GLOBAL POWER GENERATION AUSTRALIA PTY LTD

PALING YARDS WIND FARM PROJECT

DECOMMISSIONING AND REHABILITATION PLAN

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PALING YARDS WIND FARM PROJECT
Decommissioning and Rehabilitation Plan

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A	23 February 2021	Draft for client comment
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ABBREVIATIONS

CEC	Clean Energy Council
EPA	Environment Protection Authority
GPGA	Global Power Generation Australia
NSP	Network Services Provider
SEARs	Standard Secretary Environmental Assessment Requirement
WTG	Wind Turbine Generator

1 INTRODUCTION

1.1 GENERAL PROJECT DESCRIPTION

Global Power Generation Australia (GPGA) formerly known as Union Fenosa Wind Australia (the proponent) is seeking approval for the construction and operation of a wind energy facility known as the Paling Yards Wind Farm (the Project, PYWF).

The proposed project is to be located on the landholdings known as 'Mingary Park', 'Middle Station' and 'Paling Yards' which comprise a total of approximately 3,900 hectares. The Project also contains a transmission line corridor (approximately 9km in length and 70m in width) located across nine parcels of land to the north-east of the site. The site is situated in the Central Tablelands of NSW, approximately 60km south of Oberon and 60km north of Goulburn.

The proposed Paling Yards Wind Farm will likely comprise of:

- Up to 47 wind turbines (WTGs).
- An approximate maximum blade tip height of around 240m and maximum tower elevation of 150m.
- Corresponding individual kiosks for the housing of transformers, switchgear and associated control system, to be within the vicinity of the WTGs (in some WTGs either at the tower base or nacelle)
- Internal unsealed tracks for vehicle access to WTG and infrastructure.
- Underground electrical and communication cable network linking WTGs to each other and the proposed onsite substation.
- Wind farm and substation control room and facilities building.
- An onsite electrical substation approximately 9km of overhead power (70m in width) of up to 500kV to connect to the Mt Piper to Bannaby 500kV transmission line (including control room and other associated grid connection facilities).

1.2 BACKGROUND INFORMATION

In 2010, the Client submitted a State Significant Development (SSD) application package for PYWF. It is understood that the Department of Planning, Infrastructure and Environment (DPIE) advised that owing to the amount of time that had passed since submission of original application, a new application should be made. Subsequently, the Development Approval was withdrawn. As part of the initial application package, a decommissioning and rehabilitation plan was prepared for the site by a third party consultant and provided to WSP. WSP has updated the previous decommissioning and rehabilitation plan in light of the most current legislative requirements and relevant Industry guidelines, namely:

- NSW Planning & Environment, Wind Energy Guideline for State Significant Wind Energy Development (December 2016).
- Standard Secretary Environmental Assessment Requirement (SEARs), December 2016.
- Environment Protection and Heritage Council, National Wind Farm Development Guidelines (Draft, July 2010).
- Updated WTG layout and dimensions.
- Land lease agreements and clauses have stayed relatively the same as in previous DRP. A number of Deeds of Variation have been executed.
- Best practice operating guidelines/recommendations.

- Latest advances in dismantling, transportation and recycling/recovery of WTG components.
- Potential waste minimisations strategies.
- “Maximising value” strategies.
- Land rehabilitation processes.
- Associated costs and timing.

Thus, the purpose of this DRP is to identify the methodology that GPGA will use to mitigate potential impacts resulting from the cessation of operation of the facility at the end of the project’s useful economic life. This plan provides an outline of the stakeholder and landowner consultation, expected operational life, dismantling, land rehabilitation, funding arrangements, timeframe, responsibility and review of the plan associated with the decommissioning of the Paling Yards Wind Farm.

1.3 SUPPLIED DOCUMENTATION AND DATA

The documentation reviewed was provided by the Client or downloaded from the Client dataroom. Specific sections in the report reference the documents that have been reviewed for that subject matter; referenced documents can be found in section 10.

2 STAKEHOLDER AND LANDOWNER CONSULTATION

2.1 CONSULTATION WITH LANDOWNERS

The site on which the project is to be located includes three land holdings. Given the project site's location and surroundings (i.e. the site is almost entirely surrounded by vegetation), there is a significant buffer to neighbouring non-participating landowners.

Both landowners were initially contacted and consulted about the project and issues of decommissioning and rehabilitation discussed at the early stages of the project.

A lease agreement was later presented to each landowner, which reflects that the decommissioning of the wind farm is the sole responsibility of GPGA. Provisions in the lease agreement relating to decommissioning and rehabilitation are summarised in Appendix A. The entered lease agreements provide GPGA with leases of the site for an initial term of 30 years, and grants GPGA an opportunity to extend the lease for a further 30 years.

