



Planning &  
Infrastructure

# Draft

## NSW PLANNING GUIDELINES WIND FARMS

A resource for the community, applicants and consent authorities

December 2011



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These Guidelines are provided for general guidance and information only. The Guidelines are made available on the understanding that the NSW Department of Planning and Infrastructure ('Department') is not providing legal advice. The Department has compiled the Guidelines in good faith, exercising all due care and attention.

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It should be noted that the Guidelines may be affected by changes to legislation at any time and / or be subject to revision without notice.

It is recommended that independent advice be sought in respect of the operation of the Guidelines and the statutory requirements applying under the *Environmental Planning and Assessment Act 1979*.

NSW Planning Guidelines: Wind Farms

ISBN 978 1 74263 004 5

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## Executive Summary

Large areas within New South Wales offer the desired conditions to support the development of wind energy. Wind energy is projected to remain the most economical form of large-scale renewable energy over the next decade.

The NSW Government is preparing a Renewable Energy Action Plan to support the achievement of the national target of 20% of renewable energy by 2020. This target has been the primary driver of wind farm development proposals across NSW.

The *NSW Planning Guidelines: Wind Farms* (the guidelines) have been prepared in consultation with the community and energy industry to provide a regulatory framework to guide investment in wind farms across NSW, while minimising and avoiding any potential impacts on local communities.

The purpose of the guidelines is to:

- provide a clear and consistent regulatory framework for the assessment and determination of wind farm proposals across the state
- outline clear processes for community consultation for wind farm developments
- provide guidance on how to measure and assess potential environmental noise impacts from wind farms

These guidelines are predominantly designed to inform wind farm applicants, along with consent authorities and other regulators who consider these applications.

The guidelines are also intended to be a resource for use by communities and stakeholder groups with a strong interest in wind farm proposals.

The guidelines put a strong emphasis on upfront consultation with the local community where wind farm developments are proposed and outline the key assessment requirements that must be met.

The guidelines outline the matters that will be considered in the assessment and determination of wind farm proposals, including:

- landscape and visual amenity
- noise impacts
- economic issues, including potential impacts on property values
- ecological issues, including potential impacts on threatened species
- auditing and compliance provisions
- decommissioning and rehabilitation

The *NSW Planning Guidelines: Wind Farms* have been designed to deliver improved consistency and rigour in the planning assessment process and ensure effective consultation with local communities.

# 1. Planning framework for wind farms in NSW

## 1.1 Where are wind farms permissible?

Electricity generating works (including wind farms) are classified as 'permitted with consent' in Clause 34 of *State Environmental Planning Policy (Infrastructure) 2007* ("Infrastructure SEPP") in the following land use zones (or an equivalent zone in a council's Local Environmental Plan) as follows:

- RU1 Primary Production
- RU2 Rural Landscape
- RU3 Forestry
- RU4 Rural Small Holdings
- IN1 General Industrial
- IN3 Heavy Industrial
- SP1 Special Activities
- SP2 Infrastructure

Wind farms may be 'permitted with consent' in other zones in a council's Local Environmental Plan.

Where a wind farm is permitted with consent, the applicant may lodge a development application (DA) with council. Where wind farms are State significant development (SSD), development applications must be lodged with the Department of Planning and Infrastructure.

## 1.2 Which development assessment process applies?

The development assessment process for a wind farm proposal varies according to the wind farm's capital investment value as outlined below.

Capital Investment Value	Development category	Assessment by	Determination by
less than \$5 million	Local development	Council	Council
\$5-30 million <sup>1</sup>	Regional development	Council	Joint Regional Planning Panel
\$30 million or more (or \$10 million in an environmentally sensitive area) <sup>2</sup>	State significant development	Department of Planning and Infrastructure	Planning Assessment Commission

<sup>1</sup>Under Schedule 4A of the *Environmental Planning and Assessment Act 1979 (NSW)*

<sup>2</sup>Under *State Environmental Planning Policy (State and Regional Development) 2011*

Local development is assessed and determined by the council while regional development is assessed by the council and determined by the relevant Joint Regional Planning Panel. Development applications for wind farms which are SSD are assessed by the department and determined by the independent Planning Assessment Commission.

*Planning Circular PS 11-014 Assessment of State significant development and infrastructure (2011)* contains additional information on SSD. For SSD, consultation requirements are mandated in Director-General's Requirements (DGRs). The minimum public exhibition period for SSD applications is 30 days, with an extended period of consultation during school holidays. For wind farms that are SSD, these guidelines recommend a minimum public exhibition period of 60 days.

Some wind monitoring towers can be installed as 'exempt' development under Clause 39 of the Infrastructure SEPP without needing a planning approval (subject to meeting the specified requirements).

### 1.3 Key matters in the assessment process

Where a proposed wind farm is state significant development, specific assessment requirements are set out in Director General's Requirements which are issued by the department. **Appendix A** provides information to assist applicants with assessing impacts from a wind farm proposal. The assessment must be detailed in the proponent's Environmental Impact Statement.

A summary of some of the key considerations in the assessment of wind farm proposals include the following:

#### **(a) Proximity of turbines to existing residential dwellings**

If a wind farm proposal seeks to place turbines within 2km of existing residences, whether they are proposed hosts of the turbines or non-host residences, an additional upfront assessment requirement applies. A Gateway for an increased level of initial assessment of the proposed development applies if the applicant does not receive written consent from landowners with residences within 2km of proposed turbines.

If a proposal receives written consent to place turbines within a 2km radius of existing residences from all affected landowners, the proposal may proceed to the next stage of the state significant development assessment process.

If written consent from all existing landowners with residences within a 2km radius of proposed turbines is not secured, the proponent must apply for a Site Compatibility Certificate.

The Site Compatibility Certification application should focus on noise and visual amenity issues including:

- predicted levels of noise at any houses within the 2km zone (including low frequency noise)
- photomontages showing specifically how the turbine/s will appear from each non-host residence within 2 km of a proposed turbine
- any studies undertaken in relation to likely impacts on landscape values that may apply to the site (in particular in relation to any areas zones RU2 Rural Landscape zones, or other areas recognised in the relevant local environmental plans as having high scenic values)
- information on the potential for blade glint and shadow flicker.

A flow chart of the Gateway process is provided in **Figure 1**.

The certificate application must be completed by the applicant and submitted to the department. The application will be placed on the department's website with a copy forwarded to the local council and relevant landowners within the 2km zone, with an invitation for comment within 21 days. The department will place all submissions on its website.

Further consultation on the proposal will occur later in the assessment process if the application proceeds beyond this initial Gateway assessment.

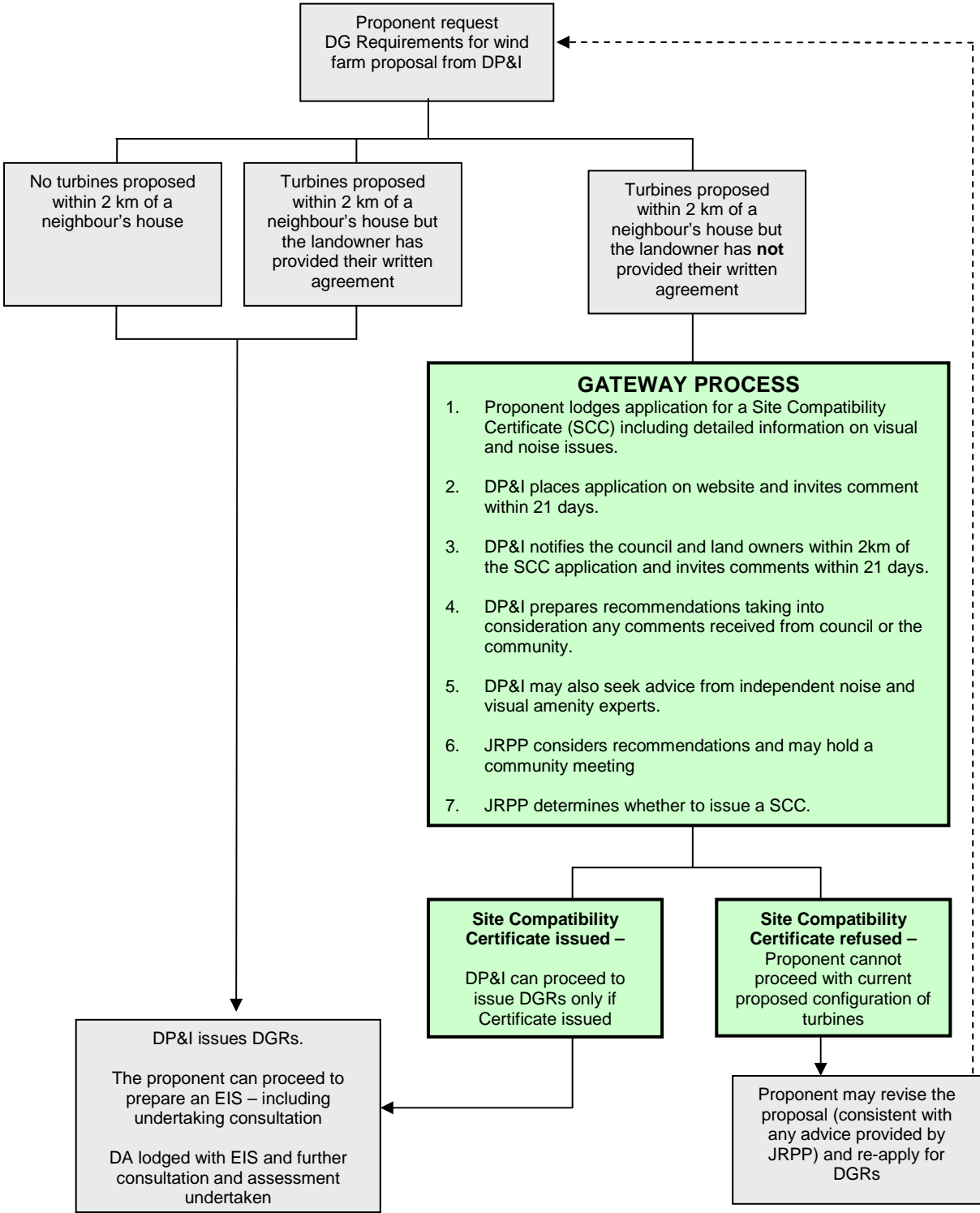
The department will assess the Site Compatibility Certificate application and any submissions received. Having made its assessment, the department will make a recommendation to the relevant Joint Regional Planning Panel (JRPP) responsible for determining the application. The department and the JRPP may also seek advice from independent experts considering the acceptability of noise and visual amenity issues.

In the process of making its determination on the Site Compatibility Certificate, the JRPP may hold a public meeting where there may be further opportunity for public comment on the initial proposal. If a Site Compatibility Certificate is not issued, then the development cannot proceed as proposed with the turbines within 2km of a neighbour's house, unless the land owner issues their written consent.

This approach has been designed to provide for increased consultation with relevant landowners by the applicants before the proposal proceeds through the assessment process.

Providing the Joint Regional Planning Panel with the role of determining the proposal ensures that there is local community representation in decision making in relation to proposed wind farms where turbines are proposed within 2km of existing residences and landowners' consent has not been obtained.

Figure 1 – Proposed Gateway Process for Wind Farm Proposals in NSW



**(b) Community consultation**

The guidelines require that proponents must undertake a comprehensive and genuine community consultation and engagement process. Key requirements include:

- For the department to place any application for a Site Compatibility Certificate on its website and for issues raised to be considered in determining whether to issue the certificate
- For the applicant to form a Community Consultation Committee early in the process to provide for early input in the assessment and, if the development application is approved, to maintain effective communication with the community during the wind farm's construction and operation phases. Detailed guidance on the establishment and operation of the community consultation committee is provided in **Appendix D**.
- For the applicant to demonstrate in the environmental impact statement that effective consultation has occurred prior to lodgement of the application and that issues raised as a result have been addressed in the assessment. Without this being adequately demonstrated, the application will not be accepted.
- For the department to exhibit the development applications for a minimum of 60 days instead of the minimum statutory 30-day period.

**(c) Visual amenity**

These guidelines set out a comprehensive framework for assessing visual amenity impacts with a focus on visual impacts on neighbours close to turbines. The visual impact of a wind farm depends on the extent of change to the landscape caused by the development, taking into account:

- the visibility of the proposed development
- the locations and distances from which the development can be viewed
- landscape values and their significance
- the sensitivity of the landscape features to change

The assessment of wind farm proposals will typically require a comprehensive assessment of the impact of proposed wind farm on the landscape character, landscape values, visual amenity and any scenic or significant vistas to be undertaken. There should be a particular focus on any neighbours' houses within 2km of a proposed wind turbine that do not host the wind farm facility. The assessment should include:

- a description of the assessment methodology and a clear justification of it including discrete justification of the methodology for assessing impacts at neighbours' houses within 2km of a proposed wind turbine
- a description of all relevant components of the project, including turbine heights and layout – where micro-siting or a range of turbines is proposed, the assessment should be based on the 'worst case' layout and turbine height
- a description of the landscape including key features
- a description of the visibility of the development
- photomontages of the project and associated transmission lines taken from:
  - potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights) within 2km of a proposed wind turbine or other associated infrastructure (note that the number of photomontages may be reduced in less sensitive landscapes such as industrial areas),
  - urban settlements, and
  - significant public view points including roads, lookout points and walkways.
- identification of the zone of visual influence of the wind farm (no less than 10km)



- a description of the significance of the landscape values and character in a local and regional context
- a description of community and stakeholder values of the local and regional visual amenity and quality and perceptions of the project based on surveys and consultation.
- assessment of cumulative impacts on the landscape and any cumulative visual impacts from transmission line infrastructure and any surrounding approved or operational wind farms in the locality

If a turbine is proposed within 2km of a neighbour's house, the landowner's consent must be obtained or a Site Compatibility Certificate obtained from the relevant Joint Regional Planning Panel focusing on visual amenity issues. Photomontages depicting how the turbine(s) will appear from each neighbouring house within 2km of a turbine must be provided during the Gateway and in the assessment.

#### (d) Noise

It is recognised by developed countries and all Australian states that wind farms need specific guidelines because wind turbines have unique noise generating characteristics including noise output that varies with wind speed and their location, which is often a quiet rural setting.

Specific *NSW Wind Farm Noise Guidelines* have been developed to provide practical guidance to proponents, planners, regulatory authorities, acousticians and the broader community on how to measure and assess environmental noise impacts from wind farms. The *NSW Wind Farm Noise Guidelines* are included as **Appendix C** to these guidelines.

The Noise Guidelines have been developed to provide greater clarity and rigour regarding the assessment and ongoing regulation of wind farm noise including:

- low frequency noise
- tonality
- excessive amplitude modulation (including the van den Berg effect)
- auditing and compliance issues

In NSW, endeavours are made to retain an acoustic amenity commensurate with the objectives of the surrounding land uses. Excluding areas affected by noise from transport corridors, these noise goals are given in Table 1.

**Table 1: Noise Amenity Goals for Residential Receivers**

Noise Amenity Area	Time of Day	Recommended $L_{eq}$ Noise Level dB(A)	
		Acceptable	Recommended Maximum
Rural	Day	50	55
	Evening	45	50
	Night	40	45
Suburban	Day	55	60
	Evening	45	50
	Night	40	45
Urban	Day	60	65
	Evening	50	55
	Night	45	50

A unique characteristic of wind farms is that the noise level from each wind turbine rises as the wind speed at the site increases. This is typically accompanied by an equal or greater increase in the background noise which may completely or substantially mask the wind turbine noise.

Wind turbines typically start generating electricity at around 4 m/s (14 km/h) and reach maximum or 'rated' capacity at wind speeds of around 11 m/s (40 km/h) at the turbine's hub height.

**For a new wind farm development, the predicted equivalent noise level ( $L_{eq}$ , 10 minute), adjusted for any excessive levels of tonality, amplitude modulation or low frequency, but including all other normal wind farm characteristics, should not exceed 35dB(A) or the background noise ( $L_{90}$ ) by more than 5dB(A), whichever is the greater, at all relevant receivers not associated with the wind farm, for wind speed from cut-in to rated power of the WTG and each integer wind speed in between.**

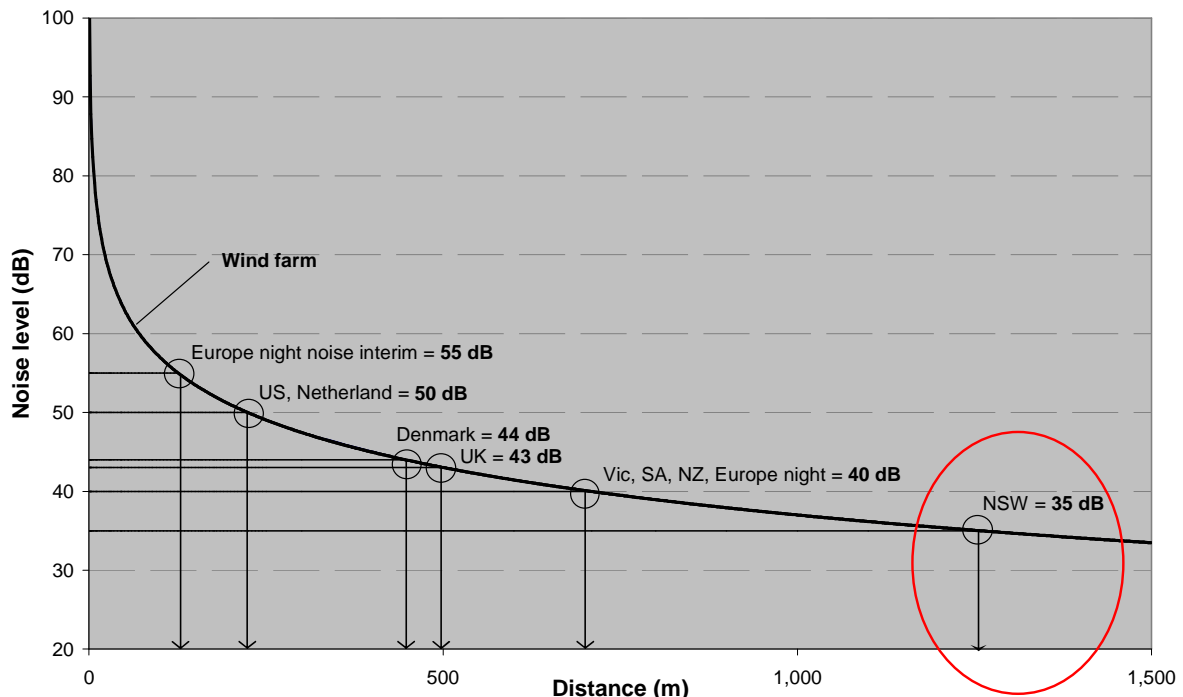
**The noise criteria must be established on the basis of separate daytime (7am to 10pm) and night-time (10pm to 7am) periods.**

The Noise Guidelines also specify stringent noise criteria including for low frequency noise and penalties for certain special audible characteristics, where present, such as tonality.

