Department of Planning and Environment

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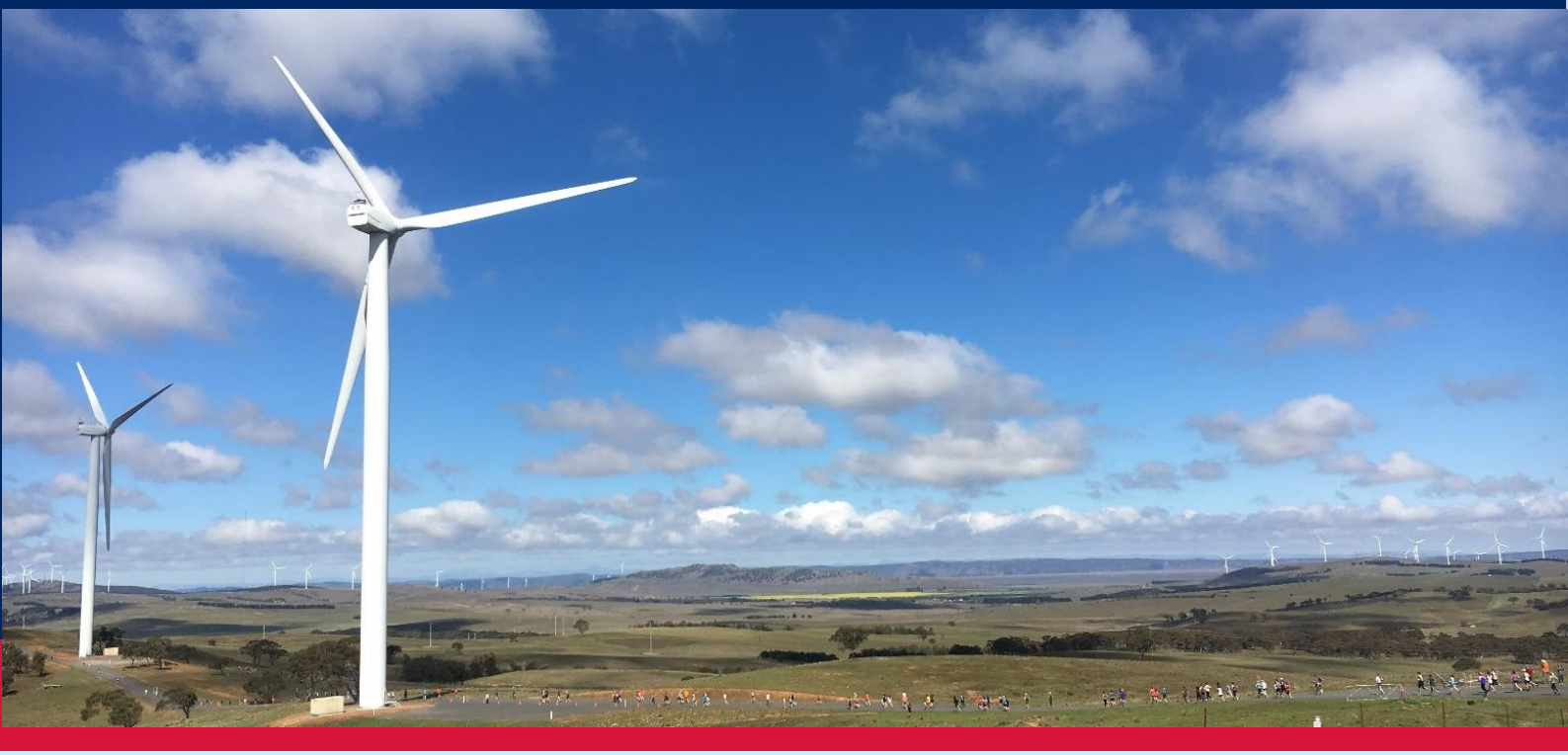
NSW GOVERNMENT

Draft Wind Energy Guideline



Guidance for state significant wind energy development

November 2023

Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Contents

Abbreviations

AEIC	Australian Energy Infrastructure Commissioner
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity development assessment report
CASA	Civil Aviation Safety Authority
CIV	Capital investment value
DA	Development application
EIS	Environmental impact statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Reg	Environmental Planning and Assessment Regulation 2021
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPA	NSW Environment Protection Authority
EPL	Environment protection licence
LEP	Local environmental plan
NHMRC	National Health and Medical Research Council
REZ	Renewable energy zone
SEARs	Secretary's environmental assessment requirements
Transport and Infrastructure SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021*
SSD	State significant development
VPA	Voluntary planning agreement

Glossary of terms

Applicant	The applicant of an SSD project seeking consent for a development application or modification application
Associated residence	A residence on privately-owned land in respect of which the owner has reached an agreement with the applicant in relation to the development and management of impacts
Benefit sharing	Benefit sharing aims to distribute benefits generated by a project between the applicant and the community through mutually agreed opportunities such as funding or sponsoring local community initiatives, programs or projects
Candela	The luminous intensity of a light source
Consent authority	The authority responsible for granting or refusing consent for a development application or modification application
Department	The Department of Planning and Environment
Decommissioning	The removal of wind turbines and ancillary infrastructure
Development application (DA)	An application made seeking consent for SSD under Part 4 of the EP&A Act
Environmental impact statement (EIS)	An environmental impact statement prepared by or on behalf of the applicant to accompany a DA. It includes a comprehensive assessment of the environmental, social and economic impacts of the project.
Landscape	A holistic area comprised of its various parts including landform, vegetation, buildings, villages, towns, cities and infrastructure
Landscape character	An area or sense of place definable by the quality of its built, natural and cultural elements
Modification application	An application seeking to modify a development consent, which may include revoking or varying a condition of consent A modification requires consent under the EP&A Act

Non-associated residence	A residence on privately-owned land in respect of which the owner has not reached an agreement with the applicant in relation to the development or A residence on privately-owned land in respect of which the owner has reached an agreement with the applicant in relation to the development, but the agreement does not cover the relevant impact or the performance measure for such impact under that agreement has been exceeded
Planning Secretary	The Secretary of the Department of Planning and Environment
Rehabilitation	The restoration of land disturbed by the development to a good condition, to ensure it is safe, stable and non-polluting
Renewable Energy Zone	A designated area to support renewable energy development as declared in the *Electricity Infrastructure Investment Act 2020*
SEARs	The Planning Secretary's environmental assessment requirements, which set out the matters that must be addressed in an EIS
Sensitivity	An element of landscape and visual impact assessment that defines the capacity to absorb the impacts from a proposed land use change and/or built form
State significant development	A development declared to have state significance due to its size, economic value or potential impacts
Viewpoint	A location within the private or public domain with a potential view of a wind energy project
Visual magnitude	The apparent size of a wind energy project in the landscape or when viewed from a given viewpoint
Wind energy development	Works, infrastructure and buildings for the purpose of generating electricity using wind turbines

1 Introduction

Australia has world-class wind energy resources and an established wind energy industry which is currently the second largest contributor to the clean energy transition after rooftop and large-scale solar. The Australian Energy Market Operator estimates that twice the current amount of wind capacity will be required by 2030 to meet electricity demand.

The NSW Government strongly promotes the ongoing development of a sustainable wind energy industry in NSW. Wind energy supports the state's transition away from fossil fuels, helps reduce greenhouse gas emissions and contributes to the delivery of a safe, stable and reliable energy supply to the people of NSW. This transition will help secure the State's Net Zero by 2050 commitment by driving down carbon emissions and increasing our resilience in the face of climate change.

Energy security concerns and new policies have accelerated the installation of renewable power and renewable energy capacity is predicted to expand much faster in the next five years. In 2021, wind and solar generated 10 per cent of electricity globally and this is expected to double by 2027.

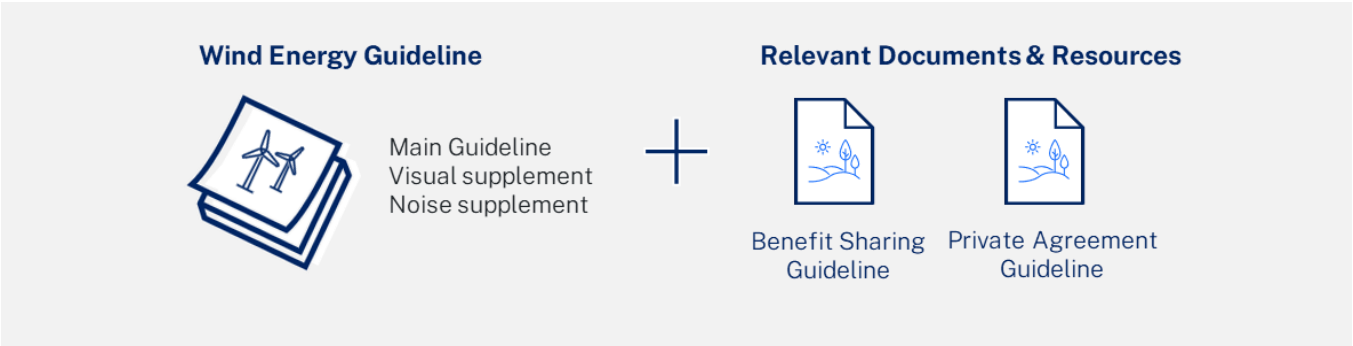
The revised Wind Energy Guideline provides updated guidance to the community, industry, applicants and regulators about the planning framework for the assessment of wind energy projects under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The guideline identifies key planning considerations relevant to wind energy development and provides updated policy and technical guidance for key issues including visual, noise and biodiversity impacts.

The guideline is supported by two technical supplements. The first for landscape and visual impact assessment which provides detailed guidance and tools for assessing, evaluating, and mitigating visual and landscape impacts. The second for noise impact assessment which provides a methodology for assessing, evaluating and mitigating potential noise impacts.

The guideline is part of a Renewable Energy Framework, and should be read in conjunction with the:

- *Draft Benefit Sharing Guideline (2023)* – provides a policy and guidance for sharing the benefits of renewable energy development with host communities
- *Draft Private Agreement Guideline (2023)* – provides guidance for landholders and applicants entering into private agreements for the use of land or the acceptance of impacts.

The Department of Planning and Environment (the department) will review and update this guideline over time to ensure it reflects any changes in knowledge and technology as the wind energy industry continues to develop and evolve.



1.1 Objectives

The objectives of the guideline are to:

- support the development of a sustainable wind energy industry in NSW by providing a clear, consistent and responsive policy framework
- encourage industry to select suitable sites for projects and locations for turbines to avoid or reduce the likelihood of land use conflicts and environmental and social impacts
- provide clear and consistent guidance on how to measure and assess key environmental impacts of wind energy projects in NSW
- promote meaningful, respectful, effective and best practice community and stakeholder engagement throughout the development assessment process

1.2 Wind energy

Wind energy is the process by which the wind is used to generate electricity. Wind turbines convert the kinetic energy in the wind into mechanical power which is then converted into electricity. With advancements in technology, wind turbines are getting larger (bigger blades), taller and more efficient. Utility scale wind turbines in NSW are now typically around 200 m in height (although new developments are proposing up to 300 m) and newer turbine models can generate up to 7 MW of electricity, enough to power 4000 homes.

Wind energy development involves the installation of wind turbines in large groups (see Figure 1). It also includes a range of associated infrastructure, works and buildings including internal access roads, hardstand areas, underground and overhead cabling, electrical operations and maintenance facilities and connections to the transmission network. Wind monitoring masts are also installed as part of the development to gather data on meteorological conditions and are typically the same height or higher than the turbines.

