Winterbourne Wind Farm Project

Decommissioning and Rehabilitation Assessment

WinterbourneWind Pty Ltd

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Executive Summary

This Decommissioning and Rehabilitation Assessment (DRA) has been prepared in response to requests to further information made by community and stakeholders to WinterbourneWind Pty Ltd (WWPL.) As part of community and stakeholder engagement currently underway, WWPL has heard concerns raised in relation to the decommissioning of the project, including the responsibility for, and costs of, removing wind farm infrastructure. WWPL acknowledges these issues raised and has undertaken an engineering and financial analysis in an effort to respond to these concerns.

This DRA has been undertaken for the proposed Winterbourne Wind Farm Project (WWF, or the Project), which is proposed to consist of up to 119 wind turbine generators (WTGs) with a combined maximum installed wind farm capacity of around 700 MW.

The Project is expected to start construction mid 2023 subject to development consent with final plant commissioning estimated in early 2026. The site for the proposed Project is located to the north east of Walcha in the Northern Tablelands of New South Wales.

This DRA details two potential decommissioning methodologies and includes cost estimates of for each method as well as the anticipated cost of rehabilitating the Project site upon completion of decommissioning.

The DRA also outlines a process to fund and cover any potential shortfall in the cost of decommissioning, should the salvage value or resale value be insufficient to cover these costs at the time of decommissioning.

At Project retirement, the facility would be decommissioned with the various structures, plant, equipment and buildings de-energised, disconnected, dismantled, demolished and removed. The approach to decommissioning and rehabilitation of the sites detailed within this assessment report is based on current practises and general requirements for decommissioning and rehabilitation of industrial facilities including extent of recycling and clean-up requirements.

The decommissioning and rehabilitation of the WWF will be undertaken in accordance with the requirements and objectives of the Development Consent determined by the Minister for Planning and Public Spaces (Consent Authority) and the requirements of the Landowner Agreements for the Project.

As an overarching principle, the waste minimisation hierarchy of avoid / reduce / reuse / recycle / dispose will be applied wherever possible to all decommissioning wastes. Any waste that is unable to be reused, reprocessed or recycled will be disposed of at a facility approved to receive that type of waste.

The overall cost of decommissioning the Project will primarily depend on the adopted method of salvage. The decommissioning methodology options include dismantling the modular components, in reverse to their erection using large cranes, or to demolish the wind turbine generators (WTGs) using controlled demolition techniques to fell the wind towers to the ground for processing as scrap and recyclable materials.

For the purpose of estimating the cost of decommissioning of the Project, it has been assumed that decommissioning of the wind farm WTGs and associated infrastructure would be undertaken either by large crane dismantling or controlled felling demolition, with the dismantled infrastructure processed and primarily sold as scrap material.

It is anticipated all major onsite decommissioning activities would be completed within a period of two years, with ongoing site monitoring and rehabilitation activities continuing for up to a further two years beyond this time.

The estimated cost of decommissioning and site rehabilitation of the Project consisting of the 119 WTGs, 50% of the access roads, crane and storage hardstands, on site substations, 33 kV collector system and the operations and maintenance compound was estimated at a cost of AUD$28,826,119 (+/- 20%) utilising the large crane dismantling technique and estimated at a profit of AUD$13,178,372 (+/- 20%) utilising the controlled felling technique. The value of scrap, and cost of decommissioning was estimated on the basis of current (2021) prices.

Based on the current analysis, utilising controlled felling and the sale of project infrastructure for scrap, the decommissioning and rehabilitation of the Project site would return a profit to WWPL.

Acknowledging the time horizon, potential changes to decommissioning methodologies, scrap pricing and technological developments, WWPL proposes the following conditions be included in any development approval issued:

a) Undertake an annual assessment of the remaining life of the Project, starting in Year 15.

b) When it is determined that the remaining economic life of the Project is less than 6 years, update this Decommissioning and Rehabilitation Assessment (DRA) to identify the expected decommissioning and rehabilitation methodology and anticipated cost.

c) If a net shortfall (cost) is identified, establish a dedicated decommissioning reserve fund to cover the decommissioning and rehabilitation cost of the wind farm. This reserve will be established out of operating cashflows, with an appropriate percentage of cash generated by the wind farm directed into this reserve over an annual basis, until the reserve is fully cash funded, based on the most recent estimate of decommissioning and rehabilitation costs.

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1 Introduction

1.1 Winterbourne Wind Farm project overview

WinterbourneWind Pty Ltd (WWPL) proposes to construct and operate the Winterbourne Wind Farm Project (WWF, or the Project), a renewable energy development located to the north east of Walcha in the Northern Tablelands of New South Wales (NSW).

WWPL is seeking State Significant Development (SSD) Consent under Division 4.7 of Part 4 of the Environmental Planning & Assessment Act 1979 (EP&A Act) for the project.

The proposed wind farm project boundary extends around an area of approximately 22,300 hectares and is at an elevation of approximately 1,100 to 1,300 metres (above sea level), comprised of hills and ridgelines rising out of the Walcha Plateau. The project locality and an indicative layout is identified in Figure 1 below.

The project land and surrounding area is generally used for grazing operations.

The project is proposed to consist of up to 119 wind turbine generators (WTGs) with a combined total installed capacity of around 700 MW. The Vestas V162-6.2 MW machine is currently proposed for the project, though other turbine models could be selected based on final design. A maximum tip height of 230 metres is proposed.

Related infrastructure will include concrete foundations, erection and storage pads, access roads, operation and maintenance buildings, meteorological towers, two collection step-up substations, an overhead transmission line, and an underground electrical cable collection network linking the WTGs to each other and to the proposed substations in the north and south of the Project (Refer to Figure 1).

Power generated from the wind turbines will be collected via the 33 kV collector network wind farm substations where the power will be stepped up from 33 kV to 330 kV via power transformers and then evacuated into the national electricity network via approximately 50 km of new 330 kV overhead lattice tower or monopole transmission line running through the wind farm and continuing north-west from the Project Site. This new 330 kV overhead transmission line would connect to the existing grid network operated by TransGrid at a new switchyard, which would be constructed by TransGrid, approximately 7 km south of Uralla, NSW.

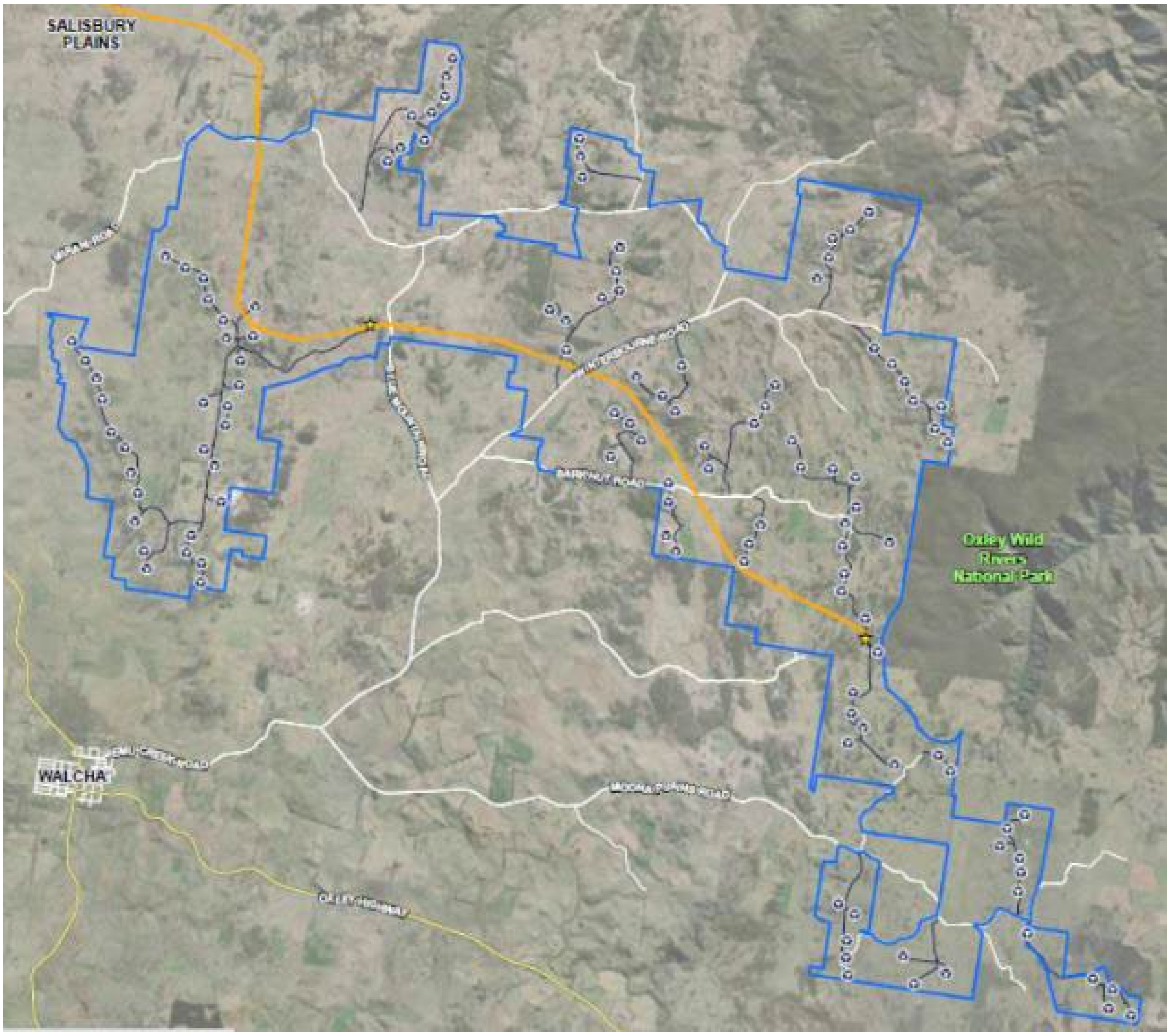

Figure 1 | Aerial image of proposed Winterbourne Wind Farm WTG locations, access road and overhead transmission infrastructure

1.2 Background and purpose

WWPL as part of its development of the Winterbourne Wind Farm Project have commissioned the preparation of this Decommissioning and Rehabilitation Assessment (DRA) that outlines the current methodology and cost estimates of decommissioning the wind farm facility and rehabilitation of the Project Site upon termination of landowner agreements or the end of the Project's economic life. The DRA also outlines procedures for individual wind turbine generators that may be decommissioned during the Project's operational phase.

This report has been prepared in response to community and stakeholder concerns in relation to the future project decommissioning, including the responsibility for, and costs of, removing wind farm infrastructure. WWPL acknowledges these concerns and has developed the engineering analysis and financial framework presented in this report in an effort to respond to these concerns.

The wind farm will have a design life of approximately 30 years. Technically, with appropriate maintenance and upgrade activities, the proposed facility could potentially operate well beyond the design life if required. Equipment associated with this wind farm would be decommissioned once it has reached the end of its economic life or at the end of landowner lease agreements.

At the end of the expected operation period, the following options may be possible:

- refurbishment of existing infrastructure to prolong wind farm operation

- “repowering” of the wind farm through replacement of infrastructure as required, or
- decommissioning and rehabilitation of the wind farm.

The decision as to whether to refurbish, replace or decommission the Project will depend on a range of factors including the energy market, advances in wind technology, the social and political climate and required Project approvals. This DRA has been developed based on the assumption that the Project will be decommissioned at the end of the anticipated 30-year operational timeframe.

At Project retirement, the facility would be decommissioned with the various structures, plant, equipment and buildings de-energised, disconnected, dismantled, demolished and removed. At this stage of the development, it is assumed that 50% of the wind farm access roads will be left for landowner use and the remaining disturbed area restored to as near as possible to the original state of the Project Site. This is considered a conservative assumption on the basis that the access roads are likely to become a valuable asset to the landowners over time.

