



Wind Power for a Remote Island Community



The wind turbines on Milman Hill, Thursday Island.

Highlights

- ▼ Reduces fossil fuel use by nearly 10%
- ▼ Reduces greenhouse gas emissions by about 1,385 tonnes/year
- ▼ Saved A\$ 303,500 in fuel costs in the first year

Summary

Two wind turbines meet almost 10% of the electricity needs of Thursday Island. This remote community is located in the Torres Strait, 800 km north of Cairns between mainland Australia and Papua New Guinea. Previously, it had relied solely on diesel power generation, consuming 3.6 million litres/year of diesel. The wind turbines produced 1,682 MWh of electricity in the first year of operation, which exceeded expectations. If the turbines continue to perform at this level, the project payback period could be seven years – two years less than originally expected. Community acceptance of the turbines is very high, demonstrating the benefits of keeping the public informed throughout the planning and construction of this type of project.

Project Background

About 4,000 people live on Thursday Island, the administrative centre of the Torres Strait Islands. Seventeen of the islands are inhabited, with a total population of 11,000. These remote communities rely almost entirely on diesel generation for power and, like the many other remote communities in Australia, present considerable potential for the use of renewable energy to replace diesel generation. Fuel costs in these areas can be very high, as a consequence of the distance and difficulty of delivery, creating a financial incentive to investigate alternative means of power generation. The noise and air pollution associated with diesel generation add to the attraction of renewables-based power generation.

In 1989, Ergon Energy (then the Far North Queensland Electricity Board), the utility responsible for the supply of electricity to the Torres Strait, began monitoring

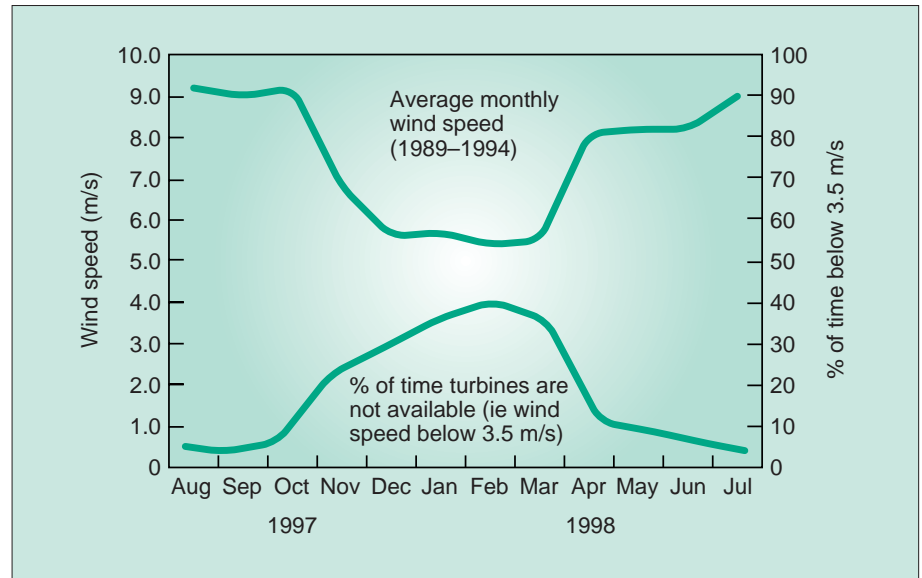


Figure 1: Thursday Island's average monthly wind speed.
(Based on monthly average data collected by Ergon Energy from 1989 to 1994)

wind conditions on Thursday Island. Six years of monitoring revealed that the island's wind resources were favourable for power generation. Thursday Island is now home to Queensland's largest wind power-diesel generation scheme. The project is part of Ergon Energy's commitment to the use of renewable energy

resources where it is economic and environmentally-appropriate.

The Project

The two wind turbines were transported by barge from Cairns, on mainland Australia, to Thursday Island, together with a 30-tonne crane to be used for unloading and the final stages of installation. The remoteness of the site led to high transport and equipment hire costs, resulting in a relatively high overall installation cost.

