Kilmarnock 500 MW Battery Energy Storage Site

Volume 1

Chapter 2 The Proposed Scheme

Kilmarnock Energy Centre Limited

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Delivering a better world

Quality information

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2. The Proposed Scheme

2.1 Introduction

2.1.1 This chapter of the EIAR describes the Proposed Scheme for which s36 consent is sought and has been the subject of the EIA. The general arrangement plan illustrating and detailing the design of the Proposed Scheme is available in Volume 2, Appendix 1-D, of this EIAR.

2.2 Site Selection

Guidance and Criteria for Site Selection

2.2.1 In the siting of energy infrastructure, such as BESS, various considerations must factor into the Site selection process. The following considerations are identified in the Horlock Rules (Ref 2-15) which provides guidance on the siting of substations, and it is considered these guidelines are relevant for the Site selection of the Proposed Scheme:

- Consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum;
- The siting of infrastructure should seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value;
- The Site should have sufficient space for screening of views by mounding or planting;
- Areas of local amenity value, important existing habitats and landscape features including ancient woodlands, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable; and
- The siting of infrastructure should take advantage of the screening provided in the land form and existing features within the landscape to keep intrusion into the surrounding areas to a reasonably practicable minimum.

2.2.2 In the determination of a preferred Site location, preference was given on identifying a Site in close proximity to Kilmarnock South Substation (KSS). A shorter cable connection would reduce adverse environmental impacts by reducing environmental effects associated with undergrounding works. Additionally, selection of a Site in close proximity to the existing substation reduces effects on local landscape character.

2.2.3 The selection of a Site needed to avoid international and nationally designated sites. The Site needed to consider the proximity of residential receptors and have land available to provide landscape screening and ecological enhancement.

Justification for Site Selection

2.2.4 The BESS has been strategically sited close to KSS to make use of existing energy infrastructure and to provide a straightforward grid connection to the Scottish Power Transmission network. The BESS would be located approximately 250 m north of KSS, and this proximity is key to providing energy storage services effectively.

2.2.5 The existing substation is capable of accommodating the transfer of electricity to and from the Proposed Scheme at an acceptable cost which will provide valuable support to the grid, protecting customers at times when high demand places stress on the wider electricity network.

2.2.6 The Proposed Scheme is located on the land parcel immediately to the north of KSS (hereafter referred to as the “Site”). The Proposed Scheme’s location adjacent to the existing KSS reduces the development’s landscape and visual impact on the surrounding area by grouping infrastructure elements closely together.

2.2.7 As a result of the proximity to the substation, the underground 400 kilovolt (kV) cable connecting the Proposed Scheme to KSS will be short, and thus avoid any major infrastructure, ensuring that environmental impacts associated with cable installation are reduced to a minimum, and minimise connection costs and transmission losses.

2.2.8 The selected Site is not located within or close to national or international designated sites, heritage designations and is not located within a flood zone.

2.2.9 There is one LWS located within 1 km of the Site, Riccarton Moss (Crossbush) Local Wildlife Site (LWS). The southern boundary of the LWS is on the edge of the Site (see Volume 3, Figure 5-2), with a small area (roughly 1380 m^2, the field edge) overlapping it which would be lost to road-widening for the access route. The LWS is described by the East Ayrshire Council State of the Environment Report as being a small remnant of raised bog habitat that has been drained but is of some botanical value, and of ornithological interest when flooded. Fieldwork showed found that no peatland exists along the road edge (i.e. there is none within the Site), and the desk study suggests there is no peat or no significant quantity of peat within the LWS as a whole. The appearance of vegetation in the LWS on aerial imagery indicates that if any remnant bog is present, it could only be in the field approximately 110 m north of the Site, therefore there would be no direct impact upon bog as a result of the Proposed Scheme.

2.2.10 Field boundaries generally consist of native hedgerows, some well-formed and some which appear to be remnants. The dense areas of hedgerows provide good screening for the Site from different viewpoints. Mature vegetation associated with the road corridors provides important visual screening and helps to lessen the impacts and visually enclose sections of the Proposed Scheme. Landscape planting in keeping with the existing landscape characteristics of the area is proposed to provide additional screening of views of the Proposed Scheme from sensitive receptors, the closest of which is approximately 350 m to the south-west.

2.2.11 The Proposed Scheme would be accessed during construction and operation using the existing unnamed road off Treeswoodhead Road. As part of the construction of the Proposed Scheme, this road would be upgraded and widened in places to allow for the movement of heavy good vehicles that will deliver construction materials to the Site.

2.2.12 The Applicant has a good relationship with the landowner of the Site and a contractual agreement is in place to ensure the landowner is financially compensated for the delivery of this Proposed Scheme.

