

# **2020 VISION – How the UK can meet its target of 15% renewable energy**

**June 2008**

## Executive Summary

**The UK has been allocated a target to increase the proportion of its energy use provided from renewables to 15% by 2020. The current percentage is less than 2%. The Secretary of State has asked the Renewables Advisory Board (RAB) to advise on policy issues and the potential for UK wealth creation and jobs related to achievement of this target.**

**RAB's strategy has been to develop its vision of the 2020 renewables market and then address the many policy issues that will need to be implemented if that vision is to be realised. This first note outlines RAB's 2020 Vision and identifies some of the most important issues that need to be tackled, many urgently. Much further work is underway addressing individual policy topics and will be reported during the forthcoming year.**

## 1. UK Renewable Energy Sectors

We have divided the UK's renewable energy use into four categories as follows:

<b>BULK ELECTRICITY</b> <ul style="list-style-type: none"> <li>• Onshore wind</li> <li>• Offshore wind</li> <li>• Dedicated biomass &amp; CHP</li> <li>• Co-firing</li> <li>• Landfill gas</li> <li>• Anaerobic digestion</li> <li>• Solid recovered fuels</li> <li>• Hydro</li> <li>• Tidal stream and Barrages</li> <li>• Wave</li> <li>• Severn Barrage</li> </ul>	<b>BULK HEAT</b> <ul style="list-style-type: none"> <li>• Industrial scale</li> <li>• Biomass heat &amp; CHP</li> <li>• Solid recovered fuels</li> </ul>
<b>BUILT ENVIRONMENT</b> <ul style="list-style-type: none"> <li>• Photovoltaics</li> <li>• Biomass CHP</li> <li>• Biomass boilers</li> <li>• Heat pumps</li> <li>• Solar thermal</li> <li>• Micro-wind</li> </ul>	<b>TRANSPORT</b> <ul style="list-style-type: none"> <li>• RTFO from 2010</li> <li>• EU Directive from 2020</li> </ul>

Biomass presents particular modelling problems since the available fuel supply will be limited, but its use is possible in all four sectors. RAB believes that Government needs to make a strategic decision on the optimal usage for biomass within the UK.

## 2. Current Policies

To assess the size of the challenge RAB firstly estimated how much renewables can be expected to deliver by 2020 if current policies e.g. Renewables Obligation, RTFO, Round 2 offshore wind, remain unaltered. Our best estimate is that the UK will achieve about 6% of our energy from renewables in our "business as usual" scenario. We note that this figure is similar to other recent studies.

It should be noted that we have forecast total UK energy use in 2020 will be 150Mtoe; this includes a reasonably aggressive assumption about future energy savings. In what follows figures are reported as percentages of this figure: for instance the 15% target equates to 22.5Mtoe; a value of 7.5% would fulfil half of the 2020 target.

### 3. 2020 Vision

Expert groups in each of the four sectors were asked to predict what could be delivered by 2020 with **significant but achievable** policy changes. In each case the groups emphasised that business as usual, or a small extension of it, would fall well short of the target.

If the 15% target is to be approached we need to establish a different energy world with new policy, economic and social drivers. Many of these changes will need to be radical and will require, above all else, political leadership and a determination to succeed. RAB believes that public concerns about climate change, fuel imports and energy price volatility make radical political action deliverable. Industry and commerce themselves stand ready to deliver but, as ever in the renewables industry, the greatest investment risk is seen as political risk. Investors need to be confident that government is determined to achieve its own targets.

In total the expert groups felt able to forecast that 14% of UK energy could be provided by renewables provided that a set of identified policy changes could be implemented in good time. We have called this our “base case”. RAB further identified three more challenging alternatives that could close the gap to 15%; indeed it may be prudent to aim for a figure somewhat higher than 15% to accommodate possible failure or slippage. See figure 1.

The following sections provide details for each sector.

