3. Description of the Proposed Development

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3.1. Introduction

3.1.1. This chapter provides a description of the proposed Lochluichart Battery Energy Storage System (BESS) (the 'Proposed Development'). The planning application is for the construction and operation of a battery energy storage system consisting of up to 55 battery energy storage units, electrical connection and control buildings, landscaping, fencing and ancillary infrastructure.

3.1.2. The Proposed Development will import and export electricity, however it would not generate any additional electricity. The BESS will have a maximum export capacity of up to 36 MW. This project has been designed with a 4-hour discharge period.

3.1.3. The battery energy storage sector is continually evolving and designs continue to improve, both technically and economically. The most suitable technology can change with time and therefore the final technical choice for the development would be made before construction through a procurement process.

3.1.4. The planning application drawings and the description of the proposals in this chapter have been based on a typical arrangement that would be expected for a BESS proposal. The number and size of battery units, the building design and the extent of external equipment required may vary as a result of the procurement process.

3.1.5. At this stage it is anticipated that the battery technology to be deployed will consist of Lithium-Ion (LI-Ion) batteries. These batteries are used widely within energy storage technology because of their high energy density and charge / discharge cycle fatigue resistance compared to other technologies. Li-Ion batteries also have a fast response time which makes them preferable for power application in grid-scape deployment.

3.1.6. The Proposed Development would be a permanent use. The battery cells within the units would need replacing at various stages in the future. It is likely that there would be initial repowering exercises after 10 – 15 years and then again at 20 – 25 years.

3.1.7. When battery cells reach the end of their life, a recycling process would be followed with an approved recycling partner. The partner would transport the batteries to a suitably licensed recycling centre, where cells would be processed. Only hydrogen, oxygen, and limited volumes of carbon dioxide would be emitted from the recycling process.

3.2. Need for the Proposed Development

3.2.1. The United Kingdom's electricity network has historically relied on large, centralised power stations. However, numerous coal fired power stations have recently been decommissioned and gas fired power stations are increasingly being used intermittently when demand is high and electricity cannot be supplied by renewable sources. Existing nuclear power stations are reaching the end of their design lives and there will be further delays before new nuclear plants come online.

3.2.2. There is an ever-increasing reliance on renewable forms of electricity generation, such as wind and solar, to meet the United Kingdom's electricity demands. The amount of renewable electricity generated from wind and solar is, however, intermittent due to weather dependency. As a consequence, electricity demand and supply are becoming more challenging to balance.

3.2.3. National and international legislation and policies are in place and set an ambitious target to reduce Scotland's emissions of all greenhouse gas emissions to net zero by 2045.

3.2.4. Battery projects located in areas where there is a large amount of renewable energy generators, play a vital role in decarbonising the energy sector whilst maintaining reliable energy security for consumers. Our current national grid has located key generation assets (coal, gas, nuclear) and transmission cables to serve areas of high energy demand with commensurate supply. In contrast, renewable generation is located to maximise optimal weather conditions such as high wind locations in northern Scotland or in the North Sea.

3.2.5. As a result, we cannot get the power where we need it or maximise the use of our own renewable electricity generation. National Grid Electricity System Operator ('NGESO') currently pays renewable generators to turn off supply in Scotland, to prevent an overload of the system, and simultaneously instructs fast response generators (normally gas power plants) in areas of high consumption to switch on to balance supply and demand.

3.2.6. Batteries are essential in overcoming this challenge and play a vital role in unlocking the full benefits of existing and future renewable energy generation, supporting the successful transition to a net-zero future. They work by importing surplus renewable energy from nearby wind or solar farms when generation exceeds demand, storing it, and then exporting it back to the grid when demand rises and supply is lower. The connection to Corriemoillie Substation enables the Proposed Development to help stabilise fluctuations in grid supply and demand, enhancing overall system reliability.