It is proposed to strengthen the regulation of noise from wind farms under the *Protection of the Environment Operations Act 1997* with the Environment Protection Authority (EPA) having a regulatory role in relation to wind farms that are State Significant Development as well as existing transitional projects.

As shown in **Figure 2**, the criteria established in this document are stringent by both Australian and world standards being approximately 10dB(A) lower than most European countries which have significant experience in the management of wind farm noise. In addition, conservative estimates of where these noise levels may begin to be measured (subject to site specific topography and meteorological conditions) are shown.

**Figure 2 – Comparison of NSW baseline A-weighted noise criteria with other jurisdictions**



**Note 1.** Noise setback distances are indicative only and do not account for site specific conditions which may increase or decrease the noise level. In NSW noise setback distances typically vary between 0.8 – 1.5 km due to project and site-specific factors such as turbine configuration, design, intervening topography and vegetation.

**Note 2.** Both the SA and NZ guidelines also set lower levels for areas of high amenity which attract a criteria of 35 dB(A). The SA guidelines apply 35 dB(A) in land use zones where the focus of the zoning is on "rural living" rather than primary production. In NSW, most wind farm applications have tended to be in areas where the focus of the land use zoning has been on primary production (e.g. RU1 Primary Production) rather than rural living (e.g. R5 Large Lot Residential).

**(e) Health**

The approach to health issues in these guidelines have been developed in consultation with the NSW Ministry of Health. The guidelines adopt a precautionary approach for the consideration of health issues. This includes requiring proponents to explicitly consider health issues as well as comply with stringent operational performance criteria including stringent noise criteria. Applications may also be referred to the Ministry of Health as part of the assessment process.

**(f) Decommissioning**

Once installed, wind turbines typically have an expected operating life of around 20-25 years at which point they are usually decommissioned. Some turbines may be replaced or decommissioned earlier than that period.

**The guidelines require that the proponent/wind farm owner rather than the “host” landowner must retain responsibility for decommissioning.**

Additionally, the guidelines require applicants to include a Decommissioning and Rehabilitation Plan in their environmental assessment report. Where this is deemed to be inadequate, but the Development Application is granted consent, a condition of consent will be imposed requiring the proponent to pay a decommissioning bond.

**(g) Auditing and compliance**

If a proponent's development application is granted consent, conditions will be specified as part of the consent requiring proponents to undertake compliance monitoring and auditing.

A number of requirements will be applied regarding auditing and compliance particularly in relation to noise including:

- Conditions of consent will require the applicant to prepare and submit a Noise Compliance Report within 12 months of the commencement of operation of the wind farm
- Noise monitoring must be undertaken during 'worst case' periods (which would include during any temperature inversions).
- Special audible characteristics such as excessive amplitude modulation (including the van den Berg effect) together with cumulative impacts must also be considered.
- The proponent must make the noise compliance report publicly available.
- Neighbour can write to the Director General of the Department of Planning and Infrastructure to request independent noise monitoring at their house.

As noted, to ensure noise from wind farms is appropriately regulated, it is proposed to amend the POEO Act and/or its regulations so that the EPA has a regulatory role.

## 1.4 Preparing an Environmental Impact Statement

Requirements for Development Applications (DAs) and an accompanying EIS (in the case of State significant development) or Statement of Environmental Effect (SEE) (in the case of local or regional development) are specified in Schedules 1 and 2 of the *Environmental Planning and Assessment Regulation 2000*.

If the development is classed as State significant development (SSD), additional requirements are specified in Director-General's Requirements (DGRs).

**Table 2** summaries key information applicants should generally include in an EIS. More detailed information on what information applicants should include in an EIS is provided in **Appendix E**. Applicants should include sufficient information and documentation in their application to allow all relevant issues to be considered and assessed for all relevant components and phases of the project.

**Table 2 – Key information to include in an Environmental Impact Statement**

<b>1. Executive Summary</b>	
<b>2. The proposal</b>	<ul style="list-style-type: none"> <li>▪ Objectives</li> <li>▪ Description of proposed wind farm – location and dimensions</li> <li>▪ Site layout plans</li> <li>▪ Construction, operation and decommissioning plans and timeframes</li> <li>▪ Onsite cabling and connection to transmission lines</li> </ul>
<b>3. The location</b>	<ul style="list-style-type: none"> <li>▪ Planning context</li> <li>▪ Site description and locality information</li> <li>▪ Overview of the affected environment</li> </ul>
<b>4. Statutory planning context</b>	<ul style="list-style-type: none"> <li>▪ Local (including consistency with a council's Development Control Plan)</li> <li>▪ State</li> <li>▪ Commonwealth</li> </ul>
<b>5. Consultation</b>	<ul style="list-style-type: none"> <li>▪ Consultation undertaken</li> <li>▪ Issues raised</li> <li>▪ Response to issues</li> </ul>
<b>6. Assessment of issues</b>	<ul style="list-style-type: none"> <li>▪ Landscape and visual amenity</li> <li>▪ Social issues including noise, blade glint, shadow flicker, electromagnetic interference, night lighting, electromagnetic fields and potential health issues</li> <li>▪ Ecological issues</li> <li>▪ Economic issues</li> <li>▪ Heritage</li> <li>▪ Hazards and risk</li> <li>▪ Construction</li> <li>▪ Decommissioning and rehabilitation</li> <li>▪ Cumulative impacts</li> </ul>
<b>7. Mitigation and management of issues</b>	<ul style="list-style-type: none"> <li>▪ Mitigation and management               <ul style="list-style-type: none"> <li>▪ Construction stage</li> <li>▪ Operational Stage</li> </ul> </li> <li>▪ Monitoring</li> <li>▪ Consultation</li> <li>▪ Community enhancements</li> </ul>
<b>8. Strategic justification</b>	<ul style="list-style-type: none"> <li>▪ Contribution to government policy objectives</li> <li>▪ Alternatives considered</li> <li>▪ Substation / transmission infrastructure</li> <li>▪ Existing and future land uses</li> <li>▪ Greenhouse issues</li> </ul>

## 2. Consulting with the community and stakeholders

Wind farms are typically highly visible and there is typically a high level of interest from local communities and interest groups.

Communities in areas where wind farms are proposed have a strong and legitimate interest in the planning and assessment process. Early and effective community consultation, demonstrating an ongoing commitment to provide information and ensure opportunities for input is therefore critical. The proponent needs to genuinely understand community concerns and ensure that such concerns are comprehensively and transparently addressed in the design and development of the wind farm proposal.

### 2.1 Requirements

Where a wind farm development application is classed as State significant development (SSD), consultation requirements are specified in Director General's Requirements (DGRs).

#### **(a) Document that effective engagement has occurred**

The proponent must undertake a comprehensive, detailed and genuine community consultation and engagement process. This process must ensure that the community is informed of the proposal, is actively engaged in issues of concern to them, and is given ample opportunity to provide its views on the proposal. Sufficient information must be provided to the community so that it has a good understanding of what is being proposed and of the likely impacts. Consultation needs to be genuine and aimed at identifying and considering options for eliminating or reducing impacts, not merely informing communities.

The proponent's assessment report should include the following information:

- clear documentation, details and evidence of the consultation process undertaken including the stakeholders consulted
- clear identification and tabulation of all issues raised during the consultation process
- a description of how the identified issues including the community's issues have been addressed, and how they have informed the proposal as presented in the assessment report.

The proponent's assessment report will not be accepted until evidence of effective consultation has been presented and it has been demonstrated that the issues raised during consultations have been appropriately addressed.

#### **(b) Engagement with neighbours early in the process**

Proponents are strongly encouraged to consult with neighbours and others likely to be directly affected by the development early in the site selection and preliminary design phases, with a particular focus on any neighbours that have houses within 2 km of a proposed wind turbine. Where a turbine is proposed within 2 km of a neighbour's house, proponents should consult with affected neighbours on specific issues including landscape and visual amenity issues, noise, health, property values, blade glint, and shadow flicker. Proponents should also consult with occupiers in the cases of rented premises.

#### **(c) Community Consultation Committees**

A community consultative committee will be required for all wind farm applications that are State significant development (SSD).

Guidelines on establishing community consultation committees for wind farm projects are provided in **Appendix D**. The Director General's Requirements (DGRs) and the conditions of consent (in the case of approved applications) will typically require such committees to be established and operated during the assessment and operational phase as appropriate consistent with the guidelines. In some cases, proponents may establish committees on a voluntary basis prior to lodging a DA to provide for consultation and community input during the design development and environmental assessment phases earlier in the project lifecycle.

## 2.2 Who to consult

Stakeholders that should be considered as part of the consultation program include:

- land owners of properties proposed for hosting a wind turbine or related facility
- neighbours in the vicinity of the wind farm site, including all neighbours within 2 km of a proposed wind turbine
- neighbours along the transport routes
- organisations that represents those with local or regional interests that are likely to be beneficially and / or adversely affected, e.g.
  - business and tourist organisations including chambers of commerce, NSW Farmers, Minerals Council
  - community organisations (environmental groups, heritage organisations, parent and citizen committees, community service groups)
  - indigenous organisations (local land councils, elders groups)
  - biodiversity or vegetation committees
- organisations that represent those with a state, national or global interest, e.g. peak environment groups and national industry associations
- the relevant local council(s)
- Aerial Agricultural Society of Australia
- relevant State and Federal agencies
- electricity network service providers
- stakeholders with petroleum or mining exploration and mining titles on or near the site.

### (a) Consultation with Local Government

Whether an approving body or not, engaging with the local council is essential at all stages of the wind farm development process. The council can:

- provide proponents with background information on the local area and community
- provide planning advice for management of matters relating to a wind farm development, including necessary permits and approvals
- facilitate the dissemination of project information to the local community (e.g. notification of community participation events)
- identify potential opportunities to maximise community benefits from the project.

In particular, the council's advice should be sought on:

- whether the wind farm proposal is permissible in the land use zone where it is proposed
- the likely compatibility of the wind farm with the existing surrounding land use
- consistency of the wind farm project with the council's strategic planning objectives for the area, including the likely compatibility of the wind farm with planned future land uses including any urban or rural expansion
- any native vegetation and biodiversity issues and any likely constraints
- any likely constraints associated with local airports and airstrips in the area
- any likely local road or bridge transport constraints during the construction phase
- stakeholders that should be consulted, including neighbours, local community groups, schools, industry associations, and Aboriginal groups.

The council should be invited to be represented on any Community Consultation Committee established for the wind farm project including during the assessment phase.

### **(b) Consultation with State Government**

State authorities which may need to be consulted for advice or an approval are summarised as follows:

Issues	State Authority
<ul style="list-style-type: none"> <li>▪ Permissibility, assessment process and requirements</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Planning and Infrastructure</li> </ul>
<ul style="list-style-type: none"> <li>▪ Biodiversity including threatened species,</li> <li>▪ Environmental pollution control including noise</li> <li>▪ Aboriginal cultural and European heritage</li> <li>▪ Heritage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Office of Environment and Heritage (OEH)</li> </ul>
<ul style="list-style-type: none"> <li>▪ Native vegetation / catchment issues</li> </ul>	<ul style="list-style-type: none"> <li>▪ Catchment Management Authorities</li> </ul>
<ul style="list-style-type: none"> <li>▪ Bushfire safety</li> </ul>	<ul style="list-style-type: none"> <li>▪ NSW Rural Fire Service</li> </ul>
<ul style="list-style-type: none"> <li>▪ Agriculture and fisheries issues</li> <li>▪ Crown land</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Primary Industries</li> </ul>
<ul style="list-style-type: none"> <li>▪ Water management and use</li> <li>▪ Mineral and petroleum resources (including titles and leases)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Trade and Investment, Regional Infrastructure and Services</li> </ul>
<ul style="list-style-type: none"> <li>▪ Public roads</li> </ul>	<ul style="list-style-type: none"> <li>▪ Roads and Maritime Services and</li> <li>▪ Relevant council</li> </ul>
<ul style="list-style-type: none"> <li>▪ Mine subsidence areas</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mine Subsidence Board</li> </ul>
<ul style="list-style-type: none"> <li>▪ Health</li> </ul>	<ul style="list-style-type: none"> <li>▪ Department of Health</li> </ul>
<ul style="list-style-type: none"> <li>▪ Work health and safety</li> </ul>	<ul style="list-style-type: none"> <li>▪ WorkCover</li> </ul>
<ul style="list-style-type: none"> <li>▪ Electrical safety and home building</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fair Trading</li> </ul>
<ul style="list-style-type: none"> <li>▪ Electricity network – transmission and distribution</li> </ul>	<ul style="list-style-type: none"> <li>▪ Network operators / supply authorities</li> </ul>

### **(c) Consultation with the Commonwealth Government**

A wind farm proposal may also need approval under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) if it is likely to have a significant impact on matters of national environmental significance, for example, threatened or migratory species listed under the EPBC Act. When an applicant proposes to take an action that they consider may need approval under the EPBC Act, the applicant must refer the proposal to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities. If the Minister determines that an approval is required, the development is considered to be a "controlled action" and must also be assessed and approved under the EPBC Act. The assessment of a wind farm proposal under the EP&A Act (NSW) can be accredited by the Commonwealth on a case-by-case basis under the EPBC Act so that the assessment process under NSW legislation does not need to be duplicated under Commonwealth legislation.

If a wind farm or wind monitoring tower is proposed in the vicinity of an airport or airfield, an approval may be required from the Civil Aviation Safety Authority (CASA) or Air Services Australia. If located near an air force defence facility, an approval may also be required from the Department of Defence. Commonwealth authorities which may need to be consulted for advice or an approval are summarised as follows:

Issues	Commonwealth Authority
<ul style="list-style-type: none"> <li>Matters of “National Environmental Significance” as defined under the EPBC Act</li> </ul>	<ul style="list-style-type: none"> <li>Dept of Sustainability, Environment, Water, Population and Communities</li> </ul>
<ul style="list-style-type: none"> <li>Aircraft safety</li> </ul>	<ul style="list-style-type: none"> <li>Civil Aviation Safety Authority</li> <li>Airservices Australia</li> </ul>
<ul style="list-style-type: none"> <li>Development near Department of Defence sites including Air Force sites</li> </ul>	<ul style="list-style-type: none"> <li>Department of Defence</li> </ul>

## 2.3 Consultation approaches

Consultation methods should be appropriate for the scale and type of development and for the particular stage in the process.

### (a) Consultation tools

Effective consultation typically includes three key aspects:

- inform / tell*: Informing the community
- consult / listen*: Gaining the community's input
- involve / discuss*: Negotiation and issue resolution

Examples of consultation techniques are listed below. The staging and combination of techniques should be tailored for the level of impacts or community concerns and for the particular stage of the environmental assessment process.

Consultation phase	Consultation methods
<b>Tell:</b> <b>Informing the community</b>	<ul style="list-style-type: none"> <li>Website</li> <li>Advertisements</li> <li>Mail-outs / notifications</li> <li>Newsletter / information leaflets</li> </ul>
<b>Listen:</b> <b>Gaining the community's input</b>	<ul style="list-style-type: none"> <li>Telephone hotline</li> <li>Submissions</li> <li>Surveys and research</li> </ul>
<b>Discuss:</b> <b>Negotiation and issue resolution</b>	<ul style="list-style-type: none"> <li>Open days</li> <li>Shopfront / drop-in centre</li> <li>Social media / chat rooms</li> <li>Workshops / roundtable discussions</li> <li>Community consultation committee</li> </ul>

### (b) Community and stakeholder consultation plan

In situations where there is a high level of community interest or concern in a wind farm, a Community and Stakeholder Consultation Plan should be developed. The Plan should clearly outline the community participation requirements / activities for each stage of the project including site selection, feasibility, environmental assessment and planning application, construction, operation and decommissioning. The Plan should usually include the following information:

- the objectives of the stakeholder participation program
- main contact persons and responsibilities for delivery
- a list of relevant stakeholders
- tools / methods used to provide information to stakeholders
- tools / methods which should be used to engage specific stakeholders



- frequency or timeframes for delivery of tools / methods
- avenues for responding to queries (including email, 1800 number, etc)
- how activities, feedback and outcomes should be recorded, used and disseminated.