In 2012, prior to each lease being executed with the landowners, the previous DRP was discussed and agreed with all landowners. Initial feedback from the landowners was generally positive with no objections to the project. A summary of the landowners' responses was as follows:

- One landowner was satisfied with the document and had no additional input; and
- One landowner expressed concern about the land being returned to its 'pre-project' condition following the decommissioning of the project, and stressed that disturbed ground should be repatriated with pasture. This landowner had no objection to the underground facilities (i.e. cable network) to remain in situ provided that they are at least one metre below the surface, and to access tracks and buildings to remain on the site provided that further consultation is undertaken closer to the time of decommissioning. Finally, the landowner wanted to ensure this DRP addresses the issue of wind turbine decommissioning during the active operational phase of the project.

In this updated DRP, the landowner responses have been considered and addressed as previously requested. GPGA has stated that they have undertaken further consultation in January 2021, with all registered landowners within a 5km radius of the site. The consultation included doorknocks and/or letters informing them of the proposed development and planned application [1].

As the decommissioning process will occur many years after construction, it is likely that there will have been changes to the makeup of the local community and local area itself. As such, the guidelines [2] require new stakeholders to be identified and the rehabilitation requirements be cognisant of any changes which may have occurred in the area. Community involvement in assessing rehabilitation requirements will be crucial and the consultation approach to be done by GPGA is as discussed below.

2.2 PUBLIC CONSULTATION PRIOR TO DECOMMISSIONING

GPGA will be undertake further consultation with all stakeholders and community prior to and during the decommissioning of the wind farm. Stakeholders to be consulted will include (but not necessarily limited to) the Oberon Council and landowners. Other relevant stakeholders will be identified and consulted as required, including regulatory authorities, industry neighbours[1], local community neighbours and community groups. The consultation process will be open and transparent, and its objectives will be to (as a minimum):

- Provide the timing of the proposed decommissioning works;
- Present the nature of the proposed decommissioning works, including the turbines dismantling procedure and the proposed land rehabilitation works and objectives;
- Obtain stakeholders comments on the decommissioning works and address any concerns (including providing timely and responsive feedback and conflict resolution); and
- Seek ideas to maximise the net benefit to the community during the decommissioning process

A complaints register will be maintained which will respond to complaints as required in the guidelines [3].

The consultation activities to be undertaken may include:

- Meetings with the Oberon Council;
- One-on-one consultation and discussion with individual landowners;
- Information session or 'Open House' forum to introduce the decommissioning activities to the local community; and
- A newsletter mail-out to all residents within 5km of the project site providing information on the decommissioning activities.

1 Includes though not limited to contractors who may be engaged in the decommissioning process, other wind farm proponents operating in the Oberon Council area and energy and supply agencies.

3 OPERATIONAL LIFE

3.1 INTRODUCTION

As noted above, the lease agreements held by GPGA are for a period of 30 years, with an option for an additional 30 years. The operational life of the Palings Yards Wind Farm is therefore expected to be of at least 30 years. Megawatt-scale wind turbine generators available on the market today have a design life expectancy of 20 to 30 years depending on site conditions. The tubular steel towers supporting the generators are of simple design and with basic routine maintenance could serve many years beyond the life expectancy of the generators.

During the design life period or as the turbine generators approach the end of their expected life, the nacelle components and the blades of the turbines may be replaced or renewed, or the turbine may be repowered to utilise newer and more efficient technology available at that time. This will economically drive the replacement of the existing generators and thus prolong the economic life of the Project until at least the end of the lease agreement period.

Any continuation of the Project may take the form of one of the following:

- Extended operation of the original turbines;
- Turbine replacement with the similar model that has newer and more efficient technology; or
- Turbine replacement with a different model that would be subject to the requisite approvals being obtained at that time.

During the operational life of the wind farm, GPGA will keep independently verified annual records of each wind turbine electricity generation production. These records will be made available to the DPIE on request.

Once the wind farm reaches the end of its useful economic life, the Project would be decommissioned.

4 DECOMMISSIONING PROCESS

4.1 INTRODUCTION

Unless the relevant electricity network operator or landowner requests that certain wind farm infrastructure be retained on land, it will be removed and the land restored to its previous condition or better. The following sections summarise how each component of the wind farm infrastructure will be dismantled and decommissioned.

4.2 DISMANTLING

4.2.1 WIND TURBINE GENERATORS

Similar to the erection process of the wind turbines, the dismantling procedure will require a crane on site to remove each of the WTG components. Each WTG will be de-energized from the MV reticulation system, following which the components will be drained of all liquids (oils, lubricants, coolants etc). The rotor will then be locked according to manufacturer's decommissioning instruction. The WTG rotor, blades, nacelle and tower will then be removed using a crane or any specialist heavy machinery as required by manufacturer's decommissioning instructions.

The dismantling process may take the two forms as described below:

- Dismantling for re-use
- Dismantling for recycling/disposal

The work sequence for dismantling and decommissioning a particular tower site will most likely proceed as follow:

- Assemble and stage crane on pad at turbine;
- Install erosion and sediment controls as required;
- Disconnect electrical connections;
- Remove rotor and set on ground;
- Remove nacelle and set on ground;
- Remove turbine tower sections and stage on ground;
- Haul off turbine components;
- Remove concrete foundation (to 1m below ground surface);
- Backfill foundation area;
- Rehabilitate foundation area; and
- Maintain the site in context of sediment control and weed management.

