



Wind Power

the technology, economics and potential in the South West of WA

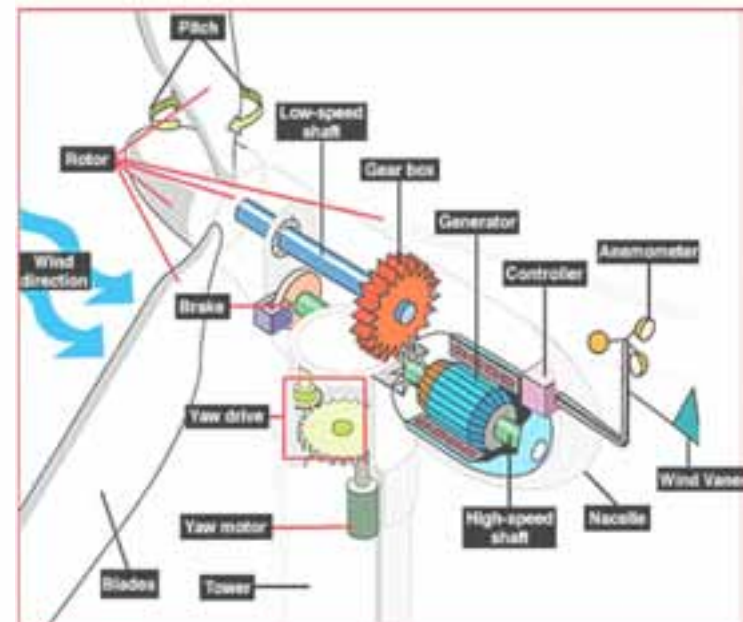
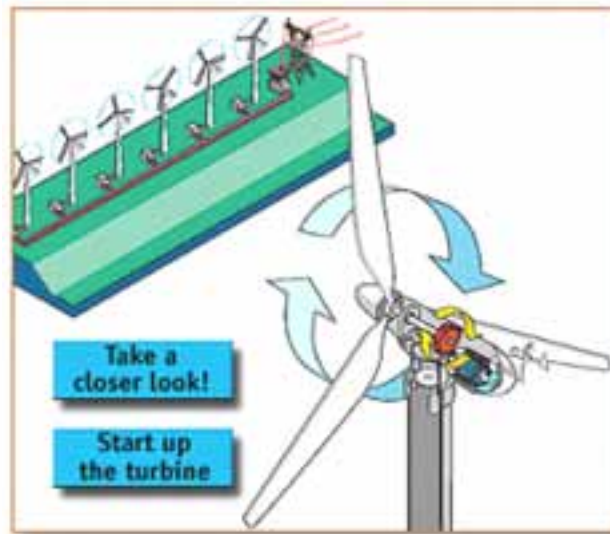
CRITICAL HORIZONS RENEWABLE ENERGY SEMINAR
ECU CAMPUS BUNBURY
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Matthew Rosser,
Founding Chair
Western Australian Sustainable Energy Association Inc.

The technology



Modern wind turbine



The scale

- Onboard cranes
- Service lifts and climbing assists



If the user weighs say 100 kg and chooses a pull of 40 kg, he only has to lift 60 kg of his own body weight. Thus, especially injuries on knees, arms and feet are avoided.