The Vestas 225 kW wind turbines were installed on 30 m high tubular steel towers. The turbines start to generate power at a wind speed of 3.5 m/s and automatically shut down at a wind speed of 25 m/s. Optimum performance occurs at a wind speed of 14 m/s. Thursday Island has an average annual wind speed of 7.5 m/s. Figure 1 shows the typical average monthly wind regime, based on data collected by Ergon Energy from 1989 to 1994 as

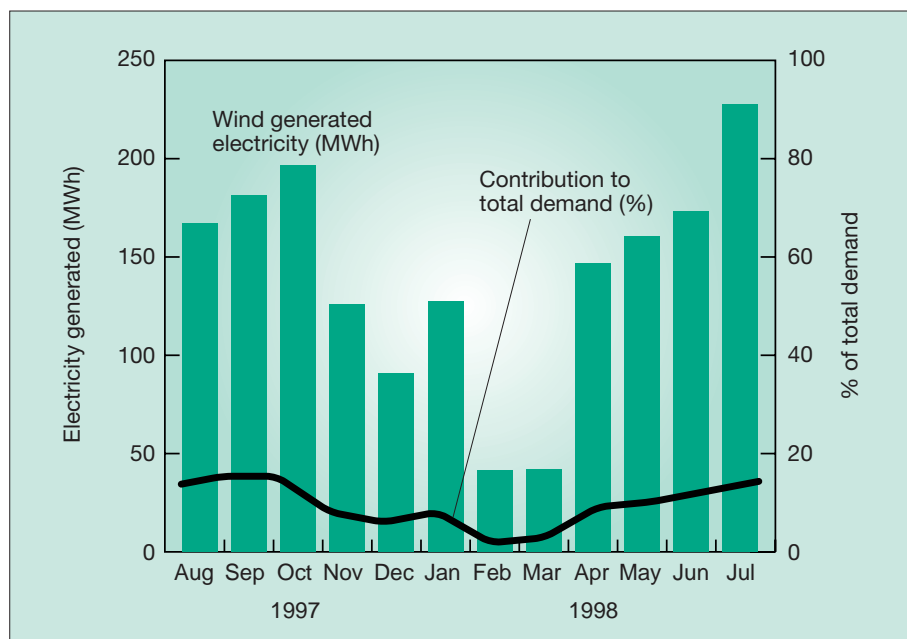


Figure 2: Monthly output during the first 12 months of operation.

part of the pre-project monitoring. The graph also indicates the percentage of time during this period that wind speeds were below the level that is required for the turbines to operate.

Prior to installation of the turbines, community concern about their impact was the main obstacle to the project. However, the community was kept informed through articles produced in the local press and at a public meeting. Acceptance of the wind turbines is now very high. The turbines appear to have minimal adverse environmental impact and they are quiet in operation. At a distance of 150 m from the turbines, the noise level is similar to that of a domestic refrigerator.

The turbines are situated at Milman Hill, where they have not affected land use. The area is also the site of the island’s main telecommunications tower, satellite communication

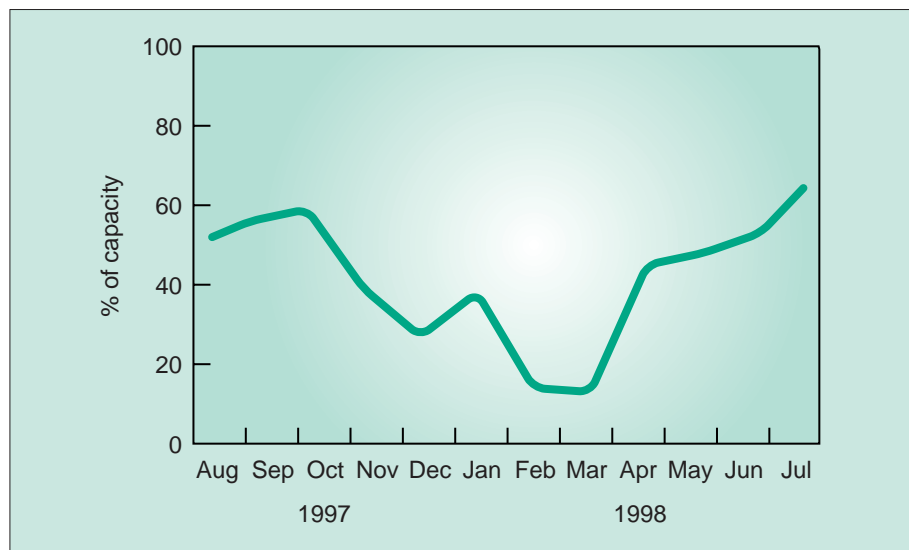


Figure 3: Monthly capacity factor.

equipment for Airservices Australia and radio communication equipment for the police, army, coastguard and Ergon Energy.