2.2.13 The Applicant screens potential sites against planning and environmental constraints at an early stage to select the most suitable ones for development. The Applicant looked at a number of potential site options. The Site selected performed best in terms of proximity to the KSS, land owner agreement and environmental constraints.

2.3 Site and Surroundings

Existing Conditions

2.3.1 The Site lies on agricultural land with farm buildings, the KSS, an industrial building and a number of residential dwellings within its immediate surroundings. The Site is approximately 2 km south-east of the town of Kilmarnock.

2.3.2 The immediate surroundings of the Site comprise of trees, hedges, Cessnock Water, Treeswoodhead Road and overhead power lines. An underground Scottish Water main runs from north to south across the Site.

Environmental Context

2.3.3 The Proposed Scheme is not located within or adjacent to any national or local landscape designations. The existing electricity transmission infrastructure adjacent to the Proposed Scheme heavily influences the landscape character in the immediate surrounding area. More information on the existing landscape character within and surrounding the Site, and views of the Proposed Scheme are provided in Chapter 4: Landscape and Visual Effects, of this EIAR.

2.3.4 There are no Sites of Special Scientific Interest (SSSI) within 2 km of the Site (existing/designated or proposed/candidate), and no Special Areas of Conservation (SACs), (existing/designated or proposed/candidate) Special Protection Areas (SPAs) or Ramsar Sites within 10 km of the Site. The Muirkirk and North Lowther Uplands SPA is located, at closest, 9.5 km south-east of the Site.

2.3.5 The Proposed Scheme access route intercepts the southern border of Riccarton Moss (Crossbush) Local Wildlife Site (LWS), as shown in Volume 3, Figure 5-2. Riccarton Moss (Crossbush) LWS is a small remnant of raised bog habitat that has been drained but is of some botanical value, and of ornithological interest when flooded. Following a site visit the project ecologists found the area of Riccarton Moss within the Site to be of low value. The area of high ecological value located within Riccarton Moss LWS, and comprised of marshy grassland is located in the north of this LWS and outside of the Site boundary. As such it is considered the Proposed Scheme would have no direct effect upon habitat of high value. More information on nature conservation designations and the habitats and species within and surrounding the Site is provided in Chapter 5 Ecology and Biodiversity, of this EIAR.

2.3.6 There are potential noise and vibration sensitive receptors in the area including a small number of residential properties located within 1 km of the Proposed Scheme. Existing sources of noise and vibration include KSS, distant road traffic from the surrounding road network and agricultural noise associated with local farming. More information on the noise and vibration baseline is provided in Chapter 7 Noise and Vibration, of this EIAR.

2.3.7 The Site is located immediately west of Cessnock Water, approximately 4.5 km upstream of the confluence with the River Irvine. Immediately east and south of the Site is a flood zone as indicated by Scottish Environment Protection Agency (SEPA) flood maps (Ref 2-1). The Proposed Scheme has been situated outside of the flood zone and maintains a 30 m buffer from Cessnock Water.

2.3.8 The Site does not lie within an area identified as having potential for peat according to the Carbon and Peatland Map (2016) (Ref 2-2).

2.3.9 As indicated on Easy Ayrshire Council Core Path Plan there is a right of way located along the existing track that would be utilised to access the Proposed Scheme (Ref 2-3).

Topography

2.3.10 A topographic survey was commissioned in August 2022 with accurate measurements collected of the Site using a combination of total stations and Global Navigational Satellite System (GNSS) receivers providing accurate levels to within +- 3mm. This survey provided main features including building outlines, roads, footpaths, kerb heights, areas of hard standing, fences, walls, embankments, changes in level, watercourses, hedgerows, mature trees (trunk position and spread) including areas of

vegetation and bushes. The survey provided enough levels to plot accurate contours at 0.2 m intervals. Data was tied to National Grid with levels related to Ordnance Datum using GNSS.

2.3.11 The topography of the site is generally low lying with moderately steep slopes. Topographic levels on site range by 10 m from approximately 55 m Above Ordnance Datum (AOD) to 45 m AOD. The proposed Site slopes at a consistent gradient from northwest to southeast towards the Cessnock Water watercourse. In elevated areas of the Site the gradient is considered sufficient that groundwater flood risk is low. The Site is not located near to any further sources of flood risk such as canals or reservoirs.

2.4 Description of the Proposed Scheme

2.4.1 The Proposed Scheme is intended to provide services supporting the flexible operation of the Scottish Power network and decarbonisation of electricity supply by balancing electricity supply and demand. The Proposed Scheme would import and export electricity but would not generate any additional electricity. The proposed batteries would store electricity that is generated, to be fed into the electricity network when required and would reduce grid fluctuations, thus improving stability and reducing the risk of power failures. The total capacity of the facility would be up to 500 MW with a 2 hour storage duration.