Some wind energy developments also include battery energy storage systems to enable energy produced from the wind turbines to be distributed at a later time.

1.3 Strategic context

In March 2020, the NSW Government released the first stage of its Net Zero Plan, which outlines a clear objective to achieve net zero emissions by 2050 while also creating new jobs, reducing household costs and attracting investment to NSW. To achieve these targets, 4 of 5 coal-fired power stations will come to their scheduled end of life in the next 15 years. These 4 power stations currently generate approximately 75% of NSW's annual electricity.

An increasing supply of renewable energy generation, including wind power, will be required over the coming decades to meet the NSW Government's net zero target. The NSW Government's Electricity Infrastructure Roadmap sets out a 20-year plan to deliver this generation infrastructure, as well as the storage, firming and transmission infrastructure required to ensure NSW has continued access to cheap, clean and reliable energy as coal-fired power stations are retired.

The roadmap is estimated to attract up to $32 billion of private sector investment in electricity infrastructure by 2030, supporting 6,300 construction jobs and 2,800 ongoing jobs, most of which will be in regional NSW.

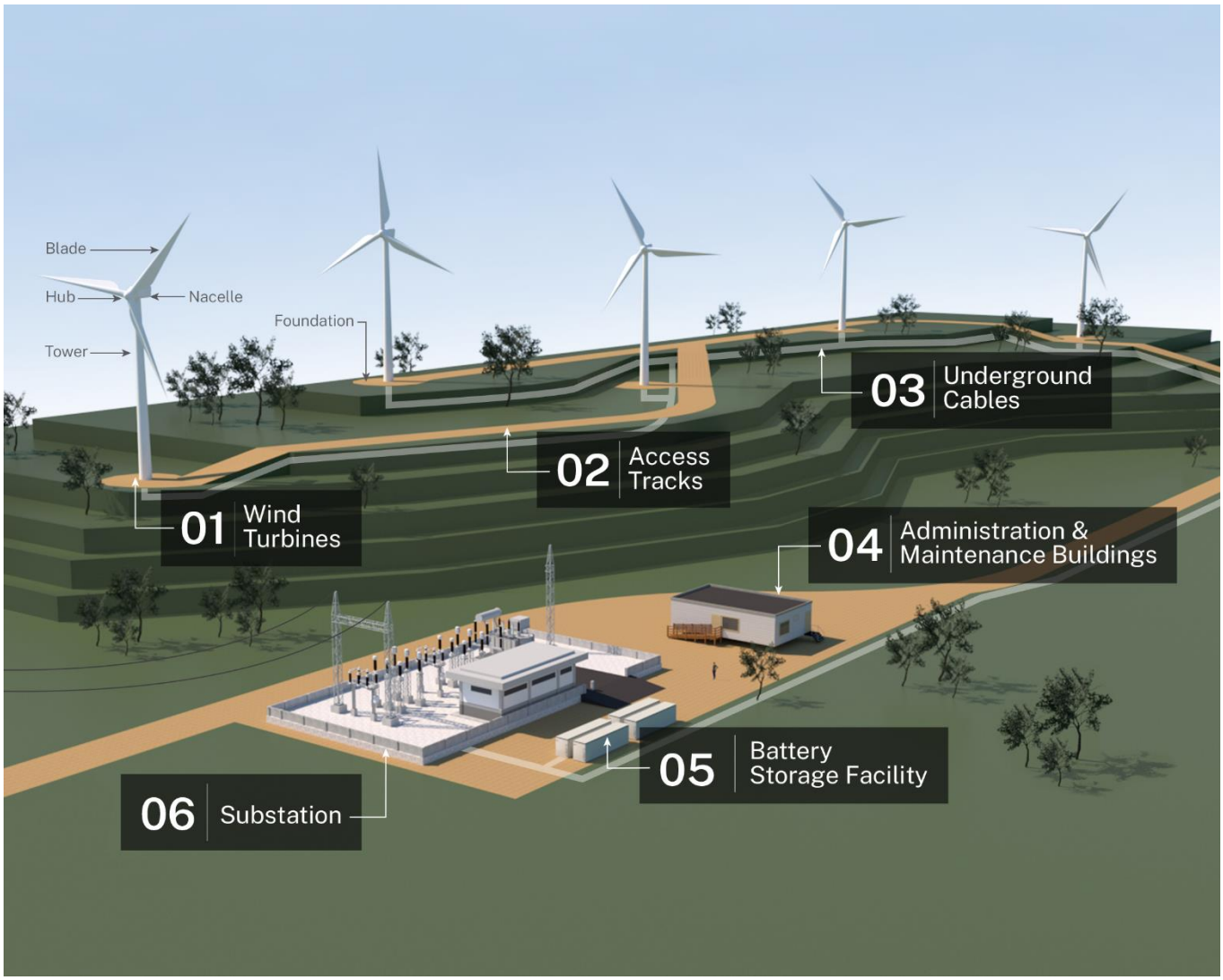


Figure 1 – Components of a typical wind energy project

1.3.1 Renewable energy zones

As part of the roadmap, the NSW Government has committed to deliver at least 5 renewable energy zones (REZs) in the Central-West Orana, New England, South-West, Hunter Central Coast and Illawarra regions of NSW. The Energy Corporation of NSW will lead the coordination and delivery of these REZs.

REZs are modern-day power stations. They combine renewable energy generation such as wind and solar, storage such as batteries, and network infrastructure such as high-voltage poles and wires in dedicated areas in NSW.

The NSW Government will encourage development in REZs to support a transition to renewable energy. This will ensure that development occurs in appropriate areas close to existing transmission

and distribution infrastructure and has fewer environmental and land-use constraints than some other parts of NSW.

While the majority of investment in and development of wind energy projects will be concentrated in the REZs, there are potential wind resources available in a select number of sites outside of these zones. Continued wind generation in these areas will further support the transition. This guideline applies to wind energy projects both inside and outside the REZs.

1.4 Application of the guideline

This guideline applies to onshore wind energy development declared as State significant development (SSD). Wind energy projects located offshore are not covered in this guideline as they are likely to have different site selection and impact assessment issues. The assessment and management of any offshore wind projects will also be led by the Commonwealth government as key infrastructure (i.e. turbines) would be located outside the jurisdictional boundaries of NSW.

Applicants of wind energy projects must consider the guideline and supporting technical supplements for visual and noise impact assessment where referenced in the Secretary's environmental assessment requirements (SEARs) and prepare its environmental impact statement (EIS) in accordance with the technical guidance.

In the case that SEARs are already issued when the Guideline is finalised and the applicant is yet to submit an EIS, the Guideline will apply if an EIS is not submitted within 6 months from the date of publication of the guideline.

The guideline and technical supplements should also be considered when preparing and assessing applications to modify an SSD consent for large-scale wind energy development. Applicants are encouraged to consult with the department when determining the level of assessment that should be undertaken. The level of detail should be proportionate to the scale of the modification and the likely additional impacts.

2 Planning Framework

The EP&A Act sets out the environmental planning and assessment framework for all development in NSW. This framework identifies where wind energy development may be permitted and the process by which it must be assessed and determined.

2.1 Wind energy projects as 'state significant development'

Most wind energy projects in NSW are considered to be SSD. A wind energy project is SSD[1] if it requires development consent and has:

- a capital investment value of more than $30 million, or
- a capital investment value of more than $10 million and is located in an environmentally sensitive area of state significance[2].

The Minister for Planning and Public Spaces (the Minister) may also, by way of an order, declare specified development on specified land to be SSD. The Minister is generally the consent authority for SSD, and a senior departmental officer may exercise the Minister's consent authority functions in accordance with certain delegations.

However, the Independent Planning Commission is the consent authority for SSD applications in the following circumstances (unless the application to carry out the development is made by or on behalf of a public authority or unless the development is declared to be SSI related development):

- 50 submissions of objection (other than from council) are made during the exhibition of the application
- the local council objects to the SSD application
- the applicant has disclosed a reportable political donation.

2.2 Where is wind energy development allowed?

The EP&A Act and relevant environmental planning instruments, including local environmental plans (LEPs) and state environmental planning policies (SEPPs), determine where wind energy development is permitted. Key provisions include:

- the zoning and land use provisions of the relevant LEP(s)
- Part 2.3, Division 4 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) for electricity generating works

In general, wind energy development is permissible with consent on any land zoned for rural (RU1, RU2, RU3, RU4), industrial (IN1, IN2, IN3, IN4) or special purpose (SP1, SP2) uses in the relevant LEP[3].

[1] Section 4.6, *EP&A Act*; section 2.6 and schedule 1, section 20, *State Environmental Planning Policy (Planning Systems) 2021*

[2] 'Environmentally sensitive area of State significance' is defined in section 2.2 of the *State Environmental Planning Policy (Planning Systems) 2021*

[3] Section 2.36(1)(b),*State Environmental Planning Policy (Transport and Infrastructure) 2021*

Where wind energy development is permitted with consent (or partly permitted), the applicant can lodge a DA for determination by the relevant consent authority if it has the consent of the owner of the land.

Not all aspects of a wind energy proposal will need development consent. For example, wind monitoring towers may be installed without planning approval (as 'exempt development') under the Transport and Infrastructure SEPP if they comply with specific requirements and would be used to investigate the feasibility of a wind resource. Electricity transmission and distribution lines might also be assessed under a different planning pathway (see Section 2.4.3).

2.2.1 Landowner's consent

If the applicant is not the owner of the land to which the DA relates (or is not the only owner), the DA may only be made with the consent of the owner of the land[4]. If there is more than one landowner, the consent of all landowners must be obtained (subject to the exceptions in s 23(2) EP&A Regulation 2021).

The consent of the owner of the land is not required for a DA made by a public authority or if it is specially designated as public notification development[5], provided the applicant gives notice in accordance with sections 23(3) and (4) of the EP&A Regulation.

Once approved, the applicant has a set time within which to commence construction of the project, and consent will lapse after this time. It should be noted that the landowner is not required to carry out the approved development.

If a project is proposing changes to an existing substation, consent must be obtained from Transgrid or the relevant distributor.

If an applicant is seeking to modify an existing development consent (see Section 2.3.2), a modification application may only be made if all owners of the land to which the consent applies provide written consent[6].

2.2.2 Regional cities

The NSW Government's regional plans identify cities that are strategically important to the ongoing growth and development of regional NSW.

Over the next few decades, significant population growth is predicted for regional cities and investment in these cities is important as they represent major centres for housing, employment, commerce, tourism, education, health and other regional infrastructure and services.

For wind energy developments to be approved near certain regional cities, the consent authority will need to be satisfied that any urban land conflicts, impacts on urban growth potential and important scenic values are not significant.

[4] Section 23(1)(b), *Environmental Planning and Assessment Regulation 2021* (EP&A Reg)

[5] Section 23(2) of the EP&A Reg

[6] Landowner's consent is required from all owners of land to which the approval the subject of the modification applies (i.e., the owners of land specified in the approval).

The Transport and Infrastructure SEPP contains the specific matters for consideration that apply to renewable energy proposals near regional cities. The matters apply to SSD development for wind energy generation located on mapped land for the regional cities of Albury, Armidale, Bathurst, Dubbo, Goulburn, Griffith, Goulburn, Mudgee, Orange, Tamworth and Wagga Wagga.

