

## Wind Energy for Power Generation

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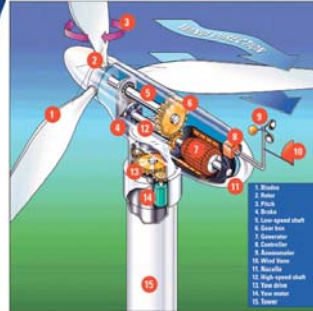
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Courtesy of:  
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## How Wind Turbine Works



- Works the opposite of a fan. Instead of using electricity to make wind, a turbine uses wind to make electricity.
- The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.
- The electricity is sent through transmission and distribution lines to a substation, then on to homes, business and schools.

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## Inside of the Wind Turbine

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## Wind Energy Facts

- Wind is a mature technology immediately accessible and off the shelf.
- Short lead times (typically a year).
- Construction within a year – modular components.
- Towers can potentially be manufactured locally.
- Operating and maintenance costs are low typically less than 2% of CoC.
- Self dispatching.
- No fuel input costs are applicable.
- No by-products or environmental pollution during its operation.
- Safe to operate.
- Land use minimal with normal activities continuing around generators – power stations without a fence.
- Rehabilitation costs minimal.

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## Wind Resource

- More wind along coastline
- Need 6-7 m/s or greater for economical sites (Europe)
- Estimates for Eskom 500 MW
- Capacity Factor = (kWh produced)/(Rated kW \* 8760 hours):
  - UK 29% (40%)
  - Klipheuwel 16%\*
  - Rural Germany: 16% (37%)
  - California 23%
  - Denmark 24% (45%)
  - TransHex 26%#



Source NASA

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\* Actual Performance 3 years / # MET Station 3 years

## West Coast Timelines

- First units on site within 12 months.
- Erection and commissioning 12 to 18 months.
- On line end of 2009 / beginning 2010.
- 228GWh / year at 26% utilization.
- Cumulative 912 GWh by 2013.
- Summer – evening peak production.

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## Technology

- 2MW Class
- 60m-80m Towers
- 40m-50m Blades
- 15m X 15m X2m Foundation
- Access Roads
- Underground Cables
- Substation
- Transmission Line



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## Anticipated Project costs

- CAPEX (+/- 50 Turbines) R 1.1 billion
- O&M Anticipated R 23 Million pa
- Fuel Costs R 0 pa
- Cost of Wind Power 67 c/kWh



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## Foundation



## Tower Sections



## Nacelle

- Life span ~ 20 years ~ 120 000 hours vs car engine of 4000-6000 hours
- Small units operational for ~ 40 yrs
- Scheduled maintenance (Grease & Oil)
- Complex Control equipment



## Thank You



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