The decommissioning activities will be undertaken in accordance with the legislation applicable at the time of retirement or closure of the facility. The approach to decommissioning and rehabilitation of the sites detailed within this assessment report is based on current practises and general requirements for decommissioning and rehabilitation of industrial facilities including extent of recycling and clean-up requirements. These practises and requirements may change in the future with new demolition technology and greater recycling capability of components such as the blades and nacelle cover.

The 330 kV overhead transmission line will likely remain in place as part of the grid network. The interconnection switchyard south of Uralla will be owned by TransGrid and decommissioning of that facility will occur at their option.

1.3 Likely development approval conditions for wind farm decommissioning and rehabilitation

WinterbourneWind is currently preparing an Environmental Impact Statement (EIS) for the wind farm and will submit the EIS as part of a Development Application for the proposed project. Assuming the project is approved, the decommissioning and rehabilitation of the wind farm will be undertaken in accordance with the requirements and objectives of any further Development Consent determined by the Minister for Planning and Public Spaces (Consent Authority).

Although such consent has not yet been issued for the Project as at the date of this assessment report, it is anticipated that the consent conditions related to decommissioning will be similar to those issued by the Minister for the Uungula Wind Farm in May 2021.These conditions are shown in Figure 2 below:

DECOMMISSIONING AND REHABILITATION

Rehabilitation Objectives - Decommissioning

B46. Within 18 months of the cessation of operations, unless the Planning Secretary agrees otherwise, the Applicant must rehabilitate the site to the satisfaction of the Planning Secretary. This rehabilitation must comply with the objectives in Table 3.

Table 3 | Rehabilitation Objectives

Feature	*Objective*
Development site (as a whole)	• Safe, stable and non-polluting • Minimise the visual impact of any above ground ancillary infrastructure agreed to be retained for an alternative use as far as is reasonable and feasible
Revegetation	• Restore native vegetation generally as identified in the EIS
Above ground wind turbine infrastructure (excluding wind turbine pads)	• To be decommissioned and removed, unless the Planning Secretary agrees otherwise
Wind turbine pads	• To be covered with soil and/or rock and revegetated
Above ground ancillary infrastructure (including the battery storage facility)	• To be decommissioned and removed, unless an agreed alternative use is identified to the satisfaction of the Planning Secretary
Internal access roads	• To be decommissioned and removed, unless an agreed alternative use is identified to the satisfaction of the Planning Secretary
Underground cabling	• To be decommissioned and removed, unless the Planning Secretary agrees otherwise
Land use	• Restore or maintain land capability to pre-existing use
Community	• Ensure public safety at all times

Progressive Rehabilitation

B47. The Applicant must:

(a) rehabilitate all areas of the site not proposed for future disturbance progressively, that is, as soon as reasonably practicable following construction or decommissioning;
(b) minimise the total area exposed at any time; and
(c) where it is not possible to carry out measures for permanent rehabilitation, employ interim rehabilitation strategies to minimise dust generation, soil erosion and weed incursion until such time that it is.

Dismantling of Wind Turbines

B48. Any individual wind turbines which cease operating for more than 12 consecutive months must be dismantled within 18 months after that 12 month period, unless the Planning Secretary agrees otherwise.

Figure 2 | Excerpt from Development Consent for Uungula Wind Farm (May 2021)

In addition, the NSW Government Planning and Environment Wind Energy Guideline for State significant wind energy development, released in December 2016, sets out three specific requirements with regards to refurbishment and decommissioning of wind farms:[1]

- *Refurbishment of turbines may not require a new development application (DA), or a modification of the existing consent if the terms of the existing consent authorise the refurbishment or decommissioning. The need for a modification or a new DA should be considered by the proponent in each instance by reference to what is proposed for the refurbishment or decommissioning.*
- *The wind energy project owner or operator, rather than the "host" landowner, must retain responsibility for decommissioning. Proponents must identify and address all relevant issues for decommissioning and rehabilitation in the project EIS and include a commitment that the operator will be responsible for decommissioning and rehabilitation.*
- *Proponents and host landowners should consider refurbishment, decommissioning and rehabilitation when negotiating landowner agreements.*

[1] NSW Government Planning and Environment Wind Energy Guideline for State significant wind energy development, released in December 2016

WWPL will comply with the requirements of any development consent issued for the project and the requirements of the Wind Energy Guideline, in addition to contractual obligation it has with landowners. Failure to comply with the conditions of the Development Consent is a breach of the EP&A Act 1979.

1.4 Contractual obligations for decommissioning and rehabilitation

WWPL is contractually obligated to remove all aboveground wind farm infrastructure from the host landowners' property at the end of the wind farm life. WWPL must also remediate degradation to the land to the reasonable satisfaction of each host landowner.

WWPL notes that some wind farm infrastructure, such as access roads, fencing, hardstands and buildings may have value to landowners and may, at the discretion of the landowner, be retained at the end of project life.

Subject to any such infrastructure selected to be retained by the host landowners, WWPL retains full responsibility to decommission all other aboveground infrastructure at the end of project life.

1.5 Public engagement prior to decommissioning

Public engagement will be undertaken well in advance of the commencement of the decommissioning of the wind farm.

The key objectives of the engagement process will be to:

- ensure the local community and stakeholders are provided with appropriate information about the planned decommissioning,
- understand key issues of interest or concern within the local community,
- allow for the amendment of plans to accommodate community and / or stakeholder feedback where reasonable,
- ensure local and regulatory authorities are kept informed about the decommissioning process,
- ensure an open forum for communication between many diverse stakeholders to facilitate resolution of any issues or concerns.

Key issues to be addressed during the community engagement will include:

- timing and phasing of the works to minimise impacts on agricultural and farming activities (i.e. avoiding lambing or harvest periods),
- management of traffic on site access tracks, surrounding local roads and regional road network to minimise traffic risks and impacts,
- coordination of local employment, business and contractor opportunities in decommissioning, to ensure local area participation is maximised.

1.6 Decommissioning Assessment Methodology

The greatest monetary value of the retired and removed WTGs, substations and associated equipment and buildings would be realised by selling these items for reuse. Given current market conditions, it is reasonably assumed that it would be unlikely that the Project would be able to sell the majority of end-of-life used components. The resale of useable WTGs would require specialist and careful dismantling and some reconditioning of components if they are to be reused. It is possible that there may be interest in the substation transformers and some of the wind turbine components as spares for other projects, which would most likely be offshore and therefore require additional transport and shipping costs.

A more likely assessment of the decommissioning process and costs is made by assuming that the wind turbines cannot be sold for re-use, and instead, are salvaged and sold for scrap. This case conservatively assumes not only that the complete wind turbines will not be resold, but that the individual components such as the wind turbine towers, blades, generator, gearbox, cabling, transformer, and switchgear have no market value for re-use. The value of the removed wind turbine is based solely on its value as scrap metal, with the greatest value being in the steel of the wind turbine tower.

This scenario forms the basis of this DRA.

The overall cost of decommissioning and rehabilitation of the Project will depend on the adopted method of salvage and the degree and extent of rehabilitation of the project area. The decommissioning methodology options include dismantling the modular components, in reverse to their erection using large cranes, or to demolish the wind turbines using controlled demolition techniques to fell the wind towers to the ground for processing as scrap and recyclable materials.

For the purpose of estimating the cost of decommissioning and site rehabilitation of the Project, it has been assumed that decommissioning of the wind farm WTGs and associated infrastructure will be essentially for scrap and recycling using either large crane dismantling or controlled felling demolition and processing techniques.

This report does not consider the time value of money, and therefore the estimated costs should be adjusted to represent the inflated costs at the time of decommissioning (e.g., annual escalation). It should also be noted that the scrap values are volatile and difficult to predict over the Project horizon.

2 Winterbourne Wind Farm components

The WWF internal electrical collection system will operate at 33 kV. The electrical collection system will consist of buried cabling and will connect the proposed WTGs to two onsite 33/330 kV substations which will, in turn, connect to the grid via 50 km of new 330 kV overhead transmission line running through the wind farm and continuing north-west from the Project Site. This new 330 kV overhead transmission line would connect to the existing grid network operated by TransGrid at a new switchyard which would be constructed approximately 7 km south of Uralla. It is proposed that the new 330 kV overhead transmission line and switchyard will be built and owned by TransGrid and become part of the grid network.

The Project Site will be accessed by approximately 113 km of new unsealed all weather access roads with WTG crane erection hardstand and preassembly areas generally 50 m by 60 m, auxiliary crane pad areas generally 16m x 8m, boom pads area generally 8m x 8m and blade lay down areas 84 m x 20 m in the area adjacent to each WTG.

The wind farm and associated infrastructure will generally consist of the following primary items:

- Up to 119 Wind Generator Turbines with a hub height of 149 m and 230 m tip height
- WTG Foundations (buried gravity reinforced concrete (approx. 800 m^3) with anchor bolt cage
- Steel tower (6 to 8 sections, subject to detailed design) and service lift
- Blades and hub
- Nacelle (nacelle structure, generator, main bearing, converter, transformer, cooling system and electrical cabling)
- Access roads and crane erection pads, hardstands and blade lay down areas
- Electrical Collection System
- Meteorological and wind monitoring masts
- Operations and maintenance area
- Two Substations
- Switchyard and 330 kV overhead transmission line (TransGrid owned)

WWPL is also considering a battery energy storage (BESS) system for the Project. At this stage the BESS is not included in this Decommissioning assessment as the operating life of a BESS unit will be much shorter than the Wind Farm and a BESS system, if installed at the Project, would be decommissioned much earlier than the wind farm. Should the BESS be installed the DRA will be updated during its scheduled review to cover the decommissioning and disposal of the BESS units.

The following figures show the various components of a typical wind farm.

Figure 3 | Typical gravity wind turbine foundation reinforcement

Figure 4 | Typical gravity wind turbine reinforced concrete foundation

Figure 5 | Typical backfilled wind turbine foundation with anchor cage

Figure 6 | Wind turbine tower base and access stairs

Figure 7 | Typical wind farm access road and crane hardstand

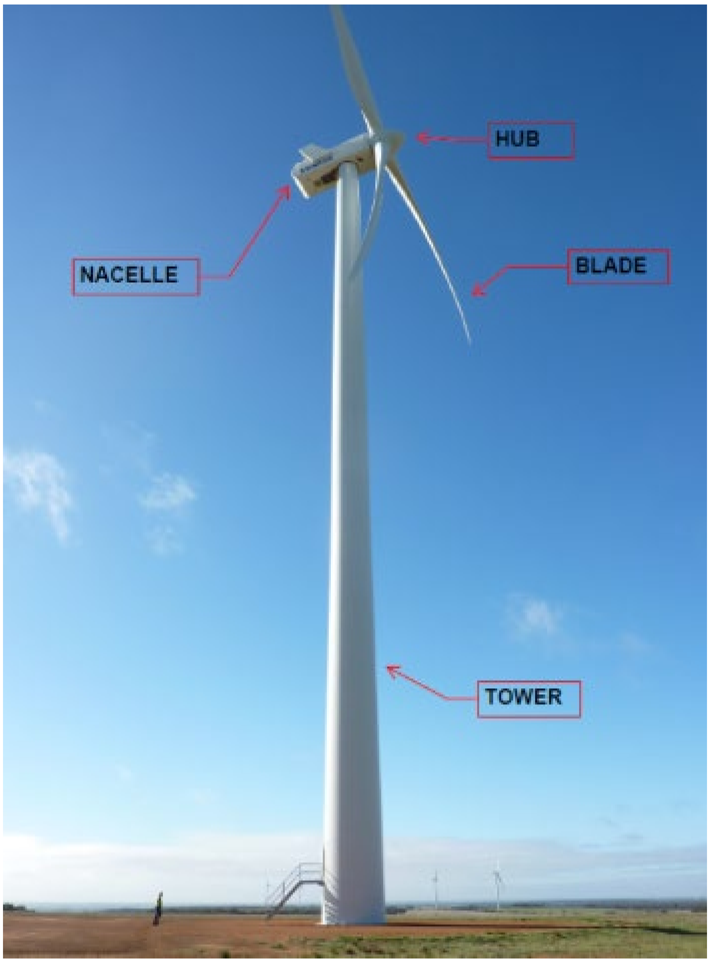

Figure 8 | Wind turbine main components

Figure 9 | 33 kV underground cabling

2.1.1 Wind turbine generators

The proposed wind turbine generator for the Project will be the Vestas V162-6.2 MW turbine with a hub height of 149 m and 230 m tip height.