While these provisions do not prohibit wind development in these areas, a consent authority must not grant development consent unless it is satisfied that the development:

- is located to avoid significant conflict with existing or approved residential or commercial uses of land surrounding the development, and
- is unlikely to have an adverse impact on the regional city's capacity for growth, or scenic quality or landscape character.

In considering these matters, the consent authority must factor in any proposed measures to avoid or mitigate those conflicts and adverse impacts.

2.3 Process for assessing wind energy projects

All DAs for wind energy projects will be subject to a rigorous, merit-based assessment that includes extensive community consultation and a detailed consideration of any environmental, social and economic impacts.

The main steps in the assessment process are shown in **Figure 2** and summarised below. The process is explained in more detail in the department's State Significant Development Guidelines.

2.3.1 Development applications

All DAs for SSD projects must be accompanied by an EIS. The purpose of the EIS is to help the community, councils, government agencies and the consent authority understand the impacts of a project so they can make informed submissions or a decision about a project's merits.

The EIS must be prepared in accordance with the SEARs. The SEARs identify the information that must be provided in the EIS, and the community engagement that must be carried out.

To enable the department to issue SEARs, the applicant must submit a scoping report that provides a clear overview of the project (for example, its location, proposed layout and proximity to important features, protected areas and neighbours) and identifies the key environmental assessment issues including a preliminary assessment of visual and landscape impacts using the tools provided in the supporting *Technical Supplement for Landscape and Visual Impact Assessment*.

The scoping report should also outline how the applicant has engaged with the local community about the project and how it intends to undertake meaningful consultation with affected stakeholders during the assessment process (refer Section 3 for further guidance).

This scoping report must be prepared to a high standard having regard to the department's State Significant Development Guidelines.

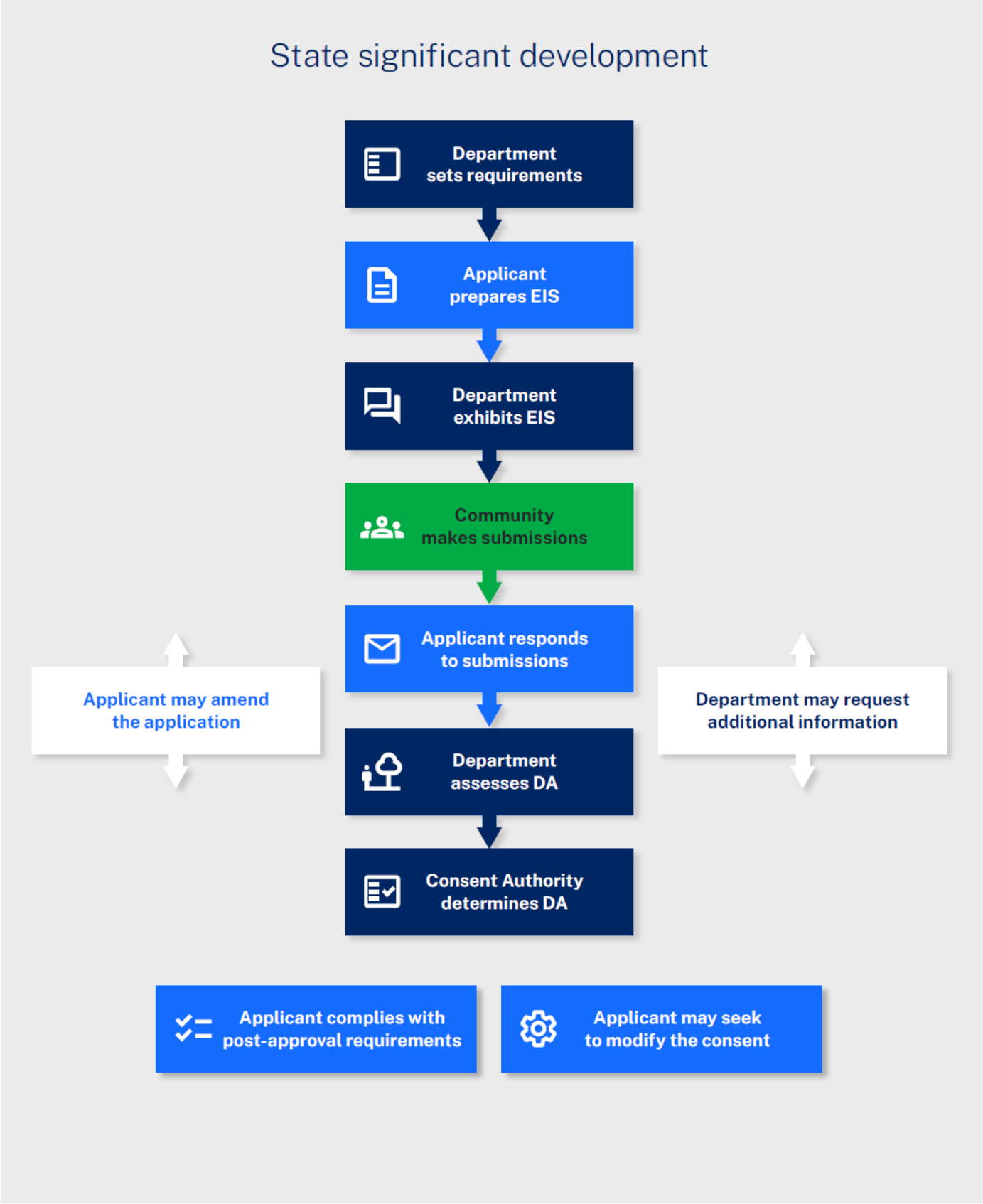


Figure 2 - SSD Assessment Process

Once the department receives the EIS, it will exhibit the DA for at least 28 days, or longer if the exhibition extends over the Christmas and New Year period[7]. This gives the community an opportunity to have a say on the merits of a project before any final decision is made. Other government agencies may also provide advice during this stage.

The consent authority will assess the overall significance of any impacts by reviewing the environmental assessment and submissions and considering the broader public interest. Any development consent granted will be subject to certain conditions (see Section 2.5).

2.3.2 Modifying an approved project

An applicant may apply, under the EP&A Act, to amend an SSD development consent. A consent authority may modify an SSD consent provided that, among other matters, the development as modified will be substantially the same as the development for which the consent was originally granted. Modifications may be necessary to change or improve the design of the project (for example, by adding battery storage or increasing the size and height of the turbines) or to change the conditions of the development consent.

A modification must be assessed and determined under the EP&A Act and in accordance with the process described in the department's State Significant Development Guidelines.

2.4 Other approvals that may be needed

This section outlines some of the other approvals that may be required in addition to the development consent. If in doubt about what approvals are required, applicants should consult the department or relevant government agency for further information.

2.4.1 Commonwealth approval

Under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) an approval from the Commonwealth Government may be required if a development is likely to have a significant impact on matters of national environmental significance or other protected matters. This includes, but is not limited to, listed threatened species and ecological communities.

An applicant must refer their project to the Commonwealth Department of Climate Change, Energy, the Environment and Water if it is likely to have a significant impact on matters of national environmental significance.

The Commonwealth Government's Significant Impact Guidelines provide guidance on whether or not an impact is likely to be significant. Referrals can be made on the Commonwealth Government's EPBC Act Business Portal.

The NSW assessment process for SSD under the EP&A Act has been accredited under a bilateral agreement with the Commonwealth Government. Under this agreement, the assessment of both NSW and Commonwealth matters can be integrated into a single assessment process. This means that as well as the SEARs, the EIS will need to consider additional matters as identified by the

[7] Schedule 1, Clause 16, *Environmental Planning and Assessment Act 1979*.

Commonwealth Government. Following an assessment and determination by the NSW government, the Commonwealth makes its decision under the EPBC Act by reviewing the department's report and issues any additional conditions of consent as part of their approval.

2.4.2 Subdivisions

Some sites may require the subdivision of land to support the proposed development. For example, subdivisions may be required for substations within a project site, or for land that will be leased for longer than 5 years[8]. If an applicant wishes to include a subdivision in the scope of its SSD application, it should first discuss subdivision options with the relevant council.

2.4.3 Network connections and transmission lines

Wind energy development will need network connections to the electricity transmission network or distribution grid to enable the distribution of the generated electricity. This may include associated infrastructure such as substations, converter stations, transmission lines and access roads.

Applicants are encouraged to consult with the relevant transmission or distribution network service provider early in the project planning process to identify the scope of works required to enable connection, and to determine the planning assessment pathway for those works.

Where possible, Applicants should include network connection works as part of their SSD application to streamline stakeholder engagement and to ensure that all aspects of the development are considered by the department during the assessment process. The potential environmental impacts of network connections, including the impacts associated with the construction of substations and above ground and underground infrastructure, should be included in the EIS. Additional approvals may be required for transmission lines.

While it may not strictly apply, the applicant should refer to the *Draft Transmission Guideline (2023)* for guidance on assessment issues and considerations associated with major transmission infrastructure.

2.4.4 Environment protection licence

An environment protection licence (EPL) regulated under the *Protection of the Environment Operations Act 1997* (POEO Act) is required for wind energy projects. The POEO Act aims to prevent the degradation of the environment by promoting pollution prevention, elimination of harmful wastes and the re-use, recovery or recycling of materials. An EPL is issued by the NSW Environment Protection Authority (EPA) and regulates the approved project for issues covered under the POEO Act, such as noise, air quality and water management. The requirements of the EPL are informed by and must be consistent with the development consent conditions, which form part of the regulatory framework for wind energy developments (discussed further below).

[8] Section 7A, *Conveyancing Act 1919* (NSW)

2.5 Regulation of approved wind energy projects

When a wind energy project is approved, the development consent will include conditions for managing and mitigating the impacts of the development, including but not limited to:

- visual impact mitigation, such as landscaped screening at affected dwellings
- road upgrades, site access and maintenance requirements
- stormwater management, erosion and sediment control and flood mitigation works
- biodiversity management and mitigation measures
- heritage protection measures
- obligations to manage risks associated with bushfire and dangerous goods
- decommissioning and rehabilitation of the site should the development cease to operate, and
- requirements for the minimisation and management of waste.

These conditions continue to apply to the project and related land throughout its construction and operational life, as well as during decommissioning and rehabilitation phases.

2.5.1 Compliance

Applicants are responsible for complying with the conditions of consent under the EP&A Act. The department's compliance teams are responsible for monitoring compliance with the conditions of consent, including following up any suspected breaches reported by the public.

Compliance-related complaints regarding wind energy development consents can be made via the department's website. The department's compliance team will contact the complainant within 14 days to seek further information or provide a progress update.

All wind energy development must comply with the EPL for the project. The EPA is the regulatory authority for the purpose of the POEO Act.

2.6 Critical state significant infrastructure

The Minister may declare development to be Critical State Significant Infrastructure (CSSI) under section 5.13 of the EP&A Act if it is considered essential to the State for economic, environmental, or social reasons. The department's Declaration of SSI and CSSI guideline sets out the general principles and reasons for the Minister to declare development as CSSI. The Minister will consider requests to declare wind energy development to be CSSI if it includes a significant energy storage system (for example, a delivery capacity of 750 megawatts or more).

