The background of the entire page is a close-up photograph of water ripples, showing concentric and irregular patterns of light and dark blue-grey tones. The ripples are most prominent in the upper and lower sections of the page.

A Tidal Solution - The Way Forward

Report and Position Paper on the
Development of Tidal Energy
in the Severn Estuary and Bristol Channel

By the Liberal Democrat
Severn Tidal Forum

Contents

Contents	3
Foreword	4
Membership	6
The Report	7

Foreword

Over the past decade climate change has become big news – it has dominated the political agenda in the World, Westminster and Wales and with good reason. The Liberal Democrats are proud of our track record of strong policies on the environment and we firmly believe in the need to make swift progress towards securing a clean, green and affordable energy supply for the future, to meet Britain's energy needs from non carbon emitting sources.

We are deeply concerned that within the next decade Britain could be facing a major shortfall in energy supply. In 2006 the UK Government's own energy review consultation warned that by 2020 we are likely to be importing around three quarters of our primary energy, yet despite this the current Government is still running behind the climate change clock.

The Government has failed to make sufficient progress towards securing alternative supplies of electricity from renewable resources and on its own timetable no decision will be made on the use of tidal power in the Severn Estuary and Bristol Channel until at least 2011 - well after the next general election. The proposal to build a barrage between Brean Down and Lavernock Point¹ could not be completed until around 2030. We simply cannot afford to wait this long.

Liberal Democrat parliamentarians and councillors from Wales and the South-West of England are spearheading this report and its recommendations, which will emerge as a motion to the party's Federal Conference in September this year. Our goal is to maximise renewable energy production from within the Severn Estuary, to contribute towards securing a green energy supply for the future, subject to the following four principles:

- That we minimise unnecessary environmental and ecological damage
- That we maximise overall reductions in greenhouse gases, taking account of both long-term targets and the need to start reducing our emissions as soon as possible
- That we propose realistic and achievable solutions
- That we are open to combinations of technologies where these will deliver a better long-term solution than putting all of our eggs in one tidal power basket

¹ Often referred to as the Cardiff – Weston Barrage

We are recommending an incremental approach, starting early, which will increase our green electricity production over the next 15-20 years. Our proposals are based on the need for rapid progress to secure a green energy supply for the future, the impact on the environment and local economies and on the cost of electricity production.

We have taken evidence from a wide range of sources, both written and oral. We have looked at the evidence provided to the Government as part of its feasibility study and have examined the potential environmental and economic impacts of a variety of options for the generation of tidal power from the Severn Estuary.

In conclusion we support a range of measures which include:

- Swift progress towards the construction of a “Shoots” Barrage – close to the line of the second Severn Crossing, which could also carry a high speed rail link to relieve the 120 year old Severn Tunnel.
- An investigation into the possibility of the siting of slim-line wind turbines along the Shoots Barrage to maximise the potential energy that would be generated from this development.
- Urgent development of a pilot lagoon to the seaward side of this barrage.
- Sufficient research and development resources to be made available to progress the Tidal Reef proposal from Aberthaw to Minehead – devoting well in excess of the meagre £0.5m being made available by the Government for all research into alternative innovative options.

Taken together, a Shoots Barrage and pilot lagoon could provide well in excess of 1% of the UK’s electricity needs within the next 10 years. Together with an eventual Tidal Reef, which could be completed within a comparable timescale to a Brean Down-Lavernock Point Barrage our recommendations would produce upwards of 8% of current UK electricity demand from renewable sources, without the immense environmental impact of a large barrage.

Our proposals are exciting and would enable the UK to be well on the way to meeting and exceeding our international obligations without resorting to new nuclear power generation.

We commend them to the Liberal Democrat party and to the people of Britain.

