

Small scale wind power

Pacific energy projects: Impacts on nature and people



*Are you planning to fund, build or manage a wind power project?
Have you considered the environmental, social and economic issues this can raise?
Are you prepared to manage these issues?*

TYPICAL WIND POWER PROJECTS

Wind power uses turbines to convert kinetic energy from moving air into electrical energy. A consistent breeze is best for a reliable electricity supply, while intermittent breezes and gusts are less effective. Like most renewable energy, wind power is intermittent power.

- **Household wind power** – these are small turbines (usually 1kW or less), mounted on existing buildings. They are raised on towers somewhat taller than the typical TV antenna, strength requiring suitably strong buildings and attachments. Batteries for storage complete the system.
- **Commercial wind power** – large turbines can be over 100m high, with a capacity of 1 MW or more. Each turbine independently aligns with the wind direction, and has its own transformer. Together, these turbines form a wind farm, and must be located away from ‘roughness’, features that disrupt airflow.

WIND POWER PROJECT DEVELOPMENT

Planning

The best time to build positive outcomes and avoid negative impacts is during development and design. The best projects will weigh up the available wind resources, local environmental concerns, equipment options, and placement of individual turbines. For example, larger turbines, with taller towers and longer blades, have higher output, but need higher average wind speeds. Involving neighbours, and placing the wind turbines, are the two biggest factors in determining the social and environmental impacts.

Research

The location determines the power output, the need for clearing, and the wider area of people and ecosystems affected. Sufficient knowledge and good planning is therefore essential.

◆ Environmental impacts

Wind turbines are used globally, powered by clean energy with no wastes or air pollutants. The energy used to produce a wind turbine is quickly 'paid back', typically in under a year. Turbines can be a hazard to birds, bats, and even aviation if tall enough. In addition to the wind turbines and foundations, wind farms can require supplementary development such as access tracks and distribution networks, which must also be considered.

◆ Social impacts

Wind power often affects a wide area. Consultation with stakeholders in the area is important to address potential concerns over noise and visual impacts. Modern turbines are quiet, but it is best to deal with this perception at an early stage. Design, size and maintenance of turbines all influence their impact. Where the blades cut through the line of sight of communications channels, they may interfere with radio, TV and other transmissions. As with other renewable energy technologies, wind power provides electricity to households and communities. This can enable lighting and productive activities in the evening, as well as improving quality of life. The technology is similar to other motor systems, requiring care, maintenance, and the associated skills and money. Failing to save money for maintenance and battery replacement can cause the system to fail giving a negative perception of the technology.

◆ Cumulative impacts

Increasing the number of wind turbines in an area can raise other issues. While a single turbine may be barely noticeable, many turbines can be a nuisance. As wind passes over the turbines, the interrupted flow is unsuitable for other turbines, an effect called 'milling'. More turbines also increase the area of interference with bat and bird flight paths, and the likelihood of overlapping with telecommunications channels. Assessing a wind farm considers the turbines collectively, but for many small turbines good policies are essential.

KEY ISSUES!

Land use – Good wind characteristics – speed, consistency (not gusts), daily and yearly patterns – are important. This is influenced by the landscape, which can be 'rough' (like forests or building) or 'smooth' (like water), turbine height, and the topography which channels air flow. Wind turbines can be conveniently placed on houses, or set on towers on hills over grasslands, pastures, or lakes. If exporting electricity, the distance to the electricity network is important. While wind farms can coexist with farms, even attracting tourists, they require consultation with land owners, tenants, and local stakeholders. There is often conflict with residences, and this is best resolved when locating each turbine.

Ecosystems and biodiversity – Wind turbines can be hazardous to birds and bats. Surveys during design should identify any migratory or threatened species, which may be present seasonally. Civil works and vegetation clearing for access and easements may affect large areas or divide habitat. Extracting gravel, sand and construction materials can have off-site impacts.

Nuisance – Wind turbines are usually located on high points and their visibility can bring aesthetic complaints. Others see them as a landmark or tourist attraction, bringing challenges and opportunities. Noise, created by the turning blades, is one of the main objections to wind power. As noise travels along lines of sight, taller and larger turbines are heard farther away, while the intermittent noise can be more disturbing than a consistent hum.

Waste – As with generators and other electrical equipment, rolling maintenance is important, but can create wastes such as oils, lubricants, scrap parts, and cleared vegetation. New jobs in maintenance and waste disposal may require new skills. For smaller networks and houses, there can be waste batteries. At decommissioning, it should be possible to fully restore the site, removing all waste.

Cyclones - Cyclones can't be avoided, but can be prepared for. This can include clearing vegetation, locking or dismounting the blades, designing foundations for the wind forces and heavy rain, and training responsible people.

FOR FURTHER INFORMATION

- 1 Wind farm basics fact sheets (AGO and AWEA, 2004); while out of print, can be found online, e.g. http://www.w-wind.com.au/WindEnergyInformation_FactSheets.html
- 2 *Greening blue energy Identifying and managing the biodiversity risks and opportunities of offshore renewable energy* http://www.iucn.org/about/work/programmes/marine/marine_resources/projects/greeningblueenergy/
- 3 Many associations promote wind power, as represented by the Global Wind Energy Council (www.gwec.net see Association Members for a current list), these members often have good information and best practice guidelines. The Danish association www.windpower.org/en is particularly useful for technical information. Information on low frequency noise <http://www.cleanenergycouncil.org.au/cec/technologies/wind/turbinefactsheets> is at the Clean Energy Council.
- 4 Refer to the relevant EIA and other environmental legislation in your country, such as an Environment Management Act. See <http://www.pacii.org> or your country's website.

Please note, this factsheet provides general guidance only and is not legal advice. Please see the references and seek assistance for technical or legal advice for your specific needs.

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