While the assessment process is generally the same as SSD, there are few key differences. The Minister is the determining authority for all CSSI decisions and cannot delegate this function. Additionally, landowners' consent is not required for CSSI applications, and a decision made cannot be subject to judicial review (a review of the administrative decisions and conduct) by the Land and Environment Court unless approved by the Minister. The process is explained in more detail in the Department's State Significant Infrastructure Guidelines.

3 Community and stakeholder engagement

Effective community and stakeholder engagement is essential for the development of the wind energy industry and the environmental assessment process. It is important for applicants to consider a diverse range of views to achieve positive planning outcomes.

Applicants must undertake meaningful engagement with stakeholders throughout the environmental impact assessment process and during the construction, operation and decommissioning phases of the project. This consultation must be undertaken in accordance with the Undertaking Engagement Guidelines for State Significant Projects.

These guidelines include requirements for applicants to:

- provide clear and concise information to the community and stakeholders about projects and their impacts
- implement activities that encourage and facilitate public participation
- report back on what was heard and what has or hasn't changed in response to this feedback and why.

The SEARs and consent conditions may include additional consultation requirements that must also be complied with.

The community should be engaged as early as possible to identify potential opportunities and constraints associated with the proposed development. The applicant should identify the elements of the project and the environmental assessment that can be influenced or shaped by the community. These could relate to the design of the project, the characterisation of the area and/or the management and mitigation measures that can be implemented. Examples include:

- the positioning and siting of the project including any setbacks
- characterisation of the scenic quality and sensitivity of the landscape and viewpoints (see the supporting *Technical Supplement for Landscape and Visual Impact Assessment*)
- visual impacts including mitigation measures.

Applicants must also ensure that stakeholders are given the opportunity to participate in the engagement process in a meaningful way. The EIS should include details of consultation activities undertaken with surrounding residents, community members, relevant authorities and councils. This includes key matters raised and how feedback was considered and incorporated into the project.

Where multiple projects are being proposed in close proximity, applicants may consider conducting combined engagement activities to reduce consultation fatigue and provide greater transparency to the community.

It is common for the applicant to enter into private agreements with landholders to either host infrastructure from the development or to manage impacts. It is important that landholders are properly informed about the implications of such an agreement and that consultation and negotiations are undertaken in a fair and reasonable manner. The *Draft Private Agreement Guideline*

(2023) provides further advice for applicants and landholders who are considering such an agreement.

Applicants should continue to engage with stakeholders after any development consent has been granted and must have an effective complaint handling system which addresses community concerns in a timely manner.

The department also has a role to play in consulting with stakeholders and the community and has requirements to:

- consult with relevant government agencies and councils to ensure that issues are fully considered in the assessment process
- exhibit the EIS for public comment for a minimum of 28 days
- publish documents and submissions relating to the project on the planning portal
- ask the applicant to respond to issues raised in submissions and agency advice to help the community and stakeholders understand how issues have been addressed and considered
- outline its decision or recommendation, including how community feedback was considered.

4 Site selection and project design

Good site selection and project design provides an opportunity to avoid or minimise negative impacts at the outset, allowing the assessment of a project to focus on mitigating and managing unavoidable impacts.

4.1 Importance of site selection

Well-sited wind energy projects can have minimal impacts on the environment, surrounding land uses and the community. A good site may result in greater social licence to operate, shorter assessment timeframes, reduced offset obligations and fewer conditions of consent to manage residual impacts.

Sites with multiple environmental and planning constraints may still be capable of being developed in a suitable manner with good design and siting of turbines, innovation and appropriate mitigation measures in place. The consent authority is obliged to consider the merits of each application.

If the applicant is not proposing to avoid impacts on the site's constraints, a clear justification for site selection and the layout of the development must be outlined in the EIS.

4.2 Process of site selection and project design

There are many technical and commercial factors that need to be considered when selecting a site for a wind energy development. The primary driver for selecting a good site will be the availability of good wind resources. However, there are other significant technical and commercial factors that need to be considered.

Figure 3 shows the most desirable areas for wind energy development considering key commercial factors and high-level environmental constraints including:

- wind resource potential
- proximity to existing and planned transmission infrastructure
- access to major energy users
- available network capacity
- development and land use constraints to a transmission connection
- land value
- development restrictions including land use zoning
- areas of high biodiversity value (NSW Biodiversity Values Map)
- distance to major towns and regional cities, and
- proximity to national parks, conservation areas and flora reserves.

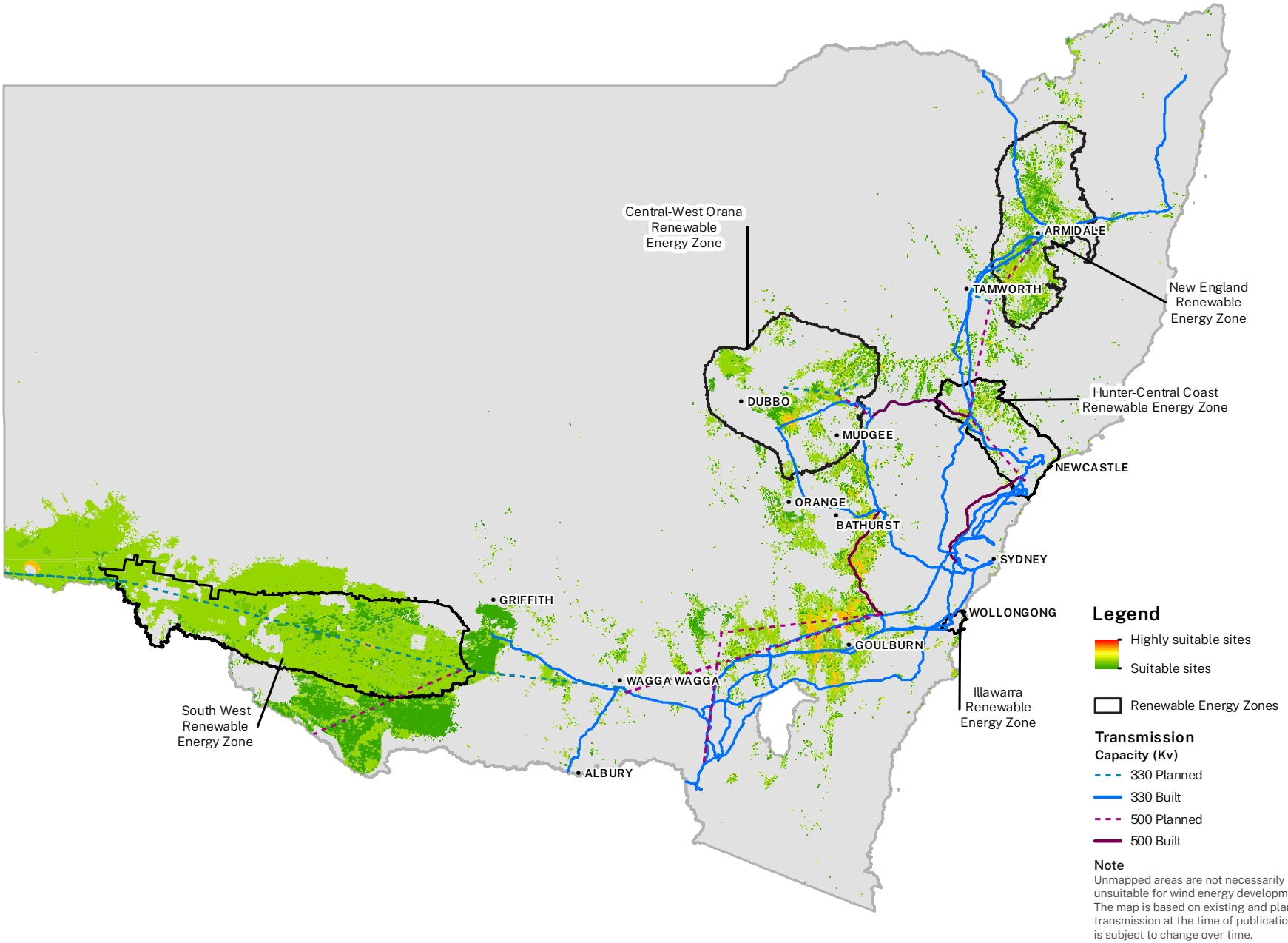


Figure 3 –Suitable areas for wind energy development

While this map provides a useful indication about where development is likely to be located, there are a range of local and site-specific considerations that need to be considered when selecting a site and developing the layout and design of a project, including:

- availability of land
- proximity to major roads and transport infrastructure
- proximity to sensitive viewpoints such as residences and public viewpoints and the potential for noise, and landscape and visual impacts
- proximity to airports and regional aircraft flight paths
- proximity to designated visitor areas
- proximity to national park boundaries
- indigenous and non-indigenous heritage items and places of significance
- threatened species, native vegetation (including grasses) and endangered ecological communities
- important known internationally and nationally significant migratory bird flight routes, and relevant threatened avian species flight paths
- watercourses and other protected wetlands, and
- flood prone and bushfire prone land.

As part of these considerations, it should be noted that any projects proposed within 500 m of a passive recreation area will be required to consider additional measures for managing potential impacts, such as noise impacts on park visitors. Any projects proposed within 500 m of a national park boundary will also be required to consider potential interference with management activities, such as feral animal, weed and fire control, or search and rescue operations reliant on low flight operations and radio communications.

Site selection factors often compete, and due to the large scale of wind energy development, it is challenging to find sites that do not have significant conflicts. Projects must also be designed in a cost-effective manner to provide benefits to energy consumers and reduced electricity costs.

Overall, the site selection process should avoid impacts as far as possible. Projects should then be designed to strike an appropriate balance between competing environmental, commercial, and social factors.

Constraints mapping

As part of the site selection process, applicants should undertake a 'constraints mapping' exercise that is informed by early engagement with local communities and councils. This should provide an overview of the project and map:

- administrative boundaries, including REZs, local government areas and the extent of the project
- turbine locations, including identifying numbers for each turbine
- nearby residences, including identifying numbers for each and identification of whether they are subject to any host or other impact agreements (see *Draft Private Agreement Guideline (2023)*)
- existing infrastructure, including transmission infrastructure and roads

- existing, approved and proposed renewable energy projects (where SEARs have been issued)
- existing vegetation, including potential visual screening
- relevant environmental and land use constraints on and around the project site including national parks, large waterways and waterbodies.

A final version of the constraints map, like that shown in **Figure 4**, should be included in the Scoping Report.

4.3 Micro-siting and environmental envelopes

There may be a need to relocate individual turbines on site during detailed design, to respond to unforeseen geotechnical or access issues, or to avoid matters of biodiversity, historic or Aboriginal cultural heritage importance. This relocation is known as 'micro-siting'.

Applicants must account for any variability in the siting of turbines in the EIS.

Micro-siting may be permitted, provided it does not materially increase environmental impacts. If it results in a revised layout of turbines or ancillary infrastructure, this must be consistent with the conditions of the development consent, or a modification will be required.

To enable micro-siting on specific sites, the department may grant consent which allows the siting of turbines within a 'development envelope'. The applicant must assess the full effect of the highest impact scenarios within the development envelope and include these impacts in the EIS.

