

Wind Energy in UK: current and future capacity

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Scottish Renewables**

**Bat Conservation Trust
workshop: Wind Turbines and Bat Populations
5th February 2007**

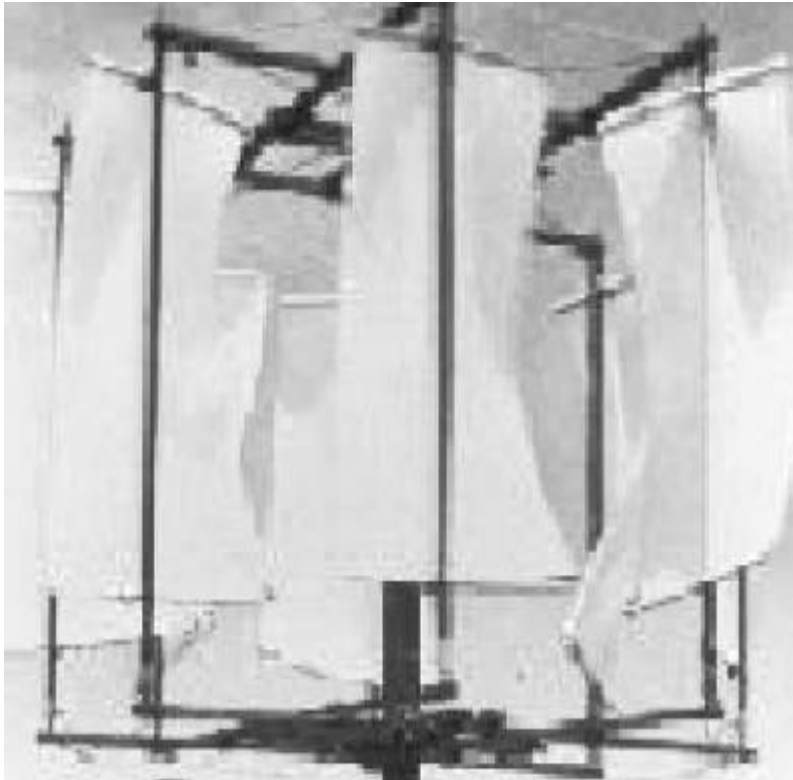


BWEA & Scottish Renewables

- BWEA is the trade and professional body for the UK wind and marine renewables industries, formed in 1978 with over 310 corporate members
- Scottish Renewables (SRF) is Scotland's Forum for the Renewable Energy Industry. Operating for ten years, we represent over 200 organisations with an interest in renewables



