

2050 Pathways Call for Evidence Coordinator
Department of Energy and Climate Change (DECC)
3 Whitehall Place
London
SW1A 2AW

8 October 2010

Dear Sir/Madam,

PATHWAYS 2050 - CALL FOR EVIDENCE

Thank you for the opportunity to respond to the 2050 Pathways - Call for Evidence. This response is made on behalf of Scottish Power Limited and ScottishPower Renewable Energy Limited.

We welcome the development of models that can be shared and used by stakeholders to quantify the numerous directions that policy may take and to support the electricity market reform debate. The comprehensive model and associated pathways clearly define the huge scale of the challenge of delivering secure and sustainable energy supplies in the UK while meeting the 80% GHG reduction target.

In our view, the approach and analysis undertaken is both rigorous and extremely beneficial in considering the diverse plausible, although in some cases extremely challenging, future outcomes that we may face. We are grateful to DECC for the obvious time and effort taken to produce such a substantial piece of work, and for the level of industry engagement both pre and post publication.

We understand you have not yet had the opportunity for the model to incorporate an assessment of the cost of the various pathways. However, from the work already carried out, it is clear that this will be a critical issue. The affordability of the proposed level of investment and the resulting energy costs (taking account of the impact on UK competitiveness) will be highly dependent on whether other nations take similar steps to decarbonise. In the absence of international agreements, some or all of the paths described could lead to reductions in UK economic competitiveness, and therefore economic activity, that may not be acceptable. Next steps should aim to quantify this issue, recognising that history (for example, unrealised concerns about future oil prices in the late 1970s/early 1980s or coal prices in Victorian times) suggests that scenarios with low to moderate fossil fuel prices ought not to be ruled out.

Points we have considered in our analysis of the 2050 Pathways work to date include:

- **Static assumptions in all Pathways**

We understand the need to hold some assumptions constant within in the model, but two areas in particular may require further consideration:

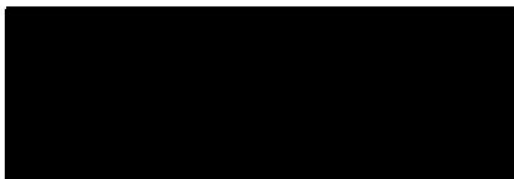
- *Constant GDP growth*: Any differential in input energy costs between the UK and other nations will affect growth prospects. The assumption of constant GDP growth in all pathways may need further consideration, as does the holding of all macro drivers constant.
- *Electric Vehicles*: The trajectories show only one level of change in car and van efficiency rates. Whilst we understand the need to keep the model manageable, as you acknowledge, the efficiency improvements included are ambitious. Further scenario analysis should possibly be included to demonstrate if these assumptions have any major impact on other sectors' requirements.

- **Security of Supply**

We believe the statement that the chosen pathways meet security of supply criteria may not be accurate, especially as respects meeting demand peaks. We believe the inputs for stress testing the system may not go far enough, and a more robust test may therefore be desirable. We appreciate this may add to the complexity of an already large model. The challenge in some scenarios may not only be meeting average levels of demand over a period as little as a couple of hours, but the speed at which the technologies could react. We have already offered our opinion and support on some of these matters to modellers within the DECC team.

We look forward to engaging further in the debate on the necessary market framework and optimum energy policy response required to achieve a secure, low carbon energy future. In the meantime, we attach our response to those of your questions where we feel qualified to comment.

Yours faithfully,



Director of Regulation

Pathways 2050 - Call for Evidence

ScottishPower response to applicable questions

1. Scope of model:

(a) Are there any low carbon technologies or processes or major demand-side options which are not currently included within the scope of the model but that you consider should be in future?

We believe that the range of technologies included in the model is very broad. Obviously, within the timeframe being considered there are likely to be some forms of technological advancement that are not considered in the model. However, claiming carbon savings from technologies yet to be discovered may be overly optimistic.

2. Scope of sectors:

(a) Does the range of alternative levels of ambition presented for each sector cover the full range of credible futures? If not, what evidence suggests that the range of scenarios should be broader than those presented?

