Wind power harnesses the power of the wind to propel the blades of wind turbines to generate electricity, converting kinetic energy into mechanical energy. Offshore wind power is widely regarded as the future of renewable energy. Wind provides an abundant source of renewable energy. In the near future wind energy will be the most cost effective source of electrical power. It is growing at the rate of 30% annually and is extensively used in Europe, Asia and the United States.

From an emerging fuel source twenty years ago, wind energy has transformed into a mature and booming global business. Europe is the world leader in offshore wind power, with the first offshore wind farm being installed in Denmark in 1991. Europe has taken the lead due to strong wind resources, shallow water in the North Sea and the Baltic Sea, and Government recognition of the role offshore wind will play to meet renewable energy targets. Countries outside Europe have been slower to embrace the technology but the industry is now growing in North America, Canada and Asia.

Onshore wind energy potential is concentrated in agricultural and industrial areas of north-western Europe. The largest offshore potential is found in low depth areas in the North Sea, the Baltic Sea and the Atlantic Ocean, with some local opportunities in areas of the Mediterranean and Black seas. The deep offshore potential is even larger but costs mean development is slow.

Offshore Wind in the UK

The UK has the largest wind energy resource in Europe with an offshore wind potential equal to three times its electricity demand. Surrounded by a large shallow continental shelf with good access to available strong and constant offshore winds it is ideally placed to exploit the enormous potential for offshore wind power and offshore wind farm development. The sea is relatively shallow around the land masses allowing for turbine foundations to be driven into the seabed rather than attempting to accomplish a complicated floating system of turbines. To date, 9 offshore wind farms have been built around the UK coastline with 330 offshore turbines, equating to 778.4 MW of installed capacity. The UK has a target of securing 15% of all its energy needs for electricity, heat and transport from renewable sources by 2020. Offshore wind farms in the UK producing 90 MW or more of power are:

Offshore Wind in Europe

Europe is currently the leader in offshore wind power generating 1951.5 MW of green power. However China is the fastest growing market and it is predicted that Asia will soon overtake Europe as the region with the largest capacity.

Europe’s offshore wind potential is huge with the technical potential of offshore wind being six to seven times greater than projected electricity demand. At the end of 2010 there were 1136 offshore wind turbines installed and connected to the grid on 45 wind farms in 9 countries with an operating capacity of 2396 MW. The 9 European countries with offshore wind power capacity in 2010 were:

Largest Offshore Operations

As of January 2011, the Thanet Offshore Wind Project in the United Kingdom was the largest offshore wind farm in the world at 300 MW, followed by Horns Rev II (209 MW) in Denmark. Greater Gabbard (504 MW) was the largest project under construction. These projects will be dwarfed by subsequent wind farms which are planned, including Dogger Bank at 9000 MW, Norfolk Bank (7200 MW), and Irish Sea (4200 MW).

Benefits of Offshore

Offshore wind farms are generally larger than onshore farms and the electricity is transported not underground or overhead, but via undersea cables. The wind is much more reliable at sea, giving better and more consistent output and there is far less public opposition to these developments. The main benefits of offshore wind farms include:

Higher wind speeds

More often windy

Less turbulence offshore

Minimal visual impact

No noise impact

The wind at sea is steadier, more consistent and not blocked by obstacles such as mountains, trees and buildings, giving better output and more consistent generation. This results in higher electricity yield per wind turbine.

Wind Energy Future

Over the past 10 years global wind power capacity has continued to grow at an average cumulative rate of over 30%. Improvements in wind energy technology mean that generation costs have dramatically decreased and modern wind turbines have better power ratings, efficiency and reliability. Countries all over the world are setting targets for wind power. It is estimated that 40 000 wind turbines will be installed in the next 10 years.

The European Union has set ambitious targets to provide 20% of Europe’s energy from renewable sources by 2020. As a proven source of clean, affordable energy, wind resources have a vital role to play in realising these goals.

Conventional fuels have a dangerous impact on the climate and the drive for a future of cleaner, more sustainable energy technologies means wind power will go from strength to strength.