Chapter 4: Sloy Pumped Hydro Storage Scheme: Description of Development

Chapter 4: Description of Development - Contents

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4. Description of Development

4.1. Introduction

This chapter describes the principal components of the Proposed Development. It also provides an overview of the likely scheme construction, the approximate timescales over which construction would take place, and an overview of the operational and decommissioning phases of the Proposed Development. This chapter is supported by a series of figures and appendices.

It should be noted that as all elements of the Proposed Development would be subject to detailed design prior to the commencement of development, the final designs for the key visible elements of the Proposed Development would be submitted to the Planning Authority for Approval. It is anticipated that this would be a pre-commencement condition of the Section 36 Consent.

4.2. Description of the Proposed Development

The Proposed Development would convert the existing Sloy Hydroelectric Power Scheme at Inveruglas, into a pumped hydro storage scheme by the construction of a separate pumphouse within the grounds of the existing hydroelectric station, immediately north of the power station, adjacent to Inveruglas Visitor Centre.

The pumphouse would be connected hydraulically and electrically the existing power station to enable water to be pumped from Loch Lomond through (up to) three of the existing four penstocks then via the tunnel to Loch Sloy during times of low demand (typically overnight) or oversupply (when there is too much renewable energy being generated from wind farms, run-of-river hydro schemes, marine devices etc).

The Proposed Development would enable the load factor at the Sloy Hydroelectric Power Station to increase from 10% to (up to) 20% and would help to reduce the likelihood of renewable energy from other sources being constrained off the grid during times of low demand.

It should be noted that it is not envisioned that there would be works required at Loch Sloy to enable the Proposed Development.

In addition, the existing 32.5MW G4 turbine will be upgraded to 40MW to match its sister units in order to maximise the generation potential of the site.

The principal components of the Proposed Development would comprise the following (see **Volume 2, Figure 4.1**):

- A new surface building to house electrical switchgear, pump infrastructure and gantry crane(s);
- New multi-stage pumps, located within a new underground pump hall;
- New pump motors located within a large open plan hall;
- A small new transformer compound containing the switchgear and transformers required to power the pumps;
- A new section of intake structure, located on the north side of the existing Sloy Hydroelectric Power Station tailrace to enable water to be conveyed to the pumps. The intake will be screened to protect fish and prevent floating debris from entering the pumps;
- New buried pipeline(s) to take the water from the pumps to connect into (up to) three of the existing four penstocks (the high pressure steel pipelines which convey water to the existing power station);

- A large reinforced concrete anchor block at the point of connection into the existing penstocks. This will require modifications to be made to the existing listed drystone wall to the rear of the power station;
- Reconfiguration of Sloy Hydroelectric Power Station internal road for vehicular access;
- Reinstatement of areas affected by construction of the Proposed Development with new profiled earthworks, and planting;
- Dismantling (to enable construction access) and reinstatement of Sloy Hydroelectric Power Station's listed northern entrance gates, gate pillars and a short section of walling;
- Creation of a site establishment area in the woodland to the north of the existing Sloy Hydroelectric Power Station and an area for on-site storage of excavated rock spoil;
- Regrading of the main construction compound / site establishment area and the reinstatement of the area to an improved condition to the existing, in order to achieve SSE's biodiversity net gain (BNG) targets of a minimum 10% net gain;
- Creation of a secondary construction compound / site establishment area and vehicle holding area in the overflow car park (owned by SSE) to the north of the Inveruglas Visitor Centre car park, including permanent upgrades to the access junction and reinstatement post-construction; And
- The existing 32.5MW G4 turbine will be upgraded to 40MW to match its sister units in order to maximise the generation potential of the site.

Details of the elements as they are currently envisaged are set out in more detail below, (see also **Volume 2, Figure 4.2** and **Figure 4.3**)

4.3. Proposed Development Components

4.3.1. BUILDINGS

A new surface building would be required to house electrical switchgear, pump infrastructure and a gantry crane to enable removal of heavy components for maintenance and repair. SSE commissioned the services of award-winning, Glasgow based architects, Page \ Park to undertake the design concepts of the proposed above ground elements.

A high-quality contemporary building is proposed (as was the case for the previously consented pumped hydro storage scheme). The building would be positioned perpendicularly to the existing Sloy Hydroelectric Power Station and would comprise a main hall with vehicular access and laydown areas with space to house transformers, electrical switchgear and control systems. The main hall would house an overhead travelling gantry crane, to accommodate this the building is likely to be up to 18m in height.