April 2009



Michael German AM
Co-Chair



Steve Webb MP
Co-Chair

Membership

Chairs:

Michael German – AM for South Wales East
Steve Webb – MP for Northavon

Members:

Brian Mathew – PPC for North Somerset
David Hando – Councillor, Newport City Council
David Heath – MP for Somerton and Frome
Jenny Randerson – AM for Cardiff Central
Jenny Willott – MP for Cardiff Central
John Gault - Forest of Dean Liberal Democrats
Lord Richard Livsey of Talgarth – Liberal Democrat Welsh Affairs Spokesperson – House of Lords
Mark Wright – Councillor, Bristol City Council & PPC for Bristol South
Martin Horwood – MP for Cheltenham & Liberal Democrat Shadow Environment Minister
Mick Bates – AM for Montgomeryshire & Welsh Liberal Democrat Shadow Minister for the Environment and Sustainability
Peter Tyzack – Councillor, South Gloucestershire Council
Simon Wakefield – Councillor, City & County of Cardiff
Stephen Williams – MP for Bristol West

The Liberal Democrat Severn Tidal Forum would also like to thank the staff of the Welsh Liberal Democrats in the National Assembly for Wales, who have volunteered their time to service this inquiry, and in particular to Sian Anne Cliff, Rachael Hitchinson and Ben Lloyd for all their efforts.

We would also like to thank all witnesses who gave oral evidence to this inquiry:

Dr Robert Kirby – Sedimentologist
Dr Tim Stowe - Director RSPB Wales
Jonathan Wynn - Geotextile Construction Consultant
Michael Evans - Environment Agency Wales
Neil Crumpton - Friends of the Earth
Patrick Kearon - Director of Public Affairs, Bristol Port Authority
Peter Gough - Environment Agency Wales
Professor Roger Falconer – Halcrow Professor of Water Management, Hydro-Environmental Research Centre, Cardiff University School of Engineering
Professor Brian Morgan - Creative Leadership and Enterprise Centre, UWIC
Rupert Evans – Evans Engineering

Please see Appendix I for a full list of all written evidence received – we are grateful to all who contributed.

The Report

Purpose of the Report

This report provides the basis for a motion to the Liberal Democrat Federal Party Conference in September 2009. If passed, this would become Party policy for the coming general election, expected in 2010.

The report represents the views of Liberal Democrat parliamentarians representing constituencies and regions in Wales and the South-West of England together with Liberal Democrat councillor representation from the local authorities served within the region.

The study has taken nearly a year to undertake and evidence has been taken directly and indirectly from a range of stakeholders. A full list of evidence received is attached.²

Liberal Democrat Policy on Renewable Energy

The Liberal Democrats were the first party to support a zero carbon Britain by 2050, with firm policies to tackle carbon emissions from every part of the economy and a commitment to 100% carbon free, non nuclear electricity by 2050. Liberal Democrats have set a target of 30% of the UK's electricity to come from clean, non carbon emitting sources by 2020, rising to 100% by 2050.

The Liberal Democrats are deeply concerned that current Government policies will not be sufficient to reach the UK target to provide 15% of energy consumption from renewable energy sources by the year 2020. We have huge resources of wind, wave, tidal, solar and even geothermal power that are currently untapped. We have an enormous opportunity to create real energy independence for the UK and as a party we want to see a real boost in renewable energy, to free ourselves from the shackles of foreign oil, coal and gas.

Over the past few decades research into alternative forms of energy such as tidal energy has been put on the back-burner in favour of the nuclear option. The current Labour Government determination to push

² See Appendix I at http://welshlibdems.org.uk/e-whatwebelieve_theme.php?themeNo=7

forward an expensive programme of new nuclear power stations at immense expense to the taxpayer will continue to undermine the potential for an increase in renewable energy and energy efficiency measures.

The Liberal Democrats do not believe that nuclear power is the answer to our energy crisis. Not only does the nuclear cycle release carbon emissions which will not help combat climate change, but added to this are the problems of radioactive waste storage, the length of time taken to decommission sites and the implications for our health. The Nuclear Decommissioning Authority has admitted that the cost of cleaning up the liabilities from existing nuclear power stations could be as much as £70billion although other estimates place this as high as £160billion³.

The UK has the natural resources to compete in a global market and become a world leader in the low carbon economy of the future. In rejecting nuclear power the Liberal Democrats continue to push forward strong policies on renewable energy which can be brought on-stream faster and provide us with a clean, green energy supply. By harnessing our natural resources we will also have the added benefit of stimulating a green revolution in the UK, with jobs and businesses that help the environment, so that we can move towards sustainable green development and a brighter future.

Renewable energy is no longer a pipe-dream. It is realistic and achievable. Just as Britain invested in the North Sea in the 1970s to transform our energy prospects through oil production, we must today make similar investment in renewable technologies to harness Britain's vast renewable energy resources, combined with major reductions in energy consumption, so that we can play our part in the climate change challenge.