In certain circumstances, it may be prudent to consult with stakeholders (e.g. via a brief survey and / or discussions with the relevant council) to identify the most effective and appropriate consultation methods and frequency.

In some circumstances, it may also be beneficial to engage professional community consultation experts to assist in this process. However, it is important that key applicant representatives are active participants in the consultation program, both in terms of their ability to resolve issues on behalf of the organisation and for the building of trust, which is important in the ongoing community relationships.

## 3. Meeting assessment requirements

### 3.1 Matters for consideration

Wind farm applications classed as State significant development (SSD) are determined by the Planning Assessment Commission under Section 79C of the *Environmental Planning and Assessment Act 1979* (EP&A Act), which requires consideration of (among other things):

- relevant provisions of environmental planning instruments (including local environmental plans and SEPPs), planning agreements under s93F of the Act and relevant regulation provisions
- likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts of the locality
- suitability of the site for the development
- submissions received on the proposal
- the public interest

The proponent should assess the consistency of the proposed wind farm with any relevant provisions of a council's Development Control Plans (DCP) and any proposed deviations from any such provisions should be fully justified and documented in the proponent's assessment report.

### 3.2 Identifying relevant assessment issues

Where a proposed wind farm is SSD, issues that need to be assessed as well as specific requirements for assessing each issue are specified in DGRs as issued for each project shortly after a DA is lodged. Issues that typically need to be assessed for a wind farm application are outlined below. Technical guidance on assessing each issue is provided in **Appendix A**.

- Landscape and visual amenity
- Social issues
  - noise
  - blade glint
  - shadow flicker
  - electromagnetic interference
  - night lighting
  - electromagnetic fields
  - any other potential health issues
- Ecological issues
- Economic issues
  - mineral resources
  - property values
- Heritage
  - Aboriginal heritage
  - European heritage
- Hazards and risk
  - aircraft safety
  - bushfire hazard
  - blade throw
- Construction
  - structural adequacy
  - traffic and transport
- Decommissioning and rehabilitation
- Cumulative impacts

Generally, the level of assessment that should be undertaken for each issue should be commensurate with the level of impact and / or the level of community concern regarding the issue.

The applicant's assessment of each issue (where relevant) should include:

- a description of the existing environment (baseline conditions)
- a prediction of the potential impacts on the environment
- an analysis of the likely significance of the impacts (including the level of confidence in the predicted outcomes and the resilience of the environment to cope with the impacts),
- the potential for cumulative impacts, and
- the proposed mitigation, management and monitoring program (including the level of confidence that the measures will effectively mitigate or manage the impacts).

### 3.3 Conditions of consent and compliance

If a Development Application for a wind farm is approved, the consent authority will issue conditions of consent covering the construction, operation and decommissioning phases as part of the approval. Key issues covered in the conditions of consent for wind farms classed as State Significant Development include (but are not limited to):

- the duration of the consent
- measures to avoid, manage or mitigate relevant impacts from the wind farm including:
  - landscape and visual amenity issues
  - social issues, including noise, flicker, glint, night lighting, electromagnetic interference
  - ecological issues
  - heritage issues
  - hazards and risk, including aircraft safety and bushfire safety
- complaints management
- compliance tracking, monitoring and reporting including noise monitoring and bird and bat monitoring
- ongoing community engagement.

Examples of conditions of approval for previously approved major wind farm projects in NSW are available on the *Major Project Register* on the Department of Planning & Infrastructure's website ([www.planning.nsw.gov.au](http://www.planning.nsw.gov.au)).

The owner of a wind farm has a legal obligation to comply with all conditions of consent. This legal obligation continues to apply regardless of whether the wind farm changes ownership, e.g. if the applicant that obtained approval sells the project or the financier assumes possession of the project and associated assets.

Additional information on conditions of consent and compliance is provided in **Appendix F**.

### 3.4 Community infrastructure contributions

The consent may require the applicant to provide a contribution, including monetary, land or in-kind contributions, towards community infrastructure under Part 4, Division 6 of the *Environmental Planning & Assessment Act 1979*. As an alternative (or in addition) to development contributions, a proponent may enter into a voluntary planning agreement (VPA) with a planning authority, including the council. VPAs can provide for such matters as:

- the provision of public amenities and services
- the conservation or enhancement of the natural environment
- the provision of transport or other infrastructure relating to the development

Further information on development contributions is contained in the *Development Contributions Practice Note* (2005) on the Department of Planning and Infrastructure's website ([www.planning.nsw.gov.au](http://www.planning.nsw.gov.au)). In addition to the statutory contributions regime set out above, it is open to a proponent to enter into private arrangements with individuals and or community organisations to deliver other kinds of community benefits. However, such arrangements are outside of the statutory planning process and are therefore not relevant to the assessment and determination of any application for approval of a proposed wind farm.

# Technical Appendices

## Appendix A: Meeting assessment requirements

Where a wind farm application is State significant development (SSD), specific assessment requirements are specified in Director General's Requirements (DGRs). This appendix includes information to assist applicants with assessing particular impacts from a wind farm proposal in cases where DGRs require particular impacts to be assessed. The assessment must be detailed in the proponent's EIS.

### Landscape and visual amenity

The visual impact of a wind farm depends on the extent of the change to the landscape caused by the development, taking into account:

- the visibility of the development
- the locations and distances from which the development can be viewed
- landscape values and their significance
- the sensitivity of the landscape features to change

The visual impact of the development relates to:

- the number, height, scale, spacing, colour and surface reflectivity of the wind turbines
- the quantity and characteristics of lighting, including aviation obstacle lighting (subject to CASA requirements and advice)
- potential for visual clutter caused by turbine layout and ability to view through a cluster or array (visually well ordered series) of turbines in an orderly manner
- the removal or planting of vegetation
- the location and scale of other buildings and works including transmission lines and associated access roads
- proximity to sensitive areas
- proximity to an existing or proposed wind farm, having regard to cumulative visual effects.

The features of the landscape include:

- the topography of the land
- the amount and type of vegetation
- natural features such as waterways, cliffs, escarpments, hills, gullies and valleys
- visual boundaries between major landscape types
- the type, pattern, built form, scale and character of development, including roads and walking tracks
- flora and fauna habitat
- cultural heritage sites
- the skyline

### Assessing landscape and visual amenity impacts

DGRs typically require a comprehensive assessment of the impact of a proposed wind farm on the landscape character, landscape values, visual amenity and any scenic or significant vistas to be undertaken. There should be a particular focus on any neighbours' houses within 2 km of a proposed wind turbine that do not host the wind farm facility. The assessment should include:

- a description of the assessment methodology and a clear justification of it including discrete justification of the methodology for assessing impacts at neighbours' houses within 2 km of a proposed wind turbine
- a description of all relevant components of the project, including turbine heights and layout – where micro-siting or a range of turbines is proposed, the assessment should be based on the 'worst case' layout and turbine height
- a description of the landscape including key features

- a description of the visibility of the development
- photomontages of the project and associated transmission lines taken from:
  - potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights) within 2 km of a proposed wind turbine or other associated infrastructure (note that the number of photomontages may be reduced in less sensitive landscapes such as industrial areas),
  - urban settlements, and
  - significant public view points including roads, lookout points and walkways.
- identification of the zone of visual influence of the wind farm (no less than 10km)
- a description of the significance of the landscape values and character in a local and regional context
- a description of community and stakeholder values of the local and regional visual amenity and quality and perceptions of the project based on surveys and consultation.
- assessment of cumulative impacts on the landscape and any cumulative visual impacts from transmission line infrastructure and any surrounding approved or operational wind farms in the locality

### **Mitigating landscape and visual amenity impacts**

The feasibility, effectiveness and reliability of proposed mitigation measures should be assessed. The extent of any residual impacts left over after mitigation measures have been implemented should also be described. Examples of mitigation measure that proponents can use to reduce the visual impact of a proposed wind farm include:

- where possible, locate turbines:
  - away from areas with high scenic values
  - away from areas with high visibility from local residents
- select turbines that :
  - look the same, have the same height and rotate the same way
  - are off-white or grey colouring
- minimise the removal of vegetation
- plant vegetation to provide a visual screen
- reduce impacts of night and obstacle lighting by
  - limiting lighting on towers to that required for safe operation and aviation safety and
  - use of lighting design which minimises glare
- underground electricity wires where practicable
- use alternative transmission line pole designs to minimise visual impact.

### **Social issues**

Social issues include:

- noise (from wind turbines, substation, construction, traffic and vibration)
- blade glint
- shadow flicker
- electromagnetic interference
- night lighting
- electromagnetic fields
- other health issues

### **Noise amenity**

Potential sources of noise from a wind farm include:

- wind turbines
- substation
- construction
- traffic noise
- vibration

An operational wind farm can emit noise due to mechanical noise (produced by the wind turbine generators) and aerodynamic noise (produced by movement of the rotor blades through the air). The level of noise impact depends on the sensitivity of the surrounding land uses, the existing background noise levels, topography, the wind speed and its direction. Noise is also a consideration during construction. The impact of wind turbine noise should be assessed consistent with *NSW wind farm noise guidelines* provided at **Appendix C**.

If agreements with landowners are proposed for areas where noise criteria cannot be met (i.e. associated landowners), sufficient information should be provided on what has been agreed and what criteria have been used to frame any such agreements. This should be undertaken with reference to sleep disturbance criteria in World Health Organisation (2009) *Night noise guidelines for Europe*.

The impacts of other noise sources from a wind farm should be assessed with reference to the following:

- *Substation* – NSW Industrial Noise Policy (EPA 2000)
- *Construction* – Interim Construction Noise Guidelines (DECC, 2009)
- *Traffic noise* – NSW Road Noise Policy (OEH, 2011)
- *Vibration* – Assessing Vibration: A Technical Guideline (DECC, 2006).

### **Blade glint**

The impact of 'blade glint' from wind turbines on neighbours' houses within 2 km of a proposed wind turbine should be assessed. Blade glint refers to the regular reflection of sun off rotating wind turbine blades. Blades should be finished with a low reflectivity surface treatment to ensure that glint is minimised.

### **Shadow flicker**

The impact of 'shadow flicker' from wind turbines on neighbours' houses within 2 km of a proposed wind turbine should be assessed. The shadow flicker experienced at any dwelling should not exceed 30 hours per year as a result of the operation of the wind farm. Specialist modelling software should be used to model shadow flicker impacts prior to the finalisation of the turbine layout.

### **Electromagnetic interference**

The potential for a proposed wind farm to cause electromagnetic interference (EMI) with communication signals and services, such as microwave, television, radar and radio transmission signals, should be assessed. Where communication facilities are located in the vicinity of the wind farm, the applicant should:

- identify any signals and services which may be affected
- assess the potential for the proposed wind farm to impact on the signals and services
- consult with the relevant parties
- outline proposed measures to avoid or mitigate against electromagnetic interference impacts.

Potential electromagnetic interference effects can be calculated from information from affected telecommunications transmitting or receiving stations, local conditions, turbine design and location. The potential for electromagnetic interference from a proposed wind farm should be minimised, if not eliminated, through appropriate turbine design, siting and mitigation. A design measure to reduce EMI is to minimising the use of turbines with metal blades or those with metallic cores. A siting measure is to avoid siting turbines in the 'line of sight' between transmitters and receivers.

If a Development Application is approved, detailed conditions of consent will be specified that aim to protect landowners in the area against electromagnetic interference and ensure that any impacts are rectified at the proponent's cost.



## Night lighting

Where night lighting is proposed, its visual impact should be assessed. Photomontages should be provided showing representative views of any turbine night lighting. Night lighting should be limited to that required for aviation safety. The lighting should be designed to minimise impacts on the ground and at dwellings while providing for appropriate aviation safety. Glare from night / obstacle lighting can be mitigated through measures such as:

- reducing the number of wind turbines with lights to that required for aviation safety.
- using obstacle lighting that minimises light intensity at ground level,
- mitigating light glare from obstacle light through measures such as baffling.

## Electromagnetic fields

The assessment should consider the potential for the proposed wind farm and associated transmission line network to generate electro magnetic fields (EMFs).

Wherever electrical equipment operates, electric and magnetic fields (EMFs) are created in the surrounding environment. The main sources of EMFs typically associated with a proposed wind farm is the electrical equipment within the turbine structures, the substation and the interconnecting underground and overhead wiring. The fields associated with these are typically localised.

Despite extensive research and numerous public inquiries, adverse health effects have not been established, but the possibility has not been ruled out. A prudent approach should be applied in designing and siting wind farm facilities. All equipment should be constructed according to industry accepted practices. Provided this occurs, the EMFs associated with the proposed wind farm will typically be well within the relevant health standards (including ARPANSA standards) and, in many cases, will be localised to areas not often frequented by people.

## Health issues

The potential for the proposed wind farm to impact on human health should be considered, focusing on neighbours' houses within 2 km of any proposed wind turbine. This may be undertaken with reference to the following:

- up to date evidence-based research
- statements from relevant health bodies, such as the National Health and Medical Research Council's (2010) *Public Statement: Wind Turbines and Health*.
- the predicted level of impact from the wind farms including impacts from noise, shadow flicker, blade glint, night lighting, electric and magnetic fields
- consultation undertaken regarding health issues and concerns

The Department of Planning and Infrastructure may refer applications to the NSW Department of Health (NSW Health) as part of the assessment.

## Ecological issues

The assessment should include an ecological assessment considering terrestrial and aquatic (where relevant) ecosystems, including consistent with DEC (2005) *Guidelines for Threatened Species Assessment* (in the case of wind farm proposals classed as State significant development). The assessment should:

- Map existing vegetation by vegetation / community type - include details on existing site conditions, including whether the vegetation comprises a highly modified or cleared landscape and the types and quality of habitat resources available. The mapping should also identify any environmentally sensitive areas identified by the relevant local council maps/studies. Provide details of the survey methodologies including the methods and representativeness for each species targeted and clear justification for species that were discounted from requiring field surveys or further assessment.
- Identify threatened species, populations and ecological communities listed under both State and Commonwealth legislation that have the potential to occur on site.

- Outline the design approach for impact avoidance on ecological values, and in particular, ecological values of high significance. Provide a 'worst case' estimate of vegetation to be cleared (in hectares), including quantifying impacts (in hectares) by vegetation type and threatened species habitat (as relevant).
- Address the risk of weed spread and identify mitigation measures.
- Assess the significance of impacts to native vegetation, listed threatened species, populations and communities and their habitats with consideration to local and region-based ecological implications, including edge effects, habitat connectivity and distribution of species including:
  - Potential impacts on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines
  - Potential impacts on vegetation including any in-stream and riparian ecology from works close to waterways and crossings.
  - Potential cumulative impacts from the clearing or changes to a bird or bat migratory corridor. This is particularly an issue if there are other wind farms in the area.
- Demonstrate how the project applies an 'avoid, minimise and mitigate' hierarchy in respect of any impacts on biodiversity. Include details of how flora and fauna impacts are proposed to be managed during construction and operation including adaptive management, rehabilitation / regeneration measures and maintenance protocols.
- Where impacts cannot feasibly be avoided or mitigated, the project may offset the residual loss of habitat/vegetation. Where such offsets are proposed, sufficient information must be provided to demonstrate that viable and achievable options to offset biodiversity impacts are available and that measures are in place to secure these offsets in perpetuity.

### **Consideration of threatened species issues**

Threatened species issues must be considered consistent with Section 5A of the EP&A Act.

### **Commonwealth approvals**

Separate approval for impacts on flora and fauna may be required from the Commonwealth under the EPBC Act. It may be possible for the assessment undertaken under the EP&A Act to be accredited under the EPBC Act.

## **Economic issues**

### **Mineral resources**

The potential for the proposed wind farm to impact on mining / petroleum leases and exploration licenses should be considered. The applicant should consult with the Minerals and Petroleum Division of the NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) and any mineral resources (including mining leases or exploration licenses) affecting the site should be identified. The DTIRIS website (see [www.dtiris.nsw.gov.au](http://www.dtiris.nsw.gov.au)) includes a searchable map showing the areas affected by licenses or leases. If a site is affected by a license or lease, the applicant should consult with the relevant lease / license holder.

### **Property values**

The potential for a proposed wind farm to impact on the value of surrounding properties that do not host the wind farm facility, including properties within 2 km of a proposed wind turbine should be considered. Relevant considerations may include (but are not limited to):

- the types of development that are permitted in the land use zone(s) in which the wind farm is proposed
- whether the wind farm is consistent with the local and regional strategic land use planning context for the area including whether the area has been identified for future subdivision
- relevant studies and credible research on wind farms and property values
- whether other impacts such as noise and visual impacts are considered to be within acceptable limits

## Heritage

### Aboriginal heritage issues

The assessment should:

- provide sufficient information to demonstrate the likely impacts of the wind farm on Aboriginal heritage values / items (archaeological and cultural) and
- outline proposed mitigation measures (including consideration of the effectiveness and reliability of the measures) in accordance with the DEC (2005) '*Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*' (in the case of a proposed wind farm that is State Significant Development).

The assessment must be undertaken by suitably qualified heritage consultants and demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures).