4.3.2. UNDERGROUND PUMP HALL

An underground pump hall would be required to house the pumps. This would connect to the intake structure and would be approximately 18m below existing ground level with some localised areas up to 20m depth. The underground pump hall would be constructed from reinforced concrete.

4.3.3. PUMPS AND PUMP MOTORS

The pumping plant would comprise pumps installed below ground level adjacent to the northern tailrace with pump motors located within a large open plan hall above ground. The power demand of each pump motor would be 40-50MW. Power supply for the pumps would be taken from the grid at point of connection to the rear of the existing power station building. A small transformer compound would be

required close to the pumphouse building containing the switchgear and transformers needed to operate the pumps, this would be connected to the pumphouse via buried cables.

4.3.4. INTAKE STRUCTURE AND TAILRACE

The purpose of the intake structure would be to provide a water passage from Loch Lomond to the new pumps. The intake structure would connect through the northern wall of the existing tailrace which would be partly removed to enable construction of the new intake structure and screens. Permanently installed trash and fish screening with an automated cleaning system, designed in accordance with the Scottish Environment Protection Agency (SEPA) guidance, would be required across the new pump intake.

4.3.5. BURIED PIPELINE + PENSTOCK CONNECTION

New buried pipelines would be required to connect the pumps into (up to) three of the four existing steel penstocks to enable water to be transferred to Loch Sloy. The pipelines would exit the underground pump hall and would follow the route of the existing internal northern access road, they would then emerge from the ground to the rear of the power station. The connection point would be encased in a new concrete anchor block approximately 40m to the rear of the existing power station. A small section of the listed drystone wall that surrounds the penstocks would need to be removed in order to make this connection and construct the new anchor block.

4.3.6. EXCAVATED MATERIALS

The proposed construction activities would result in a maximum of 40,000m^3 of excavated rock (bulked). While this is the volume considered in the EIA Report, this is the worst-case scenario and the final volume would be dependent on the type of pump selected during the detailed design stage, post Section 36 submission. The final volume is expected to be more likely in the region of 29,000m^3.

The excavated rock would be used productively in the construction of the new works, where feasible. However, it is envisaged that there would be a surplus of excavated rock spoil overall.

Environmental surveys have confirmed that the preferred area on-site for the storage of rock spoil would be to the north of the existing Sloy Hydroelectric Power Station, adjacent to the main site establishment area, (see **Volume 2, Figure 4.1**). This would require clearance of an area of woodland which was previously used during the construction of the existing Sloy Hydroelectric Power Station (see **Plate 1** and **2**). Woodland has established in this area since construction in the 1950s, however, it is in generally poor condition as a result of grazing pressures and the presence of invasive non-native species (INNS). In addition to this, Loch Lomond and The Trossachs National Park Authority (LLTNPA) has highlighted that the larch within the area will require felling in the near future to limit the spread of Larch disease which is a problem nationwide.

Plate 1: View of Sloy Hydroelectric Power Station during construction circa 1950 (Photo Credit: SSE Renewables).