The Current Government Position

There are serious concerns that within the next decade Britain could be facing a major energy crisis. Leading energy research indicates that by 2015 the UK could be facing a generating capacity shortfall of 7-16GW, equivalent to about 20% of current capacity. This does not even take into account analysis (by the International Energy Agency) that global energy demand is set to increase by 53% by 2030.

The UK Government has set the following targets on renewable energy and climate change:

- To reduce the UK's carbon dioxide emissions by 20% from a 1990 baseline by 2010.
- Reduce our UK greenhouse gas emissions by 80% by 2050.
- To reduce greenhouse gas emissions by 12.5% below 1990 levels by 2008-2012 as part of the Kyoto Protocol.
- Reduce greenhouse gases by 15-30% by 2020 below a 1990 baseline as proposed by the European Union.
- Produce 10% of energy from renewable sources by 2010, rising to 15% by 2020 in order to contribute to the EU target to produce 20% of overall EU energy consumption to be from renewable sources by 2020.

The UK Government has also been advised by the Committee on Climate Change that to meet our 80% target on greenhouse gases we must produce largely zero carbon electricity by 2030. However renewable sources currently account for just 4.6% of the UK's domestic electricity supply and current policies are unlikely to achieve more than half of the Government's own target of 10% by 2010.

Of the 27 EU Member States in 2006, Austria, Sweden and Latvia produced the highest amount of energy consumption from renewable sources, with Austria's renewable energy production standing at 56.6%, Sweden at 48.2% and Latvia 37.7%. Bulgaria and Hungary have already met and exceeded their 2010

³ Independent, 2 April 2007

target, with Bulgaria producing 11.2% of energy consumption from renewable sources against a target of 11% and Hungary producing 3.7% against a target of 3.6%.⁴

The UK Government together with the Welsh Assembly Government commenced a feasibility study of the tidal potential of the Severn Estuary in January 2008. Preliminary findings are due at the end of 2010, with final decisions to be made in 2011. This places the UK in the slow lane of decision making, given the urgent need to make a start towards meeting our international commitments on climate change.

The current aging fleet of nuclear power stations will soon be decommissioned with many already operating beyond their original design lives. Even the Government admits that there is unlikely to be much in the way of new nuclear generated electricity on stream before 2020.

The Liberal Democrats recognise the urgent need to take action to tackle climate change and therefore favour investment in a wide portfolio of renewable energy sources - reflected by our conclusions to this inquiry. A decentralised energy policy is crucial if we are to resolve tomorrow's energy crisis today and make progress towards meeting our national and international targets on climate change.

The Government's Severn Tidal Power Feasibility Study Consultation

We welcome the UK Government commitment to harnessing the power of the Severn Estuary. However, its lengthy timescale for completion of the feasibility study demonstrates its inability to grasp the fundamental driving principle of climate change. The abatement of carbon emissions must start now rather than in 2030, when they anticipate the Brean Down to Lavernock Point Barrage would be completed.

The Government has failed to be ambitious and to consider more innovative proposals that could offer a more cost effective and environmentally friendly option for the Severn Estuary and Bristol Channel. We are disappointed that the Tidal Reef proposal in particular has not formed part of the feasibility study shortlist. By ruling out technologies from the shortlist simply because they are less well developed and by allocating only £0.5million of funding into research and development for all alternative proposals such as Tidal Reef and Tidal Fence, the Government has effectively fact ruled out the possibility and potential for more effective solutions.

The Government seems determined to press ahead with the Brean Down-Lavernock Point Barrage. We believe that it is relying far too heavily on a large barrage alongside its nuclear power plans to solve our energy crisis. Yet neither of these will enable the Government to meet the UK and European target of sourcing 20% of energy demand from non carbon emitting sources by 2020.

Our Conclusions

There are a range of issues which need to be balanced when reaching a conclusion on harnessing the tidal power of the Severn Estuary and Bristol Channel:

- A timescale which meets the need to reach and exceed the targets set by the UK and European Union to play our part in combating climate change.
- To balance development in the Severn Estuary and Bristol Channel with environmental concerns.
- To achieve value for money and to ensure that expenditure needs meet realistic estimates of available funding.
- To ensure that electricity supply can be built up over time, providing opportunities for making incremental investment in securing increasing amounts of electricity supply over time.
- To secure economic benefits for the Wales and South-West of England region.
- To secure environmental advantage, such as the ability to prevent or reduce the possibility of flooding.