Given the timeframe of the study it is difficult to challenge the credibility of some of the more aggressive assumptions made by 2050. However, the following observations may be of interest:

- *Electric Vehicles* - The trajectories show only one level of change in car and van efficiency rates. Whilst we understand the need to keep the model manageable, we agree with your assessment that the efficiency improvements included are ambitious. Further scenario analysis should be included to demonstrate whether these assumptions have any major effect on the technology breaking through. (Would these assumptions affect the technology - are the technology breakthroughs not more likely to alter the assumptions?)
- *Electrification of Heat* - Some trajectories include very ambitious increases in levels over a short time frame (by 2015). Whilst perhaps these outlooks may be physically achievable on the demand side, it is unclear how this level of demand could realistically be created in the time. In any event, it seems unlikely that there will be a supply chain in place to deliver such an ambitious programme in so short a time and this must question the credibility of these increases in terms of delivering the modelled near term carbon savings.
- Some of the levels of take up of technology appear very challenging, e.g. the take up of insulation measures at level 4. To achieve 96% take up of these measures would require strong legal requirements on households to install the upgrades, presumably backed up with criminal sanctions or large civil penalties. It is unclear whether this would be politically feasible.

(b) Do the intermediate levels of ambition (levels 2 and 3) provided for each sector illustrate a useful set of choices, or should they be moved up or down?

The levels used in most instances do illustrate a useful set of choices.

(c) The 2050 Pathways Calculator currently describes alternative directions of travel rather than different levels for some sectors where changes reflect a choice rather than a scale. Is this a suitable approach and clear to users?

The use of letters and numbering helps the user understand that they are making a different kind of choice. We believe that the designers have effectively balanced ease of use for the online calculator for the layman with the needs of those requiring more information. Although the additional spreadsheet is large, it is in most instances quite easy to follow.

We have noticed however that the calculator's results are not always intuitive e.g. when there is a lot of micro-CHP, a very large fraction of the total electricity generated comes from these micro-CHP installations. However, as the concomitant emissions are not included in the gCO₂/kWh_e figure, the emissions intensity figure looks surprisingly low. We believe the emissions intensity figure should reflect all generation of electricity, whatever its source, and include the emissions of each source.

3. Input assumptions and methodologies:

(a) For each sector, are the input assumptions and the methodologies applied to those input assumptions reasonable?

We are continuing to study the assumptions and methodologies, but have so far not noted any significant issues other than as noted elsewhere in this response.

As regards specific sectors:

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

N/A

(c) 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?

The assumptions regarding the wave resource may be conservative in some regards. The distance from shore which is required in order to achieve required depths (~60m) is typically only a few km off the Scottish west coast, where most of the resource is located, due to the steeply sloping seabed. This also allows projects to remain inshore of major shipping lanes, for the most part.

Also, the devices would not necessarily be placed in one line. Most likely there will be several rows of devices per wavefarm, and it is feasible that some wavefarms could operate inshore of others without significant impact (this has been shown by studies which we have contributed to). Because of this, we would say that the energy extraction factor of 20% to 25% is realistic rather than optimistic in the longer term.

We estimate that load factors for optimised wave technology will be in the region of 30% to 35%, rather than 25%.

(d) 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?

We accept that there is considerable uncertainty over the ultimate size of the resource. However, even with the most conservative estimate, the resource is still very large and warrants priority attention for the UK to maintain its leading position and secure the economic and environmental benefits which tidal power may be able to bring – both from UK developments and from export markets.

For now, the focus should be on proving the technology and developing the industry, rather than being too preoccupied with the ultimate size of the sector.

(e) Is there any evidence that would help build an understanding of the potential impact of long term spatial development on transport demand, and how could this be accounted for in the model?

N/A

(f) Due to uncertainties in the evidence base on energy demand and associated emissions, the model currently sets out only one level of ambition for the future UK share of international shipping. Is there any evidence you could contribute to help build a greater understanding of the potential shipping trajectories?

N/A

(g) Could the relative roles of coal and gas out to 2050 vary from the assumptions shown in this work, and if so, how?

