2050 Pathways Call for Evidence Coordinator
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Dear 2050 Pathways Coordinator

2050 Pathways Analysis

The Renewable Energy Association (REA) is the largest trade association for renewables in the UK, with 650 corporate members. We cover the full spectrum of the renewable energy technologies across all the sectors; power, heat, transport and renewable gas.

The REA welcomes the opportunity to respond to the call for evidence on the 2050 pathway analysis. At present only 3% of our energy came from renewables in 2009, with less than 7% of our electricity and 2% of heat coming from renewable sources. Significant investment will need to be made in order to meet the 15% renewable target in 2020, much of which will last beyond that date. It is vitally important that there is confidence in Government's commitment to the renewables industry in the longer term.

General comments

We welcome that Government is starting to think about the pathways and trade-offs to 2050. In order to achieve the environmental targets there needs to be clear strategic direction from Government, this will be the only way to bring forward the investment and changes that need to be undertaken to ensure a smooth transition to a low carbon and sustainable energy system.

The analysis clearly illustrates that it is essential, due to the volume of information not known, that policy decisions are not made today that prevent certain technologies developing in the UK.

The scenarios and trade-offs clearly show that a diverse range of technologies will be needed. Policy today should not exclude specific technologies or attempt to pick winners. Not supporting certain technologies or focusing only on those technologies expected to deliver by 2020, may limit the options for the future or have adverse implications for costs. The REA has been urging government to support the full range of renewables, both large scale and microgeneration. These will need support at least over the next decade to ensure they have time to demonstrate their potential.

The 2050 analysis shows that wind, biomass, biofuels, energy from waste, geothermal, wave and tidal, PV, and microgeneration may all make an important contribution.

We have only provided a brief response to this call for evidence, however the REA and its members are keen to be an active part of the review and contribute evidence as projects are developed and new data is available.

The renewables sector has an important role to play in delivering carbon emissions, energy security and contributing to the economy in 2020 and beyond. A 2050 strategy with renewables playing a significant part is welcome, but is no substitute for taking urgent action now to improve investor confidence. This is notably lacking in many areas of renewable energy, in particular transport biofuels and biomass power generation (where the development of larger projects is stalled due to lack of policy direction on "the point at which grandfathering" is effective. The level of decarbonisation of electricity needs to be challenging but also realistic. A one technology solution might not be the answer in transport. Consideration could be given to a distributed model for decarbonised options in transport.

Answers to specific questions

1. Scope of model:

The REA participated in one of the sessions on the 2050 Pathways analysis and 2050 Calculator and feel that the model provides a comprehensive range of low carbon technologies and processes. It should be broadened to include new technologies as they emerge.

2. Scope of sectors:

The analysis provides a useful indication of the implications of different levels of ambition for various sectors; clearly as information changes the model takes this into account.

Given the uncertainty regarding technological developments on some sectors it seems appropriate that the calculator describes alternative directions of travel rather than levels.

3. Input assumptions and methodologies:

Are the bioenergy conversion routes used in the model accurate, or are there more efficient routes for converting raw biomass into fuels?

One possibility to improve conversion efficiency is through biomass torrefaction (heating lignocellulosic material, wood, straw, energy crops to 250C for 1 hour). The REA's biomass expert can provide further information if required.

The bioenergy conversion route described for so called 1st generation biofuels uses only a biodiesel from oil seed rape land use example, and doesn't quote an efficiency comparison with other conversion processes. This is inaccurate, and not representative. Recent work, which doesn't appear to have been taken into account here, has highlighted the importance of the co-products of biorefining to the feed/food industry. Thus it is absolutely essential to include them, and taken into account their effects, if a realistic comparison between processes is to be made.

The pathways analysis report, in establishing the efficiency of the range of processes, provides the definition of efficiency as energy out/ energy in original feedstock. On this basis, 1st generation ethanol from biorefining wheat provides an efficiency of 97% when the co-product energy content is also taken into account (which should be done for all processes which produce any co-products)

If a comparative land use is to be derived, then again, co-products need to be taken into account, and in the case of wheat, the net land yield for bioethanol is 399 GJ/ha. (= 18900 litres/ha).

The importance of co-products has been explored in 2 recent papers in the scientific literature:

- "Impact of Protein concentrate coproducts on net land requirement for European biofuel production", Lywood et al, CGB Bioenergy Dec 2009
- "Opportunities for avoidance of land use change through substitution of soya bean meal and cereals in European livestock diets with bioethanol coproducts" Weightman et al, GCB Bioenergy Aug 2010

In comparison with much climate change analysis, it only considers the issues from a UK standpoint. In particular, no assessment is made of the quantitative effect of the GHG content of imports and exports. In simplistic terms a problem can be treated by exporting it. There is some qualitative recognition under the farming and agriculture headings, but there is no real tying together between sectors, and recognition of the very positive contribution that biorefining grain to ethanol can make in the animal feed sector, by displacing imports of high GHG content animal feed from, for example, South America. This report is not alone in this failing, but we should be pointing out that successful global results will be not obtained as long as this approach continues to be taken.