### 4. Bulk Electricity

#### 4.1 Vision

Constraints on the volumes of renewables that can be delivered in both the Transport and Heat sectors (see later sections) require Bulk Electricity and the Built Environment to provide a large part of the 15% target. In our base case 2020 vision 7.1% of energy will be provided from the Bulk Electricity market. This equates to approximately 40% of the grid-connected electricity market; this compares with less than 5% today and the current Renewables Obligation target of 20% by 2020.

Three technologies are predicted to dominate the 2020 renewable electricity market: onshore wind, offshore wind, and biomass with solid recovered fuels (waste). See figure 2. The size of the challenge may be judged from the following table<sup>1</sup>.

BULK ELECTRICITY	Onshore Wind	Offshore Wind	Dedicated Biomass & SRF
Installed today MW	1850	394	576
Already consented MW	3760	3282	748
In planning MW	7750	2085	491
<b>% UK Energy by 2020</b>	<b>1.8</b>	<b>3.2</b>	<b>1.3</b>
Total MW req'd by 2020	13000	18000	4000
Indicative total capex £bn	13	36	6

<sup>1</sup> Source: <http://www.restats.org.uk/>

On average we need to install slightly less than 1GW p.a. of onshore wind, 1.5 GW p.a. of offshore wind, and 250MW p.a. of biomass and SRF. For comparison, over the next five years, Spain is expected to install 2.5GW p.a. of wind and France and Germany 2GW p.a. each (ref. BTM Consult).

Other renewable technologies are expected to provide a total of 0.6% of UK energy. These include landfill gas, digesters, hydro, smaller barrages, wave and tidal. The UK leads the world in the development of wave and tidal power devices and RAB supports ongoing support for these technologies; their UK contribution by 2020 is estimated to be at most 1GW but rapidly followed by very significant worldwide growth around that time.

The Severn Barrage has not been included in our base case. RAB awaits the outcome of the current review. It has been included as one of our “more challenging” options for closing the gap to 15%. We understand that, if completed early in the 2020s, under the currently proposed EU rules half of its capacity could be attributed to the target; this would be about 0.5% of UK energy.

#### 4.2 Policies

Given the size of the contribution expected of Bulk Electricity it is vital that current obstacles to rapid growth are removed. RAB will report later in more detail on many of these policy issues. For the time being we highlight just some of the highest priority and most urgent issues which must be resolved:

- **Urgent Grid Studies:** Development of large capacities of onshore wind in Scotland, Wales and NI will require substantial grid reinforcement. Equally connection of a further 15GW of offshore wind, much of it off the East Coast, may require significant reinforcement of the onshore transmission system. Recent experience indicates that typically this takes 10 or more years; we are relying on the recently announced IPC to reduce this period. Nevertheless RAB believes that strategic grid studies must commence immediately and the right commercial and regulatory arrangements be put in place to ensure delivery; arguably we are already starting too late.
- **Planning and Radar/Aviation:** The ongoing problems of gaining planning consents, particularly for wind farms, are well known and will continue to be addressed by RAB separately. Nevertheless the recent last minute objections to both on- and offshore projects due to radar difficulties are precisely the form of policy instability that seriously undermines investor confidence. It is RAB’s belief that there are technical solutions to radar problems, that these should be proven, and the issue of who pays for their implementation resolved; the cost is small relative to the size of capital investment that industry is being expected to make.
- **Financial Support System:** The Renewables Obligation has proved a successful mechanism and RAB has supported both its introduction and recent amendments. However it is designed to encourage 20% renewable electricity and we are now seeking to double that contribution. Within the next two years industry will need a clear idea of what will follow the current RO. In particular, investors need confidence that the renewables market will support investments made between now and 2020 well beyond the current RO mechanism that terminates in 2027.