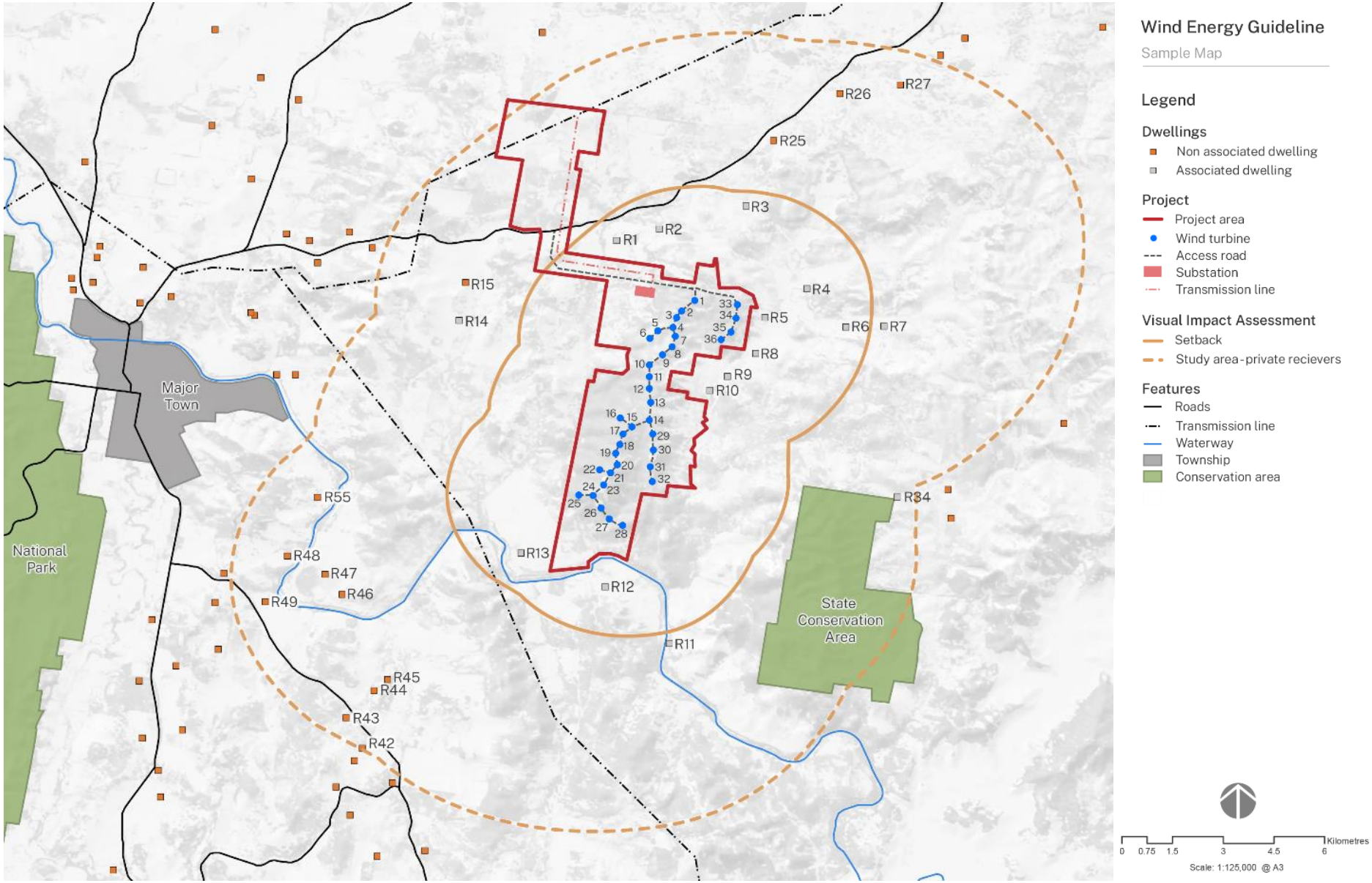


Figure 4 - Sample constraints map

5 Assessment issues and requirements

This section outlines assessment requirements for some of the common issues for wind energy development including amenity impacts (visual and noise), aviation safety and lighting, bird and bat strike, and rehabilitation and decommissioning. This section also includes key principles that should be considered in site selection, design and the detailed assessment of projects.

5.1 Landscape and visual impacts

Wind energy projects can contrast with the rural and natural landscapes in which they are typically built. They have the potential to impact on landscape features and values, particularly when built along hilltops or ridgelines, and can also have visual impacts on public viewpoints, including roads and lookouts, and private receivers including people's homes.

Visual impacts vary depending on the size of the turbines, the distance they are located from the viewpoint and the number of turbines visible. For example, a single 250 m turbine will generally have a dominant appearance if located within 2 km of a private receiver such as dwelling and tourist and visitor accommodation (see Figure 5).

Turbines remain a prominent feature in the landscape between 2 km and 8 km away, after which they become less noticeable. The supporting *Technical supplement for landscape and visual impact assessment* outlines thresholds for a range of turbine sizes (see Section 3.1.2). Visual impacts can largely be managed through considered wind turbine siting and the implementation of mitigation measures, such as vegetation screening and agreements with affected landowners.

Wind turbines are also not static structures, and the spinning blades create a moving feature in the landscape. As the blades rotate, they can cause intermittent shading of the sun (known as shadow flicker) at close distances (typically no more than 1 to 1.5 km). The duration of impact depends on a range of variables including the turbine layout and height, wind direction, surrounding topography, angle of the sun, cloud cover, viewpoint location and height, and any existing intervening vegetation.

Shadow flicker impacts are relatively uncommon given the need to setback turbines for visual amenity and noise reasons.

Wind turbines can also create amenity impacts from aviation safety lighting (see Section 5.3) and blade glint. Blade glint is the direct reflection of the sun from wind turbines and can be effectively minimised with low sheen and matt finishes.

Figure 5 – Visual prominence of 250 m turbines at varying distances[9]

[9] Note: The dwelling, transmission tower and tree line are located approximately 500 m from the viewpoint

5.1.1 Key principles

Visual amenity principles

- The baseline character of the landscape must be determined through engagement with the community
- Applicants must consider landscape character and visual impacts early in the site selection and design process to minimise impacts and conflicts, including cumulative impacts
- Projects should be designed to avoid visually dominant turbines and shadow flicker of more than 30 hours per year
- Applicants must adopt strategies to reduce or manage moderate or high visual impacts
- Turbines should be constructed and treated to minimise visual impacts and blade glint

5.1.2 Landscape and Visual Impact Assessment

The supporting *Technical supplement for landscape and visual impact assessment* has been prepared to assist applicants and provide greater transparency, consistency and objectivity in landscape and visual impact assessment. It aims to achieve balanced outcomes that avoid and manage high visual impacts (including from visually dominant turbines) whilst allowing changes to our landscapes that will be necessary to facilitate a transition to renewable energy.

The applicant must prepare a landscape and visual impact assessment in accordance with the technical supplement which is described briefly below.

Landscape character assessment

The purpose of undertaking a landscape character assessment is to understand the sensitivities of the landscape and to help determine the overall impact of a project on an area's character and sense of place.

This should be informed by a baseline analysis that establishes the area's existing character and its sensitivity. It is important that the baseline analysis is prepared in consultation with the community, relevant local council and affected landholders to ensure that landscape values and characteristics are accurately identified.

The impact of the proposal should be determined by evaluating the sensitivity of the landscape and the magnitude of the project's effects in that area. Where aviation hazard lighting is proposed, the magnitude and impacts of the lighting should also be considered in the landscape character assessment.

Visual impact assessment

An assessment must be completed for all viewpoints that could experience moderate or high visual impacts. The technical supplement includes preliminary assessment tools to identify these viewpoints based on the distance from the project and the tip height of the proposed turbines.

The overall visual impact for each viewpoint must be determined by combining the visual magnitude of the proposed wind energy development and the visual sensitivity of the viewpoint, using the tools available in the technical supplement.

These tools consider factors such as:

- a distant wind energy project generally has a smaller magnitude than one closer to a viewpoint
- a view from a residence is more sensitive to change than from a local road where views are more intermittent and less frequent
- a view a from a rural residence is more sensitive if it is from principal living spaces and the front and rear of the dwelling than from other areas
- a view is more sensitive to change if it has higher scenic qualities and more valued landscape features

Visual impacts must be assigned a rating from very low to high having regard to these considerations. Applicants must avoid high impacts (unless the impacts can be justified, or an agreement is reached with the affected landowner) and ensure effective mitigation is provided for moderate impacts such as vegetation screening.

The technical supplement sets out a range of visual impact examples.

The visual impact assessment process will consider the worst-case view of a project during the day. Whether or not the turbines have lighting is unlikely to change the impact assessment rating or whether mitigation is required. Consequently, a separate night-lighting assessment is not required for individual viewpoints. An example of the effects of lighting during the evening and night is provided in **Figure 6**.

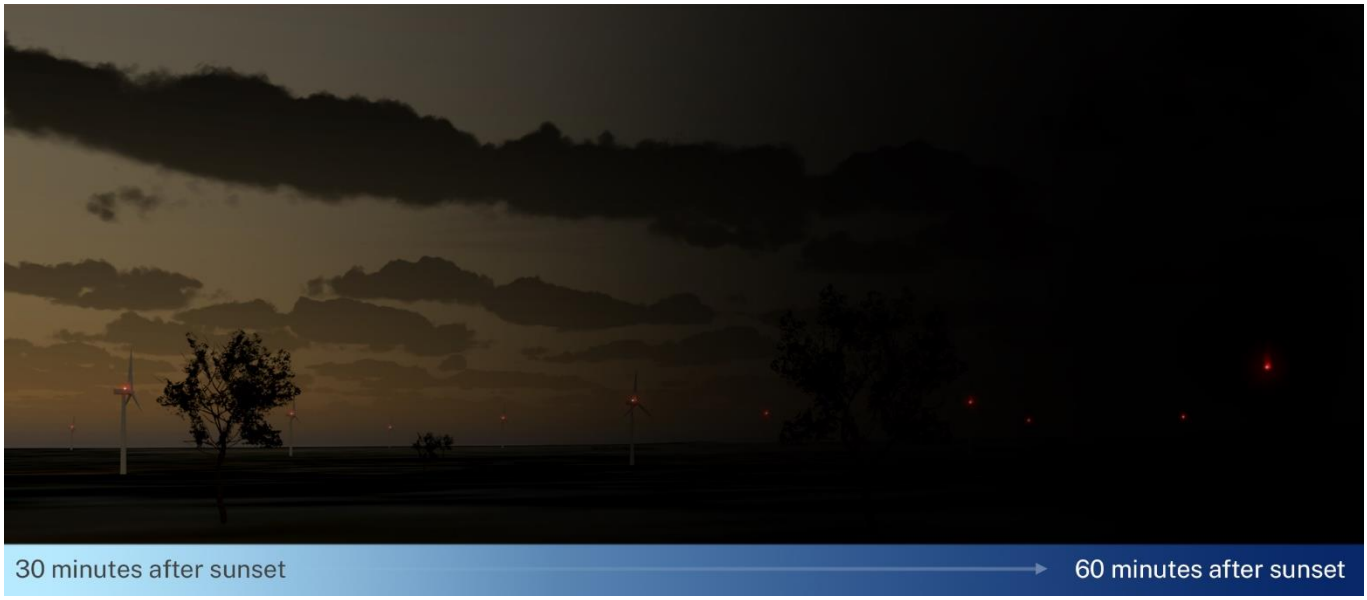


Figure 6 – The visual effects of turbine lighting

Shadow flicker assessment

While shadow flicker may cause annoyance at residences, most effects are limited in duration and occur over relatively short distances. In NSW, an exposure limit of 30 hours per year applies to all wind energy projects.