The preferred tower structure will be constructed with tubular steel tower sections with nominal 5.3 m flange diameter (approx. 6 – 8 tower sections) bolted together. The tower will be anchored and grouted to the buried reinforced concrete gravity foundation via an embedded anchor bolt cage system.

The wind turbine mainly consists of three blades, hub, nacelle structure, generator, main bearing, converter, transformer and cooling system, as shown in 10.

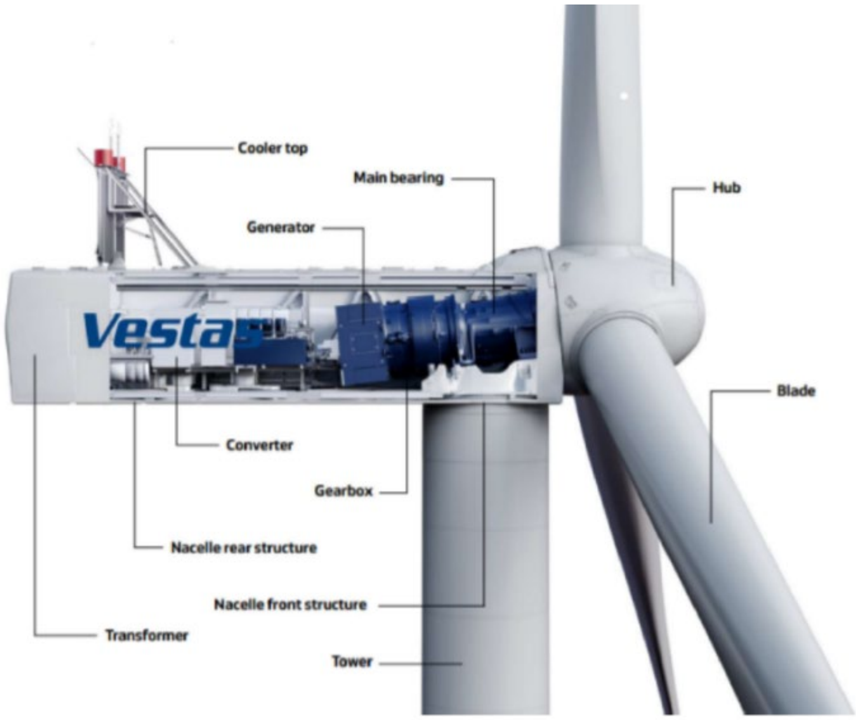

Figure 10 | Vestas wind turbine nacelle components

The blades are 79.35 m long and made of glass and carbon composites equipped with a lightning protection system.

The weights of the main wind turbine components are provided in Table 1.

Table 1 | Indicative Weights of main wind turbine components

Item	Unit	Weight
Foundation	tonnes	1900-2400*
Tower	tonnes	560-650*
Nacelle	tonnes	168
Rotor	tonnes	119

**subject to design*

The main components of the nacelle are made of steel and iron materials.

The materials breakdown summary of the wind turbine (excluding the foundation) is provided in Table 2.

Table 2 | WTG Material breakdown summary (excluding foundation)

Description	Unit	V160-5.6 MW	Weight (tonnes)
Steel and iron materials	%	89.1	873.2
Aluminium and alloys	%	1.3	12.7
Copper and alloys	%	0.5	4.9
Polymer materials	%	2.6	25.5
Glass and carbon composites	%	5.4	52.9
Concrete	%	0.0	0.0
Electronics / electrics	%	0.5	4.9
Oil and coolant	%	0.6	5.9
Not specified	%	0.0	0.0
Total		100	980

2.1.2 Wind turbine foundations

The proposed WTG foundations will consist of large buried heavily reinforced concrete gravity foundations (approx., 24 m diameter and 3.15 m deep) with anchor bolt cages to secure the steel tower to the foundation (refer to figure 11).

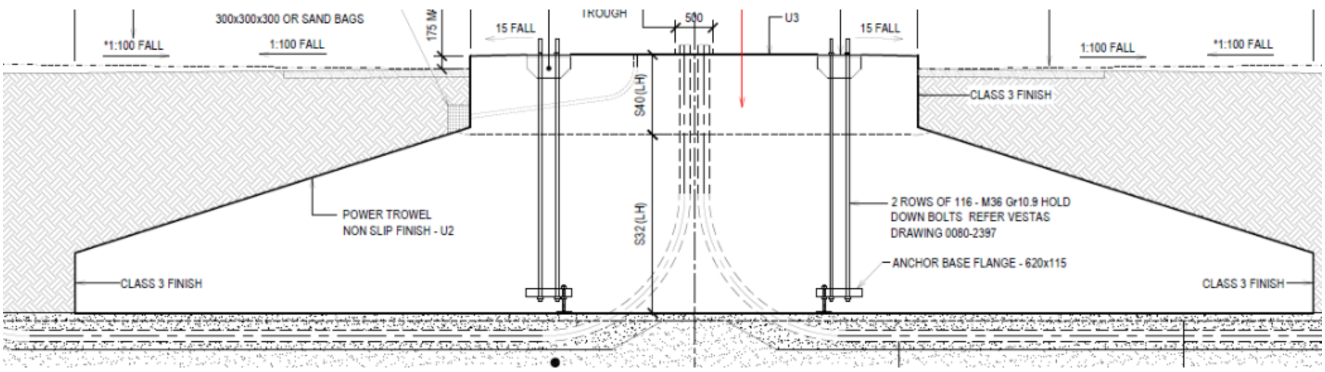

Figure 11 | Typical buried gravity concrete WTG foundation detail

2.1.3 Access roads

Based on preliminary designs, a total of 113 km of new unsealed gravel access roads are included under this Project with associated infrastructure including drainage formations, structures, culverts, and unlined drains. The nominal access road width will be approximately 5.5 metres with a 6.5 metre road clearance and consist of a 150 mm thick gravel pavement forming the road formation throughout the wind farm (refer to figure 12). The total surface area of the gravel access roads for the Project will be approximately 68 hectares. The cut and fill access road embankment slopes throughout the wind farm will be stabilised with vegetation.

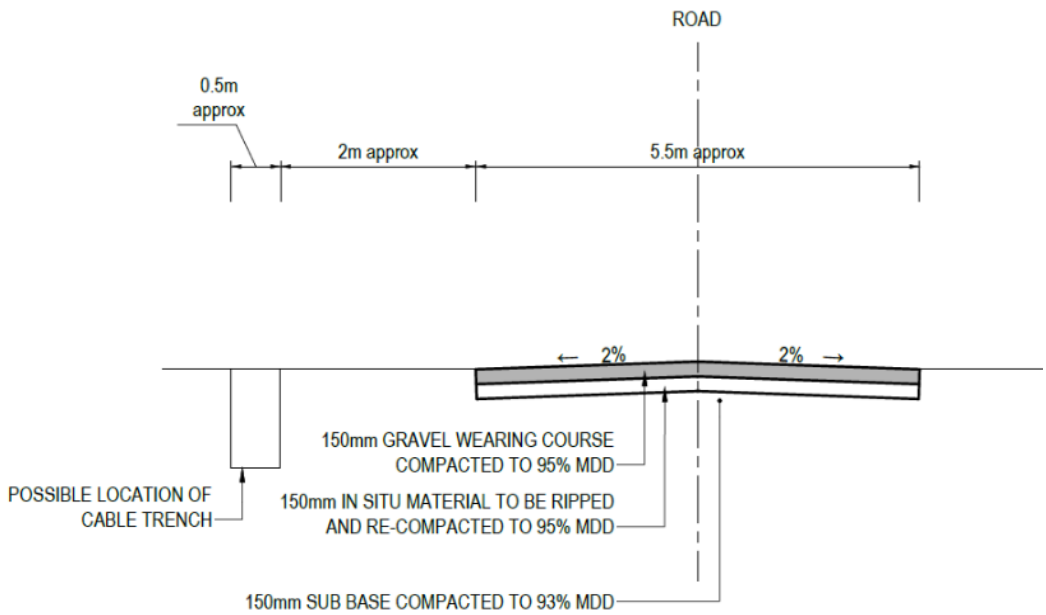

Figure 12 | Typical access road arrangement

2.1.4 Crane and storage hardstands

The crane erection hardstand will be constructed of compacted soil to form a working bench 45 m by 30 m in surface area covered with a 150 mm thick gravel pavement. In addition, a blade laydown area 84 m by 20 m and preassembly and crane boom areas will be cleared and levelled with gravel supports as required and connected to the access road system (refer to Figure 13 for a typical crane and storage pad arrangement). The total surface area of crane pads, laydown areas and assembly areas for the Project will be approximately 31 hectares.

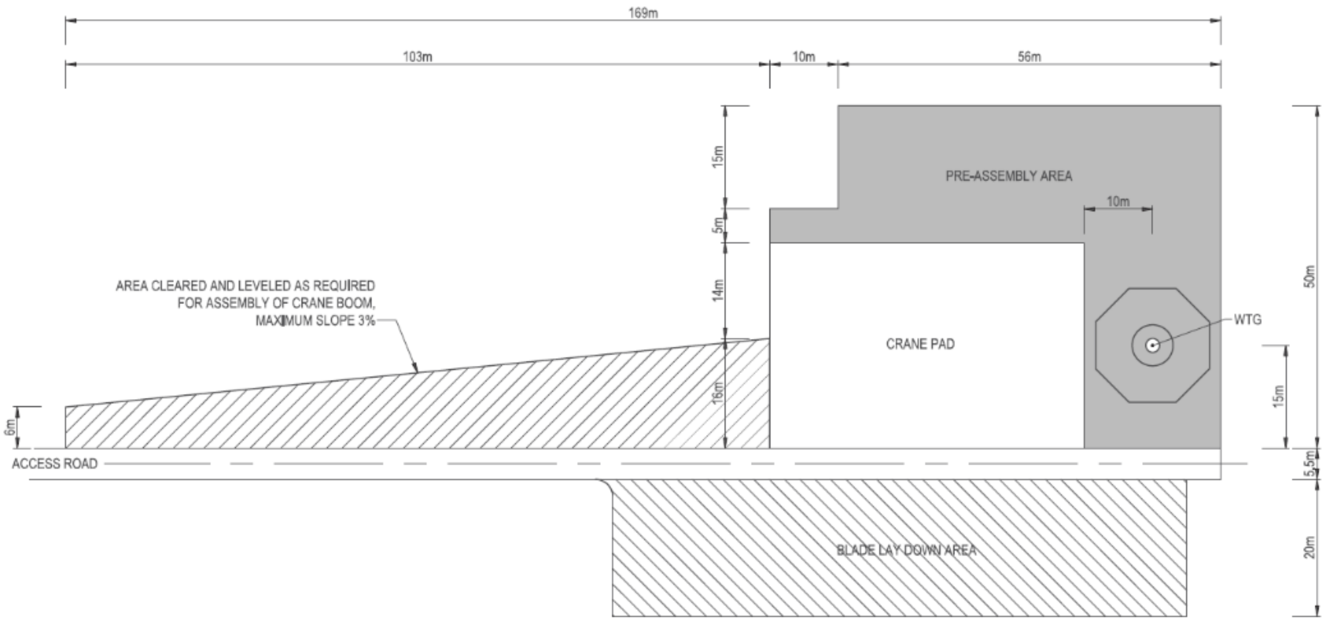

Figure 13| Typical crane and storage pad arrangement

2.1.5 Cables

The 33 kV collector network will consist of approximately 324 km of underground aluminium cable which will be a minimum of 800 mm below the general ground surface installed in excavated trenches (refer to Figure 9) and backfilled with processed in situ soil material.