The construction program must include a protocol to appropriately respond, where during the course of construction, a previously unidentified Aboriginal object(s) is uncovered. The protocol must provide for all work likely to affect the object(s) to cease and for the OEH officers to be informed. In addition, registered Aboriginal stakeholders should be informed of the finds. Works should not recommence until an appropriate strategy for managing the objects has been determined in consultation with OEH and the Aboriginal stakeholders and a permit or written authorisation has been obtained from OEH.

### Other heritage issues

The assessment should:

- provide sufficient information to demonstrate the likely impacts of the wind farm on any historic heritage values (including heritage vistas)
- where likely impacts to State or local historic heritage items are likely, outline proposed mitigation and management measures (including consideration of the effectiveness and reliability of the measures) generally consistent with the 'NSW Heritage Manual'.
- provide a statement of heritage significance where impacts to State or local historic heritage items are proposed.

The construction program must include a protocol to appropriately respond, where during the course of construction, a previously unidentified historic relic is uncovered. All works likely to affect the relic should cease and the OEH notified in accordance with the Heritage Act. Works should not recommence until authorisation has been given by the Heritage Office in OEH.

## Hazards and risk

### Aviation safety

The potential for the proposed wind farm to impact on aviation safety should be assessed. This includes aviation safety issues associated with the wind turbines, transmission lines, nearby airports, air defence facilities and private landing strips and activities such as aerial agricultural spraying / crop dusting.

Aerodromes or airfields within 30km of the proposed wind farm should be identified, e.g. using aerial photographs and through consultation and discussions with relevant councils, local communities and the Civil Aviation Safety Authority (CASA).

The proponent should consult with CASA and Air Services Australia where a wind farm is proposed within 30 kilometres of a declared aerodrome or airfield or the wind farm infringes the obstacle limitation surface around any declared aerodrome. CASA may require appropriate safeguards such as aviation safety hazard lighting or changes to turbine locations. The need for aviation hazard lighting should be considered taking into account any nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, communication systems, and navigation aids.

Applicants should also consult with the Department of Defence if the wind farm is proposed in the vicinity of air force facilities.

Where the location of the turbines is likely to prevent or restrict aerial agricultural spraying, the impacts should be considered and an offset regime developed with the affected land owners taking into consideration any cost difference between the current aerial agricultural spraying and a reasonable alternative. This may include alternative application methods or continued aerial spraying but with additional costs associated with added flight times because of the presence of the turbines.

### **Bushfire hazard**

Bushfire hazards and risks should be assessed. Relevant issues include:

- the risk that a bushfire will damage a wind turbine if the wind farm is located in or near a bushfire prone area
- the risk that the construction and / or operation of the wind farm will create a fire that could spread to nearby areas
- the potential for the wind farm to impact on aerial fighting of bushfires
- fire safety for workers and visitors during the construction and operation phase, ensuring there is appropriate fire fighting equipment and water supplies on site to respond to a bush fire.

Proponents should consult with the NSW Rural Fire Service. The assessment should demonstrate that the proposed wind farm will be designed, constructed and operated to minimise ignition risks, provide for asset protection consistent with relevant RFS design guidelines including *Planning for Bushfire Protection 2005* and *Standards for Asset Protection* and provide for necessary emergency management. The assessment should demonstrate how a turbine fire would be managed so as prevent fire spreading to surrounding areas, such as through providing an outline emergency response plan.

### **Blade throw**

The risk of 'blade throw' – involving a wind turbine's blades breaking or being ejected during operation – should be considered. Relevant considerations may include (but are not limited to):

- whether the proposed turbines are certified against relevant standards such as *IEC 61400-23 Wind turbine generator systems – Part 23: Full-scale structural testing of rotor blades* or other equivalent standards - evidence of any such certification should be provided
- overspeed protection mechanisms including 'fail safe' mechanisms (e.g. back up (battery) power in the event of a power failure)
- operational management and maintenance procedures including any regular maintenance inspections
- provisions for blade replacement in the event a blade fault is identified (e.g. during a periodic inspection)
- the separation distance between turbines, neighbouring dwellings and property boundaries
- the probability of blade throw occurring

## **Construction**

### **Traffic and transport**

The assessment should consider construction and operational traffic impacts, including:

- details of traffic volumes (both light and heavy vehicles) and proposed transport routes (including site access) during construction and operation
- an assessment of the potential traffic impacts of the project on road network function (including intersection level of service) and safety
- an assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project (including over-dimensional traffic) during construction and operation, including full details of any required upgrades to roads, bridges, site access provisions or other road features
- details of measures to mitigate and / or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes
- details of access roads within the site including how these would connect to the existing road network and ongoing operational maintenance.

If a Development Application for a wind farm that is State Significant Development is approved, conditions of consent typically include detailed specifications requiring proponents to commission a road dilapidation survey and submit it to the Director-General prior to the commencement of construction. Conditions may require the survey to:

- assess the condition of all public roads proposed to be traversed by construction traffic associated with the project in consultation with Council and the RTA,
- identify any upgrade requirements to accommodate project traffic, and
- clearly outline any recommendations from the Council and RTA and how these have been addressed.

All upgrade measures identified must be implemented to the satisfaction of Council and the RTA prior to the commencement of construction.

### **Structural adequacy**

The applicant's assessment should demonstrate that the proposed wind farm will be capable of meeting structural adequacy / design requirements in the Building Code of Australia (BCA) (where relevant), wind turbine manufacturers' specifications and other relevant standards for the construction of wind turbines such as structural design requirements in *IEC 61400-1 Wind turbines – Part 1: Design Requirements* or equivalent.

### **Construction Environmental Management Plan (EMP)**

Applicants should provide an outline Environmental Management Plan (EMP) identifying how the site will be managed through construction and future operational and maintenance specifications.

### **Decommissioning and rehabilitation**

Once installed, wind turbines typically have an expected operating life of around 20-25 years at which point they are usually decommissioned. The applicant should include an outline Decommissioning and Rehabilitation Plan in their assessment report setting out:

- Consultation undertaken with the landowner regarding decommissioning and rehabilitation issues including the amount of consultation and issues covered
- The expected operational life of the wind farm.
- The proposed approach to dismantle individual non-operational turbines or the whole farm and associated infrastructure except where the local electricity network operator or the land owner agrees they should be retained. This includes:
  - turbines and associated slab in the ground
  - any manager's residence, viewing facilities, maintenance shed or other facilities
  - site transmission cabling and control room
  - any associated electricity substation, switchyard, over head transmission line connected to the grid
  - any access roads.
- The proposed approach to transport the dismantled turbines and associated facilities from the site, including any temporary storage facilities.
- The proposed resource recovery / recycle / reuse strategy to minimise disposal of material in accordance with the EPA *Guidelines Assessment, Classification and Management of Liquid and Non-Liquid Wastes*. The method for disposing or recycling of the wind turbine's blades should be addressed.
- How the site will be restored and rehabilitated. This should be developed with the agreement of the landowner.
- The estimated cost of dismantling and proposed funding arrangements for that cost to be met. The estimated cost of dismantling should be based on recent actual examples of decommissioning costs, either locally or in comparable situations overseas, as well as estimates from independent, credible and reputable service providers regarding decommissioning costs. These estimates should be included as an attachment to the Decommissioning and Rehabilitation Plan. If the turbines' scrap metal value is proposed to fund decommissioning, estimates should also be obtained from independent, credible and reputable service providers regarding the likely scrap metal value at the time of decommissioning. The level of confidence in the estimates

should also be assessed and measures to deal with uncertainty and risk identified. Where the proponent's cost estimate and funding plan is deemed to be inadequate, a condition of consent may be imposed requiring the proponent to pay a decommissioning bond in the event the Development Application is approved.

- The timeframe to undertake the decommissioning and rehabilitation works.
- The consultation and notification procedures including informing the council and neighbours when decommissioning works are to be undertaken
- Identification of responsibility for decommissioning. The decommissioning of individual turbines or the whole farm is the responsibility of the owner of the wind farm and not the landowner as part of the lease agreement. The applicant/wind farm owner must provide evidence to demonstrate this.

If a DA for a wind farm classed as State significant development is approved, decommissioning requirements will be included in the Conditions of Consent issued by the consent authority. Conditions of Consent will generally require that:

- The wind farm owner is responsible for decommissioning (not the landowner) and that the applicant/wind farm owner must provide evidence to demonstrate this prior to construction commencement.
- The Decommissioning and Rehabilitation Plan must be updated every 5 years and made public on the applicant's website as well as providing a copy to the relevant consent authority.
- The turbines and associated facilities must be decommissioned within 18 months of cessation of the operation of the project.
- Any individual turbine that ceases operating for more than 12 months must be dismantled within 18 months
- The wind farm owner must keep independently verified annual records of each wind turbine electricity generation production. Copies of these records should be made available to the consent authority on request.

## Cumulative impacts

Potential cumulative impacts should be assessed. Cumulative impacts may occur where other existing or future activities have impacts similar to the development proposed. It includes wind farms, but is not limited to wind farms, and could include other types of development. The area that needs to be considered will vary depending on the issue, and the spatial extent of the associated impact.

Cumulative impacts that should be considered where relevant include (but are not limited to)

- landscape values issues,
- noise issues
- ecological issues, including birds and bats
- aviation safety
- electromagnetic interference

Proposed mitigation and management measures (and their likely effectiveness) should be described.

## Appendix B: NSW wind farm noise guidelines

### Introduction

The objective of this document is to provide practical guidance to proponents, planners, regulatory authorities, acousticians and the broader community on how to measure and assess environmental noise impacts from wind farms. It is recognised by developed countries and all Australian states that wind farms need specific guidelines because wind turbines have unique noise generating characteristics including noise output that varies with wind speed and their location, which is often a quiet rural setting.

In developing this guideline, consideration has been given to guidelines developed for overseas jurisdictions as well as those used regularly in Australia including the New Zealand and South Australian guidelines. In particular this document closely follows methodologies and practices presented in the 2009 South Australian document *Wind farms - environmental noise guidelines* and Australian Standard AS4959 – 2010 *Acoustics – Measurement, prediction and assessment of noise from wind turbine generators*. This document also draws on experience gained in the assessment and operation of wind farms in NSW and from community input.

### Applicability of guideline

It is proposed to strengthen the regulation of noise from wind farms under the *Protection of the Environment Operations Act 1997* with the Environment Protection Authority (EPA) having a regulatory role in relation to wind farms that are State Significant Development as well as existing major projects.

The standards in the guideline are intended to be used in the assessment and approval of the operational noise associated with wind farms applications under the EP&A Act. Ancillary operations such as sub stations are most appropriately assessed in accordance with the NSW Industrial Noise Policy. Assessment of construction noise from infrastructure developments such as wind farms should be undertaken in accordance with the NSW Interim Construction Noise Guideline.

Criteria in this guideline have been developed with the fundamental characteristics of wind turbine noise taken into consideration and have been established for sensitive receivers such as residences located in quiet rural noise environments. Goals for other less sensitive receivers should be developed on a case by case basis. This guideline is not intended to apply to small wind turbines, but aspects of the guideline may be adapted as appropriate.

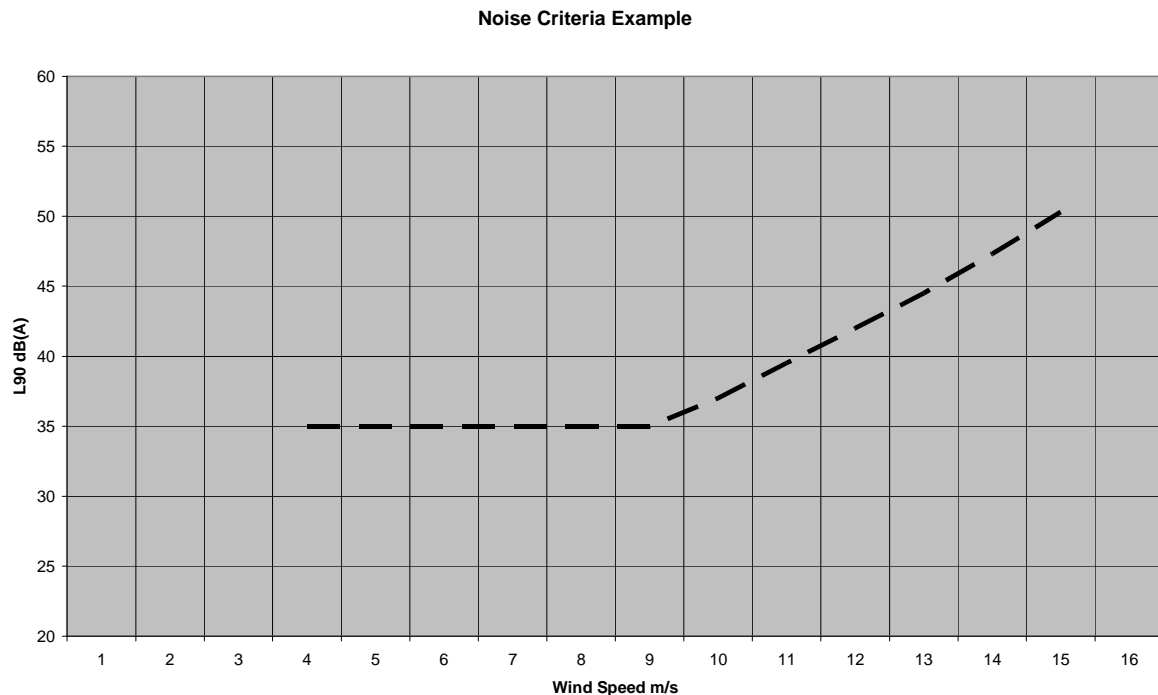
### Noise criteria

A unique characteristic of wind farms is that the noise level from each wind turbine rises as the wind speed at the site increases. This is typically accompanied by an equal or greater increase in the background noise which may completely or substantially mask the wind turbine noise.

Wind turbines typically start generating electricity at around 4 m/s (14 km/h) and reach maximum or 'rated' capacity at wind speeds of around 11 m/s (40 km/h) at the turbine's hub height. For a new wind farm development the predicted equivalent noise level ( $L_{eq}$ , 10 minute), adjusted for any excessive levels of tonality, amplitude modulation or low frequency, but including all other normal wind farm characteristics, should not exceed:

35dB(A) or the background noise ( $L_{90}$ ) by more than 5dB(A), whichever is the greater, at all relevant receivers not associated with the wind farm, for wind speed from cut-in to rated power of the WTG and each integer wind speed in between. The noise criteria must be established on the basis of separate daytime (7am to 10pm) and night-time (10pm to 7am) periods. As shown in a typical example of a noise criteria curve presented in **Figure 1** the criteria increases with wind speed as the background noise floor increases with wind speed.

**Figure 1 – Typical noise criteria curve**



**Wind farm noise criteria relative to NSW Amenity Noise Goals**

In NSW, endeavours are made to retain an acoustic amenity commensurate with the objectives of the surrounding land uses. Excluding areas affected by noise from transport corridors, these noise goals are given in Table 1.

**Table 1: Noise Amenity Goals for Residential Receivers**

Noise Amenity Area	Time of Day	Recommended L <sub>eq</sub> Noise Level dB(A)	
		Acceptable	Recommended Maximum
Rural	Day	50	55
	Evening	45	50
	Night	40	45
Suburban	Day	55	60
	Evening	45	50
	Night	40	45
Urban	Day	60	65
	Evening	50	55
	Night	45	50

To ensure that the amenity of an area is not compromised, criteria have been set to restrict noise generated by wind turbines to 5dB(A) below the lowest acceptable noise criteria for a suburban or rural amenity area (which is 40dB(A) at night) unless the area experiences background noise levels higher than the average 30dB(A)<sup>1</sup> in which case the noise criteria can be up to 5dB(A) above the L<sub>90</sub> background noise level. These criteria apply to all periods of the day regardless of whether the acceptable amenity is higher during the day or night.

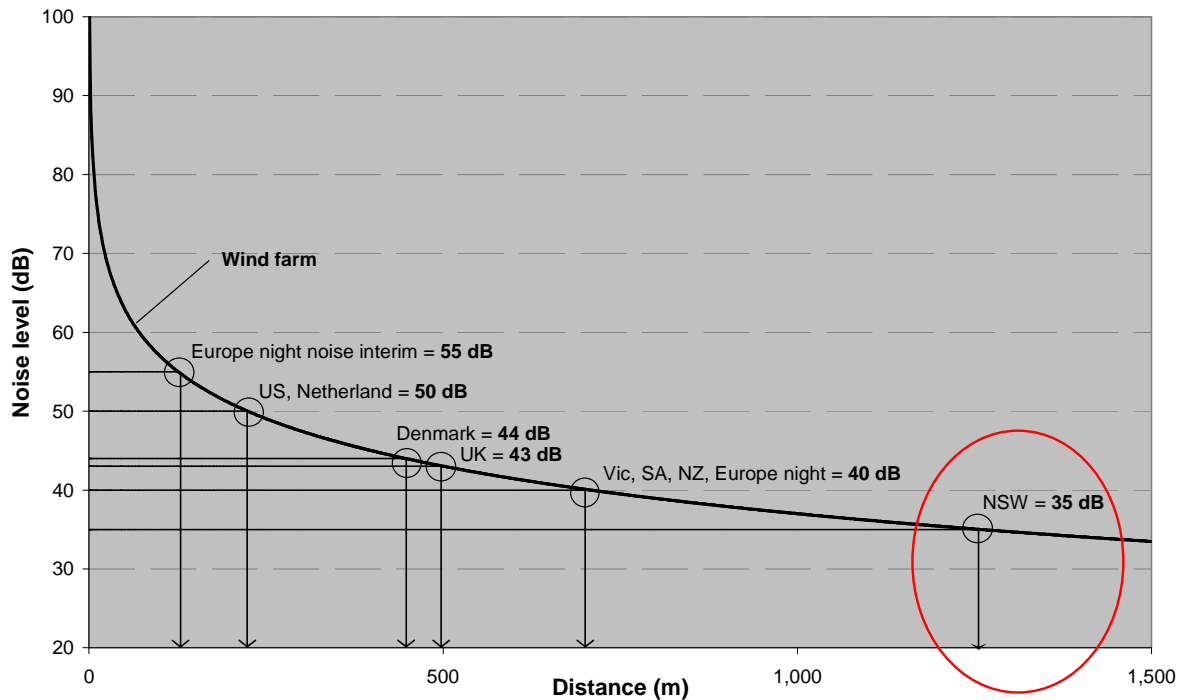
<sup>1</sup> Average background level for an area with negligible transportation noise set by AS 1055.2.Acoustics – Description and measurement of environmental noise



## Wind farm criteria adopted in other states and internationally

As shown in **Figure 2**, the criteria established in this document are stringent by both Australian and world standards being approximately 10dB(A) lower than most European countries which have significant experience in the management of wind farm noise. In addition, conservative estimates of where these noise levels may begin to be measured (subject to site specific topography and meteorological conditions) are shown.

