HM Government

Department of Energy
and Climate Change

South West RDA

SEVERN TIDAL POWER

Commercial Assessment

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ABBREVIATIONS

	Description
BBL	Bridgwater Bay Lagoon
CTRL	Channel Tunnel Rail Link
C-W	Cardiff-Weston Scheme
CCS	Carbon Capture and Storage
EPC	Engineer, Procure and Construct
FIT	Feed-in-Tariff
IPC	Independent Planning Commission
NFFO	Non Fossil Fuel Obligation
NFPA	Non Fossil Fuel Purchasing Agency
ORED	Office of Renewable Energy Deployment
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PUK	Partnerships UK
PwC	Pricewaterhouse Coopers LLP
RES	Renewable Energy Strategy
RO	Renewables Obligation
SO	Severn Obligation
STP	Severn Tidal Power

SECTION 1 – EXECUTIVE SUMMARY

1.1 Introduction

This report informs the Severn Tidal Feasibility Power ("STP") Study and considers the commercial risks associated the proposed Severn Tidal Schemes. In particular it considers the commercial delivery structure options, the nature of revenue support that a scheme would require and the terms of such support. Finally it assesses the market's response to the schemes and its potential impact on the electricity market and the appetite for investment.

1.2 Appetite for Investment

To support the assessment of the market's response to the schemes, a commercial market testing exercise was undertaken. The market testing included a broad range of market participants who might be involved in delivery of a tidal power project including electricity suppliers, construction companies, engineering consultants and finance providers. The market testing exercise indicated a general reluctance from the market to invest in a Severn Scheme in immediate timescales for the following reasons:

- **Capital Availability** – In the current economic climate even the smaller of the tidal projects has significant financing requirements at a time when there is reduced liquidity.
- **Construction Risk -** While the solution itself is not be considered technically complex and relies on proven engineering techniques, the size of the project heightens construction risk.
- **Planning and Environmental Issues –** There is concern over the scale of planning risk and a preference for this process to be Government led or Government funded.
- **Competitive Technologies –**The scale of the construction, the long pay-back period and its relatively unique nature compares less favourably with other investment opportunities.
- **Off-take risk** – The relatively limited flexibility over energy generation profiles may be problematic in terms of the management of off-take risk.

1.3 Commercial Structure Conclusions

A range of commercial structures from private sector delivery to public sector delivery were considered. The scale of delivery risk increases in proportion to the capital cost of the project itself as it influences the ability of the private sector to manage the financial penalties associated with failure to deliver. For the larger schemes the delivery risk is higher and therefore the level of commercial risk that can be transferred to the private sector will be lower.

The commercial assessment concluded that the smaller schemes could be delivered through a privately-led option provided the capital costs of the scheme remain below ca. £5bn. PPP structures would also be possible. Larger schemes (such as Cardiff-Weston or Bridgwater Bay Lagoon) could be delivered through a PPP (with Government support / participation), a Government-led option or a Regulated Concession structure. Larger schemes will require Government support either through direct funding / equity participation or guarantees, this will increase the commercial risk retained by Government.

1.4 Revenue Support Conclusions

For a smaller scheme, because the scale of off-take risk is manageable it is likely that a revenue support structure that transfers electricity price risk would be appropriate i.e. a Premium Feed-in-Tariff / Renewables Obligation[1] / Severn Obligation. Use of this approach may limit participation to utilities, and may not be the cheapest pricing structure for the Consumer because of the premium

[1] Where the Renewable Obligation was used, it would need to be amended to extend the term of support available.

payable for the electricity price risk transfer. A fixed price support structure would also be possible but is inconsistent with current market mechanisms.

The off-take risk associated with the larger schemes is significant so it is unlikely that the operator could manage the risk. This indicates the need to use a fixed price support mechanism, i.e. an availability / fixed FIT approach. The off-take would need to be managed through placing an obligation on the suppliers to take the electricity generated in proportion to their participation in the market at a fixed price. This could cause market issues as the Severn Scheme becomes a "must run" asset because the suppliers are obliged to purchase the output. It is possible for Government to retain the off-take risk and sell the electricity through shorter term contracts funding the difference between the price paid to the operator and the market sales through a levy on suppliers. This would allow the sale of electricity to happen within existing market structures but the residual risk of off-take would remain with Government.

Ideally any revenue support mechanism would need to be structured to avoid excessive cost to the Consumer while also not distorting the electricity market; this will be a difficult balance to achieve for a larger scheme where off-take risk is high. Further, high levels of revenue support for a scheme could distort the market if there were incentives to sell at a sub-market or negative price. A larger Severn scheme may therefore likely require alteration to the current market arrangements in order to be viable.

1.5 Conclusions

The market concerns raised through the market testing exercise indicates that there isn't a ready supply of investors waiting to step forward should the Feasibility Study recommend sponsoring a scheme. Equally as electricity suppliers increasingly wish to match their generation profile with that of the market, it is likely that a scheme sponsored by investors will come forward. However the perceived risk may require Government to make the scheme attractive if it is to secure the appropriate level of competition. Key risks such as construction, compensatory habitat and planning will require support or underpinning from Government which will place material risk and cost exposure on Government, the concerns raised by the market reflect the scale of risk involved.

There is also an emerging need for a protocol on the switching off of low marginal cost base load power in the context of the changing electricity supply base. The effect of this protocol on revenue support would need to be considered so that investment decisions are appropriately informed.

The STP Feasibility Study is considering a range of issues associated with the need to bring forward large scale energy infrastructure investment in the UK. It is clear that the market in which a Severn Scheme will be delivered is changing both from a demand perspective (with potential growth in electric cars, changes in energy storage technology, introduction of smart grid) and from a supply perspective (i.e. the move to a low-carbon economy and potential increase in interconnector capability).

The DECC 2050 team is reviewing the likely demand scenarios for energy in the future and the support structures and frameworks required to deliver future electricity infrastructure to support the growing demand. DECC together with Infrastructure UK are supporting the Government in its work to ensure the energy market framework can most effectively deliver a fair deal for the consumer and the low-carbon investment needed in the long term. These teams have not completed their assessments in the timeframe of the drafting of this paper. Further work will need to be done to assess the impact of any recommendations in respect of the architecture of the broader electricity market to the Severn Tidal Feasibility Study.