⁴ European Commission Website: http://ec.europa.eu/energy/publications/doc/statistics/ext_renewables_gross_electricity_generation.pdf

A solution which relies solely on a barrage would have the significant disadvantage of producing a vast amount of power concentrated in twice daily bursts based on tidal flow – not always at times when we need it, so while the aggregate power is good, usability is not. Our proposals offer a mix of schemes, permitting electricity generation over a much wider daily time span.

We have examined these issues and have reached the conclusion that the most advantageous solution is as follows:-

- **The construction of the Shoots Barrage close to the line of the second Severn crossing.**
- **An investigation into the possibility of a closely spaced series of slim-line wind turbines along the length of the Shoots Barrage, to boost power generation and create a visually striking profile.**
- **A pilot tidal lagoon project on the seaward side of the barrage.**
- **Significant investment into alternative technologies, in particular the Tidal Reef proposal, as well as further research and development into energy storage solutions.**

In reaching this conclusion we recognise the immense environmental importance of the Severn Estuary with international and national designations as a Special Protection Area (SPA), a Ramsar site, a possible Special Area of Conservation (SAC) and a Site of Special Scientific Interest (SSSI) and with many areas behind the seawall being SSSIs and SPAs. We believe that our proposals offer the best solution taking into account the need to harness the tidal power potential of the Severn Estuary, to increase our renewable energy capacity within the UK as well as the need to protect and preserve this unique environment and mitigate the impact on habitats within the estuary.

In ruling out the barrage from Lavernock Point to Brean Down we are also conscious of the difficulty entailed in identifying compensatory habitat for the species and habitats put at risk by any development in the Severn Estuary and the significant legal challenges which may arise from this requirement, which would further extend the timescale within which a large barrage could be built.

The Shoots Barrage offers the potential for a high speed rail link to relieve the ageing Severn Tunnel and to permit the electrification of the London – South Wales mainline. Combined with an investigation into the potential for a series of slim-line wind turbines to be located along the barrage to boost power generation, we believe this will make the most effective use of the barrage, helping to reduce our carbon emissions from transport as well as increasing the renewable energy capacity of this area.

Our proposal also recognises the problems of large power surges and thus includes a pilot lagoon, with the possibility of further lagoons built incrementally, to enable power generation over a staggered period of time. It also permits the possible construction of a Tidal Reef from Minehead to Aberthaw, which has the potential to generate an immense amount of energy with minimal comparative damage to the environment.

There has been insufficient investment into research and development for alternative marine and tidal technologies. Allocating only £500,000 for research into all alternative options for harnessing the tidal power of the Severn Estuary is clearly insufficient. We recommend that the Government increases this amount using finance from the Marine Renewables Fund, to encourage more innovation for technologies that will be the next generation in renewable energy.

There are a number of further studies to be made on the impact of harnessing the tide in the ways that we have proposed. Our clear statement of a route map for electricity generation in the Severn Estuary and Bristol Channel will provide strong focus for those studies and produce a swifter response time to the inevitable challenges that the proposals raise – such as siltation, loss of natural habitats, the most effective fish pass regimes, access to aggregates and safeguarding port facilities.

We believe that our proposals offer an exciting package with an incremental approach which will see the development of long-term solutions that can begin producing clean energy within a much shorter timescale than a Brean Down-Lavernock Point Barrage, whilst in the meantime ensuring investment in new and innovative technologies that can be brought on-stream in the future.

In the immediate future energy saving and energy efficiency is the most cost effective investment that we can make to reduce our carbon emissions. The development of established technologies such as wind, water, biomass, solar, investment in better buildings, engine efficiency, greener fuels, lighting and fuel substitutes are all needed to sit alongside medium and long term solutions. Immediate investment in innovative British engineering solutions for harnessing the power of the Severn and Bristol Channel will also help to provide a greener mix to UK energy generation, boost UK job opportunities and make the UK a world leader in tidal energy technology.

Shoots Barrage

The Shoots Barrage would cost £3.2bn and provide 2.7TW hours of electricity per year (nearly one percent of the UK's electricity needs). It would save 1.2M tonnes of carbon dioxide emissions annually. It would consist of a 4.1km long structure, constructed within a 4 year period which is even quicker than lagoons and significantly quicker than a barrage from Brean Down to Lavernock Point and would not require the major alterations to the current electricity grid system that other barrage proposals would entail.