**Figure 2 – Comparison of NSW baseline A-weighted noise criteria with other jurisdictions**



**Note 1.** Noise setback distances are indicative only and do not account for site specific conditions which may increase or decrease the noise level. In NSW noise setback distances typically vary between 0.8 – 1.5 km due to project and site-specific factors such as turbine configuration, design, intervening topography and vegetation.

**Note 2.** Both the SA and NZ guidelines also set lower levels for areas of high amenity which attract a criteria of 35 dB(A). The SA guidelines apply 35 dB(A) in land use zones where the focus of the zoning is on “rural living” rather than primary production. In NSW, most wind farm applications have tended to be in areas where the focus of the land use zoning has been on primary production (e.g. RU1 Primary Production) rather than rural living (e.g. R5 Large Lot Residential).

## Negotiated agreements

Wind farm proponents commonly negotiate agreements with the owners of private land suitable for hosting wind turbines. Such agreements provide the wind farm proponent with the appropriate siting while offering the landowner a level of compensation and diversity in their income stream.

Criteria in this guideline have been developed to minimise the impact on the amenity of neighbouring properties that do not have an agreement with wind farm proponent (typically referred to as non-host or non-associated landowners).

## Staged development and cumulative impacts

The procedure and criteria presented in these guidelines are for greenfield sites where no wind turbines have been installed. It is recognised that a single wind farm may be developed over a number of stages and / or that there may be a subsequent separate wind farm developed in close proximity.

To avoid any ‘background creep’ of the  $L_{90}$  noise level that may occur as a result of previous wind farm developments influencing the noise catchment, any existing wind turbine noise shall be excluded from the calculation of background noise levels. All combined (cumulative and staged) wind farm noise should meet the criteria set in these guidelines.

## Undertaking measurements

The overall objective of the measurement process is to collect:

- baseline data that will assist in setting criteria;
- background noise data at intermediate locations that may ultimately assist in demonstrating compliance (these may be non-associated receivers); and
- compliance data that can be compared against criteria and previous noise measurements.

There are two important noise indices to be measured as part of establishing existing and future noise levels.

1. The measurement of background noise as defined by the 90 per cent exceeded noise level ( $L_{90}$ ) which should be measured both in the absence of any wind farm noise prior to construction and again for compliance in the presence of the operational wind farm. This allows for the assessment of impacts on the background noise levels and assists with determination of the  $L_{eq}$ .
2. The equivalent noise level ( $L_{eq}$ ) of wind farm noise, which is mainly used for demonstrating compliance, can also be used as a screening tool to exclude data contaminated with extraneous noise due to strong relationships with the  $L_{90}$ . To improve the collection of uncontaminated data, the criteria set in this guideline include an allowance for inter-changeability of  $L_{90}$  based on a relationship for wind turbine noise proposed in AS 4959 of  $L_{eq} = L_{90} + 1.5\text{dB(A)}$  when measured at receiver locations. It is therefore appropriate to collect both  $L_{90}$  and  $L_{eq}$  information at the same time. Additionally, detailed spectral data may also be collected to examine certain noise characteristics of the wind farm.

## Measurement locations

Noise measurements should be carried out at locations that are relevant for assessing the 'worst case' impact of wind turbine noise on relevant receivers and at any intermediate locations being used to provide supplementary data. In general, any outdoor area within 30 metres of a sensitive non-associated receiver (such as a primary residence) and in the direction of the wind farm would be a valid measuring position.

Care should be taken to ensure that selected measurement locations are not shielded from the wind farm and will be suitable as a location for any future repeat monitoring (such as during compliance). Where tall trees are present which may compromise the collection of valid noise data, then it may be justified to undertake measurements at an upwind location (the wind farm side of the trees) provided that a similar offset to the trees is adopted. The microphone should be positioned 1.2–1.5 metres above the ground and at least 5 metres from any reflecting surface (other than the ground) and remote from any significant extraneous noise sources. Site information should be recorded and the area photographed.

## Wind Monitoring Location

The same location should be used for measuring wind speed and direction for the following procedures:

- background noise measurements;
- noise predictions;
- compliance checking.

Wind speed measurement locations at the wind farm site should be representative of the wind speed at all proposed wind turbines in the noise catchment of the receiver under investigation. Careful consideration should be given to the long term suitability of these locations to ensure that any future wind turbine towers do not cause undue wind turbulence. If during compliance / complaints investigation it is not possible to obtain measurements at the same location as was used for the background noise monitoring, wind speed measurements may be measured at a nearby wind turbine site provided it is demonstrated it will return similar wind data.

## Supplementary noise measurement locations

During typical operating conditions wind farm noise may be completely or substantially masked by wind or other extraneous noises. Measurement of actual wind farm noise in these conditions is often difficult and in some cases not possible. To improve the ability to undertake compliance measurements alternative techniques may be employed.

Such alternate methods will need to be assessed individually and on their merits. Methods may include the use of supplementary intermediate locations between the wind farm and the relevant receiver where the signal to noise ratio is much higher, and for which there are well established theoretical and empirical relationships to the relevant receivers. Data from such sites may be used to supplement and support conclusions obtained at the receiver locations. In most cases, it is expected that intermediate locations will be chosen from predicted noise contour maps and that these intermediate locations would return  $L_{eq}$  levels of around 45 – 55dB(A) under down wind conditions or be at around 400m from the nearest turbines.

## Noise data collection

The need for representative valid data is critical to the operation and on-going compliance of a wind farm. Therefore a high level of diligence is expected in the collection and analysis of noise data.

### Equipment

Background noise levels should be collected for continuous 10 minute intervals using sound level meters or loggers of at least Class 2 certification in accordance with Standard AS IEC-61672 *Electroacoustics – Sound level meters*. Sound level meters used for frequency analysis must be capable of collecting data between 20 Hz and 4000 Hz and have an inherent noise floor of no greater than 20dB(A). The meters or loggers must be suitably calibrated.

### Rain

If rain was recorded in the vicinity during the collection period it must be either excluded from the data set or the rain noise be shown to be at least 10dB(A) below the  $L_{90}$ .

### Wind Induced Noise

Data affected by wind across the microphone inducing 'instrumentation noise' that affects the measured noise level by more than 1dB(A) should be excluded from the data set (also refer to Section 5).

### Extraneous noise

Data that is affected by extraneous noise should be excluded from the final data set. Screening tools which develop a relationship between  $L_{eq}$  and  $L_{90}$  such as a difference of greater than 5dB(A) can be useful in identifying potentially contaminated data. Audio recordings can be used to subjectively analyse data for extraneous noise.

### Measurement duration

#### **Long term monitoring**

It is advisable to reference historical meteorological data and forecasts to schedule the collection of noise data for when there is a high probability that worst case scenarios will be captured. This could include source-to-receiver wind vectors, stable atmospheric conditions and the like.

Data collected in both the pre and post operational monitoring phases follow a similar methodology in that both the  $L_{eq}$  and  $L_{90}$  are measured over continuous 10 minute intervals and over at least the range of wind speeds from the cut-in speed to that of the maximum 'rated' power of the wind turbines. Sufficient data is considered to be approximately 2,000 valid measurement intervals (or the equivalent of two weeks' worth of data) where at least 500 of these points should be from the worst-case wind direction.

Wind speed is measured in accordance with these guidelines in intervals that correlate with the ambient noise measurements.

Endeavours should be made to collect a substantial amount of data associated with the worst case wind direction from the wind farm to the relevant receiver and for speeds generally experienced at the site. A wind direction spread of 45° either side of the direct line between the nearest actual or proposed wind turbine and the relevant receiver is considered acceptable. If it appears to be impractical to collect 500 valid data points under the worst-case wind direction conditions then data collection should continue for up to 6 weeks and the

valid data collected in this period shall be deemed to be an acceptable quantity. Natural variations in background noise may occur throughout the seasons of the year due to prevailing wind direction, changes in the density of foliage or the like. Whilst these natural variations should be accounted for, data measured during known extraneous noise events should not be included in the analysis.

### **Attended monitoring**

Data collected whilst an acoustician is present to validate or identify extraneous noise can be used for compliance measurements at a single receiver. The monitored noise is to be accurately recorded and extraneous noise should be excluded from the data analysis either during the data acquisition or post-acquisition data processing. Attended monitoring should include at least four site visits with each visit including eight hours of monitoring or more and equally including day and night time periods. Measurements should be taken when the wind direction corresponds to the worst case scenario. It will usually require periodical shut down of wind turbines to enable a determination of the noise contribution associated with operation of the wind farm.

If an alternative technique enables reliable monitoring of the wind farm noise using  $L_{eq}$  descriptor, it should be measured and reported as such. Comparison of the noise criteria with the wind farm noise should also be performed using the  $L_{eq}$  indices or equivalent.

## **Wind data collection**

Microphones should be protected with windshields, and the accuracy of the wind speed measurements at the microphone should be  $\pm 0.5$  m/s or better. Wind speed measurements must be made in 10-minute intervals that correlate/synchronise with the background noise data collection.

### **Microphone height**

For measurements made at receiver or intermediate points the anemometer must be placed at the same height as the noise microphone (i.e. between 1.2 - 1.5m above the ground).

### **Hub height**

Wind speeds (in m/s) should be measured at the proposed wind turbine hub and relevant intermediate heights for the range of meteorological conditions expected. The noise level data at hub height for each turbine is used to predict the total noise level from a wind farm. Wind speed at the wind farm site and background noise at the relevant receiver must be correlated so that background noise and wind farm noise can be compared. Wind speed measurements at other heights must be obtained to allow wind shear calculations to be made.

Final wind turbine design may result in different heights to those originally proposed. In these cases the measured data can be extrapolated to the final design hub height using the equation below. In all cases atmospheric stability conditions should be taken into account to ensure accurate conversion of the data.

#### **Wind shear factor**

$$\alpha = \log(V_1/V_2)/\log(H_1/H_2)$$

where  $\alpha$  = wind shear factor

#### **Extrapolated wind speed**

$$V_{FHH} = V_1/(H_1/H_{FHH})^\alpha$$

$V_1$  = wind velocity at originally proposed hub height in m/s

$V_2$  = wind velocity at comparison height in m/s

$H_1$  = originally proposed hub height in m

$H_2$  = comparison height of  $V_2$  in m/s (to be within 30m of the original proposed hub height)

$H_{FHH}$  = final hub height in m

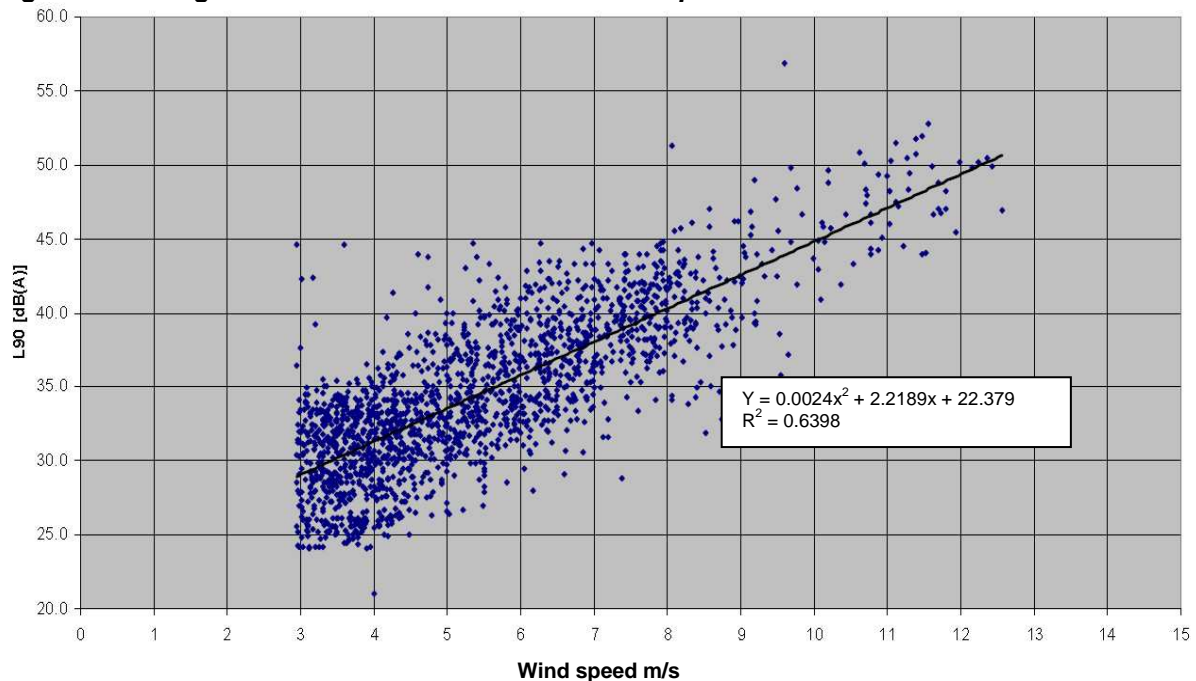
$V_{FHH}$  = wind velocity at final hub height in m/s

## Data analysis

A best fit regression analysis should be carried out on the data. The polynomial order (from linear up to third order) providing the best correlation coefficient should be used to present the fitted regression line to calculate the background noise level ( $L_b$ ). The correlation coefficient should be specified for each polynomial order. If a higher order of polynomial is used, its use should be justified. Background noise typically demonstrates an incremental trend if the wind speed increases.

The graph for each relevant receiver showing the plotted points, the fitted regression line, the polynomial describing that line and the correlation coefficient should all be reported. A table clearly showing the results for each integer wind speed from cut-in speed to the rated power should be prepared. A typical graph is shown below.

**Figure 3 – Background noise at the receiver vs wind speed at wind farm**



### Management of specific noise characteristics

These guidelines have been developed with the fundamental characteristics of wind turbine noise taken into consideration. It is expected that the criteria established, together with the use of the A-weighting filter will account for both the level of noise generated by the wind farms and any annoying characteristics of this noise.

Such annoying characteristics include reasonable levels of swish, modulation, discrete tones and low frequency noise and other characteristics that are commonly found in acoustic environments. It is further expected that the proponent will take all reasonable and feasible measures to avoid and minimise the generation of annoying noise characteristics.

Notwithstanding this, this guideline recommends penalties and procedures for assessing the presence of excessive levels of specific noise characteristics.

### Tonality

It is recognised that the emergence of discrete frequency bands in the broader frequency spectrum can increase adverse reaction to a particular noise. These tonal characteristics typically do not occur in well designed and well maintained wind turbines. If present, they are typically caused by a maintenance issue.

For the purposes of this guideline, the presence of excessive tonality is defined as when the level of one-third octave band measured in the equivalent noise level  $L_{eq}$ (10 minute) exceeds the level of the adjacent bands on both sides by:

- **5 dB or more** if the centre frequency of the band containing the tone is above 400Hz
- **8 dB or more** if the centre frequency of the band containing the tone is 160 to 400Hz inclusive
- **15 dB or more** if the centre frequency of the band containing the tone is below 160Hz

If tonality is found to be a repeated characteristic of the wind turbine noise, 5dB(A) should be added to the predicted or measured noise level from the wind farm. If tonality is only identified for certain wind directions and speeds, the penalty shall only be applied to measurements made under those meteorological conditions.

The tonal characteristic penalty applies only if the tone from the wind turbine is audible at the relevant receiver. Absence of tone in noise emissions measured at an intermediate location is sufficient proof that the tone at the receiver is not associated with the wind farm's operation.

### **Amplitude Modulation**

Amplitude modulation (AM) refers to aerodynamic noise from a wind turbine's blades, and is sometimes referred to as 'swish' or 'thump'. Noise from a wind turbine typically includes an inherent level of reasonable amplitude modulation. The criteria in these guidelines have been determined with the inherent characteristics of wind turbine noise – including reasonable levels of amplitude modulation – taken into consideration.

An excessive level of modulation is taken to be a variation of greater than 4dB(A) at the blade passing frequency.

If excessive modulation is found to be a repeated characteristic of the wind turbine noise, 5dB(A) should be added to the predicted or measured noise level from the wind farm. If modulation is only identified for certain wind directions and speeds, the penalty shall only be applied to measurements made under those meteorological conditions.