SECTION 2 – INTRODUCTION

2.1 Objectives of Commercial Assessment

The commercial assessment considers the commercial delivery structure options, the nature of revenue support that a scheme would require and the terms of such support. Finally it assesses the market's response to the schemes and its potential impact on the electricity market and the appetite for investment.

2.2 Engagement of Specialist Support

The commercial workstream engaged support from key Project Board participants including PUK, HM Treasury, Welsh Assembly Government, DECC's commercial director, the expert Chair to ORED[2] and independent experts. Workshops were run to discuss key issues and ensure that the workstream considered all aspects of commercial delivery.

For Phase One of the Public Consultation, Pricewaterhouse Coopers LLP were engaged to support DECC in its assessment of the commercial delivery options. Their study is published in the Financing and Ownership paper in the Consultation Document. This Commercial Assessment paper builds on the study conducted by PwC but was led by DECC with support from Ernst & Young LLP.

Allen & Overy were engaged to provide specialist legal support. They conducted a high-level study on the commercial structures and revenue support options.

2.3 Liaison with other DECC work

The Feasibility Study for Severn concerns a range of issues associated with the need to bring forward large scale energy infrastructure investment in the UK. The DECC 2050 team is reviewing the likely demand scenarios for energy in the future and the support structures and frameworks required to deliver future electricity infrastructure to support the growing demand. DECC together with Infrastructure UK are supporting the Government in its work to ensure the energy market framework can most effectively deliver a fair deal for the consumer and the low-carbon investment needed in the long term.

[2] Office of Renewable Energy Deployment.

SECTION 3 – MARKET TESTING EXERCISE

3.1 Objectives of Market Testing Exercise

Key objectives for the market testing can be summarised as follows:

- Review market soundings and attitude to investment in light of the changes to economic conditions;
- Gather more detailed responses from industry on the proposed commercial structures and revenue support options for both Smaller and Larger Severn Schemes; and
- Engage with the utility companies to understand their view of the likely market effect of potential revenue support options.

A key driver behind the market testing exercise was the need to retest the assumptions that had been made in the Severn Tidal Phase One Consultation, and specifically within the Financing and Ownership Options paper prepared by PricewaterhouseCoopers LLP ("PwC") as part of the Consultation[3] in light of the changes in economic climate.

As more data has been gathered in Phase 2 of the Feasibility Study, it was felt that there was sufficient information available to enable more considered responses from industry. The initial market testing responses focused on the larger Cardiff-Weston scheme, and it was felt that more feedback from the market was required on the Smaller Schemes and their deliverability.

Finally, the critical role of the utilities both in terms of attitude to investment and market effects of revenue support structures was clearly identified as part of the Phase One work and a better understanding of their response was a clear objective for the market testing exercise.

3.2 Process of Market Testing

An invitation was sent to a broad range of market participants to see if they would like to participate in the market testing, those who responded positively were sent a detailed document with both a briefing and a range of questions.

The mix of written responses and face-to-face meetings meant there was a good opportunity to discuss project characteristics and elicit informed comments from the market. In general there was a good response from the market in terms of quality of responses and willingness to share their perspective on the project.

[3] The PwC study specifically stated that the advice was prepared without regard to the change in economic conditions and assumed that the prevailing investment conditions of previous years would return. Their advice was prepared up to January 2009 and the extent of the change in economic climate could not have been predicted at this stage.

3.3 Participants in Market Testing

Outlined below is a table listing the participants to the market testing by category of interest.

Group	Responses
Energy Suppliers	EDF RWE Centrica Scottish & Southern Electric Scottish Power
Construction / integrators	Balfour Beatty RES Sir Robert McAlpine Fleming Construction Bechtel The Severn Lake Company Ltd
Engineering Consultants	Mott MacDonald Halcrow Nichols Poyry
Finance Community	EIB RBS Ernst &Young
Others	Ofgem NFPA

3.4 Contents of Market Testing Brief

To prepare the market for the market testing exercise and allow participants to provide informed comments supported by a common knowledge base of information about the Severn Schemes, a Market Testing Brief was prepared and issued to those who expressed an interest in participating in the market testing. The brief covered key aspects of the project that would affect commercial delivery and asked questions on the following key areas:

- Commercial structures;
- Impact of scheme on energy market having regard to a range of revenue support structures;
- Financing options;
- Construction risks;
- Operations risks; and
- Compensatory Measures.

It should be noted that the brief asked questions for Smaller Schemes and Cardiff-Weston separately because it was envisaged that the scale of Cardiff-Weston would result in a different response.

3.5 Key Messages for Severn Tidal Scheme

This report includes the comments received from the Market Testing Exercise in each of its core sections. A summary of the market testing response by key area is also included at Appendix A.

SECTION 4 – COMMERCIAL STRUCTURE ASSESSMENT

4.1 Commercial Structures Considered

The Feasibility Study considered four main commercial structures for ownership and delivery of a Severn Tidal scheme.

- **Fully private sector led option** – private sector own, finance, construct and operate the asset for its useful life under the terms of a licence.

- **Public Private Partnership concession** – private sector finance, construct and operate the asset for a term under the terms of a concession. The term of a PPP concession would typically be 25-35 years and the asset reverts to Government ownership at the end of the PPP concession. Government may then let concessions to operate the asset or privatise it.

- **Regulated concession** – arms-length body which could be publicly or privately owned (or a combination of the two) owns, finances, constructs and operates the asset under a regulated structure. The structure would be capable of managing the scheme for the duration of the asset life. It is likely that construction costs may be met by private sector funding, or potentially Government funding depending on the scale and value for money.

- **Public sector led option** – this option would be public sector sponsored and led. Some elements of construction risk will be transferred to the private sector. Post construction, options include that the asset is managed via concessions or franchises or the asset is privatised.

The level of commercial risk retained by the public sector increases as the commercial structure moves from private sector delivery to public sector delivery. The scale of delivery risk increases in proportion to the capital cost of the project itself as it influences the ability of the private sector to manage the financial penalties associated with failure to deliver. Where the delivery risk is high, the level of commercial risk that can be transferred to the private sector will be lower and this will influence the choice of commercial delivery structure.