## 5. Built Environment

### 5.1 Vision

Forecasting the 2020 contribution from renewables to energy use within the Built Environment has proved the most difficult challenge in developing this Vision. Whereas the rate of Bulk Electricity growth is driven predominantly by government policies, in the built environment we shall be reliant on uptake by very large numbers of individuals, households and companies. These are the same entities that have to date been relatively slow to embrace energy efficiency measures despite reasonably strong economic incentives.

The expert group made estimates on both bottom-up and top-down bases. A wide range of figures emerged with those working in the sector being more optimistic than the wider RAB group. We have adopted a forecast of approximately 5 Mtoe or 3.3% of total energy; this includes both heat and electricity, the majority being heat.

RAB have divided properties within this sector into

- New residential
- New non-residential
- Existing residential
- Existing non-residential.

Given the uncertainty surrounding our forecast it is difficult to predict the technology mix within this sector. However since the size of an installation is relatively small the number required is correspondingly large.

The following table gives an indication of size of the contribution to the 5 Mtoe target from each of the sectors, and the breakdown of technologies and the number of installations needed for the existing residential build sector by 2020:

Sector/Technology	Contribution (Mtoe)	Typical single domestic production (MWh p.a.)	Number of installations required (thousand)
<b>New build residential</b>	<b>1.1</b>		
<b>New build non-residential</b>	<b>1.0</b>		
<b>Existing build residential*</b>	<b>2.2</b>		
<i>Of which:</i>			
<i>Photovoltaics</i>	<i>0.09</i>	<i>1.5</i>	<i>680<sup>1</sup></i>
<i>Solar Hot Water</i>	<i>0.23</i>	<i>2.25</i>	<i>1,300<sup>2</sup></i>
<i>Micro-wind</i>	<i>0.33</i>	<i>4 / 2<sup>3</sup></i>	<i>1,170<sup>3</sup></i>
<i>Air Source Heat Pump</i>	<i>0.74</i>	<i>6</i>	<i>1,440<sup>4</sup></i>
<i>Ground Source Heat Pump</i>	<i>0.81</i>	<i>10</i>	<i>950<sup>5</sup></i>
<b>Existing build non-residential</b>	<b>0.7</b>		
<b>Total</b>	<b>5</b>		

\*All analysis based on 26m existing homes

1. Approx. 1 in 38 UK homes; this is ~7% of 10m homes CLG estimate to be suitable for installation in 'Review of the sustainability of existing buildings', 2006.

2. 1 in 20 UK homes; this is ~7% of 19m homes CLG estimate to be suitable for installation in 'Review of the sustainability of existing buildings', 2006.

3. 15% of 5 million rural homes installing a system generating 4MWh p.a., + 2% of 21 million urban & suburban homes installing a system generating 2MWh p.a.

4. 8% of 1.5m gas boiler replacements made annually installed with an air source heat pump.

5. 15% of the 3.9m homes estimated to be off the gas grid, + 2% of 1.5m gas boiler replacements made annually.

The UK is starting from a very low base in this sector. Germany, a country with a similar climate, is well ahead: supported by a feed-in tariff there are nearly ½ million PV installations providing 1GWp. Last year the UK installed 270 units; Germany 130,000.

## 5.2 Policies

In the Built Environment sector it will be necessary to transform public behaviour. This is always challenging although we have seen very substantial positive changes in public perceptions of renewable energy in recent times.

It is possible to enforce change in the New Residential and New Non-residential sub-sectors by regulation. The Government's announcement of Zero Carbon standards for homes in 2016 and commercial property by 2019 is welcomed and RAB has assumed compliance in our 2020 Vision. This is forecast to provide about 2 Mtoe p.a.

For existing buildings that will provide the remaining 3 Mtoe p.a., it will be necessary to use carrots rather than sticks. We have identified a long list of policies designed to induce investment by property owners and RAB will again be reporting in greater detail later in the year.

