

Technical Report – Electromagnetic Interference Assessment

Virya Energy

Yanco Delta Wind Farm 30 June 2022





Executive Summary

Virya Energy is proposing to construct, operate and maintain the Yanco Delta Wind Farm (the Project). Approval is sought under Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and Part 9, Division 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project would involve the construction, operation and maintenance of a wind farm with up to 208 wind turbine generators (WTGs), a battery energy storage system and associated electrical infrastructure. The generating capacity of the wind farm is approximately 1,500 megawatts (MW).

This electromagnetic interference assessment has been prepared to address the Secretary's Environmental Assessment Requirements relating to potential EMI on telecommunications and will assist the Minister for Planning to make a determination on whether or not to approve the Project. This assessment provides an assessment of potential EMI impacts of the Project and outlines proposed management measures.

Assessment methodology

The assessment has followed methodologies outlined in the NSW Wind Energy Guidelines and the Clean Energy Council Best Practice Guidelines to determine any potential impacts of the Project on existing telecommunications. Detail of any existing telecommunication infrastructure was taken from the Australian Communication and Media Authority database in April 2022.

Specifically, this assessment looks at the potential EMI impacts of the Project upon:

- Point to point links
- Point to multipoint links
- Point to area communication:
 - Public Telecommunications Service
 - Spectrum
 - Broadcasting
 - Fixed communication
 - Land Mobile communication
- Aviation and meteorological radar operation.

Overview of EMI impacts

Six point to point links, across three transmission paths (transmit and receive in both directions cross the Project area. These transmission paths would potentially intercept seven WTGs. The transmission paths are used by two Licensees; NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service. Consultation with these authorities is required to establish further detail on required clearances, identification of suitable options to avoid disturbances and provide actual antennae height to inform the 3D assessment during or prior to detailed design.

Point to multi point, and point to area, links have been identified close to the Project area. Unlike point to point links, it is not possible to establish communication paths for these telecommunications. The level of risk for each of these links is predicted to be low, with the exception of the Emergency Services telecommunications.



Management measures

Consultation with all identified Licensees is required to establish whether the Project would impact upon their existing telecommunications. Should a potential impact be raised, then possible mitigation options can be discussed and established including:

- Monitoring telecommunications during construction and operation to determine any impact of the Project
- Rerouting of transmission paths around the Project
- Improving existing infrastructure, such as increasing antennae gain
- Relocation and/or removal of WTGs to not disturb any telecommunications.



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Glossary and Terms

Term	Definition
ACMA	Australian Communications and Media Authority
AWL	Area-Wide Apparatus Licence
BESS	Battery Energy Storage System
EIS	Environmental Impact Statement
EMI	Electromagnetic Interference
EMM	Environmental Mitigation Measure
EPHC	Environment Protection and Heritage Council
FSS	Fixed Satellite Service
LGA	Local Government Area
LPON	Low Power Open Narrowcasting
NSW	New South Wales
PMTS	Public Mobile Telecommunication Services
REZ	Renewable Energy Zone
SEAR	Secretary's Environmental Assessment Requirement
WTG	Wind Turbine Generator



1. Introduction

1.1 Background

Virya Energy is proposing to construct, operate and maintain the Yanco Delta Wind Farm (the Project). Approval is sought under Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and Part 9, Division 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project would involve the construction, operation and maintenance of a wind farm with up to 208 wind turbine generators (WTGs), a battery energy storage system (BESS) and associated electrical infrastructure. The generating capacity of the wind farm is approximately 1,500 megawatts (MW). The Project would be located within the South-West Renewable Energy Zone (REZ), 10 kilometres north-west of the town of Jerilderie, within the Murrumbidgee Council and Edward River Council Local Government Areas (LGAs) (refer to **Figure 1-1**).

The Project area is defined as the property boundaries of Project landowners (i.e. landowners that have entered into agreements with Virya Energy to have WTGs or associated infrastructure on their properties).

There are three rural residential dwellings within the Project area, which are all owned by Host Landowners. There are 14 dwellings owned by Associated Landowners within eight kilometres of a WTG which have signed a neighbour or participation agreement. The nearest neighbouring dwelling that in Non-associated with the Project is 3.6 kilometres from the nearest WTG.

1.2 **Project Description**

The Project would include the following key features:

- Up to 208 WTGs to a maximum tip height of 270 metres
- Generating capacity of approximately 1500 MW
- BESS, approximately 800 MW/800 megawatt hours (MWh) (type yet to be determined)
- Permanent ancillary infrastructure, including operation and maintenance facility, internal roads, hardstands, underground and overhead cabling, wind monitoring masts, central primary substation and up to eight collector substations
- Temporary facilities, including site compounds, laydown areas, stockpiles, gravel borrow pit(s) and concrete batch plants.

An indicative Project layout is provided in Figure 1-2.

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1.3 Secretary's Environmental Assessment Requirements

This assessment forms part of the environmental impact statement (EIS) for the Project. The EIS has been prepared under Division 4.7 of the EP&A Act. This assessment has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) (SSD-41743746) relating to EMI impacts on telecommunications and will assist the Minister for Planning to make a determination on whether or not to approve the Project.

Table 1-1 outlines the SEARs relevant to this assessment along with a reference to where these are addressed.