4.2 Issues Common to All Commercial Structures

4.2.1 Long Term Nature of the Asset - The long term nature of the asset itself (economic life of asset is expected to last at least 120+ years, although there is clearly some uncertainty around this figure) suggests the commercial structure should mirror this in terms of incentivising the owner to maximise the asset value through extension of its residual live to the extent that it remains economic to do so.

4.2.2 High Capital Costs, Low Marginal Cost of Generation - The high capital costs combined with a relatively low marginal cost of generation post construction is a potentially large issue for this scheme; the cost driver for energy generation is therefore primarily capital. The relationship between the marginal cost of generation and the future pricing of electricity will be an important risk factor for investors. Like other renewable technologies, it is assumed that the Government will need to provide support either in the form of capital contributions or revenue support. Given that the asset has a design life of 120 plus years, this could be problematic once the debt has been repaid and the marginal cost of generation is particularly low; a Severn Scheme could undermine the market pricing depending on where electricity prices are at this stage, and/or deliver excessive returns.

4.2.3 Innovation in Design vs Progress in Planning – The design of the scheme itself and its mode of operation will drive the need for compensatory measures and planning consent. An appropriate balance between design innovation and progress on planning therefore needs to be struck.

4.2.4 Timeframe - The long timeframe for planning, establishment of compensatory habitats, grid strengthening and construction of the asset is an issue across all options. Ideally the Government would want to optimise the competitive tension between potential delivery partners to secure value but timeframes may not optimise value for money.

4.3 Structure Evaluation – Smaller Schemes

4.3.1 A – Fully Private Sector Led

This commercial structure is the traditional approach used in the market for delivery of electricity infrastructure. A key issue in using this structure for a Severn Scheme would be that the asset would be built and retained by the private sector for its useful life. Feedback from the market testing indicates that because private sector investors do not attribute financial value to the upside of the residual value of the scheme 30 years hence, as changes to the market conditions over that timeframe are likely to be material, it may not be value for money to transfer ownership of the asset through a Fully Private Sector led option. Equally an argument could be structured around the downside risk of retaining such an asset in an environment of changing technology.

The appetite of sponsors to key risks such as construction risk, off-take risk, compensatory measures risk and the nature and term of revenue support are likely to impact the value for money of a privately led option because privately led options would typically include transfer of these risks.

To be delivered in the market, this would probably need to be led by the electricity companies who are the only corporates with sufficient balance sheets to take on the finance requirement. Concerns were raised by some construction companies and finance providers about the level of construction risk involved and their ability to provide finance.

The key benefit of a privately-led option is consistency with other assets in the industry in terms of ownership. Particularly for a Smaller Scheme it is harder to make a case that it should be treated differently to other commercial arrangements in the market given its comparable scale to other generating assets. There is clearly some evidence around length of asset life that could support retention of the residual value of the asset through a PPP concession structure particularly because of the anticipated low marginal cost of production post financing term which could result in appropriate market pricing. Further, the level of support that has been given to bring forward the investment means that any perceived upside to ownership should not be easily overlooked.

It is likely that a private sector led structure could achieve an off-balance sheet structure if residual value of the asset is transferred and key risks such as electricity off-take and price risk are also transferred.

4.3.2 B – PPP Structure

A PPP structure would assume the scheme would be constructed by the private sector and operations would be managed through structure concession for a limited period (PPPs are typically 25-35 years). At the end of this term, the asset would revert to Government ownership. A payment for the residual value for the asset could be payable by Government so that the entire construction cost did not need to be amortised over the 25-35 year period (however the cost of this future obligation would need a commitment from Government to facilitate a reduction in the financial cost, this liability would need to be provided for in Government accounts). At the end of the PPP concession, Government may then let concessions to operate the asset or privatise it.

A PPP structure does not match asset life with operational management. The structure could incentivise construction of an asset with a shorter design life than the planned 120+ years, however it is envisaged that this risk would be low and managed through handback provisions. Maintenance planning may not be optimised as the contract life will expire before the first major maintenance upgrade of the turbines is due.

PPPs are used to deliver a broad range of infrastructure across Government departments but have not been used in the energy sector to date. For this reason, there may be a natural nervousness about the use of this structure in the energy market. Revenue support options for PPPs generally take the form of an Availability Payment, however a Severn Scheme concession could be supported through a range of revenue support options as discussed in Section 5. If a traditional availability based structure was used it could be structured to encourage particular behaviours through sculpting or banding of support to optimise value generation of the asset or inclusion of an energy price payment stream to the extent that it was assumed this risk allocation was appropriate.

Key benefits of PPP include clear allocation of risk, established delivery structure albeit not within the energy market (except indirectly from waste contracts with energy elements), and ability to capture the residual value of the asset for the public sector through the concession arrangement and hand-back of the asset.

4.3.3 C - Regulated Concession Structure

This structure would be an arms-length body with representatives from public and private sector in its board structure. It would be a regulated structure and could be owned by the private sector, by Government or by a combination of the two. Examples of other regulated concession structures in the market include: Network Rail, National Grid and Channel Tunnel Rail Link ("CTRL").

The structure would be capable of managing the scheme for the duration of the asset life. The terms of the regulation would have due regard to the issues of potential 'excess profit' arising later in the concession where the outturn marginal cost of generation is predicted to be low. The regulator is likely to regulate structure having regard to the following key aspects:

- Construction risks
- Operational risks
- Maintenance requirements
- Changes to the energy market that affect the structure.

The regulator will be responsible for periodically adjusting the revenue of the entity with a view to retaining the overall financial stability of the entity within agreed parameters.

For a larger scheme, the structure may need to be backed by either Government funding or guarantees or assets supported by milestone payments. Government support will be important particularly during construction if integration risk is held within the structure. It is likely that post construction there would be no further need for Government support as the material risks will have been retired.

Where the structure was funded backed by Government funding or guarantees or milestone payments it could be considered to be on balance sheet for debt classification purposes.

The structure would manage scheme delivery competing the construction and operational elements of the contract. It could be led by an integrator. The use of an integrator could be particularly valuable given the scale of construction required. The role of the integrator would be to package the construction into manageable work packages that would generate the

appropriate level of competition. The residual integration risk could be managed by recapitalisation of the structure but ideally most risk would be managed through the construction contracts and integrator risk to the extent it can be transferred. Target cost incentive fee arrangements with pain share / gain share mechanisms, PPP contracts, EPC contracts would be used where appropriate with regard to the optimal risk transfer.