2.1.6 On-site substations

The Project substations will be located in the north and south of the Project. Each substation will occupy a fenced area of approximately 1 ha and connect to the new overhead 330 kV overhead transmission line running through the wind farm and continuing north-west from the Project Site. The substations subject to detail design will contain two transformers (North Substation 2 x 270 MVA and South Substation 2 x 220 MVA) for voltage step-up from medium voltage to high voltage (33 kV to 330 kV).

The substations will generally consist of the following items:

- Compounds, slabs, foundations, firewalls, cable trenches and kerbing
- Hardstands
- Underground services
- Switch, SCADA and Control room equipment within prefabricated elevated buildings
- Lighting and lightning protection masts
- Gantry structure
- Electrical equipment (transformers, surge arrestors, earthing resistors, circuit breakers, kiosks, post insulators, disconnectors, switchgear, emergency diesel generator etc)
- Oil Management System (drainage & containment facilities)
- Water tank
- Access roads, fencing and gates.
- Refer to Figures 14 – 16 for typical 33 kV substations plant, equipment and buildings

Figure 14 I Typical Wind farm main and neutral earth transformers

Figure 15 | Typical Outdoor switch gear

Figure 16 | Typical prefabricated elevated switchroom building

2.1.7 Operations and maintenance buildings and compounds

The WWF Operations and Maintenance Compound will be approximately 40 m by 50 m in size and will be located next to the North substation. The compound will include one single storey prefabricated building for operations and maintenance staff, a metal clad workshop and storage building, staff amenities general parking and unloading areas and a fenced hardstand area (refer to Figures 17 and 18).

Figure 17 | Typical Amenities and Operations and Maintenance building

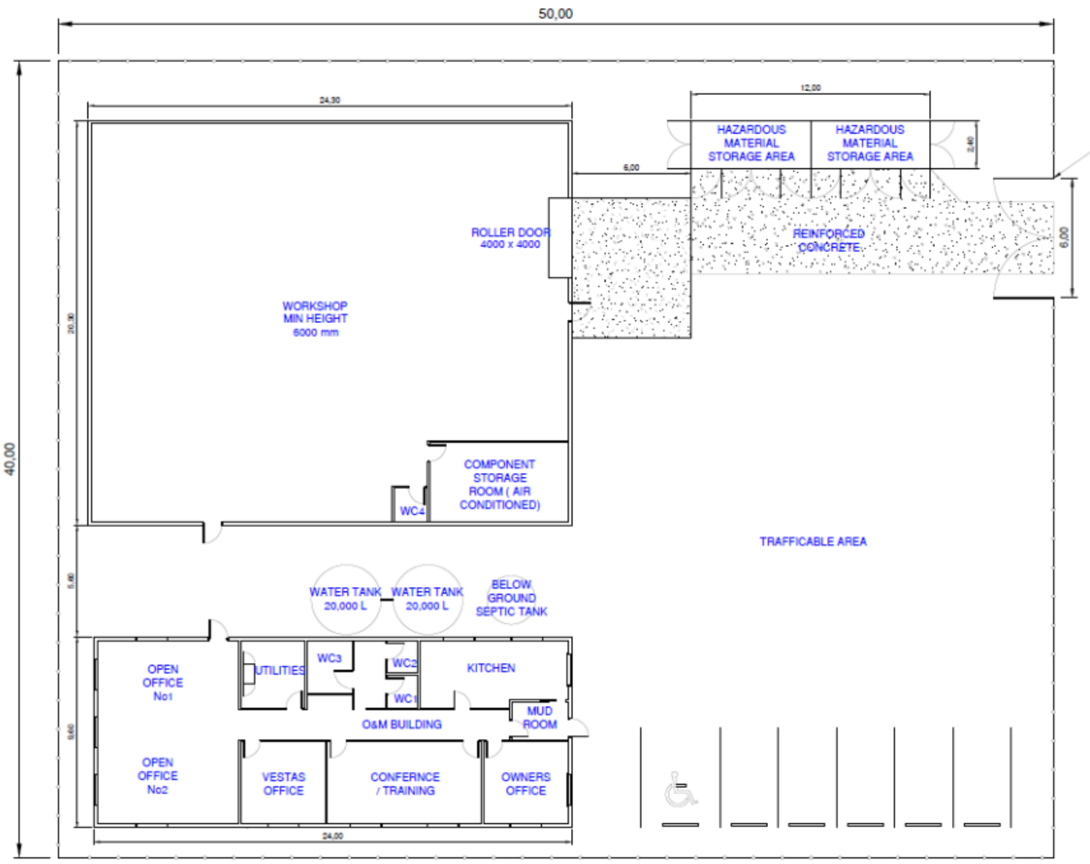

Figure 18 | Indicative O&M Compound Layout

2.1.8 Meteorological equipment

Two permanent meteorological towers are proposed to be installed as part of the Project. The towers will be permanent, galvanised steel lattice-type towers 149 m in height and supported by guying wires. The towers, including supporting foundations to a depth of 200 mm below ground, will be removed as part of the wind farm decommissioning process.

3 Decommissioning processes

Decommissioning of the WWF can take several forms, depending on the future of the wind farm development, the mechanical and electrical plant, and the site. The selected end use of the Project and its components (disposal, repower or repurpose) will determine the extent of dismantling, demolition and remediation of the site.

For this cost estimate and assessment report the decommissioning and rehabilitation of the Project will be based on retirement and closure of the wind farm at its end of life (approximately 30 years after commissioning), with disposal of the WTGs and associated infrastructure as salvage scrap and recyclable materials.

The decommissioning and site rehabilitation process shall generally include:

- obtaining all necessary Consents for decommissioning, demolition, remediation and rehabilitation
- consultation with stakeholders prior to and during the decommissioning process
- preparation and implementation of a Decommissioning and Rehabilitation Environmental Management Plan (DREMP)
- deactivating, securing, making safe, isolation and closure of the wind turbines, substation and supporting infrastructure
- installation of erosion and sediment controls as required
- removal of all liquids and other consumables from turbines, plant and electrical equipment
- removal and safe disposal of waste and hazardous materials
- dismantling or demolition and removal of turbines, buildings, structures, plant, equipment, services and other objects, excluding subsurface foundations, and services 200 mm below ground surface level, using best management practices for demolition and rehabilitation
- recycling the majority of the wind farm and substation components for scrap and materials, salvage and reuse with minimal disposal to landfill
- rehabilitation of the impacts of constructing and decommissioning the wind farm and its components
- rehabilitation of the wind farm civil infrastructure components, including top soiling where necessary and seeding with local and indigenous vegetation
- maintaining the site in context of sediment control and weed management
- compliance with all Laws applicable to the decommissioning, demolition or rehabilitation process
- monitoring of residual risks.

3.1 Wind farm decommissioning

3.1.1 General

An increasing number of wind farms, particularly in Europe and the USA, are being decommissioned as they reach the end of their operating life. Some wind farm owners are repowering aging wind site locations by upgrading or replacing the existing wind turbines or components, especially where the original WTGs can be replaced with larger, more modern machines.

With an increased number and frequency of closure and decommissioning of wind farms, it is expected that decommissioning costs decrease over time as the economies of scale increase.

As well as the economies of scale, by the 2050s further technological advances can be expected. Decommissioning WTGs involves using a range of equipment and processes. If recycling of scrap metal is to be carried out for example, there is a strong possibility that improved equipment will be available for processing the metals, thus reducing costs incurred. There may also be significant advances in transportation methods for the WTG components.

The greatest value of the existing wind turbines and associated equipment of the WWF would be realised by selling these items for reuse. It is unlikely, however, that the local market would be interested in used WTGs at the end of their design life. The resale of WTGs will require specialist and careful dismantling and some reconditioning of components if they are to be reused. It is possible that there may be interest in some of the wind turbine components as spares for other projects which would most likely be offshore and therefore would require additional transport and shipping costs.

The costs of dismantling for reuse would be significant due to the cranage, preparations and heavy transport required and most likely not be recovered. This approach to decommissioning the wind farm for reuse should only be pursued provided there is certain interest in purchase of the WTGs and that the value of the sale is in excess of the decommissioning costs.

There is an emerging global wind turbine generator refurbishment industry overseas, however this industry is yet to mature in Australia as most, if not all, Australian wind farms are still within their operational life span. As wind farms are decommissioned across Australia over the coming years there will be a growth in providers tendering to procure, transport and sell wind farm components for future uses. This market is currently competitive in Europe, particularly in Germany and Scandinavia. These methods will be reviewed during each review of the DRA to evaluate the reuse and recycling options available and the DRA will be revised as necessary.

A more conservative assessment of decommissioning costs is made by assuming that the wind turbines will not be sold for re-use, and instead, salvaged and sold for scrap or recyclable materials in the case of the blades and nacelle covers. This approach assumes that the complete set of wind turbines will not be resold and that the individual components such as the wind turbine towers, blades, generator, gearbox, cabling, transformer, and switchgear have no market value for re-use. The salvage value of the removed wind turbines is based mainly on their value as scrap metal and recycled materials.

For this cost estimate we are assuming that the wind farm will be decommissioned and removed at the end of its design life (30 years).

The wind turbine generator decommissioning process, although not a common practice in Australia at present, is not considered to be technically challenging. One method is to approach it as a “deconstruction” process, that is the reverse of constructing the wind farm. Wind turbines are modular items bolted or fastened to the foundations and the component parts similarly bolted together and can be removed in a relatively straight forward manner using appropriately sized cranes and equipment. The industry has sufficient competencies to handle this type of work. Specialist dismantling and demolition contractors would be engaged to undertake the wind farm decommissioning and rehabilitation works once the decision is made to decommission the wind farm using best management practices. Manufacturer equipment manuals and procedures would be utilised to guide decommissioning and dismantling activity.

Alternatively, the decommissioning of WTGs and associated wind farm infrastructure can be undertaken as a demolition felling process involving controlled collapse using strategic blasting or a cable pull-over process to fell the steel tower structures with blades and nacelles in place to the ground. Once on the ground the towers, blades and equipment are cut up by demolition plant and oxy- acetylene cutting equipment for sale as scrap and recycled materials.

Where areas of the wind farm do not support the cut and drop demolition method, other methods will be considered to avoid steep terrain, vegetation and protected habitat.

All above ground components including the wind turbines, buildings, structures and equipment would be removed during decommissioning. In addition, all foundations will be removed to a depth of at least 200 mm below ground surface, backfilled with topsoil to limit interference with farming activities.

Subject to discussions and agreements with host landowners, access roads and hardstands no longer needed will be covered with 200 mm of topsoil and seeded with native vegetation.

Underground cables are expected to be left in place, subject to approval and in accordance with the Project conditions of consent. Because the installed cables will be 800mm or greater below ground surface, removal of the cables may result in undesirable environmental and agricultural impacts. The cables contain no materials that are harmful to the environment and the cables will include a warning tape and tracer cable that would warn digging in the area of the cables (which will have been de-energised in any case). The locations of underground collection cables on the property will be documented and available to future potential landowners.

The WTG electrical components and cabling would be disconnected from the underground electrical collector system.

Any hazardous material such as insulating oils or lubricants will be removed in accordance with applicable Workplace Health and Safety standards. All high value sellable components, such as the copper conductor materials, would be removed and the remaining cables, equipment and other components would be salvaged for scrap value.