Table 1-1 SEARs relevant to EMI impacts on telecommunications

Secretary's Requirement	Where addressed in this report		
Hazards and Risks – including:			
• Telecommunications – identify possible effects on telecommunications systems, assess impacts and mitigation measures including undertaking a detailed assessment to examine the potential impacts as well as analysis and agreement on the implementation of suitable options to avoid potential disruptions to radio communication services, which may include the installation and maintenance of alternative sites	Possible effects and impacts on telecommunications systems are discussed in Chapter 4 . Mitigation measures are provided in Section 4.7 . These include consideration of detailed assessment to examine impacts (EMI1, EMI2 and EMI4) and analysis and agreement on the implementation of suitable options to avoid potential disruptions (EMI3, EMI5).		

1.4 Report Structure

The structure and content of this report is outlined in Table 1-2.

Table 1-2 Structure and content of this report

Chapter	Description
Chapter 1	Outlines key elements of the Project and the structure of this report (this Chapter)
Chapter 2 Regulatory requirements	Provides an outline of the requirements related to EMI that are applicable to the Project.
Chapter 3 Assessment methodology	Provides a description of the methodology used to assess the EMI impacts of the Project.
Chapter 4 Key findings	Provides the results of the assessment undertaken and recommendations on mitigation options
Chapter 5 Environmental management measures	Provides management measures to specifically manage potential EMI impacts on telecommunications that have been predicted during construction and operation of the Project.
Chapter 6 Conclusion	Summarises the findings of this report
References	Provides details of external resources used



2. **Regulatory requirements**

2.1 NSW Wind Energy Guidelines

The NSW Department of Planning & Environment Wind Energy Guideline (NSW Planning & Environment, December 2016) provides guidance on the planning framework for the assessment of large-scale wind energy development proposals. The guideline sets out the following consideration should be assessed in relation to EMI for any new wind energy proposal:

"the consent authority will give consideration to the risk of electromagnetic interference with telecommunication services in the area, and the adequacy of the measures proposed to ensure the level of service is maintained"

The NSW Wind Energy Guideline sets out the above broad requirement with respect to EMI impacts.

2.2 Clean Energy Council Best Practice Guidelines

The Clean Energy Council Best Practice Guidelines (Clean Energy Council, June 2018) are based on best practice for a "typical" project, acknowledging that projects can range from a single, small capacity wind turbine, to a utility scale wind farm with many, large capacity, wind turbines.

The Clean Energy Council Best Practice Guidelines (Clean Energy Council, June 2018) summarises the scope of potential impact to telecommunication systems as:

- The wind turbine tower may obstruct, reflect or refract the electromagnetic waves used in a range of communications systems for transmission
- The rotating blades may have similar effects, on a time variable basis. In some cases, ghosting of TV receivers close to the wind farm may occur where metal blades (or those with metallic cores or metal components such as the lightning protection system) act as an aerial to on-transmit the communication signal
- The wind turbine's electrical generator can produce electromagnetic interference, which may need to be suppressed by shielding design and maintenance of wind turbines (although in practice, a generator is little different from a typical electrical motor, and it is quite rare for a wind turbine generator to present such a problem).

The Clean Energy Council guideline sets out the steps for an EMI assessment as follows:

- 1. Identify all stakeholders potentially affected by the wind farm
- 2. Assess the potential EMI impacts
- 3. Consult with the relevant stakeholders
- 4. Mitigate against any potential EMI effects.

This report sets out to deal with steps 1 and 2 of this strategy. The report identifies those stakeholders that will require consultation and the timing that this should occur, and the potential impact of the Project upon their telecommunication systems.

The Clean Energy Council guideline also sets out the following criteria to determine whether a stakeholder may be affected:

- A wind turbine is within 2 km of a radiocommunications transmission site; or within 2 km of a radiocommunications receiver and in line with the transmission site
- A wind turbine is within the maximum second Fresnel zone (an elliptical region of space, between and around a transmitter and receiver, through which the wave travels) of a point to point radio link
- Aviation or meteorological radar operation can be affected by wind turbines. Even wind farms within 100 km of a radar installation may impact on its operation, and this can depend on a number of factors,



including the type of radar used, distance from the radar installation, terrain, layout of the wind turbines, and the size of the turbines. The owners of radar installations (e.g. the Bureau of Meteorology and Airservices) can generally assist in the assessment of the potential impact if required.

2.3 Environment Protection and Heritage Council (EPHC) Draft Guidelines

The Environment Protection and Heritage Council (EPHC) Draft Guidelines (Environment Protection and Heritage Council, July 2010) provides detailed methodologies for assessing the Project at the Feasibility stage. These EPHC guidelines suggest:

Conducting a search of the Australian Communications and Media Authority (ACMA) Register of Radiocommunications Licences can provide a listing of all licensed radiocommunications services within a specified area around the wind farm. A radial distance of 50-60km from the centre of the wind farm would normally capture all of the potentially affected services in the area.

The radial distance to identify transmitters and receivers within this Draft Guideline was doubled for the assessment undertaken for this Project, as a conservative measure.



3. Assessment methodology

This assessment looks at the potential impact of the Project upon:

- Point to point links A direct telecommunication path between a fixed transmitter and a fixed receiver
- Point to multipoint links One-to-many connection, providing multiple paths from a single location to multiple locations
- Point to area telecommunications Communication from one base to a wide area of potential receivers (such as radio or mobile phone communications), including the following categories:
 - Public Telecommunications Service
 - Spectrum
 - Broadcasting
 - Fixed telecommunication
 - Land Mobile telecommunication.
- Aviation and meteorological radar operation.

