hepburn wind community energy

Hybrid Planning Permit | Attachment 4

Noise Assessment

MARSHALL DAY Acoustics

HEPBURN WIND SOLAR FARM
PRELIMINARY NOISE ADVICE

Rp 001 20200998 | 30 October 2020

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Project: **HEPBURN WIND SOLAR FARM**

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1.0 INTRODUCTION

Hepburn Wind proposes to install two SMA Sunny Central inverter/transformer units at the Hepburn Community Wind Farm. One inverter/transformer unit is to be installed in 2020, a solar farm will then be built and a second unit will be added.

Hepburn Wind has requested that Marshall Day Acoustics Pty Ltd (MDA) undertake a preliminary desktop noise analysis to determine whether noise mitigation treatments will be required.

This report provides details of our findings and recommendations.

A glossary of acoustic terminology is provided in Appendix A.

2.0 SITE DESCRIPTION

The solar farm is proposed to be located at the Hepburn Community Wind Farm located in Leonards Hill near Daylesford in Victoria. One inverter/transformer unit will be installed to the southwest of the solar panels, and one inverter/transformer unit will be installed within the solar panel area, at the locations indicated by white circles in Figure 1.

Figure 1: Subject site and proposed inverter/transformer units location (white circles).

The nearest residential receiver is located approximately 450 m west northwest from the nearest proposed inverter/transformer at 2040 Ballan Daylesford Road.

Noise-sensitive receivers located further afield will experience lower noise levels than the nearest receiver due to attenuation provided by additional distance from the source, therefore this preliminary analysis is limited to the dwelling at 2040 Ballan Daylesford Road.

The solar farm, inverter/transformer units and the nearest residential dwelling are located on land zoned Farming (FZ). The relevant planning map is attached in Appendix B.

3.0 SOLAR FARM OPERATION

This assessment is based on the following assumptions for operating conditions of the solar farm:

- The solar farm will operate 7 days a week with maximum operating hours being approximately 0520-2115 hrs. This time period represents the maximum extents of daylight hours throughout the year
- Up to 2 SMA Sunny Central 2500 EV inverter/transformer units will be installed.

It is our understanding that one of the inverters will provide power factor support to the wind turbines during the night, which will result in the operation of one inverter continuing throughout the night. To stabilise the utility grid during non-feed-in operation, the inverter is able to provide the required reactive power both during the day and night. This function is independent of normal feed-in operation. The inverter enters the "Q on-demand" mode when the AC power generated by the inverter falls below 2 kW. The inverter feeds in reactive power in accordance with predetermined parameter settings.

4.0 REGULATORY FRAMEWORK

4.1 Key noise legislation and guidelines

The following section outlines a review of key noise legislation and guidelines in Victoria applicable to this project to assess and control environmental noise. A summary of the relevant legislation and guidelines is provided in Table 1.

Table 1: Key noise legislation/guidelines

Document	Overview
Environment Protection Act 1970 (the Act)	Establishes obligations for the control of environmental noise and applies to all types of noise sources except rail operations. The legislation does not specify noise limit values but sets out legal requirements to comply with State Environment Protection Policies and prescribed standards.
EPA Publication 1411 *Noise from Industry in Regional Victoria* (NIRV)	Prescribes recommended maximum noise levels (recommended levels) for commercial, industrial or trade premises in regional Victoria. The NIRV document is a non-statutory guideline. Accordingly, the recommended levels are only legally binding when applied through statutory instruments, such as a planning permit or notice.

4.2 Noise from Industry in Regional Victoria (NIRV)

EPA Publication 1411 *Noise from Industry in Regional Victoria* (NIRV) defines recommended maximum noise levels (recommended levels) for commercial, industrial or trade premises in regional Victoria.

NIRV is a non-statutory guideline but may be applied through statutory instruments, such as a condition of planning approval or other planning instrument.

The procedure for determining the NIRV recommended levels depends on whether the noise emitter or the receivers are in a 'major urban area' or 'rural area' according to NIRV definitions.

The subject site and neighbouring residential receivers are not located inside the boundary of any major urban areas defined on the Victorian EPA website. The recommended levels in this instance are therefore determined using the procedures for rural areas.

The procedures for rural areas are based on determining *zone levels* for the day, evening, and night period according to the land zoning of the areas where were the noise source and receivers are located. The zone levels are then adjusted, where appropriate, for a range of factors such as background noise levels and the type of noise source being assessed.

NIRV specifies that an assessment of background noise is required in *background-relevant areas*, which are defined as:

> *a noise-sensitive area where background levels may be higher than usual for a rural area. This includes areas where freeway or highway traffic is a significant audible background noise source. It also includes coastal areas, where representative background levels are elevated by surf.*

A background relevant area is characterised by higher noise levels than normal and a background level adjustment will only increase the NIRV recommended levels based on zoning alone.

Table 2 details the applicable recommended levels determined according to the NIRV methodology. The NIRV zone levels are shown in Appendix C.