It should be noted that, since decommissioning activities are not anticipated to occur for 30 years or more, best management practices may differ from current standards including demolition practices, technology and equipment which may impact the cost of decommissioning the wind farm. The costs included in this assessment report are expected to be sufficient for a demolition contractor to plan and undertake demolition, disposal and site rehabilitation of the Project.

The activities associated with the decommissioning the wind farm are anticipated to be completed within a 24-month timeframe, with shorter timeframes possible with increased equipment and workforce. This does not include permitting approvals and post decommissioning activities such as monitoring of new vegetation.

3.1.2 Waste minimisation strategy

All waste management will be undertaken in accordance with the NSW EPA's Waste Classification Guidelines, or any other guidelines relevant at the time of decommissioning.

As an overarching principle, the waste minimisation hierarchy of avoid / reduce / reuse / recycle / dispose will be applied wherever possible to all decommissioning wastes. Any waste that is unable to be reused, reprocessed or recycled will be disposed of at a facility approved to receive that type of waste.

Importantly, no turbine blades will be disposed at the Walcha Landfill.

Vestas has calculated the current average recyclability across the components of a V162-5.6 MW wind turbine to be approximately 88% with expectation that this will further increase into the future at the time of expected decommissioning. It is important to note that this figure excludes the concrete foundations of the wind turbines, which will be left in place.

3.1.3 Dismantling for WTG component reuse

The decommissioning of the wind farm, based on a scenario that the plant, equipment, structures are to be disposed of for possible reuse or sale, would generally involve a deconstruction process similar to the original wind farm construction process for the project. This form of decommissioning would use similar construction, erection and transport equipment and a sizeable dismantling work force to undertake the process of isolating, making safe, dismantling and removing the wind turbines and associated plant and equipment over the site. It would involve using the in-place access roads and crane hardstands installed for the wind farm construction and would require access for large cranes and special transport vehicles to dismantle, remove and relocate the turbines and other equipment.

It is assumed, subject to approval by the Planning Minister and in consideration of the consent conditions, that all underground foundations, cables, bonding and other infrastructure would remain in situ and all above ground infrastructure would be removed. The top of the foundations would be broken down and removed to 200 mm below the existing ground surface to remove surface traces. There is also the option should it be worthwhile to remove the subsurface cabling for the scrap return however for aluminium cabling this is unlikely to be worthwhile. This decision can be made at the time of decommissioning the wind farm.

3.1.4 Dismantling of WTGs for scrap and recycling of material

At the commencement of decommissioning based on this scenario of disposing the WTGs for scrap materials, the wind farm would be shut down and removed from active service and physically disconnected (not just isolated) from the electrical infrastructure in order to make the site and equipment safe before the dismantling process commences. Once safe and ready for dismantling, all liquids will be drained and contained (oils, grease, lubricants and coolants, etc.) and any other consumable or disposable items will be removed where necessary. Captured wastes and materials will be recycled or reused wherever practicable to do so, and if not practicable, disposed of at an appropriate waste facility. Any handling, storage and disposal of waste material will be carried out in accordance with an approved Waste Management Plan.

The dismantling of the wind turbines would be a reverse sequence to the construction sequence with the blades being removed and lowered, followed by the nacelle and then the tower sections. It would require a large main crane supported by smaller cranes to systematically support a team to unfasten and lower the various components to the ground or directly loading on to transport vehicles for transporting off site or to a central compound for storage and processing before transporting off site. The dismantling process would likely involve less cranes than the erection process which usually incorporates smaller cranes preceding the main erection crane to erect the lower tower sections on the foundation and to unload the tower sections at each wind turbine location.

The nacelle will require further break down to remove the cooler top, generator, hub etc.

Prior to dismantling the wind turbines, the access roads and crane pads may require some remedial work to allow the large cranes to traverse and safely operate during the dismantling process.

It is unlikely that the transport will be able to be synchronised for the removal of the various components as they are dismantled and lowered. Additional craneage will be required to load and transport the various components to a process area or off site as the main dismantling crane moves onto the next wind turbine location.

The typical wind turbine dismantling sequence would involve:

- 3 days to set up cranes
- 1 day to unbolt and lower blades
- 1 day to unbolt and lower nacelle
- 2 days to unfasten and lower tower sections
- 3 days to reposition the main crane for next WTG
- In ground cabling and earthing to remain
- Majority of the in-ground foundation to remain
- 5 days of cutting and processing the wind turbine components for scrap and material recycling with mechanical shears and saws, crane and oxy cutting team
- 4 days to load out processed and cut components using excavator with grab and magnet
- 2 days to break down and load out the above ground (175 mm high) reinforced concrete WTG foundation top hat including 200 mm below the formed bench level (approx. total concrete to be removed 22 m^3) using a large excavator with rock hammer and bucket including 8 hrs of oxy cutting the reinforcing and anchor bolt cage system.

Figure 19 | Wind Turbine Blade dismantling

Figure 20 | Wind Turbine Nacelle dismantling

Figure 21 | Wind turbine tower dismantling

Figure 22 | Cranage of wind turbine components

Figure 23 | Tower sections loaded onto over dimensional transport

Based on this sequence and process of dismantling with large cranes it is estimated approximately 30 months would be required to dismantle the proposed 119 wind turbines. Shorter durations could be achieved with an additional large crane, demolition equipment and workforce.

A typical work force would include an 8-person crane and support crew, 4 person dismantling crew, 4 person transport crew and overall supervisor.

The dismantling for reuse process would also require the use of special handling equipment such as blade lifting jigs, hub mounts and cradles to support the wind turbine components for transport.

The transportation of the decommissioned WTG components would be undertaken using a mixture of standard-dimensional road transport loads and over dimensional loads. Consultation with Local and Main Roads Authorities will need to be undertaken and the relevant consents gained prior to the transport of oversized loads being undertaken.

3.1.5 Demolition of WTGs for scrap & recycling of materials

In the likely situation that there is no market for the reuse or sale of the equipment, the wind turbine generators and associated wind farm infrastructure could be demolished rather than dismantled, subject to safety consideration and relevant approvals.

This would involve the strategic oxy cutting of the steel tower base and pulling the tower over with cables using large excavators or controlled blasting of the steel tower at its base and felling the tower structure with blades and nacelle in place to the ground. Once on the ground the steel tower, composite material blades and metallic plant and equipment would be cut up by demolition plant and oxy-acetylene cutting equipment for disposal as scrap and recycled materials (refer to Figures 24 to 27).

Figure 24 | Oxy-acetylene cutting preparation of tower base

Figure 25 | Wind turbine blade cutting

Figure 26 | Wind turbine components processing for scrap recycling

Figure 27 | Hydraulic excavator with shear attachment

For the glass fibre and carbon composite blades and hub cover, recycling involves a more complex process due to the heterogeneous nature of the composite. The aim of the recycling process for composite materials is to separate the polymer (resin) and fibre composites. Once separated, the resins are usually used for energy production while the fibre can be reused or recycled. There currently exist five main methods for recycling composite materials, including mechanical, thermal, oxidation, chemical and cement kiln route processes. As the global wind industry continues to grow, and as increasing numbers of older windfarms require repowering or decommissioning, more commercial options for recycling of wind turbine blades are becoming available in place of the current disposal of the blades to landfill.

The optimal solution for the recycling of wind turbine generator blades will be determined and selected closer to the time of project decommissioning. It is noted that the technology in wind turbine generator manufacture as well as in recycling processes evolves quickly and the market is expected to expand in Australia as wind farms reach the end of their life expectancy in the coming years.

Felling of the WTGs would result in damage to the WTG components which should not be a concern as the components would be cut up by hydraulic equipment for loading onto transport vehicles and will be recycled as scrap.

Cabling and earthing internal to the towers would be removed and stripped to recover the high value copper materials. Similarly control cabinets, switchgear would be stripped of high value items and disposed as ferrous and non-ferrous scrap material.

The components of the wind turbines will be cut into pieces sized to meet recycling requirements so the scrap value will be maximized. The components will then be loaded into scrap trucks and transported to a licensed recycling facility either in Newcastle or Sydney.

Any damage to the surrounding land area resulting from the felling of the WTGs would be cleaned up and rehabilitated at the completion of the WTG removal and the area restored as close as possible to replicate the surrounding terrain.

The felling of the WTGs with explosives or pulling over with cables would require less manpower and would not require the costly large cranage equipment to lower the wind turbine components to the ground. This would also reduce the costs associated with preparing crane paths and pads and reduce the number of trucks delivering equipment. The demolition contractor will be able to direct the turbines to fall where access and removals are easiest.

The turbine foundations are constructed from concrete and reinforcing steel bar (rebar). For the removal of turbine foundations to a depth of 200 mm below grade, the foundation will first be exposed using excavating equipment. The pedestal (upper part of the turbine foundation) will then be removed to a depth of at least 200 mm below grade using hydraulic impact hammers mounted on heavy equipment to break up the concrete. The rebar will be cut with oxy torches. The concrete will be broken and pulverised for transport off site as recycled crushed concrete. The rebar will also be recycled as scrap steel.

Following removal of the turbine foundation, the resulting void will be backfilled with material sourced from the hardstand rehabilitation and compacted to a density similar to the surrounding soil to limit future settlement in the backfilled areas while promoting groundwater flows and vegetation growth. Topsoil will be reapplied to the site and graded to match surrounding grade to preserve existing drainage patterns. The topsoil and subsoil will be de-compacted, as required to promote growth, and re-vegetated.

The wind turbine demolition sequence would involve:

- 2 days to prepare the WTG for pulling over or felling with explosive charges
- 5 days to fell and process the steel tower sections, nacelle and blades with mechanical cutting equipment and oxy – acetylene equipment
- 4 days for hydraulic excavator with grab or magnet to load out WTG components
- 2 days to break down and load out the above ground (175 mm high) reinforced concrete WTG foundation top hat including 200 mm below the formed bench level (approx. total concrete to be removed 22 m^3) using a large excavator with rock hammer and bucket including 8 hrs of oxy cutting the reinforcing and anchor bolt cage system.

Based on this sequence of demolition of felling the WTGs it is estimated to take approximately 24 months to decommission the proposed 119 wind turbines wind farm facility. Shorter durations could be achieved with additional workforce and plant.

A typical work force would include 2 excavator operators, 4-person crew cutting team preparing the tower for felling and cutting up components and a transport crew of 4 persons and an overall supervisor.

The transportation of the felled and cut down WTG components would be mostly achieved using standard-dimensional road transport loads and vehicles.

Transport of project decommissioning plant and equipment and the decommissioned and processed wind farm components will be undertaken in accordance with a traffic and access assessment undertaken in the Decommissioning Environmental Management Plan. An assessment of the haulage route(s) will be undertaken, and a Road Dilapidation Report prepared. Consultation with the relevant road authorities at the time will be undertaken to ensure that concerns are addressed, and agreement reached in relation to any road dilapidation requirements.

3.1.6 Decommissioning cost estimate methodology

For the cost estimate presented in this report, the decommissioning of the wind turbines is based on the two methodologies outlined in section 3.1.4, (using a main crane with support and tailing crane and team to dissemble the WTG components) and section 3.1.5, (using demolition methods to fell the WTG components to the ground. Once safely on the ground by either method the WTG components would be dismantled, cut up and processed using excavators, shears and grabs and workers with oxy- acetylene cutting equipment. Excavators with grabs and magnets and cranes would be used to load the components into trucks for transport to offsite recycling facilities.

In accordance with the proposed commitments set out in the DRA, WWPL would update this DRA once the Project was assessed as having less than six years remaining to better understand the expected decommissioning methodology and anticipated cost, and to commence discussions about timing and methodology with the relevant stakeholders, landowners and regulatory authorities.