Design

2.4.2 The design concept for the BESS facility seeks to maximise the amount of BESS infrastructure and energy storage capacity on site, inclusive of transformers and compounds or control rooms required and minimise the scheme footprint. There is minimal need for facilities on site beyond essentials for visiting operational staff and as such the space required for internal access road infrastructure and parking is kept to a minimum in favour of energy infrastructure,

2.4.3 The proposed BESS facility will include the following elements:

- Containerised battery units approximately 3.1 m in height, in sets of four battery units, with each set of four battery units supported by a PCS (Power Conversion System) and MV Transformer;
- Internal access tracks and vehicular access in the north;
- Electrical substation compounds including two 400 kV transformers - Electrical Busbars (up to 12 m in height) and Associated Switchgear to facilitate connection to the electricity grid;
- Welfare facility and control building;
- Security lighting and infrared closed-circuit television (CCTV) fixed on poles (up to 6m in height);
- Perimeter security fencing;
- Underground surface water drainage infrastructure;
- Vehicular parking area (5 spaces, including one disabled and one EV charging port); and
- Landscaping areas in the south and west of the Site.

2.4.4 The grid connection from the Proposed Scheme to KSS would be by an underground cable. The underground cable route would be the most direct route between the BESS and the substation, estimated to be 500 m in length. The underground cable does not form part of this S36 planning application and would be constructed using permitted development rights. An indicative route alignment is provided in Volume 2, Appendix 1-D Scheme Drawings, of this EIAR.

Layout

2.4.5 Batteries will be stored in fully enclosed battery storage containers. The battery storage will be within shipping or modular containers.

2.4.6 Each battery bank will be approximately 13 m long, 3 m wide and 3 m high, similar to a typical 40-foot shipping container The battery banks will be placed in rows and will be separated by a gravel permeable surface.

2.4.7 A battery storage bank will have a storage capacity of up to 5 MWh, depending on the final battery type selected.

2.4.8 The PCS units comprising Inverters and a MV transformer will be located adjacent to groups of battery storage containers. The inverters and transformers will be housed in modular containers adjacent to each battery storage container and will be mounted on hardstanding foundations.

2.4.9 A welfare facility and parking are located in the south east of the Site. Five car parking spaces, including one disabled bay and one Electric Vehicle (EV) charging port would be provided within the Site, providing sufficient space for operational staff.

2.4.10 Located in the south east of the Site is associated on site substation with plant equipment for transferring electricity to the main KSS. This section is enclosed within a perimeter security fence with a security gate for access. This area includes the following:

- High Voltage (HV) Substation compound comprised of two 400kV transformers, measuring 10 m height, 5.5 m width, 15 m length;
- Up to four 33kV Switchgear containers measuring 3.1 m height, 2.5 m width, 12.2 m length;
- Control building measuring 6 m height, 7 m width, 15 m length; and
- Three car parking spaces 2.4 m width, 4.8 m length;

2.4.11 The proposed layout has been developed to ensure optimum operational requirements while responding to constraints in and around the Site. The layout of the battery banks ensures ease of access for maintenance. An access track is located around the perimeter of the Site and located around every two rows of battery units. A narrower track is located between each row of batteries to allow for the maintenance operations.

2.4.12 Site constraints include an underground 450 mm Scottish Water main running from north to south across the western part of the Site. The Site layout has avoided the positioning of any project infrastructure within an appropriate 6 m buffer zone, as specified by Scottish Water to allow for suitable access and maintenance (Ref 2-4).

2.4.13 An attenuation pond is to be located in the south west of the Site which will allow for drainage of surface water to be suitably attenuated to greenfield runoff rates before being discharged off-site.

2.4.14 The layout of the Proposed Scheme in shown in Volume 2, Appendix 1-D Scheme Drawings.

Scale

2.4.15 Whilst the final battery technology has yet to be confirmed, the proposed battery units and inverters would be approximately 3.1 m in height, 2.5 m in wide and 12.2 m in length.

2.4.16 The High-Level Busbars within the Substation located south west of the Site would be the tallest elements within the Site at up to 12 m in height and partially enclosed by a 2.4 m perimeter security fence.

2.4.17 The scale of the Proposed Scheme is illustrated in the Site Elevations drawings, shown in Volume 2, Appendix 1-D Scheme Drawings, of this EIAR.

Appearance

2.4.18 The proposed energy infrastructure and equipment is by nature functional and utilitarian in terms of its appearance. The external finish to the BESS and associated structures will be white steel, all of which will be positioned on steel supports with concrete foundations. Seen within the wider site context with the KSS, it is considered the Proposed Scheme would not be out of keeping with the local landscape character.

2.4.19 The proposed layout design seeks to ensure that the tallest and most visible structures are located within the north eastern corner of the Site rather than positioned in the south which would be a more

exposed position for the electrical substation compound, thereby giving rise to potentially larger landscape and visual effects.