The dismantling procedures discussed above will be revised to comply with current environmental and safety management practices in place at the time.

After removal the wind turbines will be either scrapped or transported to another site for reuse. Any component that can neither be reused nor salvaged will be recycled or disposed of. If the turbines are resold for reuse, the rotor, nacelle and tower sections will be dismantled and transported from the site in a manner similar as was used to deliver the turbines to the site.

If the turbines are not sold for reuse, they will be disassembled into smaller components and sold for scrap to a scrap metal recycling company. This procedure will take place either at a central laydown area or on the hardstands below the turbine. Critical lift plans will be developed specifically for each major turbine component. The hub, blades and nacelle will be broken down and stripped of high value components. Cabling internal to the towers will be removed and scrapped to recover the high value copper conductor materials. Tower sections would be cut into transportable sections for delivery to the scrap metal recycling company.

The concrete used for the turbines foundation pads will be sent to a concrete recycling facility.

4.2.2 OTHER ANCILLIARY FACILITIES

Unless agreed otherwise with the landowners during the consultation process, all ancillary facilities related to the wind farm and located on the landowners' property would be removed. Sheds and any portable buildings will be transported off site for sale, recycling or disposal.

A demolition contractor will remove decommissioning debris to a licensed disposal facility permitted to operate under the current and applicable regulations at the time decommissioning occur.

4.2.3 ROADS AND ACCESS TRACKS

Prior to start of decommissioning, consultation with landowners will begin on whether they would like to retain any access tracks, laydown areas or crane pads. Subject to agreements, roads, access tracks and crane pads where not required for farming purposes or fire access, will be removed and the Project reinstated as close as practicable to original condition and use. Access/control gates where not required for farming purposes will be removed. Land rehabilitation will be done and fill material and topsoil used to backfill any voids. Finally, the areas will be graded to match the surrounding landform before being reseeded or revegetated as appropriate.

4.2.4 CRANE HARDSTANDS AND CONSTRUCTION LAYDOWN AREAS

Crane hardstands and construction laydown areas would be decommissioned however maybe retained at the discretion of the host landowners.

4.2.5 ELECTRICAL INFRASTRUCTURE

Prior to any decommissioning, consultation will be required with the NSP, as the electrical infrastructure upstream the project substation typically has a longer design life than the wind farm. It is likely that most of the electrical substation and transmission line infrastructure will be retained beyond the decommissioning phase of the wind farm. For the instance where the NSP do not wish to retain ownership then, the electrical on-site substation and all the overland power line poles and conductors connecting the wind farm to the national electricity grid will be removed. As far as possible, all materials and components (e.g. steel, conductors, switches, transformers, etc.) will then be reused, sold as scrap, recycled, or re-purposed to the maximum amount economically practicable. Any other components will be hauled to approved disposal facilities. Any ground disturbed as a result of these activities will be rehabilitated.

It is anticipated that the removal of underground cables would not be cost-effective and would significantly disturb the landscape and the farming activities by creating large trenches. In order to minimise the environmental and agricultural impacts, the underground cable network would therefore not be removed as part of the project decommissioning. Rather, all cables will be terminated at the end of the runs (including watercourse crossing conduits), the ends will be capped with appropriate insulation and buried to a depth of approximately one metre below the ground surface, and left in place. No known hazards exist from the presence of capped unused/inert underground cables. Any land disturbed by these activities would be rehabilitated.

4.3 TRANSPORTATION

All the WTG will be dismantled on site and broken into components that allow for easier transportation depending on whether they will be resold/re-used or recycled. If the WTG components cannot be hauled offsite immediately, they will be held on the WTG hardstands or stacked on a central laydown area until they can be removed. A central laydown area (of up to 2ha) may therefore be created, including topsoil removal, levelling and compacting. Any ground disturbed by the creation of the laydown area would later be rehabilitated

For the decommissioned WTGs that will be recycled or sold for scrap material, there are several options to consider for scrap yard metal recycler/waste management solutions either to the north towards Bathurst or to the south towards Goulburn as provided in Figure 4.1. The remainder of components will be either reused at various sites or landfill material will be disposed of through consultation with local regional council. It is noted that final location of scrap metal merchants to be used including other recycling and disposal facilities will be determined closer to the time of decommissioning.

Figure 4.1 Possible route to Waste management/scrap yard metal recyclers in Bathurst/Goulburn

Transportation of components would be undertaken in accordance with a Traffic and Transport Management Plan. This may be the Traffic and Transport Management Plan used for construction which would be reviewed and updated to reflect the decommissioning traffic movements.

