HM Government

Department of Energy
and Climate Change

South West RDA

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Severn Tidal Power Phase One Consultation

Government Response

Building Britain's Future

Contents

Executive Summary

The feasibility study is considering whether Government could support a Severn tidal power scheme. It will conclude after a second public consultation, probably in 2010.

Informed by responses to this first consultation (which took place from January to April 2009), the feasibility study's work over the next year will be as follows:

- Further examination of whether the UK needs Severn tidal power, compared with alternative sources of supply. This consultation response is published alongside The UK Low Carbon Transition Plan and Renewable Energy Strategy (RES). They show the need for significant growth in renewable energy and other low carbon energy sources over the next two decades and beyond. Over the remainder of the study, we will build on these plans to determine whether there is a case for taking forward a Severn tidal power scheme in the short, medium or longer term, provided impacts, costs and risks are acceptable.
- Strategic level assessment of the impacts, costs and risks of the following scheme proposals:
  - Beachley barrage (0.625GW, £2.3bn)
  - Bridgwater Bay lagoon (1.36GW, £3.8bn)
  - Cardiff-Weston barrage between Lavernock Point and Brean Down (8.64GW, £20.9bn)
  - Fleming lagoon at Welsh Grounds (1.36GW, £4bn)
  - Shoots barrage (1.05GW, £3.2bn)
- The feasibility study is also considering:
  - the prospect of constructing more than one of these schemes;
  - the option of not developing Severn tidal power now at all (this would not necessarily preclude development in the future); and
  - the potential for schemes based on innovative technologies, such as a tidal reef and tidal fence.
- Bringing forward the development of embryonic technologies. New options such as a tidal reef and tidal fence are at early stages of development and carry significant technical risk. But the Government wants to know how long it would take for them to develop and what their costs and impacts would be. We are funding work to define outline designs and to deliver a route map, charting the means, timescale and costs of taking promising technologies to deployment stage. We have committed £500,000 to this. Three proposals are being funded under the Severn Embryonic Technologies Scheme. Details are available at **www.decc.gov.uk/severntidalpower**. When the funding scheme concludes early next year, the Government will:
  - assess these schemes against the criteria used to determine the current shortlist
  - if a scheme meets the criteria, assess its impacts in the same way as the other shortlisted schemes;

  - consider as part of any final decision at the end of the feasibility study – in the light of technology route maps, scheme assessment, and the strategic case for Severn tidal power – whether to wait for these technologies to develop (whether they have met short-listing criteria or not)

- We consider that the other barrage and lagoon schemes proposed to the study are not feasible for construction in the Severn Estuary in the foreseeable future. This assessment will be kept under review in the light of new learning over the next year. Different variants of the short-listed options are currently being investigated – a process called design optimisation. The optimisation process and other investigations by the feasibility study will significantly increase our knowledge of short-listed schemes, particularly of lagoons which are a new form of construction. Some of this learning may be relevant to those not short-listed. We will feed this learning back to decisions taken now to check whether short-listing decisions remain valid. Should an excluded scheme become potentially feasible, it would then be assessed alongside the other potentially feasible (short-listed) schemes.

- A Strategic Environmental Assessment of Severn tidal power is underway. Most consultation responses agreed with the scope of this work as proposed. Some detailed changes have been made, including to the objectives (shown at Annex A).

- We confirm that the following points most frequently raised in consultation responses will be assessed by the feasibility study:
  - the impact any scheme would have on the local infrastructure and on local communities, including on roads and services, navigation, the Severn Bore, and construction effects
  - compliance with the environmental and other legislation that applies to the Estuary and related areas
  - where and how raw materials and skills needed to build a scheme would be sourced
  - the overall CO_2 balance of a scheme including emissions associated with construction, and knock-on effects on infrastructure and services
  - the impact on the environment, including the geomorphology of the Estuary and how sedimentation might affect scheme feasibility.

- The feasibility study will continue to work closely with stakeholders. Over 730 responses were received to this consultation, and most people who replied said they found our consultation website informative and easy to read. We are working closely with organisations such as local authorities, industry and environmental agencies, and technical experts to continue to develop the evidence base. Regular updates are available on our website. The timeline below shows the further opportunities the public will have to comment on Severn tidal power. Timings are best estimates at this point.

<table>
<tr><th>Date</th><th>Milestone</th><th colspan="2">Comment</th></tr>
<tr><td rowspan="2">2010</td><td rowspan="2">2nd Public Consultation</td><td colspan="2">Public consultation probably in 2010 on whether Government should support a Severn scheme in principle.</td></tr>
<tr><td>If a preferred option is identified following review of responses to consultation</td><td>If conclusion of study is not to support</td></tr>
<tr><td>2011-15</td><td>Scheme Development</td><td>Includes detailed engineering designs, financing arrangements, Environmental Impact Assessment, and other preparation and impact assessment.</td><td rowspan="4">Regular reviews of progress towards energy goals will be held. Need for Severn energy could be reconsidered in light of these.</td></tr>
<tr><td>2014-16</td><td>Planning permission</td><td>Planning and consenting process for both power scheme and measures to compensate for impact on environmentally-designated habitat.
Opportunity for public comment.
If approved: next stages are as follows</td></tr>
<tr><td>2015-20/22</td><td>Construction</td><td>Compensatory habitat and other compensatory measures, and power scheme. 5 years construction period is assumed for most scheme options, 7 years for a larger scheme.</td></tr>
<tr><td>2018/23</td><td>Operation commences</td><td></td></tr>
</table>

Note that timings after the feasibility study are approximate and may well move back as more work is done on timescales needed to take a scheme to full operation. A larger scheme, such as a Cardiff-Weston barrage, would take longer to plan, finance and build than a smaller one[1].

1 For example see paragraph 170.

Introduction

1 On 26 January 2009, the Government – together with the Welsh Assembly Government and the South West Regional Development Agency – launched a consultation on the conclusions of the first phase of the Government's feasibility study on Severn tidal power (available at **www.decc.gov.uk/severntidalpower**).

2 The study is investigating whether a power project using the natural tidal range resource of the Severn Estuary could be supported and, if so, on what terms. The consultation focused on:

- a recommended short-list of schemes for more detailed analysis
- the scope of the Strategic Environmental Assessment that is being carried out within the feasibility study
- the issues the feasibility study is considering and how these are being approached.

Responses Received

3 The deadline for responses was 23 April 2009. A total of 734 formal responses were received and these are available on the DECC website **http.//stats.bis.gov.uk/decc/stp/**.

4 The respondents included: local Government; environmental organisations; public sector organisations; local industry; energy suppliers; advisory organisations; individuals and other interested parties.

Academic/Professional Institute	7
Individual responses	589 (includes approximately 250 very similar responses originated from an RSPB appeal to members)
Industry	34
Local Government/Authority	36
Non Governmental Organisation (NGO)	50
Statutory Advisers	6
Trade Organisation	6
Other	6

5 About two thirds of respondents were from organisations or individuals based in Wales or the South West.

6 The Government welcomes this response. Our thanks go to all those who submitted formal responses, and those who participated through events held during the consultation period.

7 The Government's response to the consultation is set out in this document. It is organised into sections on the questions posed in the consultation document and sets out a summary of the key themes identified in the responses, followed by the Government's response.

8 All responses (both formal responses and those fed in at consultation events) have been analysed carefully. The document does not attempt to respond to every comment received during the consultation period. Comments spanned a wide range of issues as well as views on, and related to, the questions in the consultation document.

9 This document responds to the key questions or comments received. However all points raised during the consultation will be taken into account as the feasibility study continues.

Code of Practice on Consultation

10 This consultation has been conducted in accordance with the Government Code of Practice on Consultation – **http://www.berr.gov.uk/files/file47158.pdf**

Overview

i) The Feasibility Study

11 The huge 14m tidal range of the Severn Estuary could be harnessed to produce renewable, predictable electricity. This resource could help us meet our energy and climate change goals including as part of the UK's national plan to increase renewable energy production and help put the UK on a pathway to reducing our greenhouse gas emissions by at least 80% by 2050. But there are other options to meet our goals and Severn tidal power is being considered in comparison with these.

12 The Severn Estuary and its tributary rivers the Wye and Usk form part of an internationally important nature conservation site. It is designated for the species and habitats that occur there, including migratory fish and over-wintering birds and for its estuarine habitats including mudflat and salt marsh. These are important ecosystems that form part of a network of wildlife habitats.

13 A power scheme in the Estuary would impact on the natural environment, local communities and industries, as well as energy users and producers across the country.

14 The potential of this major source of renewable energy and the benefits, consequences, risks and costs of a power project in the Severn are being investigated through the cross-Government Severn tidal power feasibility study. This strategic level study will inform whether the Government could support a tidal power project in the Severn and, if so, on what terms. The founding principle of the study is to produce objective analysis based on the best possible available evidence.

15 The study is split into two phases:

- Phase One: Examining the scope of work and analysis required to make an evidence based decision on whether to support a tidal power project in the Severn and what potentially feasible schemes exist for converting this energy. Phase one ended with the publication of the consultation document in January 2009.
- Phase Two: Work on environmental, regional, economic, commercial, technical and regulatory issues to inform the study conclusions including whether any of the potentially feasible schemes are feasible

16 During Phase One, following a public Call for Proposals, a long-list of possible schemes to generate electricity from the tides of the Estuary was considered. These ranged from the largest at over 14GW (and costing over £30bn) to a 625MW option with a construction cost of £2.3bn. The consultation proposed which of these schemes should be studied further.

ii) Tidal Power in the UK

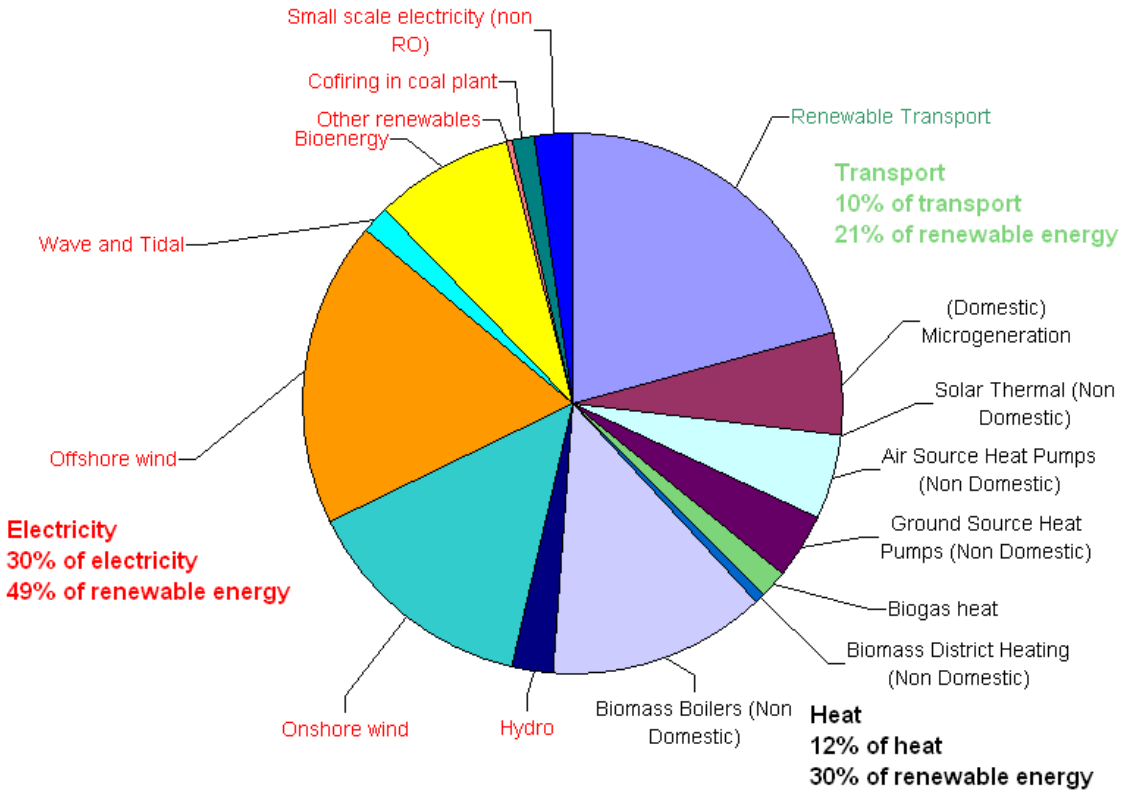
17 Given the concentration of 90% of the UK's tidal range resource in the Severn Estuary, the feasibility study only looks at schemes in the Severn. But, the UK also has excellent wave and tidal stream resources, alongside a small number of other tidal range sites. However, wave and tidal stream technologies are not yet developed to a commercially viable scale. To bring this forward, the Government is providing funding at all stages of development from research to deployment through the Research Councils, the Technology Strategy Board (TSB), the Carbon Trust and the Energy Technologies Institute (ETI). DECC also has a fund for commercial demonstration of wave and tidal technologies – the Marine Renewables Deployment Fund (MRDF). Since 2000, over £100m has been committed. In addition the Government will launch a £22 million Marine Renewables Proving Fund which will provide grant funding for the testing and demonstration of pre-commercial wave and tidal stream devices. This will accelerate wave and tidal technologies' move towards commercial demonstration and assist the development of successful projects under the Marine Renewable Deployment Fund.

18 A screening exercise has been launched to better understand the energy generation potential of marine energy devices and the realistic timescales of when multiple devices will be installed and commissioned. It covers wave, tidal stream and range in English and Welsh Waters outside the Severn, which is being investigated separately through the feasibility study. The screening exercise is the first step towards exploring when the time will be right to undertake the various studies and other activities needed to put in place a Strategic Environmental Assessment for Marine Energy Devices. The screening exercise is building upon the data being gathered in the Severn tidal SEA and that already gathered for the Offshore Energy SEA, the Welsh Marine Energy Strategic Plan and other studies.

iii) The UK Low Carbon Transition Plan and Renewable Energy Strategy

19 This response is published alongside the Renewable Energy Strategy which sets out the UK's strategy to deliver 15% renewable energy by 2020. The strategy presents a lead scenario with contributions of 12% of heat coming from renewables and 10% of transport coming from renewable sources, along with about 30% of electricity sourced from renewables.

Figure 1: Illustrative Mix of Technologies in lead Scenario for meeting the UK's share of the Renewable Energy Directive



20 Severn tidal power is treated as an option in the Renewable Energy Strategy. It may well have a place in the Strategy and the UK's National Action Plan to be developed next year, but this will not be known until the feasibility study concludes its analysis.