2.4.20 The Site has been heavily screened with woodland planting in the south and eastern edge of the Site to reduce landscape and visual effects.

Surfacing

2.4.21 The buildings, equipment and plant are due to be constructed on a range of surfaces comprising tarmac, type one stone, and limestone chippings.

2.4.22 The junction/access and internal road is proposed to be finished in tarmac.

Boundary Treatment

2.4.23 The BESS compound is to be enclosed with a 3 m high weldmesh fence with an access gate, the colour of which is yet to be confirmed.

Junction and Access

2.4.24 Sidehead Terrace / Treeswoodhead Road is a country road which runs east to west to the south of the Site. Vehicles would gain access to the Site from Sidehead Terrace / Treeswoodhead Road and along an existing Farm Access Road (unnamed). This Farm Access Road would be upgraded and widened to allow for the movement of construction vehicles including AGVs and abnormal loads. To facilitate this a visibility splay has been designed measuring 2.4 m x 70 m to the west and east.

2.4.25 The existing access track from the junction, at Treeswoodhead Road, would need to be widened to provide an adequate width of surface for the Proposed Scheme. This would need to be of the order of 5m wide (minimum) for a length of the existing track of approximately 860 m to where the track would turn southwards across agricultural land towards the BESS facility, requiring a new section of access track 5 m wide (minimum) to be constructed. The length of the new access track would be approximately 420 m. The total length of the access track from Treeswoodhead Road to the BESS facility is 1280 m.

2.4.26 This road would be used during the construction, operation and decommissioning phases. The construction of this new road prevents further widening of Farm Access Road and vehicle movement passing receptors located at the end of Farm Access Road and in close proximity to the woodland located in the north.

2.4.27 Security access gates will provide site security to the site, with a further security access gate to enter the area of the electrical substation compound located in the south east of the Site.

Drainage

2.4.28 To ensure that the proposed discharge rates can be achieved, it will be necessary to provide surface water attenuation within the Proposed Scheme. To ensure no increase in flood risk because of the development, a 41% climate change allowance uplift has been factored into the attenuation/storage assessment (Ref 2-5). Given the drainage system is proposed to manage the runoff from a catchment with an area of less than 5 ha, to deal with flashy rainfall events, the peak rainfall intensity allowance for climate change has been used. Considering the lifespan of the Proposed Scheme and the anticipated increase in rainfall intensity due to climate change, an estimate for surface water attenuation volume has been carried out for the Proposed Scheme using industry standard software named InfoDrainage.

2.4.29 The drainage layout plan is available in Volume 2, Appendix 8-A Drainage Impact Assessment, of this EIAR. This drainage layout plan illustrates how the storage volume could be realised. In addition to the creation of an attenuation basin.

2.4.30 In addition to the creation of an attenuation basin, additional storage is provided within the filter drains serving the wider site. The voids within the surrounding permeable stone of the filter drain provides additional storage when the network becomes surcharged during more significant rainfall events.

2.4.31 For more information on the drainage impact assessment, please see Volume 2, Appendix 8-A Drainage Impact Assessment, of this EIAR.

Preferred battery technology

2.4.32 It is anticipated at this stage that the battery technology to be deployed will consist of Lithium–Ion ("Li-ion") batteries. Further information on Li-ion technology and developer considerations have been provided in the section below.

2.4.33 The battery manufacturing industry is continuously evolving, and designs continue to improve, both technically and economically. The most suitable technology can change with time and therefore the final technological choice for the Proposed Scheme would be made before construction, through a competitive tender process and thorough technical evaluation.

Lithium-Ion batteries

2.4.34 Li-ion batteries have a fast response time which makes them preferable for power application in grid-scale deployment. The current UK ancillary service market has encouraged flexible technology, such as batteries, to bid into service provision: namely Enhanced Frequency Response.

2.4.35 Li-ion batteries vary in cell chemistry (common compounds include Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt Oxide, Lithium Cobalt Oxide and Lithium-Titanate) and cell arrangement (cylindrical, pouch, prismatic). Battery chemistry and arrangement dictate battery performance characteristics.

2.4.36 The final selection of the appropriate battery chemistry and arrangement will consider:

Performance:

- power rating (C-rating);
- optimum state of charge range - considering number of cycles per day and depth of discharge likely to be required to service the markets SPR plan to participate in;
- self-discharge rates;
- cell losses – through heat generated, which affects the system round trip efficiency and cooling considerations;
- rest periods required after cycles; and
- end-of-life condition.

Safety:

- Mechanical integrity – considering transport classifications, drop testing;
- Fire risk assessment – considering likelihood of thermal runaway and specific fire safety requirements; and
- Emissions – no process emissions are envisaged (air or water (leakage), however some noise is generated from the cooling systems.