4.4 WASTE MINIMISATION STRATEGY

All waste management will be undertaken in accordance with the EPA NSW waste legislation such as Protection of the Environment Operations Act 1997, Protection of the Environment Operations Waste Regulation 2014, Waste Avoidance and Resource Recovery Act 2001, or the updated or relevant guidelines available at the time of decommissioning [4].

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.

4.4.1 RECOVERY STRATEGY

As previously mentioned in Section 4.2, the WTGs will be either reused or recycled where possible. If they are sold for reuse, the WTGs will be dismantled and delivered off-site. If they are recycled, they will follow the recovery strategy discussed below. The recovery strategy aims to maximise the salvage potential of each WTG component and extract value through recycling and reusing its components. The strategy for the different components is discussed below:

4.4.1.1 METALLIC COMPONENTS

The WTG tower (i.e. should a tubular steel design be used), nacelle and hub components of the turbines primarily consist of metals including steel, aluminium and copper. As discussed in section 4.2.1, The turbines will be disassembled on site and all metal components will be transported and sold to a local scrap metal recycling facility.

4.4.1.2 WTG BLADES

WTG blades are made from of composite materials upon which the nature of such materials makes it difficult to recycle. While it may be possible to reuse the blades in some circumstances, there is currently no clear end-of-life pathway for blades in Australia [5]. Due to the rigorous safety and performance requirements of blades, it is unlikely any blades from the Project will be re-used in separation from the entire WTG. There currently exists different methods to recycle composite materials as outlined in Table 4.1.

Table 4.1 Potential recycling routes for wind turbine blades [6] [7], [8] adapted from Cherrington et al

PROCESS	DESCRIPTION
Mechanical	Through shredding, crushing, milling, and similar downsizing processes, the blade material are broken down into smaller pieces. Separation of the resulting material into resin and fibrous products is possible afterwards. A few downsides for the process is that the blades were shredded down to 15-25 mm fibres, but these were difficult to reuse due to their small size and due to the resin residue that was often attached to the fibres [8].
Pyrolysis	Blade materials are heated to high temperatures (450-700°C) in absence of oxygen. The resin is converted into a gas or vapour. The fibres remain inert and can be recovered. The by-product resin gas can be used for electricity production or heating of the ovens, while in a second rotating oven, the glass fibres would be “cleaned” in the presence of atmospheric air. Potential metals can be removed for recycling by use of magnets and dust can be removed to clean the glass fibres. Fibres can be later recovered and reused or recycled.
Oxidation in fluidized bed	Combustion of the blade material in a hot and oxygen-rich air flow with temperatures between 450 and 550°C to separate the resin from the fibres.
Chemical	In a chemical solution, the resin is decomposed into oils, which free the fibres. A recycling possibility is chemical recovering through solvolysis. However, the use of aggressive and hazardous chemicals as well as the high cost is often highlighted as a potential downside of this.

PROCESS	DESCRIPTION
Cement kiln route	Composite materials are fed into a cement kiln. Within the cement kiln, the temperature is between 1050-2000 °C. With this temperature, the fibres are converted into ashes and mixes with clinkers, whereas the resin is converted into organic matter which provides energy for the burning process

It is anticipated that once the blades are broken down and separated into their polymer (resins) and fibre composites, they can be used for energy production or reused/recycled respectively. The optimal solution will be explored closer to the start of the decommissioning phase. Information from the CEC notes as part of the effort to accelerate wind turbine circularity, a French consortium [9] is currently working to develop blades that have increased longevity and are able to be recycled at the end of their life [5]. As many wind farms in Australia source their equipment from overseas, it is possible that these blades will enter the Australian market in the coming years and be used on the Project.

Considering the ongoing evolution of WTG technology and recycling methods, GPGA is committed to staying well-informed of new research and technology and will consider the most efficient and cost-effective recovery method at the time of start of the decommissioning phase.

5 LAND REHABILITATION

5.1 INTRODUCTION

The Wind Energy Guidelines state [3] proponents and host landowners should consider refurbishment, decommissioning and rehabilitation when negotiating landowner agreements. The agreements should provide for the implementation of a broader suite of measures, such as financial compensation, acoustic treatments to buildings, landscaping and screening, and arrangements for decommissioning and rehabilitation of the site. This section discusses the proposed rehabilitation plan for the Project post the decommissioning activities.

5.2 AREAS TO BE REHABILIATED

The primary objective of rehabilitation activities will be to return the site to pre-construction conditions by reintegrating the grass/foliage of any disturbed terrain with the surrounding area. All land disturbed during the construction, operation and decommissioning will rehabilitated except for areas to be retained "as is" where agreed with the landowners or TransGrid. It is expected that the following areas will be restored and rehabilitated:

- The foundation area of each wind turbine (each pad is approx. 20m x 20m);
- The on-site central laydown area (approx. 2ha).
- The electrical substation area.
- The holes left in the ground following the removal of overhead power-line poles
- Wind farm control room facilities and facilities building areas where not required by the landowner; and
- Access roads and access track, as agreed with landowners.

