety of construction workers. This section provides a major accidents and disasters risk assessment for these utilities.

4.2. Baseline

4.2.1. The layout of the Proposed Development intersects with several utility assets. Affected assets and the relevant owner/operators are set out in the Statutory Undertakers Position Statement (Document Reference 7.7).

Hazards

4.2.2. The potential hazard associated with utility assets is physical damage to a utility resulting from construction works for the Proposed Development.

Receptors

4.2.3. The relevant receptors which could be affected by the identified hazard are:

- construction staff working close to the existing utility assets during the construction of the Proposed Development, and
- communities dependent on the utility assets who may experience a reduction or loss of services provided by the utilities

Known major utilities intersecting the site

4.2.4. The following major utilities have been identified which intersect with the Proposed Development in the Health & Safety Executive response to the Byers Gill Scoping Report[4]:

4.2.5. National Grid Gas PLC pipelines, from west to east:

- National Grid Gas PLC: HSE Ref # 7855 (7 Feeder Bishop Auckland / Sutton Howgrave), crossing PV panels and a cable route
- National Grid Gas PLC: HSE Ref # 7856 (13 Feeder Bishop Auckland / Yafforth), crossing PV panels and a cable route

[4] P62 ES Appendix 4.2 EIA Scoping Opinion Document Reference 6.4.4.2

- National Grid Gas PLC: HSE Ref # 7858 (6 Feeder Little Burdon / Billingham), crossing a cable route

4.2.6. Northumbrian Water Authority water pipelines:

- HSE Ref #0456 operated by Northumbrian Water Authority, Gateley Moor Reservoir & Pumping Station, Stockton-on-Tees, TS21 1EX.

4.2.7. Several other smaller utilities intersect with the Proposed Development site, including smaller gas, water, telecoms and electricity utilities.

4.3. Reasonable worst-case impacts

4.3.1. For workers working in the immediate vicinity of a gas or high voltage electricity utility asset, the potential impacts are physical injury or death as a result of a utility strike.

4.3.2. For communities dependent on the utility assets, the potential impact is the disruption to services provided by the assets.

4.4. Mitigation

4.4.1. Prior to construction and decommissioning phases, the design team and Principal Contractor will review the locations and alignments of the utilities using utilities plans and use them to inform the plans for the proposed works to ensure all known utilities are avoided.

4.4.2. Necessary offsets to known assets, such as the major gas pipelines identified, have been taken into account within the design and layout of the Proposed Development. Where major gas pipelines have been identified, no Proposed Development infrastructure such as PV panels or BESS containers are sited within a 20m corridor along the pipeline alignments.

4.4.3. Where high-voltage electricity cables are present, no Proposed Development infrastructure will be placed within 5.3m of the cables.

4.4.4. Signage and height-restricted gates will be placed around high voltage power lines during construction to ensure that all construction vehicles adhere to the 5.3m cable clearances

4.4.5. Good construction working practices to manage the risk to any minor utilities which are not mapped by utilities companies.

Engagement with utility owners

4.4.6. The project has carried out engagement and consultation with utilities owners, namely:

- Consultation during the EIA scoping process, with utilities companies and the Heath & Safety Executive identifying the major utilities for consideration.

4.4.7. RWE will continue to engage and consult with utility companies to identify details of all utilities on-site and agree safe methods of working around these.

4.5. Summary of residual significant effects

4.5.1. The mitigation measures will reduce the likelihood of a utility strike to a level such that a utility strike is highlight unlikely and a significant effect upon the identified receptors from such is unlikely in relation to major accidents and disasters.

4.6. Hazard identification record – damage to existing utilities

4.6.1. Hazard identification records are included below for the risks and hazards identified in the assessment.

Table 4-1 Hazard identification record – damage to existing utilities

Grouped risk event	Source and/or pathways	Receptor	Reasonable worst consequence if event did occur	Primary/tertiary mitigation	Could this lead to a major accident and/or natural disaster with existing mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with proposed mitigation in place?
Damage to an existing utility during construction	Construction activities with the potential to damage utilities	Construction workforce; communities dependent on existing utilities	Injury or death to members of construction workforce; disruption to communities dependent on existing utilities	Engagement with utilities companies to identify utilities and agree safe methods of working around existing utilities. Offsets around major utilities to avoid impacts, including 20m zones above major gas pipelines where no solar farm infrastructure is placed. No construction plant or infrastructure to come within 5.3m of high-voltage cables	No	Yes