3.2 On-site substations, and operations & maintenance buildings and compounds

The dismantling process for the substations is relatively straightforward. Following power isolation to these sites the various components and equipment would be unbolted, disassembled and loaded onto transport for disposal off site or demolished with mechanical shears, cut up and loaded into trucks for disposal to scrap processing facilities.

The most likely equipment that could be sold for reuse depending on their age and condition at the time of decommissioning would be the four main transformers (notionally 2 x 270 MVA and 2 x 220 MVA, subject to final design) and possibly the neutral earthing transformers which would all need to be drained of oil, dissembled and prepared for transport. Resale of this equipment will depend on the need at the time of disposal for this specific sized equipment for other projects or as spares for existing projects.

The remaining structures, lightning masts, fencing etc. would be dismantled or demolished and loaded onto transport for scrap processing or as steel members for reuse.

The surface and easily recoverable copper earthing would also be recovered and disposed of as scrap.

The nonferrous items such as the insulators would be dismantled and separated from the steel structures and disposed for material recycling.

It is anticipated that the removal of underground cables (mostly aluminium) would not be cost-effective and would significantly disturb the landscape and the farming activities by creating large trenches and site disturbance. In order to minimise the environmental and agricultural impacts, the underground cable network would therefore not be removed as part of the project decommissioning, subject to approval by the Planning Minister and in accordance with consent conditions. Any cables at a depth of less than 200 mm such as cables entering and exiting the turbine foundations, junction boxes, or substation components, will be removed. Following any necessary removal, the area affected will be restored by reapplication of topsoil to match the surrounding grade and preserve existing drainage patterns. The topsoil and subsoil will be de-compacted and re-vegetated.

No known hazards exist from the presence of capped unused/inert underground cables. Any land disturbed by these activities would be rehabilitated.

Should removal of underground cabling be required for any reason, cabling will be removed in a way that minimises impacts to the environment. Disturbed areas will be adequately backfilled and graded to match the slope and contour of the surrounding land. The disturbed areas will then be revegetated to prevent soil erosion and reintegrated within the surrounding environment

Any hazardous material such as oil or other lubricants will be removed in accordance with regulatory standards. In addition to steel structures, the control building will be disassembled and removed from the site. Fencing around the substation will be broken down and removed. The aggregate surfacing of the substation will be loaded onto trucks and removed for sale and reuse.

All waste which cannot be reused shall be classified in accordance with the NSW EPA Waste Classification Guidelines, removed from the site and disposed of at a facility that can lawfully accept the waste in accordance with the Protection of the Environment Operations Act and Waste Regulation.

The remaining above ground concrete structures such as the transformer compound bunds and firewall would be demolished down to 200 mm below ground level ground level and the concrete debris crushed and processed for reuse off site and the steel reinforcing disposed as scrap. The sub surface concrete footings, pavements and the below ground cables and services would remain in situ and covered with 200 mm of topsoil as part of the rehabilitation process.

The O & M building would also be removed, relocated or reconditioned. All equipment, furniture, and materials within the O & M building will be removed prior to demolition.

Alternatively, if any of the buildings are identified by the landowner as appropriate for retention, the buildings may be transferred to the landowner.

The foundations, slabs, bunding and fire walls will be demolished, crushed and processed on site and removed, consistent with the method for the wind farm foundations and hardstands. Fencing around the compound will be broken down and removed and disposed of as scrap.

The 330 kV overhead transmission line will likely remain in place as part of the grid network.

The interconnection switchyard south of Uralla will be owned by TransGrid and decommissioning of that facility will occur at their option.

4 Rehabilitation process

Rehabilitation for the Project will generally involve the removal of all above surface equipment, structures and buildings at the end of the Project life and restoration of the land returned to as close to predevelopment conditions as possible and closely replicating the surrounding terrain.

As discussed in the decommissioning sections above, based on the current custom and practice from other decommissioning projects it is assumed that the subsurface foundations, cables, and 50% of the gravel access roads will be left in place. The ground slabs, and surface of deep foundations will be demolished and removed to approximately 200 mm below the ground surface and then backfilled with local fill material and covered with topsoil and seeded.

Hardstands, laydown areas, compounds, area disturbed during the demolition process and the estimated 50% of access roads not retained would be top soiled and vegetated by seeding with local native plant and grass species in consultation with the landowners.

To prevent the introduction of undesirable plant species into reclaimed areas and ensure slope stability, seeding and site reclamation efforts will utilise seed for grasses native to the area and free of noxious weeds. If mulch is used, the mulch will be certified weed-free prior to use in reclamation efforts. Agricultural seed will likely be secured from a local source.

Any contamination resulting from the plant operation or its dismantling and demolition shall also be cleaned up and remediated to preconstruction ground soil levels.

The rehabilitation will involve the following:

- Removing, processing and disposal of the top 475 mm of wind turbine foundations including oxy cutting and recycling as scrap the protruding reinforcing and anchor bolt cages
- Removing and disposing surface slabs, general footings, pits, trenches and kerbing
- Removed concrete to be processed on site (fragmented and crushed into aggregate) and disposed as recycled crushed concrete aggregate for reuse as road base or free draining backfill material in leu of disposing to land fill (processing and sale return assumed cost neutral)
- Removal, treatment or disposal of any contaminated areas originating from the construction, operation and decommissioning of the plant
- Filling areas with clean sub-grade material, compacting and forming to match the surrounding surface
- Reshaping steep batters surrounding hardstands
- Placement of clean and suitable topsoil from stockpiles on the site
- Ripping and ploughing areas to promote resource and seed traps
- Direct seeding, hand and hydroseeding using indigenous species
- Ongoing pest and weed control
- Monitoring of rehabilitation

It is assumed that the following areas will be rehabilitated:

- Wind Turbine foundations
- Substation areas
- 50% of the access roads (estimated)
- Wind turbine crane erection hardstands and blade lay down areas
- Operations and maintenance area
- The areas where concrete footings are removed (power poles, meteorological towers and wind monitoring masts and fence posts).

5 Monitoring

Following completion of site rehabilitation, monitoring will be implemented using methods described in the DEMP at the site to ensure native vegetation, habitats and/ or land use is re-established in the areas disturbed during decommissioning of the Project and that the site has successfully been restored to preconstruction conditions.

Reseeded areas will be monitored and inspected to ensure storm water controls remain effective while vegetation is re-established for slope stability and erosion control. Once vegetation is established, any silt fences or barriers used to facilitate the process will be removed when no longer needed for erosion and sedimentation control.

Invasive species and noxious weeds will be managed during site rehabilitation to control and/or prevent the establishment of invasive species and noxious weeds within reclaimed areas. To prevent the establishment and spread of noxious and invasive weeds in reseeded areas, monitoring and control of weeds will be implemented at the site following completion of decommissioning activities.

It is anticipated that monitoring will be undertaken by the involved landholders in the first instance with any additional rehabilitation works carried out upon assessment of the area. A suitably qualified environmental professional will be engaged at the time where required to oversee the performance of the monitoring program and any additional rehabilitation works that may be required. The DEMP will include provisions for corrective actions to ensure remediation measures are adequate to achieve the objectives.

6 Decommissioning and rehabilitation costs

6.1 General

The greatest monetary value for the WWF components would be realized by selling these items for reuse followed by disposing the various components as scrap and recycling rather than disposing them to land fill.

However, it is considered unlikely that parties would be willing to purchase used (thirty years old) energy production equipment and components at the end of the design life for more than scrap value.

The resale of energy producing components would require specialist and careful dismantling and some reconditioning of components if they are to be reused. It is more likely that there may be interest in some of the components as spares for other projects which would also most likely be offshore and therefore require additional transport and shipping costs.

The costs of dismantling the WTGs for reuse would be significant and most likely would not be recovered through sale of used components.

A more appropriate assessment of decommissioning costs is made by assuming that the components will not be sold for re-use, and instead, salvaged and sold for scrap and therefore offsetting the decommissioning and rehabilitation cost for the Project.

6.2 Understanding the value of scrap

Scrap value can be a significant return in the case of a wind farm with large turbines, offset by the cost of recovering, processing and delivering the scrap to the end user.

For this cost estimate and assessment, it is assumed that the ferrous and nonferrous scrap will be processed in Australia rather than being shipped overseas for processing.

Scrap value varies greatly on a daily, weekly and yearly timescale, depending on economic conditions at the time. It cannot be estimated a year in advance, let alone 30 or more years in advance.

Scrap metal is traded on an international commodity market and its value is derived largely from international market demand for steel. Demand is closely linked to global economic conditions of construction, manufacturing and industrial markets resulting in a high degree of volatility being observed in scrap metal prices. Manufacturing indices of China and South Korea are lead drivers in global scrap prices, with frequent short-term fluctuations in market conditions and growth.

The scrap prices do not cover the cost of cutting, loading and delivering the material to the mill.

For the purpose of this report the estimated scrap values are:

Table 3 | Scrap Rates (2021)

Item	Rate*	Amount AUD
Steel scrap	AUD/tonne	500
Copper scrap	AUD/tonne	9,000
Copper wire (PVC coated) scrap	AUD/tonne	4,000
Aluminium scrap	AUD/tonne	2,900

**Current scrap prices based on pricing feedback from Australian demolition contractors*

It is worth noting the 2021 scrap prices are currently strong in comparison to historic levels.

6.3 Project decommissioning and rehabilitation cost estimate

The estimated costs of decommissioning and rehabilitating the proposed Project have been prepared using available industry information and from Aurecon's experience in decommissioning of power generation facilities and represent current year costs (i.e. year 2021).

Estimating decommissioning and rehabilitation into the future is subject to some uncertainty as regulatory requirements may change, and decommissioning technology and recycling capabilities improve. For this cost estimate, we have used current decommissioning and rehabilitation practices with a view of improved recycling availability in the future.

The total estimated cost to decommission and rehabilitate the Project and its associated components ranges between **AUD$28,826,119 (+/-20%)** based on large crane dismantling and **AUD$-13,178,372 (+/-20%)** net of the return from salvage based on controlled felling.

It is determined that at this point of time the return from the proposed 119 WTGs through sale as recyclable scrap material using controlled demolition of the WTGs will cover the decommissioning and rehabilitation of the WWF.

Costing estimate spread sheets for each component of the Project can be found in Appendix A.

Table 4 | Winterbourne Wind Farm Project Decommissioning and Rehabilitation Cost Estimate Summary, 2021

Item	Amount (AUD, +/-20%)	Amount (AUD, +/-20%)	Comment
WIND FARM INFRASTRUCTURE			
Demolition Method	WTG Felled Demolition	WTG Crane Demolition	
Decommissioning Cost	34,652,134	68,802,126	119 Vestas V162-6.2 MW Turbines – 700 MW Hub Height - 149 m (typically, 6-8 steel tower sections) Blade Length – 79.35 m WTG Weight - 900 tonnes Buried Gravity RC Foundations – 800 m^3 Access Roads – 113 km Crane Hardstand – 45 m x 30 m Blade Laydown Area – 84 m x 20 m Access Roads & Hardstand Areas – 99 ha
Salvage Value	-61,645,570	-61,645,570	
Rehabilitation Cost	4,406,179	4,406,179	
Sub Total	**-22,587,257**	**11,562,735**	
SUBSTATIONS			
Decommissioning Cost	331,957	331,957	33/330 kV On-site substations Northern Substation Area – 1 ha Southern Substation Area – 1 ha
Salvage Value	-282,058	-282,058	
Rehabilitation Cost	225,303	225,303	
Sub Total	**275,202**	**275,202**	
OPERATION AND MAINTENANCE COMPOUND			
Decommissioning Cost	14,480	14,480	One single-storey prefabricated Operations and Maintenance (O & M) and Amenities Building One metal clad workshop and storage building Compound Area – 0.2 ha
Salvage Value	0	0	
Rehabilitation Cost	3,489	3,489	
Sub Total	**17,969**	**17,969**	
WINTERBOURNE WIND FARM DISPOSAL COSTS SUMMARY			
Decommissioning Costs	34,998,571	69,148,563	

Item	Amount (AUD, +/-20%)	Amount (AUD, +/-20%)	Comment
Salvage Value	-61,927,628	-61,927,628	Wind Farm, Substations and O & M Compound
Rehabilitation Costs	4,634,971	4,634,971	
Sub Total	**-22,294,086**	11,855,906	
OVERHEADS			
Mobilisation	1,981,677	3,689,177	Based on 5 % of Decom + Rehab Costs
Project Management and Supervision	3,963,354	7,378,353	Based on 10 % Decom + Rehab Costs
Profit and Risk Margin	3,170,683	5,902,683	Based on 8 % Decom + Rehab Costs
TOTAL NET COST	**-13,178,372**	**28,826,119**	

7 Decommissioning funding

Decommissioning and rehabilitation of the WWF at the end of its operating life is WWPL's obligation and cost as the owner of the Project.