5.3 SITE MONITORING AND REHABILITATION

The initial efforts for rehabilitation of the site at completion of decommissioning activities will consist of the following:

- Re-seeding or re-grassing efforts: areas within the Project area are to be reseeded with a seed mix agreed with the landowners in order to maintain consistency with the surrounding agricultural uses and minimise the colonisation of by weeds. Typical species mix will promote species diversity and include legumes species.
- Foliage planting and replanting of any dead trees: The vegetation to be re-established will be aligned to an endemic ecosystem or local plant communities.
- Undertaking works to restore affected drainage areas where stormwater runoff is occurring causing erosion or areas where there is excessing pooling of water.
- Spreading subgrade material, backfill or topsoil: all excavated areas will be filled with clean compatible sub-grade material and compacted to a density similar to the surrounding area. Topsoil will be replaced and compacted to match the density and consistency of the immediate surrounding area. Finally contouring will be done to match the surrounding landform.
- Aeration or fertilisation of soil to promote growth: in order to promote plant establishment, all revegetation areas will be treated with fertiliser at the time of sowing.

- In all areas rehabilitation will include, as reasonably required, levelling, terracing, mulching and other necessary steps to prevent soil erosion, to ensure establishment of desirable vegetation, and to control weeds and vertebrate pests.

It is possible that initial rehabilitation efforts discussed above will be ineffective with certain areas to experience erosion or other topographic impacts or the re-grassing and foliage planting failing to provide appropriate coverage. To ensure longevity of initial rehabilitation efforts, site monitoring activities will be required. It is anticipated that a suitably qualified environmental professional will be engaged post completion of decommissioning activities to oversee performance of the monitoring program and any additional rehabilitation works that may be required.

At the completion of decommissioning, GPGA will provide a once off payment (amount to be determined) to the host landowner for coordination of the monitoring and any maintenance program required for the land. This approach to monitoring allows for the project site to experience seasonal changes and for determining if additional restoration is required, including the management and control of weed species.

6 FUNDING OF DECOMMISSIONING

Financial assurance for the decommissioning costs will be fully established for the entire useful economic life of the Project. The decommissioning funding plan for the project is summarised below.

6.1 DECOMMISSIONING COSTS

6.1.1 COST SENSITIVITY

There are a number of issues pertinent when establishing costs for decommissioning.

The assessment of de-commissioning costs to be incurred at a point in some distance in the future inevitably entails a range of tolerance and value. WSP believes the cost accuracy to be within an overall +/- 25% bandwidth (i.e. 15% on quantities and 10% on rates).

There is volatility in relation to rates applicable to the demolition and site clearance works. WSP has made reference to a proprietary handbook of rates applicable to the civil engineering industry. The handbook does provide an objective, systematic and auditable basis for the cost assessment. The rates have been applied to this decommissioning project by adapting known and established price data. These rates are generally applicable during the prevailing year but cannot reflect local variations which will only become apparent at the tendering stage for the decommissioning contract. WSP believes that this element could give a bandwidth of +/-10%. In practice demolition contractors will provide a tendered cost based on their particular experiences and commercial position.

Scrap metal sales offset the prime cost of demolition. Quantities of material to be recycled are estimated and values are prone to the volatility of world metal prices. There is an inevitable variation year on year with movements in metals prices. WSP believes that could provide a combined bandwidth of +/-20%.

The cost sensitivity considerations discussed above will need to be considered in future revisions of the DRP. Information from the Clean Energy Council in Australia notes that there is no utility scale wind farm that has gone through decommissioning of their WTGs to date [5], thus, the cost estimates in Section 6.1.2 and Section 6.1.3, come with an inherent uncertainty.

6.1.2 DECOMMISSIONING COSTS WITH TURBINE SALVAGE

WSP estimated the overall decommissioning costs of the Project related to the scope of dismantlement based on the assumptions presented above. It is important to note that the estimate is very sensitive to copper because its salvage value is significantly higher, as provided in Table 6.1, than other metals and because there is typically significant quantity of copper in WTG generators and or the collector cable network.

Table 6.1 Scrap metal prices [10]

	MIN [$/TONNE]	MAX [$/TONNE]
Iron	150	250
Aluminium	1,000	2,000
Copper	3,500	5,500

The principal source of copper is the generator of the turbine. The total copper gross weight of all the other sources combined together is negligible compared to the total copper gross weight from turbine generators. Since the copper is not easily accessible, the salvage value of the copper will greatly depend on the work required to recover the metal from the components. In consideration of this, WSP has applied a reduction factor on the total copper gross weight of 80% and

35% for Scenario 1 and 2 respectively, to take into account the recovery cost and the salvage price variability. These scenarios are to highlight the sensitivity of these factors on the cost estimate as provided in Table 6.2 and Table 6.3.