The set-up of a regulatory regime needs to be mindful of matching the level of effort involved to the value delivered through the structure. This regime would be particularly useful where it is envisaged that more than one tidal range scheme will be delivered within the UK or for the Cardiff Weston scheme (whose scale may justify the additional effort).

The cost of setting up a regulatory framework may only be value for money for a C-W or BBL scheme because of the scale of commercial risk both in terms of project delivery and off-take would necessitate such a risk-sharing approach. Feedback on the regulated concession model indicated two critical elements that need to be in place for this structure to work:

a. Regulators need something to regulate; given the anticipated low level of maintenance in-year the "teeth" of a regulator may be limited unless geomorphology indicates need for significant dredging in the operational period and these costs are hard to predict.

b. Regulated models are best designed for an operational technology with performance data available.

It may be more appropriate to consider the use of this model post construction when the terms of regulation could be better designed.

4.3.4 D – Public Sector Led

It is not envisaged this structure would be used to deliver a Smaller Scheme as this structure would have the highest level of commercial risk for the public sector and the scale of delivery risk associated with a Smaller Scheme should not necessitate such a structure.

4.3.5 Summary Assessment - Smaller Schemes

For Smaller Schemes, the electricity market would prefer a structure that was private sector led. They felt that the scale of investment less that £5bn would be manageable for a consortium of electricity companies (provided the commercial terms were appropriate) and they preferred an approach with limited involvement from Government. Construction companies were divided on whether they felt that the private sector could deliver the Smaller Schemes without public sector involvement, there were some concerns over the level of planning and construction risk involved and their ability to manage the risk for the scale of construction programmes that are being considered.

4.4 Structure Evaluation – Larger Schemes (C-W and BBL)

4.4.1 A – Fully Private Sector Led

The market testing confirmed that a fully private sector led C-W or BBL scheme is not possible because of the financial scale of the integration risk. Further the level of demand and off-take risk would be too significant and would require market interventions to manage this. It is likely that packages of a C-W or BBL scheme scheme could be delivered by the private sector. Construction could be sub-divided into parts and led by the private sector with potentially an integrator bearing some risk but with ultimate risk sitting with the Government. This will be examined further under D – Public Sector Led.

Market testing participants were asked whether larger schemes could be wholly private sector led if changes to the licensing structure and Balancing and Settlement Code were made to facilitate investment through, for example unincorporated joint ventures or multi-participant companies with participants having a proportionate interest in output (based for example on the North Sea regime). This did not seem to be a key driver behind the concerns on private sector led structures for larger schemes.

4.4.2 B – PPP Structure

A PPP structure led entirely by the private sector is also too difficult for larger schemes because of the financial scale of the construction costs and associated integration risk. It may be possible to structure a PPP where Government became a part owner of the PPP concession company at the outset and shared the integration risk, allowing Government to more easily monetise its investment through selling its shares in the PPP concession vehicle at a later date. It is also likely that packages of a C-W or BBL scheme could be delivered by the private sector potentially in the form of multiple PPPs but the overall integration risk would be retained by the Government –this would be covered under D – Public Sector Led option.

4.4.3 C – Regulated Concession Structure

As per Smaller Schemes but likely to require to be backed by either Government funding or guarantees or milestone payments particularly during construction if integration risk is held within the structure. This option could work but is probably more appropriate post construction.

4.4.4 D – Public Sector Led

Under this structure the Government accepts there is significant integration risk associated with construction and it is not value for money to transfer such a risk (likely for a C-W or potentially for a BBL Scheme). This structure is public sector sponsored and led. It may be that such a structure still transfers significant levels of risk to the private sector through the use of Engineer, Procure & Construct contracts for example or the appointment of an integrator to manage the competition of contracts and absorption of some integration risk. Where firm priced contracts are not considered to be optimal, contracts could include target cost incentive fee structures to incentivise contractors to manage cost overruns.

A key assumption of this structure is that it is supported by public sector finance until its sale post construction through a privatisation or through concession models. Arguably some of the construction could be financed by the private sector but the liability may fall to the Government upon completion of the asset.

If the asset is fully financed by the public sector there may be no need to decide on the form or scale of the required revenue support option until the time at which private sector investment is sought. There would, however, be a need for clarity on how the energy generated by the asset would be accessed in the wholesale markets so that investors can take informed decisions on other electricity generation investments.

4.4.5 Summary Assessment - Larger Schemes

For Cardiff-Weston or ca. £10 billion Bridgwater Bay Lagoon, the scale of the investment required would be too large for the private sector to lead. Electricity suppliers expressed a preference for either a PPP or Regulated Concession structure. Some of the construction companies preferred a public sector led scheme because of the scale of construction risk. They mentioned the use of an integrator to help manage letting of construction contracts and incentivising performance and cost management.

4.5 Summary of Legal Review of Commercial Structure Options

Allen & Overy were appointed in October 2009 to undertake a high-level review of the legal issues associated with delivery of the different commercial structures and revenue support options available. The results of their work to date indicate that there are no major legal issues in terms of choosing commercial structure or revenue support options They recommended that delivery of the supporting legislation would be easiest through a hybrid bill. Their work was structured in two key stages:

a) Part I – High level review of legal issues associated with the different commercial structure sand revenue support options
b) Part II – More detailed review of the Private Sector Led and PPP options for all Schemes including:
    a. How would the Government bring the scheme to market?
    b. High level procurement strategy and outline implementation timetable?
    c. Definition of what the key contractual terms may be.
    d. Identification of contractual documents required.

The reports supporting their assessment are attached at Appendix C to this report.

4.6 Conclusions

4.6.1 Private Sector led option –This option would only be possible for a Smaller Scheme and would not work for a C-W or larger Bridgwater Bay Lagoon ("BBL"). To be delivered in the market, this would probably need to be led by the electricity companies who are the only corporates with sufficient balance sheets to take on the finance requirement. A private sector-led option would leave the residual value of the asset with the private sector after an initial revenue support period of 30-35 years. Given that the asset has a design life of 120 plus years, this could be problematic once the debt has been repaid and the marginal cost of generation is particularly low; a Severn Scheme could undermine the market pricing depending on where electricity prices are at this stage, and/or deliver excessive returns which may not represent value for money. The Severn Scheme will sell into the market at a price which reflects its short-run marginal cost and thereby places downward pressure on electricity prices both in the financing period and after.