Can the model's assumptions on wave resource be improved, for example regarding the length of wave farms, their distance from shore, the efficiency of devices, constraints from other ocean users, and other assumptions?

More needs to be made of the limitations imposed by lack of grid availability in areas of high energy resource. Marine Scotland has also recently published guidance on the areas of Scotland's seas most suited to development. The guidance highlights the areas considered as most appropriate for wave and tidal energy - reflecting potential power output, limited environmental and technical constraints and development possible within the Saltire Prize timescales. These five areas are: West of Hebrides (wave); West of Shetland (wave); South West of Shetland (wave); West of Mull of Kintyre (tidal); and South West of Islay (tidal).1

Of those five most suitable areas, 4 have no grid available for power export. Therefore, the Enablers on Page 206 should include the proposed new offshore interconnector for power export.

Can the model's assumptions on tidal stream resource be improved, for example regarding the method for assessing the resource at specific locations, and the scaling up of individual devices into an array?

On the Regulatory framework (page 207), mention should be made of Marine Conservation Zones, which are likely to be designated in areas of high tidal stream resource. The monitoring costs associated with MCZs (20% of the initial project budget for MCT in Strangford Lough) are likely to make projects commercially unviable.

International Competition is mentioned in the document (page 208), although the UK may lead at present, but other countries, such as USA, Korea and Canada are rapidly playing catch-up, by providing stronger public support (financial and regulatory) for the sector.

The Load factor for tidal stream devices (p 209) seems low. MCT's load factor is higher than 40% (we are confirming this) but it may be as high as 55%. This is not unreasonable, given that tidal streams are accurately predictable (rather than statistically, as for wave power) and therefore devices can be optimally designed for the predicted conditions.

The wave energy deployment levels look unrealistic. For level 4 – 900 out of an available 1000km of wave front, the model needs to take into account the shipping lanes, also that separation zones are generally 16 – 32 km wide in the Channel and the Irish Sea[2]. A huge amount of shipping comes in from the Atlantic along the western approaches, where they have drawn the lines for wave fronts. We do agree that deployment offshore, say west of the Hebrides, will be just too challenging with regard to mooring in deep waters and export of the power.

We are checking our calculations on the levels for tidal stream, these seem reasonable (calculated as rough order of magnitude that 10,600 machines the size of Seagen will take up an area 15 km x 10 km).

Comments on assumptions in other sections

Section D. Space heating, hot water and cooling

To select the most efficient heat technology, a buildings heat load needs to be fully understood. A strong drive to improve a high percentage of existing buildings energy efficiency makes the widespread deployment of heat pumps feasible, however if this not coupled with aggressive measures to reduce the carbon content

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[1] http://www.scotland.gov.uk/News/Releases/2010/09/22101715

[2] Ref Admiralty Charts

of electricity, carbon savings will not be optimised. We would anticipate widespread deployment of biomass heating systems in rural and at the community scale and Biomethane injection into the grid will also mean retention of some traditional gas fired boilers, particularly if of the microCHP variety will be viable from a carbon saving point of view.

Section F: Bioenergy and Wastes

One our members believes that only trajectories A and B are realistic with respect to the biomatter to fuel conversion sector. Trajectories C & D are less credible due to the high costs and lower efficiencies that we believe these technologies present.

They also commented that in relation to biomass imports, Level 1 looks unrealistic (i.e. zero imports); the supply chain is developing and it is very unlikely to revert back when demand is growing. Levels 2-4 look far more credible, and they provide sufficient quantities of fuel for dedicated biomass generation to be 10-30% of total UK electricity generation by 2050. With the right investment incentives in place, a potential 5GW of generation could be commercially available by 2020, surpassing the 3GW target set by the Government in its Energy Plan Submission.

All the methods for biomass conversion appear to be captured, although CHP appears to be missing; CHP allows the capture of heat from the process, in addition to electricity generation. We acknowledge the caveat concerning its absence from an emissions perspective, but from a fuel efficiency perspective, its exclusion is perhaps questionable.With respect to conversion, like dry biomass, the efficiencies of all the other processes look reasonable on paper. However, both scale and whether the process is 100% proven have not been factored in.

The 2050 pathway analysis tool could be viewed to imply that the conversion of the biomass to gas products is significantly less advantageous displaced by the biogenic fuel. The tool would suggest that conversion of biomass to gas is not an appropriate pathway, whereas there are significant and tangible reasons.