21 Our first assessment of the merits of a Severn tidal power scheme will be to see whether it is competitive and cost-effective relative to the other technologies that are needed to meet the renewables target. This test of competitiveness will include a comparison of the capital costs, risks (in terms of costs and delivery), environmental and social impacts, subsidy costs, and impact on the rest of the energy market.

22 The emerging evidence so far is that energy from the Severn may slightly reduce the cost of meeting the 2020 Renewable Energy target. This is a preliminary assessment that has not fully considered the environmental and social costs or the risks surrounding delivery costs and timetable. This work will take place in Phase Two.

23 If we do not believe a scheme can deliver electricity (or deliver it in a cost-effective manner) roughly by 2020, we will assess whether the scheme is a cost-effective way of meeting our aim of decarbonising the UK while keeping our energy supplies safe and secure, spreading the costs fairly and maximising economic opportunities. In doing so, we will need to

present a number of scenarios of the likely generation mix and carbon abatement policies necessary.

24 In the longer term, there are likely to be a number of alternative technologies (such as nuclear, carbon capture and storage and other renewables) that can help decarbonise the electricity supply at a lower cost than energy from the Severn. However, work over the rest of the feasibility study will need to examine this preliminary assessment and give greater consideration to the uncertainty and risks associated with these alternatives including costs, technology risk, supply chain and site constraints, and to security of supply.

iv) Consultation responses: key messages

25 The consultation, which closed on 23 April 2009, sought views on the scope of further work including which schemes should be studied in greater detail.

A) SCOPE OF THE FEASIBILITY STUDY

26 Respondents were generally content with the breadth of the study and the issues being studied. A wide range of views was expressed on Severn tidal power, including whether it should be exploited at all, and if so which scheme option should be taken forward. Many asked for environmental impacts, including compliance with the Habitats Directive, and regional impacts to be given more weight. The Strategic Environmental Assessment, Habitats Regulatory Assessment and other work in Phase Two will assess the environmental and social effects of the short-listed tidal power options in more detail. There will be a public consultation at the end of the study to enable people and organisations to input into the decisions.

B) SHORT-LISTING

27 The majority of comments concerned the short-listing process. These included a review by Atkins, commissioned by a group of NGOs, of the options appraisal process. Detailed submissions were also made by, or on behalf of, some scheme proposers: groups led by Friends of the Earth, Fleming Energy, Halcyon Marine and Tidal Lagoons Ltd. These submissions have also been considered by an independent panel of experts from the Royal Academy of Engineering and other institutes. (This panel's remit is to assure the quality of the engineering analysis of the feasibility study.) The panel's comments are available on our website **www.decc.gov.uk/severntidalpower**.

28 Some consultation responses focused on the Interim Options Analysis Report (IOAR) produced by Parsons Brinckerhoff on behalf of the study.

This report examined the technical capacity and technical risks of the long-list of schemes to inform the short-listing process and provide the base information on schemes e.g. capital cost, cost of energy but were not the only factors considered in the short-listing.

29 The main points raised in these and other responses to the consultation were:

- a wide range of comments on the short-listed schemes. Some thought it would be best to build the largest possible scheme as soon as possible, while others thought it unwise to build anything in the Severn, and many lay in between. Some supported combinations of schemes or modular approach where individual energy generating units are installed separately. Few of these comments raised new evidence, though there were some further figures on lagoons and details of new wall construction techniques;
- concerns that it is too early to short-list before the feasibility study has completed gathering evidence;
- concerns that the short-listing process was biased against environmental considerations and the embryonic technology proposals that appear more favourable to the environment than conventional technologies;
- comments on the Interim Options Analysis Report including questions on the cost and power calculations used.

30 Given these concerns and comments, it is useful to restate briefly in this response the purpose and process of short-listing. The *aim* of short-listing was to identify scheme proposals that are not potentially feasible, and eliminate them from further investigation. This means that any scheme that has demonstrated that it could be potentially feasible remains within the scope of the study. The Government's view remains that this approach is both sensible and valid. The second phase of the feasibility study will investigate those proposals that appear feasible and could potentially be built. It will include an assessment towards the end of the study of whether further work on new technologies under the Severn Embryonic Technologies Scheme suggests that any of the more embryonic technologies could be potentially feasible.

31 As to the short-listing process, the assessment of feasibility was made by Ministers based on the evidence presented in a number of different reports, not the Interim Options Analysis Report alone.

32 Several factors were used to determine feasibility:

- technical risk
- construction cost and the cost of energy produced

- how this cost compared to other ways of meeting our energy and climate change goals
- affordability – i.e. the burden on taxpayers and energy consumers and the role that Government would have to play in delivering the project

And the following were used to judge whether more costly schemes presented benefits that justified further study:

- environmental impact – high-level view on schemes' environmental impact using predicted habitat loss as an indicator of severity
- regional impact – high level view on impacts on ports, fishing and employment in the Estuary area.

33 The short-listing process did not attempt to establish whether the harm caused to the environment or the regional economy was unacceptable or made a scheme unfeasible. The work to assess these impacts and inform these decisions will take place in Phase Two of the study. Schemes causing unacceptable impacts or which are shown to be unfeasible will be rejected. There will be the opportunity for the public to comment on these decisions in a second public consultation, probably in 2010.

34 Sensitivity tests were performed to assess whether a different operational mode, configuration or combination with other proposals would allow a proposal to reach the short list. Other sensitivities included discount rates, energy yield and costs and commercial risk. Schemes which did not come through the short-listing process were the Outer Barrage (primarily due to capital costs being deemed unaffordable), a Cardiff-Hinkley barrage (a variant of Cardiff-Weston barrage which had a prohibitively higher capital cost and likely to be more environmentally damaging), the tidal reef and fence (embryonic technologies judged too risky due to their early stage development), Severn Lakes (a variant of the Cardiff-Weston barrage that is a joint energy and leisure project with a high cost of energy) and offshore lagoons (primarily due to a high cost of energy for locations in the Severn).

35 The first phase of the study has focused on identifying schemes that demonstrate the potential to be feasible so that their impacts and feasibility can be studied further. The unit cost of energy threshold applied to establish potential feasibility was £170/MWh. (For comparison, the levelised cost of gas (CCGT) and nuclear generation in 2020 are currently estimated to be around £66/MWh and £45/MWh respectively.) However, schemes that could have less damaging impacts on the natural environment and industries in the Estuary were set an easier test of £200/MWh on the basis that they may justify a slightly higher cost. This was how tidal lagoons with a higher cost of energy than barrages came to be on the short-list. In the Government's view, this process is robust.

36 However, it is sensible to check that decisions taken now remain valid in the light of learning from the rest of the feasibility study. The Government proposes to review towards the end of the feasibility study the scheme options being eliminated now to check that short-listing decisions are still valid. In particular, optimisation of scheme designs could produce information which is relevant to non-short-listed schemes. Issues concerning embryonic technology schemes and how they are being taken forward in the study are set out below.

37 Further assessment of short-listed schemes will be carried out by the feasibility study over the next year. If this reveals that schemes are not feasible the Government proposes to eliminate them from the feasibility study and publish supporting evidence on the DECC website – **www.decc.gov.uk/severntidalpower**.

38 The Government is confident that the technical appraisal of long-listed schemes by Parsons Brinckerhoff in the Interim Options Analysis Report (IOAR) was sound and thorough. It was based on close consultation with the various developers in order to understand their proposals and give them the opportunity to submit revised and updated information. The comments of the independent Expert Panel confirmed the Government's view.

New technology proposals: the tidal reef and tidal fence

39 The Government is attracted by the possibility that these schemes could extract energy from the Severn in a more environmentally-benign way than barrage and lagoon options. However, they cannot be considered potentially feasible because of their high degree of technical risk. It would not be possible for the feasibility study to investigate their impacts in any meaningful way as designs are too undefined. Several, markedly different, variants have been proposed during the course of the study.

40 These are areas that need to be worked on. We have established the Severn Embryonic Technologies Scheme (SETS) to help inform whether the benefits currently claimed can be realised, and when. Alongside the consultation response, we have announced the proposals that will receive funding. Details are available at **www.decc.gov.uk/severntidalpower**. The Scheme is helping define outline designs and will also deliver a route map, charting the means, timescale and costs of taking promising technologies to deployment stage.

41 The objectives of the Scheme are:

- to develop to outline design stage embryonic design and technology proposals with the potential to contribute to tidal power generation in the Severn Estuary;

- to increase the level of confidence in the technical feasibility of proposals (construction and operation), construction costs, energy yields and profiles, and cost of energy;
- to deliver a broadly costed technology development route map, charting the means, timescale and costs of taking promising technologies to deployment stage.

42 The Scheme is offering both grant funding and expert engineering and environmental advice. It will also make available to scheme proposers the evidence gathered by the feasibility study.

43 At the conclusion of the Scheme, the Government will:

- assess proposals against the criteria used to determine the current short-list;
- if a scheme meets the criteria, assess its impacts in the same way as the other shortlisted schemes;
- consider as part of any final decision at the end of the feasibility study – in the light of technology route maps, scheme assessment, and the strategic case for Severn tidal power – whether to wait for these technologies to develop (whether they have met short-listing criteria or not).

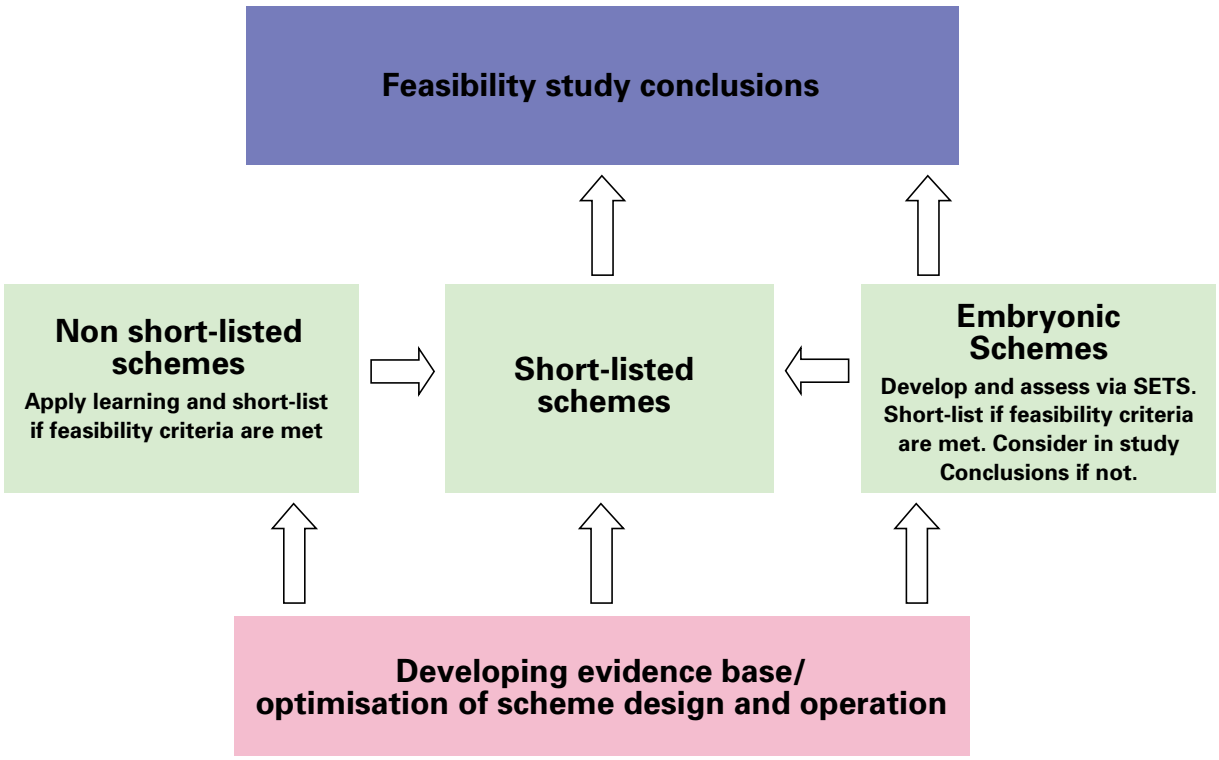
Short-listing Conclusions

44 In light of the above, we propose to maintain the short-list of:

- Beachley barrage (0.625GW, £2.3bn)
- Bridgwater Bay lagoon (1.36GW, £3.8bn)
- Cardiff-Weston barrage between Lavernock Point and Brean Down (8.64GW, £20.9bn)
- Fleming lagoon at Welsh Grounds (1.36GW, £4bn)
- Shoots barrage (1.05GW, £3.2bn)

45 The process for looking at **all** schemes is summarised in the figure below:

Figure 2: Process Diagram of the different ways in which schemes will be considered



D) STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

46 Comments received on the technical scope and content of the SEA were generally positive. Most respondents were happy with the issues being investigated and evidence being gathered. Some flagged that the study area boundary is too narrow. We confirm that impacts will be assessed as far afield as is necessary for each topic area in order to identify the significant environmental effects for the SEA. The appropriate boundaries for each topic area are being discussed and agreed at topic specific Technical Workshops. Some felt that SEA objectives should be more specific, and where appropriate these have been revised (see Annex A). A number of respondents asked how inevitable uncertainties in predicting how the environment would response to changes would be managed. These concerns are recognised and are being taken into consideration during the SEA.

47 Informed by the SEA and other work, the decision at the end of the feasibility study will be:

- to go ahead with a particular scheme or combination drawn from the potentially feasible schemes below
  - Beachley Barrage
  - Shoots Barrage
  - Cardiff-Weston Barrage
  - Fleming lagoon at Welsh Grounds
  - Bridgwater Bay lagoon

and any others which appear next year to be potentially feasible in the light of design optimisation work or the results of the Severn Embryonic Technologies Scheme.

- to do nothing – this does not preclude such power development in the future, depending on need and alternative options at the time. Options could include alternative Severn schemes to those listed above, and assessed in this SEA, if they become potentially feasible.

48 The SEA and related technical work will include work on the impacts, costs, benefits and risks of going forward with a particular scheme. This includes looking at the following issues that were raised in many of the responses to consultation:

- whether any scheme could be compliant with the broad range of Environmental legislation which is applicable to the Severn Estuary and its catchment including the Rivers Wye and Usk: for example, Water Framework Directive, Habitats and Birds Directives and Wildlife and Countryside Act 1981 (as amended). A strategic level Habitats Regulations Assessment will be undertaken, alongside the SEA – this process assesses potentially significant effects on Natura 2000 sites and also, in accordance with UK policy, Ramsar sites – part of this process will involve carrying out Appropriate Assessment on designated sites, assessing whether there are likely to be significant adverse effects and, if so, the feasibility of providing compensatory measures to meet Habitats Directive requirements. This work includes how far managed re-alignment of coastal defences might be possible to create new inter-tidal habitat, what can be done to compensate for impacts on fish, and the potential for new approaches to compensation. If a preferred option was identified and came forward into development, a project level Appropriate Assessment and a specific compensation plan would be required;
- the impact any scheme would have on the local infrastructure, including roads and services, on navigation, and on the Severn Bore;
- where and how raw materials and skills needed to build a scheme will be sourced;
- the overall CO_2 balance of a scheme including emissions associated with the construction of the scheme; and
- the impact of effects on both protected and non-protected habitats and species, and on the geomorphology of the Severn and how sedimentation might affect scheme feasibility.