Applicants are required to undertake shadow flicker modelling for all turbines, considering a worst-case scenario with the potential to impact both associated and non-associated residences. The EIS for the project must include a detailed shadow flicker assessment that models the numbers of hours of potential shadow flicker at or within 50 metres of an affected dwelling.

Where moderate or high shadow flicker impacts are predicted, mitigation strategies must be adopted to reduce impacts. This could include a revised layout or introducing vegetation screening to achieve compliance with set limits.

The assessment must:

- determine the extent of shadows from the turbines, based on a distance of 265 m x maximum blade chord length (the distance from the front edge of the blade to the back edge of the blade)[10]
- consider the impacts on residences or other sensitive land uses within this modelled zone of shadow influence
- use modelling software to calculate the theoretical annual shadow flicker duration at each sensitive receiver, having regard to the effects of topography and the following assumptions:
  - minimum angle to the sun of 3 degrees
  - modelling over one full year
  - orientation of the rotor plane perpendicular to the line from the turbine to the sun
  - receiver height of between 1.5 and 2 m (as well as second storey window/balcony height if applicable)

An assessment of cloud cover and vegetation screening effects may be used to reduce the theoretical modelled annual exposure.

5.2 Noise and health

The operation of wind energy development can cause noise that is intermittently heard above the noise levels of the existing environment. Wind turbines also emit infrasound, sound at very low frequencies. However, studies have found that wind turbines do not generate a significant amount of low frequency noise compared to other sources and low frequency noise levels near wind energy projects is no greater than in urban areas or at comparable rural areas away from wind projects[11].

The NSW Government's position on potential health impacts of wind energy projects continues to be informed by the scientific findings of the National Health and Medical Research Council (NHMRC). Based on the current NHMRC position that there is no consistent evidence of a link between wind

[10] State code 23: Wind farm development, Planning Guideline, Department of Infrastructure, Planning and Local Government, February 2022 – Appendix 2 Shadow Flicker Assessment.

[11] https://www.epa.sa.gov.au/files/477913_low_frequency.pdf

energy developments and adverse health effects in humans relating to infrasound, it is not currently necessary for developers of wind energy projects to conduct a health impact assessment in relation to wind energy development and infrasound.

The supporting *Technical supplement for noise impact assessment* sets stringent noise levels and an assessment methodology to ensure that projects do not significantly impact the amenity of surrounding residences and passive recreation areas in national parks where park visitors are expecting a quiet, nature-based experience.

5.2.1 Key principles

Noise principles

- Noise levels from wind energy projects should be minimised and must not exceed the higher of 35 dB(A) or the existing background noise level (LA90 (10 minute)) plus 5 dB(A)
- The noise assessment must consider any cumulative effects on affected residences, including noise from existing or proposed wind energy projects
- Where exceedances of the noise criteria are predicted, applicants must adopt mitigation strategies to meet the criteria or enter into an agreement with the affected landowner
- Noise levels must not exceed Leq 50 dB(A), at passive recreation areas within National Parks, when in use

5.2.2 Assessment

Applicants must prepare a noise impact assessment in accordance with the *Technical supplement for noise impact assessment*. The technical supplement provides a methodology for assessing, evaluating and mitigating potential noise impacts and sets criteria to ensure that noise remains at acceptable levels at surrounding residences.

The applicant must ensure that the noise generated by the project (including the wind turbines and any ancillary infrastructure including batteries), does not exceed the higher of 35 dB(A) or the existing background noise level (LA90 (10 minute)) plus 5 dB(A).

In the unlikely event that excessive or repeated low frequency noise is found to be a characteristic of the project, a 5 dB(A) noise penalty should be added to the predicted or measured noise level from the project.

Applicants are required to regularly monitor noise levels during the construction, operation and decommissioning of a project to ensure that noise levels do not exceed these limits and address any community concerns in a timely manner (see Section 2.5.1).

5.3 Aviation safety and lighting

Wind turbines and wind monitoring masts present a risk to aviation safety when they are proposed near airports and aircraft landing areas, or would intersect air traffic routes, aircraft operating heights or navigable airspace.

Under the Civil Aviation Safety Regulations 1998, aircraft are permitted to fly as low as 500 feet (or 152 metres) above ground level. With CASA approval, some flight operations may be lower than this, for example as part of fire and pest species control programs, or search and rescue operations. Any tall structures, such as wind turbines that are 150 metres or more above ground, are generally considered a hazard. Wind turbines may also create turbulence (noticeable downwind for a distance of up to 16 rotor diameters) that may affect aircraft behaviour and performance.

To manage these risks, aviation regulations require the location of all tall structures, including wind turbines, to be reported to the relevant aviation authorities. This enables their locations to be mapped so that pilots are aware of their locations. In addition, mitigation measures such as obstacle marking and/or lighting of wind monitoring masts or obstacle lighting of turbines, and the shutting down of turbines during fire and other emergencies (see below), may also be required to maintain an acceptable level of safety.

5.3.1 Key principles

Aviation safety and lighting principles

- Wind energy projects should be designed to reduce aviation safety risk
- Lighting of turbines and ancillary infrastructure should be designed to minimise potential amenity impacts whilst meeting aviation safety requirements
- An aviation impact assessment must include a full assessment of the risks to aviation safety in the context of existing flight patterns, the potential need for changes to flight paths or airport approach routes, and a proposed lighting management system

5.3.2 Assessment

An aviation impact assessment is required for all wind energy projects. **Appendix A** provides detailed guidance to assist applicants to determine the extent and content of the assessment. The purpose of the assessment is to ensure that applicants, aviation authorities, communities and consent authorities have a detailed understanding of:

- the type and location of any aerodromes and aircraft landing areas or flight paths around the project site
- aerial activities such as helicopter use and low flight operations for fire and pest control, mustering, asset maintenance, search and rescue, and recreational activities in agricultural, forestry and conservation settings) around the project area
- potential impacts of the project on aviation activities

- the ways in which potential impacts and risks may be mitigated.

If a wind energy development is located near a certified or registered aerodrome used by the community, or an aerodrome used by the military, the applicant must consult with the aerodrome operators and aircraft operators known to fly in the area. Applicants must also consult with Airservices Australia and the Department of Defence to determine if any nearby communications, navigation or surveillance equipment may be affected.

Aerial Fire Fighting

Aerial firefighting can continue to be undertaken around wind turbines[12] if appropriate strategies, emergency management systems and communications protocols are in place[13]. Applicants must develop and implement a bushfire management plan that includes response strategies such as shutting down and positioning turbine blades to facilitate aerial access.

If turbines and other tall structures are to be equipped with aviation obstacle lighting, the applicant must ensure there are procedures in place to quickly activate the lights during a bushfire or fog event to increase the transparency of these obstacles to pilots. The applicant must also consult with the NSW RFS to develop other appropriate procedures, such as curtailment of turbines, to minimise impacts to firefighting efforts.

5.4 Bird and bat impact assessment

5.4.1 Introduction

Wind energy development has the potential to affect birds and bats through vegetation clearing and habitat loss. They can also be struck by the turbine blades (referred to as strike) and affected by low air pressure zones caused by the blades (known as barotrauma).

The likelihood of strike mortality is highly dependent on the siting of individual turbines and the characteristics of the relevant bird and bat species. For example, locating turbines away from important habitat can reduce the likelihood of strike. Some species, such as raptors, can also be at increased risk due to their flight patterns and behaviour, which means they are more likely to interact with the swept areas of higher wind turbines.

The magnitude of turbine strike on bird and bat populations is hard to quantify and predict. Mortality rates can be difficult to measure as carcasses are often removed by scavengers before they can be counted. While counts vary, estimates indicate that between 2,000 and 8,000 birds were killed by all wind projects in Australia in 2015, which equates to 1 to 2 birds per turbine[14]. Mortality figures from NSW wind energy projects indicate an average rate of 1 to 3 bird fatalities per turbine per year, with similar figures reported for bats.

While there are data limitations to understanding this issue, the estimated mortality rates are considerably less than estimates for other anthropogenic sources. Millions of bird and bat deaths

[12] Australasian Fire and Emergency Service Authorities Council Limited - AFAC (2018) Wind Farms and Bushfire Operations

[13] Clean Energy Council (2017) In Case of Fire: a real-life experience at a wind farm site

[14] Commonwealth of Australia (2015) Official Committee Hansard: Senate Select Committee on Wind Turbines: Final Report.

can be attributed each year to collisions with buildings, vehicles and power lines, and predation by feral and domestic cats.

Notwithstanding, turbine strike has the potential to cause negative impacts for some species (including raptors), and cumulatively there may be impacts on some populations. Consequently, there is a need to carefully design wind energy projects to avoid and minimise potential strike risk and, in some cases, implement adaptive management techniques (such as turbine curtailment) to reduce mortality.[15]

5.4.2 Key principles

Bird and bat principles

- Applicants must identify at-risk species, known habitats, flight paths and baseline population levels and use this to inform site selection, project design and turbine layouts.
- Turbines should be sited at least 100 m (from blade tip to nearest canopy height) away from National Parks, state conservation areas and nature reserves.
- Applicants must adopt the hierarchy of impact management to avoid and minimise impacts on threatened bird and bat populations.
- Applicants must implement mitigation and management measures to reduce the likelihood of collisions.

5.4.3 Assessment

Applicants must include a biodiversity assessment in the EIS that considers all the biodiversity impacts of the proposal including clearing of native vegetation and indirect or prescribed species impacts including potential bird and bat strike.

The assessment must be undertaken in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method 2020 (BAM 2020). The BAM 2020 identifies turbine strike as a prescribed impact and outlines how impacts on threatened and protected animals should be assessed, avoided and minimised. Where impacts cannot be avoided, minimised or mitigated, offsets or other measures that benefit threatened entities and their habitat can be considered, however these are not mandatory. The BAM guide provides further information including how to:

- assess and document the impacts of wind turbine strike on protected species
- develop adaptive management plans to address the uncertain impacts of turbine strike on protected species
- develop and implement effective monitoring programs.

[15] Bennett et al (2022) Austral Ecology – Curtailment as a successful method for reducing bat mortality at a southern Australian wind farm.

The EIS should include the results of baseline monitoring and risk assessments to support predictions of impacts and to identify appropriate mitigation and management measures. This includes informing where turbines should be located and avoided.

The risk assessment should identify the types of species and populations most at-risk of turbine strike, their conservation status and distribution across the site. Habitat mapping and flight path analysis for high-risk species should also be undertaken to identify potential areas of high collision risk.

Impact avoidance and minimisation

Potential impacts on bird and bats can often be effectively managed by ensuring that wind energy developments are carefully sited in the first instance to avoid and minimise potential strike risk. Residual risks are managed through an adaptive management process once the development has commenced construction and operation.