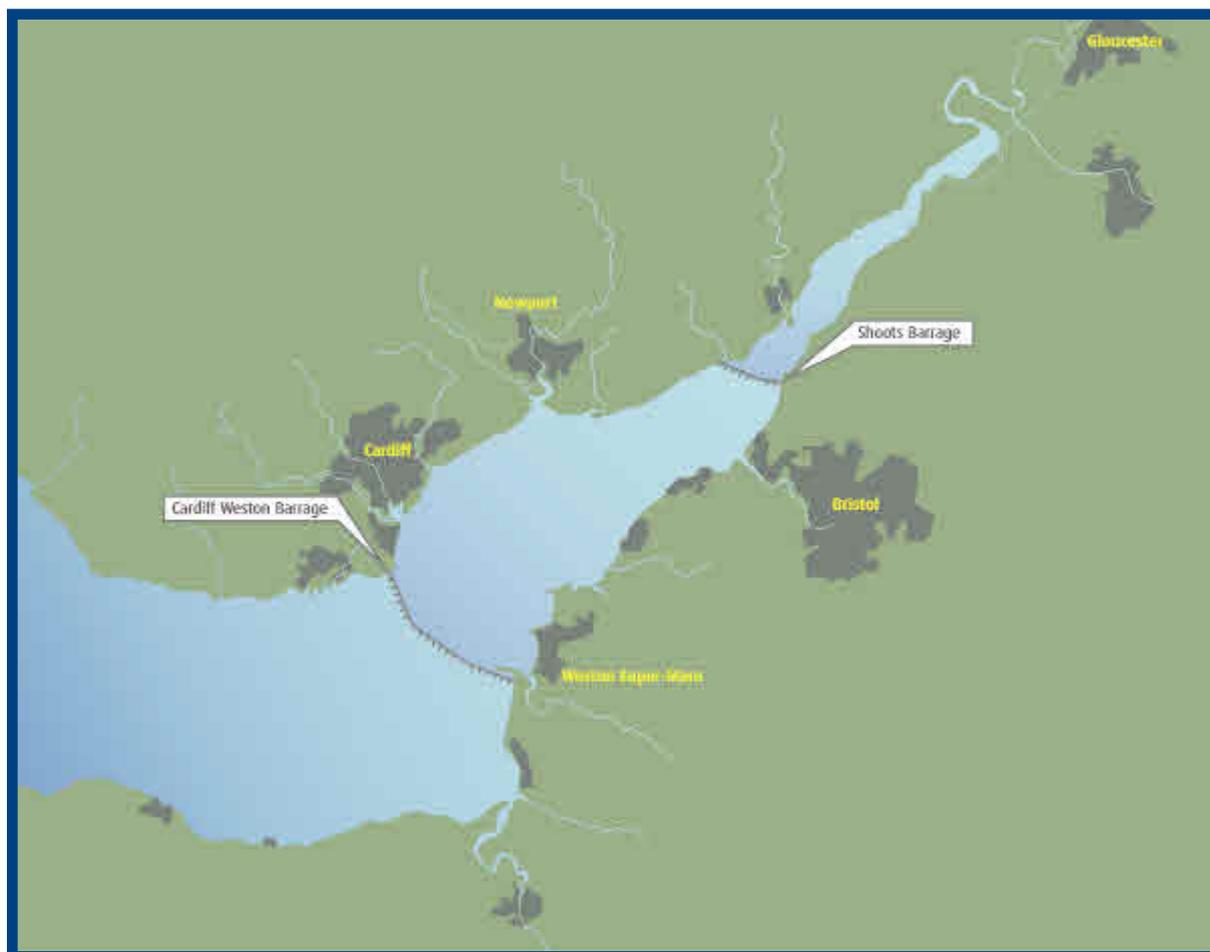


Figure 1: Proposed location of Shoots Barrage compared to Brean Down-Lavernock Point Barrage ⁵

⁵ Source: Sustainable Development Commission – ‘Turning the Tide’ October 2007 page 73 <http://www.sd-commission.org.uk/pages/tidal-power.html>

The Shoots Barrage offers the cheapest electricity per unit⁶ and is the most economically viable in terms of getting finance⁷. By virtue of its location it would provide a significantly higher load potential than the Brean Down-Lavernock Point Barrage. In addition it could have a rail link, providing potentially higher speeds on the London – South Wales rail line and could support the siting of a number of slim-line wind turbines to maximise energy generation capacity.

