TECHCNIAL APPENDIX 3.5: OUTLINE DISMANTLING PLAN FOR THE EXISTING 132 KV OVERHEAD LINES

1.1 Introduction

1.1.1 This Technical Appendix summarises the options available for dismantling a 8.7 km section of the 132 kV Fort Augustus to Fort William Overhead line (OHL) (comprising 34 towers) between the proposed Loch Lundie Substation and the existing Fort Augustus Substation, and the measures that would be put in place to safeguard and protect the environment during dismantling operations. The principles and methods set out within this Dismantling Plan would also apply to the short section (approximately 0.7 km) of the 132 kV Invergarry Tee OHL that would be rerouted from where it currently connects into the 'Skye Tee' Point (and connects into the existing 132 kV Fort Augustus to Fort William OHL) into the proposed Loch Lundie Substation, leaving a section of OHL comprising three towers and three wood poles to be dismantled.

1.1.2 This document has been prepared by the Applicant, and with input from environmental specialists, as required. It is intended to provide an outline of the dismantling options available, and where such options would likely be utilised across the project. The document will form the basis from which a detailed dismantling plan can be drawn up by the successful Principal Contractor.

1.2 Dismantling Options

1.2.1 The following provides a summary of the advantages and disadvantages of the likely options available for dismantling the existing OHL, broken down in relation to the various elements of the dismantling process (refer also to Annex 1 for further detail on equipment and plant).

Access

1.2.2 To dismantle the existing OHL, access to each tower location would be required by tracked vehicles (see Annex 1 for typical tracked vehicles). Existing access tracks would be utilised as far as practicable, including any new access tracks constructed to facilitate construction of the Proposed Development. It is not currently anticipated that any new access tracks would be required to facilitate dismantling.

1.2.3 Access to each tower is required to allow operatives to reach the work location, and to bring in equipment for the preparation of the conductor and earth wire removal such as lifting equipment and running out wheels. The number of operatives accessing each tower location will depend on the stage of the works (discussed further below).

1.2.4 It is anticipated that access for the dismantling of all existing steel tower on this project would be undertaken by tracked vehicles. Any remaining towers will be dismantled using crane.

Conductor and Earth Wire Removal

1.2.5 The methods considered for the removal of conductors and earth wires are set out in Table 3.5.1.

1.2.6 For the removal of conductors and earth wire associated with steel lattice towers, preparation works are required. This includes transferring the conductors and earth wire to running out wheels using lifting equipment i.e. pull-lift, slings and shackles. To keep spans balanced adjacent to the section being recovered, back stays need to be installed. Back stays would normally consist of sledges, kentledge blocks, Tirfors and bonds (see **Annex 1, Table 3, Option 5**) placed at a set distance, typically 1.5 – 2 times the tower height away. Alternative options to sledges and blocks include soil and rock anchors. For installation of back stays it is anticipated that 4-6 operatives would be required. Conductor and earth wire transfer to running out wheels would require 3-5 operatives, depending on the tower type.

1.2.7 Reel winders (see **Annex 1, Table 2, Option 3**) are a standalone piece of equipment that not only reel in conductor and earthwire but collect on a drum attached to the machine. These drums are smaller than a typical conductor drum and are lighter. They are usually able to be unbolted to remove the conductor rather than having to rotate the drum to remove.

1.2.8 A Tesmec machine (see **Annex 1, Table 2, Option 2**) requires more equipment than a reel winder which includes hydraulic motors and hoses, drums and spindles and stands to mount drums. As these machines are able to recover many spans, they require sledges and kentledge blocks to keep them in position.

Table 3.5.1: Conductor and Earth Wire Removal Options

Plant	Advantages	Disadvantages
Reel Winder	• Faster setup compared with Tesmec	• Not able to recover as many spans of a conductor as a Tesmec • String reel winder in multiple locations would be difficult where steep side slopes exist. • Would require towing into position
Tesmec	• Able to recover spans more quickly once set up	• Requires more equipment than the reel winder, inclusive of anchorage and drum stands etc.

1.2.9 It is anticipated that both a reel winder and Tesmec pulling machine will be utilised for the recovery of conductors and earth wire. At steel lattice towers, it is likely that both options would be required, dependent on-site specific conditions and requirements. A reel winder will be utilised where access permits and for short sections. For longer sections, a Tesmec pulling machine will be used.

Insulator and Fitting Removal

1.2.10 Once the conductor has been removed, the insulators, OHL fittings and running out wheels need to be lowered to ground level before a tower can be felled. This task is completed with the use of basic lifting equipment such as a rope, slings, and shackles. Approximately three operatives would likely be required to complete this task.

1.2.11 These redundant materials will be removed with a low pressure tracked dumper moved to the nearest point on the access route. Materials will then be loaded into lorries and removed from site.