Source: Avanti Service Lifts

The scale



Foundation



Foundation



Wiring ducts



The pour



Complete foundation



The tower



Blade assembly



Nacelle and blades



Offshore





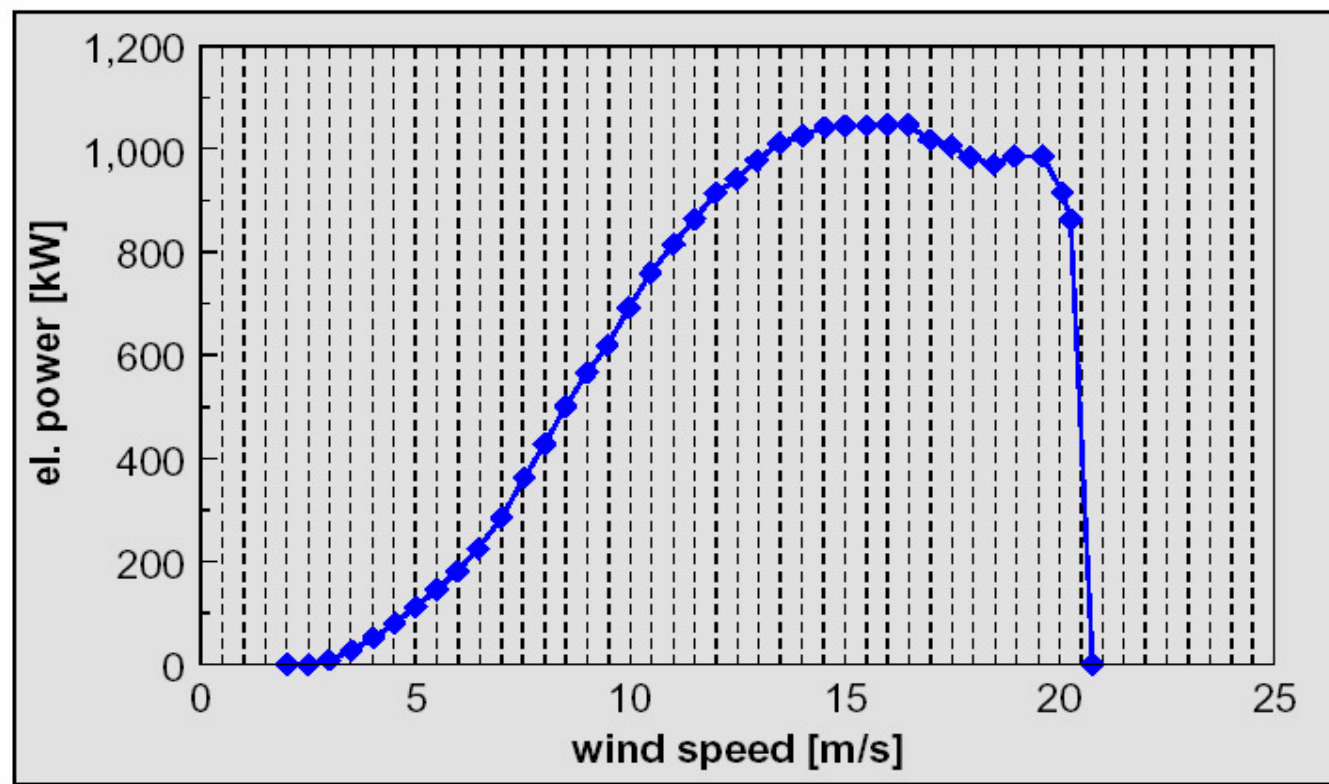
Reliability

- Often located in harsh coastal environments
- Investors need +20 years to return on investment
- Turbine manufactures guarantee availability (95-98%) (usually during warranty period 2 to 10+ years)
- Turbine preventative and predictive maintenance critical in assuring high availabilities



The economics

Power curve





Why wind

- cost competitive renewable
- fuel diversification
- price stability – known price
- clean/ environmental
- energy independence
- rural economic development

WA / Texas Comparison

| | | |
|----------------------------|---------------------------------|---|
| Population | 23 million | 2.1 m |
| Installed capacity | 120, 000 MW 4,000MW | 6,500 MW 300MW |
| Average Capacity Factors % | 40% | 35% |
| Net Electric Generation | 400 TWh | 15 TWh |
| Average cost of wind | \$40 US per MWh | \$60 US per MWh |
| Major Players | BP Energy, Shell Wind Energy | Alinta, Stanwell, Pacific Hydro, Horizon Wind Energy |



Why is wind becoming mainstream

- Electricity industry trends are favourable
 - Long term cost trends vs. the competition
 - GHG issues
 - Utility interest in portfolio diversity
 - Energy independence