3.2.7. In relation to energy security, the Proposed Development also has the potential to supply the grid with voltage support services during low voltage periods or blackouts by supplying the network with quickly dischargeable energy. Essentially the BESS would import and store electricity from the network when there is a surplus of generation and then export this again when there is a deficit. This balancing function reduces the amount of time that renewable generation needs to be 'curtailed' (i.e. switched off) reducing the need to generate electricity from fossil fuel sources; primarily gas fired power stations.

3.2.8. The operation of batteries such as the Proposed Development offer a sustainable alternative to carbon-intensive energy sources to supply and maintain the grid, which reduces the energy network's reliance on fossil fuels and ultimately contributes to achieving the UK and Scottish Governments' greenhouse gas emissions targets, whilst enabling enhanced energy security and reduced energy costs for consumers.

3.2.9. The BESS has been largely designed to fulfil a balancing function. The BESS has been sized at 36MW maximum output principally as a result of the import-export grid capacity that was available at Corriemoillie substation. The use of a 4-hour discharge design parameter enables the BESS to provide a sizeable amount of balancing.

3.2.10. The changing generation mix (explained above) and increasing intermittency is also decreasing the level of system inertia. Lower system inertia affects the ability of the system to manage the electricity network frequency within normal operating limits (within +/- 1 % of 50 hz). If the network is not maintained within the required frequency tolerance, system stress can result in widespread power supply issues and damage network infrastructure.

3.2.11. The BESS would have the ability to discharge electricity extremely quickly and therefore it could, at least in part, be operated so that it serves a frequency response purpose, as well as a balancing function.

3.3. Proposed Development Layout

3.3.1. The overall layout of the Proposed Development is shown on **Figure 'Site Plan'**. The footprint of the BESS compound including a potential future augmentation area is approximately 1 ha and the new section of access track is approximately 400 m in length. In total, the footprint of the BESS compound, potential future augmentation area and new track is approximately 1.3 ha.

3.3.2. The BESS compound would measure 115 m x 70 m, which includes a potential future augmentation hardstanding measuring 50 m x 30 m.

3.3.3. The approximate grid reference of the centre of the main battery facility compound is (eastings) 234364 (northings) 863818.

3.3.4. The proposed BESS will connect to Corriemoillie Substation via a 33 kV underground cable, meaning a high-voltage step-up transformer is not required at the BESS compound. This simplifies the electrical infrastructure and reduces the overall footprint of the site.

3.4. Description of the Proposed Development Elements

Energy Storage Units

3.4.1. The main compound is likely to contain up to 55 energy storage units, which would be installed typically in sets of four units, in a grid arrangement, as shown on **Figure 'Indicative BESS Platform Layout**'. Each unit would typically be approximately 6 m long, 2.5 m wide and 3 m high.

3.4.2. **Figure 'Indicative BESS Container Details'** shows a typical energy storage unit. The units will consist of steel containers which are designed to be secure and protect the contents from weather. The containers will have an appropriate RAL light grey and / or green finish, which will be agreed with the local planning authority.

3.4.3. The container units will house rows of battery modules arranged in racks. The battery cells are likely to be of the Li-Ion type.

3.4.4. The battery units are likely to incorporate a liquid cooling system rather than an air conditioning-based cooling system. It is therefore unlikely that there would be HVAC (Heating Ventilation and Air Conditioning) units on top or on the side of the container units.

3.4.5. It is likely that each unit would have a vent which would be flush with the side of the unit. As explained in more detail below the units will also include fire detection and suppression systems

3.4.6. It is likely that the units will sit on small, concrete footings or bases that will be approximately 0.5 m high.

3.4.7. It is proposed that the final approval of the appearance and specification of the energy storage units should be made the subject of an appropriate planning condition.

Inverter and Transformer Units

3.4.8. The Direct Current (DC) battery voltage needs to be converted into Alternating Current (AC) using inverters and then transformed to a network voltage. Each group of four energy storage units would be associated with a single combined inverter and transformer unit (Power Conversion System, PCS), which means that circa 11 of these would be required, as shown in **Figure 'Indicative BESS Platform Layout'**.