E) REGIONAL ECONOMIC IMPACTS

49 Comments raised on the DTZ study of regional economic impacts focused on whether the underlying assumptions used and, as a result, the

conclusions on the employment impact of a scheme, were correct. There were particular concerns on the coverage of ports including consideration of potential expansion at Bristol Port. In light of these comments, we will commission an independent peer review of the DTZ study. The review will examine whether the use of alternative assumptions would alter the conclusions drawn. On the conclusion of the peer review, we will assess whether further work needs to be carried out.

50 This would be in addition to the work on local level impacts that are being assessed as part of the SEA. The SEA includes impacts on community services and facilities and tourism – all issues that respondents felt to be important. We are also conducting a separate supply chain study to improve our understanding of the capability of the region to respond to demand for materials and skilled labour during construction and operation periods.

51 A number of respondents thought that a power scheme would stimulate additional investment in and around the Estuary and that such consequential development had not been clearly addressed in the feasibility study. There were also concerns about the additional environmental impact that further development might have. Although a Severn energy scheme would be first and foremost an energy project – and developments such as leisure water sports are a matter for investors and planners – we recognise respondents' views that the existence of a power scheme in the Severn Estuary could stimulate consequential development that is not itself necessary to the construction or operation of a scheme. The SEA will consider at a high level what consequential development might arise from a power scheme and will indicate its environmental and social impacts, both positive and negative.

52 The feasibility study also includes work on ecosystems valuation, and how people benefit from the natural environment in the area that would be affected by a scheme. The study will look at the changes in the value of ecosystem services that result from the short-listed tidal power options, and how ecosystems and the biological diversity contained within them contribute to individual and social wellbeing. The study will include an examination of the value of fishing, grazing areas for sheep and cattle, flood protection, recreational use in the Estuary, heritage assets and practices.

v) Stakeholder and public engagement

53 The Government welcomes the full and considered responses to this consultation. It is a key principle of the feasibility study to make information accessible to the public and all those interested in the study and to seek informed views.

54 Many respondents wanted to know when there would be further opportunities to make their views known. We have therefore included

a rough timeline in the Executive Summary of the steps that would be required before a tidal power plant could operate. We have indicated the potential timing when public views would be sought:

- a further public consultation at the end of Phase Two on the study's conclusions, and if a scheme proceeds (probably in 2010)
- a planning and consents process for any scheme, possibly as early as 2014-15.

How to get involved over the next year

55 One of the main messages from this first consultation was the importance of seeking views from local communities, organisations and people and ensuring that when we do so that detailed but non-specialised information about each of the potential schemes and their likely benefits and impacts is provided. Respondents reminded us that it is important that people know when a public consultation is open, and that information provided on the web will not reach everyone.

56 We agree with these points. In our second public consultation (in 2010) we are planning to do more to both raise awareness of the consultation and to speak to those who could be directly impacted by proposals. At that point we will be able to set out strategic-level information (on likely costs, benefits and impacts of the proposals) to inform opinion on whether or not Government could support a Severn tidal power scheme and if so which one. Plans for this consultation will be made available on our website nearer the time and will include open public meetings on both sides of the Estuary. We will also send a copy of the consultation document (and details of public meetings) to public libraries in the South West and Wales to help provide information to those without internet access. In the meantime, we will continue to make information available on our website and provide regular updates on progress (**www.decc.gov.uk/severntidalpower**).

57 We will continue working with stakeholders over the course of the second phase of the feasibility study this year and in early 2010. In particular, this means working with organisations that could be impacted by Severn tidal proposals and/or who have knowledge and expertise to contribute to the study, and with representatives of local communities and people that could be impacted by the proposals. There are a number of groups and events for these stakeholders to participate in, including:

- A Strategic Environmental Assessment (SEA) Steering Group to guide and comment on the process of the SEA. Members on this group include Statutory Agencies, Environmental NGOs, industry representatives, academics and Other Government Departments.

- A Parliamentary Forum chaired by Lord Hunt and Jane Davidson (Minister for Environment, Sustainability and Housing, Welsh Assembly Government). These are roughly quarterly meetings for interested Members of Parliament, Assembly Members, Peers and Members of the European Parliament (when available).
- A Regional Forum chaired by Lord Hunt of Kings Heath OBE, Jane Davidson and Jim Knight (Minister for the South West of England). These are also roughly quarterly meetings for Local Authorities, local ports, and regional business and environmental representative organisations.
- A South West Advisory Group for key stakeholders in the South West to both review progress of the feasibility study and represent views of wider stakeholders in the South West of England.
- The South East Wales Spatial Planning Group will have a standing agenda item on Severn tidal power. The Group includes members drawn from local authorities, business and environmental groups.
- Technical and environmental expert workshops on specific issues, including: flood risk and land drainage, freshwater environment and associated interfaces; hydraulics and geomorphology; marine ecology; marine water quality; migratory and estuarine fish; and ornithology.
- Roughly quarterly stakeholder events for around 350 invited organisations.
- Bi-lateral meetings.
- Small scale public meetings for invited members of the public to gain an early and, as far as possible, representative view on priority issues for people.

58 We also send out a regular electronic newsletter with progress on the study and you can sign up to receive these by emailing us at **severntidalpowerunit@decc.gsi.gov.uk**.

59 Further information about all our stakeholder groups, events and how you can get involved is available on our website **www.decc.gov.uk/severntidalpower**, or you can contact us at:

Severn Tidal Power team
Department of Energy and Climate Change
3 Whitehall Place London SW1A 2HD

Analysis of Response by Question

Overarching Questions

60 **The consultation posed the following questions:**

Q1 Is the feasibility study taking the right issues into account?

61 Most respondents considered that the feasibility study is taking the right issues into account.

62 However, some respondents did feel that further consideration was required of the social and environmental impacts. In particular, local authorities and individuals responding to the consultation wanted to ensure that the impact on local people including on local infrastructure, services and regional industry (including tourism) is taken into account. A number of respondents also asked how inevitable uncertainties would be managed, and how the impacts of consequential development that might arise as a result of a scheme being built, but which is not necessary to its operation would, be assessed. This could include additional transport links or leisure developments.

THE GOVERNMENT'S RESPONSE

63 We are pleased that as a whole there was agreement that the right issues were being taken into account. We have taken on board where possible omissions that have been raised and sought to either flag more clearly how they are being taken into account in the feasibility study and, where necessary, undertaken to do more work.

64 The possible impacts of tidal power schemes on communities are being assessed in a number of ways across the many studies that make up the feasibility study. This includes assessing local level impacts and possible effects on existing tourism under the SEA. The ability of the South West and Wales to satisfy the workforce and skills needed for such a large construction project will be covered as part of a study of the supply chain. An ecosystems valuation study will examine the benefit that people derive from the natural environment and the changes in the value of ecosystem services that result from the short-listed tidal power options, in the area that would be affected by a scheme. These different strands will be drawn together for public comment next year, providing a picture of the social impacts of a Severn Tidal Power scheme.

65 Although this is first and foremost an energy project – and developments such as leisure water sports are a matter for investors and planners – we recognise that the existence of a power scheme in the Severn estuary could stimulate consequential development that is not itself necessary to the construction or operation of a scheme. The SEA will therefore consider at a high level what consequential development might arise from a power scheme and will indicate it's environmental and social impacts, both positive and negative.

66 We also agree on the importance of studying the environmental effects of any scheme before deciding on whether a Severn tidal power scheme can be supported. We are conducting a SEA which examines both the environmental and social impacts of schemes and a strategic level Habitats Regulatory Assessment under the Habitats Directive, part of which will identify Natura 2000 and Ramsar sites where there are likely to be significant adverse effects. Similarly we are studying whether a Severn tidal power scheme could be compliant with other environmental legislation covering the Estuary and the surrounding area including rivers feeding the Severn Estuary including the Water Framework Directive and new Marine Bill. Concerns over uncertainty in predicting environmental effects are recognised and will be taken into consideration during the SEA.

67 Network Rail and the Highways Agency have reported that the existing road and rail links across the Severn estuary are sound and have the capacity to meet the forecast increase in demand over the next two decades. The consultation has not produced any evidence to invalidate these conclusions and so transport links remain outside the scope of the feasibility study.

Q2 Are there other aspects or other evidence that should be taken into consideration?

68 Other aspects raised by respondents were:

- Impacts on local communities (often raised by local councils and individuals)
- Tourism
- Impact during construction of a scheme
- CO_2 impacts of scheme (including how long it would take for a project to pay off the CO_2 released during construction)
- Marine fish and fisheries
- Flood risk and sea level rise
- Connecting a project to the grid
- Further funding to develop new technologies.

THE GOVERNMENT'S RESPONSE

69 We agree that these issues need to be taken into consideration. As set out above, the strategic level impacts on local communities (including on tourism) are included within the study. This is mostly through the SEA which covers a broad range of environmental and social issues. These are listed below in the Government's response to Question 3. The SEA will look at the impacts both during construction and over the expected lifetime of schemes.

70 The SEA includes a carbon footprinting topic which assesses carbon dioxide and other greenhouse gas emissions as a result of the construction and operation balanced against savings in the emissions of these gases as a result of the operation of any tidal power option within the Severn Estuary. This includes changes to the ecosystem, including habitat loss and creation (including associated changes in methanogenesis and sequestration) and also what the effect might be if more goods were transported by road rather than through the region's ports.

71 Within the SEA, the flood impacts of schemes are being studied in detail. Much of the land adjoining the Severn Estuary on both the English and Welsh banks is low lying and protected by existing flood defences. Flood risk in the short to medium term is likely to be reduced upstream of any tidal barrage option but there are currently differences of opinion as to downstream effects, and on the longer term behaviour of the Estuary. Further studies are being proposed to look into this. At the end of the study, we will know more on whether the schemes impact flood risk positively or negatively and the costs and consequences of any requirement to strengthen flood defences.

72 We are also looking at connecting a scheme to the grid and all relevant aspects of the grid connection. This includes the thermal capacity of the network, voltage performance, fault level in-feeds, system stability, and the possible impact on other network users (e.g. Distribution Network Operators and other generators). For large schemes the value of a Direct Current (DC) connection is being explored. The study will also review the onshore to offshore connections and indicate the likely preferred connection point(s) for the output.

73 In addition, in parallel to the SEA, the Severn Embryonic Technologies Scheme is helping developers of potentially less damaging technologies map their path to development and deployment. At the end of scheme, we will know the cost and timeframe of developing these technologies and have greater certainty on impacts, power output and costs.

Q3 Have we given due weighting to the different benefits and impacts under consideration in our analysis?

74 Over 200 hundred responses were received to this question. A large proportion of respondents (including individuals and NGOs) raised concerns that the effect of a scheme on the environment was not being given enough consideration. It was also suggested that an independent expert environmental group should be set up.

THE GOVERNMENT'S RESPONSE

75 The SEA is being undertaken to assess the significant environmental effects of Severn tidal power at a strategic level. The SEA is an iterative process of gathering data and evidence and assessing these effects. If a Severn tidal power scheme were to go ahead, further in-depth studies would be needed, including an Environmental Impact Assessment (EIA) and further Habitats Directive assessments. In Phase One the scoping of the environmental and social studies was done at a high level. This work identified a range of uncertainties that required more detailed investigation and this work has been planned for 2009 in Phase Two of the Study. Collectively the data will inform the Environmental Report that will document the significant environmental effects of each short-listed tidal power option. This process will ensure that we have a high-level understanding of the Estuary's environmental resource and the impact of any potential power scheme on it prior to making a decision on whether any power scheme in the Severn is supportable. Part of the work includes looking at reducing and mitigating the negative environmental and social impacts of schemes.

76 Further work in the SEA will focus on 16 topic areas. These are: flooding and land drainage, fish, ornithology, marine ecology, geomorphology and hydraulics (potential changes to the shape of the Estuary due to movement of the high volumes of sediment found in the Estuary); terrestrial and freshwater ecology, water quality, carbon footprinting – which assesses carbon dioxide and other greenhouse gas emissions as a result of the construction and operation balanced against savings in the emissions of these gases; navigation, other sea uses, historic environment, landscape and seascape, noise and vibration, society and economy and waste and resources.

77 An ecosystems valuation study is also being done. This will help illustrate the economic value of environmental assets in the area that may be affected by a tidal power Scheme, and their relative value to society.

78 We will also study the impacts of a Severn tidal power scheme against the standards and aims of environmental protection legislation that covers the Estuary and how any negative effects could be mitigated to ensure

compliance. This includes effects on the UK's compliance with the Water Framework Directive, and the Habitats and Birds Directives. Under Habitats Directive legislation a strategic Habitats Regulations Assessment will be carried out in parallel with the SEA to assess the effect on the integrity of Natura 2000 protected sites designated under European legislation including as a matter of Government policy features designated under the Ramsar Convention. This will include determining whether or not sites would be significantly affected, whether there are alternative solutions, whether there are over-riding reasons of public interest to take forward a scheme and the feasibility of providing compensation to maintain the coherence of the Natura 2000 network. The feasibility study is also undertaking investigations on the feasibility and cost of different types of compensatory measures.

79 Collectively, all these outputs will provide a strategic view of what the Estuary and surrounding area is like at the moment and the impact the different schemes and/or combinations thereof could have. This would also consider as a baseline the impacts that could be envisaged in the Estuary due to climate change and other factors in the absence of a tidal power scheme.

80 We are also working closely with the statutory conservation agencies (Natural England, the Countryside Council for Wales, the Environment Agency, English Heritage and Cadw), NGOs, the Sustainable Development Commission, and regional stakeholders to ensure maximum coverage of the environmental and social impacts. This is through bi-lateral discussions and collectively through a Steering Group for the SEA. Given the breadth of expertise and peer review function in these groups we do not think it necessary to set up any other independent expert environment group.

ENVIRONMENTAL IMPACTS AND SHORT-LISTING

81 The first phase of the study has focused on identifying schemes that were potentially feasible. If schemes have less damaging impacts on the natural environment and the economy of the region than other schemes of a similar size, they may be justifiable at a higher cost of energy. As such, we used a £200/MWh energy threshold for more costly schemes that may have less damaging impacts rather than the £170/MWh used for the other schemes. This was why tidal lagoons with a higher cost of energy are on the short-list. This is explored in detail in the response to Q12.