Short history of wind



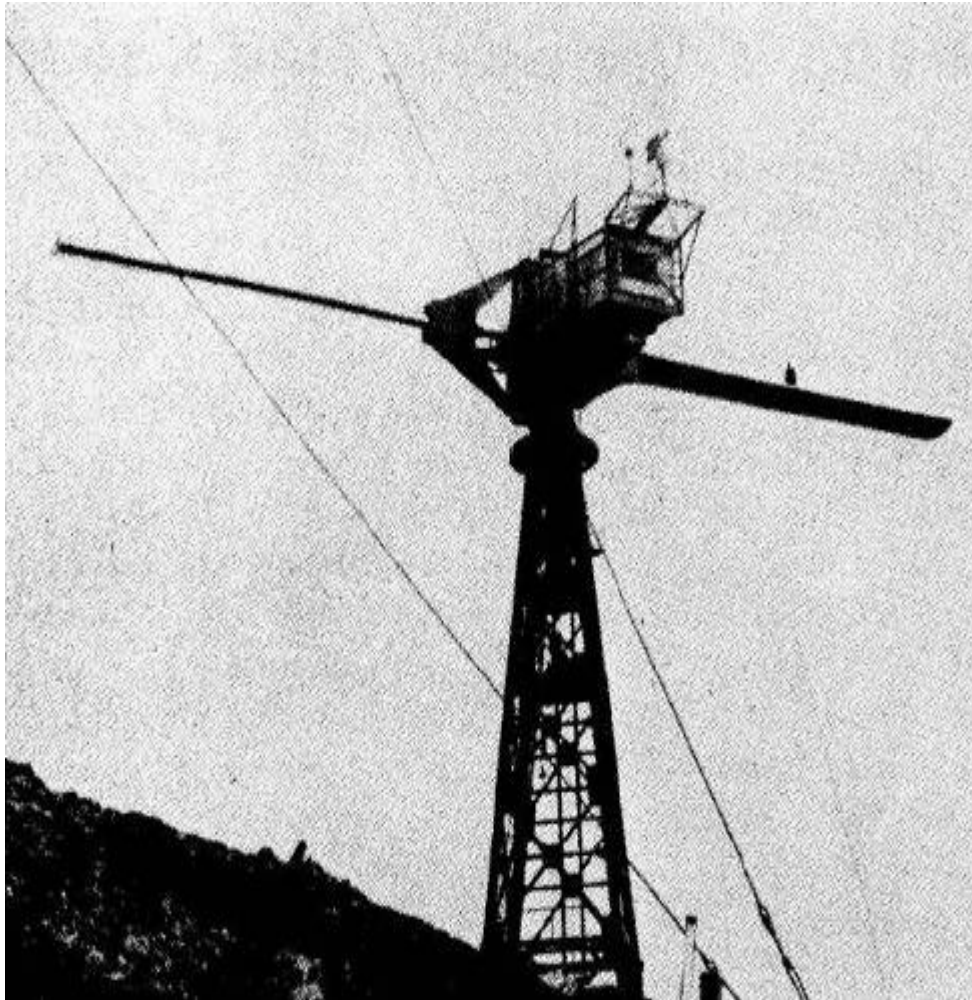
Pumping
water in
Persia

500 BC



First UK windmill
Weedly, Yorkshire





First grid connection
US, Grampa's Knob

Windy Miller, Camberwick Green



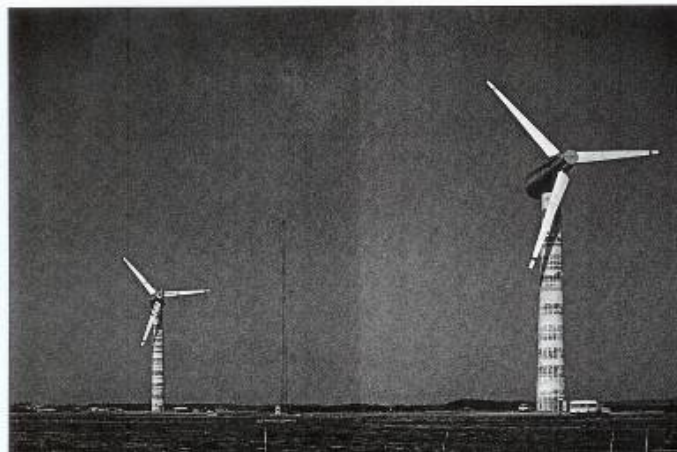
DANISH WIND POWER

The Nibe Wind Turbines, near Aalborg, Denmark

| | |
|--------------------------|---------------------------------------------------------------------------------------|
| Client: | Ministry of Energy and Danish Electric Utilities |
| Architects: | Gottlieb, Ingsted and Palsdan |
| Engineering consultants: | B. Hejlund Rasmussen (lowers) |
| Rotor blade project: | Rise National Laboratory, Fluid Mechanics Department, Technical University of Denmark |
| Contractors: | Danskraft Ltd |

Right: Detail of the rose. Middle: Aah, nacelle and top of the concrete tower.

Below: Three Nibe wind turbines on their flat site near Aalborg.



Nibe, Denmark
41 metre tower

Concrete Quarterly, 1981

Burgar Hill,
Orkney

20 metre rotor
dia.

WIND ENERGY

Prototype wind turbine, Burgar Hill,
Orkney

Design and
construction Wind Energy Group (WEG)

The forerunner of the largest wind turbine generator in the United Kingdom was erected in July this year on Burgar Hill, Orkney, by the Wind Energy Group (WEG)

This 20 m diameter turbine prototype has been funded by WEG which comprises Taylor Woodrow Construction Limited, British Aerospace Dynamics Group, GEC Energy Systems Limited, the North of Scotland Hydro-Electric Board and the Department of Trade and Industry.

The prototype machine has a rated power of 250 kW in a near gale force wind of 17 metres per second, and a rotational speed of 88 revolutions per minute.

It has been built on a site where WEG will commission in 1985 a 60 m diameter turbine rated at 3 MW - the largest yet planned in the United Kingdom.