3.1 Study Area

The Australian Communications and Media Authority Register of Radiocommunication Licences (Australian Communications and Media Authority, 2022), as of April 2022, was downloaded to conduct the EMI assessment. The EPHC guidelines suggest all transmitters and receivers within a radial distance of 50 to 60 km from the centre of the Project would normally capture all of the potentially affected services.

For this assessment, transmitters and receivers within a 100 km radius from a notional centre point of the Project have been assessed. The following radii were then utilised within the respective sections of the assessment:

- Point to point links A radius of 100 km from the notional centre point of the Project
- Point to multi point links A radius of 100 km from the notional centre point of the Project
- Point to area telecommunication A radius of 20 km from each WTG was used
- Aviation and meteorological radar operations A radius of 100 km from each WTG was used.

3.2 Point to Point Links

Point to point links use line of sight communication for transmission of data. WTGs risk interference of point to point telecommunication through potential obstruction, reflection, or refraction of the electromagnetic waves along the transmission path.

All point to point links are identified within a 100 km radius of a notional centre point for the Project (taken as a latitude and longitude of -35.11836 and 145.6024 respectively). These point to point links are then correlated so that corresponding transmitters and receivers are matched. Any point to point links with a transmission path intersecting the Project are then identified.

For any point to point links with a transmission path intersecting the Project, the radius of the second Fresnel zone of each transmission path is calculated using the following formula:

$$F_2 = \sqrt{\frac{2\lambda d_1 d_2}{d_1 + d_2}}$$

where:

- F₂ is the second Fresnel Zone radius
- λ is the wavelength in metres
- d₁ and d₂ are the distances from the transmitter and receiver at the point under consideration.



Initially, a two-dimensional (2D) transmission path between the point to point links is assessed against the proposed WTG locations. The transmission path width is calculated using the maximum width of the second Fresnel zone, the maximum WTG rotor diameter, and an additional tolerance of 10 m either side of the transmission path. The maximum width of the second Fresnel Zone is calculated using a distance halfway between the transmitter and the receiver. This transmission path is assessed against the centre point of each WTG location to determine whether there is any potential interference on the point to point links.

If any transmission path is identified to intersect the WTG locations, then a three-dimensional (3D) analysis of the transmission path is conducted. Any transmission path that intersects the WTGs within the 3D analysis is then listed for stakeholder consultation with the owners of the telecommunication towers, such that mitigation measures can be put in place.

3.3 Point to Multi Point Links

Point to multi point links are a variation on point to point links. The difference is that a point to multi point licence allows communication between one or more fixed locations, whereas a point to point link allows communication between only two fixed locations. The ACMA Register of Radiocommunication Licences details only the static base station location of the point to multi point links, and not all the remote stations. As such, it is not feasible to plot all the transmission paths of the point to multi point links. All point to multi point links are identified within a 100 km radius of the Project, consistent with the approach taken on the point to point links. All these towers are then listed, with detail provided on the service offered and the owners of these towers. Stakeholder communication with these owners is then required to determine the potential transmission paths of the point links, and whether any interference with the Project is possible.

3.4 Point to Area Telecommunication

All point to area telecommunication towers identified in the following categories are identified within 20 km of any WTG (noting that the Clean Energy Council guideline recommends that best practice is to only identify those within 2 km of a WTG):

- Public Telecommunications Service
- Spectrum
- Broadcasting
- Land Mobile telecommunication.

All these towers are then listed, with detail provided on the service offered, the owners of these towers, and the Project level of risk for interference with the telecommunications. Stakeholder communication with these owners can then be informed by this level of risk.

3.5 Aviation and Meteorological Radar Operations

All aviation and meteorological radar operation towers within 100 km of the Project, as suggested by the Clean Energy Council guideline, are identified. All these towers are then listed, with detail provided on the service offered and the owners of these towers. The owners of radar installations (e.g. the Bureau of Meteorology and Airservices) can generally assist in the assessment of the potential impact, if required.

3.6 Project Elements

The following specific details have been used to inform this assessment:

- WTG locations as set out in **Figure 1-2**
- Maximum Rotor Diameter of 220 m
- Maximum Tower Height of 180 m.



4. Key findings

4.1 Transceivers

Within the study area, 11,403 transceivers (combined radio transmitters and receivers) were identified (**Figure 4-1**).



Figure 4-1 Transceivers identified within a 100 km radius of the Project.



4.2 Point to Point Links

Within the study area, 1,640 point to point towers were identified. 616 transmission paths were identified with both a transmitter and receiver within this area. All point to point links identified within the study area are shown in **Figure 4-2**. This figure also shows the 2D transmission path of all point to point links which have a corresponding transmitter and receiver within 100 km of the Project.



Figure 4-2 All Point to Point Links within 100 km radius of a notional centre of the Project.



Six point to point links across three transmission paths (transmit and receive in both directions) are identified to cross the Project area. These are shown in **Table 4-3** and with further detail in **Figure 4-4**.



Point to Point transmission paths intersecting the Project

Figure 4-3 Point to point transmission paths intersecting the Project





Figure 4-4 Point to point transmission paths intersecting the Project.