82 In parallel to the SEA, the Severn Embryonic Technologies Scheme is helping developers of potentially less environmentally damaging technologies map their path to development and deployment. At the end of the scheme, we should know the cost and timeframe of developing these technologies and have greater confidence as to what the impacts, power output and costs are.

83 The decision at the end of the Study on whether to support a tidal power project will depend on further analysis. This will cover not just whether the benefits of a scheme justify its impacts, including whether environmental legislation could be met, but also on whether it could reduce the cost, or increase the certainty, of meeting the UK's energy and climate change goals. This means both looking in the near term to our renewable energy for 2020 but also putting the UK on a pathway to meeting an 80% reduction in greenhouse gas emissions by 2050.

Q4 Do you think that it is better to wait for new and perhaps less environmentally damaging technologies to be developed, or to move ahead more quickly with available proposals?

84 Respondents provided a mixed set of responses. These ranged from moving ahead quickly with a scheme in order to meet the 2020 renewable energy target, to waiting for new and less environmentally damaging technologies to develop. Several respondents believed that potentially less environmentally damaging schemes could come forward more quickly if more development funding is provided by Government.

THE GOVERNMENT'S RESPONSE

85 Government must act now to deliver both our 2020 Renewable Energy targets to provide 15% of the UK's energy from renewable sources by 2020 and our longer term climate change goals to reduce greenhouse gas emissions by at least 80% in 2050 which are enshrined in legislation through the Renewable Energy Directive and in the UK's Climate Change Act. Making a decision on whether or not we can harness the huge potential of the Severn Estuary by supporting a Severn tidal power scheme is part of this work. We need to study the proposals that can show at present that they have the potential to be built to help determine whether the benefits of a scheme justify its impacts, but also on whether it could reduce the cost, or increase the certainty, of meeting the UK's energy goals. This assessment will consider both the merit and lost opportunity of building a smaller scheme with a shorter construction period and a smaller capital costs against schemes that generate more energy but have longer construction periods and higher capital costs.

86 In parallel, we are assessing the potential of new technologies that may be less intrusive to the natural environment to develop through the Severn Embryonic Technologies Scheme. As suggested by respondents, this scheme puts in place funding but we are also making available the knowledge and expertise of the technical and environmental consultants working on the study for Government too.

87 The scheme will inform not only the timeframe to develop these technologies but also the level of certainty that they are less-damaging than

technologies that are ready to be deployed now. In addition to providing this strategic level information to inform the final decision, if a proposal developed through the Scheme shows that it could meet the short-listing criteria used to identify potentially feasible options in Phase One, we will be able to consider that scheme in the same way as the currently short-listed schemes.

88 The Government is providing funding at all stages of development from research to deployment for wave and tidal stream through the Research Councils, the Technology Strategy Board, the Carbon Trust, and the Energy Technologies Institute. DECC also has a fund for commercial demonstration of wave and tidal technologies – the Marine Renewables Deployment Fund. Revenue support for deployment is provided through the Renewables Obligation. In addition the Government will launch a £22 million Marine Renewables Proving Fund which will provide grant funding for the testing and demonstration of pre-commercial wave and tidal stream devices. This will accelerate wave and tidal technologies' move towards commercial demonstration and assist the development of successful projects under the Marine Renewable Deployment Fund.

Regional Economic Impacts Study

Q5 Do you agree with the conclusions of the DTZ study and are there any other factors that the feasibility study should be aware of?

89 Just under half of respondents to this question agreed with the conclusions of the study. The remainder, i.e. those that disagreed with the analysis or did not express strong views either way, were primarily concerned about the employment data. Many thought the job loss figures were too low and that job creation figures (in number and value) were overstated. The wide ranges given in the DTZ report were also seen as unhelpful.

90 Some respondents thought that tourism impacts were not sufficiently covered. Comments related to both impacts on existing tourism infrastructure (particularly at the local level) and the assessment of tourism potential that may arise as a result of a tidal power scheme being built but which is not part of the power scheme itself or the infrastructure necessary to support it.

91 Where this type of consequential development had been examined in the study a few respondents thought the potential had been understated. However, other respondents cautioned that if consequential development was valued then an assessment of environmental cost should also be made.

92 Some respondents, including some statutory agencies were concerned that the report did not sufficiently pick up the full implications for fish and

fisheries. This includes impacts on fisheries outside the estuary as a result of disrupting nursery areas of species such as bass.

93 The impact on communities/local residents was felt to be a significant omission in the report by many respondents. This included the impact of a potentially large migrant labour force entering and later leaving local areas. A greater focus on local area effects was requested by many.

94 A few respondents have raised inclusion of transport links in the study and the potential benefits they would bring. No further evidence has been submitted to support these views or challenge Highways Agency/Network Rail report on need.

THE GOVERNMENT'S RESPONSE

95 In light of the consultation responses received Government will commission an independent peer review of the DTZ study. The outputs of the review will be used to inform what further work would be useful to assess regional impacts and what assumptions should be used when undertaking any further work. The terms of reference for the review will be made available on the Severn tidal power website.

96 A number of respondents thought that a power scheme would stimulate additional investment in and around the Estuary. Others were concerned about the additional environmental impact that further development might have. Although this is first and foremost an energy project – and developments such as leisure water sports are a matter for investors and planners – we recognise that a power scheme in the Severn Estuary could stimulate consequential development that is not itself necessary to the construction or operation of a scheme. The SEA will therefore consider what consequential development might arise from a power scheme and will indicate its environmental and social impacts, both positive and negative. We will not be considering consequential development outside the SEA.

97 On impacts on tourism and local residents, many of the issues highlighted by respondents are being addressed within the study. The SEA is the main place for this work as it will include an assessment of local level impacts, including impacts on community services and facilities and tourism.

98 The feasibility study also includes work on how people benefit from the natural environment in the Severn Estuary. This ecosystems valuation study recognises that ecosystems and the biological diversity contained within them contribute to individual and social wellbeing. The study will include an examination of the value of fishing, grazing areas for sheep and cattle, flood protection, recreational use in the Estuary, heritage assets and

practices. The SEA will also expand on the work on impacts on fish and fisheries.

99 Through a study on the supply chain, we will gain a deeper understanding of the capability of the region to respond to demand for materials and skilled labour during construction and operation periods – recognising that not all of the skills and materials will necessarily be sourced locally. The study will provide manufacturers and suppliers with a view of possible future demand, highlighting both the need to improve production capacity and the skills and training required to meet this possible demand. The supply chain study will also include an assessment of the capability of existing transport infrastructure. The impact of construction traffic on local areas will be assessed as part of the SEA.

100 The impact of Severn tidal power schemes on individuals and communities is therefore being assessed in a number of ways across the many studies that make up the feasibility study. These different strands will be drawn together in the final consultation document, providing a picture of the social impacts of a scheme.

COMMENTS ON TRANSPORT LINKS

101 The existing road and rail links across the Severn estuary are sound and have the capacity to meet the forecast increase in demand over the next two decades – both Network Rail and the Highways Agency have looked at this and their reports are publicly available. The consultation has not produced any evidence to invalidate these conclusions. Transport links are therefore not being considered as part of the feasibility study.

102 New Super Express trains will provide additional capacity and quicker journeys for long distance passengers on the Great Western Main Line from 2016. In addition, the case for electrification of the busiest parts of the Great Western Main Line appears strong as electric trains are quicker, quieter, cheaper to maintain and they emit less CO_2.

103 If a barrage or lagoon is built it would probably be in place for hundreds of years. If new transport links are needed beyond 2025-30, it would be feasible to accommodate suitable foundations either as part of the design of a barrage (but not a lagoon) or subsequently by developing a design that adapted the existing structure for a future transport link. Further specific assessments would need to be undertaken at that time. A road or rail link on a barrage across the Severn Estuary would not necessarily be a cost effective solution as it would need to be elevated to provide adequate clearance for vessels to pass through locks.

Financing and Subsidy Mechanism

104 Analysis and the Government response to questions 6 and 8 have been grouped as they both concern ownership and delivery. Question 7 on subsidy mechanism is considered separately below.

Q6 Do you agree with PricewaterhouseCooper's analysis on ownership and delivery of a Severn scheme?

Q8 Government believes that the private sector is best placed to design, build and operate a Severn tidal scheme. Government's role would be to set the conditions in which a scheme could come forward. Do you agree?

105 These questions were each answered by between 40 and 60 respondents.

106 There was a broadly even split between those who stated that they agreed and disagreed with the analysis undertaken by Pricewaterhouse Cooper's (PwC). The majority of respondents agreed with the principle that the private sector is best able to design, build and operate a scheme.

107 Some noted that the public sector would need to take on a degree of planning consent risk and take a significant role in the delivery of a larger scheme such as a Cardiff-Weston barrage. Many thought a significant government role would be required to deliver the compensatory measures, with energy companies having little expertise in this area. This view was particularly notable from those in the energy sector.

108 Those that expressed a preference for private sector ownership/delivery (including the energy companies) stated a few key factors behind their view;

- Concerns over increasing the tax burden and that any cost overruns would fall to taxpayers – with government having a poor record in managing project costs.
- The view that the private sector is better equipped to manage the risks.

109 A number of respondents (mostly individuals rather than organisations or companies) suggested the Government should develop and/or own/operate a scheme. This seemed to be driven by one or more of the following factors;

- Public ownership would result in more of the benefits accruing to taxpayers/Government and that the private sector are likely to engage in profiteering
- Concern that Government will have to pay for cost overruns, particularly if a private sector owner/developer went bankrupt.

- Profit would be the primary motivation of the private sector and environmental concerns could be reduced.
- The private sector would be unable to take on many of the risks.

110 As noted above, some respondents stated that private sector ownership was inappropriate given the need to ensure the environmental impacts were adequately considered in operations. However many others commented that private sector ownership would be suitable but would require a significant role for government regulation to ensure the environmental impacts are considered.

111 A number of respondents highlighted that the analysis had not estimated the impact of the current economic downturn or the availability of credit from the financial market on the ability for either the private or public sector to provide finance.

THE GOVERNMENT'S RESPONSE

112 Work will continue throughout Phase 2 on working up a delivery and ownership structure, delivery route and subsidy mechanism for a potential Severn tidal scheme. This work will need to consider recent changes in the capital markets as well as changes in the Government's available resource.

113 In investigating these issues, we are looking at the objectives we wish to meet and then assessing which options are best able to meet these objectives. In terms of an appropriate delivery/ownership structure, a key objective is the overall cost to taxpayers/consumers and government exposure to risks, including upside risks.

114 We plan to undertake further market sounding with construction and energy companies and potential sources of finance in the upcoming months to further identify which risks these companies would be willing to take and to how they are likely to price them in terms of required subsidy. This work will also examine different subsidy mechanisms.

115 Throughout this work we will also recognise the need for any subsidy mechanism and delivery route to consider environmental and navigation impacts of a tidal scheme

Q7 Are there any other options for delivery or subsidy that should be considered? Would they be appropriate for all of the tidal power options under consideration?

116 Issues raised regarding the subsidy mechanism included;

- Concern over both the complexity and the impact on energy bills from the multiple funding mechanisms – i.e. the Renewables Obligation, Feed-in-Tariffs for micro-generation and a possible Severn tidal power subsidy mechanism. This concern had also been raised in the market sounding exercise undertaken by PwC.
- However this view was countered by a number of respondents who raised concerns as to the impact a Severn tidal scheme may have on other investment funded through the Renewables Obligation, with the majority of respondents agreeing that an Renewables Obligation was not a viable option for subsidising a large scheme (such as a Cardiff-Weston barrage).
- It was highlighted that it is important that electricity output is subject to the same market forces as other electricity, to encourage generation at peak time.

THE GOVERNMENT'S RESPONSE

117 In designing a subsidy mechanism, there are clearly a number of objectives to meet including those stated above such as encouraging generation at peak time, avoiding adverse impact on other investment and avoiding creating an overly complex set of mechanisms within the energy market. Work within Phase Two will investigate funding mechanisms that can meet these objectives, acknowledging that there will need to be some trade-offs as to how far each objective can be met.

Impacts on Energy Markets

Q9 What are the impacts and potential risks of tidal intermittency on the balancing energy market?

118 Electricity from the Severn would be generated in line with the tides. This means we can predict when and how much electricity will be generated but that it is not continuous. This means it needs to be planned into the system. A number of respondents believed that the intermittency of tidal power could be managed effectively especially with smart metering, sufficient interconnection with mainland Europe and energy storage, and additional demand control options associated with electric cars and hydrogen production. A number of respondents welcomed the predictability of the tidal generation compared with other forms of renewable electricity generation, and felt that the predictability could

enable energy market initiatives that would not be possible with less predictable forms of generation.

119 A number of respondents supported further work to assess the impact of the intermittency and the cost of backup and reserve generation. It was also advised that further studies should be carried out to assess the value of multiple basins and pump storage options, and also the possible wear and tear on other generation required to operate more flexibly as a result of tidal intermittency.

120 One respondent suggested that building a network of tidal generators around the coastline of Great Britain could reduce the overall impact of tidal intermittency as the different tide times would enable more constant tidal output to be maintained through the day.

121 One respondent believed that barrage tidal generation options were unacceptable because of their impact on intermittency. Other issues raised by one respondent include power shortages, and impact on the output from nuclear generation at Hinkley Point.

122 The British Wind Energy Association (BWEA) responded with a reference to a recently commissioned and published report into the benefits of marine energy[2]. This report highlighted that there are likely to be significant benefits of having a more diverse renewables mix (i.e. a mixture of wind and marine) than having a renewable supply concentrated in wind generation. These benefits are in the form of a lower cost and volume of reserve and balancing capacity as a result of tidal generation being uncorrelated with wind generation and more predictable. It should be noted that this analysis did not consider any differences in the capital costs between the technologies or the impact of a tidal resource heavily concentrated in one place. However, the regular changes in output will create an additional challenge to the industry and the system operator in terms of energy balancing and flexible plant. This would become more pronounced for larger tidal generation schemes.

THE GOVERNMENT'S RESPONSE

123 All the studies carried out to date and many of the responses to this consultation support the view that the intermittent nature of the tidal generation can be managed, systems and processes available to the industry to operate the electricity market efficiently and economically. This additional work will need to include an assessment of the potential cost of managing intermittency for each of the short-listed options, and also to indicate the potential benefits of demand management, interconnection and energy storage.

