



Wind farm development in New Zealand

A FRAMEWORK FOR BEST PRACTICE





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Photo 1. Front cover - Te Uku Wind Farm, Waikato
Photo 2. Inside cover - White Hill Wind Farm, Southland

About the New Zealand Wind Energy Association

The New Zealand Wind Energy Association (NZWEA) is a membership-based industry association committed to the development of wind as a reliable, sustainable, clean and commercially viable energy source.

NZWEA aims to fairly represent wind energy to the public, government and the energy sector. The focus of NZWEA is on utility-scale wind generation (generally over 100 kilowatts). NZWEA is a central point for information and aims to be a trusted voice in the debate about wind energy in New Zealand.

NZWEA members include over 65 companies involved in New Zealand's wind energy sector, including:

- electricity generators
- wind farm developers
- lines companies
- turbine manufacturers
- consulting firms
- researchers
- law firms.

NZWEA works hard to ensure that New Zealand's world class wind energy resource is harnessed in a responsible and sustainable manner for our generation and generations to come.

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Photo 3. Tararua Wind Farm, Manawatu

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Acronyms

AEE	Assessment of Effects on the Environment, also referred to as Assessment of Environmental Effects
EECA	Energy Efficiency and Conservation Authority
HPA	Historic Places Act
kW	kilowatt
MfE	Ministry for the Environment
MW	megawatt
NPS	National Policy Statement
NPSET	National Policy Statement on Electricity Transmission
NPSREG	National Policy Statement on Renewable Electricity Generation
NZCPS	New Zealand Coastal Policy Statement 2010
NZS 6808	NZS6808:2010 Acoustics - Wind farm noise
NZWEA	New Zealand Wind Energy Association
RMA	Resource Management Act

1. Introduction

The New Zealand Wind Energy Association (NZWEA) is committed to New Zealand's wind energy industry. The New Zealand wind energy industry comprises a range of competitive businesses making a significant contribution to safe, reliable, economically and environmentally sustainable energy supply.

Commercial wind generation began in New Zealand in 1993 with the installation of a 225 kilowatt (kW) wind turbine on the hills above Wellington. Since then New Zealand's wind industry has grown to supply about 4.5% of NZ's electricity in 2013, with generation occurring at 17 locations throughout the country.

Since 1993, there have been significant advances in wind turbine technology, resulting in an increase in turbine size and generation capacity. The largest turbines in New Zealand have a generating capacity of 3 megawatts (MW). Consents have been sought for turbines of 6MW capacity. Wind farms in New Zealand have proven to have unique characteristics and be diverse in scale, ranging from one turbine to hundreds of turbines.

Central government recognises the importance of renewable generation to New Zealand's future. Its current energy strategy includes a target of 90% electricity from renewable sources by 2025. Currently, renewable sources generate about 75% of NZ's electricity. Achieving the 90% target requires a substantial increase in renewable generation. The New Zealand Wind Energy Association (NZWEA) expects wind generation to grow to 20% of generation by 2030, resulting in a five-fold growth in wind farms.

The National Policy Statement on Renewable Electricity Generation (NPSREG) provides government direction on the benefits of renewable electricity generation and requires all councils to make provision for it in their plans.

Any wind farm development will have positive and adverse environmental effects that need to be managed under the Resource Management Act (RMA).

NZWEA anticipates that over the next two decades there will be numerous resource consent applications for a variety of new wind farms, repowering of existing wind farms, and redesigning of wind farm proposals that have been consented but not yet built.

Consenting wind farms has become cumbersome, with many of the parties involved uncertain about the assessment and evaluation of actual and perceived environmental effects of wind farms. This uncertainty can lead to increased costs and delays for wind farm developers, councils, communities, tangata whenua and other stakeholders alike.



Photo 4. Te Apiti Wind Farm, Manawatu

NZWEA has produced this document as a step towards enabling a high level of consistency and transparency in the way wind farms are consented, constructed and operated. This document:

1. provides a common point of reference for all involved with a wind farm proposal to have access to an independent source of information about wind farm development in New Zealand
2. outlines best practice development and consenting principles.

Over time, NZWEA will continue to publish fact sheets and industry practice notes to promote the consistent and robust assessment of wind farm proposals. This should help improve the efficiency of consenting processes and reduce costs for all parties involved.

The New Zealand Wind Energy Association (NZWEA) expects wind generation to grow to 20% of generation by 2030, resulting in a five-fold growth in wind farms.

This document is intended to inform any person involved in a wind farm development, including:

- wind farm developers and their suppliers
- consultants
- neighbours of a proposed wind farm and other members of the public
- local community groups and organisations
- non-governmental organisations and special interest groups
- councils and other consenting authorities.

NZWEA invites local and regional planning authorities and decision makers to use these guidelines, and supporting NZWEA publications, to help improve the consenting process for wind farms throughout New Zealand.

This document will be a living document and will be updated to take into account changing technical, legislative, environmental and social circumstances.

Feedback on this document is welcome via info@windenergy.org.nz.

What is a wind farm?

A wind farm is a system of harnessing wind energy to generate electricity for supply into a local distribution network or the national grid.

Wind farms can vary widely in size, design, and generating capacity, but will typically comprise the following core components:

1. access roads
2. wind turbines
3. internal electricity transmission
4. accessory buildings and structures such as transformers, substations, and onsite depots.

The above definition excludes:

- the external transmission infrastructure that connects the electricity generated by a wind farm to the local distribution network or the national grid
- investigation structures such as meteorological masts required to monitor the wind energy resource
- investigation activities such as geotechnical investigations required to inform turbine foundation and road design.

Wind farms are a Renewable Electricity Generation Activity. The National Policy Statement for Renewable Electricity Generation (NPSREG) defines 'renewable electricity generation' as the:

" generation of electricity from solar, wind, hydro-electricity, geothermal, biomass, tidal, wave, or ocean current energy sources."

The NPSREG defines 'renewable electricity generations activities' as:

" the construction, operation and maintenance of structures associated with renewable electricity generation. This includes small and community-scale distributed renewable generation activities and the system of electricity conveyance required to convey electricity to the distribution network and/or the national grid and electricity storage technologies associated with renewable electricity."

Figure 1. Wind speed variation over complex terrain at West Wind

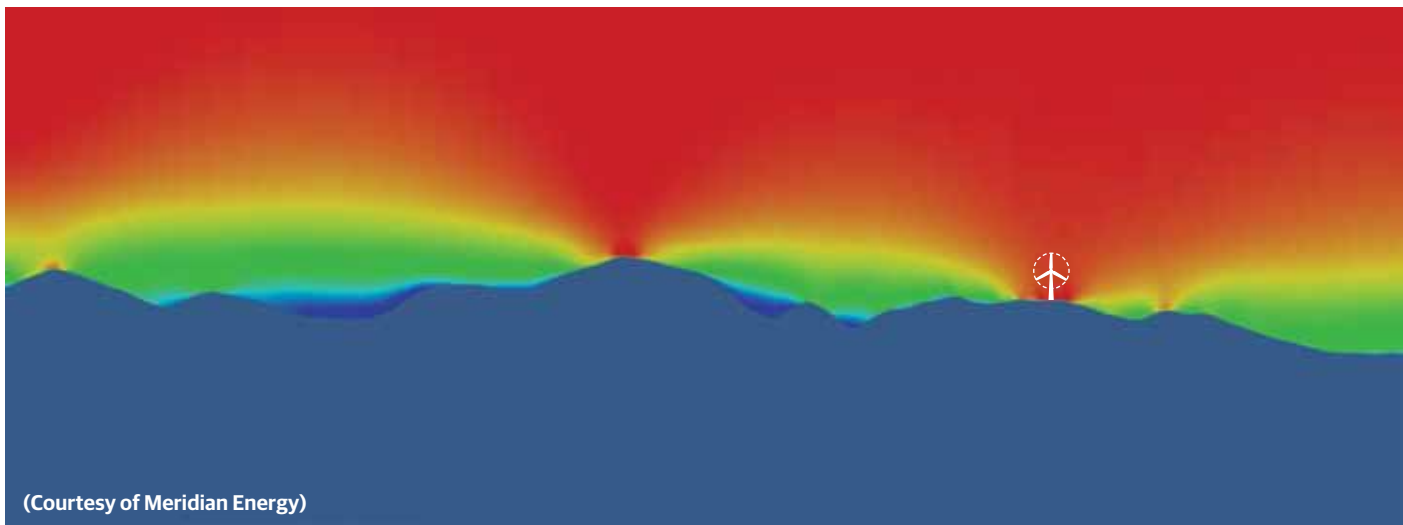




Photo 5. Mt Stuart Wind Farm, Clutha

The layout of wind turbines is largely dictated by the practical constraints associated with arranging the turbines, such as the available wind resource, the physical capacity of the landform, and the associated costs of each component of the wind farm (which vary depending on the arrangement option).

Generally speaking, more energy can be derived from taller turbines than shorter ones, therefore fewer large turbines are required to produce the same (or more) energy than a greater number of smaller turbines. Most new wind farms will use wind turbines that are larger, both in size and generating capacity, than those installed 10 years ago. However, some developers still choose to make use of smaller wind turbines, particularly for wind farms that have a generating capacity of under 10MW.

Wind turbines typically have an operating life of 20 to 25 years before they are decommissioned, although with appropriate maintenance and refurbishment a turbine can operate for longer than this.

