Review of post-construction noise compliance assessment conditions included in various wind farm planning permits in Victoria, Australia

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ABSTRACT

The New Zealand Standard 6808:1998 *Acoustics - The assessment and measurement of sound from wind turbine generators* (the “New Zealand Standard”) is currently used in the State of Victoria (Australia) to assess noise emissions from wind farms. Section 5 of the New Zealand Standard, related to the post-construction compliance assessment, details the methodology to determine compliance with the limits, but does not detail practical measures to undertake the noise monitoring.

In Victoria, the planning permit conditions for a proposed wind farm are determined by an independent panel appointed by the Minister for Planning, when the project's power output exceeds 30MW, or by the local council for smaller projects.

These planning permit conditions usually outline the post-construction compliance assessment requirements and may be more or less stringent for different wind farm projects.

This paper presents a general review of planning permit conditions for a number of approved Victorian wind farms. It highlights various conditions regarding noise compliance assessment of wind farms and discusses their practicability and limitations.

1. INTRODUCTION

This paper presents a general review of planning permit conditions pertaining to post construction noise compliance assessment for a number of approved Victorian wind farms. The practicalities and limitations associated with the method proposed for compliance assessment are examined and discussed.

This paper will attempt to develop a post-construction noise compliance method that could be used for all future wind farm projects in Victoria and beyond.

The sites included in this study are presented in Figure 1.

Figure 1 – Reviewed sites

2. PLANNING PROCESS

In Victoria, the planning permit conditions for a proposed wind farm are determined by an independent panel appointed by the State Minister for Planning, when the project's power output exceeds 30MW, or by the local council for smaller projects.

During the panel hearing, the community, local council and technical experts provide submissions to assist the panel in making its decision. The panel members usually consist of lawyers, planners and engineers. During this process planning permit conditions can be proposed by any submitters and the panel will then decide on the final set of conditions to be included in the planning permit.

An indicative flowchart of the process is presented in Figure 2.

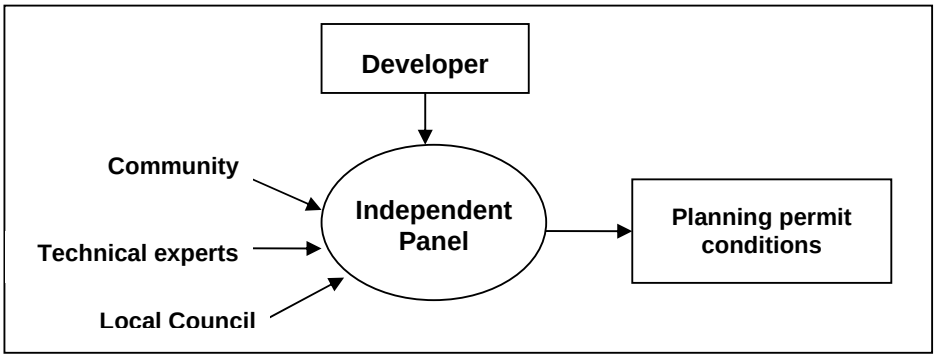

Figure 2 – Planning process indicative flowchart

3. THE NEW ZEALAND STANDARD

The New Zealand Standard 6808:1998 *Acoustics - The assessment and measurement of sound from wind turbine generators* is currently used in the State of Victoria (Australia) to assess noise emissions from wind farms. Section 5 of the New Zealand Standard, related to the post-construction compliance assessment details the methodology to determine compliance with the limits and is presented in Appendix A.

The New Zealand Standard is currently under review; therefore it is possible that a method for post-construction noise compliance monitoring such as that proposed in this paper may be included within the Standard.

4. PLANNING PERMIT CONDITIONS

The conditions of the planning permit relating to the post-construction noise assessment for each of the wind farms included in this study are presented in Appendix B.

A summary of requirements is detailed in Table 1.