Environmental Impact:

In terms of environmental impact, it is estimated that the Shoots Barrage would cause a 20% loss of inter-tidal habitat compared to an 80% loss of inter-tidal habitat for the Brean Down-Lavernock Point Barrage 8.

The following conclusions of the Sustainable Development Commission are also noted:-

“In relation to a Shoots barrage, the loss of inter-tidal area would be considerably less and the resulting impact on birds would be significantly less than for a Cardiff-Weston scheme. Many key areas of bird usage are seaward of the Shoots barrage line. Dunlin, for example, is rarely found above this line so the impact on this species would be minimal.”

The effects on fish are very much influenced by the location of a barrage within the estuary. The Shoots Barrage, higher up the estuary, would not ‘block’ the River Usk (a SAC in its own right) and so the impacts for fish (especially Shad, Lamprey and Salmon) would be directly reduced and the overall reduction of leaving one of the key protected rivers ‘open’ could be material.

Economic Impact:

The current 120 year old Severn Tunnel is a bottleneck for rail traffic and currently stifles any potential to develop high speed rail as an alternative to short haul flights. The long overdue electrification of the line from London, if taken over a Shoots Barrage, would open the way for Eurostar to serve Cardiff. The potential for reduced journey times of just 70 minutes between Cardiff and London would provide a significant boost to the tourism potential of the region, as well as offer enormous benefit to those using

⁶ **Table 1:** The estimated cost (2006) of electricity generated from the Brean Down-Lavernock Point barrage at four different discount rates and two different time build scenarios, with a repayment period of 40 years.

Construction Duration	Cost (p/kWh) at four discount rates			
	3.5%	8%	10%	15%
Brean Down - Lavernock Point 5 year construction period	4.57	8.93	11.43	19.15
Brean Down - Lavernock Point 5 year construction period	4.72	9.67	12.64	22.39
Shoots Barrage middle scenario	4.03	7.08	8.79	13.92

⁷ **Table 2: The Severn Tidal Power Feasibility Study short-listed and innovative schemes**

Note: Innovative options which are not short-listed in italics

Option	Cost	Output TWh/yr	% UK electricity	Estimat-habitat loss
Shoots Barrage	£3.2 bn	2.7	<1	20
Beachley Barrage	£2.3 bn	1.6	<<1	14
Fleming Lagoon	£4.0 bn	2.3	<1	26
Bridgewater Bay Lagoon	£3.8 bn	2.6	<1	22
Cardiff-Weston Barrage	£20.9 bn	16.8	5	80
<i>Tidal Reef</i>	<i>£19.3 bn</i>	<i>13-20*</i>	<i>5-7*</i>	<i>25*-32</i>
<i>Tidal Fence</i>	<i>£6.7 bn</i>	<i>3.3</i>	<i>1</i>	<i>10</i>

Source: Technical Options Report; * The tidal reef’s output is estimated at 20TWh/yr in the Atkins Tidal Reef Report and loss of inter-tidal habitat at 25%;

⁸ See Table 2

Bristol Parkway and stations in South Wales and provide added impetus to the development of a Gwent Parkway station at Severn Tunnel Junction, Rogiet.

The La Rance Barrage in North Western France has proved to be a tourist attraction in its own right and there is no reason why the proposals we have outlined should not also act as a visual attraction for tourists. A Shoots Barrage would also increase the potential for upstream leisure activities currently unavailable due to the tidal currents.

Inward investment in the area would lead to increased land and property values and the creation of thousands of short and long term employment opportunities, which should be retained within the local region to enhance the economic prosperity of the surrounding area.

We recognise that there will be an impact upstream on the River Wye which supports a huge amount of fishery tourism. Whilst we believe that the impact on fish will be easier to mitigate with a Shoots Barrage as opposed to a Cardiff-Weston Barrage, careful work is needed to minimise this impact and to preserve our valuable fish tourism industry.

Lagoon Pilot

According to the Technical Options Report of the Severn Tidal Power Feasibility Study the lagoons on the proposed shortlist would lead to a 22-26% loss of inter-tidal habitat, compared to an 80% loss for the Cardiff-Weston Barrage⁹. Comparative costs of electricity output estimated by Tidal Electric and the DTI for the proposed Swansea Bay tidal lagoon project produced diverse figures¹⁰. However without an existing tidal lagoon development it is difficult to estimate the potential economic and environmental impact of this technology.