After decommissioning, the wind farm may be repowered by replacing the old wind turbines with modern wind turbines. Repowering may result in changes to the location of turbines and some land rehabilitation.

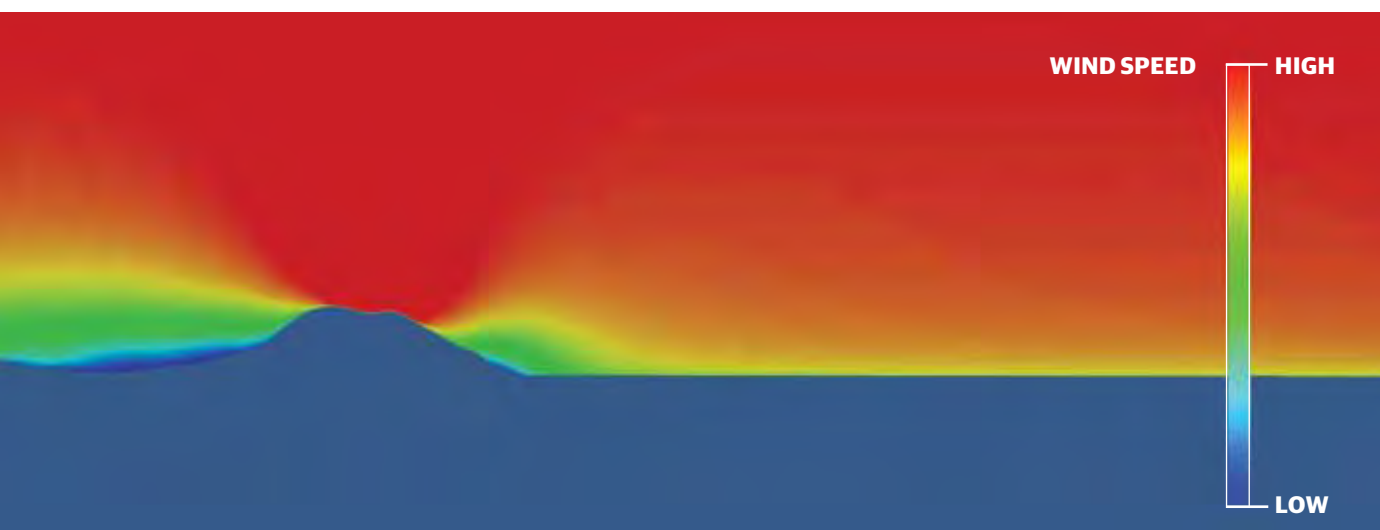


Figure 2. Operating wind turbines in New Zealand

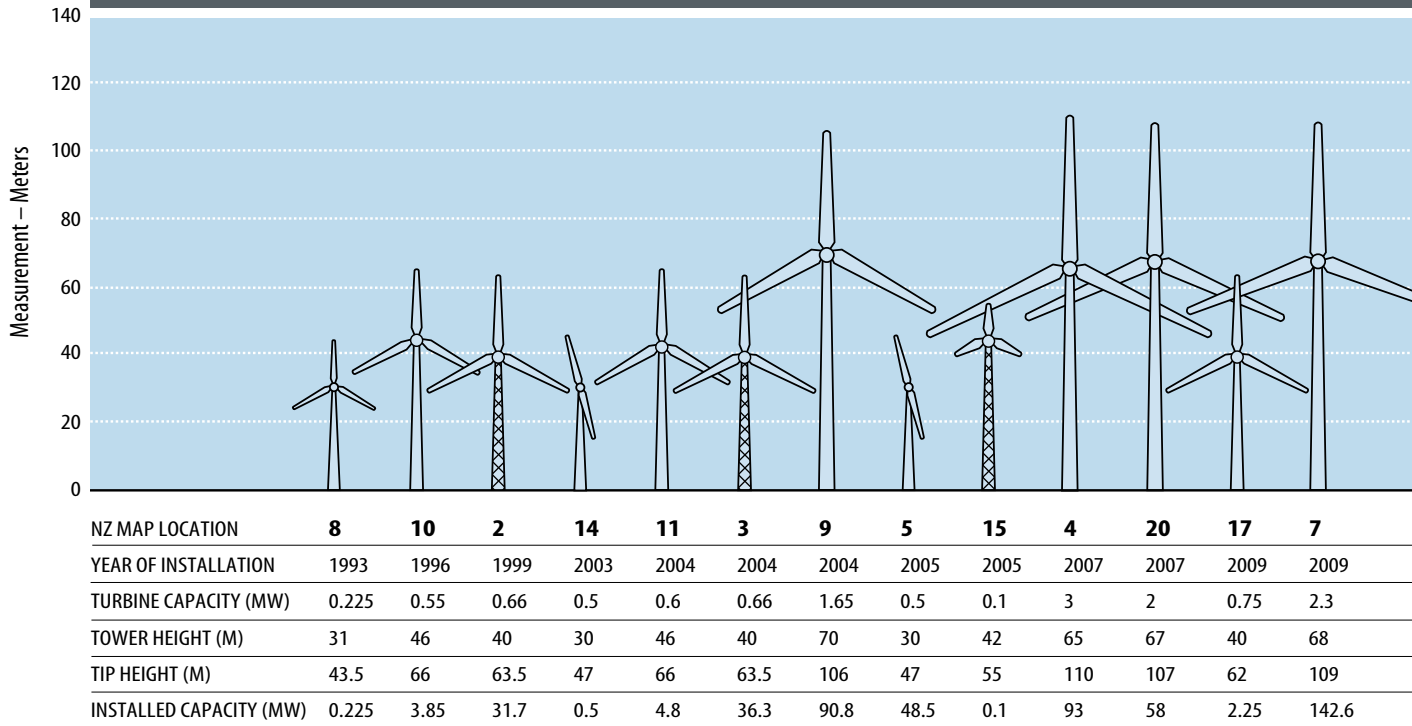
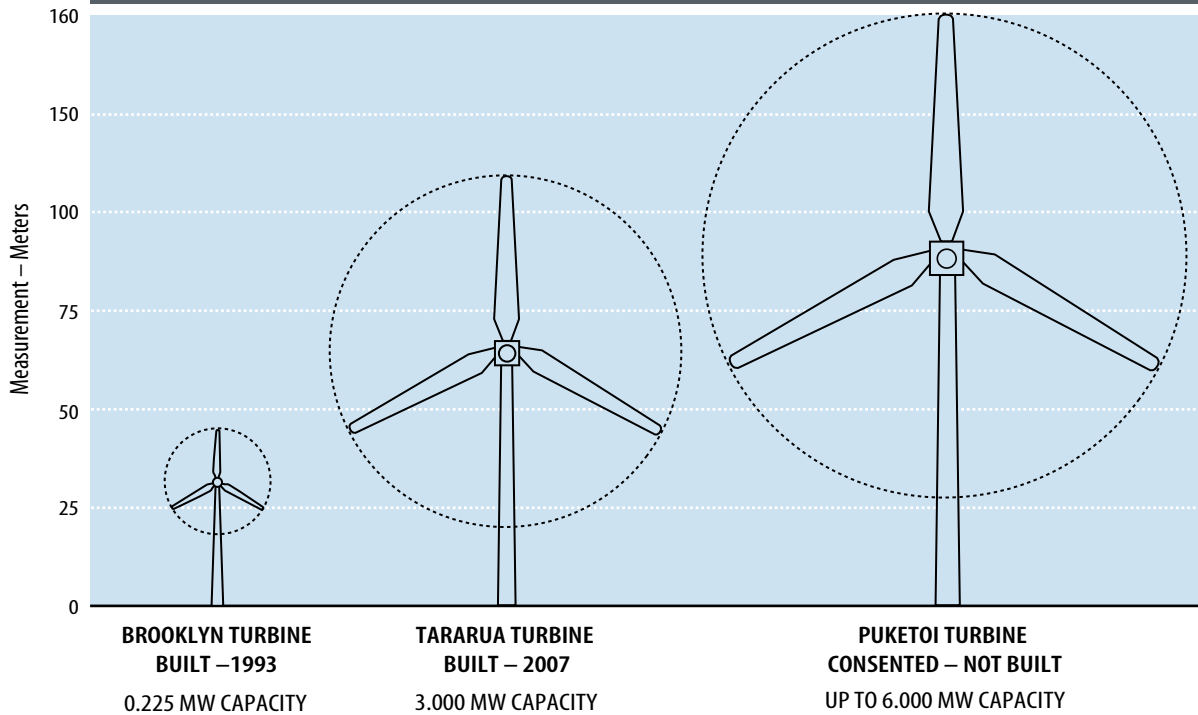
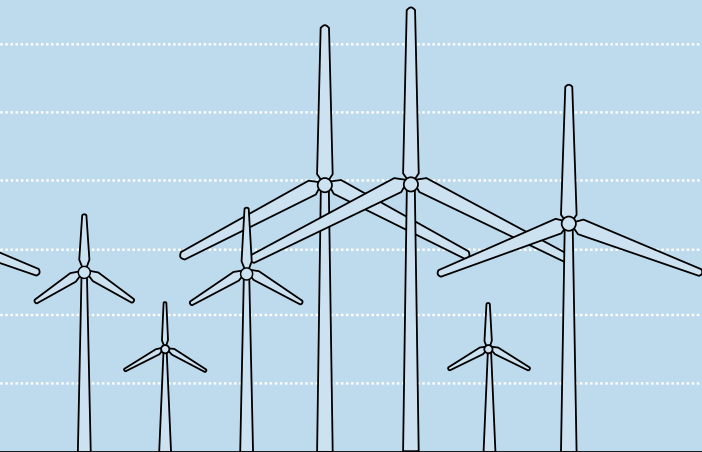