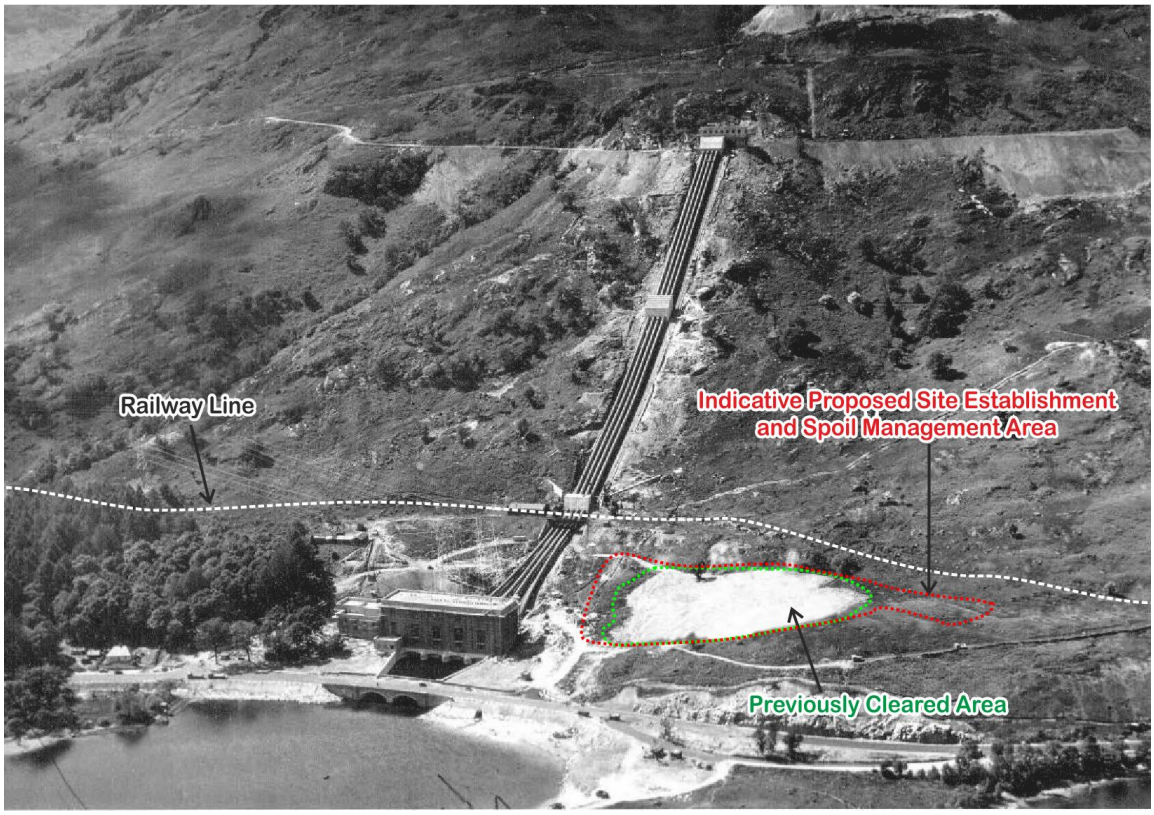
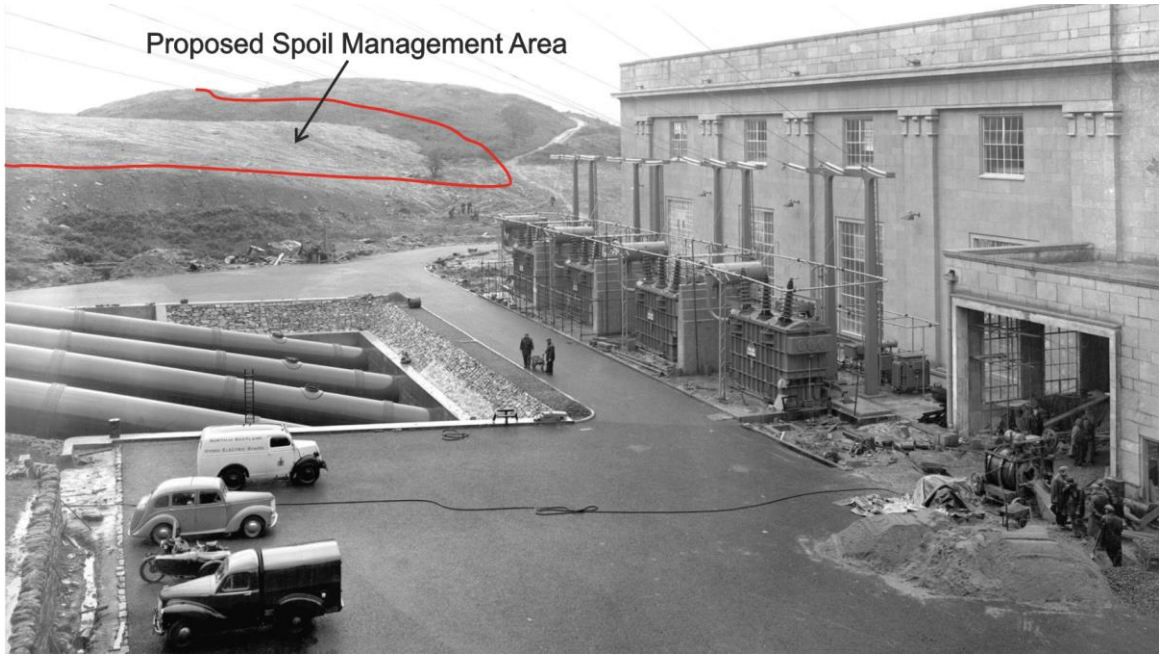


Plate 2: View of the rear of Sloy Hydroelectric Power Station during construction circa 1950 (Photo Credit: SSE Renewables).