3.4.9. The combined inverter and transformer units would typically be 6.1 m long, 2.4 m wide and 2.9 m high. An indicative elevation is shown in **Figure 'Indicative Power Conversion System Details'.**

Switchgear and Control Building

3.4.10. As shown in **Figure 'Indicative BESS Platform Layout'** there would be one switchgear and control building. They are typically 21.5 m long, 6.0 m wide and have a height to the ridgeline of the roof of 4.0 m. **Figure 'Indicative Control Building Plan and Elevations'** provides a typical elevation for the building. The control building would be for the battery facility operator. Part of this building would house switchgear and other connection equipment. It would also contain the control room which would include the supervisory control and data acquisition (SCADA) and the battery management system (BMS) equipment. There would be an office with stores and welfare facilities within another part of the building. No staff will be based at the Proposed Development. Four parking places will be provided adjacent to the battery facility operator's building for visiting maintenance personnel.

3.4.11. The Proposed Development would not have a foul sewer connection. Foul drainage from staff welfare facilities on site would be disposed of either by a packaged biological foul treatment plant with discharge to the surface water system or to a storage tank for offsite disposal via road tanker.

3.4.12. The battery units would be connected to the onsite switchgear and control building via cables which would be buried in trenches of around 0.5 m to 1 m in depth, within the compound.

Generator

3.4.13. A backup generator would be installed within the BESS compound to provide emergency power supply to key systems in the event of a grid outage or operational failure. This ensures the safe shutdown and continued operation of essential control, monitoring, and cooling systems during unexpected power interruptions. The generator will operate infrequently and only under emergency or maintenance conditions, in line with relevant environmental and safety standards. See **Figure 'Indicative BESS Platform Layout'** for the positioning of the generator within the platform.

Water Tanks

3.4.14. Three standby water tanks will be located within the BESS compound. Two tanks, each with a capacity of 230,000 litres, will store dedicated firefighting water, providing a total of 460,000 litres for fire suppression. The third tank will remain empty to serve as containment for any water runoff from the bunded areas, in accordance with fire safety and environmental management requirements. See **Chapter 14 Outline Battery Safety Management Plan** for more information and **Figure 'Indicative BESS Platform Layout'** for the positioning of the water tanks.

Potential Future Augmentation Area

3.4.15. The storage capacity and maximum output from the battery units is likely to diminish after a period of about 10 years. There are various methods of maintaining the output including: progressive replacement of battery cells within units, replacement of whole units within the main facility (commonly known as repowering) or installing additional battery units within or next to the main facility.

3.4.16. The decision on whether to install further battery units would be taken at a later date. As a precaution, a potential future augmentation area measuring 50 m by 30 m has been included in the Proposed Development layout design and planning application. This is located immediately to the east of the access track opposite the main BESS compound access gate.

3.4.17. The potential future augmentation area would be laid out as a crushed rock hardstanding, during the construction programme for the main facility.

Construction Compound

3.4.18. During the construction phase a temporary construction compound area would be required. This will be located within the potential future augmentation area. The compound would be used to store materials, provide vehicle parking, and would form a location for site cabins, offices and welfare facilities.

3.4.19. The construction plant and materials would remain for the anticipated 36-week duration of the groundwork and installation phases of construction but would be removed during the commissioning stage to leave a clear hardstanding.

Hardstanding

3.4.20. The BESS compound would be formed of crushed aggregate laid on permeable membranes. The aggregate would be sourced from local quarries and transported to the Site via the A832, existing access track and proposed new track.

3.4.21. Cut and fill earthworks across the compound area would be carried out at an early stage of the construction process to create a suitable level development platform. The earthworks would be designed to minimise the need for fill material to be brought to the site or for excess material to be removed from site, as far as practicable.

