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Renewable Energy in the UK

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Renewable Energy in the UK

- Legislation and Targets:

- International Frameworks
- EU Context
- National Context

- Technology:

- Overview and outlook for key renewable technologies



International Framework

- UN Framework Convention on Climate Change
- Kyoto targets: UK to reduce annual emissions to 2012 12.5% below 1990 levels
- G8
- EU
 - EU Climate and Energy Package 2008
 - 20-20-20 Targets



EU Climate and Energy Package

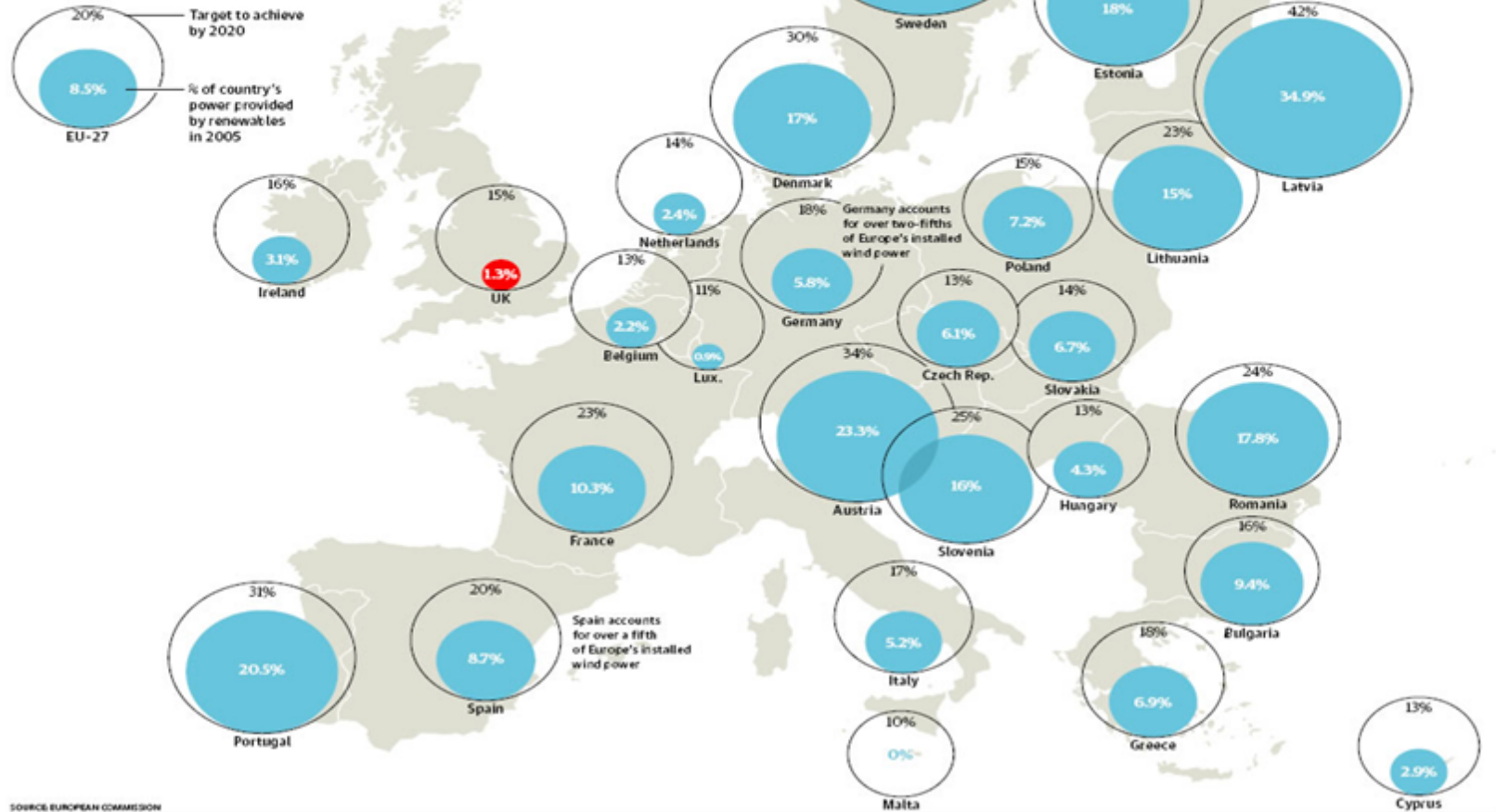
- Draft EU Renewable Energy Directive:
- 20% of EU's energy needs from renewable sources by 2020
- Binding targets for each member state
- UK to increase share of total energy needs from renewables from 1.5% to 15%
- 10% of transport from renewable sources



Ambitious EU Targets (source: The Guardian)