Upon completion of the construction works, and in conjunction with conventional suppression techniques, spoil would be spread over the area to help eradicate the INNS. The area would be reprofiled, covered in suitable soil, seeded and planted to ensure an improved habitat would be established. This would be fenced to protect the area of new woodland from grazing. This would also reduce the need for rock spoil to be transported off site via the public road network.

For the purpose of this EIA Report, two spoil management scenarios are to be assessed based on which forms the worst-case for the individual chapters (As discussed in **Chapter 3: Site Selection and Design Evolution).**

- Approximately 40,000m^3 of spoil to be kept on site in area to the north of the existing power station; and
- Approximately 12,000m^3 of spoil to be kept on site in area to the north of the existing power station to supress invasive species. Approximately 28,000m^3 of spoil to be transported off site south along the A82/A83 to be used on Forestry and Land Scotland (FLS) or RTS Forestry projects or similar in the area.[1]

SSE has undertaken a review of the woodland to determine the extent of felling that would be required to accommodate the spoil storage area and remove the larch while maintaining a windfirm edge for the remaining woodland. The review confirmed that the existing buffer of broadleaved trees along the A82 could be retained to maintain a visual screen, but that a large part of the existing woodland would need to be felled.

4.3.7. TEMPORARY CONSTRUCTION COMPOUND AND SITE ESTABLISHMENT AREA

A main construction compound / site establishment area would be created to the north of the existing power station. The use of this area would require the clearance of an area of woodland prior to commencement of construction activities.

It is anticipated that a secondary construction compound / site establishment area and vehicle holding area, would be constructed in the overflow car park to the north of the Inveruglas Visitor Centre car park which is owned by SSE. This would remain in place for the duration of the construction activities. It is proposed that this area would be completely segregated from the public car park to the south during the construction of the scheme and accessed via the junction to the north, which is not currently in-use.

The existing junction into the overflow car park is currently only safely accessible from the southbound A82, so improvement works would be required to enable safe access and egress to / from both the north and south. The central vegetated ‘island’ area within the overflow car park would be cleared temporarily, to enable an adequate area to be created for vehicles to turn safely. No construction vehicles would be allowed to enter the public car park at Inveruglas and the gate between the two parking areas would remain closed for the duration of the works. Following completion of the construction works, the improved road junction would remain, and the area would be reinstated, with the central ‘island’ replanted with appropriate native species.

[1] Initial discussions have been held with FLS and RTS Forestry to understand their requirements for excavated rock in the area. It was determined that there are a number of track construction, improvement and maintenance projects in the area whose timescales are expected to align with the Proposed Development which will require rock of the type anticipated to be excavated.

4.4. Scheme Hydrology

Loch Lomond is the largest area of fresh water in Great Britain with a surface area of approximately 71km^2. It has a stored volume of over 2.6Bn m^3 which is exceeded only by that of Loch Ness. The loch and its catchment waters have many existing uses including recreation and drinking water supply.

The water level in Loch Lomond is controlled by the barrage across the River Leven just downstream of the loch. The primary role of the barrage since it was commissioned in 1971 is to ensure that the loch level remains high enough for water supply abstraction. The main abstraction point from Loch Lomond is at Ross Priory.

The loch has a direct catchment area of 763km^2 and a catchment average annual rainfall of around 2040mm per annum. The rainfall over the catchment varies significantly with rainfall in the southern parts of the catchment as low as 1500mm per annum rising to up to 3600mm per annum above Sloy.

Catchment average daily inflow (ADF) to Loch Lomond was calculated as being approximately 40m^3/s based on the catchment average rainfall figure above. The largest inflow is from the Endrick Water with a long term ADF reported by SEPA of 7.7m^3/s closely followed by the River Falloch at 5.9m^3/s. Other significant inflows to the loch are from the Fruin Water, Luss Water and the Douglas Water.

Loch Sloy has a spillway crest level of 285m AOD and has a capacity of around 36 million m^3. The loch has a direct catchment area of approximately 17km^2. A system of aqueducts and tunnels was built to divert water into Loch Sloy from areas well to the north and south, significantly increasing the catchment. The average annual rainfall within the mountainous catchment area of Loch Sloy is over 3000mm.