Attenuation Basin

3.4.22. An attenuation basin has been included in the overall scheme layout. The basin would be designed as a SuDS feature. Runoff from the impermeable elements of the BESS compound would be collected and directed into the pond which would provide treatment and attenuation prior to discharge to the receiving watercourse.

3.4.23. The pond would have graduated margins and be natural in shape so it would be well integrated into the surrounding landscaping area. The margins would be planted with wetland plant species appropriate to the local area to promote biodiversity.

3.4.24. The detailed design of the pond would be provided as part of a surface water drainage scheme to satisfy a planning condition.

3.4.25. Further information about the Attenuation Basin can be found in **Chapter 10 Hydrology and Hydrogeology** and **Chapter 14 Outline Battery Safety Management Plan**.

Grid Connection

3.4.26. The Proposed Development would connect to Corriemoillie Substation, located approximately 250 m east of the BESS compound. A 33 kV underground cable would be installed along the existing cable corridor, linking the BESS compound to the Substation.

Fencing

3.4.27. The BESS compound would be enclosed by a 3 m high steel palisade fence installed along the outer perimeter, providing security for the internal infrastructure.

3.4.28. The exact colour of the fences would be agreed with the council but they are likely to be either dark green or brown. The position of the fences are shown in **Figure 'Indicative BESS**

Platform Layout' and the details of the fences are shown in **Figures 'Indicative Palisade Security Fence Detail'.**

Lighting

3.4.29. There would be no permanent visible lighting within the BESS compound. The visible lighting within the main compound will solely consist of motion-sensitive lighting at the entrances to the storage units and buildings, which will only be activated during occasional visits by maintenance personnel. This will be designed to be downward facing to minimise any light-spill beyond the enclosure.

3.4.30. There would also be invisible infra-red lighting within the compound which would be detectable by security cameras. It is proposed that a condition be attached to the planning permission requiring the submission and approval of a lighting scheme for the BESS. The indicative lighting scheme is shown in **Figure 'Indicative Lighting and CCTV Column Details'**.

Closed Circuit Television Masts

3.4.31. Closed circuit television (CCTV) cameras would be installed on 4 m high columns; the cameras would also be mounted on the 3 m high palisade security fencing at each corner and at strategic intervals along the BESS compound.

3.4.32. The masts would accommodate infrared night-time cameras, as well as standard cameras, to maintain security surveillance during hours of darkness.

3.4.33. The detailed design of the CCTV masts and equipment would be submitted at a later stage to satisfy a planning condition. See **Figure 'Indicative Lighting and CCTV Column Details'.**

Access Track

3.4.34. Access to the BESS platform from the Site entrance along the A832 will initially be along the existing forestry track which extends northeasterly adjacent to the western Site boundary, then along a new section of track approximately 400 m long, orientated west-east.

3.4.35. The use of the existing forestry track is environmentally beneficial as it avoids the creation of another access junction from the A832, minimising impact to undisturbed ground.

3.4.36. The new section of track will be constructed of crushed rock and have an approximate running width of 5 m. The track passes across land that is undulating, and it has been designed to avoid areas of deep peat. An indicative cross-section of the track is shown in **Figure 'Proposed Access Track Cross Section Detail'.**

3.4.37. A watercourse crossing culvert is proposed along the new access track which will be designed to accommodate a 1-in-200-year flood event plus climate change event, ensuring no increase in off-site flood risk. See **Figure 'Indicative Culvert Detail'** for details on the proposed Culvert design.

Site Access Junction Improvement Works

3.4.38. Minor improvement works are required at the Site Access Junction to widen the track. This upgrade is designed to safely accommodate the passing of two HGVs entering and exiting the Site, enhancing access efficiency and road safety. Refer to **Figure 'Site Plan'** and **'Proposed Site Entrance Improvement Works'** for more details.