Performance

During the first 12 months of operation, the turbines had 99.3% availability and met 9.2% of

Thursday Island’s total electricity demand. Initially the turbines were expected to provide about 1,440 MWh. In fact, they produced more than 1,680 MWh.

Output from the wind turbines varied monthly with the prevailing wind regime, which follows a regular trade wind seasonal pattern as shown in Figure 1. During the warm months of February and March the region experiences a period of low winds known as “the doldrums”.

Figure 2 traces the performance of the turbines in MWh produced and the percentage contribution made to total demand on a monthly basis. During the doldrums, the island’s electricity demand is at its highest, so the percentage contribution from wind drops to as low as 2–3%.

An average load factor of 42.5% was achieved during the first year of operation, exceeding the anticipated capacity factor of 36%. Monthly capacity factors are shown in Figure 3.

Table 1: Cost breakdown for the Thursday Island wind project	
	(A\$ '000)
Supply and installation of 2 x Vestas V29 225 kW turbines (including ancillary equipment and civil work)	1,590
Remote control system	138
Micrositing	40
Spare parts for 24 months	32
Wind turbines total	1,800
Infrastructure – labour	49
Infrastructure – material	100
Infrastructure – freight and transport	12
Infrastructure – plant hire	7
Other contract services	14
Accommodation, fares and travel	22
Finance and customs charges	19
Promotional activity	15
Environmental works	8
All other costs	246
Total project costs	2,046

Economics

The total capital cost of the project was A\$ 2.05 million (where A\$ is the Australian dollar), well below the budget estimate of A\$ 2.5 million. Table 1 provides a detailed breakdown of the total project costs.

Performance data for the first year show that installation of the wind turbines saved 433,572 litres of diesel, which equates to 1,385 tonnes/year of CO₂. With a cost of A\$ 0.70/litre for diesel, the cost savings from reduced fuel

consumption were A\$ 303,500 in the first year. Savings at this rate would give a simple payback period of 6.7 years. Prior to installation, the expected compound payback period was nine years, but if the first year's exceptional performance continues, this will shorten.

The operational and maintenance costs for the first year were A\$ 6/MWh, which includes the cost of training the Ergon Energy staff who will take over responsibility for maintenance from Vestas after two years.

Host Organisation

Ergon Energy
PO Box 358
Cairns
Queensland 4870
Australia
Contact: Glenn Walden
Tel: +61 7 4050 2841
Fax: +61 7 4050 2702
E-mail: glenn.walden@
ergon.com.au

Information Organisation

Integrated Energy
Management Centre
PO Box 349
Moonah
TAS 7009
Australia
Contact: Cam Douglas
Tel: +61 3 6271 6428
Fax: +61 3 6273 3420
E-mail: cameron.douglas@
auroraenergy.com.au

Please write to the address below if you require more information.



CADDET Centre for Renewable Energy
ETSU, 168 Harwell, Didcot
Oxfordshire OX11 0RA
United Kingdom
Tel: +44 1235 432719
Fax: +44 1235 433595
E-mail: caddet.renew@eat.co.uk

International Energy Agency

The International Energy Agency (IEA) is an autonomous body which was established in 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.

Printed on environmentally friendly paper.

CADDET

CADDET was set up in 1988 as an IEA Centre for the Analysis and Dissemination of Demonstrated Energy Technologies. Today, there are two CADDET operations: one is for energy-efficient technologies and the other for renewable energy technologies. The Centres co-operate with member countries in the exchange of high quality information on energy technologies.

Disclaimer

Neither CADDET, nor any person acting on their behalf:

- makes any warranty or representation, expressed or implied, with respect to the information contained in this brochure; or
- assumes any liabilities with respect to the use of this information.

See the whole range of CADDET Renewable Energy projects on www.caddet-re.org