2.5 Construction Phase

Construction Programme

2.5.1 The overall construction period is anticipated to last up to 24 months, however the intensity of the construction processes will vary during this period, and it will not comprise a sustained 104 week period of intense work. There will be peaks and troughs during the construction period which coincide with more intensive works – e.g. earthworks and laying of foundations. The peak period of construction is anticipated between weeks 13 – 19.

2.5.2 The construction process would consist of the following principal activities:

- set up of temporary works compound;
- building out of internal site access roads;
- site preparation/ laying of any further required hardstanding;
- construction of equipment foundations/drainage;
- construction of Portal Frame building;
- installation of electrical equipment;
- testing and commissioning; and
- site restoration.

2.5.3 Most of these activities would be carried out concurrently, although predominantly in the order identified, in order to minimise the overall length of the construction programme and limit impacts on soft ground by installing the access tracks early in the process. Site restoration would be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

Terracing

2.5.4 The Site is currently agricultural land which slopes from north-east to south-west from approximately 56 – 44 m AOD. As part of the Site preparation to enable the siting of battery containers on flat land, a programme of earthworks would be undertaken to 'level' the Site into two distinct terraces. The higher terrace in the north of the Site would be gently slope from 56 – 52 m AOD over a distance of approximately 140 m. The second terrace would be relatively flat at between 51 – 49 m AOD over a distance of approximately 120 m.

2.5.5 The levelling of the Site is essential to allow the safe siting of battery storage units and associated plant. Building up to these levels would require the import of approximately 30,000 m^3 of clean materials to the Site. A proposed Site levels drawing is provided in Volume 2, Appendix 1-D Scheme Drawings, of this EIAR

2.5.6 The Site levelling works would take approximately 3 months to complete, and all vehicle movements associated with these works, including for the import of material have been considered as part of the Traffic and Transport impact assessment presented in Chapter 9 Traffic and Transport, of this EIAR.

Temporary Works

2.5.7 The Site compound and all necessary Site access would be accommodated within the Site for the Proposed Scheme.

2.5.8 A temporary construction compound would be located in the south of the Proposed Scheme, as illustrated in Volume 2, Appendix 1-C.

2.5.9 Temporary traffic management will be required on Treeswoodhead Road, as detailed further in Chapter 9 Traffic and Transport, of this EIAR

Construction Site Working Hours

2.5.10 Construction working hours would be 07.00 hours to 19.00 hours Monday to Friday and 07.00 hours to 13.00 hours on Saturday. There would be no working outside of these hours or on Sundays or Bank Holidays without prior agreement of the local planning authority (Easy Ayrshire Council).

Construction Staff on Site

2.5.11 It is anticipated that approximately 30 staff would be on Site at any one time and will include office staff and the construction workers

Construction Lighting

2.5.12 Temporary flood lighting for safety reasons would be installed at the Site compound.

2.5.13 During the winter period when daylight hours are reduced, task lighting would be placed within the confines of the Site compound. Tower lights would be positioned at key access points during these winter periods to allow safe access into the Site compound. Additional tower lights would be positioned within key areas of the work site. All lighting would face in a downward direction to avoid light spill onto adjacent land and sensitive receptors.

Fencing

2.5.14 The construction works would be fenced off from the rest of the land using industry standard braced and weighted Heras fencing. This fencing will secure the perimeter of the Site.

2.5.15 Hoarding or semi-permanent fencing would be installed at the compound for security reasons to secure the plant storage area and office facilities.

Construction Traffic and Access

2.5.16 For the construction of the Proposed Scheme both Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs) will be required to transport materials and personnel to and from the Site. Following classifications in accordance with the Driver and Vehicle Standards Agency (DVSA) Lorry types and weights guide 1 the following classifications are proposed to be used for the Construction Traffic Management Plan (CTMP):

- LGV = Vehicles 3.5 tonnes or below in gross weight;
- HGV = Vehicles above 3.5 tonnes in gross weight up to 11 tonnes; and
- Abnormal Indivisible Loads (AILs) = Vehicles above 11 tonnes in gross weight.

2.5.17 The management of traffic and travel demand during construction would be set out in a CTMP that will be prepared by the Contractor in advance of the works.

Construction Environmental Management Plan

2.5.18 The Principal Contractor (PC) would be required to develop a Construction Environmental Management Plan (CEMP), which will include roles and responsibilities, detail on control measures and activities to be undertaken to minimise environmental effect and monitoring and record-keeping requirements.

2.5.19 A commitment will be made to periodically review the CEMP and undertake regular environmental audits of its implementation during the construction phase. The CEMP would be prepared and agreed upon in consultation with the LPA. Therefore, the submission and approval of the CEMP will likely be secured by a s36 consent condition.