Table 4-1 shows the six point to point links (each transmission path is bi-directional) that cross the Project area and would intersect the proposed WTGs, based on a 2D analysis, the locations of the base towers, and the WTGs that would impact upon the second Fresnel zone¹. This shows that seven of the proposed WTG locations have potential to impact upon two Licensees; NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service.

ID	Tower 1 Location (Lat, Lon)	Tower 2 Location (Lat, Lon)	SDD_IDs	Frequency (Hz)	WTGs impacted	Licence ID	Licensee
1	(-35.366072, 145.324627)	(-34.798484, 145.719700)	1661571557 1661571558 1661571559 1661571560	44,630,000 42,630,000	W-078 W-087 W-069 W-145 W-176	21536/2	NSW Electricity Networks Operations Pty Limited
2	(-35.307335, 145.180242)	(-34.798287, 145.874943)	1661614709 1661614710 1661614711 1661614712	413,725,000 404,275,000	W-134	1213555/1	NSW Rural Fire Service
3	(-35.307335, 145.180242)	(-35.005810, 145.775001)	1661650962 1661650963 1661650964 1661650965	460,825,000 451,325,000	W-172	1902304/1	NSW Rural Fire Service

Table 4-1 Point to Point Links where WTGs are within transmission path

Table 4-2 shows the assessment of these transmission paths at each WTG in a 3D space. This shows that the transmission centreline for the point to point communication paths identified as ID 1 and ID 2 are very close to the ground level, in some cases below the ground level. This likely indicates that the antennae heights within the ACMA database have not been captured accurately, with the antennae levels above those detailed. Stakeholder consultation is required pre or during detailed design to identify the exact height of the antenna and undertake an accurate 3D analysis of the transmission path relative to each WTG. It can also be seen that the transmission centreline for transmission path ID 1 is typically more than 50 m offset from the WTG centre point. It is feasible, given accurate antennae elevation, that a calculation may identify that this transmission path passes underneath a given WTG rotor.

Table 4-2 also shows that the centreline of the transmission path for point to point link ID 3 is approximately 36 m offset from WTG W-172, and approximately 37 m above ground level. Given the flexibility in WTG selection at this stage of the Project, it cannot be explicitly stated whether the 2nd Fresnel Zone in this case will directly interfere with the WTG rotor, It is possible, however, that the WTG rotor for WTG W-172 may pass through this transmission path. For example, a turbine diameter of 220 m with a tower height of 130 m will result in the WTG rotor tip being 26 m above the floor at an offset of 37 m and therefore impacting upon the 2nd Fresnel Zone of point to point link ID 3.

¹Seven WTGs have been assessed as potentially impacting the point to point communication links by the methodology outlined in **Section 3.2**. This includes an additional tolerance of 10m either side of the Fresnel zone. Should this tolerance be removed the number of WTGs potentially impacting the communication links drops to four. This reduction does not affect the output and next steps required.



ID	Tower 1 Elevation (m)	Tower 2 Elevation (m)	WTG	WTG Elevation (m)	Worst case 2 nd Fresnel Zone Radius (m)	Transmission centreline height above ground (m)	Transmission centreline offset from WTG central point (m)
1	99	113	W-078	106	1.88	0.90	103.26
1	99	113	W-087	104	1.88	2.11	88.56
1	99	113	W-069	106	1.88	-0.11	115.23
1	99	113	W-145	105	1.88	0.11	106.55
1	99	113	W-176	105	1.88	-0.11	53.30
2	91	119	W-134	106	0.61	-3.04	23.92
3	141	145	W-172	106	0.58	37.20	36.61

Table 4-2 3D analysis of point to point transmission paths at each impacted WTG

4.2.1 Stakeholder Consultation and Mitigation Options

Further stakeholder consultation is required with each of the Licensees associated with the point to point links that are potentially impacted by the WTG locations. Antennae heights are required to inform a 3D assessment. Further detail on required clearances and identification of suitable options to avoid disturbances are also suggested to be part of any consultation.

The following mitigation options are possible rectification options to avoid any point to point link interferences:

- Relocation of WTGs out of 2nd Fresnel Zone
- Rerouting of transmission path around the Project.



4.3 Point to Multi Point Links

Figure 4-5 shows all point to multi point links identified within the study area, consistent with the approach taken on the point to point links. All these towers are listed, with detail provided on the owners and distance to the Project in **Table 4-3**.



Figure 4-5 Point to multi point transceivers within 100 km of the Project

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Table 4-3 Point to Multi Point Links within 100 km radius of the Project