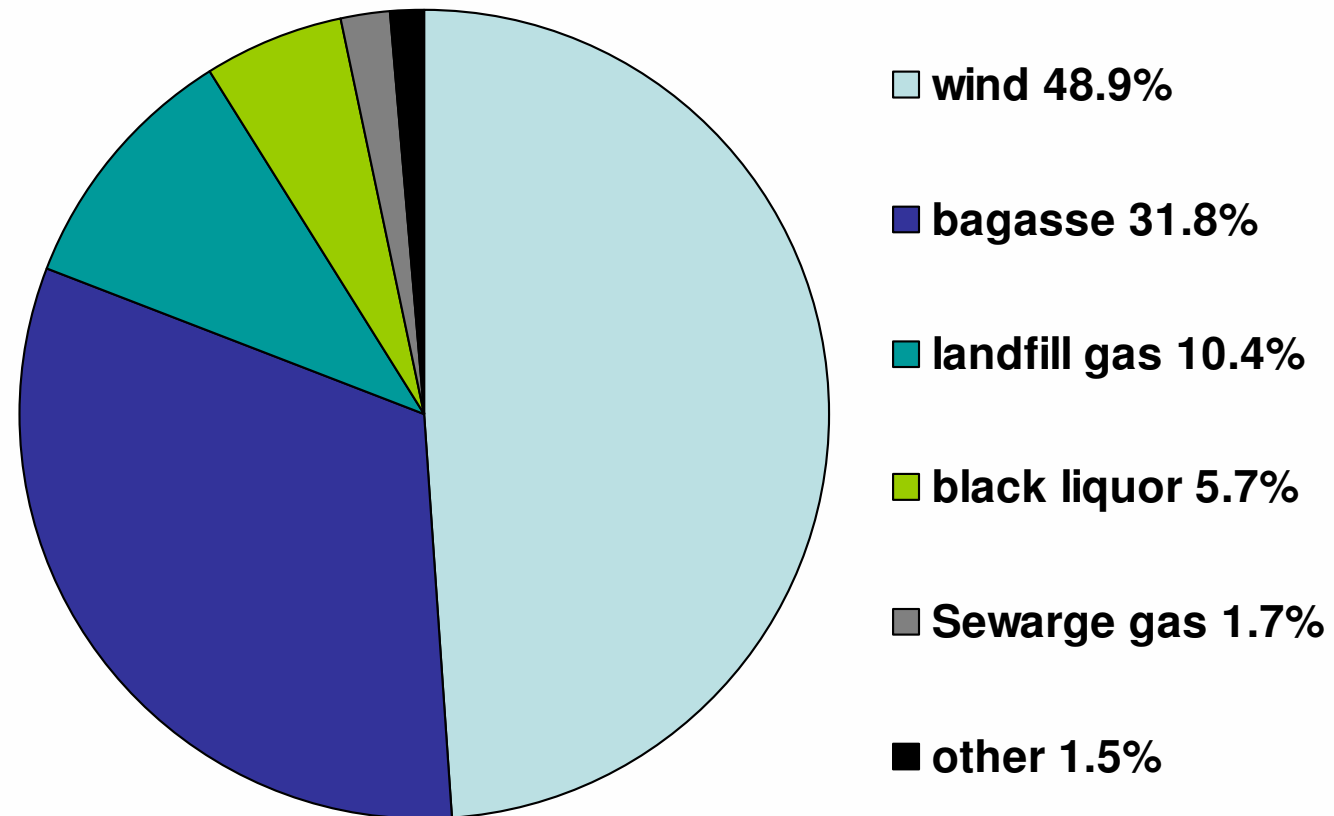


Employment in RE

- hydro 1,566
- wind 988
- geothermal 100
- wave 20
- bioenergy 900
- solar pv 1,350
- solar hot water 1,320
- total 6,244