This is one of the biggest uncertainties facing the power industry and there are many possible outcomes which may arise in the future. These outcomes will be heavily dependent on activity across the globe as the unconventional gas story unravels and developing nations continue to build large quantities of thermal generation. The current electricity market reform debate needs to take account of this uncertainty. The government should consider the time it will take to bridge to a decarbonised world and the best policies to ensure that coal generation expertise is maintained. A possible strong coal presence with CCS is prevalent in all but one of the illustrative pathways.

It is interesting to note that the paper suggests that you do not distinguish between CCGT or coal generation with CCS. This choice may not be clear for many years to come, but we believe the current coal CCS competition is the correct direction for the time being.

4. Common implications and uncertainties:

(a) The introduction to the report sets out some of the implications and uncertainties common to the illustrative pathways. Does this list cover the key commonalities? If not, please identify other common implications and uncertainties and provide evidence as to why these are key conclusions from the analysis.

We believe these common themes and uncertainties address the need to get to a 80% carbon reduction by 2050. However, they do not fully address the trilemma in terms of security of supply and costs. For example, page 6 makes a passing reference to the

ability to offset carbon reductions outside the UK beyond 2020. However, we do not believe the work carried out to date covers off this point sufficiently, considering that all example pathways drive to internal abatement. If offsetting was included as an option, the relevant pathways could appear less challenging.

5. Impact of pathways:

(a) What criteria should be taken into account in understanding the impact and relative attractiveness of pathways?

The impact on the trilemma, namely carbon reduction, security of supply and least cost should be taken into account. While the first two are addressed in this model, the cost of reaching the 2050 carbon target is not fully addressed. We recognise that you are clear about this limitation in the report, but we think the issue needs to be addressed.

As noted earlier, we also have concerns about whether the illustrative pathways result in sufficient electricity generation and flexibility in the fleet to meet demand at all times.

While jobs can be created in the supply chains needed to create a low carbon economy, it is important that these are not at the expense of jobs elsewhere in the economy. In particular, it is desirable that resources are allocated efficiently to provide the UK with competitive/comparative advantage in the future. The optimal pathway should provide for efficient allocation of resources based on the appropriate pricing of externalities and the design of a reformed electricity market which will appropriately allocate risk and return. This will help to maximise the probability that sufficient investment will be made and policy goals achieved.

Close attention should be paid to risks of carbon leakage and supply chain bottlenecks associated with likely international activity. Whilst the model is described as one based on physical limits it is not clear if international behaviour has been considered.

6. Cost analysis:

(a) Can you suggest a methodology by which the wider cost implications of choosing one pathway over another could be accurately reflected, and any relevant findings from such an approach?

See answer to 5(a).

The required infrastructure investment over the coming decades, combined with the changing nature of generation (intermittent wind etc.) will require significant electricity network upgrades. These costs should be included in the assessment of any pathway.

Ultimately, the impact on the wider economy needs to be balanced against the costs of inaction. Any assessment of pathways which leads to policy reform will need to consider the impact of sectoral GDP growth and carbon leakage.

While this type of modelling will be resource intensive, the costs of getting policy wrong could have long-term implications for UK GDP growth.

7. Future improvements to model:

(a) Do you have any further suggestions for refining the 2050 Pathways Calculator?

See response for questions 5(a) and 6 (a). Upgrading the assessment of security of supply and getting some sort of view on costs are the key next steps.

(b) Could the 2050 Pathways Calculator be improved to reflect the fact that the level of ambition for some sectors will depend on local preferences? Could the Pathways Calculator be improved such that the inherent degree of individual and local choice in a chosen pathway were clear?

A clear accounting of consumer preferences will be a crucial aspect of attaining policy targets which rely on behavioural changes. Some of the trajectories involve a sharp improvement in the rate of insulation for example, or the use of walking and public transportation. Being overly optimistic about the likelihood of consumers voluntarily changing their behaviour is counter-productive. As such, we feel that this aspect could be modelled more thoroughly to account for consumers' indifference curves as well as the possibility that achieving these changes to a very high level might require consideration of legal measures to compel compliance.