There are currently no examples of wind farm decommissioning in Australia. Available data from overseas projects indicates that the salvage value of turbine components is generally adequate to provide for the decommissioning of wind farm infrastructure and site rehabilitation.

Based on the current analysis and assuming that the WWF will be decommissioned by controlled felling of the WTGs for scrap and not reuse, then the scrap return of the WTGs and associated infrastructure will cover the wind farm decommissioning and rehabilitation costs.

However, to cover any potential future shortfall in the decommissioning costs WWPL propose to commit to the following conditions to be included in any development approval issued:

a) Undertake an annual assessment of the remaining life of the Project, starting in Year 15.

b) When it is determined that the remaining economic life of the Project is less than 6 years, update this Decommissioning and Rehabilitation Assessment (DRA) to identify the expected decommissioning methodology and anticipated cost.

c) If a shortfall (cost) is identified establish a dedicated decommissioning reserve fund to cover the decommissioning and rehabilitation cost of the wind farm. This reserve will be established out of operating cashflows, with an appropriate percentage of cash generated by the wind farm directed into this reserve over an annual basis, until the reserve is fully cash funded, based on the most recent estimate of decommissioning and rehabilitation costs.

8 Timeframe for decommissioning and rehabilitation

WWPL commits to commence all decommissioning and rehabilitation works outlined in this assessment within 18 months after the end of Winterbourne Wind Farm's operational life. Assuming the wind farm is commissioned by 2026, then project decommissioning would be expected around 2056, assuming there is no repowering or life extension of the Project. If repowering or life extension were to occur, then of demolition and rehabilitation would not be required for another period of time.

It is anticipated all major onsite decommissioning activities would be completed within a period of two years, from commencement of the activities, with ongoing site monitoring and rehabilitation activities continuing for up to a further two years beyond this time

9 Decommissioning and rehabilitation assumptions

In addition to other assumptions noted herein, the following key assumptions are utilised for the decommissioning cost estimates presented herein:

- All costs are presented in current (2021) AUD
- The decommissioning estimate is based on wind farm and equipment details provided by WWPL and documents provided by Vestas
- The decommissioning and rehabilitation cost estimate is based on retirement and closure of the wind farm with disposal of the WTGs and associated infrastructure as salvage scrap and recyclable materials
- For the purpose of this decommissioning cost estimate it has been assumed that decommissioning of the wind farm and restoration of the land will be either by conventional large crane dismantling or controlled demolition of the WTGs
- The haulage distance to scrap metal and recycling facilities is 270 km to the closest city (Newcastle)
- The majority of the materials generated from the decommissioning process will be processed and recycled with minimal items going to land fill. No turbine blades will be disposed in Walcha Landfill
- Scrap metal prices are based on current rates from a local experienced large demolition contractor
- Fluids located within the turbine nacelle, including oils, fuels, solvents, and process chemicals, are assumed to be drained and disposed of offsite for reuse or to an approved waste process facility as part of the decommissioning
- All underground foundations, equipment and services will be removed to a depth of 200 mm below project ground level in accordance with the decommissioning regulations. All non-hazardous structures, foundations, cables, and services greater than 200 mm below project ground level will remain and are excluded from the decommissioning estimate
- Access roads, hardstands, storage yards, crane pads, and all other areas constructed from concrete and blue metal be removed, processed, and recycled
- Gravel hardstands and compound areas will remain with the areas topsoiled and vegetated by seeding with local native plant and grass species
- 50% of the wind farm access roads and associated infrastructure shall remain for use of the landowner
- Concrete shall be processed on site (fragmented and crushed into aggregate) and disposed as recycled crushed concrete aggregate for reuse as road base or free draining backfill material in lieu of disposing to land fill (processing and sale return assumed cost neural)
- It is assumed that the disturbed areas (hardstands, compounds, and storage areas) will be restored to the existing grade, reclaimed with native soils, seeded, and replanted with native vegetation consistent with the surrounding land use
- The plant, equipment and structures shall be cut up and processed on site for haulage to scrap and recycling facilities for further processing
- The 330 kV overhead transmission line and new switchyard to the south of Uralla will belong to TransGrid and are not included in the wind farm decommissioning process
- Costs include 20% contingency
- Market conditions may result in cost variations at the time of contract execution.

10 Roles and responsibilities

WWPL will be responsible for decommissioning and rehabilitation of the wind farm, in accordance with the expected conditions of development consent in addition to contractual obligations with host landowners.

11 Review of this decommissioning and rehabilitation assessment

As described above, WinterbourneWind will undertake an annual review of the expected remaining life of the wind farm, starting in Year 15. When it is determined that the remaining economic life of the wind farm is less than 6 years, WinterbourneWind will update this DRA to identify the expected decommissioning methodology and anticipated cost.

The DRA may also need to be revised for reasons including:

- A modification to the condition of the Approval
- Changing environmental requirements
- Instructions of the Consent Authority
- Change in legislation, and
- Improvements in knowledge or technology become available.

Any major changes to this assessment will be undertaken in consultation with the appropriate regulatory authorities and stakeholders.

12 References

NSW Government Planning and Environment Wind Energy Guideline for State significant wind energy development requirement, December 2016.

DP&I (2011) Draft NSW Planning Guidelines: Wind Farms, NSW Department of Planning and Infrastructure, December 2011.

ERM Winterbourne Wind Farm Scoping Report, 2020NSW EPA (1999) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non- Liquid Wastes, NSW Environmental Protection Agency, Chatswood, NSW.

Job, S. (2010) Composite Recycling – Summary of recent research and development, Materials Knowledge Transfer Network Report, September 2010.

Vestas Document 0083-5282 VER 01 - Results of Streamlined Assessment: EnVentus™ V150-5.6 MW & V162-5.6 MW, 2020.

Vestas Wind Systems A/S - Large Diameter Steel Tower Technical Specification, 2017.

Appendices

Appendix A

Winterbourne Wind Farm Project Decommissioning and Rehabilitation Cost Estimate

Winterbourne Wind Farm Project - Decommissioning and Rehabilitation Cost Estimate Summary

Item	Amount (+/- 20%)	Amount (+/- 20%)	Comment
WTG & Infrastructure			
Demolition Method	**WTG Felled Demolition**	**WTG Crane Demolition**	119 x Vestas V162-6.2 MW Turbines - 700 MW Hub Height - 149 m (typically, 6-8 steel tower sections) WTG Weight - 900 tonnes (excluding foundation) Access Roads - 113 km, 5.5 m wide Buried Gravity RC Foundations - 800 m^3
Decommissioning Cost	$34,652,134	68,802,126	
Salvage Value	-$61,645,570	-61,645,570	
Rehabilitation Cost	$4,406,179	4,406,179	
Sub Total	-$22,587,257	11,562,735	
Substations			
Item	**Amount (+/- 20%)**	**Amount (+/- 20%)**	**Comment**
Decommissioning Cost	$331,957	$331,957	33/330kV on-site substations (Northern & Southern) Substations Area – 2 x 1 ha Buried Cables - 310 km (left in ground)
Salvage Value	-$282,058	-$282,058	
Rehabilitation Cost	$225,303	$225,303	
Sub Total	$275,202	$275,202	
O&M Compound			
Item	**Amount (+/- 20%)**	**Amount (+/- 20%)**	**Comment**
Decommissioning Cost	$14,480	$14,480	One single-storey prefabricated Operations, Maintenance and Amenities Building Metal clad workshop and storage building plus fencing remain for landowner use Compound Area – 0.2 ha
Salvage Value	$0	$0	
Rehabilitation Cost	$3,489	$3,489	
Sub Total	$17,969	$17,969	
Decommissioning and Rehabilitation Summary			
Item	**Amount (+/- 20%)**	**Amount (+/- 20%)**	**Comment**
Decommissioning Cost	$34,998,571	$69,148,563	Wind Farm WTGs, Hardstands, 50% 0f Access Roads, Substation and O & M Compound
Salvage Value	-$61,927,628	-$61,927,628	
Rehabilitation Cost	$4,634,971	$4,634,971	
Sub Total	-$22,294,086	$11,855,906	
Overheads			
Item	**Amount (+/- 20%)**	**Amount (+/- 20%)**	**Comment**
Mobilisation	$1,981,677	$7,378,353	Based on 5% of Demo + Rehab Costs
Project Management and supervision	$3,963,354	$3,963,354	Based on 10% of Demo + Rehab Costs
Profit and Risk Margin	$3,170,683	$5,902,683	Based on 8% of Demo + Rehab Costs
Grand Total Net Cost	**-$13,178,372**	**-$28,826,119**	

Winterbourne Wind Farm Project Rates - 2021

Rates				
Item	Units	Amount	Daily Rates	Reference
Steel scrap value (Heavy metal scrap HMS1)	$/tonne	500		Rates from demolition contractors & dealers
Copper scrap value	$/tonne	9,000		Rates from demolition contractors & dealers
Copper wire (PVC coated) value	$/tonne	4,000		Rates from demolition contractors & dealers
Aluminium scrap value	$/tonne	2,900		Rates from demolition contractors & dealers
Cost of General Labour	$/hour	126	1260	Based on current tenders received
Supervisor	$/hour	218	2180	
Hire cost of 50t excavator + cutting & grab attachment	$/hour	362	3620	Hire Contractors
Hire cost of 30t excavator + cutting & grab attachment	$/hour	253	2530	Hire Contractors
Hire cost of 25t front end loader	$/hour	172	1720	Hire Contractors
Hire cost of 14t Grader	$/hour	155	1550	Hire Contractors
Haulage cost semi load (by tonne)	$/tonne	60		Database rates
Low loader cost by load (e.g. for transformers)	$/tonne	80		Hire Contractors
Main lattice boom crane (e.g. LG 1750) with operator and support crew	Daily rate		27,143	Provided by vestas
Preassemble Large Crane with operator and support crew	Daily rate		16,475	Provided by vestas
100 t crane plus rigger hourly rate	$/hour	621	6210	Hire Contractors
50 t crane plus rigger hourly rate	$/hour	299	2990	Hire Contractors
30t crane plus rigger hourly rate	$/hour	218	2185	Hire Contractors
Rate to remove 2.1m high chain link fence	$/m	20		Database rates
Rate to break up reinforced concrete slabs	$/m^2	63		Database rates
Rate to lay 200mm layer of topsoil	$/m^2	5		Database rates and assuming topsoil stockpiled on site
Rate to remove access track pavement, grade and re-seed.	$/m^2	10		Database rates
Rate to re-seed large areas	$/ha	17850		Database rates
Rate to demolish and remove substation in enclosed building (i.e. switchroom)	$/m^2	100		Database rates
Rate to demolish and remove switchyard	$/m^2	100		Database rates
Rate to dispose material to land fill	$/tonne	370		Database rates
Rate to dispose oil etc	$/litre			Database rates
Rate to backfill voids with local material	$/m^3	8.5		Database rates
Haulage Low Bed less than 30t	$/tonne/100km	40		Database rates
Haulage Low Bed less than 30t - 40t	$/tonne/100km	60		Database rates
Haulage Low Bed > 40t	$/tonne/100km	80		Database rates