Waste

2.5.20 The Applicant has undertaken a detailed earthworks modelling exercise to determine the cut and fill balance and required importation of material to site. The levelling of the Site is essential to allow the safe siting of battery storage units and associated plant. Building up to these levels would require the import of approximately 30,000 m^3 of clean materials to the Site. The proposed Site levels drawing is provided in Volume 2, Appendix 1-D Scheme Drawings, of this EIAR.

2.5.21 The PC would be required to manage Site waste sustainably by adopting measures to limit waste (not over-ordering), appropriate stock control and recycling waste, where possible. The Contractor will be required to adopt and maintain a Site Waste Management Plan (SWMP), as industry best practice.

2.6 Operation Phase

2.6.1 After commissioning, the Proposed Scheme will be operated and maintained in such a manner as to keep it safe and in good working condition. Where relevant, the operation and maintenance will take account of the requirements of any authorities or third parties such that the Scheme integrity is not compromised.

2.6.2 The Proposed Scheme will have an operational lifetime of around 40 years, and will operate in either "energy charge", "energy storage" or "energy discharge" modes.

Operational Environmental Management

2.6.3 The Proposed Scheme will be operated in accordance with the Applicants Health, Safety and Environmental Management System.

Operational Safety

2.6.4 The Proposed Scheme will be equipped with control and protection systems which will continuously and automatically monitor variables from a central off-site host computer, via a Distributed Control System (DCS).

2.6.5 In addition, specific design requirements for any required diesel fuel, oil and chemical storage containers and containment systems will be included in the Proposed Scheme specifications.

Fire Risk

2.6.6 The control and protection systems will include a comprehensive fire detection and protection system.

2.6.7 There is a potential fire risk associated with certain types of batteries such as lithium ion, which are proposed for the Site.

2.6.8 A small risk when using lithium-ion battery technology for BESSs is thermal runaway, where excessive heat and fire in one cell keeps creating more heat, igniting neighbouring cells and creating a fire which is difficult to control.

2.6.9 Latest battery technology includes a cooling system which is designed to regulate temperatures to within safe conditions to minimise risk of fire.

2.6.10 The UK's existing safety guidance for BESSs is covered by a range of regulations and requirements surrounding electrical installation, grid connectivity, product safety and dangerous goods. This includes:

- Underwriters Laboratories Standard UL 9540A: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (Ref 2-6);
- UK Power Networks Engineering Design Standard 07- 0116: Fire Energy Storage Systems (Ref 2-7);
- DNV Recommended Practice 0043: Safety, Operation and Performance of Grid-Connected Energy Storage Systems (Ref 2-8);
- National Grid Technical Specification 3.01.03: Limitation of Fire Risk in Substations (Ref 2-9);
- British Standard 5839-6:2019+A1:2020: Fire Detection and Fire Alarm Systems for Buildings (Ref 2-10);
- The Regulatory Reform (Fire Safety) Order 2005 (Ref 2-11); and
- International Electrotechnical Commission 61936-1:2021: Power installations exceeding 1 kV AC and 1,5 kV DC – AC (Ref 2-12).

2.6.11 Any electrical installation that the public will come into contact with as part of their day to day lives must comply with the Institute of Engineering and Technology's wiring regulations (BS 7671L2018+A1:2022) (Ref 2-13).

2.6.12 Fire detection and suppression features would be installed to detect (e.g. multi-spectrum infrared flame detectors) and suppress fire to minimise the effect of any fire. The Proposed Scheme design will include adequate separation between battery units to ensure that an isolated fire would not become widespread and lead to a major incident.

2.6.13 The risk of fire is small and therefore not likely to lead to any major accidents or disasters as this has been mitigated by the design of the equipment and the design of the Site.

2.6.14 The battery technologies and Site design with regards to fire protection, is in line with regulations as the following apply:

- The batteries would not be installed in an environment where temperatures routinely approach or exceed 80°C;
- The batteries would not be installed near heating equipment or heat sources;
- The batteries would be located outside of a flood zone and would not increase the risk of flooding elsewhere; and
- The installation area would comply with the appropriate local fire, electrical and building code requirements.

2.6.15 Once the system is commissioned, regardless of the technology used, the whole installation will report and be monitored continuously by a central hub (Operations and Maintenance Centre) where engineers and technology experts will ensure that it is operating optimally and safely 24 hours a day, 7 days a week, with all safety issues related to overheating flagged immediately.

System design to reduce fire risk

2.6.16 A crucial consideration for reducing fire risk in BESSs are the materials used as part of the system itself. For example, the insulation of the container would be made using non-combustible materials where possible. Additionally, the system would include a ventilation system to minimise the risk of overheating.

Fire protection systems

2.6.17 For BESSs, implementing a fire detection and suppression system that is unique to the Proposed Scheme and its individual uses and requirements is key for ensuring optimum safety. The Proposed Scheme has considered the importance of fire suppression systems and minimising fire risk, for example the battery containers have an appropriate separation distance to thermal runaway of 5 m.