Applicants are required to avoid and minimise the potential impacts of wind turbine strike on birds and bats and must demonstrate how they have considered impact avoidance, including consideration of the following:

- selecting sites with limited or minimal biodiversity values (e.g. previously cleared land or land mapped as category 1-exempt land on the native vegetation regulatory map)
- locating turbines at least 100 m (from blade tip to nearest canopy height) away from National Parks, state conservation areas and nature reserves
- siting turbines away from key habitat and habitat features likely to be utilised by at-risk species (for example, hollow-bearing trees, wetlands and riparian corridors)
- configuring turbine layouts to create buffers to known flight paths for nomadic or migratory species
- maintaining turbine free movement corridors between key landscape and habitat features such as known roosting or breeding sites and foraging areas

Due to the inherent difficulties in predicting impacts for highly mobile bird and bat species (such as accounting for seasonal or climatic fluctuations that may change movements patterns), it is also imperative that wind energy projects monitor and adaptively manage impacts when they occur. Impacts can be further avoided and minimised by considering the following management actions:

- establishing livestock exclusion zones and ensuring that rabbit burrows are ripped or treated to minimise rabbit numbers and consequent attraction for raptors
- relocating habitat features to adjacent retained remnant vegetation (e.g. hollow logs)
- scheduling turbine shut-downs during critical migration periods or specific times of high activity
- projecting acoustic signals from wind turbines to alert and deter avian species
- adopting a smart curtailment approach that uses sensor technology to curtail turbine movements at certain wind speeds known to correlate with increased avian activity levels
- consideration of other novel or experimental approaches that could potentially mitigate the impact of turbine strike on the affected species.

Avoidance and mitigation strategies should be proportionate to the impact and risk, and there is not necessarily an expectation that these measures will eliminate collisions entirely.

Adaptive management plan

The EIS must include a Bird and Bat Adaptive Management Plan (BBAMP) that sets out the proposed management measures and a regular and robust monitoring method and schedule for mortality monitoring.

This plan should include a trigger action response plan that identifies when management measures will be implemented (e.g. the curtailment of turbines). Where turbine strike impacts are likely to be ongoing, the consent authority should impose conditions of consent to ensure that any impacts are minimised, monitored and proactively managed through the implementation of the BBAMP.

5.5 Traffic and transport

The construction and decommissioning of wind energy projects can cause impacts on traffic and transportation routes. These largely occur when moving large wind turbine components via public roads and across private land.

Transporting large components from ports or manufacturing points through regional NSW requires the use of designated heavy and over-dimensional vehicles. To enable these over-dimensional vehicles to move through the road network, road upgrades, temporary hard stand areas and/or traffic sign relocations may be required.

On-site access routes should be designed to utilise existing farm access tracks and avoid crossing waterways or drainage features in low lying areas. They should also be designed to follow the landform where possible to reduce cut and fill.

5.5.1 Key principles

Traffic and transport principles

- An assessment must be undertaken that considers both the project and cumulative impacts on the local and classified road network.
- If the network cannot accommodate the traffic generated by the project, upgrades must be proposed to facilitate the development.
- Applicants must ensure that local Councils and communities are informed about potential traffic disruptions and construction scheduling to manage and address traffic safety concerns and avoid cumulative impacts with other major developments where possible.

5.5.2 Assessment

Applicants must identify and address all relevant issues for traffic and transport in the project EIS.

The assessment must account for all traffic generation associated with the project including transport of construction materials (e.g. from local quarries), be conducted over the entire length of the transport route (i.e. from Port to site), and consider the key issues outlined in Table 1Table 1: Requirements for traffic and transport impact assessment.

Agreements with the relevant roads authorities and any affected landowners should be obtained about the nature and timing of upgrades prior to lodgement of the EIS.

A range of measures are likely to be required before the commencement of construction, and the consent authority should consider requirements for:

- road upgrades to be completed prior to the commencement of construction (not required for State roads)
- a dilapidation survey for local roads and roads on the haulage route be completed prior to and within 1 month of completion of both construction and decommissioning
- rehabilitation of the haulage route where any development-related damage has occurred
- development and implementation of a Traffic Management Plan that includes measures to address any community concerns around potential conflicts with other traffic-generating developments or other road users.

Table 1: Requirements for traffic and transport impact assessment

Key Issue	Assessment Considerations
Transport Route Options	• include a detailed analysis of available haulage options and justification for the final route selection • identify impacts to private property or public lands other than road reserves along the haulage route
Capacity of Road Network	• consider the structural capacity of road networks to handle heavy vehicles • consider the width of roads, bridge capacities and clearance of bends to accommodate over-dimensional vehicles
Road Upgrades	• identify all road upgrades required to facilitate the development in consultation with relevant roads authorities (RMS and local Councils), local communities and affected landowners/managers • identify any upgrades requiring separate landowners' consent
Traffic Movements	• identify the number of vehicle movements to and from the project site (including light, heavy and over-mass and over-dimensional vehicles) during construction, operation and decommissioning, including those required for the delivery of construction materials and project components as well as workforce traffic

Key Issue	Assessment Considerations
Environmental Impacts	• identify heritage, biodiversity and other environmental impacts from increased traffic, such as increased dust and disturbance of environmentally sensitive areas as well as direct impacts associated with road upgrades or temporary traffic controls that require land disturbance
Traffic Safety	• consider disturbance and safety impacts to the local community due to increased traffic • identify safety concerns raised during consultation and outline measures that would be implemented to minimise impacts during construction, upgrading or decommissioning works • consider cumulative traffic impacts with other major developments, including other wind energy development

5.6 Infrastructure contributions, benefit sharing and agreements

5.6.1 Infrastructure contributions

Local infrastructure contributions are collected by councils to help fund local infrastructure needs resulting from development including stormwater drainage, traffic management and community facilities.

Wind energy projects typically have limited impacts on local infrastructure with the exception of traffic and transport. Roads will generally need to be improved to accommodate the movement of over-dimensional vehicles, and increased traffic during construction. Specific impacts of this nature should be addressed through conditions of development consent rather than through local contribution mechanisms or planning agreements.

Notwithstanding, a local contribution mechanism or planning agreement can be used if there is a link between the development and the infrastructure to be funded.

5.6.2 Benefit sharing

Benefit sharing is a term used to describe different approaches and mechanisms that aim to distribute proceeds of a project (financial and other benefits) between the applicant and the community through mutually agreed opportunities.

Benefit sharing can assist in building community support by ensuring that projects deliver a net positive outcome for local and regional communities, including tangible and long-term social and economic initiatives.

Consequently, the NSW Government strongly supports benefit sharing programs and has developed a *Draft Benefit Sharing Guideline (2023)* which contains best practice guidance for applicants to coordinate benefit sharing programs in their communities.

This includes detailed information on how applicants can work with Councils and communities to fund community programs and projects. The details of any benefit sharing program should be included in the EIS.

5.6.3 Private agreements

It is common for applicants to enter into private agreements with landholders to either host infrastructure or to manage impacts from development. The two most common forms of private commercial agreements for wind energy projects are described briefly below. Further information, including a template agreement and advice for landholders, can be found in the *Draft Private Agreement Guideline (2023)*.

Host and impact agreements

Host agreements are where applicants enter into agreements with 'host' landholders who are willing to have project infrastructure located on their land. These agreements are essentially commercial leases and should set out the terms to enable the applicant or project owner to install, operate and maintain the project infrastructure as well as arrangements for decommissioning and rehabilitation of the project infrastructure.

Impact agreements are agreements negotiated between the applicant and neighbours of the development when the development may significantly impact the neighbour or their land. The agreement aims to manage and mitigate these impacts. For example, impact agreements are commonly negotiated to mitigate high visual impacts from a project.

Assessment requirements

Where an agreement is in place between an applicant and a landholder, the affected residence is taken to be 'associated' with the development for the purpose of the assessment (if the agreement relates to the relevant impact/s). Applicants should identify the nature, extent and duration of any impacts covered by an agreement.

Where an agreement is not in place between an applicant and a landholder/s, the affected residence should be identified as 'non-associated' in the EIS (see **Figure 4** for an example) as it relates to the relevant impact/s.

Separate to the EIS, the applicant should provide copies of any agreements, and these should clearly outline the impacts being accepted, any conditions of acceptance, and the relevant phases to which the agreement relates (construction, operation and decommissioning). Further requirements are outlined in the *Draft Private Agreement Guideline (2023)*.

5.7 Decommissioning and rehabilitation

5.7.1 Introduction

Once installed, wind turbines typically have an expected operating life of around 25 to 30 years, although some turbines may be decommissioned or refurbished earlier.

At the end of the operating life, the main options for decommissioning are to:

- replace the wind turbines with new technology (subject to landholder agreements, planning approvals and the condition of the equipment)
- decommission the project and remove wind turbines and associated infrastructure.

In most circumstances, the refurbishment of wind turbines and infrastructure will not require a new DA or a modification of the existing consent, as refurbishment may be authorised by the terms of the existing consent.

The applicant may choose to cease operation of the wind project and decommission and rehabilitate the project site. Decommissioning typically follows the reverse order of installation of the development. This involves dismantling and removing the turbine components, above ground and ancillary infrastructure. Pending the final agreed land use, below ground cabling and conduits may be left in-situ, and access tracks retained.

Materials and waste products are removed from the site for recycling, reusing or disposing of in approved waste facilities (see Section 5.8). This also involves disconnecting the project from the electricity network.

The decommissioning cost calculator tool can be used to help applicants and landholders to estimate the likely costs of decommissioning. This factors in key input values for a range of activities most likely to influence the final costs. The cost of decommissioning is estimated to be around $480,000 per turbine (inclusive of recovery costs), although this rate may vary substantially depending on factors such as whether the access roads and underground cables are removed. If they are not removed, the value of steel and iron recovery from the turbine components is estimated to mostly offset the cost of decommissioning.

5.7.2 Key principles

Decommissioning and rehabilitation principles

- The land on which a wind energy project and supporting infrastructure has been developed must be returned to pre-existing or agreed use if the project is decommissioned.
- If operations cease, redundant above-ground infrastructure should be removed within 18 months unless there is significant justification for retaining it.
- The applicant of a wind energy project should be responsible for decommissioning and this should be reflected in the host agreement with the landholder.
- Applicants should ensure host landholders are informed about the proposed decommissioning plan for the project.

5.7.3 Responsibilities and financial assurances

It is expected that the applicant of the wind energy project be responsible for decommissioning and rehabilitation, and this should be reflected in a host agreement with the landholder (see the *Draft Private Agreement Guideline (2023)* for specific guidance).

This agreement may also prescribe assurances to fund decommissioning, including ongoing evidence that the applicant has the capacity to fund decommissioning activities.

Applicants and hosts may estimate the costs of decommissioning for the development using the department's decommissioning cost calculator tool.

If an applicant fails to meet the decommissioning and rehabilitation obligations of the project's development consent, the department can use its enforcement powers under the EP&A Act to address any breaches of the consent condition.

5.7.4 Assessment

Applicants must identify the decommissioning and rehabilitation activities that will take place and address all relevant issues for decommissioning and rehabilitation in the project EIS.

This may include dust and noise generation from earthwork activities and vehicles, increased traffic generation and/or traffic disruptions and risks to biosecurity, particularly related to pests, diseases and weeds. Notwithstanding, it is recognised that such impacts are likely to be short-term and similar to, or less than, construction impacts.

The consent authority should impose conditions of consent to ensure that the above key principles are met. Conditions of consent generally contain decommissioning and rehabilitation performance objectives which are outcomes-based and do not include post-approval requirements such as management plans.

5.8 Waste management and circular design

5.8.1 Introduction

Wind energy projects can generate different waste streams throughout the various phases of their lifecycle. Waste is typically minimal during the construction and operation of a wind energy project, generally consisting of solid material classified as non-putrescible and that has the potential for recovery through reuse and/or recycling.

The operation of the project produces negligible amounts of waste, except for repair and maintenance activities.