Table 2: NIRV recommended noise levels

Period	Day of the week	Applicable times	NIRV recommended level, dB L_{eff}
Day	Monday-Friday	0700-1800 hrs	46
	Saturday	0700-1300 hrs	
Evening	Monday-Friday	1800-2200 hrs	41
	Saturday	1300-2200 hrs	
	Sunday	0700-2200 hrs	
Night	Monday-Sunday	2200-0700 hrs	36

The recommended levels apply to the effective noise level (L_{eff}) from the subject site at neighbouring sensitive locations. The effective noise level represents the average level (equivalent noise level, L_{Aeq}) over a 30-minute period, with adjustments applied to account for the character of the noise. Characteristics which attract adjustment include tonality, impulsiveness, intermittency and the duration the noise is present.

5.0 EQUIPMENT NOISE LEVELS

Publicly available literature from SMA indicates that the SC2500-EV has an overall A-weighted sound power level of 92 dB L_{WA}. This data has been used to estimate an octave band spectrum based on measurements of similar equipment from the MDA data base. The data used in subsequent noise predictions is provided in Table 3.

Table 3: Sound power levels, dB L_w

		Octave Band Centre Frequency (Hz)						
Description	**A**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Sunny Central 2500-EV	92	88	86	89	83	80	80	90

6.0 NOISE ASSESSMENT

6.1 Calculation method

Noise predictions have been made based on the methodology in the international standard ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613). This Standard assumes favourable propagation conditions, which is described as a slight wind blowing from source to receiver, or a moderate ground-based temperature inversion. There are no user inputs for weather; it is always favourable for the propagation of noise.

The ISO 9613 standard describes three distinct ground surface types, namely hard, porous and mixed ground and states the following:

> *Hard ground includes paving, water, ice, concrete and all other ground surfaces having a low porosity. Porous ground includes ground covered by grass, trees and other vegetation, and all other ground surfaces suitable for growth of vegetables, such as farming land. Mixed ground consists of both hard and porous ground.*

Noise predictions consider the following:

- The amount of noise being generated by the various noise sources
- The distance between the sources and receivers
- The presence of any obstacles such as hills, buildings, screens or barriers, in the propagation path
- The hardness of the ground between the source and receiver
- Absorption of sound by the air
- Meteorological influences such as wind or temperature gradients.

6.2 Basis for noise predictions

The following assumptions have been made for noise predictions at this site:

- A worst-case half hour of operation is represented by both SMA inverter/transformer units operating continuously
- The ground surface between source and receiver is assumed to be 50 % soft ground
- There are no intervening obstacles in the propagation path.

6.3 Predicted noise level

Noise from the operation of both inverters were predicted based on the assumptions above and summarised in in Table 4 at the nearest dwelling to the west (2040 Ballan-Daylesford Road) and other nearby dwellings as requested by Hepburn Wind.

Table 4: Predicted noise levels from both inverters

Receiver	Distance to the nearest inverter, m	dB L_{eff}
12 Gambles Lane	638	20
1975 Ballan-Daylesford Road	494	22
2040 Ballan-Daylesford Road	362	26
2084 Ballan-Daylesford Road	675	20
64 Gambles Lane	458	23
76 Gambles Lane	501	22
1914 Ballan-Daylesford Road	777	17
1922 Ballan-Daylesford Road	706	18
1941 Ballan-Daylesford Road	675	18
1989 Ballan-Daylesford Rd	494	22

Noise levels are predicted below the most stringent night-time recommended level of 36 dB L_{eff} for the operation of both inverter/transformer units.

7.0 CONCLUSION

A preliminary desktop assessment of the inverter/transformer units associated with the proposed solar farm at the Hepburn Community Wind Farm has been undertaken in accordance with NIRV.

Noise levels from the proposed equipment were predicted below the most stringent night-time recommended level of 36 dB L_{eff} by up to 10 dB.

The noise assessment therefore demonstrates that the inverter/transformer units associated with the proposed solar farm at the Hepburn Community Wind Farm can be designed and developed to achieve Victorian policy requirements for operational noise.

APPENDIX A GLOSSARY OF TERMINOLOGY

Frequency	The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).
Hertz (Hz)	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
Octave Band	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
L_{Aeq}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
L_{eff}	The effective noise level of commercial or industrial noise determined in accordance with *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1* (SEPP N-1). This is the L_{Aeq} noise level over a half-hour period, adjusted for the character of the noise. Adjustments are made for tonality, intermittency and impulsiveness, as relevant.