Figure 3. Size of wind turbines in New Zealand





16	12	19	18	1	13	6
2010	2010	2011	2011	2011	2011	2014**
0.225	0.25	0.85	3	2.3	0.25	2.3
55	30	54	80	80	30	67
70	43	72	125	130	43	111
0.45	0.75	7.65	36	64.4	1	59.8

Locations of operating and consented wind farms

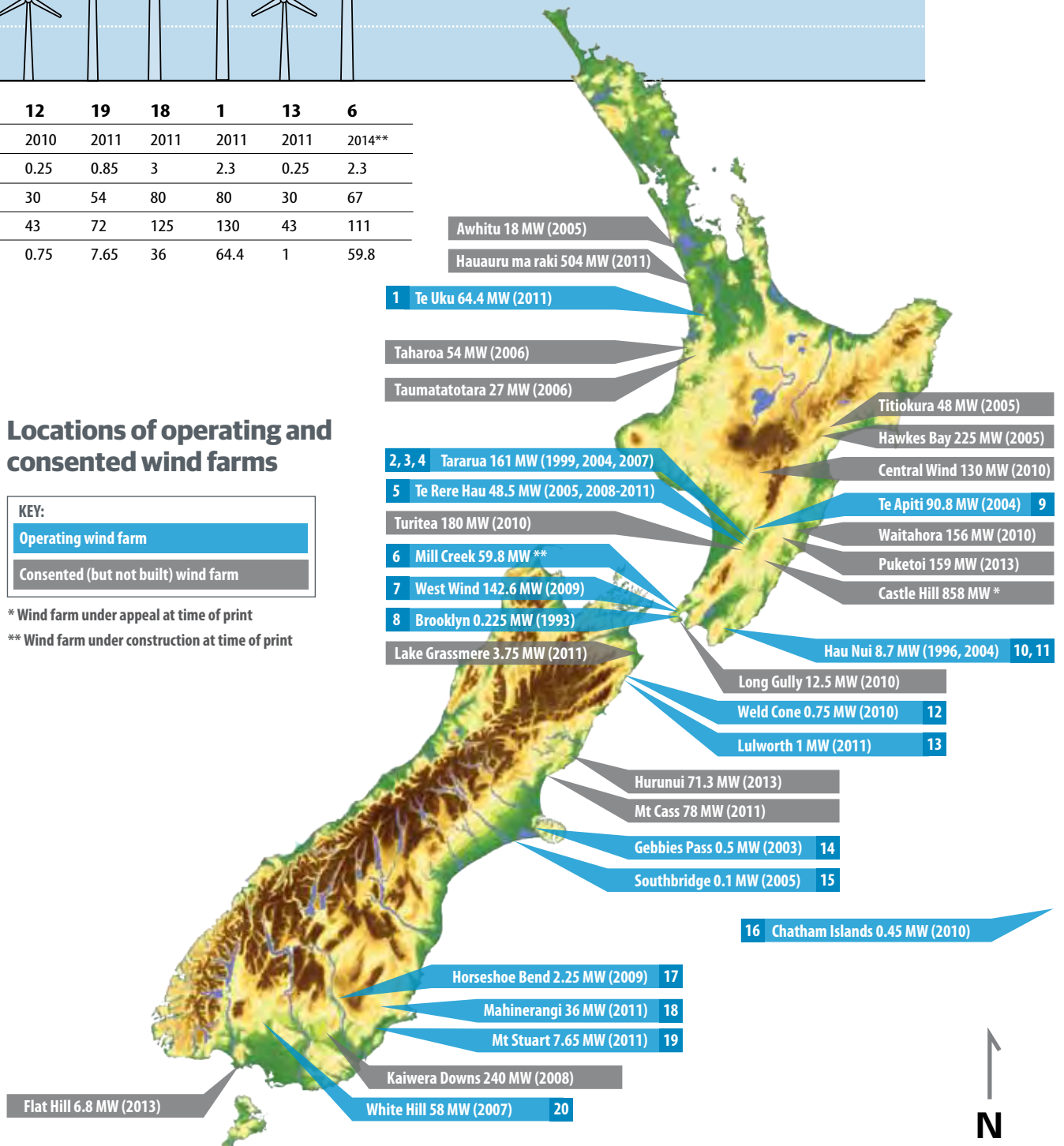
KEY:

Operating wind farm

Consented (but not built) wind farm

* Wind farm under appeal at time of print

** Wind farm under construction at time of print



Wind farm project development stages

Developers usually follow a staged approach to developing a wind farm. Table 1 summarises the typical stages of a wind farm development. Within each development stage there are certain activities that can be grouped into the following broad themes:

- technical
- environmental
- consultation.

Technical

Technical considerations include the various technical aspects of the development required to harness the wind and then use, transmit or distribute the electricity. For example: the wind resource; site access; foundation requirements; available turbine technology; and the ability to connect to the electricity network.

Environmental

Environmental considerations include the potential consenting requirements and assessment of the environmental effects of the project. These considerations will vary considerably from location to location. High-level environmental impact assessments will assist in the initial site selection. They are typically followed up with detailed studies as part of the detailed assessment and consenting stages. Environmental considerations provide essential inputs to the detailed design of the wind farm and often require iterative processes. Environmental considerations can extend to the monitoring of the project during operation and site decommissioning and rehabilitation. For example, most operating wind farms are monitored to compare the actual effects with those permitted by the resource consent. Environmental considerations are subject to the RMA's case-by-case consenting framework.

Consultation

Consultation between the applicant, key stakeholders, affected parties, local communities and the consenting authorities during the full life of a wind farm, from proposal to decommissioning, is important. Consultation is undertaken at the discretion of the developer and will vary from project to project accordingly.

Commercial considerations

Development stages will vary between projects and will be influenced by an applicant's commercial considerations. Commercial considerations include the ability to generate and sell electricity on the wholesale market. Cost effectiveness is a key driver for any electricity generator and lies at the heart of New Zealand's competitive electricity generation system. Commercial considerations vary considerably between electricity generators.



Table 1. Typical wind farm development stages

	Project stage	Technical considerations	Environmental considerations and consultation
SCOPING	1. Site selection	<ul style="list-style-type: none"> • Ascertain wind resource by desktop assessment and/or preliminary on-site wind monitoring • Ascertain potential critical impediments to development • Scope preliminary site design 	<ul style="list-style-type: none"> • High level desktop investigations into site constraints and regulatory approval processes • Consultation with land owner
	2. Project feasibility	<ul style="list-style-type: none"> • Arrange access for wind farm and transmission infrastructure • Perform advanced on-site wind monitoring • Understand project design options and anticipated development costs 	<ul style="list-style-type: none"> • Scope Assessment of Effects on the Environment (AEE) and regulatory approval processes • Consultation with key stakeholders
CONSENTING	3. Detailed assessment	<ul style="list-style-type: none"> • Detailed site-specific investigations to optimise the site design • Ongoing consultation 	<ul style="list-style-type: none"> • Detailed site-specific investigations to enable assessment of the environmental effects • Initial community engagement or consultation
	4. Consenting	<ul style="list-style-type: none"> • Detailed site-specific investigations to optimise the site design • Ongoing consultation 	<ul style="list-style-type: none"> • Pre-application consent administration matters and information requirements clarified with consenting authorities • Draft documentation prepared and peer reviewed if relevant • Formal consent process and consultation
CONSTRUCTING	5. Project confirmation	<ul style="list-style-type: none"> • Finalise project design, access rights and other project approvals required • Finalise procurement and construction contracts • Secure an <i>off-take/power purchase agreement</i>, if required • Finalise project business case 	<ul style="list-style-type: none"> • Confirm project design fits within consent parameters • Formal consent process if required (e.g. to change conditions)
	6. Construction	<ul style="list-style-type: none"> • Prepare construction drawings • Construct the project as required • Turbine commissioning and testing 	<ul style="list-style-type: none"> • Prepare, implement and monitor environmental management plans in accordance with consent conditions • Ongoing stakeholder and community engagement
OPERATING	7. Operations and maintenance	<ul style="list-style-type: none"> • Operate and maintain wind farm components as required 	<ul style="list-style-type: none"> • Monitor and comply with consent conditions and management plans
REPOWERING	8. Upgrading or decommissioning	<ul style="list-style-type: none"> • Upgrade wind farm by repeating stages 2 through 7 above (except the consenting stage if it is not required) • Remove infrastructure and rehabilitate land 	<ul style="list-style-type: none"> • Activities carried out in accordance with applicable consent conditions or environmental management plans • Stakeholder and community engagement or consultation

2. New Zealand policy context

This section outlines the legal and policy framework for obtaining resource consents to construct and operate a wind farm. It discusses how the RMA applies to wind farms and outlines the resource consent application and decision-making processes. Relevant provisions of the Civil Aviation Act, Conservation Act, Historic Places Act, and the Wildlife Act are also covered.

Resource Management Act 1991

The RMA is the primary piece of legislation for environmental management in New Zealand. The purpose of the RMA is to promote the sustainable management of natural and physical resources. Under the RMA, natural and physical resources are managed through various national, regional and local resource management plans. These documents in turn provide the primary environmental regulatory framework for wind farm proposals.