The modulation characteristic penalty applies only if the modulation from the wind turbine is audible at the relevant receiver. Absence of excessive modulation in noise emissions measured at an intermediate location is sufficient proof that the modulation is not a feature of the wind farm.

### **Low frequency noise**

Low frequency noise is present in all types of environmental noise and is particularly difficult to measure when in the presence of wind. Analysis of wind turbine spectra shows that low frequency noise is typically not a significant feature of modern wind turbine noise and is generally less than that of other industrial and environmental sources.

If it is shown that the C-weighted noise (measured from 20Hz upwards) from a wind farm (excluding any wind induced or extraneous C-weighted noise) is repeatedly greater than 65dB(C) during the daytime or 60dB(C) during the night-time a more detailed low frequency noise assessment should be undertaken.

Should a detailed assessment confirm that excessive levels of low frequency noise above the human threshold of hearing are occurring internally at non-associated residences (as described in the UK Department for Environment, Food and Rural Affairs document *Proposed criteria for the assessment of low frequency noise disturbance*), then a 5dB(A) penalty should be applied to the predicted or measured noise level from the wind farm for the periods and meteorological conditions under which the low frequency noise has been identified.

It should be noted that the low frequency characteristic penalty applies only if excessive low frequency noise is present, or predicted to be experienced at the relevant receiver.

If C-weighted measurements at intermediate location(s) extrapolated to non associated receivers using relevant geometric spreading techniques demonstrate that C-weighted noise levels are less than the trigger levels, this is considered sufficient to demonstrate an absence of excessive low frequency noise impacts.

### **Definitions and additional management of noise characteristics**

Definitions and additional management of specific noise characteristics are listed below:

- **A single exceedance**
  - A single exceedance occurs when wind farm noise displays a characteristic described in Section 6.1.1 to 6.1.3 for a 10 minute averaged period. Where this occurs, a penalty shall be applied to the identified equivalent noise level  $L_{eq}$  (10 minute) data point and this point is to be included in the data set.
- **A repeated exceedance**
  - A repeated exceedance occurs when single exceedance events occur for more than 10% of an assessment period. An assessment period is defined as day (7am – 10pm) or night (10pm – 7am).
- **A sustained exceedance**
  - A sustained exceedance occurs when a repeated exceedance is shown to occur for greater than 30% of a season. A season is defined as either Spring, Summer, Autumn or Winter. Should a sustained exceedance be identified then operation of the wind farm should be modified to ensure that those wind speeds and directions that cause exceedances of noise characteristic goals are minimised.

The above definitions refer to valid wind farm noise only.

### **Application of Penalties**

Should penalties be applicable for specific noise characteristics then a maximum penalty of 5dB(A) shall be added to the relevant time period.

## **Noise predictions**

The noise level associated with the wind farm should be predicted at all locations identified as relevant receivers under these guidelines, for wind speeds from cut-in speed to the speed of the rated power and each integer speed in between. Where wind farms are shown to comply with the noise level criteria in these guidelines up to the turbine's maximum rated power, it is unlikely that adverse impacts will occur at higher wind speeds and the wind farm is considered to be in compliance at these higher wind speeds.

### **Noise propagation model**

A suitable model must be selected (or developed) to predict the 'worst-case' noise level at all relevant receivers and at any proposed intermediate points. There is no standard procedure directly applicable to sound propagation from wind farms although ISO9613-2: 1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* or the CONCAWE noise propagation model is commonly used.

The noise level at the relevant receiver locations should be predicted, allowing for the propagating effect of wind in the direction from the wind farm to the receiver at each reportable wind speed.

The intent, is to predict a worst- case scenario whilst recognising that in practice there will be different wind directions and speeds between each WTG on a wind farm site and the relevant receiver which will reduce the actual noise level when compared to that predicted under worst-case conditions. A conservative approach should be used for predicting wind farm noise by calculating noise levels in relative octave bands to determine an overall predicted level.

The details of the model should be clearly stated and the approach documented.

The following information should be provided as part of the noise impact assessment:

- the propagation model, and any variation of the model, used for the prediction;
- an estimate of the model accuracy in dB(A) referenced and peer reviewed papers;
- the assumptions used as input to the model, including allowances for noise absorption due to air, ground, topographical and wind effects.

Noise levels should be predicted by an appropriately qualified and experienced acoustician. Details of the acoustician's qualifications and experience should be included in the assessment report.

### **Micro-siting of turbines**

Micro-siting of turbines up to 100m from each turbine's nominated location will generally be permitted. Noise levels at receivers must be based on the 'worst case' turbine layout / configuration having regard to any micro-siting.

### **Noise model calibration**

The results of compliance noise monitoring should be used to further calibrate the noise model developed for the project and to identify any areas of concern or additional testing requirements.

### **Noise assessment report**

The applicant must prepare a report detailing the noise assessment undertaken and include this as part of the applicant's Environmental Impact Statement (EIS). As a minimum, the noise assessment report must include the following information:

- background noise measurement locations;
- time and duration of the background noise monitoring regime;
- wind speed monitoring locations and heights above ground;
- graphical correlation plot of the wind speed versus background noise level data;
- a summary of the environmental noise criteria for the project at each integer wind speed based on the correlation;
- the make and model of the representative wind turbine(s);
- the positions of the wind turbines;
- the model used to predict the wind farm noise levels;
- the input assumptions and factors used in the model;
- the predicted noise levels at the closest dwellings to the wind farm at each integer wind speed;
- a comparison of the predicted noise levels against the criterion at each integer wind speed for the closest dwellings to the wind farm;
- the modifications or operating strategy that would be employed to address any unforeseen non-compliances.

Equipment, methodologies and documentation used and prepared in the prediction of wind farm noise and subsequent compliance should be outlined in the Noise Management Plan and be of a standard that will allow completion of an independent review if required and shall be commensurate with the risk and size of the proposal. The Department of Planning and Infrastructure shall determine whether an acceptable standard has been met.

### **Assessing compliance**

The 'worst-case' noise propagation conditions predicted using the procedure in these guidelines typically won't occur during the operation of the wind farm or will only occur a minority of the time. The actual impacts will therefore typically be less than the predicted worst case impacts. Notwithstanding this, the prediction process in these guidelines relies on assumptions about a range of inputs. The compliance procedure outlined below is a means of confirming that the actual noise levels comply with the criteria and predicted impact.

### **Conditions of consent**

If a Development Application for a wind farm classed as State Significant Development is granted consent, conditions of consent will require the applicant to undertake noise compliance monitoring.

This includes a requirement for the applicant to prepare and submit a Noise Compliance Report within 12 months of the commencement of operation of the wind farm. Noise monitoring must be undertaken during period(s) commensurate with the 'worst case' operational and meteorological factors (including temperature inversions). Any relevant special audible characteristics including tonality and modulation-related noise from the wind turbines and any cumulative noise impacts from the operation of the turbines and substation must also be considered. The applicant must make the Noise Compliance Report publicly available including to the community consultation committee and on the proponent's website.



### **Independent review**

A condition of consent will also be included so that a neighbour may ask the Director-General in writing for an independent review of the impacts of the wind farm project on his/her land. If the Director-General is satisfied that an independent review is warranted, then the Director-General may require the proponent to commission a suitably qualified, independent expert, whose appointment has been approved by the Director-General, to consult with the landowner to determine his/her concerns, and conduct monitoring to determine whether the project is complying with the relevant impact assessment criteria.

If the project is not complying with these criteria then measures to ensure compliance with the relevant criteria must be identified and implemented in consultation with the affected neighbour. Alternatively, the proponent may seek to secure a written agreement with the neighbour to allow exceedances of the relevant criteria to occur. A copy of the independent review must be provided to the Director-General and the affected neighbour.

### **Compliance data**

Where background data needs to be collected or confirmed after operation of the wind farm has commenced then this may be achieved with the wind turbines parked / offline or with the wind turbine rotor revolutions below 2 revolutions / minute. Alternative methods may also be proposed. The data to be analysed should be representative of all wind speeds above the cut-in speed of the wind turbines.

This guideline recommends that noise compliance monitoring be repeated at different seasons of the year where warranted by community concerns.

If data adjusted for special noise characteristics (if needed) is below the criteria it should be reported as such and no further data analysis or additional noise measurements are required.

As per the methodology described in Section 3 operational wind farm valid  $L_{eq}$  and  $L_{90}$  data delineated into day (7am – 10pm) and night (10pm – 7am) periods is collected at relevant non-associated receiver locations and any proposed intermediate monitoring locations. Where collection of valid  $L_{eq}$  data at the relevant receivers (not at any intermediate monitoring locations) proves difficult to distinguish above the ambient background noise level, then the  $L_{eq}$  is taken to be equivalent to the  $L_{90} + 1.5dB$ .

### **Analysis of wind farm noise measurements**

Regression analysis of both the pre and post wind farm data should be compared and the results compiled.

### **Calculation of wind farm equivalent noise level ( $L_{eq}$ )**

To identify the contribution of the wind farm to the total noise level and hence the wind farm's equivalent noise level ( $L_{eq}$ ), the  $L_{eq}$  (or adjusted  $L_{90}$ ) noise level before the wind farm is installed needs to be logarithmically subtracted from the  $L_{eq}$  (or adjusted  $L_{90}$ ) after the wind farm is installed. The resultant noise level can then be compared against the criterion for the relevant integer wind speed.

### **Additional management**

In the event that an exceedance is identified through compliance monitoring, the proponent must identify the meteorological conditions under which the exceedance occurs and take all reasonable and feasible measures to resolve the non-compliance including a timetable for their implementation. Measures may include, but are not limited to, sector management to eliminate the occurrence of exceedances under the identified problematic meteorological conditions and/or negotiation with the affected resident.

If a compliance issue is not resolved, the regulator may restrict operation of the wind farm until satisfied that acceptable operation of the wind farm can be demonstrated.

## Appendix C: Guidelines for wind farm community consultative committees

### Purposes of the committee

A community consultative committee will generally need to be established by the applicant for all major new wind farm proposals in NSW. For these wind farms, the Director General Requirements and the conditions of approval will provide for a committee to be established and operated by the applicant generally in accordance with this guideline.

The purpose of a community consultative committee is to provide a forum for open discussion between representatives of the proponent, the community, the council and other stakeholders on issues directly relating to the assessment of the wind farm and if approved, its environmental performance and community relations, and to keep the community informed on these matters.

The committee provides a forum to:

- establish good working relationships between the proponent, the community and other stakeholders in relation to the wind farm
- provide for the ongoing communication of information on the assessment, operation and environmental performance of the wind farm, including:
  - on project assessment including scoping of issues for assessment and comment on the implementation of conditions of approval, the management plan and any other management plans (including rehabilitation and wind farm decommissioning plans)
  - the results of environmental monitoring
  - annual environmental management reports
  - outcomes of audit reports (including audits required as a condition of approval)
- discuss community concerns and review the resolution of community complaints
- advise on the allocation of community enhancement funds in the community
- discuss how best to communicate relevant information on the wind farm and its environmental performance to the broader community, and
- work together towards outcomes of benefit to the wind farm, immediate neighbours and the local and regional community.

The committee will:

- provide feedback to the proponent and/or relevant State agencies regarding environmental management and community relations outcomes relating to the wind farm
- undertake visits of the wind farm's operations, as necessary
- review the wind farm's complaints-handling procedures and the handling of concerns from the community regarding the wind farm environmental management or community relations
- provide advice to the proponent on how to address community relationships, including on:
  - how the proponent can provide information to the community
  - community initiatives to which the proponent could contribute
- liaise with community consultative committees of other wind farms where there are common issues or where there is the potential for cumulative impacts, with a view to information sharing and joint meetings on matters of common interest

Responsibility for oversight of the wind farm's compliance with the project approval and all other government approvals remains with the relevant consent authority.

### Membership of the committee

The membership of the committee should comprise:

- an independent chairperson
- five to seven representatives of the local community and other stakeholders, including at least two representatives of any landowners that own houses within 2 km of a proposed wind turbine
- one representative of the local council

- two or three representatives of the proponent, including the person with direct responsibility for environmental management at the wind farm.

The representatives of the proponent are part of the committee. State government agencies will not be represented on the membership of the committee. State government agencies will, however, attend committee meetings at the request of the committee and at the discretion of the agency.

### **Independent chairperson**

The role of the chairperson is to be a convenor, facilitator, mediator and advisor for the committee. They must undertake their role in an independent manner, and refrain from perceptions of bias either for or against the proponent or any individual or group of representatives on the committee.

The chairperson will be appointed by the Director General of the Department of Planning and Infrastructure, following such consultation as the Director General may consider appropriate. In selecting the chairperson, preference will be given to a candidate who can manage and represent the concerns of a variety of interest groups. Selection criteria are:

- ability to convene and manage stakeholder committees in an independent manner
- experience in community relations, facilitation, mediation or public advocacy
- understanding of the wind energy industry and awareness of local issues.

The chairperson will report annually to the Director General on the operation of the committee and will make this report publicly available. The Director General may review the appointment of the chairperson from time to time (e.g. every five years).

### **Community representatives**

The local community and other stakeholder representatives will be appointed by the Director General, following advertisement in the local press and such consultation as the Director General may consider appropriate. Community representatives will be selected to represent neighbours (including those within 2 km of a wind turbine that do not host the wind farm facility) and the broader local community. Representatives may also be selected from environmental organisations or other affected or interested stakeholders. Employees of the proponent are not eligible to be appointed as community representatives.

In selecting the community representatives, preference will be given to candidates who can represent the concerns of a variety of interest groups. Selection criteria are:

- willingness to contribute constructively
- experience and ability to provide feedback to the community and stakeholder groups
- current residence in the local area and / or awareness of local and other relevant issues.

The Director General may review the appointment of community and other stakeholder representatives from time to time (e.g. every 5 years).

### **Proponent and council representatives**

Proponent and council representatives are to be appointed to the committee by the proponent and the council respectively.

### **Alternate representatives and observers**

Alternate community representatives may be nominated by a community member. An alternate representative may substitute for a community member of the committee when the member is unavailable to attend a meeting. Alternate representatives for proponent and council members may be appointed by their organisation and similarly may substitute for proponent and council members of the committee.

The committee may agree to any person acting as an observer to any meeting of the committee. Observers cannot participate in the business of the committee unless invited to do so by the chairperson. State government agencies, for example, will attend committee meetings (on an as needed basis) at the request of the chairperson

## Committee meetings

### Timing and location of meetings

The committee should determine the frequency of its meetings. It is suggested that the committee meet at least every two or three months during the assessment period (between when Director General's Requirements are issued and the committee is established and when the application is determined). If the project is refused, the committee will be abandoned. If the project is approved, then it is suggested that the committee meet:

- every 3 or 4 months during the period of wind farm construction and during the first 2 years following commencement of operations.
- after the first 2 years, it is suggested that the committee should meet 2 times per year.

Any member may request that the chairperson convene an extraordinary meeting of the committee to discuss any matter warranting urgent consideration. The chairperson shall determine whether an extraordinary meeting is warranted.

At least 2 weeks' notice must be given to all members of any meeting of the committee. Meetings should be held at a time and place generally convenient to the committee. The proponent should provide facilities for committee meetings, if required to do so by the committee.

If regional committees have already been established, clustering of meetings or committees may be considered on a case-by-case basis. Depending on the situation, this could include a single committee with permanent standing members and other members that rotate and attend for part of a meeting relevant to a particular project. In this way, a single committee could accommodate multiple projects.

### Meeting proceedings

The chairperson should convene and chair meetings of the committee. Meetings of the committee should follow good meeting practice. The committee may agree to adopt any particular set of standard meeting practices if it wishes to do so. As the committee is not a decision-making body, it is not a requirement that consensus be reached on issues discussed.

The chairperson should determine the agenda items. Any member may propose a matter for inclusion on the agenda, either before or during a meeting, providing the matter is within the purpose of the committee. The chairperson should ensure that issues of concern raised by community representatives on behalf of the community are properly considered. Late items may be deferred to a following meeting.

The committee may decide to undertake its regular inspections of the wind farm in conjunction with its meetings, or at other times convenient to it. The meeting agenda items would normally include:

- Apologies
- Declaration of pecuniary or other interests
- Confirmation of the previous meeting minutes
- Business arising from previous minutes – response to issues raised or provision of additional information requested
- Correspondence
- Proponent reports and overview of activities:
  - progress at the wind farm – assessment or operational issues
  - issues arising from site inspections
  - monitoring and performance
  - community complaints and response
  - information provided to the community and any feedback
- General business
- Next meeting.

## Minutes of meetings

Minutes are to be kept of all meetings of the committee. The Minutes must record issues raised and actions to be undertaken, who is responsible for taking those actions and by when. If a member so requests, then the Minutes must record that member's dissenting views on any matter.

The Minutes are normally recorded by the proponent. Meetings can only be tape-recorded with the agreement of the chairperson and the committee. The Minutes are to be distributed to all members. The proponent should ensure that a copy of the Minutes is made available on the proponent's project website and in another public place agreed to by the committee (e.g. the local council offices or a public library) within 28 days of each meeting. The Minutes must be endorsed by the chairperson prior to them being distributed or placed on the proponent's project website.

The Minutes must be endorsed by the committee at its following meeting. If the Minutes are amended by the committee, then the amended version must be placed on the proponent's project website.