The Proposed Development would pump water from Loch Lomond to Loch Sloy at a rate of up to 36m^3/s. Typically the scheme would pump for between 1 and 10 hours at a time with the water typically being released back to Loch Lomond the next day or soon thereafter. However, longer periods of pumping are possible if the hydrological, storage and energy market conditions are right.

During 6 hours of pumping, around 777,600m^3 of water would be abstracted from Loch Lomond. Given the surface area of Loch Lomond the impact of 6 hours of pumping would lower Loch Lomond by approximately 1cm. At a starting level of 275m AOD in Loch Sloy, 6 hours of pumping would increase the level by approximately 70cm.

It is considered that further derogations are not required due to the fact that Loch Sloy is already modified as a result of the existing hydroelectric scheme and no further modification would result from the proposed scheme. Also, it is not predicted that the pumping of water from Loch Lomond to Loch Sloy would significantly affect water levels or water quality in Loch Lomond so therefore, it does not seem likely that there would be any deterioration to the classification of Loch Lomond.

4.5. Access

There are two existing bellmouth junctions off the A82 at the Sloy Hydroelectric Power Station. The southern junction is used for day-to-day operations, the northern junction acts as a secondary access and the gates are normally locked. As was the case for the previously consented scheme, it is anticipated that the northern junction would be used exclusively by construction vehicles during the construction of the Proposed Development. This would allow construction traffic to be separated from operational traffic while utilising an existing access junction. The internal road alignment to the north of the existing power station would need to be reconfigured to accommodate the footprint of the Proposed Development. During the operational phase access to both the existing generating and new pumping stations would be via the existing southern junction with very occasional use of the northern junctions.

To facilitate construction of the Proposed Development, and enable safe access for delivery vehicles, the existing northern gates, gate posts and a short section of walling (which are all part of the Category A listed Sloy Hydroelectric Power Station) would be carefully dismantled and stored prior to construction. The junction would be fully reinstated in its current location upon completion of construction. This work would require Listed Building Consent (as it was for the previously consented scheme) and would be subject to further discussion with LLTNPA and Historic Environment Scotland (HES).

In order to enable the use of the overflow car park at the Inveruglas Visitor Centre as the secondary construction compound / site establishment area, the northern access junction which is currently locked would be improved. The overflow car park would be fenced off to maintain separation between the construction works and the Visitor Centre, public facilities and main car park. Construction access would be through the northern junction only.

Consultation has taken place with Transport Scotland regarding the temporary use of these junctions onto the A82 (refer to **Chapter 13: Traffic and Transport** and associated appendices).

4.5.1. TRAFFIC MANAGEMENT

The Principal Contractor would prepare a Construction Traffic Management Plan (CTMP) in consultation with SSE, LLTNPA and Transport Scotland prior to works commencing. This would describe all mitigation and signage measures that are proposed on the local public road access. A Staff Travel Plan would also be deployed where necessary, to manage arrival and departure profile of staff and to encourage sustainable modes of transport.

4.6. Construction Programme

It is anticipated that construction of the project would take place over an approximately 36-month period, following the granting of consents. Detailed programming works would be the responsibility of the Principal Contractor in agreement with SSE.

It is anticipated that the standard working hours would generally be between 07.00 and 19.00 hours Monday to Saturday, and 07.00 to 16.00 hours on Sunday with some key periods within the programme requiring 24 hour working. In the event of work being required outwith standard hours, e.g., commissioning works or emergency mitigation works, the Local Authority, key stakeholders, and local residents would be notified prior to these works taking place, wherever possible.

During the winter, work areas across the site would have temporary construction lighting at the start and end of the working day to ensure a safe working environment for the construction teams. In the event of work being required outside of the proposed working hours, temporary lighting would also be required and would be agreed with the Local Authority in advance.

Ongoing engagement with the local community during the construction of the Proposed Development would be an important consideration for SSE and the Principal Contractor. A community liaison group would be set up to provide the local community with information about the timing of key construction activities and a mechanism by which feedback and concerns from within the local community could be shared and discussed.