Decision making under the RMA

Decision makers must consider a range of RMA provisions when assessing a wind farm proposal, as set out in Part 2 and section 104 of the RMA.

Part 2 of the RMA

All decisions made under the RMA are subject to Part 2 of the Act. Part 2 is made up of sections 5, 6, 7 and 8.

Section 5 provides the overarching purpose of the RMA, being 'sustainable management of natural and physical resources'. Sections 6 and 7 provide guidance for decision-makers on how to achieve this

purpose by reference to matters to be 'recognised and provided for' as matters of national importance, and other matters to have 'particular regard to'. Section 8 requires decision-makers to 'take into account the principles of the Treaty of Waitangi'.

Case law on how to apply Part 2 of the RMA to wind farms and avoiding, remedying and mitigating effects, is constantly developing.

Section 104

When making a decision on a resource consent application, section 104 of the RMA directs consent authorities to have regard to:

- any actual and potential effects on the environment of allowing the activity;
- any relevant provisions of –
 - › a national environmental standard;
 - › other regulations;
 - › a national policy statement;
 - › a New Zealand coastal policy statement;
 - › a regional policy statement or proposed regional policy statement;
 - › a plan or proposed plan; and
- any other matter the consent authority considers relevant and reasonably necessary to determine the application.



Photo 7. Different wind turbines on the Tararua Ranges, Manawatu

Section 3 of the RMA defines 'effect' as including any positive effect as well as any adverse effect. This definition must be kept in mind when discussing the effects of renewable electricity generation projects such as wind farms.

A consent authority must not have regard to trade competition or the effects of trade competition, or any effect on a person who has given written approval to the proposal.

National policy statements

National policy statements (NPS) are created by central government. A NPS states objectives and policies of matters of national significance that are relevant to achieving the purpose of the RMA. Matters contained in an NPS are still subject to Part 2 of the RMA. One NPS does not override any other national policy statement.

Local authorities are generally required to give effect to NPSs in local resource management plans. Consenting authorities are generally required to give effect to NPSs in resource consent application decisions.

The NPSREG applies to all wind farm proposals. The New Zealand Coastal Policy Statement (NZCPS) applies to wind farm proposals located in the coastal environment.

National Policy Statement for Renewable Electricity Generation 2011

Under the NPSREG, all RMA decision-makers must recognise and provide for the development of renewable electricity generation activities, which include activities associated with generating electricity from wind, as matters of national significance.

The Ministry for the Environment (MfE) has published an implementation guide for NPSREG that provides direction on how the NPSREG can best be incorporated into regional and district planning instruments. The guide is available on the MfE website (see www.mfe.govt.nz).

The Energy Efficiency and Conservation Authority (EECA) has published a technical guide that provides local government, planners and the public with explanations of the technical terms and concepts used in the NPSREG. The guide is available on the EECA website (see www.eeca.govt.nz).

New Zealand Coastal Policy Statement 2010

The New Zealand coastal environment contains wind energy resources of significant value. This is recognised in the NZCPS.

The NZCPS provides guidance to local authorities and decision makers regarding the management of the coastal environment. As with other national

policy statements, local authorities must give effect to the provisions of the NZCPS in local resource management plans.

The NZCPS's seven objectives and 29 policies generally seek to protect environmental values associated with the coastal environment, particularly public access, natural character, indigenous biodiversity, historic heritage, and Māori values. Objective 6 and Policy 6 seek to ensure the protection of coastal values while not precluding the provision of development and recognise that the coastal environment contains renewable energy resources of significant value.

Each provision in the NZCPS will need to be considered to the extent applicable to the location of the proposed wind farm.

Local resource management plans

All Regional Councils must have a Regional Policy Statement. The purpose of Regional Policy Statements is set out in section 59 of the RMA:

“to achieve the purpose of the Act by providing an overview of the resource management issues of the region and policies and methods to achieve integrated management of the natural and physical resources of the whole region”.

The RMA directs that Regional Policy Statements must include objectives, policies and methods relating to the significant resource management issues of the region. Regional Policy Statements are implemented through: Regional plans and associated rules; District Plans and associated rules; or a Unitary Plan.

Regional Plans, District Plans, and Unitary Plans are prepared and administered by the applicable Regional Council, District Council or Unitary Authority. Each plan sets out objectives and policies against which wind farm resource consent applications are assessed. The plans also specify the 'activity status' of certain activities. The activity status influences the degree of discretion in a resource consent assessment and influences the thresholds in relation to granting or declining consent.

The RMA consenting processes

Wind farm proposals require resource consent approval from the respective consenting authority, unless a rule in the District or Regional Plan permits that activity, the activity is designated in the District or Regional Plan, or the District or Regional Plan is changed to permit that activity.

To date, all wind farms in New Zealand have required resource consent. Some wind farms have consented the external transmission activities via a designation process.

Types of resource consent

There are five different types of resource consents as defined under section 87 of the RMA. Table 2 outlines the type of resource consents typically required for activities associated with developing and operating a wind farm.

Ideally, at the outset a developer will seek all the consents required for the proposal. However this is not always practical, particularly in circumstances where:

- resource consents for relatively benign activities are required from different consenting authorities, for example temporary discharge permits required from regional councils for temporary construction activities
- unforeseen activities arise, for example, as a result of technological advancements or alternative mitigation options arising from the consenting process.

Resource consents have a standard lapsing period of five years. Many wind farm developers seek an extension to this timeframe because of the range of factors that affect the lead time for developing a wind farm.

Consent processes

There are three different routes by which resource consent applications can be granted for wind farms. These are:

- 'standard' resource consent process
- 'direct referral'
- 'call-in'.

Table 2. Types of resource consents often required for a wind farm

Resource Consent	Wind farm activity	Maximum consent duration
Land use	Earthworks, vegetation removal, buildings, structures, storage and use of hazardous substances, noise, dust, light spill, road upgrades/transportation	No maximum
Subdivision	Land tenure arrangements (i.e. long term leases) for a term of more than 35 years	No maximum
Water permit	Disturbances to waterbodies (i.e. roads, culverts, bridges), water take (e.g. to supply concrete batching plants)	35 years
Discharge permit	Discharges of contaminants to land, air or water (i.e. temporary construction activities)	35 years
Coastal permit	Likely to be required only if an activity is located within or near the coastal marine environment	No maximum

The procedure for obtaining the necessary consents is set out in Part 6 of the RMA. The decision-making criteria applied in each consenting approach will be the same, regardless of who the decision maker is.

During the site identification stage the wind farm developer may broadly consider the likely consenting route. Once a site is selected and a general project description is known, the need for various resource consents and consenting routes can generally be determined. Determining the consenting route will typically require input from the District and Regional councils, and potentially the Environmental Protection Authority (EPA). Wind farm proposals may be located across the boundaries of Local and/or Regional Councils, in which case all councils need to be involved to some extent.

Standard resource consent process

The standard process for obtaining resource consent is by applying to the relevant local authority(s). After an application is lodged the local authority(s) will determine the appropriate type of notification for the application. Wind farm applications are likely to be publicly notified. If the application is publicly notified the public can make submissions on the application. The local authority(s) will prepare an Officer's Report in accordance with section 42A of the RMA that provides an assessment of the resource consent application against the relevant section 104 and Part 2 considerations. The report will also make a recommendation to approve (subject to conditions) or decline the application as sought.

A hearing will then be held (if there are parties which have submitted on the proposal), after which the hearings committee or hearings commissioners will make a decision on the application. A joint hearing may be held where consents are applied for from multiple consenting authorities. The applicant or submitters can appeal all or part of a decision to the Environment Court.

Direct referral

The direct referral process allows applicants to make a request to the local authority that their notified resource consent application be decided by the Environment Court rather than by the local authority. In a direct referral, the application is lodged with the local authority, the local authority notifies the application and receives submissions, but the application is then transferred to the Environment Court for a decision. The local authority has discretion to decide on the direct referral request.

Call in

An application may proceed down an entirely different route to the standard process or direct referral. There are four different ways in which a proposal can be called in:

- an application is lodged directly with the EPA and the EPA makes a recommendation to the Minister for the Environment whether or not the application should be called in
- an applicant requests the Minister 'calls in' an application

- a local authority requests the Minister 'calls in' an application
- the Minister intervenes on an application after it has been lodged with a local authority.

The Minister has the discretion to defer the application back to the local authority or the Environment Court. Alternatively, the Minister may appoint a Board of Inquiry. The Chairperson of a Board of inquiry must be a current, former or retired Environment Court Judge or a retired High Court Judge. The Minister must seek suggestions from relevant local authorities when appointing a Board, but is not bound by those suggestions.

Designations

Designations allow a requiring authority (which can include wind farm operators that are network utility operators) to designate an area of land for a specific purpose. A requiring authority may undertake work on the designated land without the need for resource consents from the relevant territorial authorities. In this way, designations provide an alternative to resource consents or plan provisions and/or changes.

Typically, wind farm applicants can only seek a designation for the external transmission infrastructure connecting the wind farm to the local lines network or national grid. This is because a designation cannot be used for electricity generation unless allowed by an Order in Council. The procedure for designating land is set out in Part 8 and Schedule 1 of the RMA.