2 Redpoint (2009); The benefits of marine technologies within a diversified renewables mix – http://www.bwea.com/pdf/marine/Redpoint_Report.pdf

124 It is hoped that this work will be further informed by National Grid. They are planning to study similar issues including intermittency as part of their assessment of the future transmission network in 2020 and 2030.

125 There should be no detrimental impact on the operation of nuclear generation at Hinkley Point. Each independent generator connected to the transmission system in Great Britain has its own discrete access rights to use the transmission system. Therefore sufficient transmission capacity would be provided to meet the commercial requirements of each generator as economically and efficiently as possible. Options for two generators to share the same transmission capacity should also be accommodated.

Q10 Is it worth considering exploring the option of demand management?

126 The general view was that demand management should definitely be studied further as part of the feasibility study, with areas including energy storage, electric cars and hydrogen production to be assessed.

127 A number of respondents linked demand management with improved energy efficiency, and that energy efficiency should be a major objective independent of any initiatives in the Severn Estuary. One respondent believed that demand management linked to the Severn may be difficult as a result of its intermittency, and another respondent felt that there may be options for industrial demand to follow tidal generation.

128 A few respondents raised concerns over their practicality and cost of demand management including whether the predictably intermittent nature of tidal range power could be accommodated.

THE GOVERNMENT'S RESPONSE

129 The Government firmly support the views that energy efficiency is a crucial part of meeting our energy and climate change goals. Work outside the feasibility study is looking at the management of an electricity market with much higher levels of intermittency from wind and tidal generation. We do not believe that the ongoing assessment of the options for tidal generation in the Severn Estuary can be completely divorced from issues such as demand management and intermittency. We need to understand how each of the tidal schemes impact on these areas to allow fair comparisons.

130 We will do further work to understand the potential benefits of linking a Severn scheme, should one go forward, with demand management initiatives.

Q11 Do you consider that a Severn tidal scheme could impact on investment in other energy supply capacity, and if so in what ways?

131 A number of respondents expressed concern that costs of the proposals, especially a Cardiff-Weston barrage, could be better spent on developing new technologies that have less environmental impact.

132 Others believe that going ahead with a Severn scheme would result in less need for other energy supply. Some thought a Severn scheme would be preferable to expansion in wind or nuclear power whilst others were concerned cheaper technology or work on energy efficiency would be displaced.

133 A few respondents commented that a Severn scheme could reduce the amount of private finance available for other projects.

THE GOVERNMENT'S RESPONSE

134 The Government is committed to meeting our energy and climate change goals. This Response is published alongside the Renewable Energy Strategy which sets out the financial incentives available to support and bring forward the technologies and project we need to meet these goals. We need to ensure development comes forward across a wide range of technologies and size of schemes. A scheme in the Severn may reduce the cost of meeting these targets and this is one factor in reaching the study's conclusions on whether a Severn scheme could be supported. An appropriate subsidy mechanism would be needed to ensure that necessary development in other energy supply capacity is not adversely affected.

135 In addition to the funding and support available through the Severn Embryonic Technologies Scheme, substantial Government financial support is available for low-carbon energy innovation to speed the development of innovative proposals. The Energy Technologies Institute and the Carbon Trust, and DECC's Marine Renewables Deployment Fund, all support the development of low carbon energy. For example, £35M for innovative industry-led technology development under former BERR Technology Programme, now administered by the Technology Strategy Board and the £1.1bn Energy Technology Institute will boost support for R&D. The Institute's first call for Expressions of interest, launched in December 2007, included wave and tidal technologies, and one of the four successful projects recently announced was a marine energy technology. Under the newly-banded Renewables Obligation, emerging technologies such as wave and tidal energy will receive 2 Renewable Obligation Certificates (ROCs) for each MWh of eligible generation produced. It is our intention that projects supported by the Marine Renewables Deployment Fund will receive 2 ROCs/MWh. In addition the Government will launch a £22 million Marine Renewables Proving Fund which will provide grant

funding for the testing and demonstration of pre-commercial wave and tidal stream devices. This will accelerate wave and tidal technologies' move towards commercial demonstration and assist the development of successful projects under the Marine Renewable Deployment Fund.

136 A screening exercise has been launched to better understand the energy generation potential of marine energy devices and the realistic timescales of when multiple devices will be installed and commissioned. It covers wave, tidal stream and range (outside the Severn) in English and Welsh Waters and the results will inform a decision on whether a Strategic Environmental Assessment on marine energy devices is required.

Short-listing Process

Q12 Do you agree with the factors that have been used to determine the short-list for further study?

137 The responses to this question were fairly evenly balanced between those who agreed with the factors selected and those who believe that the factors were not appropriately weighted against each other. For example, some believed that economic and technical considerations were given too much importance at the expense of environmental impacts. A small number of responses from NGOs, believed that it was not appropriate to short-list at this stage in the process prior to more work being undertaken on the impacts of schemes and whether these could be mitigated.

THE GOVERNMENT'S RESPONSE

138 The short-listing process was used to identify which of the schemes could be feasible, and to eliminate the unfeasible schemes. All of the schemes judged to be potentially feasible have been included on the short-list. It is a fair and comprehensive approach to study all the potentially feasible options in Phase Two. The assessment, made by Ministers, was based on the evidence presented in a number of different reports.

139 To assess feasibility a number of different factors were used:

- Technical risk – whether a scheme that could be seen to work had been presented including confidence in the energy yields and timeframe for delivering a project, maturity of technology
- Cost of Energy – how do costs (in £/MWh) compare to other renewables, using the predicted cost of meeting the final percent of the 2020 renewable energy target as a comparator
- Affordability – burden on taxpayers and energy consumers the role that Government would have to play in delivering the project.[3]

3 We also considered whether impact on energy market and the grid impacts impacted on a scheme's feasibility at this stage but it was found not to.

The following were used to judge whether more costly schemes nevertheless justified further study:

- Environmental impact – high-level view on environmental impacts using predicted habitat loss as an indicator of severity;
- Regional impact – high level view on impacts on ports, fishing and employment.

140 Note we did not attempt to establish whether the harm caused to the environment or the region made options unfeasible or unacceptable – this work takes place in Phase 2 of the study and will inform whether any of the potentially feasible schemes are feasible.

141 Even if a scheme was acceptable on some factors, it did not progress to the short-list if it was unfeasible because of others. For example, the Outer barrage between Minehead-Aberthaw had an acceptable cost of energy but its estimated capital cost in excess of £30bn was considered unaffordable in any timeframe. This was around £10bn higher than the £20.9 Cardiff-Weston barrage, the largest scheme on the short-list.

142 The first phase of the study has focused on identifying schemes that demonstrate the potential to be feasible so that their impacts and feasibility can be studied further. The unit cost of energy threshold applied to establish potential feasibility was £170/MWh. This was calculated as the marginal cost of the large scale electricity required to meet the draft UK Renewable Energy Strategy target and with the changes in the final Renewable Energy Strategy is now estimated to be below £150/MWh. The level of actual, rather than potential, feasibility therefore may be lower. (For comparison, the current estimated levelised cost of gas (CCGT) and nuclear generation are around £66/MWh and £45/MWh respectively.) However, schemes that could have less damaging impacts on the natural environment and industries in the Estuary were set an easier test of £200/MWh on the basis that they may justify a slightly higher cost. This was how tidal lagoons with a higher cost of energy than barrages came to be on the short-list. In the Government's view, this process is robust. Some schemes were eliminated for other reasons than their cost of energy, as set out above.

143 With the potentially feasible schemes identified, we need to establish absolute costs and how each scheme would operate. With this information we can establish how schemes perform against each other and which if any are feasible and could be supported. Information from the SEA on their environmental and social impact will play a key role as will a scheme's ability to comply with environmental legislation covering the Estuary.

144 Part of this work looks to mitigate the impacts of schemes and also to further define schemes in terms of how they are configured and operate. If this work results in design improvements that are relevant to schemes

that have not been short-listed, we will assess whether this could lead to any excluded scheme becoming potentially feasible. It is sensible to check that decisions taken now on short-listing remain valid in the light of learning from the rest of the feasibility study. Should an excluded scheme become potentially feasible, it would then be assessed alongside the other potentially feasible (short-listed) schemes. Issues surrounding schemes that were not short-listed due to technical risk and how they are being treated in the study are set out in the next section.

145 In practice, this may only be applicable for schemes that have similar characteristics (like lagoons) and there are some areas, like technical risk, which cannot be mitigated in this way. The results of the Severn Embryonic Technologies Scheme will show whether technical risk can be reduced.

Q13 Do you agree that the test of economic feasibility should be relative to the cost of other renewables?

146 The majority of respondents to this question agreed that it was appropriate to test the economic feasibility of the Severn based schemes compared to other renewables. Several respondents also felt that the costs of Severn tidal power should be compared to low-carbon options more generally as there would be no point going ahead with a scheme if costs are substantially higher than alternative low carbon energy. In addition, some respondents highlighted the need for comparisons to be made on accurate and comparable figures. A small number of responses stressed that as economic feasibility was being considered social and environmental feasibility should be considered also.

THE GOVERNMENT'S RESPONSE

147 A Severn tidal power scheme could help meet our commitments to provide 15% of the UK's energy from renewables sources in 2020 and to reduce our greenhouse gas emissions by 80% by 2050.

148 As the responses highlight, we need to assess the cost of Severn tidal schemes against alternative technologies that can help meet these targets. Current estimates suggest that the generating costs of technologies that can help meet the 2020 renewable targets are higher than those that can meet the longer term targets. As such, a comparison with meeting this earlier target was used in the feasibility assessment.

149 In making a final assessment as to whether Government will support a Severn tidal scheme, it is important that we ensure that we are making a fair comparison between any Severn tidal scheme and the alternatives. Thus the comparison will need to assess the costs for all the technologies, (including an appropriate adjustment for risk), and an estimate of the wider costs, such as those associated with the need for additional thermal

(coal, gas or biomass) capacity/back up to deal with the intermittent nature of different forms of generation and the costs associated with the environmental impact of technologies.

150 As part of the consultation, we published a Partial Impact Assessment which compared the costs of Severn schemes against different comparators or counter-factuals i.e. renewables and the cost of carbon dioxide savings with those from Combined-Cycle Gas Turbine generation and nuclear. The Impact Assessment will be updated as further evidence comes forward across the course of the Feasibility Study, and will be published alongside the public consultation on the outcomes of the study.

151 Data on social and environmental impacts is being gathered in the SEA. We are also studying whether any scheme could meet the environmental legislation that applies to the Estuary. This will help determine whether any scheme is supportable.

Q14 Do you have any further comments on Parsons Brinckerhoff's Interim Options Analysis Report? Please support your response with evidence where possible.

152 Few responses commented on Parson Brinckerhoff's (PB) Interim Options Analysis Report. Of those that did, many were happy overall but some expressed concerns that construction costs have been over-estimated, though there was limited evidence to support this. Some also questioned why the costs presented in the report may be different from those provided by scheme proposers.

153 A consortium of NGOs[4] submitted a report by Atkins that examined the cost and power calculations used by PB. This report also questioned the assessment framework. The latter issue has been addressed in the response to Question 12 on the factors used to short-list.

THE GOVERNMENT'S RESPONSE

154 PB used a fair basis assessment applying common assumptions (including operating mode) and cost rates across all options. This meant that all options were treated fairly relatively to each other, and that schemes that were more recent and had not been studied in as greater detail as others were not dis-advantaged. Data received from proposers was checked by engineering experts and reviewed by the independent expert engineering panel (from the Royal Academy of Engineering and other engineering institutes). The fair basis approach is why costs and outputs were not always the same as those submitted by scheme proposers.

4 including the WWF, WWT, National Trust, RSPB and the Wye and Usk Foundation

155 The estimates for construction costs used by PB consider the likely design and reflect today's prices, a 15% contingency and the estimated costs of replacing lost inter-tidal habitat at a ratio of 2:1. They are not yet final costs as they have used common assumptions to allow a fair basis assessment across schemes. We are looking at risks around the figures and technologies, and will apply Treasury guidance on optimism bias to develop final costings.

156 Atkins assessment of PB's cost and power calculations has been reviewed both by PB and the independent expert engineering panel. Neither agreed with the Atkins conclusions. The advice from the expert panel is available on our website **www.decc.gov.uk/severntidalpower**.

157 As the Fleming Lagoon has been included in the provisional short-list of options for further study, the points raised by Halcrow on behalf of the scheme proposers will be looked at during these further studies. This includes operating lagoons on both the ebb and flood tide.

Severn Tidal Power Proposals

Q15 Do you agree that the two lagoon options selected for further study represent a good basis for studying the lagoons?

158 Most respondents that commented directly on the lagoons options chosen for further study agreed with the recommendation to study the Fleming lagoon at Welsh Grounds and the Bridgwater Bay lagoon. However, a few responses questioned the inclusion of Bridgwater Bay lagoon due to either its proximity to the nuclear power station at Hinkley or a potentially high environmental impact due to impounding the River Parrett.

159 A small number of respondents asked why we were not studying all the lagoons, in particular offshore lagoons. A greater number questioned the need to study lagoons at all, mostly related to a belief that the electricity supplied by lagoons was too small in comparison to the larger barrages or that the technology risk was too high.

THE GOVERNMENT'S RESPONSE

160 The lagoons proposed are similar size to the other options on the short-list bar the largest option – the Cardiff-Weston barrage. Although there are no lagoons built in the world at the moment, the principle behind the construction and the turbines used are similar to those used in barrages.

161 As lagoons do not form a complete barrier across the Estuary they may have a lesser environmental or regional impact e.g. on migratory fish, designated sites and shipping. Studying lagoons further will allow us to

determine whether these benefits are realisable and to compare the costs, benefits, risk and impacts of lagoons against the other options.

162 This will include looking at the impacts of operating lagoons on both the ebb and flood tides not just the ebb. This may lead to additional energy yield. As a result, the overall cost of energy may be reduced, though construction costs will be affected including by the ground conditions. Currently lagoons have higher levelised costs than the other options on the short-list, and offshore lagoons an even higher levelised cost of energy of between £269-317/MWh. If the changes from ebb to ebb-flood are significant, we will examine whether this will positively impact the costings for offshore lagoons to such a degree that they become a potential feasible option for the Severn in the Government's view. However, concerns remain over whether the offshore lagoon design proposed would be suitable for the location in the Severn suggested due to the need for the embankment or walls of the lagoon to be built on rockhead.

163 We will also look at combinations of schemes including lagoons with each other and with barrages.

164 One of the reasons for studying a lagoon impounding Bridgwater Bay is to examine the possible flood risk benefits. Discussions will be held with the owner/operator of Hinkley Point nuclear power station, and locks will be considered to allow ships and recreational boats, which may be moored within any Bridgwater Bay lagoon, access to the wider Severn Estuary and River Parrett.