Table 4.1: Indicative Construction Programme

Quarter	2027				2028				2029				2030	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Site Establishment and Site Clearance														
Groundworks including Bulk Excavation														
Substructure Works														
Superstructure Works														
New Intake Structure														
Penstock Connection and Rising Main														
New Transformer Compound														
Mechanical & Electrical Works														
Commissioning														
Reinstatement														

4.7. Environmental Management during Construction

4.7.1. SENSITIVE LOCATIONS

Prior to the commencement of construction works, sensitive ecological areas, and other specific sensitive locations (e.g. cultural heritage assets and watercourses) would be marked out as appropriate on site by specialist advisers (e.g. the Environmental Clerk of Works (ECoW)) in order to avoid unnecessary encroachment and protect sensitive areas during construction. An Architect and Landscape Clerk of Works would also be involved during the detailed design and construction phases of the Proposed

Development where required, to ensure the key principles of the design and mitigation are realised. The Principal Contractor would ensure that no vehicle movements or other activities take place outwith the approved working area without prior approval.

4.7.2. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

It is proposed that construction method statements for the construction of the Proposed Development would include the requirements of the Construction Environmental Management Plan (CEMP) which would apply to all construction activities required as part of the proposals (see **Volume 4, Appendix 4.2: Outline CEMP**). In particular, the CEMP would specify conditions relating to protection of habitats and species, pollution prevention and the means by which site monitoring would occur. The final site-specific CEMP would be secured by a condition of consent and would be prepared by SSE in conjunction with the Principal Contractor, and in consultation and agreement with the Local Authority, Scottish Environment Protection Agency (SEPA), and NatureScot.

4.7.3. WASTE MANAGEMENT

It is anticipated that any excavated material generated during the works, would be re-used on site where possible, as described within **Chapter 3: Site Selection and Design Evolution**. Any materials to be removed from site (packaging etc.) would be segregated on site and removed to suitable recycling facilities or disposed of to a suitably licensed waste management facility, in accordance with current waste management regulations.

A Waste Management Plan would be provided by the Principal Contractor as part of the Construction Phase CEMP.

4.7.4. SITE REINSTATEMENT

Reinstatement works would generally be undertaken during construction (and during the immediate post-construction phase) and would aim to restore areas of ground disturbance and changes to the landscape as part of the construction works. Reinstatement would be undertaken as soon as practical following the construction works. A Site Reinstatement Plan would be provided by the Principal Contractor as part of the CEMP.

Outline Landscape Proposals have been included within **Volume 2, Figure 12.7** and would be updated and implemented as part of the Proposed Development in order to ensure an improved habitat would be established in the woodland area to the north once it has been reprofiled, covered in suitable soil, seeded and planted and fenced to protect the area from grazing.

All construction equipment and other temporary infrastructure would be removed from site and the temporary storage areas would be reinstated including the Inveruglas Visitor Centre overflow car park.

4.8. Mitigation

A schedule of mitigation is included in **Volume 4, Appendix 4.3: Schedule of Mitigation** which consolidates and cross references all of the suggested mitigation measures documented in this EIA Report to minimise or offset potential environmental effects.

4.9. Operation And Maintenance

The existing Sloy Hydroelectric Power Station is used by the Sloy/Awe Hydro Group as a local operational base. The station is not currently manned 24 hours a day and this would continue to be the

case, with the operation of the Proposed Development being controlled via a remote link to SSE Hydro Operations Control Centre in Perth. However, regular visits would be made to the Proposed Development, to inspect and maintain structures along the following lines:

- Daily visits to the Proposed Development to carry out routine maintenance and inspection works;
- Monthly, six monthly and annual maintenance tasks would be carried out to the electrical and mechanical equipment; and
- Periodic inspection of the inside surface of the pipeline. This is not expected to be more frequent than once every six years; and would be undertaken in a co-ordinated programme with outages of power station sets and the existing penstock pipelines.

Once operational, internal lighting would be required in the pumphouse building, predominantly during working hours, unless essential operational and maintenance activities were required outwith these hours. Any external lighting required at the pumphouse building would be designed to be discrete and minimise light pollution in keeping with the lighting of the existing power station.

4.10. Decommissioning

The existing Sloy Hydroelectric Power Station was opened in 1950 and there are no plans for decommissioning in the future. With proper maintenance, the Proposed Development should remain functional indefinitely. If decommissioning was required in the future, full details of the decommissioning plan would be agreed with the appropriate authorities prior to any works taking place. Therefore, decommissioning has been scoped out of this assessment.

4.11. Socio-Economic Benefit

SSE has a long-standing, demonstrable commitment to sharing socio-economic value with its communities.[2] The delivery of a major programme of capital investment provides the opportunity to share socio-economic benefits with local communities and the wider region, thereby also maximising the support of local communities.