Private plan change requests

A developer can seek changes to district or regional plans through a request for a private plan change. The procedure for a private plan change request is set out in Part 2 of Schedule 1 of the RMA. An applicant can request a private plan change at any time. When a council receives a request for a plan change, it must decide whether to adopt the plan change request, accept it as a private plan change, convert it to a resource consent application, or reject it. Councils normally require very detailed information and must consider the cumulative effects of private plan changes when making a decision. The impact of existing activities on the proposed development (known as reverse sensitivity) is often an important matter for consideration.

Other relevant legislation and policy

The following legislation and policy may also be relevant in the consideration of a wind farm proposal.

Civil Aviation Act 1990

In accordance with the Civil Aviation Act, wind farms and wind monitoring masts need to be sited so as not to cause a hazard to aircraft. Under Part 77 of the Civil Aviation Act, wind farm developers often require approval from the Manager Aeronautical Services to issue a determination of a hazard in navigable airspace.

Conservation Act 1987

The Conservation Act applies to wind farms that are located on conservation land. Under the Conservation Act, a person may apply to the Minister of Conservation for a concession in the form of a lease, license, permit or easement for an activity on conservation land. For a concession application relating to a wind farm, the Minister is generally required to give public notice *if* the Minister forms an 'intention to grant' the concession. Any person may make a submission on a concession application that has been publicly notified. The Minister may impose conditions on any concession granted.

Historic Places Act 1993¹

The Historic Places Act applies when applicants seek to destroy, damage or modify an archaeological site, regardless of any resource consent requirements. An archaeological site is defined under the Historic Places Act as being a place in New Zealand that is either associated with human activity that occurred before 1900 and is, or may be able, through investigation by archaeological methods, to provide evidence relating to the history of New Zealand. Under section 11 of the Historic Places Act, any person seeking to destroy, damage, or modify the whole or any part of any archaeological site must first apply to the Historic Places Trust for authority to do so. Under section 11(2)(e), the application must include the approval of the owner if the owner is not

¹ The Historic Places Act is expected to be replaced by the Heritage New Zealand (Pouhere Taonga) Bill 2011.

the applicant. Alternatively, under section 12 of the Historic Places Act, a person can apply for a general authority to destroy, damage, or modify all or any archaeological sites within a specified area of land. Any unidentified sites of significance unearthed during the course of a development are also covered by the provisions of the Historic Places Act.

Wildlife Act 1953

The Wildlife Act protects most of New Zealand's indigenous mammals, birds, reptiles, frogs, and some terrestrial and freshwater invertebrates. Some introduced species are also protected. The Department of Conservation manages wildlife on behalf of all New Zealanders. Under the Wildlife Act the Department of Conservation will generally require an evaluation of any impact of wind farm development on threatened indigenous species and/or impacts on large numbers of unthreatened species.

The Wildlife Act and the RMA, require wind farm developers to avoid, remedy or mitigate effects on indigenous wildlife, for example ensuring passage for migratory fish species.

NZ Energy Strategy & New Zealand Energy Efficiency and Conservation Strategy

The *New Zealand Energy Strategy 2011-2021* is a government policy document that sets the strategic direction for the energy sector and the role energy will play in the New Zealand economy. The Government has set a target of 90% of New Zealand's electricity generation coming from renewable energy sources by 2025, providing this does not affect security of supply.

The *New Zealand Energy Efficiency and Conservation Strategy 2011-2016*, is a statutory strategy document prepared under the Energy Efficiency and Conservation Act 2000. The Act is specifically focused on the promotion of energy efficiency, energy conservation and renewable energy. An objective of the document is to have an efficient, renewable electricity network supporting New Zealand's 'global competitiveness'. The Government intends to achieve this through:

- removing unnecessary barriers to investment in large-scale renewable electricity generation, such as further improving consenting

processes under the RMA and supporting the implementation of the NPSREG to provide clear guidance for decision-makers

- incorporating the cost of greenhouse gas emissions into electricity investment decisions through the New Zealand Emissions Trading Scheme.

The Government has set a target of a 50% reduction in New Zealand's greenhouse gas emissions, from 1990 levels, by 2050.

New Zealand Biodiversity Strategy

The *New Zealand Biodiversity Strategy* outlines the current state of New Zealand's biodiversity, and actions to halt the decline and then turn the tide of biodiversity loss.*

International Biodiversity Obligations

New Zealand is a signatory to the following international conventions:*

- *The Convention on Biological Diversity*, which promotes the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of benefits arising from the utilisation of genetic resources. New Zealand's strategy for implementing the convention is described in the *New Zealand Biodiversity Strategy*
- *The Convention on Wetlands*, which is an intergovernmental treaty for the conservation and wise use of wetlands by national action and international co-operation as a means of achieving sustainable development throughout the world
- *International Convention of the Conservation of Migratory Species*, which promotes co-operation between countries in identifying, understanding and conserving endangered and threatened migratory species and their habitats, and taking action to prevent other migratory species becoming endangered.

* Further information can be found at www.doc.govt.nz

3. Potential environmental effects of wind farms

This section summarises the potential environmental effects of wind farms that decision makers are often required to have regard to under the RMA. Table 3 highlights specific RMA provisions and policies of particular relevance to decision makers when consenting wind farms under the RMA.

Table 3. Environmental effects of wind farms and national RMA provisions

Environmental effect	RMA Sections					National Policy Statement
	s5	s6	s7	s8	s16	
Benefits of wind farms	✓		✓			NPSREG
Health and safety	✓					
Social impact	✓					
Landscape and natural character	✓	✓				NZCPS
Ecology	✓	✓				NZCPS
Historic heritage	✓	✓				NZCPS
Māori relationship with the environment	✓	✓		✓		NZCPS
Visual amenity values	✓		✓			NZCPS
Noise	✓		✓		✓	
Tourism and recreation	✓		✓			NZCPS
Transportation	✓		✓			
The electricity transmission network	✓		✓			NPSET
Communication networks	✓		✓			
Aviation	✓		✓			
Disturbance and discharges to land, water and air	✓	✓	✓			



Photo 8. Brooklyn Wind Turbine, Wellington

Benefits of wind farms

The NPSREG identifies that renewable electricity generation activities have national, regional and local benefits including but not limited to:

- a) maintaining or increasing electricity generation capacity while avoiding, reducing or displacing greenhouse gas emissions;
- b) maintaining or increasing security of electricity supply at local, regional and national levels by diversifying the type and/or location of electricity generation;
- c) using renewable natural resources rather than finite resources;
- d) the reversibility of the adverse effects on the environment of some renewable electricity generation technologies;
- e) avoiding reliance on imported fuels for the purposes of generating electricity.

NZWEA has prepared a fact sheet and a series of case studies identifying additional benefits of wind farm development: www.windenergy.org.nz/resources/resources/factsheets.

Health and safety

Under the RMA, decision makers must provide for people's health and safety.

Potential causes for human health effects associated with wind farm development arise from:

- construction and operational health and safety concerns
- potential health risks associated with electric and magnetic fields created by transmission cables
- sleep disturbance associated with wind turbine noise.

Credible scientific literature has found no direct links between wind turbines and adverse human health effects, for example:

" There is no reason to believe, based on the levels and frequencies of the sounds and... sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences. (Colby, 2009)"²

"... there is no scientific evidence that noise at levels created by wind turbines could cause health problems other than annoyance..."(Pedersen, 2003)"³

" The perception of noise depends in part on the individual - on a person's hearing noise. For example, a persistent "whoosh" might be a soothing sound to some people even as it annoys others."(National Research Council, 2007)"⁴

Health effects are generally addressed through ensuring compliance with the New Zealand Standard for wind farm noise, NZS6808:2010 *Acoustics - Wind farm noise*, international standards relating to magnetic fields, and avoiding, remedying or mitigating potential effects of shadow flicker and blade glint.

2 Colby et al. (2009), Wind Turbine Sound and Health Effects: An Expert Panel Review

3 Pedersen (2003), Noise annoyance from wind turbines: A Review for the Swedish Environmental Protection Agency

4 National Research Council (USA) (2007), Impact of wind energy development on humans

To date, the Environment Court has been satisfied that:

- the effects on a person's health from wind turbine noise will be no more than minor provided the limits in NZS6808:2010 are met
- a person's health will not be impacted from electric and magnetic fields created by transmission cables provided well known international standards are met
- occupational health and safety risks can be suitably avoided, remedied and mitigated through operational safety management procedures
- wind turbines can neither cause epilepsy nor exacerbate the condition in anyone already suffering from it
- wind turbines do not cause any vibration that can adversely affect human health
- annoyance caused by glare and blade glint can be mitigated by painting turbine blades a light grey or off-white colour with a low reflectivity finish
- annoyance from shadow flicker can generally be avoided or mitigated
- generally, most people will adapt to their environment to a large extent and the effects of wind farms on their well-being will be minor.

Social impact

RMA decision makers must provide for social, economic and cultural wellbeing.

Inevitably some people in a community will benefit from a proposal, some will be adversely affected, and others will neither benefit nor be adversely affected. As individual behaviour and community dynamics vary considerably it is a complex process to accurately predict the social impact of a wind farm development.

Any evaluation of social impact should be based on the particular community that may be affected. Often local people and communities raise concerns about their connection with the surroundings and landscape as a potential social impact. However, such perceptions are best incorporated into an evaluation of the effect on landscape and amenity values.

Landscape and natural character

Decisions made under the RMA must recognise and provide for the preservation of the natural character of the coastal environment and the protection of outstanding natural features and landscapes as a matter of national importance. There is no national record of these areas and to date only a few councils have identified and mapped them.