Tower Steel Removal

1.2.12 A number of different options are available with regards to the removal of tower steelwork depending on the gradient of the accesses and land around the tower base. Towers are generally felled utilising an excavator mounted winch (see **Annex 1, Table 1**, **Option 10**). A steel bond is installed at the top of the tower and then connected to the winch. The tower legs are cut, normally with oxyacetylene torches, and the tower pulled over. Once on the ground a second excavator with cutting shears would cut the tower into small enough pieces for removal by a tracked dumper.

1.2.13 Most of the existing towers will be felled with a winch using shears mounted on an excavator see (**Annex 1, Table 1, Option 10**), the steel will be cut up into lengths that are suitable to be removed by low ground pressure tracked dumpers. Any remaining tower will be removed via a crane, with the steelwork lowered to the ground in sections, cut and then removed from site.

Foundations Removal

1.2.14 The methods considered for removal of foundations are set out in Table 3.5.2.

1.2.15 Typically tower foundations are removed to below ground level. This is achieved by digging around the tower stub & concrete and breaking off at a specified depth.

1.2.16 When excavators are unable to access tower locations, the alternative would mean some steel and/or concrete is still visible above ground level, unless material was imported by helicopter to cover over. The steel protruding from the concrete could be cut leaving only the concrete. Leaving any concrete or steel should only be considered in areas deemed inaccessible.

1.2.17 Removal of the tower foundations by an excavator would be completed just after the tower has been felled, which would be carried out by a single operator.

Table 3.5.2: Foundation Removal Options

Removal Method	Advantages	Disadvantages
Leave Stubs In-situ	• No excavating or cutting required	• Leaves a potential hazard
Cut Steelwork Above Concrete Muff	• No excavating required • Leaves only concrete above ground level	• Leaves a potential hazard • Fire risk from abrasive wheels on oxyacetylene torches
Cut Steelwork Above Concrete Muff and Build Up Land to Cover	• No excavating required • Hidden concrete	• Requires material to be imported • Fire risk from abrasive wheels or oxyacetylene torches

Removal Method	Advantages	Disadvantages
Remove to Below Ground Level	• Removes the steel and concrete visible above ground level	• Requires an excavator to be tracked to tower

1.2.18 For tower locations where an excavator can access the foundations they will be removed to below ground level. In more difficult to access locations there may be an option to cut the steel level with the foundations and leave the remaining foundation in place. This would need to be agreed with the landowners.

1.3 Dismantling Plant

1.3.1 The various plant available for use in dismantling the existing 132 kV Fort Augustus to Fort William OHL are illustrated in **Annex 1**. These include ATVs, conductor recovery plant and various supporting mobile plant.

1.3.2 All but three towers will be accessed by ATV **(Annex 1, Table 1)**. The remaining towers (Tower(T) 2R and T34) will be accessed by crane **(Annex 1, Table 2, Option 1)**, or another mode of access (T1).

1.3.3 All but four towers will be felled by Low ground bearing Tracked Excavators (**Annex 1, Table 1, Option 6**). The remaining four towers will be felled using crane (T2R, T6 and T34) or other method (T1).

1.3.4 All but three towers will be removed using low ground bearing tracked dumper (**Annex 1, Table 1, Option 7**). The remaining towers will be removed using crane (T1, T6 and T34).

1.3.5 It is anticipated that all of the 132 kV Invergarry Tee towers that are to be dismantled would be accessed by ATV **(Annex 1, Table 1),** felled by Low ground bearing Tracked Excavators (**Annex 1, Table 1, Option 6**) and removed using low ground bearing tracked dumper (**Annex 1, Table 1, Option 7**).

1.4 Duration of Works

1.4.1 Dismantling works across the project are anticipated to last approximately four months. Whilst there are a number of variables that determine how long each tower would take to dismantle, including terrain, access type and length, it is generally anticipated that two days per removal of a steel lattice tower would be expected.

1.5 Environmental Management during Dismantling

1.5.1 All dismantling works would be carried out in accordance with industry best practice construction measures, guidance and legislation, together with the following documents and procedures:

GEMPs

1.5.2 General Environmental Management Plans (GEMPs) have been developed by the Applicant. The GEMPs considered relevant for this project are identified in **Technical Appendix 3.2: General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs)** of this EIA Report.

SPPs

1.5.3 Species Protection Plans (SPPs) have been developed by the Applicant and have been agreed with NatureScot. These can also be found in **Technical Appendix 3.2: General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs)** of this EIA Report.

CEMP

1.5.4 A contractual management requirement of the successful Principal Contractor would be the development and implementation of a Construction Environmental Management Plan (CEMP). This document would detail how

the successful Principal Contractor would manage the site in accordance with all commitments and mitigation detailed in the EIA Report, statutory consents and authorisations, and industry best practise and guidance. An Outline CEMP is included in **Technical Appendix 3.6** of this EIA Report. **Technical Appendix 3.3: Schedule of Mitigation Measures** provides a summary of all mitigation measures included in this EIA Report.