During the design, development and construction phases the Proposed Development would:

- **Generate local and national economic impact**: The civil works for the Proposed Development will be a large and complex package of work which will be tendered to UK and Scottish-based contractors. Further, the investment in the Proposed Development will have a multiplier effect, resulting in wider expenditure in the local economy by businesses and workers linked to this project. For example, the workers on site are likely to lodge and spend locally, bringing further added benefit to the local area. SSE will also host a 'Meet the Buyers' event to ensure that local suppliers are aware of project opportunities.
- **Support approximately 70 FTE jobs at peak of construction**: Employment of construction staff will be the responsibility of the Principal Contractor, but SSE encourages the Principal Contractor to make use of suitable labour and resources from areas local to the works. SSE anticipates that the construction period would run from Q1 2027 to Q1 2030, a period of three years. SSE has forecast that there could be up to 70 people on site at the peak of construction. This would provide a significant positive benefit to the local economy during this period and potential opportunities for the local construction supply chain (material suppliers, specialist sub-contractors, security firms, concrete

[2] For further information, please see our SSE Renewables Sustainability Report (2024): sserenewables.com/media/0wpjybhb/sser-sustainability-2024.pdf; SSE Renewables Community Investment Review (2024); 2024-community-investment-review_final.pdf

suppliers, plant hire firms, etc.). In terms of the Gross Value Added (GVA) effect of this level of employment, the Scottish Annual Business Statistics reports a GVA per head for the Civil Engineering sector in Argyll and Bute as £82,339. Preference will be expressed in contract documents for local sub-contractors and suppliers to be used where possible.

- **Promote fair and inclusive work**: SSE is committed to being a Real Living Wage employer and all those working on site will be paid at least a Real Living Wage (this will be a requirement of all the main contracts associated with the project), contributing towards fair work and reducing inequalities. SSE will ensure that the site is set up in an accessible and inclusive manner to ensure a fair and inclusive working environment and will ensure this is upheld by contractors.
- **Support apprentices and traineeships**: Discussion would be held between SSE and the Principal Contractor to understand possibilities for local apprentices to be involved at construction stage, to support wider long-term career development in the area for young people.
- **Facilitate community engagement during construction**: A proactive community engagement plan would be delivered throughout the development and construction period to ensure local communities are informed of the project and opportunities. Engagement would be tailored to local needs and may include, but not limited to, the creation of a Community Liaison Group, regular updates to key stakeholders, attendance at local community council meetings, advanced notification of any activities which may cause disruption locally and school engagement.
- **Commit to a Community Benefit Fund**: In addition, SSE Renewables is committed to having a Community Fund for the Sloy Pumped Hydro Storage Scheme. SSE Renewables has a proven track record of delivering Community Benefit as part of its long-term development and refurbishment programmes. It is anticipated that the Community Fund for the Proposed Development would be a six-figure sum based on current estimates of the overall capital cost of the development, with 50% made available to local community projects during the construction phase of the project and the remaining 50% made available through the wider SSE Renewables Hydro Community Fund, which is open to applications for funding from communities across the entire SSE Renewables hydro estate.
- **Reporting on impact**: SSE will collect data relevant to the above during the construction period through digital tools and supplier collaboration in order to be able to report on the overall socio-economic impact upon completion of the construction period, in line with its overall socio-economic reporting schedule.

During operation the Proposed Development would:

- **Support skills development and continued secure employment for local workforce:** Sloy Hydroelectric Power Station is a hub for SSE Renewables' Sloy/Awe Hydro Group which currently employs approximately 40 FTE, most of these employees reside locally. It is anticipated that existing staff would be trained to maintain the new pumped hydro storage facility which would be remotely controlled from the Hydro Operations Centre in Perth. This will help to broaden operational experience and provide skills development for existing staff. The Proposed Development further illustrates SSE's commitment to securing long-term employment in the region. Support for ongoing maintenance of the Proposed Development could bring additional opportunities for the local supply chain, however, SSE is not able to confirm these requirements at this stage.
- **Support apprenticeships and traineeships:** The Sloy/Awe Hydro Group already has an established, successful apprenticeship and traineeship programme with 2 FTE currently undergoing training programmes within the Sloy section, building upon the accomplishments of previous apprentices. SSE intends to expand this programme during the operational phase of the Proposed Development, leveraging the addition of pumped hydro storage at Sloy to enhance training opportunities for both apprentices and trainees. Additionally, this development will complement SSE's adult craft

programme, which provides upskilling pathways for existing employees and supports the career progression of the local workforce.