Q16 Given the short-listing criteria, are there any proposals on the short-list which are not suitable? Please support your response with evidence where appropriate.

165 This question led to mixed response ranging from all schemes were inappropriate to calls to remove particular options. Many respondents felt that the Cardiff-Weston barrage (the largest option on the proposed short-list) should not be studied further. This view was largely due to the perceived environmental impact and doubts on whether this could be compensated for whilst some questioned whether the capital cost of the scheme was affordable. This was either because of the size of the scheme (Cardiff-Weston) or because they believed that all barrages would cause too much damage to fish.

166 Several respondents however believed that schemes smaller than Cardiff-Weston, whether they were lagoons or barrages, should not be studied as they did not make a great enough use of the energy potential of the Severn.

167 A few respondents were concerned about the potential build up of sediment in the smaller projects, in particular the Beachley barrage.

168 The majority of responses did not provide any further evidence.

THE GOVERNMENT'S RESPONSE

169 There was little further evidence submitted to challenge the grounds on which any scheme was short-listed. As such, we propose not to remove any of the schemes from the short-list at this stage. This allows for all potentially feasible schemes to be studied – which represent a range of options in size and cost. The Severn Estuary has the second highest tidal range in the world and is the single biggest tidal range resource in the UK. Given the scale of ambition of our energy and climate change goals, it is important that the Cardiff-Weston barrage which has successfully come through the short-listing process to be considered as it would make use of a large proportion of that resource.

170 A Cardiff-Weston barrage could be generating by 2020, even if not fully commissioned. However, this would be a best case scenario. There would still be a risk that it would not contribute significantly towards the 2020 renewables target. Providing over £20 billion of finance for Cardiff-Weston, either publicly or privately, would be very challenging and we do not believe that the private sector could carry this risk alone. Taxpayers/consumers would likely bear a large part of the cost burden and risk. The Government will need to consider the macro-economic and fiscal impact this scale of spending and risk exposure would have on a 2020 timeframe. In this context, it may be appropriate to consider the feasibility of the Cardiff-Weston barrage on a longer timescale.

171 The assessment in Phase 2 will consider both the merit and lost opportunity of building a smaller scheme with a shorter construction period and a smaller capital costs against schemes that generate more energy but have longer construction periods and higher capital costs.

172 We take concerns over the environmental impact of schemes very seriously. We are conducting a SEA which analyses in detail the impact of the schemes on the environment and the region and will use this information to help us judge whether the harm caused by any of the potentially feasible schemes is acceptable. In addition, before any scheme could come forward it would need to be compliant with the environmental legislation that covers the Estuary. Further studies are looking at the feasibility of compensatory measures. At this stage in the study, we do not yet know enough to say whether this would be possible or impossible for any of the short-listed schemes.

173 We will be studying sediment flows within the Estuary. This work includes modelling the impact the schemes will have on the hydraulic regime, the risks associated with sediment build up, and the cost of removing or dredging the sediment. This work may demonstrate that shortlisted schemes are not feasible. If this should be the case, schemes will be ruled out of further study and the reasons published on our website.

Q17 Does the short-list represent an appropriate level of ambition given the energy potential of the Estuary?

174 Responses to this question were mixed. A roughly equal number of responses said that the Government was not being ambitious enough because either:

- Many short-listed schemes did not utilise enough of the Severn Estuary's energy potential and the focus should be moved to larger schemes; or
- Embryonic technologies like the reef and fence were not proposed to be short-listed.

175 A few respondents believed that it was not appropriate to study Severn tidal power at all due to potential environment impacts. In addition, some respondents believed that the Government should be focusing on a modular approach, i.e. constructing a number of schemes in combination or power generation units, as it may reduce the risks of embarking on a large project.

THE GOVERNMENT'S RESPONSE

176 We believe it is appropriate to study the potentially feasible schemes. They make use of differing proportions of the Severn Estuary's resource. This allows us to study whether the increased benefits in terms of energy generation for larger schemes could outweigh their potentially increased impacts. As part of the next phase of work, and taking on board concerns raised in the consultation about the scale of the Severn's energy resource, we will also consider the lost opportunity that would result from building a smaller scheme rather than a larger one. In addition, we will consider whether schemes can work in combination with each other and what the impacts of that would be.

177 We have recognised the need to study embryonic technologies in parallel to the assessment of options that we know are potentially feasible now to see whether they could be deployed and realise the benefits claimed. As such, we have established the Severn Embryonic Technologies Scheme which is discussed elsewhere in this Response.

Q18 Are there any other schemes that, in your view, should be short-listed? Please provide appropriate evidence wherever possible and refer to the short-listing criteria.

178 This question received the most responses. The majority of respondents requested the tidal reef and/or tidal fence be short-listed. The reasons given largely focused on their potential to be less environmentally damaging. Some respondents questioned whether, if the schemes were operated on and ebb and flood basis, they would have performed better in the short-listing process.

179 A few respondents requested the Outer Barrage (between Minehead and Aberthaw) be short-listed as it is the largest scheme and therefore make the greatest use of the Estuary's tidal range resource, have the greatest impact on climate change and offer flood protection.

180 There were also calls for offshore lagoons to be studied further due to potential lesser impacts on shipping and the environment.

181 There were detailed responses on lagoons, how they might be constructed and the costs from three respondents. Aside from these responses, there was little further supporting evidence provided.

THE GOVERNMENT'S RESPONSE

182 The short-listing process has been discussed in detail above, and was designed to identify those schemes that were potentially feasible. This assessment included the degree of technical risk. The technical risk for the tidal reef and fence was considered too high to take the schemes into the SEA for further study. This stems from a number of factors. For the tidal reef, the concept lacks essential technical definition. During the course of the study, the scheme design was refined and a further variation on the concept was proposed by Atkins. Neither of these variants has been developed to a point where there is certainty that the concept and the technology could be developed sufficiently for deployment in the Severn.

183 The tidal fence was also not short-listed due to a high degree of technical risk. As with the reef, the scheme also developed over the course of the study. The tidal fence does not make use of the Severn's tidal range but its much smaller tidal stream resource. Tidal stream technology is in development and first devices are being piloted. However, the devices needed for the tidal fence are far greater in size than these, and would be deployed in much larger numbers. As with the tidal reef, developing this technology to deployment stage for the Severn is uncertain. The effect of so many devices working side by side would then need to be studied. Although some respondents felt that the reef and fence would be more likely to be feasible if operated on ebb and flood mode, this would not

reduce the technical risk and sensitivity tests on operating mode were applied during the short-listing process.

184 The technical risk and uncertainty has resulted in the reef and fence proposals being highly conceptual; the lack of clear definition at present means that it would not even be possible for the feasibility study to investigate their impacts on a contingency basis in any meaningful way.

185 Additional work is needed to take these technologies forward to a position where their potential and impacts can be assessed. We have established the Severn Embryonic Technologies Scheme to facilitate the development of schemes like these. Through the Scheme, a development route map for embryonic technologies can be established to inform on the time and cost it would take for them to develop at the scale proposed for the Severn Estuary. Further work will also help reduce the technical risk and uncertainties surrounding embryonic schemes. At the end of the Scheme, we will consider whether any of the schemes meet short-listing criteria, or have the potential to do so in a defined time period and, if so, assess its impacts in the same way as the currently short-listed schemes. As part of the final decision at the end of the study, we will consider the results of the Severn Embryonic Technologies Scheme and whether to wait for these technologies to develop (whether they have met short-listing criteria or not).

THE OUTER BARRAGE

186 The Outer Barrage was not short-listed due to its capital cost being unaffordable to Government. There is no prospect of reducing this cost to a level that would be considered affordable.

OFFSHORE LAGOONS

187 Offshore lagoons were not short-listed as the cost of the energy they would produce at locations in the Severn Estuary is too high. This cost is beyond the level which we consider would ever be competitive with other means of meeting our energy and climate change goals, even when factoring in the bias we applied to costs to allow potentially less environmentally damaging schemes to come through the process. There was also a degree of technical risk because of the proposed means of constructing the walls of the lagoons and the material on the Estuary bed which would be their foundation. Given these dual concerns, we consider it unlikely that offshore lagoons could be a realistic alternative for the Severn, against other means of meeting our energy and climate change goals. Nevertheless, if further work on other lagoon options shows that costs could fall significantly, we will see whether this evidence could change our view of the feasibility of offshore lagoons in the Estuary. If so, we would do further work on the technical constraints on offshore lagoons in this location, to see whether

they could become potentially feasible options and, if so, bring them back into the feasibility study. Some further locations were reviewed by PB and the independent expert panel but were judged to be less feasible than the locations included in the study.

188 Given the above, the short-list will remain as proposed subject to checking that feasibility assessments made now are still valid in light of further work and the results of the Severn Embryonic Technology Scheme.

Strategic Environmental Assessment

Q19 Which plans, programmes or environmental protection objectives are most significant for this strategic-level environmental assessment?

189 This question received around 50 responses. The majority of the answers suggested:

- Useful recommendations of other plans and programmes for consideration as part of the SEA.
- That complying with environmental legislation was the most important consideration.
- That meeting Government climate change objectives was the most important consideration.

THE GOVERNMENT'S RESPONSE

190 The plans and programmes suggested are being considered within the SEA. We also agree that it is necessary to determine – before a scheme could go ahead – whether it could comply with environmental legislation and how it would contribute to Government climate change goals. Studies in Phase 2 will explore these aspects more widely.

Q20 Is there any additional information that could help supplement the baseline data? Any further information relating to the baseline indicators, existing problems and trends over time would be very useful.

191 This question drew few responses. Those that replied highlighted the need to examine and learn the lessons from other similar projects for example barrages in Bay of Fundy, Canada and La Rance, France as well as non-energy projects in the Eastern Schelde and the Thames Estuary. In addition, information sources of navigation and shipping flows and a recent study on seaweed were provided.

THE GOVERNMENT'S RESPONSE

192 Like the respondents, we believe it's important to learn from existing projects like the two working tidal range projects in Canada and France. We are already looking at these models, and other similar projects, in more detail in the second phase. This includes engineering as well as environmental impacts. The information sources suggested will be used as part of the ongoing SEA process.

Q21 Is there any important information that has not been addressed in view of the SEA scope?

193 This question received approximately 40 responses. Most issues were raised in single responses. These include:

- Naming areas vulnerable to sediment build up
- Impact on public health
- Impact on maritime industry
- Impact on fish and fisheries
- Impact on water quality and resources including sediment and discharges into the Estuary
- The Severn Bore and recreational water uses
- Upheaval in communities during construction phase
- Calculation of carbon dioxide impact of a scheme including whether shipping emissions would be displaced
- Flood risk
- The do-nothing option.

194 Although not addressed particularly to this question, a few respondents raised concerns that the study area boundary is not appropriate for all environmental topics, for example those for fisheries and aspects of the marine environment.

THE GOVERNMENT'S RESPONSE

195 The SEA will cover all these issues and an Environmental Report will be published for public consultation at the end of the Feasibility Study.

196 Most points raised are already included in the SEA. The majority of new points raised were minor changes to what was already being planned in the SEA. In some topic areas a wider study boundary is proposed. This highlights a lack of clarity of the differences in study area that will in fact vary for each topic area. The study area will include examination

of any wide-ranging effects; for example the work on hydraulics and geomorphology effects will extend as far as necessary to establish the extent of measurable change in significant environmental effects for other topic areas.

197 Analysis and response to the supplementary questions on the SEA are provided at the end of this document.

Next Steps

Q22 Do you agree with the work plan, as outlined in Chapter 6? If not please specify any other areas to be studied.

198 This question attracted less than 70 responses. Respondents generally agreed with the work plan but raised other areas they thought should be studied. These included:

- the supply of construction materials (both sourcing and transporting),
- flood risk
- planning and consenting a scheme
- the Severn Bore
- developing new technologies
- compliance with environmental legislation including the Habitats Directive.

199 A few responses, including some of the statutory agencies, considered that there is insufficient time to fully consider all issues and impacts on the environment and for technologies to develop. They felt this would increase uncertainty over the environmental response of the Severn Estuary and its designated features to any tidal power structure; particularly concerning fish and geomorphology.

THE GOVERNMENT'S RESPONSE

200 Flood risk, impact on the Severn Bore and the supply of construction materials are all being considered as part of the SEA. Whether a scheme could be compliant with the environmental legislation covering the Estuary is being studied in line with the requirements of the legislation. For example the four-stage Habitats Regulatory Assessment will be completed. This includes investigating:

- whether significant effects would be likely to arise on any internationally designated sites, and if so,
- whether there would be an adverse impact on the integrity of the sites, through an Appropriate Assessment

- whether there are alternative solutions, and if not,
- whether there are imperative reasons of over-riding public interest to justify going ahead with Severn tidal power.
- the likely level of environmental compensation required, the feasibility of compensating for the different options, how this could be delivered and the risk surrounding its delivery.

201 The study is at strategic level – to decide on whether the Government could support a project in the Severn and if so on what terms. The length of the study reflects the need to gather robust evidence in order to make decisions. The risk of there being scientific uncertainty at the end of the study is already understood and will need to be clearly documented in the SEA Environmental Report. The results of the SEA will help inform this process. We are applying confidence limits to both assumptions and outputs and using sensitivity testing to ensure that relevant uncertainties to the assessment are acknowledged. Further assistance on this issue is being sought from Government Chief Scientific Advisors.

202 We will take this uncertainty into account, including scale and consequences of effects on the study across the range of issues being considered – not just on the environment but economics and engineering too.

203 If the decision is to proceed with a scheme or combination of schemes, further, in-depth studies would be undertaken to support any project level proposal that might happen to go forward, including an Environmental Impact Assessment (EIA) and further Habitats Directive assessments. This proposal would be subject to planning approval and other consents.

Additional Questions on the SEA

Q23 Is the range of environmental problems, issues and receptors covered appropriate? Is the level of receptor sensitivity appropriate?

204 Less than 30 responses were received to this question. Of these some issues were raised on the use of technical language used with the SEA and clarity of the large amount of material published as part of the consultation.

205 There were also comments on how the impact on the sediment regime in the response was being addressed.

THE GOVERNMENT'S RESPONSE

206 Efforts will be made in future published documents to make technical language as clear and transparent as possible, using Plain English wherever possible and providing a non-technical summary of the Environment Report. The impact on sedimentation is being modelled and covered in

the Hydraulics and Geomorphology theme within the SEA. The modelling extends well offshore from the Severn Estuary.

Q24 Is the methodology proposed appropriate for this strategic-level environmental assessment?