Lagoons have the advantage of additionally acting as pump storage systems, smoothing intermittency from other renewable sources such as wind and a tidal barrage. They would produce electricity close to the major demand centres in South Wales and South-West England, ensuring grid security and reducing transmission loss and would not be an impediment to shipping.

A lagoon pilot is needed to enable consideration of the impact on the hydrodynamics within the Severn Estuary and to identify likely impact. The pilot would provide real life data on the economic and environmental viability of lagoons, however its primary purpose is not about how to generate power from the estuary or how to build a lagoon in a marine environment – it must establish the local impact of a lagoon in a dynamic estuary environment therefore the pilot must be situated within the Severn Estuary.

⁹See Table 2

¹⁰Source: Sustainable Development Commission – ‘Turning the Tide’ October 2007 page 61 <http://www.sd-commission.org.uk/pages/tidal-power.html>

Unit cost of output (p/kWh)	Capital cost (£m)	Annual output (Gwh/y)	Discount rate			
			3.5%	8%	10%	15%
Tidal Electric Ltd	£81.5m	187	2.05	4.15	5.13	7.67
DTI-commissioned Review	£255m	124	8.7	18.39	22.91	34.63

Tidal Reef

We are excited about the potential for the Tidal Reef proposal, which would produce more electricity than the Brean Down-Lavernock Point Barrage, cost less and by using a lower two metre head to operate would have a lower environmental impact. With an estimated loss of inter-tidal habitat of 25-32% compared to 80% for the Cardiff-Weston Barrage and the potential to generate 5-7% of UK electricity compared to 5% for the large barrage, we believe that the Tidal Reef proposal firmly justifies the additional investment to bring this concept to development stage so that it can be comparatively assessed with other options on the UK Government feasibility shortlist.

WS Atkins has produced a report on the feasibility of the Evans Engineering Tidal Reef project which concludes that:

- it would be feasible for this concept to generate 20TWh of electricity per year - more than the Cardiff-Weston barrage proposal of 17TWh
- it is probably economic and would cost £2bn less than the Cardiff-Weston barrage proposal
- it could be developed to a project design stage with £0.5m within the two year timescale of the Government Feasibility Study.

This proposal needs to be taken forward urgently, with Government support, to both design and development stages, so that it could be implemented within a timescale not dissimilar, or even earlier, than that proposed for the Brean Down-Lavernock Point Barrage. Early investment into this technology could also offer the potential to influence the technology used along the Shoots line and still incorporate a rail connection.

Storage Research

The Government must invest in future technologies through significantly increasing funding for research into energy storage solutions. This will offer the potential to increase the efficiency of many intermittent technologies such as wind energy which currently suffer from fluctuations in energy production and also has a clear link to research on lagoon technologies, which have the additional benefit of acting as water storage basins for electricity generation at peak demand times.

Additional considerations

Fish Pass Technology

Although no technology is benign we do acknowledge that barrages and lagoons present a major problem for fish. The Severn Estuary supports a range of migratory and marine fish species, including salmon, twaite, allis shad, sea and river lamprey, eel and sea trout. The Severn is one of only four rivers in the UK which are known to support spawning twaite shad.

According to the SDC report 'Turning the Tide', a barrage would affect fish species in a number of ways: the physical presence of the barrage, including turbine designs, rotation speeds, fish pass size and location and patterns of generation, changes to water quality including dissolved oxygen, turbidity and contaminants, increases in prey on juveniles by birds and fish, change in prey resources, changes to spawning and feeding grounds and delays to migration¹¹.

Minimising the impact on fish populations is crucial. Our evidence has highlighted that as fish are attracted by fresh water they can be encouraged to take a particular path through water by pumping fresh water into the route we wish them to take. Feeding these routes with the relevant organic compounds may also assist. However increased investment is needed into high quality research to

¹¹ Sustainable Development Commission – 'Turning the Tide' October 2007 page 100 <http://www.sd-commission.org.uk/pages/tidal-power.html>

resolve these issues and to develop the most advanced fish pass technology so as to minimise damage to fish stocks, particularly in the River Wye which will be most affected by the developments proposed.