1.5.5 The CEMP would also reference the aforementioned GEMPs and SPPs. The implementation of the CEMP would be managed on site by a suitably qualified and experienced Environmental Clerk of Works (ECoW), with support from other environmental professionals as required.

Potential Environmental Constraints

1.5.6 Table .3 provides a summary of potential environmental constraints associated with dismantling operations. Further assessment of dismantling works is included within relevant technical chapters of the EIA Report.

Table 3.5.3: Potential Environmental Constraints

Activity	Potential Impact	Mitigation
Access by tracked vehicle	• Potential for damage to sensitive habitats, for example peatland habitats; • Potential for disturbance to birds and protected species; • Potential for pollution, erosion and sedimentation of the water, geology and soils environment; and • Potential for damage to archaeological remains.	• Adherence to industry best practice and guidance, as well as the project specific CEMP, GEMPs and SPPs; • Pre-construction surveys to establish presence of protected species; and • Monitoring by ECoW and ACoW where required.
Foundation Removal	• Potential for damage to adjacent sensitive habitats; • Potential for disturbance to birds and protected species; • Potential for pollution, erosion and sedimentation of the water, geology and soils environment; and • Potential for damage to archaeological remains.	• Adherence to industry best practice and guidance, as well as the project specific CEMP, GEMPs and SPPs; • Pre-construction surveys to establish presence of protected species; and • Monitoring by ECoW and ACoW where required.

ANNEX 1 – PLANT AND EQUIPMENT OPTIONS FOR DISMANTLING

Annex 1, Table 1 – All-Terrain and Tracked Vehicles

Image	Details
	**Option 1 - Hagglund** Designed for load and passenger carrying. Ground pressure of 8psi. Front cab can accommodate up to five occupants with seating totalling 15 with people carrying body. Trailer load capacity up 2,500 kg, with integrated hi-ab can replace rear cab section of the machine.
	**Option 2 - Argocat** Argocats come in various configurations. These machines can be fitted with winches, canopies and tracks. Tracks create half the ground pressure of the wheeled version. Load carrying capacity of approximately 450 kg. Six seats including driver.
	**Option 3 - Soft Track** Very low ground pressure, lightweight and high ground clearance. Various configurations available. Wheel and tracked trailers with integrated Hiab can be towed. Hydraulic power take-off (PTO) allows machine to be fitted with a capstan.
	**Option 4 - Mule** Two-seater machine with carrying capacity up to approximately 450 kg. More suited to level, less undulating terrain.
	Option 5 - Polaris

Image	Details
	These machines come in a variety of specifications. The Ranger Crew (shown) has six seats with a rear box able to carry approximately 450 kg. Designed for off-road, these types of machines would be suited to more level ground conditions. Similar style machines can also be fitted with tracks.
	**Option 6 - Low Ground Bearing Tracked Excavator** Low ground bearing tracked excavators are available in many sizes. The benefit of these compared to standard tracks is they are less likely to create ruts and cut up the ground. Increased traction and stability could provide more access to remote areas.
	**Option 7 - Low Ground Bearing Tracked Dumper** Reduced ground pressure would likely result in fewer ruts and less land damage. Increase traction and stability could provide more access to remote areas. These would be used deliver equipment required for conductor recovery and removal of redundant tower steel, fittings and insulators.
	**Option 8 - Tracked Crane** The use of tracked cranes would primarily be in the dismantling of decommissioned trident steel tower.
	**Option 9 - Tracked Mobile Elevated Working Platform** Used for work at height during removal of steel tower.

Image	Details
	**Option 10 – Excavator Mounted Winch** Used for felling of steel towers and removing steelwork.

Annex 1, Table 2 – Dismantling and Conductor Recovery

Image	Details
	**Option 1 - Crane** Used for the removal of towers at substation locations / where felling is not possible.
	**Option 2 - Puller / Tensioner (Tesmec)** Used in the recovery of conductors.
	**Option 3 - Reel Winder** Used in the recovery of conductors.

Annex 1, Table 3 – Other Mobile Plans

Image	Details
	**Option 1 - 4x4 Hiab Lorry** 4x4 lorries are used to deliver / collect plant and materials to locations off main highways where standard rigid body trucks and low loaders have trouble accessing due to rough tracks and steep climbs. Mounted cranes are available in different load lifting abilities and reach.
	**Option 2 - Roll-on Roll-off Skip Lorries** Sections of steel would be taken from the tower locations to the nearest track and loaded into skips to be taken to a recycling facility. These type of roll-on off skips are also used to remove conductors, OHL fittings and insulators.
	**Option 3 - Telehandler with Drum Carrying Attachment** Used to replace conductor drums.
	**Option 4 - Towable Fuel Bowsers** Available in different capacities. Potable & towable with 4x4. Fuel pump can be electric and manual.
	**Option 5 – Backstay Equipment** Sledges, kentledge blocks, Trifors and bonds.