Wind farms are a visually prominent form of development. Their effects on landscape can be a key issue at the consenting stage.

A landscape assessment will generally be prepared to inform the AEE and include:

- an outline of how landscape matters were considered throughout the design process from overall wind farm layout to details of project elements
- reference to a baseline landscape assessment as part of the design process
- a summary of landscape inputs to the design process
- proposed conditions to provide sufficient certainty that the effects can be confidently mitigated where possible.

Protection of intrinsic values of ecosystems can also be relevant to natural character so aspects of an Ecological Impact Assessment (see Table 4) may contribute to the assessment of effects on natural character.

Ecology

RMA decision makers must recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. They must also have particular regard to the intrinsic values of ecosystems, the maintenance and enhancement of the quality of the environment, any finite characteristics of natural and physical resources, the protection of the natural character of the coastal environment, and the protection of the habitat of trout and salmon.

A well-designed wind farm should not have any long-term significant adverse ecological effects. No significant adverse ecological effects have been reported from New Zealand's operating wind farms.



Photo 9. Scientists conducting field monitoring work

Four wind farms are monitored to record bird mortalities. To date, the monitoring results have demonstrated that wind farms appear to cause limited bird strike and there is no evidence of any significant adverse effects on bird populations.

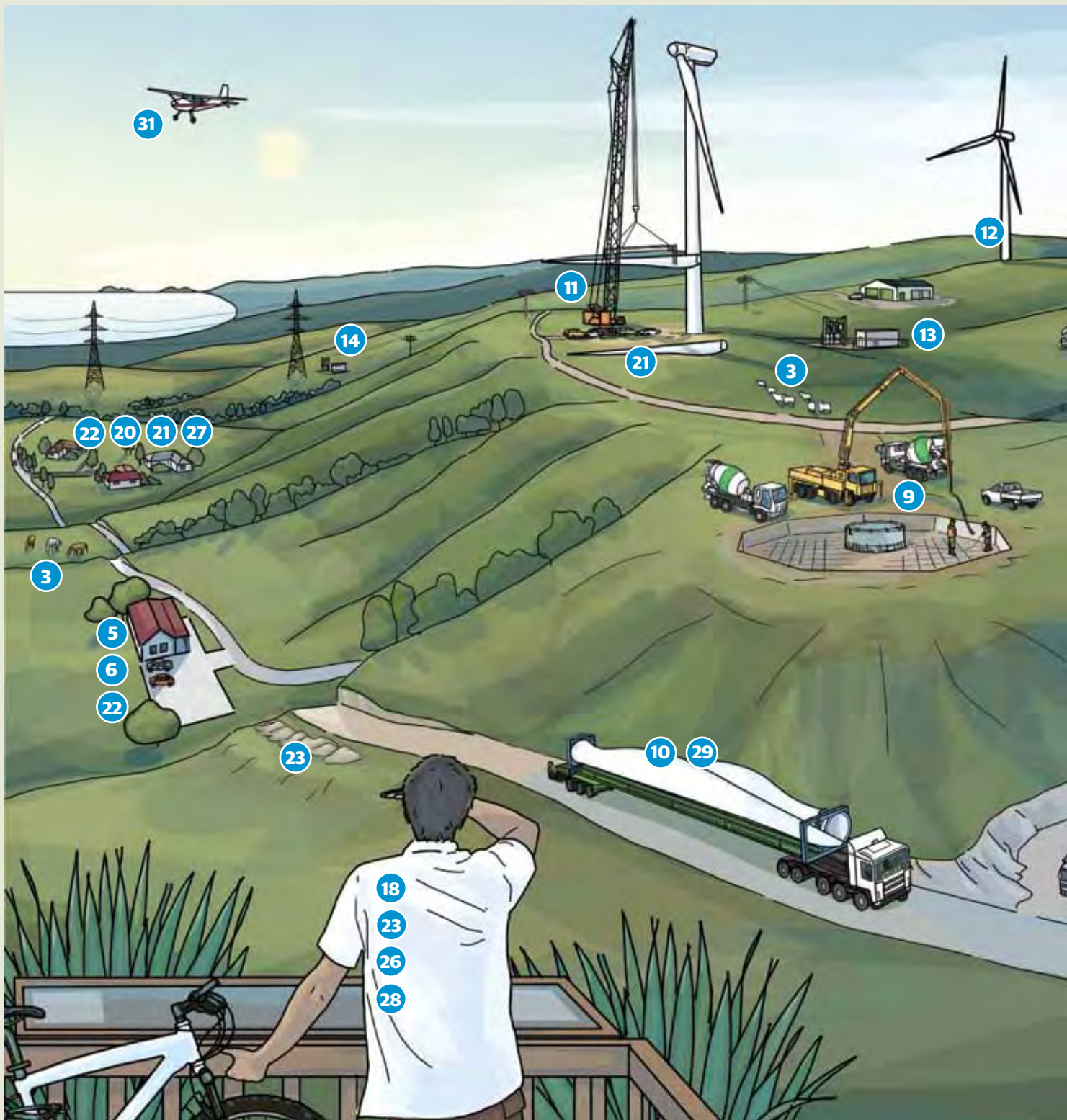
Construction activities can involve substantial earthworks and vegetation clearance, which can disturb significant flora and fauna. Different species will be exposed to varying potential risks during the construction and operational stages of a wind farm project. Evidence from existing wind farm development shows that impacts on indigenous biodiversity can be managed and there are well established methods for doing so.

An Ecological Impact Assessment will generally be prepared to inform the AEE. Potential effects on significant indigenous biodiversity will drive much of the assessment of ecological effects. Table 4 outlines a staged process that an ecological assessment for a wind farm development should follow. The assessment process for many wind farm proposals will not need to go beyond Level 1 or Level 2. This is because often the level of risk can be estimated to be low, or the risks can be appropriately reduced through mitigation measures, design reviews or siting alterations.

Table 4. Ecological Impact Assessment process for wind farms

LEVEL	INVESTIGATION
Level 1: Preliminary site evaluation and site sensitivity analysis	Preliminary site evaluation and initial assessment of potential risk to indigenous flora and fauna from construction and/or operation of the proposed wind farm. This stage calls upon sources of existing information and reconnaissance surveys to determine the sensitivity of the site and of the wildlife known to be present. If the level of risk is estimated to be low, or can be reduced to that level through mitigation measures, design reviews, or siting alterations, no further investigations may be needed. Otherwise, Level 2 investigations may need to be undertaken.
Level 2: Site-wide investigation	Site-wide investigation to refine the risk assessment from Level 1 investigation using more intensive methods. This requires a reasonably clear turbine layout so that effects can be accurately assessed. If the level of risk is estimated to be low, or can be reduced to that level through mitigation measures, design reviews or siting alterations, no further investigations may be required. Otherwise, Level 3 investigations may need to be undertaken.
Level 3: Population-level studies	Level 3 investigations may be initiated if the results of the Level 2 investigation indicate a greater than low level of residual risk of significant bird impacts from the operation of the proposed wind farm. Research design may seek to answer questions on fatality pathways, the quantification of risk to populations, and the evaluation of risk reduction management practices. These studies should establish both the scale of risk (i.e. probability x impact) and the scale of mitigation needed to fully compensate this risk.
Level 4: Post-construction monitoring	Post-construction monitoring to test the pre-operational predictions and to confirm the success of mitigation measures where they are necessary. This enables validation and refinement of prediction methods, allows regulatory compliance monitoring (e.g. whether a project is fulfilling the terms of its approval by planning authorities), and permits proponents to monitor their own environmental performance.

Figure 4.
Wind farm development and potential environmental effects





KEY:

DEVELOPMENT ACTIVITY

SCOPING

1. Technical investigations
2. Environmental investigations
3. Compatibility with existing land uses

CONSENTING

4. Detailed site specific investigations
5. Stakeholder consultation
6. Formal consent process

CONSTRUCTING

7. Earthworks for the construction of internal roads, turbine platforms, and building foundations
8. Temporary concrete batching plants for the turbine foundations
9. Constructing turbine foundations
10. Transporting wind farm components from ports along public roads to the wind farm site
11. Constructing the wind turbines
12. Wind turbine commissioning
13. Electricity substation and transmission to the national grid or local distribution network
14. Connecting to the existing national grid or local distribution network
15. Onsite monitoring and compliance

OPERATING

16. Monitoring and compliance
17. Ongoing health and safety
18. Public information and viewing

REPOWERING

19. Consultation
- Decommissioning and remediation
- Re-consenting and re-construction

ENVIRONMENTAL EFFECT

20. Benefits of wind farms
21. Health and safety
22. Social impact
23. Landscape and natural character
24. Ecology
25. Historic heritage values including archaeology
Māori relationship with the environment
26. Visual amenity values
27. Noise
28. Recreation and Tourism
29. Transportation
30. Communication networks
31. Aviation

Historic heritage values (including archaeology)

The RMA requires that decision makers provide for the protection of historic heritage from inappropriate use and development. A site of historic heritage may also be given a higher level of protection through a Heritage Protection Order under Part 8 of the RMA, or through recognition in a District Plan. However, a site does not need to have a Heritage Protection Order or be recognised under a District Plan for it to be protected under the RMA.