207 Less than 20 responses were received to this question. Half of the responses agreed the methodology was appropriate. The remaining responses were concerned with whether a do-nothing option has been included, that combinations of schemes should be studied in addition to schemes on their own, whether the scope of alternatives under the SEA was broad enough and appropriateness of eliminating some schemes prior to optimisation. Concerns were also raised by some respondents that there has been insufficient reference to and lessons learnt from existing relevant SEAs, including the Offshore Renewables SEA and the Offshore Oil and Gas SEA. A small number of respondents questioned whether it was appropriate to use a large barrage, small barrage and lagoon as basis to scope the SEA.

THE GOVERNMENT'S RESPONSE

208 Issues surrounding alternatives and the short-listing process have been addressed earlier in this response under Question 12. A 'do-nothing' option is included in the SEA. Combinations will be studied. Methodologies from other SEAs including the nuclear SEA and offshore SEA were assessed at the beginning of the study. This was carried out in order to learn from these processes and ensure consistency between approaches to help develop a methodology for the Severn tidal power feasibility study. The SEA methodology is tailored to the types of environmental and social receptors being examined, and takes account of the types of strategic, high level decisions that will need to be made. Links with other SEAs will continue to be addressed as part of Phase Two of the feasibility study and there is regular contact between Government teams working on SEAs. When setting the scope of the SEA for consultation, a representative range of tidal power options were used in the Topic Papers to identify the full range or effects that could occur with any schemes. It was anticipated that the types and scale of the effects that would occur with embryonic schemes would fall within the bounds of the generic options studied, though the lack of a defined and potentially feasible definition of these schemes means that it is not possible to be certain that there would not be different types of impacts.

Q25 Are there any major plans or projects that should be included in the assessment of cumulative effects?

209 Less than twenty responses were received to this question. They included suggestions to include work of coastal realignment at Steart Point,

proposed deep water port at Avonmouth (Bristol Port) and potential for development of wind farms in the outskirts of the Bristol Channel.

THE GOVERNMENT'S RESPONSE

210 The potential sites for wind farms have been identified within the study but are outside the study area. The proposed port development at Avonmouth is being considered within the study. Ongoing coastal defence work will be considered within the future baseline. We are investigating several different combination effects:

- cumulative effects, where several developments have insignificant effects but together have significant effects or where individual components of one development have a combined effect.
- secondary effects, where effects that are not the direct result of the plan but occur away from the original effects
- synergistic effects interact to produce a total effect greater than the sum of individual effects.

Q26 Are there any changes that should be made to the proposed SEA objectives; including any consolidation of the objectives? Are there any other SEA objectives, assessment criteria or indicators that should be included?

211 Fewer than fifteen responses were received to this question. Around half of these commented that they were happy with the questions. The remainder asked for changes including those related to navigation, clarification of the duration of impact in which on the objectives was being considered and dredging. Consultees suggested changes to the objectives. Some considered that objectives should be tied more directly to the issues; phrases such as "to seek to…" should be removed; and that objectives should be as clear as possible so progress can be properly measured. Some consultees also considered that the SEA objectives are written in a negative context that only aspires to limit damage.

THE GOVERNMENT'S RESPONSE

212 The SEA objectives will be assessed over the proposed lifetime of a Severn tidal power option (120 years). This will include construction, operation and decommissioning. Mitigation will be recommended for each short-listed option. This will permit an assessment of objective compliance. Some amendments have been made to the objectives in light of comments received (please see Annex A). Comments relating to clarity and rationalisation of the objectives have either resulted in a change to an objective, or where this has not been the case, an explanation given as to where in the SEA this impact is included (see Annex A for the revised

objectives). There are no recommendations or comments that entail significant change in SEA scope. Regarding the suggestion of making the objectives less negative, this is already the case for some. But in general the Government believes that the objectives relating to environmental effects should focus on avoiding harm.

Q27 Are the relevant aspects of sustainable development covered, if the SEA addresses the issues identified in this SEA Scoping Report?

213 Very few responses were received directly to this question. Issues raised directly include the impact on the Severn Bore and tourism related to it. Wider issues raised included the need to embrace concepts of sustainable development and to wait for embryonic technologies to develop as they may be less environmentally damaging.

THE GOVERNMENT'S RESPONSE

214 Government principles on sustainable development are being taken into account. We have established the Severn Embryonic Technology Scheme to support technology development. Effects on the water quality of the Severn Estuary will be considered in the Marine Water Quality topic of the SEA. Effects on the Severn Bore will be considered in the Hydraulics and Geomorphology, water quality and other sea uses topics of the SEA for assessment of effects on recreation.

Q28 Any further suggestions regarding the scope of the SEA and its proposed assessment of the short-listed options?

215 Just over twenty responses were received to this question. Respondents raised various issues including impacts on shipping and navigation, marine fish and fisheries, the need to provide for compensatory habitats and impacts on the Severn Bore.

THE GOVERNMENT'S RESPONSE

216 These issues are being considered within the relevant SEA topic papers – shipping in Navigation and sedimentation in both Hydraulics and Geomorphology and Freshwater Environment and Associated Interfaces. Fish and fisheries issues will be looked at in both the Marine and Estuarine Fish, Marine Ecology and Society and Economy topic areas. Compensatory habitat is being considered outside the SEA as part of the Habitats Regulations Assessment.

Annex A: Revised SEA Objectives

Please find below a full list of the Strategic Environmental Assessment (SEA) objectives. The list reflects changes that have been made due to comments provided in the recent public consultation. Text that has been added is shown *in italics*, while text that has been removed is shown ~~struck out~~. (Specifically, changes have been made to: Marine Water Quality objective 1, Ornithology objective 2, Society & Economy Objectives 1, 3 & 6, Other Sea Uses 5 and 9, Carbon Footprint 1, Resources and Waste 1 & 2 and Freshwater Environment & Other Associated Interfaces 4.)

Marine Water Quality

WQ.1 To avoid adverse effects on water quality in relation to water quality standards *and targets*

WQ.2 To avoid adverse effects on designated marine wildlife sites of international and national importance due to changes in water quality

WQ.3 To avoid adverse effects on water quality which would affect human health, flora and fauna, recreation and other users

WQ.4 To avoid adverse effects on inherent water characteristics (temperature, salinity, pH) that could lead to adverse changes in water quality

WQ.5 To minimise risks of pollution incidents

Ornithology

O.1 To avoid adverse effects on designated wildlife sites for birds and protected habitats of international and national importance

O.2 To avoid adverse effects on other ~~protected~~ bird habitats and species

O.3 To avoid adverse effects on national and local biodiversity target features that include bird habitats and species

Landscape & Seascape

LS.1 To conserve the character and qualities of the landscape/seascape, recognising its diverse features and distinctiveness at different scales – including designated and non-designated areas

LS.2 To conserve the character and qualities of the physical and visual resource associated with land and sea

LS.3 To accord with the Aims and Articles of the European Landscape Convention

Society & Economy

SE.1 To ~~seek to~~ create ~~local~~ employment opportunities accessible to all

SE.2 To avoid adverse effects on the local and regional economy

SE.3 To ~~seek to~~ promote the development of sustainable communities

SE.4 To avoid adverse effects on physical and mental health

SE.5 To avoid adverse effects on access to community services and facilities

SE.6 To *promote* access to recreational facilities and open space

SE.7 To avoid adverse effects on existing, proposed and committed land uses

SE.8 To seek opportunities to improve degraded environments

SE.9 To avoid adverse effects on the housing market

Other Sea Uses

SU.1 To avoid adverse effects on the aggregate extraction industry

SU.2 To avoid adverse effects on marine waste disposal sites and infrastructure

SU.3 To avoid adverse effects on the commercial fishing industry

SU.4 To avoid adverse effects on marine recreational users

SU.5 To avoid adverse effects on *sustainable estuary-based tourism in both the South Wales and South West England* Regions

SU.6 To avoid adverse effects on military activity in the region

SU.7 To avoid adverse effects on the energy industry

SU.8 To avoid adverse effects on seabed cables in the region

SU.9 To minimise adverse effects on the Severn Bore

Navigation

N.1 To avoid adverse effects on Severn Estuary Navigation arising from sedimentation, geomorphology, water density, and water levels

N.2 To avoid adverse effects on the integrity of existing and proposed port operations

Historic Environment

HE.1 To avoid adverse effects on designated sites in the historic environment

HE.2 To avoid adverse effects on the non-registered internationally, nationally, regionally and locally important sites within the historic environment

HE.3 To avoid adverse effects on the potential historic environment, the as yet unidentified sites and finds, within the Severn Estuary

HE.4 To avoid adverse effects on the character, quality and integrity of the historic and/or cultural landscape

Terrestrial & Freshwater Ecology

TFE.1 To avoid adverse effects on designated terrestrial and freshwater wildlife sites of international and national importance

TFE.2 To avoid adverse effects on valuable terrestrial and freshwater ecological networks

TFE.3 To avoid adverse effects on other protected terrestrial and freshwater habitats and species

TFE.4 To avoid adverse effects to national and local biodiversity target features including terrestrial and freshwater habitats and species

TFE.5 To minimise the risk of introduction of non-native invasive terrestrial and freshwater species

TFE.6 To conserve and enhance designated freshwater and terrestrial site features

TFE.7 To restore and enhance freshwater and terrestrial BAP species populations and/or BAP habitat

Carbon Footprint

CF.1 To ~~seek to~~ maximise the opportunities for use of sustainable sources of energy for the UK

CF.2 To avoid adverse effects from GHG emissions over the lifecycle of the project

Resources & Waste

RW.1 To ~~seek to~~ promote sustainable use of resources particularly with respect to aggregate

RW.2 To ~~seek to~~ reduce waste generation and disposal, increase re-use and recycling and achieve the sustainable management of waste

Freshwater Environment & Other Associated Interfaces

FE.1 To avoid adverse effects on water quality (whether surface water, groundwater or coastal waters) in relation to water quality standards

FE.3 To avoid adverse effects on water quality which would affect human health, flora and fauna, recreation and other users

FE.3 To avoid adverse effects on water abstractions (whether surface water or groundwater), particularly those utilised for the PWS

FE.4 To avoid adverse effects to *the water regime of* designated *water dependent* ~~freshwater~~ sites of nature conservation interest

FE.5 To avoid adverse effects to buildings and infrastructure

FE.6 To avoid adverse effects on the soil resource

FE.7 To avoid adverse effects on agricultural land currently in use

FE.8 To avoid adverse effects on designated geological and geomorphological sites of international and national importance

FE.9 To conserve and enhance designated geological and geomorphological site features

Noise and Vibration

NV.1 To avoid adverse effects of negative noise and vibration on (humans) noise sensitive receptors

NV.2 To avoid adverse effects on the acoustic quality of the marine environment

NV.3 To avoid adverse effects on noise (vibration) sensitive receptors

NV.4 To avoid adverse effects through vibration

Migratory & Estuarine Fish

F.1 To avoid adverse effects on designated wildlife sites for fish of international and national importance

F.2 To avoid adverse effects on the populations of other protected fish species and habitats

F.3 To avoid adverse effects on national and local biodiversity target features that include fish habitats and species

F.4 To avoid adverse effects on recreational and heritage fishing

F.5 To avoid adverse effects on commercial fish resources

F.6 To minimise the risk of introduction of non-native invasive fish species

Marine Ecology

ME.1 To avoid adverse effects on designated marine wildlife sites and protected habitats of international and national importance

ME.2 To avoid adverse effects on valuable marine ecosystems

ME.3 To avoid adverse effects on other protected marine species and their habitats

ME.4 To avoid adverse effects on national and local biodiversity target features that include marine habitats and species

ME.5 To avoid deterioration in status class of WFD water bodies

ME.6 To minimise the risk of introduction of non-native invasive marine species

ME.7 To conserve and enhance designated marine site features

ME.8 To restore and enhance marine BAP species populations and/ or BAP habitat

Flood risk and land drainage

FR.1 To avoid an increase in flood risk to property, land and infrastructure where this might otherwise occur as a consequence of the construction and operation of any tidal power structure

Annex B: List of Questions

Overarching Questions (to be taken into consideration throughout the Consultation Document)

1. Is the feasibility study taking the right issues into account?

2. Are there other aspects or other evidence that should be taken into consideration?

3. Have we given due weighting to the different benefits and impacts under consideration in our analysis?

4. Do you think that it is better to wait for new and perhaps less environmentally damaging technologies to be developed, or for economic conditions to improve, or to move ahead more quickly with available proposals?

Regional Economic Impacts Study

5. Do you agree with the conclusions of the DTZ study and are there any other factors that the feasibility study should be aware of?

Financing and Subsidy Mechanism

6. Do you agree with PwC's analysis on ownership and delivery of a Severn scheme?

7. Are there any other options for delivery or subsidy that should be considered? Would they be appropriate for all of the tidal power options under consideration?

8. Government believes that the private sector is best placed to design, build and operate a Severn tidal scheme. Government's role would be to set the conditions in which a scheme could come forward. Do you agree?

Impacts on Energy Markets

9. What are the impacts and potential risks of tidal intermittency on the balancing and energy market?

10. Is it worth considering exploring the option of demand management?

11. Do you consider that a Severn tidal scheme could impact on investment in other energy supply capacity, and if so in what ways?

Short-listing Process

12. Do you agree with the factors that have been used to determine the short-list for further study?

13. Do you agree that the test of economic feasibility should be relative to the cost of other renewables?

14. Do you have any further comments on PB's Options Analysis Report? Please support your response with evidence where possible.

Severn Tidal Energy Proposals

15. Do you agree that the two lagoon options selected for further study represent a good basis for studying the lagoons?

16. Given the short-listing criteria, are there any proposals on the short-list which are not suitable? Please support your response with evidence where appropriate.

17. Does the short-list represent an appropriate level of ambition given the energy potential of the Estuary?

18. Are there any other projects that, in your view, should be short-listed? Please provide appropriate evidence wherever possible and refer to the short-listing criteria.

Strategic Environmental Assessment

19. Which plans, programmes or environmental protection objectives are most significant for this strategic-level environmental assessment?

20. Is there any additional information that could help supplement the baseline data? Any further information relating to the baseline indicators, existing problems and trends over time would be very useful.

21. Is there any important information that has not been addressed in view of the SEA scope?

Next Steps

22. Do you agree with the work plan, as outlined above? If not please specify any other areas to be studied.

Additional Questions on the Strategic Environmental Assessment

23. Is the range of environmental problems, issues and receptors covered appropriate? Is the level of receptor sensitivity appropriate?

24. Is the methodology proposed appropriate for this strategic-level environmental assessment?

25. Are there any major plans or projects that should be included in the assessment of cumulative effects?

26. Are there any changes that should be made to the proposed SEA objectives; including any consolidation of the objectives? Are there any other SEA objectives, assessment criteria or indicators that should be included?