4.6.2 PPP Structure –This structure would be possible for all schemes, though for a C-W or BBL this would only be possible if there was Government participation either in the form of capital commitments or equity shareholding. Use of a concession structure gives clarity on the allocation of risks and clear definition on the implications should they arise.

4.6.3 Regulated Concession Structure – The cost of setting up a regulatory framework may only be value for money for a C-W or BBL scheme because of the scale of commercial risk both in terms of project delivery and off-take would necessitate such a risk-sharing approach. Feedback on the regulated concession model indicated two critical elements that need to be in place for this structure to work:

- Regulators need something to regulate; given the anticipated low level of maintenance in-year the "teeth" of a regulator may be limited unless geomorphology indicates need for significant dredging in the operational period.

- Regulated models are best designed for an operational technology with performance data available;

It may be more appropriate to consider the use of this model post construction when the terms of regulation could be better designed.

4.6.4 Government-led Option – Under this option Government would be intervening in the market and owning electricity assets which could cause market concern. However there was also recognition that the scale of construction risk, particularly for the larger schemes i.e. C-W and BBL, may necessitate Government involvement. It is likely that this structure would include private sector delivery where possible and where efficient, potentially managed by an integrator. Most respondents said that post construction, provided the asset was working reliably, it could be an attractive investment for a purchase or for a concession structure.

4.6.5 Summary Assessment – Smaller Schemes – If a Smaller Scheme was being considered, it may not be appropriate to consider that to be the driver to introduce a change in the nature of asset ownership or infrastructure investment delivery within the sector unless these changes were being driven across the electricity market as a method for infrastructure delivery. For this reason in the absence of a driver for other changes, the Private Sector Led option may be the most appropriate with a PPP being the next best contender.

4.6.6 Summary Assessment – Larger Schemes – For C-W or BBL, the PPP structure has the highest level of support from industry and is likely to support the sharing of risk in a defined way. The PPP would need to have regard to the particular nature of the electricity market in the drafting of any of its terms and in particular the revenue support structures would need to be appropriate to the market. Alternatively the Regulated Concession or Government led options could also support the scheme delivery.

SECTION 5 – REVENUE SUPPORT OPTIONS ASSESSMENT

5.1 Revenue Support Evaluation Criteria

In assessing the most appropriate revenue support mechanism for a Severn Tidal Scheme, due regard must be given to the criteria against which they will be assessed and the constraints which will be placed on any revenue support scheme. Outlined below are the key criteria and constraints identified in respect of a revenue support mechanism for a Severn Scheme

Criteria	• **Efficient financing mechanisms to facilitate investment** • **Precedent / signal to rest of market and impact on other investments** • **Incentive to generate when value is high**
Constraints	• State aid • Balance sheet / tax treatment • Admin costs • Impact on delivery time • Impact on consumers

The impact of the revenue support options on the wider electricity market is also a critical element of evaluation and to support this assessment, the effect on a range of key stakeholders needs to be considered including:

- Finance market
- Severn Scheme generator
- Suppliers
- Other generators
- Consumers
- Government
- National Grid.

This is considered further at para 5.9 in this section.

5.2 Revenue Support Options

This section considers the options for a Severn Scheme revenue support mechanism and assesses the pros and cons of each against the criteria identified above:

There are two key categories of support mechamism:

a) Mechanisms with **electricity price exposure** for the STP operator

- Renewables Obligation
- Severn / Tidal Obligation
- Premium Feed-in-Tariff (FIT)
- Contract for Difference (CfD)

b) Mechanisms with **fixed price support** for the STP operator

- Fixed Feed-in-Tariff (FIT)
- Availability Fee
- Non-Fossil Fuel Obligation ("NFFO")-like Levy Option

Detailed explanations of how each revenue support option works are set out in Appendix B. From a risk perspective, mechanisms with electricity price exposure are clearly only manageable where the market has confidence in its ability to sell the electricity generated at a reasonable price. There is a clear linkage between off-take risk and the choice of revenue support structures.

5.3 Market Testing Comments on Revenue Support

In the market testing work, electricity suppliers indicated they would prefer to include power price exposure in the payment stream for a Smaller Scheme. Part of the rationale for owning electricity generating asset is to match ongoing demand from customers for electricity and use of a fixed price support mechanism would divorce the ownership of the asset and the beneficial use of its electricity which could make it a less attractive investment. Equally most respondents saw that ownership of an asset that had a regulated or fixed pricing mechanic was attractive where the balance of risk or the uniqueness of the asset required such a support structure. They did not believe a C-W or potentially a BBL scheme could be supported with electricity price risk exposure because of the scale of off-take risk.

By contrast the finance community and construction companies preferred the use of a revenue support structure without exposure to electricity price and off-take risk. This position was maintained in part because of the natural nervousness of these participants over the scale of risk exposure in a market which they do not ordinarily operate but also because inclusion of the electricity price risk is likely to reduce the appetite of lenders to fund such a scheme unless the scheme is supported by a long term PPA from reputable companies. They felt that the deliverability of external funding would be more achievable through the use of a fixed price support mechanism.

5.4 Demand and Off-take Risk

In the context of Severn Tidal, demand risk is the risk that the energy generated by a tidal scheme cannot be sold on the energy markets or that the energy will be sold but only at a very low price. There are three key elements to demand risk exposure in the context of an energy project being:

- Exposure to long term power price risk (i.e. the long-term price of electricity)
- Exposure to short term power price fluctuations (arising from fluctuations in demand and intermittency on the system).
- The risk that electricity cannot be sold – off-take risk.

Exposure to short term power price risk and off-take risk can be managed through flexing the timing of generation where possible, exposure to long term power price risk is managed through physical hedging (the management of other assets within a portfolio) or contractual hedging.