APPENDIX B PLANNING MAP

APPENDIX C NIRV ZONE LEVELS

NOISE FROM INDUSTRY IN REGIONAL VICTORIA

Table 1: Zone Levels – must only be applied in conjunction with steps 2 to 5

Planning zone for noise-receiving location

Planning zone for noise-generating use (Generating Zone ↓ / Receiving zone →)	❑ Green Wedge A GWAZ ❑ Rural Conservation RCZ ❑ Rural Living RLZ	❑ Low Density Residential LDRZ ❑ Public Conservation and Resource PCRZ ❑ Public Park and Recreation PPRZ ❑ Public Use 2,5 PUZ ❑ Urban Floodway UFZ	❑ Farming FZ† ❑ Green Wedge GWZ ❑ Residential 1 R1Z ❑ Residential 2 R2Z ❑ Residential 3 R3Z ❑ Rural Activity RAZ ❑ Township TZ ❑ Urban Growth UGZ‡	❑ Business 1 B1Z ❑ Business 2 B2Z ❑ Business 5 B5Z ❑ Comprehensive Development CDZ‡ ❑ Mixed Use MUZ ❑ Priority Development PDZ‡ ❑ Public Use 1,3,4,6,7 PUZ ❑ Road RDZ	❑ Industrial 3 IN3Z ❑ Special Use SUZ‡	❑ Business 3 B3Z ❑ Business 4 B4Z	❑ Industrial 1 IN1Z ❑ Industrial 2 IN2Z
▸ Low Density Residential LDRZ ▸ Public Conservation and Resource PCRZ ▸ Public Park and Recreation PPRZ ▸ Residential 1 R1Z ▸ Residential 2 R2Z ▸ Residential 3 R3Z ▸ Urban Floodway UFZ	Day: 45 Evening: 37 Night: 32	Day: 45 Evening: 39 Night: 34	Day: 45 Evening: 40 Night: 35	Day: 47 Evening: 42 Night: 37	Day: 48 Evening: 43 Night: 38	Day: 50 Evening: 45 Night: 40	Day: 53 Evening: 48 Night: 43
▸ Business 5 B5Z ▸ Farming FZ† ▸ Green Wedge GWZ ▸ Green Wedge A GWAZ ▸ Public Use 2,5 PUZ ▸ Rural Activity RAZ ▸ Rural Conservation RCZ ▸ Rural Living RLZ ▸ Urban Growth UGZ‡	Day: 45 Evening: 38 Night: 33	Day: 45 Evening: 40 Night: 35	Day: 46 Evening: 41 Night: 36	Day: 48 Evening: 43 Night: 38	Day: 50 Evening: 45 Night: 40	Day: 52 Evening: 47 Night: 42	Day: 54 Evening: 49 Night: 44
▸ Business 1 B1Z ▸ Business 2 B2Z ▸ Comprehensive Development CDZ‡ ▸ Mixed Use MUZ ▸ Priority Development PDZ‡ ▸ Public Use 1,3,4,6,7 PUZ ▸ Road RDZ ▸ Township TZ	Day: 45 Evening: 40 Night: 35	Day: 47 Evening: 42 Night: 37	Day: 48 Evening: 43 Night: 38	Day: 50 Evening: 45 Night: 40	Day: 52 Evening: 47 Night: 42	Day: 53 Evening: 48 Night: 43	Day: 55 Evening: 50 Night: 45
▸ Industrial 3 IN3Z ▸ Special Use SUZ‡	Day: 46 Evening: 41 Night: 36	Day: 49 Evening: 44 Night: 39	Day: 50 Evening: 45 Night: 40	Day: 52 Evening: 47 Night: 42	Day: 53 Evening: 48 Night: 43	Day: 55 Evening: 50 Night: 45	Day: 56 Evening: 51 Night: 46
▸ Business 3 B3Z ▸ Business 4 B4Z	Day: 48 Evening: 43 Night: 38	Day: 50 Evening: 45 Night: 40	Day: 52 Evening: 47 Night: 42	Day: 54 Evening: 49 Night: 44	Day: 55 Evening: 50 Night: 45	Day: 56 Evening: 51 Night: 46	Day: 57 Evening: 52 Night: 47
▸ Industrial 1 IN1Z ▸ Industrial 2 IN2Z	Day: 50 Evening: 45 Night: 40	Day: 52 Evening: 47 Night: 42	Day: 53 Evening: 48 Night: 43	Day: 55 Evening: 50 Night: 45	Day: 56 Evening: 51 Night: 46	Day: 57 Evening: 52 Night: 47	Day: 58 Evening: 53 Night: 48

† In the Farming Zone, where the noise-emitting subject agricultural activity is 'intensive', then an adjustment of +3 dB should be applied to the determined Zone Levels to reflect amenity expectations of locally intense farming activities. Intensive farming activities are agricultural activities under the planning scheme (Clause 74), including horticulture and timber production, but not:

- 'extensive animal husbandry'
- 'apiculture'
- other 'crop raising'.

‡ For Special Use, Comprehensive Development and Priority Development, see notes in previous page.

Note: The UGZ designation should be used prior to incorporation of the Precinct Structure Plan (PSP) for the zone. When incorporated, the PSP will outline the different land uses planned for the zone. It should be used for determining Zone Levels.

Note: The public-use zones are grouped into two categories and include: Service & Utility (PUZ1), Health & Community (PUZ3), Transport (PUZ4), Local Government (PUZ6), Other Public Use (PUZ7), Education (PUZ 2), Cemetery/Crematorium (PUZ 5).

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