As examples we highlight here just three policies that RAB believes deserve immediate consideration:

- Statutory targets to give investor confidence of new policy development if existing measures fail
- Financial and fiscal strategy with significantly stronger and better targeted incentives in a range of deployment measures
- Remaining regulatory barriers on planning and certification to be solved

## 6. Bulk Heat

### 6.1 Vision

The use of renewables to supply large quantities of heat is effectively limited to burning of biomass and solid recovered fuels, preferably in CHP associated with heat networks or industrial loads. We have estimated that 0.9% points of the 15% target could be produced from this source.

### 6.2 Biomass and Solid Recoverable Fuels Policy

As mentioned earlier, RAB believe that Government needs to follow up its recent review of Biomass resources with policy decisions that will assign the available indigenous and imported fuel resources to specific sectors. These policy decisions will need to take account of

- potential indigenous production of energy crops.
- expected availability of indigenous SRF.
- potential imports of biomass, recognising concerns about sustainability, food production and global competition for such fuels.
- the need to meet the separate EU 10% target for road transport fuels.
- the carbon intensity and cost effectiveness of different technologies.
- the environmental impacts of the different options.

In terms of meeting the 15% target it is largely immaterial which sectors benefit.

## 7. Transport

We have assumed that the RTFO of 5% biofuels by 2010 and the EU target of 10% by 2020 will be implemented in full and that vehicle technology will constrain development beyond these levels. In 2020, Transport is expected to contribute 2.7% points of the 15% target.

## 8. 'Further Stretch' Options

In Section 3 we noted that the sum of contributions from the four sectors falls short of the 15% target by about 1% point. RAB have identified three possible options to fill the gap but stress that delivery of each will present further challenges beyond already stretching aspirations. The three options are:

- Installation of the Severn Barrage, half of which would count towards the 2020 target provided construction begins before 2016.
- A further 6GW of wind power, mostly offshore, bringing the total offshore capacity to about 24GW.
- A further 30% increase in energy production from renewables in the Built Environment sector. This would need to be retro-fitted to Existing stock, and would probably require installation of district-wide heat networks.

## 9. Supply Chain – Opportunities and Challenges

In order to achieve this vision the capital investment from UK industry and property owners is expected to exceed £100 billion. It is imperative that the UK supply chain captures the maximum value and creates the maximum number of “green collar” jobs from this market. Major opportunities are identified as follows:

TECHNOLOGY	Expected Capital Investment by 2020, £ billion	Major opportunities for UK business
Offshore Wind	36	<ul style="list-style-type: none"> <li>• Project development</li> <li>• Foundations</li> <li>• Installation, vessels, servicing</li> <li>• Grid connections</li> <li>• Turbines and components</li> </ul>
Onshore Wind	13	<ul style="list-style-type: none"> <li>• Project development</li> <li>• Civil engineering</li> <li>• Installation, servicing</li> <li>• Grid connections</li> <li>• Components</li> </ul>
Bioenergy	6	<ul style="list-style-type: none"> <li>• Energy crops and SRF</li> <li>• Technology, infrastructure</li> <li>• Transport</li> </ul>
Built Environment	50 *	<ul style="list-style-type: none"> <li>• Installation</li> <li>• Servicing</li> </ul>
Wave & Tidal	3	<ul style="list-style-type: none"> <li>• Technology development</li> <li>• Installation</li> </ul>
Financial Institutions	100*	<ul style="list-style-type: none"> <li>• Investment</li> <li>• Re-financing, hedging etc</li> </ul>

\* Indicative; very dependent on technology mix



In order to benefit from these opportunities the supply chain needs to have confidence in the creation of a stable, growing market. Once again this will depend above all else on positive perceptions of political will and implementation of policy frameworks.

The supply chain for renewables will be a global competition: all EU nations will be pursuing similar ambitions within their own 2020 targets. Other countries such as USA, China and India will be developing their own technologies and many have the advantages of cheaper labour costs. Nevertheless the UK leads the world in some technologies, in our financial skills, and we have some of the most abundant natural resources in our wind, wave and tidal sectors.

