[youtube:http://www.youtube.com/watch?v=wlv5-iuyriA auto]Windmills have been used for centuries – using wind to turn machinery. Electricity generation using wind also has a long history, but has only taken off in the last three to five years, now growing 30% a year. Wind already provides a peak global capacity greater than 100 gigawatts – to compare, the entire UK uses only a peak of 57 gigawatts.

How they work

Large wind turbines cost around £2m to build, the energy they use is free, and they last for at least 20 years. They pay for themselves in as little as 5 years and then make their owners pure profit. In 2008 there were already 165 wind farms operating 1,944 turbines in the UK with another 34 bring built, 118 more had planning consent and 220 were being reviewed for planning (British Wind Energy Association). Turbine efficiency and reliability have greatly improved in the last five years.

Why they matter

Wind power offers huge potential for the future especially in relatively unpopulated and windy nations such as the US. It only provides around 1% of electricity globally. Denmark produces 19% of electricity this way, Spain 9%, Ireland 6% and Germany 6%. The current US contribution of wind to electricity is only 1% but this could rise to 15% by 2020. General Electric is forecasting that half of all new generating capacity in America over the next decade will be wind-powered. The cost of wind electricity has already fallen to 4p a kilowatt which makes it competitive with natural gas.

Challenges

Wind power varies from day to day which means it is expensive to use wind for more than a small proportion of total electricity generation. Many people object to the appearance of wind farms on hills or coastline. Many wind farms are built in remote places where energy yield can fall significantly for two reasons. Firstly long roads built for maintenance can use a huge amount of energy in building (1 ton of carbon dioxide per ton of cement). Secondly, an average of 7% of all power generated in the US or UK is lost in transmission, and the longer the cables, the greater the problem.

Business opportunities

General Electric sells more than $6bn a year of turbines and this is only the beginning. A single new installation in Texas will soon generate a gigawatt of power – with a capital cost of $2bn. Subsidies and high electricity prices mean a single UK onshore wind turbine can make £500,000 of pure profit per year. A farmer can earn £50,000 a year from a quarter of an acre with a single installation – compared to just £150 of bioethanol.

A typical 2 megawatt (2MW) turbine can now generate power worth £200,000 on the wholesale markets - plus another £300,000 of subsidy from taxpayers. That represents a great financial return if you have planning permission and a small amount of capital. The market for wind farm equipment and installation could be more than £6bn a year in EU alone - £2bn in UK which is aiming for 20,000 new turbines by 2020.

Expect massive government subsidies around the world, as non-oil producing nations look to reduce oil dependence at same time as solving global warming challenges US sales of small turbines are likely to exceed 100,000 a year.

Unlike power stations, wind generation can be built piecemeal as needs change and technology improves. Innovations include flexible blades which bend to spill very strong winds and special composite materials which are strong and light.

Large turbine manufacture is a capital intensive and specialist market. Single blades can be more than 250 feet long, offering opportunities for local manufacture. Small turbine production also offers huge opportunities for medium sized business. Installation and maintenance are great business opportunities for medium and large companies.

There are also huge business opportunities to rebuild national grids using direct current rather than alternating current – better at transporting power long distances from windy hills to cities.

Many more Global Warming Videos by Futurist Dr Patrick Dixon and Sustainagility book.

Articles and Videos on Global Warming

Here are more resources on this site that you may find helpful.

True Cost of Global Warming
How business will help solve global warming with green technology
CARBON DIET to save the World
Global Warming - Science Summary
Future of Oil Prices: Middle East, global economy
Roof Gardens Impact on Energy Saving
Biofuels Controversy and Climate Change
Iceland Volcano Eruption - Geothermal Power Potential
Energy Use Consulting - Boom Industry
Smart Power Regulation - Energy Saving
Green Technology Innovation Awards Chaired by Patrick Dixon
Product Exchanges and Climate Change
Wind Turbines and Global Warming
Solar Cell Roofing and Climate Change
Low Energy Streetlights and Global Warming
Polymer Cement - to save 2% global CO2
Carbon Capture - Climate Change Business
Future of Oil Industry when will oil run out? Kuwait and region
Heat Pumps - to prevent global warming
Cost of global warming - practical answers
The $40 trillion climate change business
Impact of Global Warming on Human Life
The Future of the Environment
Green Technologies innovation will help with climate change
Sustainability, climate change and crazy biofuels policy
Sustainagility: innovation will help save world. Sustainable business future
Sustainable business: $40 trillion green tech boom will help save world
How Green IT saves money and energy, improves image and environment - keynote
Water Wars Risk? Futurist Q&A with Patrick Dixon
Global Warming: green technology will help world
Economic Growth Limits? Sustainability. FUTURIST Q&A