ID	Licensee	SDD_ID	Tower location (Lat, Long)	Distance to nearest WTG (km)
1	Murray Irrigation Ltd	1661597346	(-35.606356, 145.784277)	38.9
		1661597348	(-35.605383, 145.417910)	44.7
		1661597352	(-35.468573, 145.035783)	55.3
		1661600073	(-35.807909, 145.792865)	61.1
		1661602497	(-35.807909, 145.792865)	61.1
		1661605200	(-35.468573, 145.035783)	55.3
		1661759832	(-35.633741, 145.581654)	42.2
		1661787230	(-35.807909, 145.792865)	61.1
		1661787445	(-35.398558, 144.806239)	69.0
		1661790224	(-35.461470, 145.769280)	23.0
		1661958120	(-35.588399, 145.247275)	53.0
2	Coleambally Irrigation	1661608303	(-34.806050,145.879703)	36.3
	Cooperative LTD	1661614219	(-34.802164,145.890523)	37.3
		1661614909	(-34.802164,145.890523)	37.3
		1661615018	(-34.697063,146.115964)	60.6
		1661615020	(-34.949925,145.969246)	34.9
		1661615022	(-34.840181,146.014189)	43.9
		1661617881	(-34.884222,145.969740)	38.1
		1661617883	(-35.019861,145.872936)	23.3
		1661617885	(-34.869638,145.827967)	28.1
		1661617994	(-34.787379,146.023595)	47.8
		1661850125	(-34.802164,145.890523)	37.3
3	Murrumbidgee Irrigation	1661617082	(-34.566417,146.459429)	94.6
	Limited	1661657922	(-34.751195,146.567489)	92.8
		1661799402	(-34.566417,146.459429)	94.6
		1661826014	(-34.401925,146.019332)	79.2
		1661854716	(-34.473694,146.293433)	89.2
		1661890339	(-34.668826,146.457368)	88.6
4	Water NSW	1661807078	(-34.705384,146.416574)	83.4
		1661807163	(-35.524854,144.964143)	64.3
		1661807291	(-35.353446,145.734241)	10.6
		1661807354	(-34.576441,145.486078)	45.1
5	Goulburn Valley Region	1661591848	(-35.913794,145.660651)	72.3
	Water Corporation	1661599370	(-35.914647,145.660271)	72.4
		1661673592	(-35.913794,145.660651)	72.3
6	Telstra Corporation	1661597883	(-34.465870,145.421585)	57.8
	Limited	1661613927	(-34.791758,144.627738)	79.8
		1661614182	(-34.753261,145.374158)	28.0

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ID	Licensee	SDD_ID	Tower location (Lat, Long)	Distance to nearest WTG (km)
7	Narrandera Shire Council	1661597465	(-34.738095,146.554224)	92.6
		1661697952	(-34.751195,146.567489)	92.8
8	Berrigan Shire Council	1661814465	(-35.788870,145.781100)	58.9
		1661879072	(-35.788870,145.781100)	58.9
9	Essential Energy	1661602318	(-35.800230,144.900311)	90.7
10	Goulburn-Murray Rural Water Corporation	1661605788	(-36.007905,145.536566)	83.8
11	Hay Shire Council	1661615481	(-34.512973,144.839507)	79.9
12	Deniliquin Council	1661621787	(-35.525520,144.945459)	65.6
13	Federation Council	1661843076	(-35.333122,146.284408)	53.0
14	Orica Australia Pty Ltd	1661886673	(-35.775994,145.555765)	58.2
15	Edward River Council	1661909315	(-35.525520,144.945459)	65.6

The level of risk for each of these point to multi point links is predicted to be low. The distance from each of the telecommunication towers to the Project is greater than 10 km, and it is anticipated that each of these point to multi point telecommunication towers is used for communication with local receivers. It is therefore unlikely that the Project will interfere with any local communications that are dependent on these telecommunication towers.

4.3.1 Stakeholder Consultation and Mitigation Options

Stakeholder communication is recommended for all towers identified in **Table 4-3**, but specifically for Murray Irrigation Ltd, Coleambally Irrigation Cooperative LTD, Water NSW, and Telstra Corporation Limited, as the distances to the closest WTGs are less than 30 km.

Should mitigation options be required, these can be discussed with the relevant stakeholders as any issues come to light.



4.4 Point to Area Telecommunication

The assessment identified 168 transmitters and receivers for point to area telecommunications within 20 km of the nearest WTG.

Figure 4-6 shows these point to area telecommunication towers. The number of towers identified by licence type and licence category is provided in **Table 4-4**. Further detail about specific telecommunication types is provided in **Section 4.4.1** to **Section 4.4.6**.

Table 4-4 Point to Area	Telecommunication	noints within 20) km of the neares	t WTG
Table 4-4 Foint to Area	relecommunication	points within 20	KIII OI LIE HEALES	LWIG

Licence Type	Licence Category	Number of Transmitters and Receivers within 20 km of nearest WTG
Spectrum	1,800 MHz Band	6
Spectrum	2.3 GHz Band	48
Spectrum	3.4 GHz Band	12
Spectrum	700 MHz Band	22
Spectrum	800 MHz Band	2
Spectrum	AWL - FSS Only	5
Land Mobile	Land Mobile System - > 30MHz	26
Land Mobile	Land Mobile System 0-30MHz	20
Land Mobile	Paging System - Exterior	3
Broadcasting	Commercial Television	3
Broadcasting	Narrowcasting Service (LPON)	2
Broadcasting	National Broadcasting	3
Public Telecommunications Service	PMTS Class B	6
Public Telecommunications Service	PMTS Class B (935-960 MHz)	10





Figure 4-6 Point to Area Transmitters within 20 km of any WTG.



4.4.1 Internet Coverage

Figure 4-7 shows all internet coverage towers identified within 20 km of the closest WTG. The owners of these towers are provided in **Table 4-5** with detail on the closest tower to the Project provided.

Table 4-5 Internet Coverage Providers within 20 km of closest WTG

Owner	Location of closest tower (Lat, Lon)	Distance of closest tower to nearest WTG (km)
NBN CO LIMITED	(-35.357300,145.737967)	11.1
Viasat Australia Pty Ltd	(-35.356216,145.726384)	10.7





Figure 4-7 Internet Coverage towers within 20 km of nearest WTG



4.4.2 Mobile Phone Coverage

Figure 4-8 shows all mobile phone coverage towers identified within 20 km of the closest WTG. The owners of these towers are provided in **Table 4-6**, with detail on the closest tower to the Project provided.