## Conduct of members

In meetings of the committee and when otherwise involved in the business and activities of the committee, members and alternate representatives shall, to the best of their abilities:

- act properly, honestly and in accordance with an open and transparent process
- perform their functions impartially and in the best interests of the local and broader communities
- be respectful to fellow members and not engage in unconstructive, threatening, intimidating or disorderly behaviour
- refrain from any form of conduct which may cause any reasonable person unwarranted offence or embarrassment.

The chairperson should bring any breach of these requirements to the attention of the persons concerned. Following three such breaches, the chairperson may request the Director General (in the case of a community or other stakeholder member), organisation which appointed them (in the case of a proponent or council representative or alternative representative), or community member (in the case of an alternative community representative) replace the member or alternative representative.

The chairperson may similarly request the replacement of any member who fails to attend committee meetings for more than four meetings.

## Pecuniary and other interests

Members should declare any pecuniary or other interest which may be considered to prevent them undertaking their role impartially and in the best interests of the local and broader communities. Examples include holding a private contract with the proponent or holding voluntary acquisition rights. These guidelines establish no requirement in respect of personal interests other than declaration. However, the committee may determine that a personal interest is sufficient that a member should withdraw from discussion on a particular issue.

## Committee training

The committee may seek funding or other assistance from the proponent to develop the skills necessary to achieve the purposes of the committee. Examples may include training or skills development in best practice environmental management of wind farms. The proponent should make every endeavor to support reasonable requests from the committee for necessary training or skills development.

## Committee funding and remuneration

The committee may seek annual or one-off funding from the proponent for activities related to its purposes. It is within the proponent's discretion whether or not to agree to such requests. The chairperson, community and other stakeholder members of the committee may seek the payment of sitting fees and / or personal expenses from the proponent. Again, it is within the proponent's discretion whether or not to agree to such requests. If such fees or expenses are paid, then the proponent should indicate that this is occurring on the proponent's project website, so that the broader community remains fully informed.

## Dispute resolution

The committee is encouraged to discuss and seek agreement on all matters that may be the subject of substantial disagreement between its members. The chairperson carries a particular responsibility in respect of dispute resolution, in regard to both disputes between members of the committee and also between the committee and the proponent.

If a dispute between the committee and the proponent cannot be resolved by the chairperson, the chairperson should seek the advice of the Director General. For example advice may be sought from the Department of Planning and Infrastructure in determining the appropriateness of the environmental performance of certain aspects of the wind farm, whether the wind farm is complying with approval conditions or whether the wind farm's response to community complaints has been appropriate.

If a dispute between community or council members cannot be resolved by the chairperson, then the chairperson may request that the Director General review the appointments of any or all members of the committee, with a view to making a new appointment or appointments.

Where three or more members are concerned about the manner in which the chairperson is fulfilling the role (e.g. there is an ongoing perception of bias, inappropriate control, refusal to share information or to adhere to the wishes of the committee), they may request that the Director General review the chairperson's appointment, with a view to making a new appointment.

## Responsibilities of the proponent

During the assessment process, the proponent must provide the committee with updates on the assessment studies being prepared and the issues being investigated, and design and layout options being considered.

Once the project is approved, the proponent should regularly provide the committee with timely, accurate and comprehensive reports on the wind farm's operations and performance on its environmental management and community relations. The proponent should also provide the committee with copies of:

- the wind farm's development approval including conditions of consent,
- any management, decommissioning or rehabilitation plans
- results of environmental monitoring
- annual environmental management reports
- audit reports (including audits required as a condition of approval)
- reports on community concerns or complaints and proponent responses
- any other information specified by the Director General.

Annual environmental management reports, audit reports, monitoring reports and the like are to be distributed to committee members at the same time as they are submitted to agencies. The proponent must consult with the committee if it intends to seek amendments to conditions of approval, to change operational requirements, or to expand the operations of the wind farm.

The proponent should respond in a timely fashion to any questions or advice the committee may give it concerning the wind farm's environmental performance or community relations. The proponent should forward to each committee member within 28 days of the committee's meeting:

- a copy of the minutes
- the proponent's response to any questions or advice by the committee
- any information requested by the chairperson

The proponent should organise inspections of the wind farm for the committee. The frequency of inspections is to be determined by the committee, but the inspections should usually be undertaken in conjunction with committee meetings. In addition, the proponent should accommodate any reasonable request by the chairperson for the committee to undertake additional inspections, providing at least 48 hours notice has been given to the proponent by the chairperson.

## Communication with the broader community

Committee members are encouraged to discuss issues and disseminate information about the wind farm with the wider community, including special interest groups. If appropriate, the chairperson of the committee may also give briefings to community organisations such as the Chamber of Commerce, Parents and Citizens Committees and environmental and heritage organisations.

The committee may agree to release statements or other information to the media or to adopt other approaches to public dissemination of information. However, only the chairperson may speak publicly on behalf of the committee. Individual committee members may make comments to the media or in public forums on behalf of themselves or the stakeholders that they represent, but not on behalf of the committee.

There is a presumption that all documents and other information considered by the committee should be generally available to the community. However, any member may request that particular information (e.g. a declaration of a personal interest, or information which the proponent considers to be commercial-in-confidence) be kept confidential to the committee. In the absence of full consensus amongst the committee over whether such information should be kept confidential, the decision of the chairperson shall be final and be binding on all members.

## Appendix D: Information to include in an EIS

Requirements for Development Applications (DAs) and an accompanying Environmental Impact Statement (in the case of State significant development) or a Statement of Environmental Effects (in the case of local or regional development) are specified in Schedules 1 and 2 of the *Environmental Planning and Assessment Regulation 2000*. If the development is SSD, additional requirements to address in an EIS may be specified in Director-General's Requirements. A guide for applicants on information that may need to be included in an Environmental Impact Statement is provided below.

### Description of the proposal

#### Description of the proposal

A detailed description of the wind farm proposal should be provided so that all the impacts can be identified and assessed. The description should include the following information:

- proposed generation capacity and envisaged lifespan of the wind farm
- proposed market for the energy and any relationship with any electricity generator, network retailer or any energy users
- height, capacity, materials, design and standards of all components of the proposal
- the transmission connection on the site and to the grid/energy users – capacity, length, route, any easement issues, substations, ownership/ management arrangements
- estimated project costs including transmission infrastructure and access roads
- the number of construction and operational employees on site and off-site
- outline land ownership or lease arrangements (if leasehold indicate the number of landowners and length of lease)
- overview of the proposed operational, management and maintenance regime
- overview of the arrangements for decommissioning
- possible future expansion or future stages

#### Site layout

The site layout should be described. Plans, sketches, diagrams, maps, aerial photographs or photomontages should be provided indicating the location of the following:

- any land proposed as wind farm sites and associated construction - indicate:
  - the current land use
  - location of all residences within 5 km
  - any significant vegetation communities, water bodies, buildings or features
  - existing transmission lines, pipelines, roads or crown easements
- proposed lay-out and spacing of turbines; administration buildings, access roads, any viewing facilities, landscaping, any noise and visual screening. If flexibility in the layout or spacing of turbines is sought to enable post approval micro-siting, the extent of flexibility sought should be described and justified
- proposed transmissions lines on the site and to the grid and substations
- construction area including access roads, construction camps, fabrication or assembly areas, any on-site concrete batching facilities; stores for fuels and any dangerous goods, storage areas for soil and construction materials, drainage protection and sediment control works. and rehabilitation works
- possible future expansion area, where relevant



## Construction issues

The construction activities related to site establishment, construction or post construction rehabilitation should be described. This may include:

- Proposed location of construction facilities and overview of construction phase
- The construction program and any staging, including:
  - the construction period and daily hours
  - construction location
  - proposed sources and volumes of construction materials, chemicals, fuels and other materials to be transported to the site
- Details of site establishment works, such as:
  - the establishment of site offices, construction compounds, temporary concrete batching plants, stockpiles of materials, the erection of temporary fencing, lighting and signage
  - relocation and adjustment of utilities and services; any diversion of drainage lines
  - any demolition of unwanted buildings and structures.
- Details of construction works such as:
  - tower fabrication, assembly and erection
  - blade/rotor assembly and erection
  - construction of underground and above ground transmission lines and connection to the grid and associated substations
  - upgrading or construction of temporary and permanent access tracks
  - temporary and permanent erosion and sediment control structures
  - buildings and maintenance facilities.
  - any vegetation clearing in construction and other areas - outline rehabilitation plans, showing final contours and drainage for the site along with the staging of the rehabilitation and landscaping
- Transport issues, including:
  - method of transporting large items to site
  - proposed truck routes and any upgrade works or road safety protocols required on the access routes to allow for transport of large items
- Demonstration that the proposed wind farm will be capable of meeting structural adequacy / design requirements in the relevant standards, Building Code of Australia (BCA), wind turbine manufacturers' specifications and other relevant standards for the construction of wind turbines
- Provide details of waste management and disposal, such as:
  - volumes and types of surplus fill and demolition material; proposed transport arrangements; disposal methods and sites; recycling opportunities and stockpile requirements
  - the management strategy for any contaminated spoil or materials.

## Description of the location

### Description of the site

The site characteristics should be described including information on the following:

- local government area boundaries, zoning, permissibility
- land tenure and title details of the proposed site; where Crown land is involved, any constraint associated with the form of lease or tenure, where appropriate, the Native Title status of the land and the procedures to be followed to satisfy the requirements of the Commonwealth's *Native Title Act 1993*
- current and previous use of the site, and any associated constraints on the proposal
- a site description including:
  - topographic maps, plans or aerial photographs clearly identifying the location of the proposal relative to surrounding urban or non-urban communities and land uses,
  - important natural features and vegetation characteristics
  - sight-lines from dwellings or public places
  - general soil / geological characteristics which could affect construction
  - existing and proposed roads on site and proposed connection to local roads
  - location of any existing or proposed utilities and services; or equipment (anemometer masts, transmission facilities etc).

## Description of the surrounding area

A description of the surrounding environment should be provided so that the proposed wind farm can be considered in its local and regional context. The description may be general, as specific details will be provided when assessing the environmental impacts of the proposal. Information that should be provided includes an overview of the following:

- landuses adjacent or nearby to the proposed sites including infrastructure and public utilities (airports, roads, pipelines, telecommunications, transmission lines etc); outline trends in land use in the area (e.g. extensive farming transitioning to small lots etc)
- all neighbour's houses that do not host the wind farm facility within 2 km of a proposed wind turbine must be identified
- the provisions of any relevant strategic plan by council(s) or government authorities applying to the site or area (land use, economic development, vegetation, biodiversity, electricity distribution, etc)
- meteorological characteristics which may influence
  - the viability of the project - wind intensity, direction, reliability and variability as well as characteristics which could affect environmental issues such as rainfall intensity, frequency and seasonal distribution
  - the level of impact from the project including the incidence of any temperature inversions
- the geomorphological factors such as major landform features and slope gradients
- predominant vegetation communities in areas surrounding the wind farm sites, their conservation values including potential habitat likely to attract birds or bats
- the location of any nearby natural or artificial water bodies including wetlands likely to attract birds
- scenic or visual significance of the landscape
- the heritage, conservation, historical, cultural, or scientific significance of any buildings, items, places, landforms, flora, fauna or areas likely to be affected by the proposal

## Statutory planning context

The statutory planning context for the site and proposed wind farm development should be described, including:

- identify
  - the land use zone, and whether the proposal is permissible with consent under the relevant LEP(s) or Infrastructure SEPP
  - the relevant planning authority under the EP&A Act
  - any provisions in other SEPPs (or deemed SEPPs) which may apply
  - any provisions of the relevant council's LEP(s) or Development Control Plan (DCP)
- identify all statutory and other obligations the applicant is required to fulfil in relation to the project, including all approvals and licenses
  - whether any approvals are required under other NSW legislation, such as the *National Parks and Wildlife Act 1974*, *Heritage Act 1977*, *Protection of the Environment Operations Act 1997*, and the *Road Act 1993*
  - whether any approvals are required under Commonwealth legislation, in particular, the EPBC Act or from CASA / Air Services Authority
  - whether referral is required to any other State or Commonwealth authority for concurrence / advice

## Consultation

The proponent's assessment report must include the following information:

- clear documentation, details and evidence of the consultation process undertaken including the stakeholders consulted
- clear identification and tabulation of all issues raised during the consultation process
- a description of how the identified issues including the community's issues have been addressed, and how they have informed the proposal as presented in the assessment report
- a description of the higher level of consultation undertaken with neighbours that own houses within 2 km of a proposed wind turbine

## Assessment of issues

A detailed assessment of impacts from a wind farm proposal should be provided. See **Appendix B** for guidance on assessing impacts from a wind farm. All neighbours' houses within 2 km of a proposed wind turbine must be identified.

## Mitigation and management of issues

Applicants should include a Management Plan in their assessment report outlining proposed avoidance, mitigation, management and monitoring measures. If a DA is approved, mitigation, management and monitoring requirements will also be specified in the conditions of consent.

The EIS should include an assessment of the likely effectiveness of the proposed mitigation and management approaches to avoid, minimise or manage impacts. Particular attention should be given to potential impacts on neighbours within 2 km of a proposed wind turbine (that do not host the facility).

The Plan should include:

- an outline of an environmental management plan (EMP) for the construction and operation of the wind farm. This should consist of a compilation of the applicant's commitments with regard to the location, layout, design or technology features to minimise or manage impacts on the environment
- an outline of environmental monitoring, auditing and reporting program, and
- an outline of the ongoing community consultation program including complaints management and conflict resolution measures.

## Management

The Environmental Management Plan (EMP) should demonstrate sound environmental practice during the construction, operation and decommissioning of the proposal and the environmental management principles which would be followed in the subsequent planning, design, construction and operation of the proposal. Issues that the EMP should address include (but are not limited to):

- construction stage; where relevant, including:
  - erosion and sedimentation management
  - noise and dust
  - constraints on land clearing, rehabilitation and revegetation
  - waste management
  - transport management
  - management of operation impacts including maintenance
  - induction programs for construction and operational staff
- operational stage, where relevant, including:
  - describe how environmental performance will be managed to meet acceptable outcomes including measures to manage noise emissions, visual impacts, flora and fauna impacts, electro-magnetic interference impacts, emergency management measures including measures in relation to bushfires
  - describe maintenance activities associated with the project to demonstrate how appropriate environmental performance will be met
  - undertake an environmental risk analysis covering the operations phase
  - outline relevant training provisions to ensure employees are aware of their environmental and compliance obligations
  - outline procedures for the periodic review and update of the operational component of the EMP
- an outline of how compliance with licensing and approval requirements will be achieved and due diligence attained

## Monitoring

The assessment should outline the monitoring program to be implemented. The program should be carefully designed and relate to the predictions made in the assessment. Issues which may be relevant include (but are not limited to) noise impacts and bird and bat impacts.

The outline should include the following:

- the key information that will be monitored, its criteria and the reasons for monitoring (which may be compliance with requirements)
- the monitoring intervals and duration
- procedures to be undertaken should the monitoring indicate a non-compliance or abnormality
- internal reporting procedures and links to management practices and action plans
- external reporting procedures to relevant authorities and the community.

## Ongoing consultation

The applicant should outline commitments for ongoing stakeholder consultation, including consultation with neighbours and the broader community, covering the construction and operation phases of the wind farm project. The community consultation committee, if required, will also provide for the ongoing engagement with the community (see **Appendix D**).

## Strategic justification

The assessment should include a strategic justification for the proposed wind farm. This includes justification of the need, scale, scope and location for the proposed wind farm. Relevant considerations are outlined below.

## Contribution to government policy objectives

Consider the extent to which a project can contribute to government (local, State and Commonwealth) policy objectives and priorities. This includes:

- policies regarding electricity supply, electricity demand, generation technologies, greenhouse reduction, renewable energy targets, economic and regional development
- the contribution of wind farms generally to any increased demand for back-up power supply, and
- the contribution of the renewable energy target to retail electricity prices.

## Alternatives considered

Alternatives considered (location and/or design) should be described for all project components. Justification for the preferred project should be provided including demonstration of the proposed wind farm project's benefits on a local and strategic scale and how it achieves stated objectives. This should include consideration of the relative cost and competitiveness of wind farms compared to other renewable energy technologies and their capacity for immediate large scale deployment to meet the renewable energy target.

## Substation / transmission infrastructure

Demonstration should be provided that the electricity network (including substations and transmission infrastructure), existing or as augmented, has sufficient capacity to accommodate the project.

## Existing and future land uses

Demonstration should be provided that the project is consistent with existing and future surrounding land uses (including urban communities, land of high agricultural value, land of significant scenic or visual value, rural residential development, mineral reserves, forestry, conservation areas and crown land), taking into account relevant local and regional strategic land use plans and including consistency with agricultural land use objectives. Potential cumulative social and economic impacts on the local community should also be addressed.

## Greenhouse issues

A clear demonstration of quantified and substantiated greenhouse gas benefits should be provided, taking into consideration sources of electricity that could realistically be replaced and the extent of their replacement, with reference to the *NSW Greenhouse Gas Savings Tool* (DECCW).

## Appendix E: Conditions of consent and compliance

If a Development Application for a wind farm is approved, the consent authority will issue conditions of consent covering the construction, operation and decommissioning phases as part of the approval. Key issues covered in the conditions of consent for wind farms classed as State Significant Development include (but are not limited to):

- the duration of the consent
- relevant impacts from the wind farm including
  - landscape and visual amenity issues
  - social issues, including noise, flicker, glint, night lighting, electromagnetic interference
  - ecological issues
  - heritage issues
  - hazards and risk, including aircraft safety and bushfire safety
- complaints management
- compliance tracking, monitoring and reporting including noise monitoring and bird and bat monitoring
- ongoing community engagement

The owner of a wind farm has a legal obligation to comply with all conditions of consent. This legal obligation continues to apply regardless of whether the wind farm changes ownership, e.g. if the applicant that obtained approval sells the project or the financier assumes possession of the project and associated assets.