Table 1
Summary of requirements

Wind Farm	Compliance with NZ Standard	Post-construction noise monitoring program			
		Required?	Commencement	Duration	Comments
Challicum Hills	Yes	No	n/a	n/a	To the satisfaction of the responsible authority
Wonthaggi	Yes	Yes	Not specified	Not specified	At any existing dwelling at the time of the application To the satisfaction of the responsible authority
Yambuk	Yes	Yes	2 months from the commissioning of the first generator	A minimum of 12 months after the commissioning of the last generator	Monthly results must be forwarded to the Minister for Planning within 30 days of the end of each month
Waubra	Yes	Yes	2 months from the commissioning of the first generator	A minimum of 12 months after the commissioning of the last generator	Report summarising the results of the monitoring program must be forwarded to the Minister for Planning within 45 days of the end of the monitoring period

Table 1 (cont.)
Summary of requirements

Wind Farm	Compliance with NZ Standard	Post-construction noise monitoring program			
		Required?	Commencement	Duration	Comments
Macarthur	Yes	Yes	Initial program: within 2 months of the commissioning of the last turbine (or group of turbines if staged construction) Second program: between 10-12 months of the start of the initial program for the whole site		Monitoring starting date and extent to be agreed between the responsible authority and the facility operator Concurrently monitoring at all dwellings where background noise monitoring was undertaken If compliance was demonstrated by the initial program, a second noise compliance monitoring program is to be undertaken No further noise compliance monitoring program is required if compliance is demonstrated by the second program Further noise compliance monitoring may be required by the responsible authority at any dwelling on the basis of a reasonable belief that the noise limits are exceeded.

In addition to these requirements, most planning permits will ask for a noise management plan which includes methods in which to respond to complaints.

5. DISCUSSION

It can be seen from this selection of planning permits that the conditions relating to post-construction noise assessment may be either very brief or very detailed depending on the project and also go beyond the requirements of the New Zealand Standard. The level of detail and extra requirements are usually related to the level of opposition to the development of the project in order to increase the level of security for the neighbouring residents.

The New Zealand Standard provides a generic methodology to assess post-construction noise compliance, but does not detail practical measures to undertake the noise monitoring. The New Zealand Standard leaves the relevant authority to deal with the following issues:

- The best time to start the noise compliance monitoring program
- The duration of the noise compliance monitoring program
- The wind conditions under which the monitoring should be performed

The following section attempts to identify the fairest and most practical ways to address the issues above by reviewing the planning permit conditions for the Victorian wind farms included in this study.

5.1. Challicum Hills

Owned by Pacific Hydro Limited
Completed in August 2003
35x1.5MW (Total 52.5MW)
68m hub height

The Challicum Hills wind farm is located to the north-west of Melbourne near Ararat. The conditions of the planning permit relating to the post-construction noise assessment are presented in Appendix B1.

The planning permit requires that the operation of the wind farm must comply with the New Zealand Standard to the satisfaction of the relevant authority, but does not provide any guidance on when or how to demonstrate compliance. This condition does not specify that the post-construction noise monitoring should be undertaken at the most appropriate time to allow for worst-case wind conditions.

A post-construction noise monitoring program was undertaken in early 2004 at the four residential properties where pre-construction background noise levels were monitored as required by the New Zealand Standard. Compliance was demonstrated at the Challicum Hills wind farm and, to my knowledge, no complaints regarding noise have been received.

5.2. Wonthaggi

Owned by Wind Power
Commissioned in December 2005
6x2MW (Total 12MW)
65m hub height

The Wonthaggi wind farm is located to the south-east of Melbourne near the township of Wonthaggi. The conditions of the planning permit relating to the post-construction assessment are presented in Appendix B2.

The planning permit requires that the wind farm must comply with the New Zealand Standard to the satisfaction of the responsible authority (the Minister for Planning) at any existing dwelling at the date of the approval of the planning permit. This additional detail provides little guidance on where compliance is to be achieved to protect the wind farm operator from having to comply with the New Zealand Standard noise limits at dwellings which did not exist at the time when the wind farm was designed.