Table 6.2 Dismantling cost breakdown

ITEM	WORKS	QUANTITY	UNIT	UNIT PRICE (AUD)	AMOUNT (AUD)
1	Roads	0	km	0	0
2	Work Areas (routes +crane pad)	47	Unit	25,200	1,184,400
3	Foundations	47	Unit	14,700	690,900
4	Wind Turbine	47	Unit	145,400	6,833,800
5	Overhead and Underground Cables	9	km	40,300	364,973
6	Substation	1	Fixed	80,800	80,800
7	Met Tower	1	Unit	12,800	12,800
Total Indirect Costs					**9,167,673**
8	Project Management and Construction Management (7%)	7	%		641,800
9	Construction fees	1	Fixed	100,000	100,000
	Total				741,800
Gross Decommissioning Costs					**9,909,473**
Cost per MW					**31,761**
Cost per WTG					**190,567**
(Scenario 1 – 80% of copper transformation cost)					
10	Salvage Value	1	Fixed	-11,955,400	-11,955,400
11	Contingency (10% of Gross Decommissioning Costs)	10	%		991,000
12	Contractor Mark-up (10% of Gross Decommissioning Costs)	10	%		991,000
Net Decommissioning Costs (Gross – Salvage costs)					-63,927

*Assumed no road/access tracks will be removed provided that further consultation with landowners are undertaken closer to the time of decommissioning as discussed in section 2.1.

**Assumed cables to remove will be above ground cables i.e. the 9km of overhead powerline. Underground cables which are part of the collector network will remain in situ.

Scenario 2 considers salvage costs when there is a lower copper transformation cost of 35% as presented in Table 6.3. It is clear that low transformation of copper will decrease the salvage revenue of the Project as demonstrated in Table 6.3. Under this scenario, the salvage revenue is not sufficient to provide full coverage of the decommissioning costs and the Project will need to ensure they have appropriate funds (see further discussions in section 6.2).

Table 6.3 Scenario 2 salvage costs (copper transformation cost of 35%)

ITEM	WORKS	QUANTITY	UNIT	UNIT PRICE (AUD)	AMOUNT (AUD)
10	Salvage Value	1	Fixed	-7,868,500	-7,868,500
11	Contingency (10% of Gross Decommissioning Costs)	10	%		991,000
12	Contractor Mark-up (10% of Gross Decommissioning Costs)	10	%		991,000
Net Decommissioning Costs (Gross – Salvage costs)					4,022,973

6.1.3 DECOMMISSIONING COSTS WITH TURBINE RESALE

Table 6.4 presents sale prices for recently decommissioned WTGs in Europe as of September 2021 [11]. The resale values are for WTGs with ratings in the range of 1.25MW to 3MW with prices starting from $44,000 per MW to $108,000 per MW. The cost estimates in Table 6.4, assumes the buyer will bear the costs to dismantle.

As discussed in section 3, the proponent wishes to operate the wind farm for a period of 30 years. It is highly unlikely that the WTG components will have significant residual life left at year 30 to be used at another site. Furthermore, the data from Table 6.4 seems to suggest Developers typically sell their WTGs toward year 20. It is unlikely such a scenario will be contemplated for the Project, however, GPGA will explore the decommissioning costs versus scrap/resale value to determine which method will have the most significant cost saving measure.

Table 6.4 Wind turbines available for sale (1.25MW to 3MW) [11]

WTG TYPE	YEAR OF BUILD	AGE	RATING	PRICE PER WTG (AUD)	PRICE PER MW (AUD)
Nordex N90/2500	2006	15	2.5	111,600	44,640
GAMESA G87 2.0MW	2014	7	2	153,792	76,896
GE 1.5s	2003	18	1.5	140,400	93,600
W2E Wind Turbines W93 - 2.05MW	2011	10	2.05	187,500	91,463
SUZLON S88 - 2.1MW	2006	15	2.1	136,800	65,143
NEG MICON NM92	2004	17	2.75	124,897	45,417
Enercon E66	1997	24	1.5	135,792	90,528
V66 - 1.75MW	2002	19	1.75	176,400	100,800

WTG TYPE	YEAR OF BUILD	AGE	RATING	PRICE PER WTG (AUD)	PRICE PER MW (AUD)
Vestas V66 - 1.65MW	2003	18	1.65	176,400	106,909
GE 1.5 SLE	2003	18	1.5	135,000	90,000
NORDEX N60	1998	23	1.3	105,097	80,844
DEWIND D6	2008	13	1.25	110,250	88,200
GE 1.5S	2003	18	1.5	153,000	102,000
SUZLON S66	2006	15	1.25	135,450	108,360
Average				141,598	84,629

By reference, assuming the average resale value per WTG is $141,600 as presented in Table 6.4 is indicative of future resale prices for WTGs, and assuming the buyer bears the dismantling costs, then the gross decommissioning costs will be $65,440 per WTG resulting in a net position for the Project of -$76,159 per WTG for the Project.

However, for the instance where the buyer does not assume the dismantling costs, then the net position for the Project will be $48,968 per WTG. GPGA will need to reassess the prices available for the WTGs given Table 6.4 only considers resale values of WTG up to 3MW and likely buyers available on the market closer to when decommissioning will likely be required.