Wind farms can often be designed to avoid adverse effects on historic heritage and co-exist with heritage values. In some cases wind farms can provide opportunities to enhance heritage values in the project area by, for example, the restoration of specific historic sites, improving access and/or interpretation.

Māori relationship with the environment

Decision makers must recognise and provide for Māori values and world views. The RMA contains a number of provisions relating to tangata whenua that must be considered in RMA processes and should be borne in mind at every stage of the development process.

Māori interests in the environment can include those of guardian, resource user and developer. Wind farms may affect Māori or Māori interests in a number of ways. For example, a wind farm may affect a site of wāhi tapu, cultural and historical associations with landforms, or a natural resource of value to Māori, such as a stream. Consultation with tangata whenua is typically required to identify the extent of potential cultural effects of a wind farm proposal.

Visual amenity values

Decision makers must have particular regard to the maintenance and enhancement of amenity values. Visual amenity effects are a key issue when it comes to consenting wind farms. Visual amenity effects are created when a proposal causes changes to the views experienced by people. What a landscape looks like (its visual characteristics) is often considered as one of the most important

contributors to the overall amenity value of a landscape. Generally speaking, the more dominant turbines are in a view, the greater the effect on visual amenity.

Whether a wind farm has an adverse effect on amenity values must be determined on a case-by-case basis as often there are mixed perceptions (positive and negative) of the effect of the proposed wind farm on visual amenity. Many people like the look of wind farms, usually as a result of the sculptural form of the turbines and the fact that they provide green, renewable energy. In some cases, wind farms become an accepted feature of interest and are promoted as iconic to an area, for example the wind farms in Palmerston North, and the Brooklyn Turbine in Wellington City. However, some people may find the presence of new turbines in a landscape, or near to their property, obtrusive and unacceptable.

Visual amenity effects are often identified through public consultation processes and should be informed by an independent Landscape and Visual Impact Assessment.



Photo 10. West Wind: Old Makara Radio Station in the foreground



Photo 11. Tararua Wind Farm: images of the site before, proposed (simulated), and after construction

Noise

RMA decision makers must provide for people's health and have particular regard to maintaining and enhancing people's amenity values. In addition, under section 16 of the RMA, every occupier of land must adopt the best practicable option to ensure that the omission of noise from that land does not exceed a reasonable level.

Wind turbine noise is heavily debated during consent hearings for wind farms. In New Zealand, the Courts have accepted the use of NZS6808 as the appropriate measure for noise effects of wind turbines. The purpose of NZS6808 is to provide suitable methods for the prediction, measurement and assessment of sound from wind farms. It recommends limits on the level of sound that can be heard from locations near wind farms, and it explicitly addresses cumulative effects, reverse sensitivity, and noise characteristics specific to wind farms. It is used by wind farm developers, acoustics specialists, councils, and decision makers involved in setting and monitoring wind farm noise limits in planning documents and resource consent conditions.

NZS6808:2010 recommends the following noise limit:

At any wind speed, wind farm sound levels (LA90(10 min)) should not exceed the background sound level by more than 5 dB, or a level of 40 dB LA90(10 min), whichever is the greater.

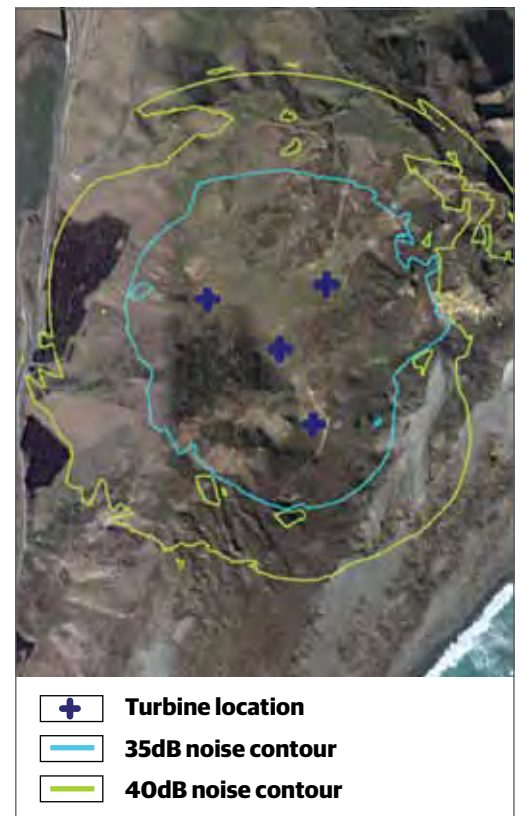
A secondary lower noise limit is recommended during evening and night time where special circumstances apply (High Amenity Areas):

Where a high amenity noise limit is shown to be justified... wind farm sound levels during evening and night-time should not exceed the background sound level by more than 5 dB or a level of 35 dB LA90(10 min), whichever is the greater.

The noise limits recommended in NZS6808 are based on the World Health Organisation's standards and are intended to provide protection against sleep disturbance and maintain a reasonable amenity at locations surrounding a wind farm. People living near a wind farm may still hear the wind farm at times, but if the limits recommended in NZS6808 are properly applied and complied with, the level of sound should not be unreasonable and noise and associated health effects should be no more than minor.

A Noise Impact Assessment will generally be prepared in accordance with the requirements of NZS6808 to inform the AEE.

Figure 5. Predicted noise contours, Lulworth Wind Farm



(Courtesy of Energy³)

Transportation

Decision makers often need to have regard to transportation effects because constructing wind farms involves frequent truck deliveries and the transportation of large structures.

Most traffic effects occur during construction. While construction traffic occurs for a limited time, its introduction into the existing traffic network can be rapid.

Managing traffic effects requires identifying options for minimising traffic effects and then managing the introduction of the new traffic into the existing environment, accordingly.

Typically a Traffic Management Framework will be prepared as a condition of the resource consent which may cover some or all of the following:

- site access
- local intersections
- road width and alignment
- traffic noise
- dust
- stock droving
- horse flight
- school travel
- schools
- road maintenance
- driver distraction
- events
- road upgrades
- oversize load management.

Recreation and tourism

Under the RMA, decision makers must have particular regard to recreational values (as a subset of amenity values). Recreation is loosely defined as activities pursued for pleasure during free time. Tourism is a subset of recreation. A tourist is a person staying away from home for at least one night while undertaking recreation. It can be very hard to tell the difference between a tourist and a recreational visitor within a recreation setting – they do the same things.



Photo 12. West Wind recreation area

The Environment Court has confirmed that effects of wind farms on tourism and recreation activities tend to be both positive and negative. Submitters on wind farm proposals have often voiced a concern that, because some international studies into the effects of wind farms on recreation and tourism report some unfavourable responses, wind farms have a default negative effect on recreation and tourism activity. However, in New Zealand there appears to be very little if any evidence of adverse effects from wind farms on recreation and tourism activity. In some cases there have been clear positive outcomes.

Potential impacts on tourism and recreation can usually be identified by preparing a Recreation and Tourism Effects Assessment that identifies potential impacts of noise, landscape, and traffic impacts on local recreation and tourism activities.

...in New Zealand there appears to be very little if any evidence of adverse effects from wind farms on recreation and tourism activity. In some cases there have been clear positive outcomes.

Communication networks

Decision makers often need to consider the potential for wind turbines to interfere with radio communications in the surrounding area. Such effects are routinely assessed and managed as part of any wind farm development.

Wind turbines can interfere with radio, television and microwave transmission. Interference can be caused by four distinct mechanisms:

- electromagnetic noise (EMI), whereby the wind turbine generator's electrical and electronic equipment is radiated in a frequency-band used by a radio service
- modification of an antenna's radiation pattern where a wind turbine is in close proximity
- obstruction of a radio path by a wind turbine, which attenuates the amount of radio signal received
- reflection (scatter) from a wind turbine, which can cause echoes of radio signals to be received along with the direct signal. These 'ghost' signals can cause distortion and noise.

The effects on communications activities are typically identified and assessed in a report which will make recommendations as to how any adverse effects can be avoided or mitigated. These are generally fairly standardised procedures where the wind farm developer works closely with potentially affected stakeholders, from the initial design stages, to take into account radio operators' equipment and service area requirements.

Aviation

Decision makers are required to consider potential effects of wind turbines, wind monitoring masts and lighting on aviation activities.

Wind farms must meet Civil Aviation Authority (CAA) requirements, which are stringent in areas surrounding major airfields and also apply to small rural airstrips, such as those used for top-dressing.

Aviation effects can typically be addressed through meeting the CAA regulatory requirements and consultation with all aviation stakeholders in the early stages of the wind farm development process. Often navigational safety lights are required to be installed on some of the highest wind turbines or on the periphery of a wind farm.



Photo 13. Transporting part of a wind turbine tower for the Mahinerangi Wind Farm

4. Other matters raised within wind farm proposals

This section outlines other common matters that applicants and decision makers are challenged with when consenting a wind farm:

- consultation
- wind turbine syndrome (perceived health effects)
- project economics and commercial considerations
- consideration of alternative sites
- impact on property values
- effects on livestock.

To date, submitters in opposition to wind farm proposals have consistently raised these matters as reasons for objecting to wind farm proposals. These matters often require considerable amounts of time and resources on the part of the developer and consenting authority to address in consent hearings.