The planning permit also requires that a post-construction noise monitoring program be undertaken in accordance with the New Zealand Standard to the satisfaction of the relevant authority.

A post-construction noise monitoring program was undertaken June 2006 at two of the three residential properties where pre-construction background noise levels were monitored as required by the New Zealand Standard (permission to monitor noise levels was not granted by the owner of the third property). Compliance was demonstrated at the Wonthaggi wind farm and, to my knowledge, no complaints regarding noise have been received apart from entrenched opponents to the project.

5.3. Yambuk

Owned by Pacific Hydro Limited
Completed at the end of 2006
20x1.5MW (Total 30MW)
70m hub height

The Yambuk wind farm is the first stage of the Portland Wind Project located on the coast of south-western Victoria. The Yambuk wind farm is located to the west of Melbourne near Portland. The conditions of the planning permit relating to the post-construction assessment are presented in Appendix B3.

In a similar way to the Wonthaggi wind farm, the planning permit requires that the wind farm must comply with the New Zealand Standard to the satisfaction of the responsible authority (the Minister for Planning) at any dwelling existing or approved at the date of the approval of the planning permit.

The planning permit also requires the following in Condition 17(a):

> *post-construction monitoring must commence two months from the commissioning of the first generator and continue for a minimum of 12 months after the commissioning of the last generator.*

The post-construction noise monitoring must be undertaken in accordance with the New Zealand Standard and results of each calendar month must be forwarded to the Minister of Planning within 30 days of the end of that month.

As part of section 5.1.2, the New Zealand Standard states the following:

> *Once the WTG (or windfarm) is installed and operational, it may be necessary to monitor the sound level in the surrounding area (…)*

Condition 17(a) contradicts the above by requiring the noise monitoring program to start before the whole wind farm is operational.

It is my understanding that this condition was introduced to protect residents' amenity against staged wind farms and to avoid excessive noise emissions during operation of the potential first stages. Monitoring noise levels from within 2 months from the commissioning of the first turbine will not prove compliance or otherwise of the New Zealand Standard noise limits as these measurements will not be representative of the whole wind farm and are likely to be affected by construction noise.

A monthly noise monitoring program over a period of at least 12 months will provide noise emissions from the wind farms under a large number of wind directions and may show non-compliance under certain wind conditions.

The worst case scenario is when the dwelling is located downwind from the wind farm, and it is possible to determine an appropriate period for noise monitoring at each affected dwelling using recorded wind patterns on site. Noise monitoring should be undertaken during a period where the monitored dwelling is located downwind from the wind farm. If compliance is achieved during this worst case scenario, it is very likely that compliance will be achieved at all times.

Complying with such conditions is very expensive and time consuming for the wind farm operator and may not be necessary to demonstrate compliance.

Post-construction noise monitoring is currently being undertaken at Yambuk and, to my knowledge, no complaints related to noise have been received.

5.4. Waubra

Owned by Acciona Energy Oceania
Expected to be operational by mid 2008
128x1.5MW (192MW)
80m hub height

The Waubra wind farm is located to the north west of Melbourne near Ballarat. The conditions of the planning permit relating to the post-construction assessment are presented in Appendix B4.

The conditions set in the planning permit are very similar to those for the Yambuk wind farm. The only difference is that results are to be forwarded to the Minister for Planning within 45 days of the end of the monitoring period.
Similar comments as for the Yambuk conditions can be made for these conditions.

The Waubra wind farm received approval from the Minister of Planning in June 2005 and construction started in November 2006.

5.5. Macarthur

Owned by AGL Energy Limited
Planning approval in October 2006
Proposed 183x1.8MW (330MW)

The Macarthur wind farm is proposed to be located to the west of Melbourne near Portland. The conditions of the planning permit relating to the post-construction assessment are presented in Appendix B5.