Table 4-6 Mobile Phone Coverage Providers within 20 km of closest WTG

Owner	Location of closest tower (Lat, Lon)	Distance of closest tower to nearest WTG (km)
Optus Mobile Pty Limited	(-35.326194,145.788299)	10.6
Telstra Corporation Limited	(-35.359330,145.724463)	11.0
Vodafone Australia Pty Limited	(-35.415209,145.700454)	16.8
Vodafone Hutchison Australia Pty Limited	(-35.415209,145.700454)	16.8





Figure 4-8 Mobile Phone Coverage towers within 20 km of nearest WTG



4.4.3 Government Telecommunication

Figure 4-9 shows all government telecommunication towers identified within 20 km of the closest WTG. The owners of these towers are provided in **Table 4-7**, with detail on the closest tower to the Project provided.

Table 4-7 Government Telecommunications within 20 km of closest WTG

Owner	Location of closest tower (Lat, Lon)	Distance of closest tower to nearest WTG (km)
Murrumbidgee Council	(-35.355243,145.725078)	10.6
New South Wales Government Telecommunications Authority	(-35.355566,145.730026)	10.7





Figure 4-9 Government telecommunication towers within 20 km of nearest WTG



4.4.4 Emergency Services

Figure 4-10 shows all emergency services towers identified within 20 km of the closest WTG. The owners of these towers are provided in **Table 4-8**, with detail on the closest tower to the Project provided.

Table 4-8 Emergency Service Towers within 20 km of closest WTG

Owner	Location of closest Tower (Lat, Lon)	Distance of closest Tower to nearest WTG (km)
NSW Police Force	(-35.358671,145.718304)	10.8
NSW Rural Fire Service	(-35.358671,145.718304)	10.8
Ambulance Service of NSW	(-35.356941,145.732205)	10.9





Figure 4-10 Emergency services towers within 20 km of nearest WTG



4.4.5 Broadcasting

Figure 4-11 shows all broadcasting coverage towers identified within 20 km of the closest WTG. The owners of these towers are provided in **Table 4-9**, with detail on the closest tower to the Project provided.

Table 4-9 Broadcasting Towers within 20 km of closest WTG

Owner	Location of closest tower (Lat, Lon)	Distance of closest tower to nearest WTG (km)
Southern Cross Communications Pty Limited	(-35.342881,145.660845)	9.2
Prime Television (Victoria) Pty Limited	(-35.342881,145.660845)	9.2
WIN Television Vic Pty Ltd	(-35.342881,145.660845)	9.2
Special Broadcasting Service Corporation	(-35.342881,145.660845)	9.2
Australian Broadcasting Corporation	(-35.342881,145.660845)	9.2
Hello Radio Pty Ltd	(-35.355508,145.724524)	10.6
United Christian Broadcasters Australia Limited	(-35.355508,145.724524)	10.6





Figure 4-11 Broadcasting towers within 20 km of nearest WTG



4.4.6 Miscellaneous

Figure 4-12 shows all miscellaneous coverage towers identified within 20 km of the closest WTG. The owners of these towers are provided in **Table 4-10**, with detail on the closest tower to the Project provided.

Table 4-10 Miscellaneous Towers within 20 km of closest WTG

Owner	Location of closest Tower (Lat, Lon)	Distance of closest Tower to nearest WTG (km)
SST Development Group Australia Pty Ltd	(-35.088842,145.447392)	2.7





Figure 4-12 Miscellaneous towers within 20 km of nearest WTG



4.4.7 Stakeholder Consultation and Mitigation Options

The level of risk associated with each of the point to area telecommunication towers identified in **Section 4.4.1** to **Section 4.4.6**, with the exception of Emergency Services, is predicted to be low. This is because the number of dwellings sitting on the far side the Project in relation to the telecommunication towers is relatively small. The potential impact to any telecommunications cannot be established without an understanding of the stakeholder's usage. The level of risk with regards the Emergency Services towers needs to be established by communication with these owners directly.

Stakeholder consultation pre and during detailed design is recommended for all point to area owners detailed in **Section 4.4.1** to **Section 4.4.6**. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established, including:

- Monitoring telecommunications during construction and operation to determine any impact of the Project
- Rerouting of transmission paths around the Project
- Improving existing infrastructure, such as increasing antennae gain
- Relocation and/or removal of WTGs to not disturb any telecommunications.

4.5 Aviation and Meteorological Radar Operations

4.5.1 Aeronautical Towers

15 aeronautical towers, across six locations, are identified within 100 km of the nearest WTG. These are displayed in **Figure 4-13**, with more detail provided in **Table 4-11**. The owners of these towers would be consulted pre and during detailed design to determine any potential impact to their telecommunications from the Project.