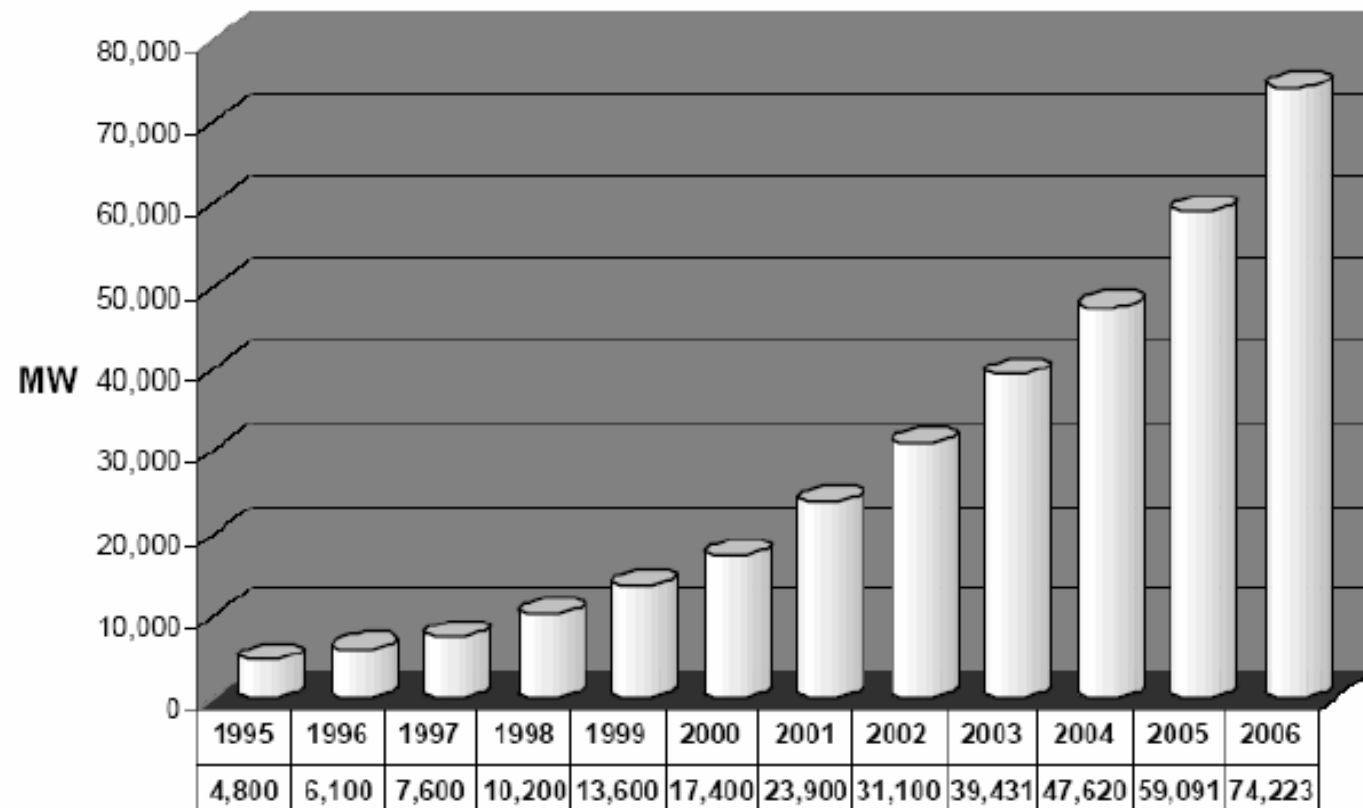


Installed RE capacity -no hydro





Global cumulative capacity 95 - 06





Growth in Australia

- By end 2006
 - 651MW of wind installed
 - 750MW under construction or committed
- WA by end 2007
 - 90MW Alinta wind farm at Walkaway
 - 80MW Stanwell wind farm at Emu Downs
 - 21MW at Albany
 - At Esperance;
 - 10 Mile Lagoon, 9 x 225kW Vestas machines
 - 9 Mile Beach, 6 x 600kW Enercon E40s
 - At Hopetoun and Bremer Bay; 1 x 600kW Enercon E40 each



Australian wind potential

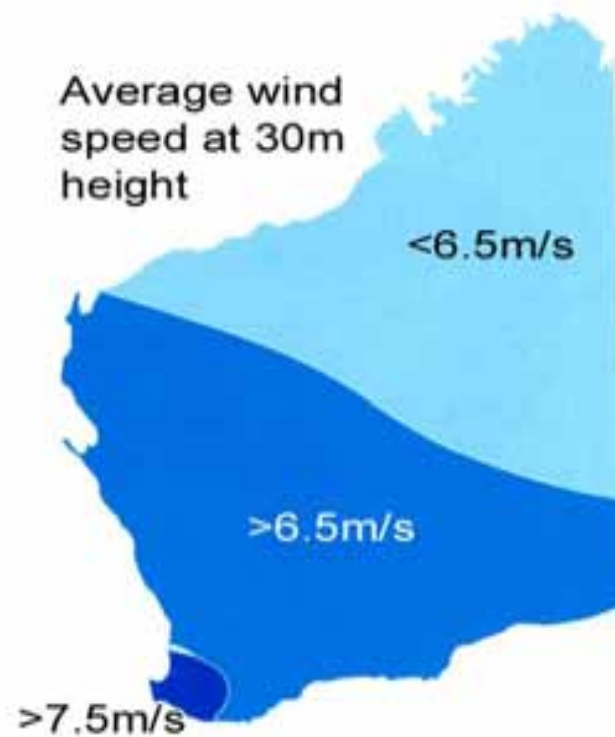
- Strong, consistent and predictable wind resource
- Installed or under construction – 1000 MW, over 650 turbines
- 1.2% of current Australian power needs
- 15% of South Australia's power needs
- Over 6500 MW under development and evaluation
- Easily meet 20% of Australia's power needs
- 20,000 MW of wind capacity