Consultation

Broadly speaking, there is no duty for applicants and councils to undertake consultation for resource consent applications under s36A of the RMA. Whether to undertake consultation, and the extent and nature of consultation, is therefore largely undertaken at the discretion of the developer and will vary from project to project. Nonetheless, consultation between the applicant, key stakeholders, affected parties, local communities and the consenting authorities during the life of a wind farm project is important. Early engagement with all parties potentially affected by a project allows issues to be identified earlier, and thereby either addressed or recognised as a risk.

Consultation is often required to provide a robust AEE, which must accompany a resource consent application. Schedule 4 of the RMA (Clause 1(h))

requires that an AEE should include an identification of the persons affected by the proposal, the consultation undertaken (if any) and any response to the views of any person consulted. For any wind farm proposal, it is important that:

- changes to the original design or project development programme during the evolution of the project are generally communicated and discussed with key stakeholders in a timely fashion
- if parties do consult, there is a general requirement to have meaningful consultation.

Typically a developer will prepare an in-house stakeholder engagement strategy which can be reviewed and adapted at each stage of the development.

Wind turbine syndrome

Wind turbine syndrome is an alleged condition suffered by people living close to wind turbines. There is no recognition or evidence of wind turbine syndrome in any credible scientific literature and, as highlighted on page 21-22, there should be no reason to believe that wind turbines could plausibly have direct adverse physiological health consequences.



Photo 14. Sheep, cattle and wind farming at Mt Stuart, Clutha

Project economics and commercial considerations

The financial viability of any given project depends on a whole range of factors, which will vary from developer to developer. The Environment Court has repeatedly determined that the economic viability of a project lies in 'the boardroom' to be determined by the potential developer, and it is not for the Court to determine the viability of a proposal. The commercial viability of wind farms has been proven as evidenced in the growth of the industry over the past twenty years (Deloitte, 2011)⁵. Moreover, it is widely accepted that wind energy has a significant part to play in meeting New Zealand's energy requirements.

Early engagement with all parties potentially affected by a project allows issues to be identified earlier, and thereby either addressed or recognised as a risk.

⁵ Deloitte (2011), Economics of wind development in New Zealand

Consideration of alternative sites

An applicant for a resource consent is not required to consider alternative sites unless it is likely an activity will result in a significant adverse effect on the environment. In that case, Schedule 4 of the RMA suggests a 'description' of possible alternative locations or methods for undertaking the activity should be included. The High Court has emphasised that this provision requires a 'description' of alternatives, not a comprehensive cost benefit analysis of alternative sites.

Impacts on property values

Some property owners near proposed wind farms may perceive that their property values will diminish due to the wind farm. However, the perception of diminished property value is often from a subjective point of view. To date there has been no credible evidence in New Zealand confirming that a wind farm has significantly affected the market value of a neighbouring property.

Moreover, the Environment Court has generally held that a diminution of property values is not a relevant RMA consideration. The Court has also stated that if a diminution in property value does occur, this is another measure of adverse effects on amenity values.

Effects on livestock

Typically, livestock (i.e. farm animals including horses) will readily acclimatise to operating wind turbines. Evidence supported by the Environment Court to date suggests that any adverse effects from wind farms on farm animals are insignificant.

5. Industry best practice

The need for a case-by-case assessment

Wind farm activities and environmental effects can be generalised. However, each wind farm development, wind farm site and local environmental values will have unique characteristics.

Whether or not a site is suitable for a wind farm development depends on various commercial, technical and environmental considerations. Because each of these considerations may vary significantly between projects it is not practical to provide best practice standards. Instead, best practice principles can be applied to ensure specific issues relating to a proposed development's environmental effects on a particular site can be suitably investigated and addressed during the development process.

The best practice principles set out below should remain the same for every wind farm development. However, every wind farm proposal should be assessed on its own merits in accordance with the applicable regulatory framework. Similarly, the work required by a developer in project design, environmental assessment and stakeholder consultation, will vary from project to project.

Attributes of a best practice wind farm

The New Zealand wind energy industry is committed to ensuring wind farms in New Zealand are:

1. Safe

The wind farm will be developed, constructed, operated and decommissioned in a manner that promotes health and safety.

2. Reliable

The wind farm will supply renewable electricity into the electricity system in accordance with the relevant industry standards.

3. Economically sustainable

The wind farm will have positive local, regional, and national economic benefits.

4. Ecologically sustainable

The wind farm's effects on indigenous biodiversity are appropriately addressed.

5. Socially sustainable

The applicant will actively seek tangata whenua and stakeholder participation and support through open, inclusive and responsive engagement processes that respects local knowledge and interests.

Consenting principles

1. Provide certainty about the wind farm design, transmission and build

The applicant should demonstrate reasonable certainty about the proposed wind farm layout, turbine characteristics, transportation options, external transmission and the intended timing of construction.

Wind turbine locations should be identified in the application as being within 100 metres of a recorded GPS location. An applicant could pursue more general turbine locations if they provide decision makers and the community with sufficient detail to determine the maximum potential impact of a proposal in relation to each component and each type of effect.

2. Use experts

The applicant should engage suitably experienced experts early in the wind farm design process.

Experts should meet the requirements of applicable Environment Court Practice Notes for Expert Witnesses and where relevant be a registered/affiliated member of a professional institute.



Photo 15. Horseshoe Bend Wind Farm, Central Otago

3. Accurately assess and address the effects of the wind farm

The applicant and its experts apply robust and consistent methodologies to demonstrate how environmental effects will be addressed, specifically in relation to:

- landscape and natural character
- visual amenity values, including shadow flicker and blade glint
- noise
- ecology
- Māori relationship with the land
- historic heritage values
- transportation
- the electricity transmission network
- communication infrastructure
- aviation
- disturbances and discharges to land, water and air.

Technical reports should be accurate and, where appropriate, supported by a peer review undertaken by a suitably qualified professional. The expert peer reviewer may be commissioned by the consenting authority.

Where significant adverse effects are anticipated an applicant should demonstrate in the application:

- that consideration has been given to alternative design options
- the reasons why the proposed option is the most appropriate.

4. Openly engage tangata whenua and stakeholders early

Applicants genuinely engage with:

- tangata whenua, community stakeholders and affected parties, to identify and consider their respective interests through the design, establishment and on-going management of the proposed wind farm
- relevant consenting authorities to:
 - › identify administrative processes (i.e. appointing contact people and discussing the likely consenting options and processes)
 - › identify potential consenting issues and expectations around the information to be provided in the application
 - › appoint independent peer reviewers, where appropriate
 - › identify sensitive receiving environments
 - › identify community stakeholders and affected parties.

This process, and the conclusions reached, should be summarised in consent applications.

6. Conclusion

The New Zealand wind industry comprises a range of competitive business interests and NZWEA is committed to fostering a wind energy industry that makes a significant contribution to safe, reliable, economically and environmentally sustainable energy supply.

NZWEA expects numerous resource consent applications to be made for a range of small to large wind farm developments throughout New Zealand over the next two decades.

The New Zealand policy context supports a significant increase in renewable electricity generation by 2025 and requires local government to provide for the development of renewable electricity generation activities, including wind farms, to the extent applicable in every region or district.

Wind farm development will always be subject to various commercial, technical and environmental considerations and a best practice approach will vary on a case-by-case basis accordingly. Wind farm developments should be able to avoid, remedy or mitigate most environmental effects. However, practical constraints exist that can prevent all effects being avoided, remedied or mitigated. Ultimately, the environmental effects of wind farms can, and should, be managed on a case-by-case basis.

Applicants and consenting authorities have repeatedly exerted significant time and resources to address various other matters that have no consequences on the actual outcome of RMA consenting processes.

NZWEA has produced this document as a step towards enabling a high level of consistency and transparency in the way wind farms are consented, constructed and operated.

This is a living document and NZWEA will continue to provide a significant database of reference material relating to the development of wind farms in New Zealand.

Wind farm development will always be subject to various commercial, technical and environmental considerations and a best practice approach will vary on a case-by-case basis accordingly.



Photo 16. Tararua Wind Farm

7. Sources of further information

General reference material

The NZWEA website provides a significant database of reference material relating to the development of wind farms in New Zealand: www.windenergy.org.nz. Some further information is available only to NZWEA members.

Fact sheets

NZWEA has produced a series of evidence-based fact sheets that explore a range of issues to do with wind energy. The following fact sheets can be downloaded from www.windenergy.org.nz/resources:

1. Wind Farm Development in New Zealand
2. The Benefits of Wind Farms
3. Practical Constraints of Developing Wind Farms in New Zealand
4. The New Zealand Wind Farm Noise Standard
5. Sound and Wind Turbines
6. Wind Turbine Technology
7. Electricity Supply and Wind Generation
8. Wind Energy and Climate Change
9. Considering a Wind Farm on Your Land?
10. Wind Energy and Your Community
11. Wind Energy and Public Opinion

NZWEA will add to these fact sheets and will update them periodically.

The NZWEA website provides a significant database of reference material relating to the development of wind farms in New Zealand: www.windenergy.org.nz.

Industry practice notes

As a relatively new industry, the wind industry is constantly developing knowledge and understanding about its environmental effects. For example, bird mortality data from operating wind farms is showing that wind farms have negligible impacts on birds overall. However, this data has been gathered from only a few operating wind farms and no wind farms have been constructed in known flight paths, or destinations, of migrant bird species.

Over time NZWEA will prepare practice notes that collate information and outline collective views of those involved in wind farm development. These practice notes will help ensure that all participants in consenting wind farms can have up to date information relevant to wind farm development in New Zealand.



Photo 17. West Wind



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