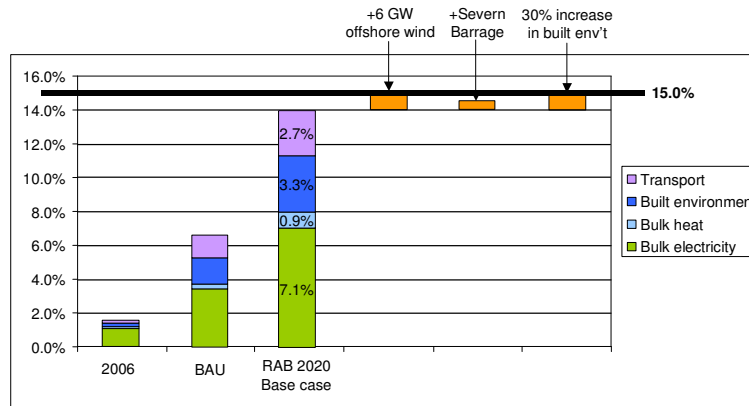
To maximise our national share of wealth creation from renewables we must:

- Create a stable, growing market.
- Build on our existing pool of appropriate skills.
- Be flexible in interpretation of EU Procurement and State Aid rules.

## **10. Key Messages**

- The 2020 target of 15% UK energy from renewables is achievable, BUT
- This requires rapid development of a transformed energy framework with radically new economic, political and social drivers. Renewables must be at the heart of energy policy.
- Many new policies are required and some are very urgent.
- UK industry has the resources and investment required, provided it gains confidence in a stable, growing market.
- The prize for the UK industry is a substantial share of UK capital investment totalling some £100 billion, plus a share of a global market very many times as large.

Advancing Renewables Together  
**2020 Vision**



**UK energy 150Mtoe – aggressive efficiency measures assumed**

Figure 1: Contributions to 2020 total UK energy by %

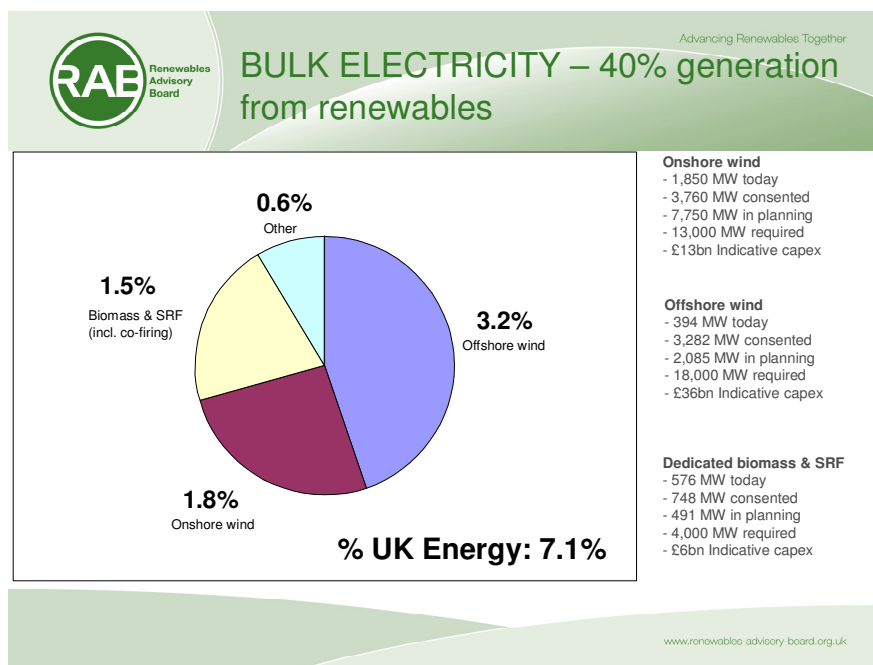


Figure 2: Contributions to 2020 Bulk Electricity market, total 7.1% of UK energy or 40% of UK electricity