Forestry Felling

3.4.39. Tree Felling is required on site for the proposed new track and BESS compound. This would include small areas of native pinewood or native birch woodland. The Site has been carefully designed to minimise tree loss as far as practically possible.

3.4.40. A small amount of felling is required along the A832 near the Site entrance, to achieve the necessary eastern and western visibility splays for road safety.

3.5. Construction of the Proposed Development

3.5.1. The start of construction would depend on the planning process, and the procurement stage.

3.5.2. The on-site construction period is estimated to be approximately 6-12 months, however, this could be longer if there is a delay between the ground works and the installation stage due to the lead in time for the delivery of the battery units and inverters.

3.5.3. The construction activities are listed below in the approximate order that they would take place, albeit that the duration of some activities will overlap.

Ground works

- Site Entrance Junction improvement works.
- Felling and extraction of forestry within the main part of the site.
- Formation of the construction compound (potential future augmentation area) immediately to the east of the main BESS compound.
- Construction of new onsite access track from the existing forestry track within the Site.
- Levelling and preparation of the main BESS platform.
- Preparation of battery unit and other foundation footings within the compound.
- Trenching and laying of cables within the compound.
- Formation of compound with imported aggregate.

- Construction and electrical fit out of buildings and enclosures within the compound.
- Formation of Attenuation Basin.
- Erection of palisade fences around compound perimeter.

Installation

- Delivery of the battery units, inverters and transformers using heavy goods vehicles and installation using a crane.

Commissioning

- Installation of underground electrical cable to Corriemoillie Substation.
- Setting, testing and monitoring initial operation of the battery facility

Proposed Site Reinstatement and Enhancement

- Peatland restoration and enhancement;
- Compensatory planting;
- Woodland enhancement and tree / shrub planting;
- Common Rhododendron management;
- Sphagnum Moss enhancement; and
- Installation of Bat boxes and Hibernacula.

3.5.4. The typical construction plant to be used would include: excavators, graders and haulage vehicles, mobile and tower cranes, heavy and light goods vehicles.

3.5.5. The crushed rock used to form the compound hardstanding will be imported from local quarries. The material for the foundations will be imported ready mixed concrete. Material excavated during the ground works phase will be reused within the site.

3.5.6. Normal construction working hours would be Monday to Friday 08:00-18:00 and Saturday 08:00-13:00. No Sunday, bank holiday or night working is proposed except as described below. Up to an hour before and after the normal construction working hours, the following activities may be undertaken:

- Arrival and departure of the workforce at the site and movement around the project site that does not require the use of plant.
- Site inspections and safety checks; and
- Site housekeeping that does not require the use of plant.

3.5.7. Non-noisy activities such as fit-out within buildings may be undertaken outside of those hours where these would not cause disturbance off-site. It is possible that certain construction activities that cannot be interrupted, such as a continuous concrete pour, may be required for the foundation slabs of the development platforms.

3.5.8. Directional task lighting may be required during normal construction hours in winter. Outside normal construction working hours, motion-activated directional security lighting may be used at the site.

3.5.9. A Construction Environmental Management Plan (CEMP) will be prepared and agreed prior to any work commencing on site. A Construction Traffic Management Plan (CTMP) will also be produced prior to the commencement of construction.

3.6. Operation of the Proposed Development

3.6.1. The BESS is likely to operate intermittently on a 24-hour, seven day a week basis, although operation during the middle of the night would be less likely to occur, as electricity demand is lower at this time.

3.6.2. The BESS would not require a permanent manned presence. Maintenance would be overseen by suitably qualified personnel who would visit the development as required. This would typically be less than twice per month. Online monitoring of performance and identification of issues would be provided on a 24-hour basis.

3.6.3. Typical traffic to the site would be typically 2 vans per month. During the normal course of operations, no heavy good vehicles (HGV) are anticipated to be required. There would, however, be some additional HGV movements if any part of the BESS required replacement during the operational life of the development.