ID	Aeronautical Tower Location (Lat, Lon)	Distance to closest WTG (km)	Name	Licensee
1	(-34.702071, 146.517064)	91.9	Airport NARRANDERA	Regional Express Holdings Limited
2	(-34.704990, 146.513887)	91.4	AWIB Site Narrandera Airport NARRANDERA	Narrandera Shire Council
3	(-35.557498, 144.946110)	67.9	Deniliquin Regional Airport MacKnight Drive DENILIQUIN	EDWARD RIVER COUNCIL
4	(-34.255187, 146.062573)	95.1	Airport GRIFFITH	Regional Express Holdings Limited Griffith City Council
5	(-34.255254, 146.062436)	95.1	Griffith Airport terminal building, Remembrance Drive Griffith	Qantas Airways Limited
6	(-34.256056, 146.061583)	94.9	Aviation Fuel Depot Griffith Airport GRIFFITH	World Fuel Services (Australia) PTY LTD

Table 4-11 Aeronautical Towers within 100 km of the Project

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Figure 4-13 Aeronautical Towers within 100km of the Project.

4.5.2 Meteorological Stations

Two meteorological stations are identified within 100 km of the nearest WTG. These are displayed in **Figure 4-14**, with more detail provided in **Table 4-12**. The Bureau of Meteorology should be consulted to determine any potential impact to their telecommunications from the Project.

Table 4-12 Bureau of Meteorology	Towers within	100 km	of the Project
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ID	BoM Tower Location (Lat, Lon)	Licence Type	Distance to closest WTG (km)	Name
1	(-36.029700, 146.022742)	Radiodetermination	90.2	Met Bureau Site YARRAWONGA AIRPORT
2	(-36.029400, 146.030600)	Fixed Receive	90.4	BoM Site Yarrawonga Aerodrome Cahills Road YARRAWONGA

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Figure 4-14 Bureau of Meteorology Towers within 100 km of the Project.

4.6 Cumulative Impacts

The Project would be located in the South-West REZ. This zone has potential to become an area where wind farms are densely developed. To date, confirmed projects within this zone are all outside of the study area. A couple of 'announced' projects are located adjacent to the Project area, although details of these projects have not been confirmed. Cumulative impacts are considered unlikely. However any mitigation activities, such as rerouting of transmission paths or upgrading existing telecommunications infrastructure, should consider the implications of these 'announced' projects and any additional projects which are made public in the future.



4.7 Summary of EMI Assessment Results

A summary of the assessment results is provided in **Table 4-13**.

Table 4-13 EMI assessment results summary

Service type	Assessment findings	Actions
Point to point links	Six point to point links cross the Project and would intersect the proposed WTGs, based on a 2D analysis. Seven of the proposed WTG locations have potential to impact upon two Licensees; NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service.	 Further stakeholder consultation pre and during detailed design would be undertaken with each of the Licensees. Antennae heights are required to inform a 3D assessment. Further detail on required clearances and identification of suitable options to avoid disturbances are also suggested to be part of any consultation. Possible rectification options to avoid any point to point link interferences include: Relocation of WTGs out of 2nd Fresnel Zone Rerouting of transmission path around the Project.
Point to multi point links	49 point to multi point telecommunication towers have been identified within 100 km of the Project. These towers are owned by 15 different Licensees. The level of risk for each of these point to multi point links is predicted to be low. The distance from each of the telecommunication towers to the Project is greater than 10 km and it is anticipated that each of these point to multi point telecommunication towers is used for communication with local receivers.	Stakeholder communication pre and during detailed design would be undertaken for all towers identified within 100 km of the Project, and particularly for Murray Irrigation Ltd, COLEAMBALLY IRRIGATION CO-OPERATIVE LTD, WATER NSW, and Telstra Corporation Limited, as the distances to the closest WTGs are less than 30 km.
Point to area telecon	nmunication:	
Internet coverage	Two internet coverage towers are identified within 20 km of the closest WTG. The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small. The potential impact to any communications cannot be established without an understanding of the stakeholder's usage.	 Stakeholder consultation pre and during detailed design would be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: Monitoring telecommunications during construction and operation to determine any impact of the Project Rerouting of transmission paths around the Project Improving existing infrastructure, such as increasing antennae gain Relocation and/or removal of WTGs to not disturb any telecommunications.



Service type	Assessment findings	Actions
Mobile phone coverage	Four mobile phone coverage towers are identified within 20 km of the closest WTG. The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small. The potential impact to any telecommunications cannot be established without an understanding of the stakeholder's usage.	 Stakeholder consultation pre and during detailed design would be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: Monitoring telecommunications during construction and operation to determine any impact of the Project Rerouting of transmission paths around the Project Improving existing infrastructure, such as increasing antennae gain Relocation and/or removal of WTGs to not disturb any telecommunications.
Government telecommunication	Two government telecommunication towers are identified within 20 km of the closest WTG. The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small. The potential impact to any communications cannot be established without an understanding of the stakeholder's usage.	 Stakeholder consultation pre and during detailed design would be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: Monitoring telecommunications during construction and operation to determine any impact of the Project Rerouting of transmission paths around the Project Improving existing infrastructure, such as increasing antennae gain Relocation and/or removal of WTGs to not disturb any telecommunications.
Emergency services	 Three emergency services telecommunication towers are identified within 20 km of the closest WTG. The Licensees for these are: NSW Police Force NSW Rural Fire Service Ambulance Service of NSW The level of risk with regards the Emergency Services towers needs to be established by communication with these owners directly. 	 Stakeholder consultation pre and during detailed design would be undertaken for all these towers to establish level of risk for the Project. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: Monitoring telecommunications during construction and operation to determine any impact of the Project Rerouting of transmission paths around the Project Improving existing infrastructure, such as increasing antennae gain Relocation and/or removal of WTGs to not disturb any telecommunications.