Both machines will start to rotate at a wind speed of 7 metres per second (moderate breeze) and shut down when speeds exceed 27 metres per second (storm force). They will rotate and generate power most days in the year and be operational for about 70 per cent of the hours of the year.

This prototype wind turbine will have an annual output of 700,000 kilowatt hours (kWh). Its two-bladed rotor will turn about 30 million times a year, producing sufficient electricity to supply 150 homes. The performance of the machine is to be extremely monitored by the Wind Energy Group under a separate contract with the Department of Energy.

The machine sits on a tower made up of a steel cylinder fixed to a conical concrete frustum at the base. The 60 m diameter turbine will sit on top of a 45 m tall concrete tower with access via a four-person lift. Its design will make it suitable for a wide range of on-shore and off-shore sites and a considerable range of wind conditions.

The 20 m diameter prototype wind turbine generator at Burgar Hill, Orkney



Concrete Quarterly, 1983





2006...turbines from 660kW to
5MW

Up to 150 metres to blade tip

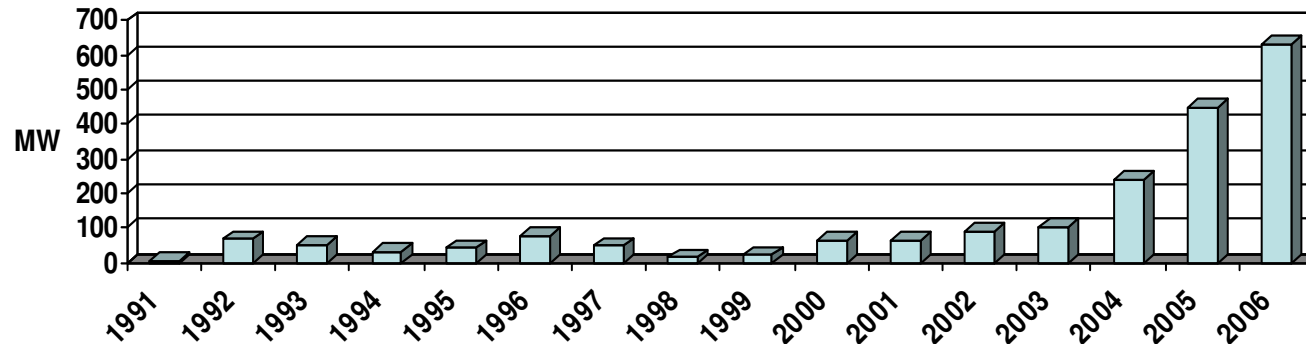


Background of UK installed wind capacity

- Non-Fossil Fuel Obligation (NFFO) was introduced in 1990's
- In April 2002 the Government introduced the Renewables Obligation (RO) to replace NFFO
- Primary purpose to displace generation from coal fired power stations and narrow the cost of production with conventional power
- 1999 installed operational capacity was 344MW (50 wind farms)