Unlike the other reviewed planning permits, Condition 21 allows for a potential staged wind farm and provides a sound methodology to determine compliance or otherwise with the New Zealand Standard noise limits. Furthermore, this condition allows the responsible authority to determine the date at which the post-construction noise monitoring program should start. In this case, it would be reasonable that a period when worst-case wind conditions are likely to be experienced should be selected for each of the dwellings to be monitored.

Condition 21 is presented below:

> *The initial compliance noise monitoring program must commence within 2 months of the commissioning of the last turbine in the wind energy facility or, if the facility is constructed in groups of turbines, separate programs within 2 months of the commissioning of each group. The date at which 'commissioning' has been deemed to occur and the extent of the noise compliance monitoring shall be agreed between the responsible authority and the wind energy facility operator.*

If compliance has been demonstrated during the first period of noise monitoring, Condition 26 of the same planning permit requires for a second period of noise monitoring to be undertaken at approximately the same time of year as the first noise monitoring period.

This condition reads as follows:

> *Should compliance be demonstrated by the program above the compliance noise monitoring program must be repeated commencing not less than 10 months and not greater than 12 months after the commencement of the initial compliance noise monitoring program for the whole site.(…)*

If the second noise monitoring program demonstrates compliance with the New Zealand Standard noise limits, then no further monitoring is required unless requested by the responsible authority at any dwellings on the basis of a reasonable belief that the New Zealand Standard noise limits are being exceeded.

The Macarthur wind farm received approval from the Minister of Planning in October 2006.

6. RECOMMENDATION

After reviewing a selection of planning permit conditions related to post-construction noise assessment, it was found that the level of complexity and detail varied significantly between projects. The New Zealand Standard provides only the methodology for determining compliance and limited details regarding the way the post-construction noise monitoring program is to be undertaken

It is considered that permit conditions requiring measurements to be performed once the first generator is completed will not prove compliance or otherwise of the New Zealand Standard noise limits as these measurements will not be representative of the whole wind farm and are likely to be affected by construction noise.

In addition, guidance regarding the wind conditions required during the measurement period must be provided as well as the duration of the monitoring period.

The following recommendations are proposed and could be included in the New Zealand Standard as part of the revised version:

- Post-construction noise monitoring should be undertaken during a period of worst case wind when the monitored property is located downwind from the nearest turbines

- Compliance should be demonstrated during two periods of noise monitoring separated by at least ten months and no more than twelve months

I propose that the following post-construction noise assessment conditions, based on the Macarthur wind farm conditions, be used as a model for wind farms assessed in accordance with the New Zealand Standard:

> *The operation of the wind energy facility must comply with the New Zealand Standard 'Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators' (NZ 6808:1998) (the 'New Zealand Standard'), in relation to any dwelling existing or approved in the vicinity of the wind energy facility at the approval date of this document.*
>
> *A post-construction noise monitoring and compliance assessment program must be undertaken by the wind energy facility operator. This must be to the satisfaction of the responsible authority with regard to timing, program design, determination of compliance, any necessary remedial action and information dissemination.*

The initial compliance noise monitoring program must commence within 2 months of the commissioning of the last turbine in the wind energy facility or, if the facility is constructed in groups of turbines, separate programs within 2 months of the commissioning of each group. The date at which 'commissioning' has been deemed to occur and the extent of the noise compliance monitoring shall be agreed between the responsible authority and the wind energy facility operator.

After the complete wind energy facility is commissioned, noise monitoring shall be carried out at all dwellings used to measure background sound levels, subject to the approval of their owners. The wind turbines shall be operating in their normal mode.

The design of the program and the evaluation of the acoustic data must be undertaken by an independent expert who has had experience in the analysis, interpretation and presentation of acoustic data from wind turbines, and who is preferably a member of a recognised professional association in that field.