2.6.18 During detailed the design the following will be considered:

- The use of dedicated fire areas;
- The type of detection and suppression system that should be installed to account for a site's individual risks;
- How these systems should be tested; and
- Information for firefighters, typically involving the fire service or fire engineering expertise in planning for an emergency response.

2.6.19 Fire protection and detection systems will be provided throughout the Proposed Scheme. This will cover all equipment on the Proposed Scheme that could constitute a fire risk.

2.6.20 As the costs for these systems come down and their adoption more widespread, it must be recognised that attention to detail will not just shape the future performance and reliability of such systems, but it will also impact public confidence in their widespread use.

2.6.21 The fire protection and detection system (which will incorporate heat sensors) will be used in conjunction with automatic spray nozzles, smoke detectors, fire alarms and typical portable appliances.

2.6.22 A BESS fire may cause pollution within surface water runoff. In the detailed design stages of the works, any run off will be contained within localised bunding and attenuated within gravel subgrade of lined permeable Sustainable Drainage System (SuDS) features prior to being forwarded to the local drainage network.

2.6.23 In the event of a BESS fire, self-actuating valves at outfalls of the BESS will be automatically closed. This would isolate the Site drainage from the wider drainage network.

2.6.24 Any contaminated water at the Site will then be tested, treated, and released. If this was not possible then any contaminated water would be removed from the Site by tanker, as necessary.

Operational Security

2.6.25 Whilst the Proposed Scheme will be unmanned, regular inspection and maintenance visits will be undertaken. Accordingly, a small number of parking spaces and a small welfare building are incorporated.

2.6.26 Operational security of the Proposed Scheme will be achieved by providing suitable fencing on the Site perimeter (3 m in height), and security will be monitored via the use of CCTV/ security cameras (attached to emergency lighting columns, up to approximately 4 m in height)

2.6.27 Specifically, regarding security lighting, there will be no permanent or regular lighting, and only emergency lighting is proposed.

2.6.28 Lighting columns will be motion sensitive (for example, controlled by an infrared monitor sensor system), and will switch on only when movement within the BESS site is detected when essential operational maintenance is required. The emergency lighting will be highly directional (for example, controlled by cowling) to avoid excessive light spillage beyond the boundary fencing. The emerging lighting design will be undertaken with reference to the relevant guidance such as the “Guidance Note 01/21 for the Reduction of Obtrusive Light”.

2.6.29 Furthermore, whilst it is noted to be up to approximately 4 m in height, the emergency lighting columns will be of the minimum height possible to provide the required lighting. As the lighting will be motion sensitive and direction, no potential for nuisance arises.

Operational Site Access

2.6.30 Access to the Proposed Scheme will be strictly controlled.

2.6.31 Operational site access will be via the new main site access only.

Operational Working Hours and Anticipated Vehicle Movements

2.6.32 Once operational, the Proposed Scheme will be unmanned, and operated and monitored remotely with an automated system alerting an engineer in case of a component or system issue. Each battery module contains a failsafe monitoring control system that will shut down the module if a battery becomes faulty.

2.6.33 Visits to the facility will be related only to those required for maintenance purposes. Traffic movements will therefore be a single vehicle per day (two vehicle movements) as a worst-case frequency.

2.7 Decommissioning Phase

2.7.1 At the end of the project’s operational life the BESS will be fully decommissioned. This will involve the careful dismantling of the component elements including the electrical equipment and welfare facilities to leave the concrete base upon which the BESS site sits.

2.7.2 The operational lifespan of the project is 40 years and over this time any landscaping associated with proposals will establish and grow to form mature trees, hedgerows and shrubbery. All landscaping will be retained in situ.

2.7.3 All project elements will be removed from the Site and where possible will be recycled. Under the 2009 Waste Batteries and Accumulators Regulations (Ref 2-14) the appointed BESS integrator will be required to take back any waste batteries, and ensure they are delivered to an approved treatment and recycling facility. In addition, wherever possible, the equipment will be removed offsite by an approved and licensed waste management operator, for treatment and an approved and licensed facility.

2.7.4 An alternative option for decommissioning would be to export the equipment for use in third world countries. The developer in discussion with EAC would determine the preferred decommissioning option, in accordance with relevant environmental legislation and best practice at time of decommissioning.

2.7.5 Decommissioning would take account of the environmental legislation and technology available at that point in time, with notice being given to EAC in advance of commencing such works.

2.7.6 A decommissioning programme will be agreed with the relevant authorities prior to commencement of the required works.

2.7.7 Decommissioning would be timed to minimise its environmental impact and all necessary licenses or permits would be acquired. As many elements as possible from the Proposed Scheme would be recycled / re-used.