Reaching the 1st GW

Wind energy built capacity 1991 - 2006

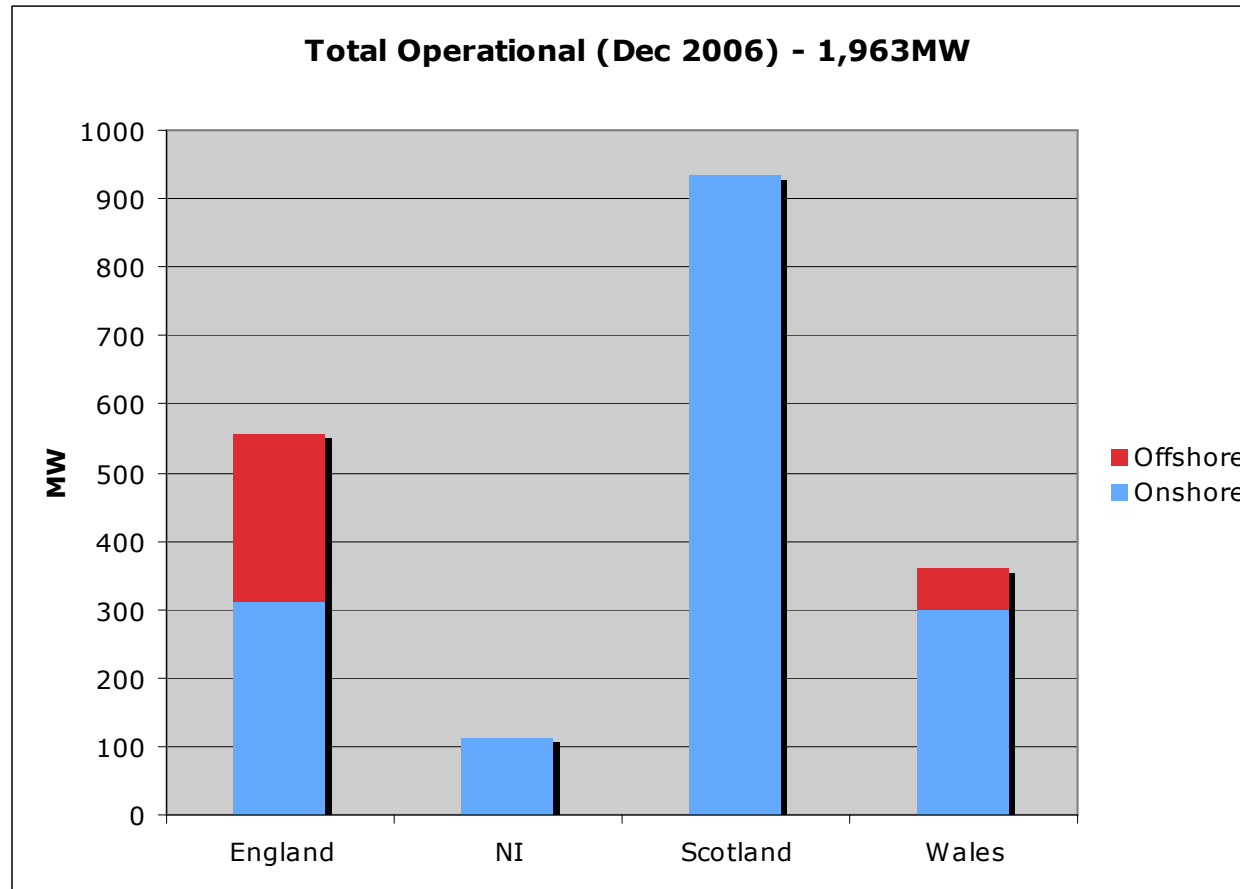


- April 2005 UK reached 1GW of installed capacity - 890MW onshore (107 wind farms) and 124MW offshore (3 wind farms).
- The UK is now approaching it's 2nd GW of installed wind capacity: *it took 14 years to build the first GW, and will be less than 24 months to build the second.*