Should compliance be demonstrated by the program above the compliance noise monitoring program must be repeated commencing not less than 10 months and not greater than 12 months after the commencement of the initial compliance noise monitoring program for the whole site. Should the further monitoring program demonstrate compliance with the noise criteria no further noise compliance monitoring shall be required at those locations unless otherwise determined by the responsible authority.

The responsible authority may require noise compliance monitoring at a dwelling or dwellings other than the reference dwellings on the basis of a reasonable belief that noise criteria may not be being complied with.

7. FURTHER WORK

As the New Zealand Standard was primarily written to assess noise from wind farms in New Zealand, a review of planning permit conditions for wind farm projects in New Zealand could lead to adopting the same model of conditions for all wind farms assessed in accordance with the New Zealand Standard. This study could then be undertaken for wind farms throughout other Australian states as they use different noise guidelines.

Acknowledgments

I would like to thank Acciona Energy Oceania, Pacific Hydro and Wind Power for providing copies of the planning permits.

APPENDIX A

SECTION 5 OF NZS6808:1998

5. Post installation sound compliance testing

5.1. Section overview

5.1.1.
This section outlines the precise method for the post installation compliance testing of sound from WTGs in the far field, i.e. at distances where the cyclic variations in sound due to blade rotation are no longer discernible. The procedure is based upon the method outlined in 4.5 with the exception that the WTGs will now be operational. Acceptable limits are outlined in 4.4.2.

5.1.2.
Once the WTG (or windfarm) is installed and operational, it may be necessary to monitor the sound level in the surrounding area. If so, measurements shall be taken of the sound level, and in addition, consideration needs to be given as to whether there are any special audible characteristics of the sound which may justify analysis and possible application of a penalty which must be taken into account when determining acceptability (see 4.4.3).

5.2. Compliance level testing
(NOTE – The procedure outlined below should be followed whether or not background sound levels have been measured.)

5.2.1.
Sound from the WTGs shall, where practical, be measured at the same locations where the background sound levels were determined. The method of measurements shall be consistent with the measurement of background sound levels as described in 4.5 with the exception that the WTG (or complete windfarm) will now be operational.

5.2.2.
Compliance level testing shall take place at the same positions and across a similar range of wind conditions for which background sound level data has been previously collected.

5.2.3.
As with the background sound level measurements, the compliance level testing shall take place at known windspeeds in the range 0m/s to rated windspeed (typically 13m/s-15m/s) measured at an anemometer height consistent with the background level measurements. As a check on sound levels generated at higher windspeeds, it is necessary to obtain measurements at windspeeds in excess of 15m/s. For dual speed WTGs, this shall be above the cut-in speed for the higher generating capacity.

NOTE – WTG sound measurements should be taken over a representative range of windspeeds and directions, each measurement being typically 10 minutes in time duration, as described above for background sound level determination. If typically 1440 data points were collected over the required windspeed range, it would be possible to repeat the regression analysis.

An assessment of any special audible characteristics should be undertaken.

5.3. Special audible characteristics

5.3.1
Sound from a WTG that has special audible characteristics (clearly audible tones, impulses, or modulation of sound levels) is likely to around adverse community response at lower levels than sound without such characteristics. At present, there is no simple objective procedure available to quantify special audible characteristics, and subjective assessment is therefore necessary, supported by objective evidence (e.g. frequency analysis) where appropriate.

5.3.2
When sound has a special audible characteristic, the measured sound level of the source shall have a 5dB penalty applied. This is because the subjective reaction to a sound containing a special audible characteristic is generally found to be similar to a sound 5dB louder, but without the special audible characteristic. A maximum penalty of 5dB shall be applied by adjustment of the measured sound level by arithmetic addition of +5dB.

NOTE – The objective method for determining whether a sound exhibits a tonal character shall be that used in IEC DIS 1400-11 for assessing wind turbine tonal character close to the turbine, i.e. The Joint Nordic Method. The method takes a number of narrow band spectra over a period of 2 minutes and compares the sound level of the tonal frequency to the 'masking sound level' in that of a critical band positioned around the tonal frequency. As the method takes the five highest tonal values within the 2 minute monitored period, it automatically considers those cases where the sound level of the tonal frequency is fluctuating.