The profile of the tidal movements will mean that a Severn Tidal scheme will for part of its generation period be generating at times when there is a relatively low levels of demand and a risk therefore of oversupply. The predictable nature of the tidal pattern means that the profile while it is intermittent is predictably intermittent. It is anticipated that there is an element of flexibility in the timing of generation but probably only to the extent of an hour or so. The tidal pattern means a long delay in generation will significantly reduce the energy yield.

In an efficient market, wholesale prices reflect the value society places on marginal generation at any point in time. To the extent that the operator is exposed to energy power prices and off-take risk, he will be incentivised to flex his generation in line with the demand of the markets. The relative fixed nature of tidal generation means that a Severn Tidal operator has a limited ability to respond to changes in demand (except through management of the other assets in his portfolio) and so heightened exposure to demand may not represent value for money where the operator has a limited ability to manage this risk.

The market testing work to date indicates that the scale of off-take risk is likely to be manageable for Smaller Schemes such as Beachley Barrage (0.625GW), Shoots Barrage (1.05GW) and Welsh Grounds Lagoon (1.0GW). Bridgwater Bay Lagoon (3.6GW) is potentially at the edge of manageability and it is not envisaged that the off-take risk for Cardiff Weston (8.64GW) is manageable without participation across the supply base.

The different revenue support mechanisms being assessed for Severn Tidal schemes reflect differing exposures to demand risk. All revenue support mechanisms proposed will insulate the revenue from demand risk to some extent as the subsidies do not vary directly with the "value" of energy generated as reflected in the power price. The choice of revenue support mechanism will influence how responsive an operator would be to changes in demand.

The choice of revenue support mechanism applied will influence the off-take of energy from a scheme. Where there is a differential between revenue support mechanisms for different energy technologies, the operator with the highest unit subsidy relative to short run marginal cost will be the operator who is willing to accept the lowest market price (including negative price) for generation. The revenue support mechanism chosen will impact on the existing market structures and its effects need to be clearly understood.

5.5 Assessment of Revenue Support Options with Electricity Price Risk Exposure

5.5.1 Renewables Obligation ("RO")

The Renewables Obligation support mechanism is the primary support mechanism for renewable in the UK. It works by placing an obligation on suppliers to source a specified number of Renewables Obligation Certificates ("ROC") per MWh. The ROCs have a tradeable value which allows generation to receive a premium in addition to their electricity. See Appendix B para B.1 for explanation of how the Renewables Obligation works.

5.5.1.1 Applicability of RO Regime to a Severn Scheme

Because the RO support structure contains both a market based support element and an element that is exposed to electricity price risk, this mechanism is only appropriate where the level of off-take risk is perceived to be manageable. Further, the stability of the RO would be at risk where a Severn Scheme represented a significant proportion of the RO as in the event of any downtime or slippage in delivery, this could increase ROC prices in a year without any increase in renewable energy generated because of a shortage of supply.

Because the off-take risk is manageable, it is likely that the Smaller Schemes could be placed within the RO structure. The planned expansion of off-shore wind over the next few years means that a Smaller Severn Scheme would be comparable in scale to other schemes that would be operational at that time and would not represent a significant proportion of the RO market. For Cardiff-Weston (and potentially the Bridgwater Bay Lagoon) both the off-take risk and the scale of energy generated indicate that the RO structure is not appropriate.

5.5.1.2 Amendments to the RO regime for a Severn Scheme

The RO is not planned to continue post 2037 and the term of support for an individual scheme is capped at 20 years. The longer term nature of the Severn Schemes and the high capital spend suggests that a longer term of support than 20 years may be more appropriate to better match the support with the beneficial use of the asset. The shorter the term of support, the higher the in-year support required would be. Amendments would be required to the ROO to create a 'Severn' band, or to put the Severn into an existing band. Extension of the RO scheme would require legislation as would extending support for longer than the maximum 20 years. If extended support for other technologies is not planned and other tidal schemes are not developed, post 2037 Severn could be the only scheme covered by the RO, where this was the case, mechanisms such as headroom would not be appropriate as these rely on market participation, it is likely therefore that a number of amendments would be required to the current regime.

Alternatively the scheme could be funded through the existing RO until 2037 with a bespoke Severn mechanism established post RO termination. Legislation for this bespoke mechanism would need to be in place prior to a scheme being sponsored by industry as failure to do so would place the security of their revenue at risk. The added complexity of managing two revenue support structures is arguably overly complex.

5.5.1.3 Industry Perspective on the use of the RO regime for a Severn Scheme

There were some concerns from industry over further changes to the RO that may need to be introduced for a Severn Scheme. The concern was not about the actual changes required but rather the stability of the mechanism itself. The long term stability of the RO mechanism underpins the finance of a large number of renewable investments and there have been a number of changes to the scheme since its introduction, further changes due to a Severn Scheme may give the lending community concerns.

Industry accepted that in general a Smaller Scheme could sit within the RO and there were benefits of allowing a Severn Scheme to participate within existing market structures, there were however some concerns about the effect of material delays to construction and the impact that could have on ROC prices in the planned period of commencing operations where a shortage of supply could push up ROC prices.

The scale of the electricity price exposure for even a Smaller Scheme would be material and unless supported by appropriate PPAs from reputable purchasers, the financial exposure is potentially be too high for a 3rd party lender. This means the choice of support structure would favour investment from the electricity suppliers.

Conclusions on use of RO support structure for Severn

Smaller Schemes – The RO could be used to support a Smaller Scheme and while there are some concerns from the supplier base about further amendments for the RO regime, there are clear benefits of allowing a Severn Scheme to operate within established market structures in comparable terms to other renewable infrastructure. Use of an RO regime would favour investment from an electricity supplier because of the exposure to electricity price risk.

Larger Schemes – The scale of both off-take risk and the quantities of energy produced would mean the RO support mechanism is not appropriate for larger schemes, this applies to C-W and potentially BBL.

5.5.2 Severn Obligation or Tidal Obligation ("SO")

A Severn Obligation would be designed to be the same as the RO and would place an obligation on suppliers to buy a proportion of output from Severn or from Tidal range generation. See Appendix B para B.2 for explanation of how a Severn Obligation would work.