Renewable energy in the EU

By 2020 renewable energy should account for 20% of the EU's final energy consumption (8.5% in 2005). To meet this common target, each Member State needs to increase its production and use of renewable energy in electricity, heating and cooling and transport





2020 Targets

- Very challenging for UK
- Will need to increase proportion of energy met from renewable sources 10-fold between 2006 and 2020
- Possible scenario for reaching target in 2020:
 - 10% renewables in transport (less than 1% today)
 - 14% in heat (less than 1% today)
 - 32% in electricity (less than 5% today)



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EU Climate and Energy Package

Other key elements:

- Strengthening of EU Emissions Trading Scheme
- Proposed targets for each MS to reduce emissions in non-traded sectors
- Plans for promoting & regulating CCS technologies



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National Context

- History of Renewables in the UK
- Current legislation and targets
- UK Renewable Energy Landscape
- And predictions for individual technologies



History of Renewables in the UK

- Small amount of renewable capacity commissioned under 1983 Energy Act arrangements
- 1989 Electricity Act introduced Non-Fossil Fuel Obligation (NFFO) which required network operators to purchase electricity from renewable sector.
- 1989-1999 saw five rounds of NFFOs for technologies including sewage gas, landfill gas, energy from waste, onshore wind and hydro.
- Price of renewables fell strongly over decade
- By 2001, there were 302 wind farms contracted under the NFFO, with a total capacity of 1.15GW.



Current Renewables Legislative Framework

- Renewables Obligation introduced 2002
 - Obliges suppliers to source increasing proportion of electricity from renewable sources.
 - Has increased level of renewable generation from 2% to 4.4% in 2006
 - But more dramatic increases needed to meet 2020 targets
 - Need to overhaul incentive framework vs. need to maintain stable environment for investors



UK Perspective: domestic targets

- 2003 Energy White Paper: Target of 10% of electricity from renewables by 2010 and 20% by 2020
- Climate Change Bill currently passing through Parliament
- Will provide legal framework for UK to reduce carbon emissions by 80% by 2050
- Bill and budgets to be adopted by June 2009



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Other UK legislation

- Planning and grid connection identified as key problem areas for renewable deployment
- Planning Bill & Marine Bill
 - New Infrastructure Planning Commission to deal quickly with major onshore and offshore wind projects
 - National Policy Statement on renewables for planners
- Energy Bill
 - Proposes reforms to Renewables Obligation



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UK Renewable Energy Landscape

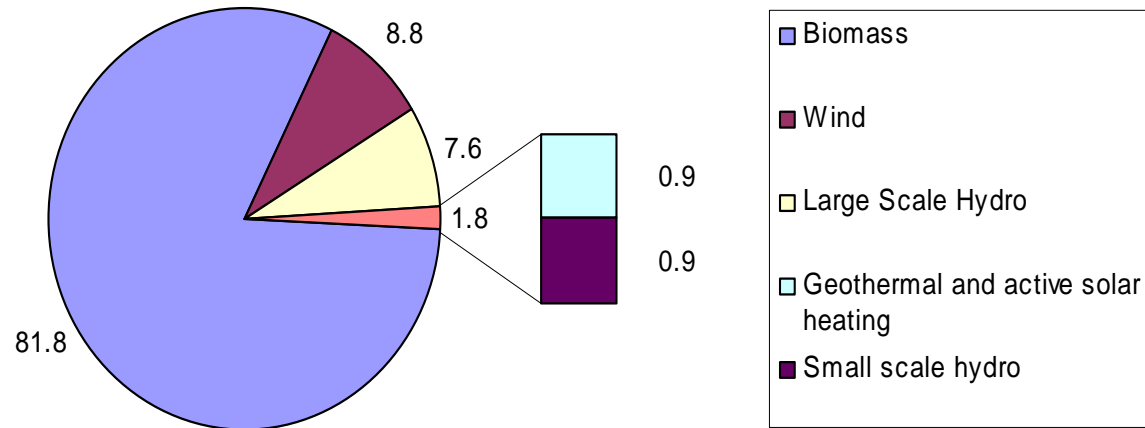
- Mainstream technologies- onshore and offshore wind, landfill gas, hydro.
- Emerging Technologies- other biomass, tidal and wave, photovoltaic and solar thermal, energy from waste



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Renewable Energy Sources in UK 2007