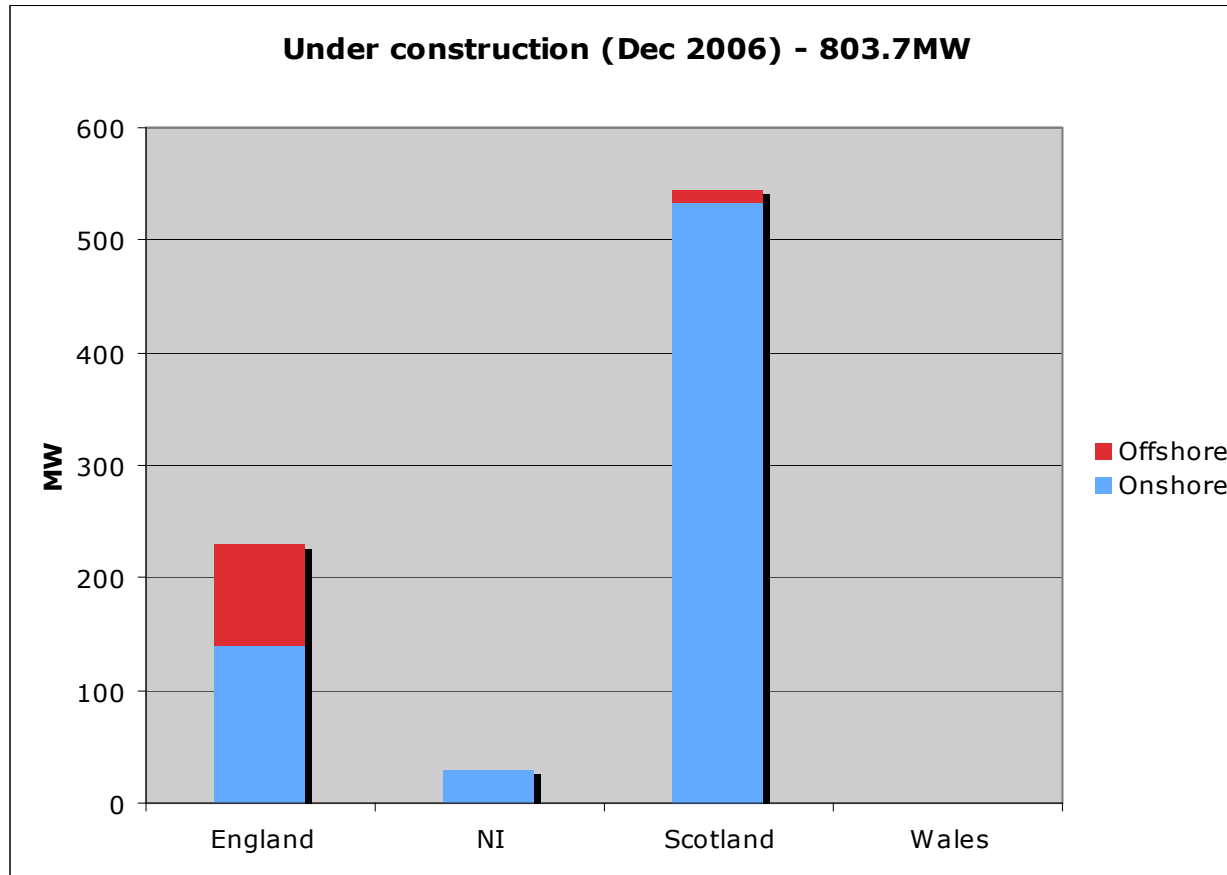
Current capacity

- Wind energy is expected to meet the majority of the UK's 2010 target of 10%
- However various constraints holding up delivery...planning, grid and finance