5.4 Compliance assessment

To determine conformance with the limits set out in 4.4.2, a comparison shall be made between the best fit regression line of the background sound levels and the regression curve of the operation windfarm corrected for any special audible characteristics. If the background levels were not measured prior to installation (4.5.1), it may be necessary to obtain background sound level measurements for limited periods at critical windspeeds to satisfy 4.4.2 (e.g. if wind turbine or windfarm sound levels exceed 40dBA L_{95}). This may be for a limited range of windspeeds and directions, with the WTG(s) non-operational.

5.5 Further monitoring

When sound levels from WTGs have been established as complying with the criteria for acceptability set down in 4.4.2 of this Standard, nothing in this Standard shall prevent further monitoring at any later date as a further check on compliance. All such follow-up testing shall be carried out in accordance with the procedures set down in this Standard. Such testing may, for example, be conducted at a later date when investigating noise complaints, as provided for under procedures set down in relevant legislation.

APPENDIX B

EXTRACTS OF PLANNING PERMITS

B.1 Challicum Hills

Planning permit No. 1107 by the Ararat Rural City Council
Part of the Ararat Planning Scheme
Dated 8 October 2001

11. The operation of the windfarm must comply with the New Zealand Standard "Acoustics - The assessment and measurement of sound from wind turbine generators" (NZ 6808:1998) (the "New Zealand Standard") to the satisfaction of the responsible authority.

B.2 Wonthaggi

Planning permit No. 0266 by the Minister for Planning
Part of the Bass Coast Planning Scheme

13. The operation of the wind energy facility must comply with the New Zealand Standard 'Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators' (NZ 6808:1998) (the 'New Zealand Standard'), in relation to any dwelling existing at the date of approval of this document to the satisfaction of the Minister for Planning.

Note: As a guide to acceptable limits consistent with the New Zealand Standard, the sound level from the wind energy facility, when measured outdoors within 10 metres of a dwelling at any relevant nominated wind speed, should not exceed the background level (L_{95}) by more than 5dBA or a level of 40dBA L_{95}, whichever is the greater.

14. An independent post-construction noise monitoring program must be undertaken by the proponent to the satisfaction of the Minister for Planning in accordance with the New Zealand standard and in consultation with the Environment Protection Authority.

B.3 Yambuk

Portland Wind Energy Project – Yambuk Wind Energy Facility
Incorporated document as part of the Moyne Planning Scheme
Dated April 2003

13. The operation of the wind energy facility must comply with the New Zealand Standard "Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators" (NZ 6806:1998) the ("New Zealand Standard"), in relation to any dwelling existing or approved (by way of a planning permit or a building permit) at the date of approval of this document, to the satisfaction of the Minister for Planning.

Note: As a guide to acceptable limits consistent with the New Zealand Standard, the sound level from the wind energy facility, when measured outdoors within 10 metres of a dwelling at any relevant nominated wind speed, should not exceed the background level (L_{95}) by more than 5dBA or a level of 40dBA L_{95}, whichever is the greater.

(…)

17. An initial post construction noise monitoring program must be undertaken to the satisfaction of the Minister for Planning as follows:

(a) post-construction monitoring must commence two months from the commissioning of the first generator and continue for a minimum of 12 months after the commissioning of the last generator;

(b) measurement must be undertaken in accordance with the New Zealand Standard;

(c) the results of the monitoring program of each calendar month must be forwarded to the Minister for Planning within 30 days of the end of that month; and

(d) the Minister for Planning must make a copy of the monitoring program from each month available without delay at its office during office hours for any person to inspect free of charge.