27. Are the relevant aspects of sustainable development covered, if the SEA addresses the issues identified in this SEA Scoping Report?

28. Any further suggestions regarding the scope of the SEA and its proposed assessment of the short-listed options?

Annex C: A-Z List of Respondents to Severn Tidal Power Phase One Consultation

i) Organisations

Allerton Environmental Group
Aquatonics Limited
Archaeology Forum, Institute of Archaeologists
Assembly Member, PC
Associated British Ports
Association of Drainage Authorities
Atlantic Salmon Trust and Salmon and Trout Association
Avon Wildlife Trust
BAM Nuttall
BargeConsult
Barnt Green Fishing Club
Berkeley Town Council
Berrow Parish Council
Bogs Hash and Open Water Swimmers Clevedon
Brean and Berrow Residents Association
Brean Leisure Park Limited
Brean Parish Council
Bridgend County Borough Council
Bristol City Council
Bristol Naturalists' Society
Bristol Ornithological Club
Bristol Port Company
Bristol West Labour Party
British Wind Energy Association (BWEA)
Burnham and Somerset Levels Sea Flood Study Group
Burnham and Highbridge Town Council
Burnham-on-Sea Chamber of Trade & Commerce
CADW
Caldicot and Wentloodge Levels Internal Drainage Board for Wales
Caldicot and Wentloodge Levels Internal Drainage Board for North Somerset
Campaign to Protect Rural England (CPRE)
Cardiff County Council
Cheddar Caves
City and County of Swansea
Cleeve Parish Council
Commercial Boat Operators Association
Compton Bishop Parish Council
Conduit PR
Council for British Archaeology
Country Land and Business Association
Countryside Council for Wales (CCW)
Crown Estate
Devon County Council
Devon Conservation Forum
East of England Rural Forum
EDF Energy
English Heritage
Environment Agency
E-ON UK
Evocati Limited
Exploration
Falmouth Friends of the Earth
Flat Holm Society

Fleming Energy and Bord Gais Eireann
Friends of the Earth (FOE)
Forest of Dean District Council
Frampton on Severn Parish Council
Freight by Water
Fugro GeoConsulting
Gloucester Harbour Trustees
Gloucestershire Association of Parish and Town Councils
Gloucestershire County Council
Green World Trust
GWE Business West
Gwent Angling Society
Halcrow Group Limited
Halcyon Marine Hydroelectric Corporation
Highways Agency
Independent Hydropower Consultant
Institution of Civil Engineers (ICE)
Kingston Seymour Parish Council
Liberal Democrat Severn Tidal Forum
Malvern Wells Parish Council
Manchester University School of Earth, Atmospheric and Environmental Sciences
Mendip Society
MHR Hicks Leisure Limited
Monmouthshire County Council
MP for Wells
National Grid
National Trust
Natural England
Natural Environment Research Council (NERC)
Natural History Museum
Neath Port Talbot County Borough Council
Newport City Council
Northwest Somerset Council
Parents Concerned about Hinkley (PCAH)
Perpetual Power
Peterston-Super-Ely Community Council
Plaid Cymru
Renewable Energy Association (REA)
RE-generation Partnership (University of Wales in Cardiff)
Royal Academy of Engineering (RAENG)
Royal Institute for Chartered Surveyors (RICS)
Royal Town Planning Institute (RTPI)
Royal Yachting Association
Royal Society for the Protection of Birds (RSPB)
RWE Npower Renewables Limited
Save our Severn
Savills
Scottish and Southern Energy
SeBAS
Sedgemoor District Council
Severn Barrage or What? Bristol and Cardiff Public Forums
Severn Estuary (Nets & Fixed Engines) Fishermen's Association
Severn Rivers Trust
Severn Tidal Power Group
Sharpness Dock
Shawater Limited
Somerset Association of Local Councils
Somerset County Council
Somerset County Council – Brent Division
Somerset Wildlife Trust
South Gloucestershire Council
South West Green Party
South West Regional Aggregates Working Party
South West Regional Assembly
South West TUC
Stop the Barrage NOW campaign
Stroud District Council
Sully Community Council
Surfers Against Sewage
Thornbury and Severnvale Branch of the Liberal Democrats
Tidal Lagoons Limited
Town and Country Planning Association
UK Chamber of Shipping
Unite

University of Bristol, Dept of Archaeology and Anthropology
University of Liverpool
Vale of Glamorgan Cabinet
Water Power Engineering
WD Re-Thinking Limited
Welsh Ornithological Society
Welsh Water
Wessex Regionalists Party
Wessex Water
West Mendip Internal Drainage Board
Wetlands and Wildfowl Trust (WWT)
Wildlife Trust
Woodlandscape Design
Woodshed Technologies Limited
World Wildlife Fund (WWF)
Wye and Usk Foundation, Angling Trust, Wye Salmon Fishery Owners Association and United USK Fisherman's Association
Wye Valley Society

ii) Individuals[5]

Acland, T
Adelson, D
Alder, C & J
Allbeury, D
Allen, H
Allliston, A
Alston, B
Andy
Archer, G & D
Ashton, D
Baker, A
Baker, B
Bancroft, M
Banks, L
Bannister, C
Barkla, D & J
Barnes, P
Barrett, A
Barry, M
Bartlett, A
Batcup, M
Bates, D
Batten, M
Battersby, A
Battison, A
Beauchemin, A
Beecher, S
Bennet, D
Bennett, S
Bentley, J
Berkeley, C
Berthoud, L
Best, T
Binnersley, P
Bishop, C
Bishop, E
Bishop, L
Black, M
Black, U
Bland, R
Blaydon, J
Bletsoe, E
Bodley, D
Bool, S
Booth, A
Boss, J
Boston, E & R
Botten, K
Boucher, A
Boulton, A
Bowsher, D
Bradley, D
Bradshaw, G
Brandes, S
Bratby, P
Brian
Briody, J
Britton, C
Brock, H
Brooke, R
Broughton, S
Brown, R
Brunning, J
Buck, R
Buckett, M
Buist, J
Burlington, J
Burrows, J
Bursell, M
Butterton, D

5 19 anonymous responses were received also.

Buttery, P
Callard, M
Camden, K
Cannings, F
Carpenter, T
Carr, D
Carrick, H
Cartwell, L & Learwell, S
Cave, L
Chandler, R
Chaplin, S
Chapman, J
Charlesworth, D
Chatterton, R
Cholerton, C
Chopping, R & M
Christopher, J
Clark, H
Cleator, C
Cleaver, M
Clifford, P
Clifton, B
Clutterbuck, E
Cohen, D
Cohen, D
Cole, J
Coleman, J
Coney, J
Conridge, P
Conroy, S
Constable, T
Cooke, T
Coppin, J
Costen, A
Cottrell, R
Craven, A
Craven, P
Crispin, R
Croft, B
Croome, S
Croome, S
Cross, B
Crutchley, A
Cudlipp, W
Cullen-Jones
Dando, J
Darling, S
Darton, G
Davidson, R
Davies, A
Davies, E
Davies, K
Davis, A
Davis, P
Day, C
De Lacy, H
Debenham, A &
Jurgensen, J
Dee, B
Dennison, B
Dodwell, E
Donaldson, P
Dove, S
Downing, P
Dugmore, A
Dutton, I
Dye, C & J
Dyke, J
Dyson, R
Earle, P & M
Early, K
East, M
Edginton, C
Edwards, A
Edwards, J
Edwards, V
Eggleton, R
Elcock, B
Elderfield, N
Elkington, P
Elliot, J
Elliot, P
Ellis, L
Elvin, Y
Elwell, P
Endsor, R
England, T
English, E
Etty, V
Evans, M
Eyre, R
Farndon, D
Farr-Cox, F
Ferguson, H & A
Ferrier-Williams, D
Ffoulkes, L
Fidler, A
Fieldhouse, M
Filleul, K & V
Finch, B
Finch, D
Fletcher, C
Fletcher, T
Flint, J
Flint, S
Ford, S
Forteath, A & R
Fox, R
Fuller-Hazelden, E
Gamon, J
Gard, P
Gardner, F
Garnett, B
Garrison, J
Garvey, E
Gee, A
German, D
Gething, J
Gibbins, P & B
Gibbs, R & C
Gibson, J
Gilchrist, C
Gill, W
Glas, J
Glen, D
Glossop, C
Goldthorpe, R & S
Golothan, D
Goodfellow, P
Gordon, D
Gorringe, D
Graham, M
Graham-Hunt, R
Graves, N
Gray, D
Gray, J
Green, D
Greenough, B
Greenwood, D
Gwynne, N
Hall, K

Hamar, R
Hanbury, J
Hann, D
Hannay, S
Harborne, R
Harling
Harper, J
Harraway, R
Harrington, S
Harris, P
Harrison, J
Harrison, R
Harrison, S
Harry, E
Haslam, H
Hawkins, M
Hayward, A
Hayward, M
Hazel, M
Headen, M
Heathcote, R
Heppell, B
Hewitt, E
Hewitt, E
Heyes, J
Hill, A
Hill, K
Hill, S
Holden, J
Holden, M
Holland, J
Hollington, J
Homer, H
Homes, S
Houssart, J
Howard, K
Howard, R
Howe, S
Howells, W
Howes, S
Hoyland, P
Hozier, A
Hudson, B & A
Humby, G & P
Humphreys, E
Hyde, J
Hytch, D
Ireland, M
Irving, W
Isaacs, J
Jackman, J
Jackman, M
Jackson, J
Jacobs, B
Jaggers, C
James, M
Janes, M
Jarrett, C
Jeffery, A
Jeffrey, M
Jeffrey, M
Jenkins, C
Jenkins, R
Johnson, L
Johnson, W
Johnston, J & I
Jolley, D
Jon
Jones, M
Jones, M
Jones, S
Keele, G
Kelly, B
Kelly, B
Kelly, S
Kerby, M
Key, P
Kiddell, D
Kilshaw, I
Kimber, R
King, I
King, S
Kinnersley, P
Kirk, J
Knight, J & S
Laborde, M
Laborde, S
LaMonica, A
Lander, H
Langton, R
Lawrence, J
Lawrence, S
Lawson, R
Lee, J
Lee, R
Leece, G
Lees, N
Lennon- Wood, J
Leslie, R
Lewis, C
Lewis, J
Lewis, M
Lilly, C
Llewellyn, N
Lloyd, E
Lock, S
Lodge, B
Long, G
Long, K
Looker, J
Lord, G
Love, C
Love, L
Love, R
Love, S
Lowe, M
Lowy, J
Lucena, G
Lugg, B
Macallistor, D & Davies, L
Macho, A
Maciag, A
Mackay, M
Main, M
Maister, R
Marle, B
Marriott, J
Martin, C & E
Martin, P
Martyn, D
Maskall, M
Maslen, C
Mauger, P
Maurice, K
McAllister, D
McEvoy, D
McGeoch, J
McHugh, S
Metcalf, C
Miller, C
Miller, R

Mills, D
Milner, P
Minter, B
Model, D
Moncrieff, J
Moon, S
Moore, E
Morgan, E
Morris, D
Morris, I
Morris, S
Mugnaioni, J
Murray, A
Murrin, P
Myhill, C
Nash, L
Nash, R
Nellins, C
Nettleton, J
Neve, A
Newbould, P
Nicholas, B
Nicholas, J
Nicholas, L
Nicholls, A
Nicholls, F
Nottage, L & R
Novak, J & J
Nursaw, F
Nursaw, L
O'Callaghan, M
O'Donovan, P
Osborne, J
Owen, C
Owen, G
Palmer, A
Palmer, J
Palmer, M
Panton, N
Parfitt, A
Parkhouse, G
Parsons, A
Parsons, R
Paul, I
Pears, C
Pearson, R
Pearson, S
Pencavel, R
Penn, E
Pethers, D
Phillips, D
Phillips, N & V
Phipps, J
Picken, V
Pitman, J
Player, A
Pollard, R
Pool, O
Porter, M
Powel, P
Powell, T
Pratt, N
Preen, A
Preston, D
Price, S
Prince, B
Prince, J
Pryce, L
Prytherch, R
Puxley, R
Rabone, C
Rachel
Radcliffe, R
Rainey, C
Rees, J
Rees, R
Reeve, N
Regelous, K & R
Relton, Z
Revely, C
Rhodes, C
Richard
Richards, H
Richardson, T
Richert, S
Richter, V
Ritchie, J
Roberts, D
Rofe, B
Rogers, J
Rose, C
Rose, E
Rowett, R
Rowley, J
Ruddy, J
Rundle, W
Russell, J
Saltman, S
Savage, M
Scheffer, I
Schindehutte, F
Scott, C
Scott, M
Seymour, F
Shah, N
Sharpe, R
Shatford, D
Shaw, P
Shepherd, M
Sheppard, R
Simpson, C
Skinner, S
Slowe, P
Smart, B
Smetham, S
Smith, D & P
Smith, E
Smith, J
Smith, K
Smith, M
Smith, M
Smith, P
Smith, P
Smith, R
Smith, S
Smith, S
Speake, P
Speht, R
Spencer, C
Spencer, V
Spicer, A & L
Spiller, R
Spittle, D
Stabb, J
Stallybrass, A
Stanforth, H
Stanley, A
Stephenson, J
Stephenson, L
Stewart, W
Stiling, L

Stockdale, T
Stone, A
Stoneham, J
Street, P
Street, R
Strickland, D
Strickland, P
Stringer, R & S
Stuckey, C
Symonds, M
Tait, W
Talbot, D
Talbott, B
Taylor, J
Theobald, P
Thomas, G
Thomas, R
Thomas, R
Thompson, P
Thrift, A
Thwaites, W
Torrens-Spence, J
Trevor
Tsibu-darko, S
Tucker, K
Tucker, V
Turner, A
Turner, B
Turner, H
Turner, J
Turner, K
Tuttle, H
Tyler, A
Upton, J
Varnam, B
Vijeh, L
Vliet, A
Wade, S
Wadey, S
Wain, N
Wallbank, R
Walsh, J
Walton, L
Ward, V
Warden, P
Watson, L
Watts, J
Webber, B
Webster, M
Wells, T
West, N
Westlake, J
Weston, M
Whitby, G
White, A
White, G
White, J
Whitehead, K
Whittle, J
Wicks, E
Wilk, A
Williams, A
Williams, C
Williams, E
Williams, P
Wills, H
Wilson, C
Wilson, K
Wilson, P
Wodd, K
Wood, C
Woodman, S
Wooff, C
Wray, C
Wright, J
Youdale, G
Young, A

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