5.5.2.1 Applicability of SO Regime to a Severn Scheme

The key benefit of a SO system would be to avoid any potential negative effects on existing investments supported by the RO regime. The downside to using a separate mechanism is that there would be additional administration costs to setting up the regime and managing the sale of associated certificates. The regime could potentially include participation from other tidal range schemes if they are brought forward. It should be noted that where the value of the Severn Obligation was different to that of the RO, it would lead to prioritisation of purchases by technology.

While this mechanism would be consistent with the RO mechanism in that its structure is the same, it is not typical to set up a new obligation regime for a single asset. Because obligation levels would be set in advance for a given year, a shortage in the supply of SO Certificates ("SOC") because of changes in generation would push up SOC prices and consequentially costs paid by the consumer.

The administration costs of the current RO regime are covered through the use of the buy-out fund and headroom mechanism, these may not be appropriate if there is only one operational scheme and separate budgets for scheme administration would be required.

Conclusions on use of SO support structure for a Severn Scheme

Smaller Schemes – The SO could be used to support a Smaller Scheme albeit there would be costs to set up the regime. Further the impact of a different support regime for Severn operating outside of market conditions for other renewable or low-carbon purchases could result in perverse market effects. Use of an SO regime would favour investment from an electricity supplier because of the exposure to electricity price risk.

Larger Schemes – The scale of off-take risk would mean the SO support mechanism is not appropriate for a larger scheme, this applies to C-W and potentially BBL.

5.5.3 Premium Feed-in-Tariff

Under this support mechanism generators sell their electricity on the open market and in addition receive a fixed price premium per unit of output. See Appendix B para B.3 for explanation of how a Premium Feed-in-Tariff would work.

5.5.3.1 Applicability of Premium FIT Regime to a Severn Scheme

From an STP generator perspective, a Premium FIT will result in a two payment streams one of which is a fixed payment stream which is not subject to change. This fixed element of revenue could secure efficient finance provided the finance community was satisfied with the level of off-take and electricity price risk of the remaining income stream.

The scale of the electricity price exposure for even a smaller scheme would be material and unless supported by appropriate PPAs from reputable purchasers, the finance exposure would be too high for a 3rd party lender. This means the choice of support structure would favour investment from the electricity suppliers.

Where the negative impacts on the RO market wished to be limited, this support structure would allow the scheme to operate independently of existing mechanisms. There is an associated risk that where the premium was high, the generator may be incentivised to sell at sub-market prices.

Legislation would be required to support the introduction of a levy on the Consumer and it would be treated as a tax. Administration costs of collection of the levy would need to be considered, similar structures are being used on Carbon Capture and Storage.

Conclusions on use of Premium FIT support structure for a Severn Scheme

Smaller Schemes – The Premium FIT could be used to support a Smaller Scheme and would be particularly useful if a stand-alone mechanism is required with electricity price exposure. Use of a Premium FIT regime would favour investment from an electricity supplier because of the exposure to electricity price risk.

Larger Schemes – The scale of off-take risk would mean the Premium FIT support mechanism is not appropriate for a larger scheme, this applies to C-W and potentially BBL.

5.5.4 Contract for Difference ("CfD")

This is a financial contract to pay the generator the difference between a strike price and a wholesale electricity price index. In other words the income would be fixed provided the generator can achieve the wholesale price in is sales of electricity. The operator is therefore incentivized to sell on the market and maximise the retail value of his power. See Appendix B para B.4 for explanation of how a Contract for Difference contract would work.

5.5.4.1 Applicability of Contract for Difference structure to a Severn Scheme

The key issue associated with a CfD support structure is the need to identify a suitable wholesale price index with long-term liquidity – this will be particularly difficult. The possibility of a CfD mechanism has been raised within the RES[4] for use alongside the RO – again this is likely to expire in 2037. Severn could use similar principles for the development of its own CfD with a strike price reflecting the level of support required. However, the lack of suitable benchmark indices to apply for this Contract for Difference contract means that at this stage it cannot be practically applied.

Conclusions on use of Contract for Difference support structure for a Severn Scheme

The lack of suitable benchmark indices to apply for this Contract for Difference contract means that at this stage it cannot be practically applied.

5.6 Assessment of Revenue Support Options with Fixed Price Support

5.6.1 Fixed Feed-in-Tariff

This will provide the generator a fixed price for the electricity generated. It will be funded through an obligation on suppliers to purchase the electricity at the fixed price in proportion to their market participation. See Appendix B para B.5 for explanation of how a Fixed FIT would work.

5.6.1.1 Applicability of Fixed FIT Regime to a Severn Scheme

A Fixed FIT insulates the operator from off-take risk and long term power price risk leaving the generator with exposure only to operational risk of the asset itself.

For Cardiff-Weston (and potentially Bridgwater Bay Lagoon) there was consistent market feedback that the scale of the off-take risk would be too large for a small group of suppliers to manage and the need to use a structure that removed off-take risk from the scheme operator of

[4] Renewable Energy Strategy – July 2009

which the Fixed FIT is one option. The electricity companies in general accepted that the off-take for a larger scheme would need to be shared across the market in an appropriate manner. The allocation of the obligation on suppliers would need to have regard both to the market share / portfolio of each participant and half-hourly availability.

There were concerns about the impact of an obligation on the rest of the market because structuring a Severn Scheme as a "must-run" scheme would displace other generation in periods of oversupply and it could affect the rest of their investment portfolio.

Conclusions on use of Fixed FIT support structure for a Severn Scheme

Smaller Schemes – Provided the off-take risk is perceived to be manageable, there is no need to consider the use of a Fixed FIT for a Smaller Scheme except to broaden the level of market investment interest in the scheme beyond the existing electricity supply base. Use of a Fixed FIT may however reduce the cost of finance where the perceived exposure to electricity price risk was too high.

Larger Schemes – The scale of off-take risk would mean the Fixed FIT support mechanism would be appropriate for larger schemes. Care would need to be taken to ensure the allocation of obligation was appropriate. The market effect of Severn becoming a "must-run" asset could have serious implications on investment portfolios across the energy sector.

5.6.2 Availability Payment

This provides the generator with a fixed income stream based on the asset being available to generate. It would be funded through an obligation on suppliers to purchase electricity at the fixed price in proportion to their market participation. See Appendix B para B.6 for explanation of how an Availability Payment would work.