6.2 ENSURING DECOMMISSIONING FUNDS

Detailed assessment of decommissioning costs will be done with a focus on decommissioning cost versus resale/scrap value to determine if there will be a deficit. If there is a deficit, a percentage of the revenue will be retained from the Project each year and held in a reserve account to fund the deficit. GPGA has confirmed their business case will analyse the project costs/lifetime/revenue and determine total project revenue at end of life after 30 years [1].

7 TIMEFRAMES

GPGA commits to undertaking all decommissioning and rehabilitation works as outlined in this plan within a period of 18 months after the end of operational phase of the Project.

During the operational life of the project, it is possible that individual turbines will cease operating for extended periods of time if they are malfunctioning and need to be repaired. Dependent on market availability for such spare WTG parts which if not locally available would have to be sourced overseas, some WTGs may be inactive for periods longer than twelve month before they can be repaired. Any WTG that cannot be repaired and is deemed permanently unworkable (due to environmental, social, economic or other unforeseen issues) will be decommissioned and dismantled, and the site rehabilitated within 18 months.

8 RESPONSIBILITY

GPGA (or any future owner) will be fully responsible for the decommissioning of the project. This is supported by the provisions in the lease agreements which will be executed between GPGA and the landowners prior to the construction commencement (refer to Appendix A).

9 REVIEW OF THIS PLAN

This DRP will be reviewed, and revised as required, every 5 years following the practical operation date. This is to ensure that the DRP is representative of final as-built Project site which may be subject to modification (new WTG technology considered, revised access routes for roads or network etc) or micrositting prior to start of construction. GPGA will ensure that during each review of the DRP, the effectiveness of the plan will be re-assessed against its objectives, and cost estimates and funding arrangements will also be independently reviewed.

Examples of why the plan may need to be revised include:

- A modification to the condition of the Approval;
- Deficiencies being identified;
- Changing environmental requirements;
- Change in legislation; and
- Improvements in knowledge or technology become available.

Any major changes to this plan will be undertaken in consultation with the appropriate regulatory authorities and stakeholders. From year 15 onwards, detailed assessment of decommissioning costs will be done with a focus on decommissioning cost versus resale/scrap value to determine if there will be a deficit and whether a percentage of the revenue should be placed in a reserve account.

This DRP, as well as all subsequent reviews, will be made public and placed on GPGA website. GPGA will also provide a copy of the revised DRPs to the relevant consent authority at the time.

10 REFERENCES

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[10] SMP, “Scrap metal prices per kilo,” [Online]. Available: https://www.scrapmetalpricer.com/au/. [Accessed 09 February 2021].

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[12] “Waste disposal fees for our landfills and transfer stations,” [Online]. Available: https://www.eastgippsland.vic.gov.au/environment-and-waste/waste-disposal-fees. [Accessed 21 September 2021].

[13] General Electric, “Technical Description and Data Wind Turbine Generator Systems GE 158 - 50/60 Hz,” 02 May 2019.

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APPENDIX A

DECOMMISSIONING PROVISIONS WITHIN THE LEASE AGREEMENTS

The lease agreement recognises the responsibility of decommissioning will be of the proponent (GPGA is the “Lessee”) with the relevant clause from the land lease agreements as follows:

Clause 5.3 Lessee must observe Law and Rules:

The Lessee must comply with the law, any Authorisation and any notice from any authority that requires the Lessee to do or not do anything concerning the Premises, the Lessee’s use of the Premises, or this lease (for example, laws relating to occupational health and safety and environmental matters)

Clause 10.4 Consequences of termination or expiry

a. If the Lessees serve a notice of termination under clause 10.1(a) as a consequence of a default arising under clause 9.1(a) or 9.1(b), the Lessees may, at the same time, serve notice on the Lessor electing to remove all or part of the Improvements from the Premises provided that the Lessees must repair any damage caused by that removal.

(b) If:

(1) the Lessees serve a notice of termination under clause 10.2 or under clause 10.1(a) as a consequence of a default arising under clause 9.1(c);

(2) the Lessor serves a termination notice under clause 10.1(a); or

(3) this lease expires through the effluxion of time,

then the Lessees must promptly remove all of the Improvements from the Premises and reinstate the Premises to the standard referred to in clause 10.5, and extinguish any easements on the Land.

(c) Without prejudice to any obligations under clause 10.4(a) or 10.4(b), once this lease has been terminated the Lessees are absolutely discharged from their future obligations under this lease, provided that, if the Lessees have an obligation under clause 10.4(b) to remove all Improvements from the Land and repair any damage caused by that removal, or the Lessees elect to remove Improvements from the Land under clause 10.4(a), then the Lessees must continue to pay Rent until the relevant Improvements have been removed and the Land has been repaired.

Clause 10.5 Handing back Premises:

In addition to any obligations the Lessee may have under clause 10.4, within 6 months of the end of this lease, the Lessee must give back the Premises to the Lessor in a condition consistent with the Lessee’s obligations under this lease, to the reasonable satisfaction of the Lessor, except for fair wear and tear.