2.7.8 An alternative option if the prevailing market conditions or electricity supply constraints at the time indicate that it would be appropriate to extend the Proposed Scheme operational lifetime, then decommissioning may be deferred. At the end of the BESS operational life cycle the BESS units may be refurbished or replaced. This action would be dependent upon many factors all of which would combine to inform viability at such future date. Any such proposal would require a new development consent application.

2.8 Proposed Scheme Design Considerations

Drainage Design

2.8.1 In support of the Proposed Scheme, a proposed drainage layout has been provided that captures, treats and restricts runoff from the site at 20.5l/s as required by EAC's Local Development Plan, where a rate of 4.5l/s/ha was specified.

2.8.2 In accordance with Scottish Water's hierarchy, and general good industry practice, the disposal of surface water through the capture/re-use and infiltration have been discounted due to the sites use and underlying geology respectively. Therefore, the next and most suitable point of discharge is to the adjacent watercourses, as per the existing pre-development scenario.

2.8.3 A total of c.3,725 m^3 of storage volume is required to achieve the restriction in rate. Filter drains and a detention basin are proposed to provide both treatment and attenuation of runoff from the access tracks and sealed container units with associated hard standing.

2.8.4 The substation compound will have its own dedicated oily water drainage system, which will discharge to the wider surface water system serving the Site. This will include several treatment features including, sumps, bunds and full retention separators, as required. This will both treat conventional runoff as well as provide sufficient means of intercepting and storing more significant pollution events (from a leakage of transformer oil) prior to discharge to the nearby Muggersland Burn.

2.8.5 For more information on the proposed drainage layout plan, please see Volume 2, Appendix 8-A Drainage Impact Assessment, of this EIAR.

Flood Risk Design

2.8.6 The Proposed Scheme has been assessed against the risk of flooding from all sources including fluvial, tidal, surface water and sewer flooding, groundwater and other sources of flood risk (canals and reservoirs).

2.8.7 The existing hydraulic model of the River Irvine and its tributaries was used in this study, accepting that the 1D cross sections and LiDAR accurately represented the current situation. No new survey, either in the channel or on the Site, was undertaken as part of this Flood Risk Assessment (FRA). The Site lies in an area of LiDAR that was flown in 2016 as part of the Irvine Valley Flood Study and is therefore considered to provide an accurate representation of the floodplain.

2.8.8 The Site has been carefully sited to avoid areas of flood zone. The areas of flood zone within the Site is designated for landscape planting and as such there would be no increase to flood risk due to the construction, operation and decommissioning of the Proposed Scheme.

2.8.9 For more information on the FRA, please see Volume 2, Appendix 8-B Flood Risk Assessment, of this EIAR.

Landscape Design

2.8.10 A number of considerations have influenced the design from the initial concept of the Proposed Scheme through to the presented design. The landscape proposals are shown on the Landscape General Arrangement plan, please see Volume 2, Appendix 1-D Scheme Drawings, of this EIAR.

2.8.11 The planting design and species choices has been guided by the surrounding landcover patterns, habitats and plant species found locally and identified in the local landscape character assessments.

2.8.12 An attenuation pond has been carefully designed to present a more naturally occurring pond and to avoid an engineered appearance.

2.8.13 The landscape proposals incorporate a range of plant and habitat types including the following:

- Strategic dense woodland planting along the eastern and southern extent of the Site is proposed to provide mitigation screening and ecological enhancement. As the woodland planting would be located in a flood zone, a wet woodland mix is proposed. Woodland buffer planting is proposed in the south west of the Site along the border, to protect the proposed woodland in the south west.
- One of the most important functions is to provide screening. The screen belt will consist of a mixture and a combination of shrubs, fast growing trees, and dense long-lived trees. A multi layered structure of mainly native species is proposed.
- Native trees in keeping with the local landscape are proposed to the south. Plant species were also chosen so that benefited the local conservation and integration within the landscape.
- Scrub planting in the east and would provide as transitional vegetation between the woodland and grassland.
- Wetland grassland would be located east and south east of the Site perimeter fence. A wetland grassland mix has been selected due to this area of the Site being located within a flood zone.
- Wildflower grassland is located south west of the perimeter fence.
- Hedgerow planting along the access track will replace hedgerows lost for widening works of the access track.
- No vegetation is proposed within the perimeter fence of the Site to prevent the spread of fire, in an unlikely event a fire does break out.
- The planting will help to reinforce the mitigation effects and to soften the created landform and lighting as it matures.
- In order to reduce the impact on the development on the surrounding environment, come of the natural vegetation was protected and augmented.
- By careful siting and design of the development and approaches, some strands of existing vegetation were retained.
- Planting style and structure is in keeping with the surrounding vegetation.
- Blocks of vegetation link to the established vegetative corridor and maintain habitat corridors.

2.9 References

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