Common issues regarding conditions of consent are addressed below. Examples of conditions of approval for previously approved wind farm projects in NSW are available on the *Major Project Register* on the Department of Planning & Infrastructure's website ([www.planning.nsw.gov.au](http://www.planning.nsw.gov.au)).

### Modification of consents

Consents may be modified in accordance with Section 96 of the EP&A Act. There are 4 types of Section 96 applications:

- 96(1)A Modifications involving minimal environmental impact principally to fix a minor error, misdescription or miscalculation
- 96(1A) Modification involving minimal environmental impact usually to make minor changes
- 96(2) Other modifications which do not substantially change the development
- 96AA Modifying a consent granted by the NSW Land and Environment Court

If the proposed changes result in a significant alteration, a new development application is required to be lodged so that impacts can be assessed.

### Lapsing of consent if not acted upon

Under the EP&A Act, a development consent must specify the time when the consent lapses if physical commencement has not occurred. The maximum period is 5 years. A lesser lapsing period may be specified in the consent. The consent may be extended by up to one additional year upon request of the applicant.

### Micro-siting of turbines

Conditions of consent may make provision for micro-siting of turbines. Micro-siting of turbines includes any consequential changes to access tracks and electricity reticulation lines. The determining authority will not consent to micro-siting of turbines unless the determining authority is satisfied that it will not give rise to an adverse change to assessed landscape, vegetation, cultural heritage, visual amenity, shadow flicker, noise, fire risk or aviation impacts when compared to the site shown on the endorsed plans. Any proposed micro-siting must be accompanied by supporting material addressing relevant matters to the satisfaction of the determining authority.

## Ongoing community engagement

Conditions of consent for wind farms classed as State Significant Development will require the proponent to continue the community consultation committee during the construction and operation phases of the project as well as develop a Community Information Plan. The applicant will be required to establish a website (if not done so already) to:

- provide information to the community on stages of development
- provide access to associated documents
- provide information on the complaints handling framework and outcomes
- make all monitoring and performance reports publicly available

## Complaints

Conditions of consent will require the applicant to develop a Complaints Handling Framework including:

- nomination of a Complaints Handling Manager
- complaints handling procedures
- methods for complainants to lodge a complaint such as a 24-hour telephone line, email and postal address
- a complaints register and reporting on complaints

Complaints must also be considered at each meeting of the Community Consultation Committee.

## Compliance

Wind farm proponents have a legal obligation to ensure their wind farm projects are carried out in strict compliance with conditions of approval. Proponents must monitor the environmental performance of their projects to ensure compliance is maintained. The Department of Planning & Infrastructure has an important role in monitoring and enforcing compliance with State Significant Development approvals. The Department's compliance teams:

- conduct inspections and audits of approved projects
- respond to reports and complaints received from local councils, members of the public and other State agencies
- investigate potential breaches
- carry out enforcement action where breaches are confirmed

A compliance policy and associated guidelines for breach management, prosecutions and penalty notices are available on the Department of Planning & Infrastructure's website ([www.planning.nsw.gov.au](http://www.planning.nsw.gov.au)).

## Compliance during construction

Conditions of consent for wind farms classed as State Significant Development may require applicants to develop a compliance tracking program to monitor the environmental performance of their projects during the construction phase to ensure compliance is achieved. This should include mechanisms for reporting outcomes, recording incidents and procedures for rectifying any non-compliance - including in relation to:

- construction hours along with noise performance
- road dilapidation reports and changes to road conditions and associated works
- implementation of any conditions to protect endangered species nominated in the consent
- location of turbines in relation to vegetation clearing, especially hollow bearing trees
- the revegetation and rehabilitation program
- implementation of advice from Rural Fire Service about risk management
- storage and management of any dangerous goods
- dust and water quality management
- construction waste recycling, treatment and disposal management.

## **Compliance during operation**

Conditions of consent for wind farms classed as State Significant Development will require applicants to undertake compliance monitoring including noise monitoring and bird and bat monitoring.

### **(a) Noise compliance monitoring**

The purpose of operational noise compliance monitoring is to assess whether the wind farm is operating in compliance with the approved noise limits and ensure that any exceedances identified are rectified in a satisfactory manner. Conditions of consent may require the applicant to prepare and submit a Noise Compliance Report within 12 months of the commencement of operation of a large-scale wind farm to:

- assess the performance of the wind farm against the operational noise criteria,
- undertake noise monitoring during period(s) commensurate with the 'worst case' operational and meteorological factors (including temperature inversions)
- consider any relevant special audible characteristics including modulation-related noise from the wind turbines and any cumulative noise impacts from the operation of the turbines and substation
- make the noise compliance report publicly available to the community consultation committee and on the proponent's website

If noise compliance monitoring indicates that noise from the wind turbines exceeds the approved noise limits, the applicant must identify reasonable and feasible noise mitigation and management measures to achieve compliance with the noise limits, including a timetable for their implementation. Once all reasonable and feasible source controls (for example, sector management) have been exhausted, remedial measures should be considered. Depending on the nature of the issue, remedial measures may include offering building acoustic treatments and / or noise screening to affected residents (only with their agreement). The Noise Compliance Report must include details of exceedances and discussions with affected landowners where at-receiver measures are proposed.

### **(b) Independent noise review**

A neighbour may ask the Director-General in writing for an independent review of the impacts of the wind farm project on his/her land. If the Director-General is satisfied that an independent review is warranted, then the Director-General may require the proponent to commission a suitably qualified, independent expert, whose appointment has been approved by the Director-General, to consult with the landowner to determine his/her concerns, and conduct monitoring to determine whether the project is complying with the relevant impact assessment criteria.

If the project is not complying with these criteria then measures to ensure compliance with the relevant criteria must be identified and implemented in consultation with the affected neighbour. Alternatively, the proponent may seek to secure a written agreement with the neighbour to allow exceedances of the relevant criteria to occur. A copy of the independent review must be provided to the Director-General and the affected neighbour.

### **(c) Bird and bat monitoring**

Prior to the commencement of construction, the applicant may be required to prepare and submit a *Bird and Bat Adaptive Management Program* to monitor, assess, avoid, mitigate and report on bird and bat impacts from a wind farm. The program, to be prepared by a suitably qualified expert, will include a monitoring and decision matrix that clearly sets out how the proponent will respond to the outcomes of the monitoring. The applicant's bird and bat monitoring reports should be made publicly available.

## Decommissioning and rehabilitation

Once installed, wind turbines typically have an expected operating life of around 20-25 years at which point they are usually decommissioned. As noted, the applicant should include an outline Decommissioning and Rehabilitation Plan in their assessment report.

If a Development Application for a wind farm classed as State significant development is approved, decommissioning requirements will be reflected in the Conditions of Consent issued by the consent authority. Conditions of Consent will generally require that:

- The wind farm owner is responsible for decommissioning (not the landowner) and that the applicant/wind farm owner must provide evidence to demonstrate this prior to construction commencement.
- The Decommissioning and Rehabilitation Plan must be updated every 5 years and made public on the applicant's website as well as providing a copy to the relevant consent authority.
- The turbines and associated facilities must be decommissioned within 18 months of cessation of the operation of the project.
- Any individual turbine that ceases operating for more than 12 months must be dismantled within 18 months



## Appendix F: Additional information and resources

Additional information and resources relevant to wind farms are outlined below. Note that the relevance of different guidelines may vary depending on whether a wind farm Development Application is considered as local, regional or State significant development.

Issue	Reference
<b>Aircraft safety</b>	<ul style="list-style-type: none"> <li>▪ Aerial Agricultural Association of Australia (2009), Windfarm Policy, <a href="http://www.aerialag.com.au">www.aerialag.com.au</a></li> <li>▪ Aerial Agricultural Association of Australia (2009), Powerlines Policy, <a href="http://www.aerialag.com.au">www.aerialag.com.au</a></li> <li>▪ AirServices Australia, <i>Information Sheet – Airport Related Development</i></li> <li>▪ Civil Aviation Safety Authority (2007), <i>Advisory Circular 139-18(0) Obstacle Marking and Lighting of Wind Farms</i> (Note: this advisory is currently withdrawn; a replacement had not been issued at the time of publication of these guidelines)</li> </ul>
<b>Community attitudes</b>	<ul style="list-style-type: none"> <li>▪ Department of Environment, Climate Change and Water (2010), <i>Community Attitudes to Wind Farms in NSW</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ NSW Electoral Commission (2008), <i>Community attitudes towards wind farms in Upper Lachlan Shire Council</i>, results of a poll conducted during the 2008 local government elections <a href="http://www.elections.nsw.gov.au">www.elections.nsw.gov.au</a></li> </ul>
<b>Community wind</b>	<ul style="list-style-type: none"> <li>▪ Alternative Technology Association, <i>Australian non-profit organisation that can provide advice on community wind power projects</i>, <a href="http://www.ata.org.au">www.ata.org.au</a></li> <li>▪ Embark, <i>Australian non-profit organisation focused on accelerating the uptake of community renewable energy projects in Australia including wind projects</i>, <a href="http://www.embark.com.au">www.embark.com.au</a></li> <li>▪ Hepburn Wind, <i>community wind power project underway in Australia</i>, <a href="http://www.hepburnwind.com.au">www.hepburnwind.com.au</a></li> </ul>
<b>Ecological</b>	<ul style="list-style-type: none"> <li>▪ Australian Wind Energy Association, <i>Assessing the Impacts on Birds – Protocols and Data Set Standards</i></li> <li>▪ Auswind (2005), <i>Wind Farms and Birds: Interim Standards for Risk Assessment</i></li> <li>▪ DEC (2004), <i>Threatened Biodiversity Survey and Assessment – Guidelines for Developments and Activities Working Document</i></li> <li>▪ DEC (2007), <i>Threatened Species Assessment Guidelines – Assessment of Significance</i></li> <li>▪ DECCW (2009), <i>Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians</i></li> <li>▪ Department of Environment and Heritage (2006), <i>Cumulative Risk for Threatened and Migratory Species</i></li> <li>▪ DEWHA (2008), <i>EPBC Act Policy Statement 2.3 – Wind Farm Industry</i>, <a href="http://www.environment.gov.au">www.environment.gov.au</a></li> </ul>
<b>Greenhouse</b>	<ul style="list-style-type: none"> <li>▪ Department of Environment, Climate Change and Water (2010), <i>Estimating Greenhouse Gas Emissions Abatement</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ Department of Environment, Climate Change and Water, <i>NSW wind farm greenhouse gas savings tool</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> </ul>
<b>Heritage</b>	<ul style="list-style-type: none"> <li>▪ DECCW (2010), <i>Aboriginal Cultural Heritage Consultation requirements for applicants</i></li> <li>▪ DECCW (2010), <i>Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW</i></li> <li>▪ OEH (2011), <i>Applying for Aboriginal Heritage Impact Permits: Guide for Applicants</i></li> </ul>

Issue	Reference
<b>Human health</b>	<ul style="list-style-type: none"> <li>▪ National Health and Medical Research Council (2010), <i>Public Statement: Wind Turbines and Health</i>, <a href="http://www.nhmrc.gov.au">http://www.nhmrc.gov.au</a></li> <li>▪ National Health and Medical Research Council (2010), <i>Wind Turbines and Health – A Rapid Review of the Evidence</i>, <a href="http://www.nhmrc.gov.au">http://www.nhmrc.gov.au</a></li> <li>▪ State Government of Victoria, Australia, Department of Health, <i>Statement on wind farms and human health</i>, <a href="http://www.health.vic.gov.au/environment/community/windfarms.htm">www.health.vic.gov.au/environment/community/windfarms.htm</a></li> </ul>
<b>Jobs</b>	<ul style="list-style-type: none"> <li>▪ The Climate Institute (2011), <i>Clean energy jobs in regional NSW</i>, <a href="http://www.climateinstitute.org.au">www.climateinstitute.org.au</a></li> <li>▪ The Climate Institute (2011), <i>Clean energy jobs in Regional Australia</i>, <a href="http://www.cleanenergyjobsmap.climateinstitute.org.au">www.cleanenergyjobsmap.climateinstitute.org.au</a></li> </ul>
<b>Landscape</b>	<ul style="list-style-type: none"> <li>▪ Australian Wind Energy Association and Australian Council of National Trust (2007), <i>Wind Farms and Landscape Values: National Assessment Framework</i>, <a href="http://www.cleanenergycouncil.org.au">www.cleanenergycouncil.org.au</a></li> </ul>
<b>Mapping</b>	<ul style="list-style-type: none"> <li>▪ Department of Planning and Infrastructure (2011), <i>NSW wind map</i>, <a href="http://www.planning.nsw.gov.au">www.planning.nsw.gov.au</a></li> <li>▪ Sustainable Energy Development Authority (2002), <i>The New South Wales Wind Atlas</i>, <a href="http://www.industry.nsw.gov.au">www.industry.nsw.gov.au</a></li> </ul>
<b>Miscellaneous</b>	<ul style="list-style-type: none"> <li>▪ Clean Energy Council, <i>peak body representing the wind farm industry in Australia</i>, <a href="http://www.cleanenergycouncil.org.au">www.cleanenergycouncil.org.au</a></li> <li>▪ Department of Planning and Infrastructure, <i>NSW Major Project Register</i>, assessment documentation for major wind farm projects that are approved or under assessment, <a href="http://www.planning.nsw.gov.au">www.planning.nsw.gov.au</a></li> <li>▪ Department of Planning and Infrastructure (2005), <i>Development Contributions Practice Note</i>, <a href="http://www.planning.nsw.gov.au">www.planning.nsw.gov.au</a></li> <li>▪ Department of the Environment, Climate Change and Water (2010), <i>The wind energy fact sheet</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ Office of Environment and Heritage, <i>NSW Renewable Energy Precincts</i>, community information and education initiative focusing on wind energy, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ Sustainable Energy Development Authority (2002), <i>NSW Wind Energy Handbook</i>, <a href="http://www.industry.nsw.gov.au">www.industry.nsw.gov.au</a></li> </ul>
<b>Noise</b>	<ul style="list-style-type: none"> <li>▪ <i>Australian Standard AS 4959-2010 Acoustics – Measurement, prediction and assessment of noise from wind turbine generated</i></li> <li>▪ Broner, N. (2010), <i>A simple criterion for low frequency noise emission abatement</i>, 'Journal of low frequency noise, vibration and active control', Volume 29, Number 1, 2010</li> <li>▪ DECC (2006), <i>Assessing Vibration: A technical guideline</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ DECC (2009), <i>Interim Construction Noise Guidelines</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ DECCW (2011), <i>NSW Road Noise Policy</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ EPA (2000), <i>NSW Industrial Noise Policy</i>, <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></li> <li>▪ Hellweg, O'Neal and Lampeter (2011), <i>Low frequency noise and infrasound from wind turbines</i>, 'Noise Control Engineering Journal', Volume 59, Number 2, March-April 2011</li> <li>▪ Moller, H. and Pedersen, C. S. (2010), <i>Low-frequency noise from large wind turbines</i></li> <li>▪ Sonus (2010), <i>Infrasound measurements from wind farms and other sources</i>, study commissioned by Pacific Hydro Pty Ltd.</li> <li>▪ World Health Organisation (1999), <i>Guidelines for Community Noise</i></li> <li>▪ World Health Organisation (2009), <i>Night noise guidelines for Europe</i></li> </ul>
<b>Planning guidelines</b>	<ul style="list-style-type: none"> <li>▪ Auswind (now the Clean Energy Council), 2006, <i>Best Practice Guidelines for Implementation of Wind Energy Projects in Australia</i>, <a href="http://www.cleanenergycouncil.org.au">www.cleanenergycouncil.org.au</a></li> <li>▪ Department of Planning and Infrastructure (2002), <i>Draft EIS Guideline: Network Electricity Systems and Related Facilities</i>, <a href="http://www.planning.nsw.gov.au">www.planning.nsw.gov.au</a></li> </ul>

Issue	Reference
	<ul style="list-style-type: none"> <li>▪ Environment Protection and Heritage Council (2009), <i>Draft National Wind Farm Development Guidelines</i>, <a href="http://www.ephc.gov.au">www.ephc.gov.au</a></li> </ul>
<b>Property values</b>	<ul style="list-style-type: none"> <li>▪ NSW Valuer General (2009), <i>Preliminary assessment of the impact of wind farms on surrounding land values in Australia</i>, <a href="http://www.lands.nsw.gov.au">http://www.lands.nsw.gov.au</a></li> </ul>
<b>Water quality</b>	<ul style="list-style-type: none"> <li>▪ ANZECC (2000), <i>National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i></li> <li>▪ DECC (2008), <i>Managing Urban Stormwater: Soils and Construction, Volume 2C Unsealed roads</i></li> <li>▪ Department of Water and Energy (2008), <i>Guidelines for Controlled Activities</i>, covers watercourse crossing, instream works, laying pipes and cables in watercourses, outlet structures, and riparian corridors.</li> <li>▪ DLWC (1998), <i>NSW State Groundwater Quality Protection Policy</i></li> <li>▪ DLWC (2002), <i>The NSW State Groundwater Dependent Ecosystems Policy</i></li> <li>▪ Landcom (2004), <i>Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition</i></li> </ul>