Due to the large amount of infrastructure in one of the properties, the Lease Agreement of this landowner has the following additional clause:

Clause 13.1 Decommissioning Security Establishment

(a) A bank guarantee, bond, deposit or similar from an Australian trading bank or insurance company approved by the Lessor (which consent will not be unreasonably withheld) (Decommissioning Security) be established at:-

(i) Five years prior to expiry of the initial 30 year Lease Term,

(ii) Five years prior to expiry of subsequent Lease Terms following renewal of the Lease, or

(iii) In the event where the Lessee are in default of it’s obligations pursuant to this Lease for non-payment of rent and the Lessors are entitled to terminate this Lease in accordance with clause 10 hereof.

(b) The Lessors and Lessee may agree that the establishment of the Decommissioning Security is not required if all monies payable pursuant to this Lease have on termination been paid by the Lessee to the Lessors in full and the Lessee have observed all of their obligations on their part provided herein.

Clause 13.2 Decommissioning Security removal

(a) The Decommissioning Security shall be released when:

(1) The Lessee renews the Lease for a further term accordance with clause 11, or

(2) In the case of a default event, when the default is remedied and this Lease continues to operate, or

(3) In the case of termination of expiry of this Lease, when the site is reinstated in accordance with clause 10.5 to the reasonable satisfaction of the Lessors.

Clause 13.3 Value of Decommission Security

The value of the Decommissioning Security shall be agreed between the Lessors and the Lessee at the time of its establishment and will take into account the cost of decommissioning less any returns from resale of equipment, components or scrap but if not agreed, will be $50,000 per turbine as increased by the increase of the Consumer Price Index (from the Commencing Date hereof to the date of delivery of the security by the Lessee)

APPENDIX B

DECOMMISSIONING COST ESTIMATES

B1 ASSUMPTIONS

General assumptions as below:

- The assumed estimates for the resource costs of substation and met mast removal are provided in Table B.1 and Table B.2.
- Tooling and resource costs are subject to final contractor pricing and do not consider any competitive tendering overtime/weekend/standby rates which may impact final pricing schedule.
- 10 days to dismantle substation and 3 days to dismantle met mast.
- No weather delays have been accounted for during crane deinstallation of the WTGs. Any inclement weather is most likely to increase the daily costs of having the crane on site.
- Steel tubular tower made up of 6 sections at a hub height of 120.
- Dismantling rate of approximately 3WTGs per week.
- Weight of WTG components used in estimating decommissioning costs and salvage provided in Table B.3.
- Blades will be cut into 3m section and disposal costs for blades is assumed to be $94 per tonne as the representative landfill cost for commercial waste charged by Municipalities [12]. It is noted that Municipalities revise landfill costs annually, and this cost needs to be revised inline with Municipal landfill rates closer to the time of decommissioning.
- Using a generic foundation drawing it is estimated that approximately $50m^3$ of concrete per WTG will be removed to meet the landowner requirements of 1m below ground surface. This number should be revised once foundation design is complete.
- Repair of public roads has not been considered at this stage.
- Costs associated with creation and rehabilitation of a central laydown area have not been considered. As a central laydown area will be required closer to decommissioning, these costs will need to be included in the updated cost estimates.
- We have applied industry practice norms in estimating Construction Fees which will cover for
  - Mobilisation and demobilisation
  - Road signage.
  - Road maintenance and dust control.
  - Security.
- Where applicable our cost estimates have been derived from publicly available data, or our internal database drawing from decommissioning cost estimates from other projects.

Table B.1 Substation team costs

SUBSTATION TEAM	RATE (AUD/H)
Senior Project/ Program Manager	230
Labourer	80
Labourer	80
Plant operator	120
Deinstallation Manager	250

SUBSTATION TEAM	RATE (AUD/H)
Project Manager	250

Table B.2 Met Mast team

MET MAST TEAM	RATE ($/h)
Labourer	80
Labourer	80
Plant operator	120
Project Manager	250

Table B.3 Weight of WTG Components from GE 158-6.0 Specifications

COMPONENT	WEIGHT (KG)
Hub	50,000
Nacelle fully installed on tower top	96,500
Drivetrain with Gearbox	74,000
Drivetrain with Gearbox incl shipping fixture	79,000
Drive train with gearbox and drive train roof section	82,000
Drive train with gearbox and drive train roof section incl shipping fixture	87,000
Gearbox incl. torque support and elastomer elements	45,500
Generator	14,400
Transformer	14,400
Blades	20,000
Towers (6 sections of the tower)	351,000

Table B.4 Tooling costs

DESCRIPTION	RATE
Main crane [$/week]	70,000
Tower crane [$/week]	35,000
D9 Dozer [$/hour]	415
Grader [$/hour]	210
Drum roller [$/hour]	165
5 Tonne Telehandler [$/hour]	180