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A barrage of objections

ASSESSING SCHEMES FOR TIDAL POWER IN THE SEVERN ESTUARY

Over the years various schemes for the development of the Severn estuary, and in particular for the erection of a barrage to harness tidal power, have been suggested. In January 2008, the UK Government published the terms of reference for a feasibility study. Frontier Economics was commissioned by a group of non-governmental organisations (NGOs) to examine two aspects of the debate.

The decision by the Secretary of State for Business, Enterprise and Regulatory Reform (BERR) to publish terms of reference for a feasibility study of the use of tidal power in the Severn estuary followed an earlier report by the Sustainable Development Commission (SDC) on the potential use of tidal power in the UK¹. The UK Government's action places a spotlight on two hotly-debated sets of issues: the appropriate use of the estuary, itself an important natural habitat that merits at least a degree of preservation, and the delivery of the Government's commitments with respect to the reduction of greenhouse gases, which it might be assisted to meet by a tidal power-based electricity generation scheme.



Government intervention in support of a barrage would therefore require careful justification. So Frontier Economics was asked by a group of NGOs to undertake two related pieces of analysis: an examination of the policy framework for such decisions, and the application of this framework to an analysis of the costs and benefits of a Severn barrage.

FRAMING THE QUESTIONS

The Government has established a framework designed to help it make, and justify, decisions about using taxpayers' money or its regulatory authority to intervene in the economy. The approach is based on:

- establishing a clear rationale for intervention;
- developing objectives for the intervention;
- assessing the costs and benefits of ways of meeting those objectives.

Within this framework, two clear rationales for intervention to promote the development of alternative energy sources can be established.

- First, intervention may be required to ensure that investors price carbon use into their decisions. Although the European Union's Emissions Trading Scheme has introduced carbon pricing, the immaturity and volatility of the carbon market may still inhibit long-term investment in carbon-saving projects.
- Second, early research into, and development of, new alternative energy technologies may have spill-over benefits that cannot be captured by investors, so that levels of investment in such technologies may be inefficiently low.

However, while these may be good general arguments for intervention, they do not provide a justification for specific, targeted support for a Severn barrage. To move to this point, one has to take the argument beyond rationale to the objective (reducing carbon emissions) and thence to cost-benefit analysis of different ways of meeting it. Before doing that, however, we need to ask whether there are other possible rationales that justify support of a barrage.

In our report, we discuss a number of possible justifications, relating primarily to the scale of the investment that would be needed for such an undertaking. But with all of these, we conclude that they do not provide a case for specific action by the public sector. Although an estuary barrage would clearly be a major project, its cost – estimated to be of the order of £15 billion – is not beyond the capacity of the capital markets to finance.

A related argument – that since the taxpayer sometimes has to bail out private operators of such schemes, the public sector should be involved from the start to avoid the “moral hazard” of picking up the downside without benefiting from the upside – is not particularly applicable in this case. Once past the initial construction phase, in the event of bankruptcy of the developer the Government should be able to find another operator without much difficulty, since such an operator could earn revenue at very little extra cost.

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A third potential argument involves the opposite risk: that development which is economically efficient will not take place because would-be developers fear expropriation by the Government should the investment prove profitable. This argument for the public sector to undertake the investment in the first place is not particularly powerful either. While all infrastructure investments involve some risk that the Government will change the rules of the game if they prove to deliver high levels of profit, this applies to many economic activities, from banking to energy, that have in turn been subjected to windfall profit taxes. Meanwhile, the policy stance of both the main political parties in the UK makes the risk of outright expropriation seem relatively low.

WHAT'S THE ALTERNATIVE?

In the second part of our report, we therefore address the further steps in the policy argument laid out by the Government's framework: comparing the cost-effectiveness of different means of meeting the objective of reducing carbon emissions. To conduct this analysis, we built a bottom-up model of the costs of alternative renewable options. This involved:

- adding together capital, operating and other relevant costs of different generation methods (e.g., wind, hydro, combined heat and power, solar, tidal) over the lifetime of typical schemes; and
- incorporating relevant load factors; in order to
- calculate a total lifetime cost per unit of generation for different technologies.

For these comparisons, we looked at two of the barrage options analysed in the SDC report: the major project known as "Cardiff-Weston", involving the construction of a 16-kilometre barrage across the mouth of the river just downstream of Cardiff and Weston-super-Mare, and a much more limited scheme known as "Shoots", involving the construction of a 4-kilometre dam across the river upstream of Bristol. The first would have an expected capacity of

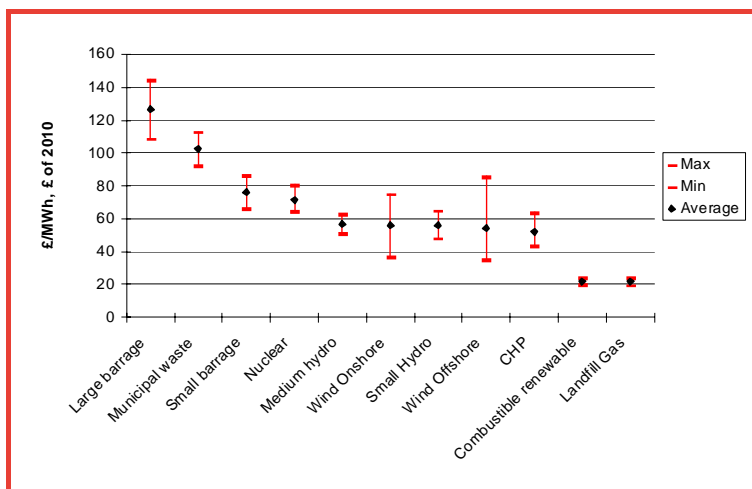


Figure 1: The cost per megawatt hour of generating electricity through different technologies

Source: Frontier analysis

about 8.6 GW, the second only about 1 GW; but since neither would be able to operate 24 hours a day, these figures would translate into less electricity generation than conventional power stations of similar capacity.

The chart illustrates the cost ranges for a number of different alternative energy sources. It indicates that a large barrage is an expensive method of all those we analysed, while even a small barrage is relatively high-cost. An important point to note is that, in this analysis, we focused entirely on direct costs, and therefore entirely ignored the environmental costs associated with a barrage. While this may also lead to underestimation of the costs associated with some other alternative generation methods, such as onshore wind turbines, it is clear that a downstream barrage would involve significant extra costs to manage and mitigate its environmental impact.

CONCLUSION

The results of our preliminary analysis indicated that:

- there is no clear rationale for specific Government support of a barrage on the Severn; and
- under a wide range of plausible assumptions, the construction of a large barrage in the Severn estuary would be expensive, compared with alternative ways of generating renewable energy.

This analysis was conducted on a relatively short timescale, and its conclusions are only indicative. They are, in particular, subject to further consideration of a number of issues identified in the report, for example the importance of minimising overall system cost. However, the in-built conservatism in the estimates for the cost of a barrage created by, for example, ignoring indirect environmental costs, and the range of sensitivities applied to the conclusions, suggest that considerable new evidence would be needed to make a large barrage in the Severn estuary an attractive way of meeting the Government's alternative energy objectives.

SOURCES

- 1 Turning the tide: tidal power in the UK, Sustainable Development Commission, <http://www.sd-commission.org.uk/publications.php?id=607>*

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| CONTACT | Matthew Bell matthew.bell@frontier-economics.com |
| | Michael Ridge michael.ridge@frontier-economics.com |
| | Frontier Economics Ltd |
| | FRONTIER ECONOMICS EUROPE BRUSSELS COLOGNE LONDON MADRID |
| | www.frontier-economics.com |