However, when the project is decommissioned, large amounts of waste materials are generated. While 85 to 95 per cent of a wind turbine can be recycled, some residual materials may need to go to landfill. The tower and nacelle comprise mainly steel, along with copper and aluminium which all can be easily recycled in NSW. Other minor components such as plastics on cables would need to be disposed of.

Wind turbine blades generally comprise of composite materials such as epoxy resin and glass fibre, or carbon fibre, which are difficult to recycle in Australia and need to be disposed of at special facilities. These elements make up a very small portion of the overall waste, however, the Australian wind energy industry currently generates around 10,000 tonnes of waste per year from wind turbine blades. This will increase to 20,000 tonnes in 2030 and around 300,000 tonnes by 2050.

5.8.2 Key principles

Waste management key principles

- Waste generation from a wind energy project during construction must be minimised and this waste should be comprised of as much reusable and recyclable materials as possible.
- Impacts on local waste management facilities must be minimised as far as practicable during construction, operation and decommissioning.
- Recycling of wind turbine components should be prioritised and maximised as far as possible.

5.8.3 Assessment

Applicants should clearly demonstrate how waste will be minimised at all stages of the development and how reuse and recycling will be optimised.

The EIS must include:

- identification of waste types (including the appropriate waste classification) and estimates of waste expected to be generated at each stage of the project (construction, operation and decommissioning)
- identification of viable end markets for waste materials generated at each stage of the project
- consideration of how the proponent will ensure all recyclable materials are sent to appropriate recovery facilities to minimise waste sent to landfill at each stage of the project
- consideration of circular design principles and strategies to mitigate impacts and reduce waste generation throughout all stages of the project (such as using recycled, reusable and low-emissions and low-impact raw materials where possible)
- end-of-life reuse, refurbishment and recycling strategies for wind turbine components to maximise recovery rates, having regard to industry best practice.

The applicant should also consider appropriate mitigation measures that include:

- separating waste streams on site prior to transport to waste management facilities
- selecting waste management providers that specialise in recycling end-of-life wind turbine blades and associated infrastructure.

6 Other assessment issues

Other matters that are relevant to wind energy developments and require careful consideration and assessment of impacts include:

Issue	Assessment
Erosion and sediment control	Surface water-related impacts, such as erosion, discharge/runoff and sediment control need to be identified and appropriate measures proposed where warranted. Applicants are required to minimise any soil erosion associated with the construction and decommissioning of the development by implementing the relevant mitigation measures in Managing Urban Stormwater: Soils and Construction (Landcom, 2004 – commonly referred to as the "Blue Book"), or its latest version.
Biodiversity	Where the proposed site contains native vegetation, habitat of threatened species, or ecological communities, and requires clearing, an assessment in accordance with the *Biodiversity Conservation Act 2016* and the BAM must be undertaken and documented in a biodiversity development assessment report (BDAR). Applicants are expected to demonstrate that they have applied principles of avoidance, minimisation and mitigation of impacts in project design.
Water supply	If there is any water take associated with the project, the applicant should identify the source of water (both potable and non-potable) and may need to acquire water access licences if the project is approved. The applicant should detail the volume of water supply during construction and operation, and detail the assumptions used to estimate water consumption and ensure it is included in the traffic assessment if being trucked to site. The applicant should also provide evidence of the ability of identified potential water suppliers for the project to meet the necessary water demands. The applicant should outline the proposed wastewater management plan as well as the potential impacts of the project on downstream flows and flooding, including measures proposed at all stages of the development to mitigate and manage surface water runoff.
Batteries	If the project includes battery energy storage that has a capacity of more than 30 MW, the applicant must undertake a preliminary hazard analysis in accordance with Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning, Hazardous Industry Planning Advisory Paper No 6 – Hazard Analysis and Multi-level Risk Assessment Further information on hazard assessment is available on the departments hazards webpage.

Issue	Assessment
Hazards	The location of wind energy infrastructure should avoid any land subject to identified natural hazards (such as bushfires, flooding or land instability) and should not contribute to an increase in risk of a natural hazard. Any natural hazards or risks associated with the construction, operation and decommissioning of the wind energy project must be assessed. These include those associated with hazardous materials (for instance, battery storage), and the threat of fire spreading to a wind energy development or being caused by blade throw or associated infrastructure such as cables or transmission lines. If the project is located in a bushfire prone area, applicants must prepare a strategic bushfire study in accordance with the NSW Rural Fire Service's Planning for Bush Fire Protection (November 2019 or its latest version). An assessment of operational risks from potential blade throw should be undertaken and appropriate setback distances from residences, National Parks, roads and battery storage facilities incorporated as a risk management measure.
Heritage	An assessment of the likely impacts on Aboriginal cultural heritage that includes consultation with the Aboriginal community undertaken in accordance with the Aboriginal Cultural Heritage Requirements for Proponents 2010. An assessment of the likely impacts on European archaeological objects and places.
Cumulative impacts	Any cumulative impacts from any other developments (proposed, approved and operative), especially biodiversity, socio-economic and construction traffic impacts must be assessed in accordance with the department's Cumulative Impact Assessment Guidelines for State Significant Projects (July 2021, or its latest version). For example, multiple wind developments in close proximity to each other may have a cumulative impact on dwellings or adjacent land uses, amenity, biodiversity, visual effects or scenic landscapes.
Social and economic impacts	A social impact assessment is required for all State significant projects and must be undertaken in accordance with the department's Social Impact Assessment Guideline for State Significant Projects (July 2021, or its latest version). This will include an assessment of impacts, both positive and negative (including how they are distributed), of the proposed development on potentially affected people and groups. This should include consideration of any increase in demand for community infrastructure and services, including the need for temporary construction workers accommodation, job opportunities, and flow-on economic impacts to local communities.

Issue	Assessment
Strategic context	Whether the project is consistent with local or state planning strategies, and government policies such as climate change and energy policies, including the capability of the project to contribute to energy security and reliability[16] .
Public interest	An analysis of the public interest, including the public interest in renewable energy, the objects of the EP&A Act and the principles of ecologically sustainable development.

[16] For further guidance on addressing electricity system security and reliability, proponents should see the department's publication Electricity System Security and Reliability Environmental Assessment Requirement: Guidance for proponents of State significant electricity generation projects.

Appendix A - Aviation and lighting impact assessment

In Australia, all wind energy projects must include an assessment of potential impacts under the National Airports Safeguarding Framework (NASF) Guideline D[17] to determine potential risks to aviation safety.

Assessment requirements

Applicants must consider aircraft flightpaths and ensure that the final turbine layout does not pose an unacceptable risk to air safety, including areas where low flying operations are likely to be conducted. Applicants must also identify and assess any potential impacts of the project on nearby airfields and propose reasonable and appropriate measures to mitigate risk.

If a proposed wind turbine or monitoring tower is greater than 150 metres in height or infringes on the Obstacle Limitation Surface (OLS) of a certified aerodrome, an aviation impact assessment must be undertaken in accordance with Guideline D and the requirements in **Table 2**.

Table 2: Requirements for aviation impact assessment

Requirement	Content and form
Consultation	Undertake and outline consultation with: • nearby aerodrome (certified and un-certified) operators and aircraft operators known to fly in the area (low flying activities that may include fire spotting and control). • Airservices Australia and the Department of Defence to determine whether any nearby aeronautical communications, navigation or surveillance equipment may be affected. • NPWS and other land management operators to identify potential impacts to low flight operations (e.g. aerial pest/weed control and firefighting activities), and to develop procedures to reduce the risk of collisions with turbines and other infrastructure...
Impacts and risks	• Assess the potential impacts of the project on any aviation activity including cumulative effects with any other wind energy projects in the vicinity and potential wake / turbulence issues. • Conduct a risk analysis using AS/NZS ISO 31000:2018 Risk Management and Guidelines. • Assess the need for aviation obstacle lighting (see further discussion below), considering defined air traffic routes, aircraft operating heights, approach/departure procedures, radar interference, communication systems and navigation aids

[17] Australian National Airports Safeguarding Framework (NASF) Guideline D: Managing the Risk to Aviation Safety of Wind Installations (Wind Farms) / Wind Monitoring Towers

Requirement	Content and form
Lighting	• Consider measures to minimise the amenity impacts of lighting (see further discussion below). • Where only a select number of turbines are proposed to be lit, provide a detailed justification demonstrate that this would not increase the level of aviation risk. • Assess any impacts on the Siding Spring Observatory and the Dark Sky Region in accordance with the *Dark Sky Planning Guideline*, if located within 200 km of the observatory. • Identify the type of lighting management system proposed (e.g. permanent fixtures or motion sensor/radar detection systems) and include a detailed lighting plan. • Identify measures to ensure obstacle lights always remain lit as indicated in the lighting management system, and any disruption or outages are minimised to the extent practicable. • Undertake consultation with CASA on the proposed lighting system.
Other forms of mitigation	Describe other measures to mitigate potential risks, including: • providing as-constructed details (including the specific location coordinates and elevations) of turbines and monitoring masts to Airservices Australia so they are registered on the national databases. • marking monitoring towers in accordance with the requirements of National Airports Safeguarding Framework Guideline D – Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers. • marking overhead transmission lines in accordance with Australian Standards AS 3891.1 with visual identification tools, such as marker balls, and in consultation with the transmission network provider.

Lighting

While important from a safety perspective, aviation obstacle lighting has the potential to impact regional and rural areas where other light sources are minimal. Consequently, applicants should seek to minimise the effects of lighting on visual amenity, having regard to the aviation safety risk assessment. The visibility and impact of any lighting depends on the nature and intensity of lighting required and potential cumulative effects with other developments.

Any tall structures (including turbines) that are greater than 150 metres (500 feet) AGL will need to adhere to certain aviation safety standards and applicants will need to consider the need for markings and obstacle lighting of these structures.

NSW adopts a risk-based approach to the assessment of the potential risk of wind energy projects to aviation safety. Therefore, whether turbine lighting is required is based on an assessment of the risk of unlit turbines to aviation safety and advice from CASA and other relevant authorities. The department acknowledges CASA's current position to recommend some level of aviation obstacle lighting for tall structures, including wind turbines.

Lighting of turbines and tall structures is intended to improve safety outcomes and alert pilots to the presence of potential obstacles in low altitude flight paths. Aircraft detection systems can be used to trigger lights only when an approaching aircraft is identified. CASA has also advised that the use of management systems to regulate obstacle lights and their intensity (such as the use of visibility meters or radar detection systems) are acceptable options in Australia.

Australia aviation authorities have generally adopted international standards[18] for lighting intensity which recommend 2000 candela medium intensity obstacle lights for greater than 150 metres AGL. However, CASA has accepted the use of 200 candela lighting in circumstances where a lack of back lighting such as in rural and remote areas (means a lower intensity light is still visible to pilots at an acceptable distance to avoid the obstacle[19]).

To reduce visual amenity impacts, the following mitigation options should be considered:

- minimising the number of turbines to be lit, considering selective lighting that clearly indicates the general height and extent of the development
- using the lowest intensity turbine light suitable for the site
- where fixed lighting is proposed (instead of being controlled through detection systems) all turbine lighting should be turned on simultaneously, be a steady medium intensity red light and should not flash
- ancillary lighting should be installed to direct light below the horizontal to avoid unnecessary impact on residences.

[18] ICAO (International Civil Aviation Organization) Annex 14, Volume 1, Chapter 6.2

[19] CASA Advisory Circular AC 139.E-05v1.1 Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome, October 2022