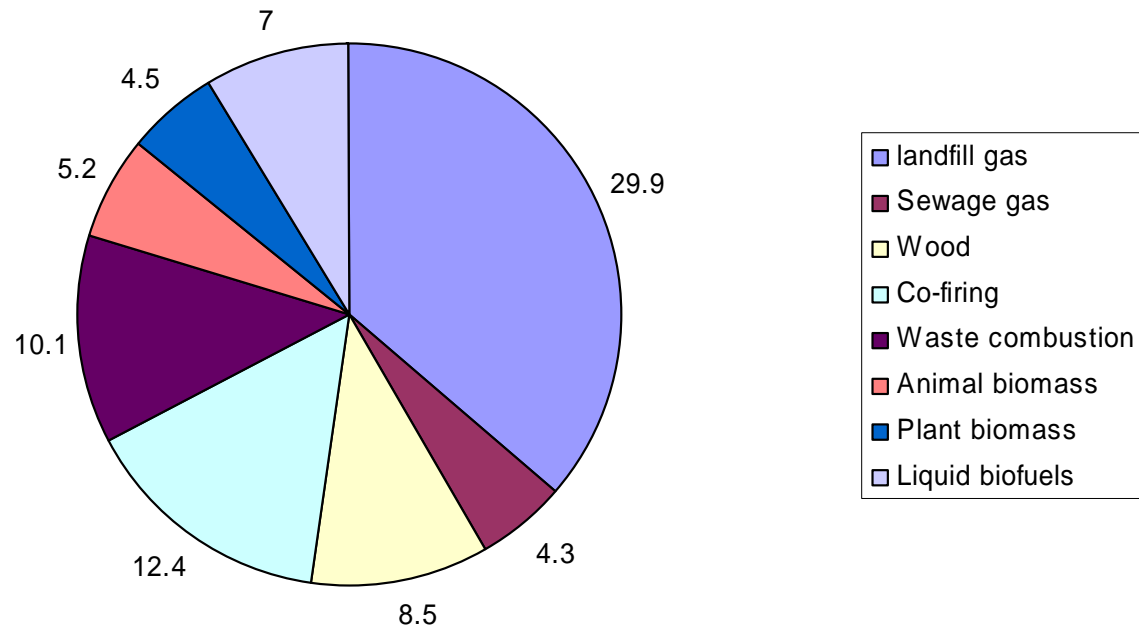
(source BERR)





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Biomass use by sector 2007 (source BERR)





Onshore Wind

- 182 wind farms operational, 32 under construction, 126 granted planning permission
- Installed capacity of 2.34 GW
- 14 GW predicted by 2020
- Wind power strongest in remote areas with poor grid access
- Problems with planning and grid access
- Supply chain constraints, but these can be resolved



Offshore Wind

- Key growth area for 2020 targets
- 9 windfarms in operation with 565.8 MW capacity
- 20 projects in pipeline with 5.5 GW capacity
- 33 GW achievable by 2030 (10-18 GW by 2020)
- Planning, grid and supply chain constraints
- Technology challenges as wind moves farther offshore (improved reliability, new turbines designed expressly for offshore use)



Landfill Gas

- Using methane created by breakdown of organic materials in landfill dumps to generate electricity
- UK landfills 100m tonnes organic waste per annum
- Little potential now remaining
- EU legislation discourages landfills, moves towards waste recovery and recycling
- Renewables Obligation now disincentivises landfill gas in favour of energy from waste



Hydro-electric power

- Large-scale hydro developed strongly from 1950s on in mountainous areas of Scotland and Wales
- Predominately pumped storage schemes
- Dinorwig pumped storage station in Snowdonia, Wales is UK's largest at 1.7 GW
- Little scope remains for new large-scale build



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Wave power

- UK has 35% of Europe's wave resource and world leading base of marine renewable technology (Pelamis, WaveDragon)
- European Marine Energy Centre (EMAC) in Scotland is testbed for developing technologies and standards
- Too many concepts- optimum technologies need to be identified and rapidly developed if wave is to become commercial
- UK in very favourable position if wave power commercialised



Tidal Power and Barrages

- Severn Estuary has 2nd highest tidal range world-wide-ideal for tidal power
- UK Government currently analysing options for tidal power in river Severn- tidal stream turbines, impoundments or barrage
- If it goes ahead, Severn Barrage would be UK's largest civil engineering project
- Barrage could deliver 9 TWh/yr- 5% of UK's electricity needs



Photovoltaic and Solar Thermal

- UK receives 60% of insolation received on equator, but massive seasonal variation
- Not ideal climate for photovoltaic electricity
- UK research in 3rd generation photovoltaics strong (e.g. EPSRC PV21 project)
- 100,000 houses out of 18m have installed solar thermal panels for heating- less than .6%. Huge scope remains.



Energy from waste

- Waste strategy for England 2007 identified combustion as preferred option for waste wood (over recycling) and anaerobic digestion as preferred option for food waste
- Current shortage of well located, EU compliant waste incineration capacity
- £2bn programme of Private Finance Initiative credits for waste infrastructure
- Local objections to waste incineration plants (e.g. Cory Environmental- Belvedere Incinerator)



Conclusions

- UK has strong potential in wind (short to medium term) and wave (longer term)
- 2020 and 2050 targets very challenging for UK
- If UK is to achieve these targets, intensive work needed, especially on grid adaptation and planning system