Decommissioning and Rehabilitation Cost Estimate - WTGs (Felled Demolition)			
Item	**Units**	**Amount**	**Reference**
WTG			
WTG total weight (excluding foundation)	t/WTG	900	Vestas WTG data documentation
Ferrous weight + tower + reo & anchor bolts from top of footing	t/WTG	873.2	Vestas WTG data documentation
Copper & Alloys weight	t/WTG	4.9	Vestas WTG data documentation
Aluminium and alloys weight	t/WTG	12.7	Vestas WTG data documentation
Fibre glass, Polymer & Carbon composites weight	t/WTG	78.4	Vestas WTG data documentation
Crane erection pads	m^2/WTG	2600	Estimate based on typical large crane WTG hardstand requirements
Access Roads 50% to be rehabilitated	ha	34	50% of access roads to remain for landowner use
Concrete foundation demolition 475mm depth (top 200 mm buried and 175 mm proud)	m^3/WTG	22	Foundation top hat dia 7.65 m
Concrete (top of footing) weight	t/WTG	53.02	Estimate based on typical WTG gravity foundation
WTG demolition preparation	$/WTG	$15,380	Preparing WTG tower for felling 2 days
WTG internal preparations	$/WTG	$5,040	2 persons draining oils and preparing turbine for felling 2days
WTG cutting and processing for transport to recycling facility	$/WTG	$156,300	1 Excavators + 3 person oxy cutting team 5 days
Concrete foundation demolition 675mm depth (top 500 mm buried and 175 mm proud)	$/WTG	$6,068	Assume 2 days of excavator with rock breaking and loading out of concrete rubble + 8 hrs of oxy cutting reo and anchor cage per WTG
Total loading cost for scrap transport	$/WTG	$10,120	Excavator with grab/magnet 4 days
Haulage cost per WTG to scrap mill (ferrous & non-ferrous)	$/WTG	$53,508	270 km trip, total metal transported tonnes
Haulage cost per WTG to recycling facility (blades & nacelle cover)	$/WTG	$9,408	Assume 270 km trip, total 72.3 tonnes - assume extra trucking as lighter loads
Haulage cost per WTG to recycling facility (pulverised concrete)	$/WTG	$8,676	Assume 270 km trip, total 72.3 tonnes
Recycling Costs (blades & nacelle cover)	$/WTG	$29,008	Assume recycling cost to be equivalent to landfill disposal cost
Recycling Costs (reinforced concrete)	$/WTG	$0	Assume recycling cost is offset for receiving site processed concrete rubble at $0 cost
WTG Decommissioning			
Dismantling & Processing of WTGs	$/WTG	$192,908	
Haulage	$/WTG	$69,278	Ferrous, Non-Ferrous, Concrete & Blades & Nacelle Cover
Recycling salvage return	$/WTG	-$518,030	Ferrous & Non-Ferrous
Recycling Cost	$/WTG	$29,008	Blades & Nacelle Cover - assume similar to disposal cost to landfill
Net cost per WTG	$/WTG	-$226,836	
Net Wind Farm Decommissioning Cost	$	-$26,993,436	

WTG Rehabilitation			
Hardstand rehabilitation	$/WTG	$17,641	200 mm of topsoil and seeding (includes wind turbine foundation area)
Rehabilitation per WTG	$/WTG	$17,641	
Access road rehabilitation	$	$2,306,900	50% of access roads to be rehabilitated with 200 mm of topsoil
Wind Farm Rehabilitation Net Cost	$	$4,406,179	
Wind Farm Decommissioning and Rehabilitation Cost			
Decommissioning Cost	$	$34,652,134	
Salvage Value	$	-$61,645,570	
Rehabilitation Cost	$	$4,406,179	
Total Cost	$	-$22,587,257	Approx. - $190k per WTG

Decommissioning and Rehabilitation Cost Estimate - WTGs (Large Crane Dismantling)			
Item	**Units**	**Amount**	**Reference**
WTG			
WTG total weight (excluding foundation)	t/WTG	900	Vestas WTG data documentation
Ferrous weight + tower + reo & anchor bolts from top of footing	t/WTG	874.2	Vestas WTG data documentation
Copper & Alloys weight	t/WTG	4.9	Vestas WTG data documentation
Aluminium and alloys weight	t/WTG	12.7	Vestas WTG data documentation
Fibre glass, Polymer & Carbon composites weight	t/WTG	78.4	Vestas WTG data documentation
Crane erection pads	m^2/WTG	2600	Estimate based on typical large crane WTG hardstand requirements
Access Roads 50% to be rehabilitated	ha	34	50% of access roads to remain for landowner use
Concrete foundation demolition 675mm depth (top 500 mm buried and 175 mm proud)	m^3/WTG	22	Foundation top hat dia 7.65 m
Concrete (top of footing) weight	t/WTG	53.02	Estimate based on typical WTG gravity foundation
Main Crane & Assembly Crane Mob & Demob		$2,000,000	Provided by Vestas
WTG internal preparations	$/WTG	$5,040	2 persons draining oils and preparing turbine for dismantling 2days
WTG crane dismantling	$/WTG	$285,548	Cranes and dismantling team 6 days
WTG cutting and processing for transport to recycling facility	$/WTG	$156,300	1 Excavators + 3 person oxy cutting team 5 days
WTG foundation footing (top 675 mm & reo) cutting, breaking loading out	$/WTG	$6,068	Assume 2 days of excavator with rock breaking and loading out of concrete rubble& reo + 8 hrs of oxy cutting reo and anchor cage per WTG
Total loading cost for scrap transport	$/WTG	$10,120	Excavator with grab/magnet 4 days
Haulage cost per WTG to scrap mill (ferrous & nonferrous)	$/WTG	$53,568	270 km trip, total metal transported tonnes
Haulage cost per WTG to recycling facility (blades & nacelle cover)	$/WTG	$9,408	Assume 270 km trip, total 78.4 tonnes - assume extra trucking as lighter loads
Haulage cost per WTG to recycling facility (pulverised concrete)	$/WTG	$8,676	Assume 270 km trip, total 72.3 tonnes
Recycling Costs (blades & nacelle cover)	$/WTG	$29,008	Assume recycling cost to be equivalent to landfill disposal cost
Recycling Costs (reinforced concrete)	$/WTG	$0	Assume recycling cost is offset for receiving site processed concrete rubble at $0 cost
WTG Decommissioning			
Dismantling & Processing of WTGs	$/WTG	$479,883	
Haulage	$/WTG	$69,278	Ferrous, Non-Ferrous, Concrete & Blades & Nacelle Cover
Recycling salvage return	$/WTG	-$518,030	Ferrous & Non-Ferrous
Recycling Cost	$/WTG	$29,008	Blades & Nacelle Cover
Net cost per WTG	$/WTG	$60,139	
Net Wind Farm Decommissioning Cost	$	$7,156,556	

WTG Rehabilitation			
Hardstand rehabilitation	$/WTG	$17,641	200 mm of topsoil and seeding (includes wind turbine foundation area)
Rehabilitation per WTG	$/WTG	$17,641	
Access road rehabilitation	$	$2,306,900	50% of access roads to be rehabilitated with 200 mm of topsoil
Wind Farm Rehabilitation Net Cost	$	$4,406,179	
Wind Farm Decommissioning and Rehabilitation Cost			
Decommissioning Cost	$	$68,802,126	
Salvage Value	$	-$61,645,570	
Rehabilitation Cost	$	$4,406,179	
Total Cost	$	$11,562,735	Approx. $97k per WTG

Decommissioning and Rehabilitation Cost Estimate - Substations			
Item	**Units**	**Amount**	**Comment**
Substation Decommissioning			
Redeployment of grid transformer			
Salvage value of main transformer (1 of) after 20 years of life	$	-$200,000	As transformers have a life of 40+ years have assumed a resale return $50,000 for each main transformer after dismantling, and transporting
Electrical Works			
Dismantling substation electrical equipment, remove oils and ducted cabling - team and resources	$	$191,550	5 persons plus plant: supervisor, excavator, crane, and minor equipment - 10 days per substation
Demount, strip and remove switchgear and equipment	$	$20,000	Aurecon estimate. Includes demount, strip and remove switchgear and equipment, transport included, scrap values deducted.
Removal from site and salvage cost/value of switchyard aluminium conductors, fittings and substation electrical equipment	$	$0	Assumed to be net cost neutral
Civil and structural works			
Structural reinforced concrete (and minor concrete)	m^3	120	Bunding, slabs, drainage and trench structures, fence sill etc.
Demolish and load out reinforced concrete structures	$	$90,960	1 excavator with rock breaker + oxy cutter 12 days per substation
Structural scrap steel mass	tonnes	160	Aurecon estimate for both substations.
Structural steel salvage	$	-$80,000	
Scrap Steel Haulage cost	$	$9,600	
Transformer Haulage	$	$25,600	Low loader transport
Fencing			
Length of security fence	km	0.98	
Rate to remove security fence	$/m	$20.00	Database rates
Cost to remove security fence	$	$19,600.00	Calculated
Mass of steel in security fence	t/km	4.2	Based on 3.45kg for one post and 31.35kg per 10m of chain-link. 2.1m high, 1 post every 3.3m. 50mm x 2.5mm chain link.
Mass of steel in security fence	tonnes	4.12	Calculated
Scrap value	$	-$2,058	Calculated
Haulage cost	$	$247	
Net cost	$	$17,789	
Substation Rehabilitation			
Concrete demolition & removal	$	$90,960	Assume concrete crushed and sold as recyclable crushed concrete
Hardstand rehabilitation	$	$130,272	Based on spreading and covering with 200 mm of topsoil, fertilizing and seeding
Concrete surfaced area rehabilitation	$	$4,071	
Net Cost	$	$225,303	

Total Substation Cost			
Decommissioning Cost	$	$331,957	
Salvage Value	$	-$282,058	
Rehabilitation Cost	$	$225,303	
Total Cost	$	$275,202	

Decommissioning and Rehabilitation Cost Estimate – O&M Compound			
Item	**Units**	**Amount**	**Comment**
O&M Compound Decommissioning			
Buildings			
Dismantle and remove enclosed portable buildings (i.e. Control room & amenities and maintenance facility)	$/m^2	$100	Database rates
Demolition & removal of buildings	$	$14,480	Main store and workshop to remain and donated to the landowner
Fencing			
Rate to remove 2.1m high chain link fence	$/m	$20	Database rates
Length of security fence	km	0.18	
Rate to remove security fence	$/m	$20.00	Database rates
Cost to remove security fence	$	$0	Fence to remain for landowner use
Mass of steel in security fence	t/km	4.2	Based on 3.45kg for one post and 31.35kg per 10m of chain-link. 2.1m high, 1 post every 3.3m. 50mm x 2.5mm chain link.
Mass of steel in security fence	tonnes	0.76	Calculated
Scrap value	$	$0	Calculated
Haulage cost	$	$0	
Net cost	$	$0	
O&M Compound Rehabilitation			
Footing demolition & removal	$	$3,150	O&M Building footings only, slab under workshop and driveway to remain
Hardstand rehabilitation	$	$0	Hardstand to remain for landowners use
Concrete surfaced area rehabilitation	$	$339	
Net Cost	$	$3,489	
Total O&M Compound Cost			
Decommissioning Cost	$	$14,480	
Salvage Value	$	$0	Decommissioning cost includes salvage
Rehabilitation Cost	$	$3,489	
Total Cost	$	$17,969	

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