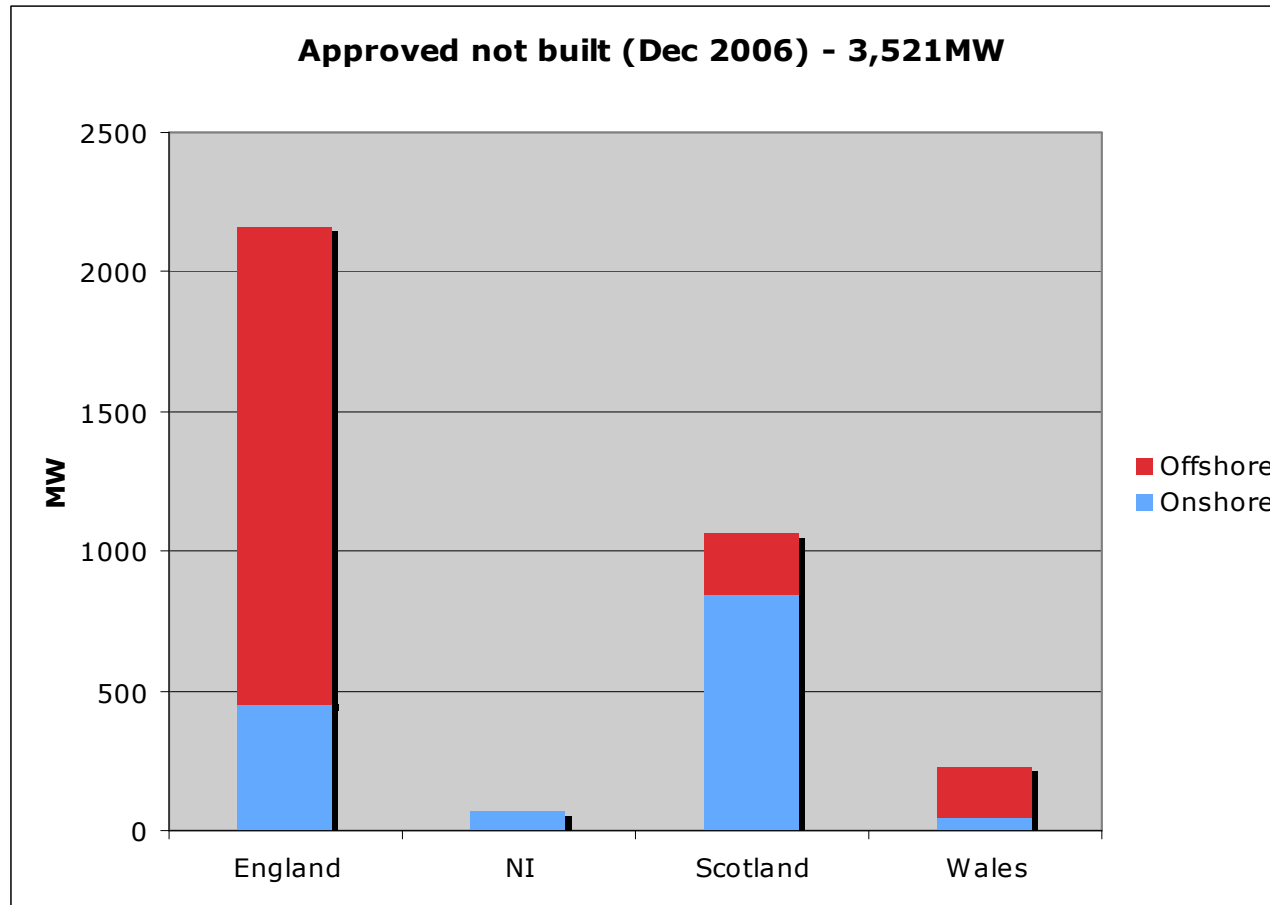
Current operational capacity



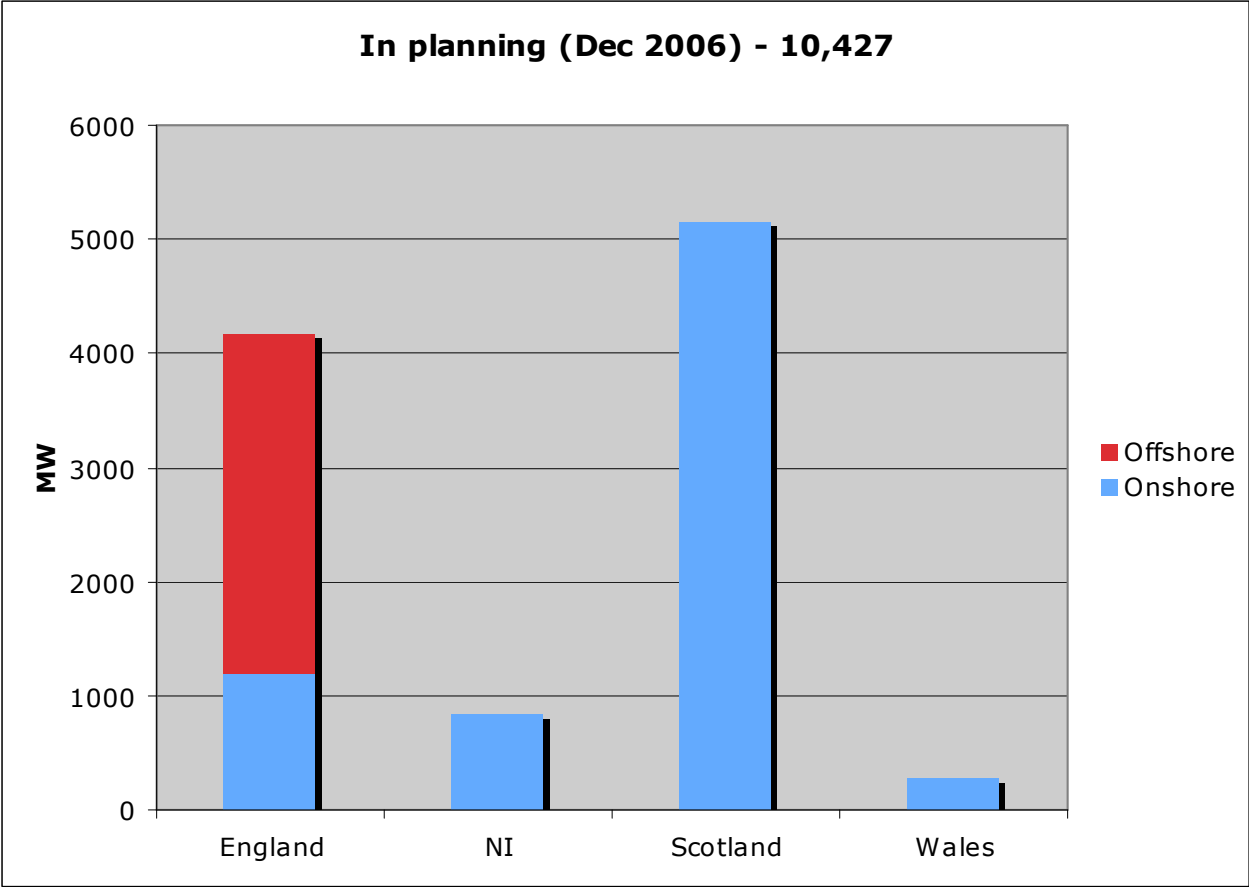
Capacity under construction



Capacity approved



Capacity in planning

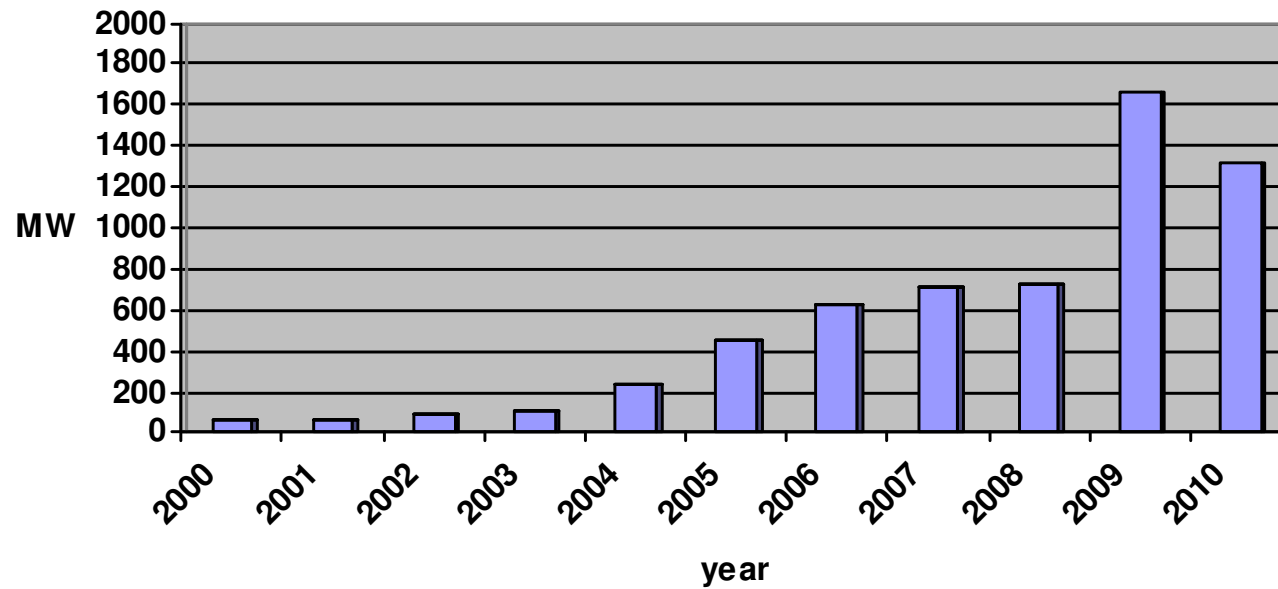


Greater capacity, fewer turbines

- As industry has matured, greater yearly capacity has been achieved with relatively fewer numbers of wind farms & turbines.
- BWEA database shows that the number of turbines required to install 1MW of installed capacity has decreased 6-fold since 1991; and still dropping
- Average hub height has increased approximately 2.5 times, as has length of blades

UK wind energy capacity to 2010

Onshore built capacity and year on year potential 2000 - 2010



Beyond 2010 to 2020

- A positive and proactive approach to wind energy must be adopted and maintained in planning policies
- BWEA research shows that by 2020 onshore wind could contribute up to 12,500MW (9% of UK supply)
- Offshore wind could contribute up to 11,500MW under optimum conditions (9.4%)

Summary

- Onshore wind needs to make the largest single contribution to the 10% target for 2010; constraints mean this is at risk
- A potential 5% (7,800MW) of UK electricity supply is held up in the onshore planning system
- All consultees & stakeholders have a vital role in delivering a sufficient number of good wind farm developments

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