Australian Greenhouse Office map of background winds in Australia³





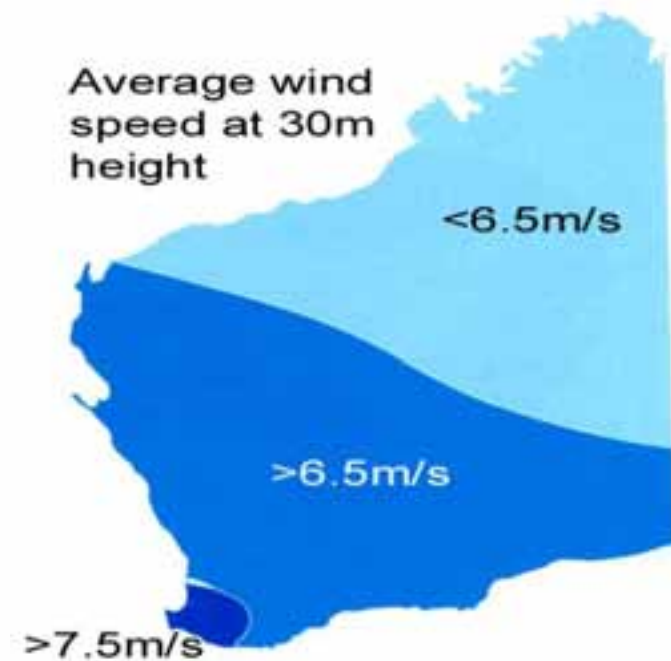
The potential in the south west





WA's wind potential

- Strong, consistent and predictable wind resource
- Can meet 20% of SWIS needs easily
- Will occur in regional areas

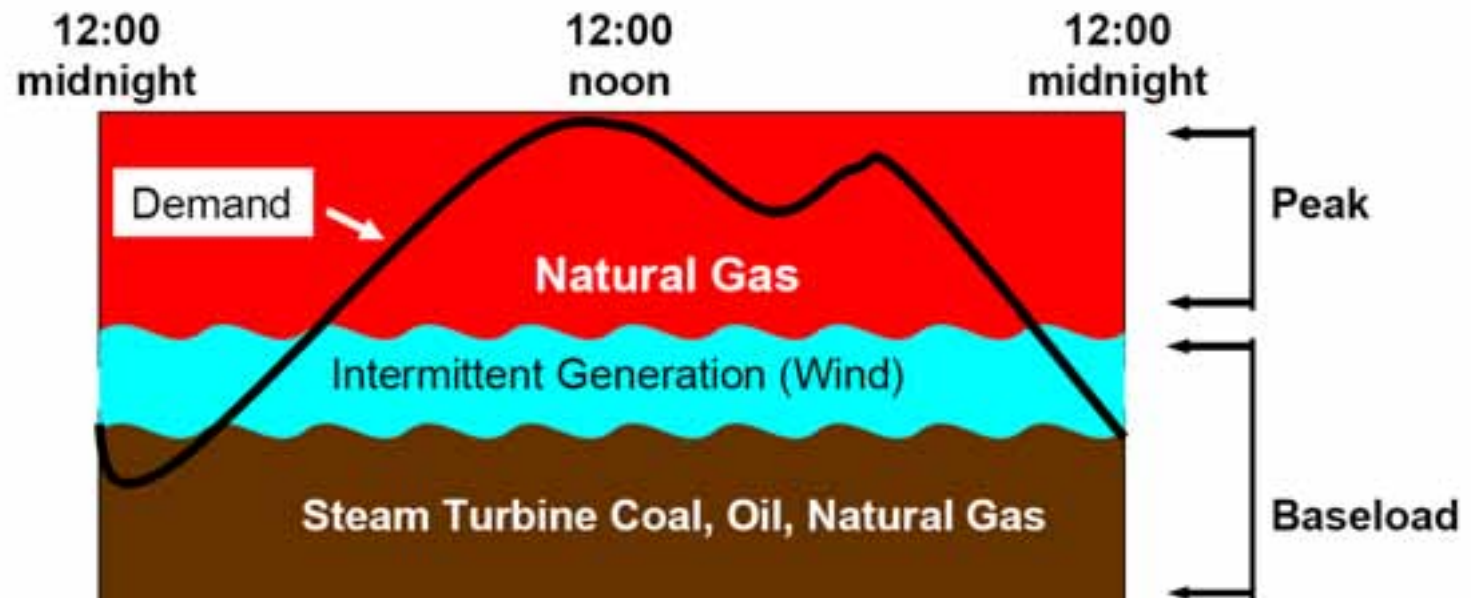




Constraints

- approvals and land use constraints eliminate potential sites or make for small projects
 - visual impact
 - avian and wildlife impacts
 - noise impacts (setback 1km from dwellings typical)
 - miscellaneous (Crown land, mining, etc)
- grid-interconnection and general interference are critical (and often lacking) variable at potential project sites

Constraints - baseload, intermittent and peak generation vs 24 hour demand curve



Greenhouse gas intensity of WA's electricity generation