B.4 Waubra

Planning permit No. PL-SP/05/0152 by the Minister for Planning
Part of the Ballarat Planning Scheme
Dated 26 May 2005

17. An independent post-construction noise monitoring program must be commissioned by the proponent within 2 months from the commissioning of the first generator and continue for 12 months after the commissioning of the last generator all to the satisfaction of the Minister for Planning. The program must be carried out in accordance with the New Zealand standard as varied by condition 14(a), (b) and (c) above. The permit holder must pay the reasonable costs of the monitoring program.

18. An independent report summarising the results of the monitoring program, and the data collected, and indicating compliance or non compliance with the New Zealand Standard, must be forwarded to the Minister for Planning within 45 days of the end of the monitoring period. The results must be written in plain English and formatted for reading by lay people.

B.5 Macarthur

Planning Permit No. PL-SP/05/0283 by the Minister for Planning
Part of the Moyne Planning Scheme
Dated 26 October 2006

16. *The operation of the wind energy facility must comply with the New Zealand Standard 'Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators' (NZ 6806:1998) (the 'Standard'), in relation to any dwelling existing in the vicinity of the wind energy facility as at 7 February 206. In determining compliance with the Standard, the following shall apply:*

    a) *The sound level from the operating wind energy facility, measured outdoors within 10 metres of a dwelling at any relevant nominated wind speed, shall not exceed the background level (L_{95}) by more than 5dBA or a level of 40dBA $L_{95,}$ whichever is the greater. This 'background sound level' shall be determined by the method specified in NZS 6806:1998. Compliance shall be determined separately for all time data and for night time data. Night time is defined as 10pm to 7am. For sleep protection purposes, a breach of this standard, for 10% of the night, amounts to a breach of the condition.*

    b) *If sound has a special audible characteristic the measured sound level of the source shall have a 5dB penalty applied. The EMP must provide details on how special audible characteristics are to be determined and penalty is to be applied.*

20. *A post-construction noise monitoring and compliance assessment program must be undertaken by the wind energy facility operator. This must be to the satisfaction of the responsible authority with regard to timing, program design, determination of compliance, any necessary remedial action, and information dissemination. The PEMP provides more detailed requirements on this.*

21. *The initial compliance noise monitoring program must commence within 2 months of the commissioning of the last turbine in the wind energy facility or, if the facility is construction in groups of turbines, separate programs within 2 months of the commissioning of each group. The date at which 'commissioning' has been deemed to occur and the extent of the noise compliance monitoring shall be agreed between the responsible authority and the wind energy facility operator.*

22. *After the complete wind energy facility is commissioned the monitoring shall be carried out at all six reference dwellings used to measure background sound levels, subject to the approval of their owners.*

23. *The locations shall be monitored concurrently, and with the wind turbines operating in their normal mode. As far as possible the noise meter calibration and noise monitoring program shall be carried out by organisations accredited with the National Association of Testing Authorities (NATA).*

24. *The design of the program and the evaluation of the acoustic data must be carried by an independent expert who has had experience in the analysis, interpretation and presentation of acoustic data from wind turbines, and who is preferably a member of a recognised professional association in that field.*

25. *Compliance at noise reference locations is determined by comparing the curve of the operation wind farm noise results to which has been arithmetically added the 5dB penalty for any special audible characteristics should such be required, with the noise criterion curves for each site and for each time period. Compliance is demonstrated by the noise curve for the operational wind farm falling below the noise criterion curve at all wind speeds.*

26. *Should compliance be demonstrated by the program above the compliance noise monitoring program must be repeated commencing not less than 10 months and not greater than 12 months after the commencement of the initial compliance noise monitoring program for the whole site. Should that further monitoring program demonstrate compliance with the noise criteria no further noise compliance monitoring shall be required at those locations unless otherwise determined by the responsible authority.*

27. *The responsible authority may require noise compliance monitoring at a dwelling or dwellings other than those reference dwellings of condition 22 above on the basis of a reasonable belief that noise criteria may not be being complied with.*