Shipping

Any barrage will have an impact on the ports within the Severn Estuary and Bristol Channel. 3% of UK seaborne trade, some 17.2million tonnes of cargo, moves through ports in the areas investigated. It is difficult to estimate the effect a particular barrage location may have on trade in the region, but toll charges and delays resulting from the barrage would make alternative ports more attractive to shipping firms.

Bristol Port today accepts very large ships up to 130,000 tonnes deadweight and 34% of containers currently go into the port, but it is limited by a ship lock up to 14.5metres draught. With the Department of Transport estimating an increase in containers from some 7million today to 20million by 2030, the Bristol Port Company has submitted proposals for the construction of a non locked deep sea container terminal with an annual capacity of 1.5 million containers, able to handle extra large containers of up to 16metre draught.

Bristol, Newport and Cardiff Ports are close to population centres. They have significant economic and CO₂ advantages through reducing the distance that cargo must travel overland. We agree that the Brean Down-Lavernock Point Barrage would result in major loss of trade to these ports which would have a knock-on impact on the environment and economy within the region.

We believe the Shoots Barrage and lagoon provides the best balance between the need to harness the tidal power of the Severn Estuary given the urgency of climate change and the need to protect the existing economy and infrastructure within the region. We must ensure the use of appropriate locks which would minimise the detrimental impact on ports upstream of the Shoots Barrage including Sharpness, Gloucester and the heritage harbour facilities at Chepstow and Lydney.

Ebb and Flow

Current proposals are for generation in one direction only, however there are considerable benefits to two-way generation of electricity, both in terms of load and timing. We are very interested in the potential for the Tidal Reef proposal to generate electricity on both the ebb and flow tides; however more research is needed to determine whether generation in both directions can be achieved without increasing environmental damage or creating further siltation problems.

Sustainable Procurement

We must use the most sustainable construction processes possible for the Shoots Barrage, lagoons and future developments. This is particularly important for the sourcing of aggregate. However, we cannot simply dig out parts of Monmouthshire or Somerset to provide the base materials for construction. Aggregates will be needed in large quantities - these should be sourced from nearby countries with significant availability, such as Norway. A deep water facility will be needed for their shipment into the estuary.

Siltation

We do not know enough as yet about the effects of siltation and sediment problems caused by harnessing the tide in particular ways. We know that there could be some beneficial as well as adverse effects. We need to spend more on research to understand the effects of silting associated with our proposals.

There are methods by which silt can be removed or its negative effects mitigated. We need to investigate these impacts and solutions as a matter of urgency.

Future Activity

The electricity generation package we recommend will provide upwards of 8% of the UK's electricity needs. Our proposals are based on an incremental approach, maximising opportunities with the need for urgent action to tackle climate change. The incremental steps that we have described can be introduced without prejudicing those proposals which would be developed earlier – it would be feasible to build a Tidal Reef after a Shoots Barrage and lagoon has been built within the estuary and according to the SDC report 'the effect of the Shoots barrage on potential tidal lagoons would be less than for the Cardiff-Weston barrage'¹².

The current Labour Government is relying too heavily on the potential for development within the Severn Estuary, combined with nuclear, to reach our domestic and European targets on renewable energy. If we are serious about using non nuclear renewable resources for electricity generation then we must secure a decentralised renewable energy supply with the expansion of other green solutions including wave, tidal, wind, CHP, solar and photovoltaic energy.

In the immediate future energy efficiency is key, offering the potential to help reduce carbon emissions, save money, reduce fuel poverty and stimulate the economy with green jobs. The Energy Saving Trust has shown that since 1970, doubling the energy efficiency of the household sector has reduced carbon emissions by 28MtC¹³ per annum and saved consumers £10 billion every year - equivalent to three times the saving from the whole nuclear industry and almost as much as the total emissions from the UK's coal-fired power stations. The Liberal Democrats continue to propose strong policies, highlighted in our policy paper 'Zero Carbon Britain', to promote long term changes in behaviour and encourage people to use energy in more efficient ways.

Note: Appendix I - A full list of all written evidence received is available at http://welshlibdems.org.uk/e-whatwebelieve_theme.php?themeNo=7

¹² Sustainable Development Commission – 'Turning the Tide' October 2007 page 74 <http://www.sd-commission.org.uk/pages/tidal-power.html>

¹³ MtC = Million Tonnes Carbon



Liberal Democrat Severn Tidal Forum members visit the River Severn at the site of the proposed Shoots Barrage