In the default case, solid biomass displaces highly emitting solid fossil fuel, ie coal, and biomethane displaces relatively low carbon natural gas, therefore the savings via the biomethane appear to be low. For the model to attribute the benefit of the biomethane route: (a) the market- side constraints of utilising solid biomass must be recognised (ie that conversion to gas enables greater biomass penetration) and potentially (b) constraints on fossil fuel resources must be recognised (such that for example if natural gas were a limited resource, shortfalls in gas availability would need to be accommodated by the use of other fossil fuels, unless biomethane could be supplied). In these cases the absolute level of emissions will decrease by adopting the gas vector.

It is also not clear how the different categories of waste proportions have been derived from the source data. There is no clear source data for the biomass and waste arisings of the different types nor basis of conversion between tonnage and calorific value of the raw material.

The model should also consider the potential of CCS on biomass installations which would effectively achieve negative emissions. It is important that this is not a requirement for biomass stations but installations that have CCS should receive recognition for the additional carbon savings.

Section M: Microgeneration of electricity

We believe small-scale generation is the most effective way to engage homes and businesses with their energy use and it is disappointing that we still need to rely on 'anecdotal evidence'. However, we need to move on from these philosophical debates and concentrate, as other countries such as Germany are doing, on widespread deployment. The introduction in April of FITs is a start and as volumes grow costs will come down with grid parity for these technologies being achieved against the retail price of electricity, a valid measure for building and community specific installations, toward the end of the decade.

More pressing are issues around planning law and its impact on wind deployment and renewables generally in the non domestic sector. Also ensuring the grid and connection rights are assured will be essential to ensure higher levels of ambition are achieved.

Note, we would expect to see significant roll-out of sub 500kW in Level 3 and not just Level 4 making the capacity of 3 closer to that of 4.

For solar PV, one of the metrics to gauge the feasibility of the scenarios posed is access to roofs. Currently the market for roof covering in the UK is around 60m m^2 p/a, this equates to a realistic potential annual installation capacity for PV then achieving a trajectory akin to Level 4 is feasible. However, this will need the exceeding 5GW. Add to this installations which are independent of roofing work, supply chain to develop quickly, something which can only be achieved with stable government policy designed to deliver and support ambitious targets.

Section N: Geothermal electricity generation

Deep Geothermal can play a significant role in meeting the countries needs for not only power but heat as well. Analysis by the REA's deep Geothermal Group points to 2020 capacities of 200MW Electricity, 190MHth Heat, plus an additional 1,100MWth off-take of heat from CHP plant. These installations will still be providing power and heat well beyond 2050.

Some of the benefits of Deep Geothermal which enables it to be an attractive source of renewable energy are:

- Abundant resource
- Can provide baseload supply
- Despatchable power generation
- Security of supply
- Low or zero carbon dioxide emissions
- Power and heat price stability
- Low visual impact means it can be imbedded in the community
- Proven technology

A level of ambition as set out under Level 3 is certainly attainable as is pushing toward Level 4. However, without sufficient support RO, FITs and RHI to support Deep Geothermal in place before to enable real growth leading to 2020 this level of ambition is unlikely to be realised. Therefore swift action is needed to address this issue and set Deep Geothermal on a pathway to being a significant and cost effect energy source to meet out 2050 obligations..

4. Common implications and uncertainties:

No comment under these questions

5. Impact of pathways:

We do not think it sensible for government to contemplate a situation where no new renewables were built. The "Delta" option has the lowest cost, but it will not meet the legally binding 2020 commitment, and therefore would incur infraction proceedings and ultimately significant financial penalties.

Renewables provide security of energy supply due to the diverse sources, most of which are proven at least at demonstration or commercial level. As the industry works towards delivering the 15% target, it is likely that innovation and efficiency will increase, with a reduction in costs. Ultimately we would expect that renewables would become the most obvious technology trajectory to 2050 and beyond.

6. Cost analysis:

The cost analysis in the current report is quite misleading given it is only based on the physical resource costs. The review needs to look at a comprehensive list of costs and benefits. Adding simple modelling of costs into the model would help establish the commercial viability of the pathways, which would, in turn, aid decision making. Flexing the model to achieve an 80% GHG saving is of course possible, but costing each option in principle is important. This has to be an uncertainty that is covered.

It should also provide a thorough sensitivity analysis for those technologies where cost estimates are not based on actual plants. This is all the more important if have a large role to play in a scenario.

7. Future Improvements to the Model

All renewable and energy policy strategies should be based on the assumption that electricity from coal is displaced at the margin. A marginal analysis is likely to give the right answer, using the average will give you an inaccurate one.

We hope you find these comments useful.

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Chief Executive, REA.