Service type	Assessment findings	Actions
Broadcasting	Seven broadcasting towers are identified within 20 km of the closest WTG. The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small. The potential impact to any communications cannot be established without an understanding of the stakeholder's usage.	 Stakeholder consultation pre and during detailed design would be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: Monitoring telecommunications during construction and operation to determine any impact of the Project Rerouting of transmission paths around the Project Improving existing infrastructure, such as increasing antennae gain Relocation and/or removal of WTGs to not disturb any telecommunications.
Miscellaneous	One miscellaneous coverage tower is identified within 20 km of the closest WTG. The level of risk associated with this telecommunication tower is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small. The potential impact to any communications cannot be established without an understanding of the stakeholder's usage.	 Stakeholder consultation pre and during detailed design would be undertaken for this tower. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: Monitoring telecommunications during construction and operation to determine any impact of the Project Rerouting of transmission paths around the Project Improving existing infrastructure, such as increasing antennae gain Relocation and/or removal of WTGs to not disturb any telecommunications.
Aviation radar operations	15 aeronautical towers, across six locations, are identified within 100 km of the nearest WTG.	The owners of these towers would be consulted pre and during detailed design to determine any potential impact to their telecommunications from the Project.
Meteorological radar operations	Two meteorological stations are identified within 100 km of the nearest WTG.	The Bureau of Meteorology would be consulted pre and during detailed design to determine any potential impact to their telecommunications from the Project.



5. Environmental management measures

The following management measures detailed in **Table 5-1** have been developed to specifically manage potential EMI impacts on telecommunications that have been predicted during construction and operation of the Project.

Table 5-1 EMI environmental management measures

Impact	Reference	Environmental Management Measure	Responsibility	Timing
Point to point impacts	EMI1	Consultation will be carried out with NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service, to determine their antennae heights, and regarding potential interference due to the seven WTGs identified potentially in their communication paths. A detailed 3D analysis should be undertaken when further information is available.	Proponent	Detailed design
Point to multi point links	EMI2	Consultation will be carried out with the 15 different Licensees of the 49 point to multi point telecommunication towers identified within 100 km of the Project. This consultation will determine the potential interference due to the Project.	Proponent	Detailed design
Point to point and point to multi point links	EMI3	Should consultation with point to point, or point to multipoint, link Licensees determine that interference is a risk, then options to relocate WTGs and/or rerouting of transmission paths around the Project will be considered	Proponent	Detailed design
Point to area telecommunications	EMI4	Consultation will be carried out with all point to area telecommunication tower owners within 100 km of the Project. This consultation will determine the potential interference due to the Project.	Proponent	Detailed design
Point to area telecommunications	EMI5	 Should consultation with point to area communication tower owners determine that interference is a risk, then options for mitigation will be considered in the following order: Monitoring telecommunications during construction and operation to determine any impact of the Project Improving existing infrastructure, such as increasing antennae gain Rerouting of transmission paths around the Project Relocation and/or removal of WTGs to not disturb any telecommunications. 	Proponent	Detailed design, construction and operation
Aviation and meteorological radar operations	EMI6	Consultation will be carried out with the owners of the 15 aeronautical towers, and the Bureau of Meteorology, to determine any potential impact to their telecommunications from the Project.	Proponent	Detailed design



6. Conclusion

This assessment has followed the methodology outlined in the NSW Wind Energy Guidelines (NSW Planning & Environment, December 2016) and the Clean Energy Council Best Practice Guidelines (Clean Energy Council, June 2018) to determine any potential impacts of the Project on existing telecommunications. Detail of any existing telecommunication infrastructure was taken from the Australian Communication and Media Authority database in April 2022.

Six point to point links, across three transmission paths (transmit and receive in both directions), are identified to cross the Project area. These transmission paths would potentially intercept seven WTGs based on their current locations. The transmission paths are used by two Licensees; NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service. The ACMA database does not contain sufficient antennae height information at all towers sufficiently to inform a 3D assessment. Consultation with these authorities will be undertaken to establish further detail on required clearances, identification of suitable options to avoid disturbances and actual antennae height to inform the 3D assessment.

Point to multi point and point to area links have been identified close to the Project area. Unlike point to point links, it is not possible to establish communication paths for these telecommunications. The level of risk for each of these links is predicted to be low, with the exception of the Emergency Services telecommunications, as the number of dwellings sitting on the far side the Project in relation to the telecommunication towers is relatively small. Stakeholder consultation is required with all the owners of these telecommunication towers to understand whether the Project will impact upon their existing telecommunications. Should a potential impact be raised, then possible mitigation options can be discussed and established including:

- Monitoring telecommunications during construction and operation to determine any impact of the Project
- Rerouting of transmission paths around the Project
- Improving existing infrastructure, such as increasing antennae gain
- Relocation and/or removal of WTGs to not disturb any telecommunications.



References

Australian Communications and Media Authority. (2022, April). Retrieved from https://web.acma.gov.au/rrl/register_search.main_page.

Clean Energy Council. (June 2018). Best Practice Guidelines for implementation of wind energy projects in Australia. Clean Energy Council.

Environment Protection and Heritage Council. (July 2010). *Draft National Wind Farm Development Guidelines*. Environment Protection and Heritage Council.

NSW Planning & Environment. (December 2016). *Wind Energy Guideline For State significant wind energy development*. NSW Planning & Environment.