5.6.2.1 Applicability of an Availability Regime to a Severn Scheme

The financial and commercial effect of a Fixed FIT and an Availability Payment are likely to be almost the same. The critical part will be the definition of availability and the performance regime that may support that definition.

From a legal perspective availability regimes would sit within a concession contract rather than being established through legislation. Where an availability payment would need to be passed through the supply chain to the Consumer via a levy or an obligation on suppliers to fund it, this would require legislation to establish.

Conclusions on use of Availability based support structure for a Severn Scheme

Smaller Schemes – As per Fixed FIT.

Larger Schemes – As per Fixed FIT

5.6.3 NFFO-like Structure

A NFFO-like structure is an option whereby the Severn Operator / Generator would be paid a Fixed FIT but instead of an obligation structure, the off-take risk would be passed on to an intermediary and the electricity sold independently into the market via a series of contracts probably of differing terms and packaged into manageable bundles of electricity. The

difference between the electricity value and the FIT would be levied on suppliers. See Appendix B para B.7 for explanation of how a NFFO-like structure would work.

5.6.3.1 Applicability of NFFO-like Regime to a Severn Scheme

This structure would ensure that the electricity was sold via the existing market structures and suppliers would be able to bid for the power in the normal way in accordance with their demand profile. It provides to the STP operator / generator a long term guaranteed price contract for his output against which he can obtain finance with the same interest levels described in the Fixed FIT / Availability payment above. It provides electricity suppliers the ability to purchase output on a shortish term basis at a time when they are better placed to judge its value than would be the case if they were being asked to provide terms for a PPA over many years. This structure would avoid the difficult negotiation that a Fixed FIT or Availability Payment would require with an underpinning obligation and allocation of that obligation across the supply base. Sale of the electricity in open market conditions allows for suppliers to purchase profiles that match their needs.

The difference between the revenue generated from the sales and the Fixed FIT payment to the Severn Operator would be recovered through a levy. There is a risk that suppliers protect their own investments first if there is no obligation to purchase the electricity generated and there is an excess of supply, this will mean levies from the Consumer would rise to make up the shortage in electricity revenue. Where the demand is met from generation elsewhere, the overall cost to the Consumer will have increased. Provided demand exists for the electricity, it should be sold. The intermediary would need to be clearly incentivised to package its sales to ensure the efficient sale of the generation and limit the unsold electricity.

The structure would force the power to be sold on competitive terms because the intermediary would be competing for sales in the open market. This structure would not produce windfall profits for generators if electricity prices rise unexpectedly as their payment is fixed, the increase in electricity revenue generated on the market would mean the levy would fall in proportion to the electricity price increase. Equally however in the event of power prices falling below expected levels the payment to the generator is unchanged and the fall in expected electricity revenue will be compensated for through an increase in the levy meaning the overall cost to the Consumer being the levy and the electricity price remains unchanged.

Conclusions on use of NFFO-like support structure for a Severn Scheme

Smaller Schemes – Provided the off-take risk is perceived to be manageable, there is no need to consider the use of a NFFO-like support mechanism for a Smaller Scheme except where there is a need to broaden the level of market investment interest in the scheme beyond the existing electricity supply base. Use of a Fixed FIT may however reduce the cost of finance where the perceived exposure to electricity price risk was too high.

Larger Schemes – The scale of off-take risk would mean the NFFO-like support mechanism would be appropriate for a larger scheme. The benefit of the approach would be allowing the power to be sold in the open market and within existing market structures. From a supplier's perspective they can purchase power without having to take long term power price exposure. There is a risk that suppliers protect their own investments first if there is no obligation to purchase the electricity generated and there is an excess of supply, this would mean levies from the Consumer would rise, however provided demand exists for the electricity it should be sold. The intermediary would need to be heavily incentivised to package its sales to ensure the efficient sale of the generation and limit the unsold electricity.

The structure would force the power to be sold on competitive terms because it would be competing for sales in the open market. This structure would not produce windfall profits for generators if power prices rise unexpectedly, equally however in the event of power prices falling below expected levels the levy would need to increase.

5.7 Summary Assessment of Revenue Support Options

Support Mechanism	Summary Comments
Smaller Schemes	For a Smaller Scheme, because the scale of off-take risk is manageable it is likely that a revenue support structure that transfers electricity price risk would be appropriate i.e. a Premium Feed-in-Tariff / Renewables Obligation / Severn Obligation approach. Use of this approach may limit participation to utilities (though PPAs could be negotiated by a non-utility), and may not be the cheapest pricing structure for the Consumer. The lowest risk option would be the use of the RO as it is already established, however the timeframes issue may mean it is more appropriate to consider a Premium FIT particularly if it is the only technology receiving support. Use of a Fixed FIT may however reduce the cost of finance where the perceived exposure to electricity price risk was too high.
Larger Schemes	The off-take risk associated with the C-W and BBL schemes is material so it is unlikely that the operator could manage the off-take risk. This indicates the need for a fixed price support mechanism. Through a Fixed FIT or Availability payment, the off-take would be managed through placing an obligation on the suppliers to take the electricity generated in proportion to their participation in the market at a fixed price. This could cause serious market issues as the Severn Scheme becomes a "must run" asset and would affect investment decisions for other technologies. It is possible for Government to retain the off-take risk and sell the electricity through shorter term contracts funding the difference between the price paid to the operator and the market sales through a levy on suppliers, i.e. a NFFO-like structure. This would allow the sale of electricity to happen within existing market structures but the residual risk of off-take would remain and failure to sell the electricity would result in higher costs to the Consumer.

5.8 Wider Market Change

It is clear that there may be changes proposed to the wider electricity market to bring forward investment in low carbon technology. The market in which a Severn Scheme will be delivered is changing both from a demand perspective (with potential growth in electric cars, changes in energy storage technology, introduction of smart grid) and from a supply perspective (i.e. the move to a low-carbon economy and potential increase in interconnector capability).

The DECC 2050 team is reviewing the likely demand scenarios for energy in the future and the support structures and frameworks required to deliver future electricity infrastructure to support the growing demand. DECC together with Infrastructure UK are supporting the Government in its work

to ensure the energy market framework can most effectively deliver a fair deal for the consumer and the low-carbon investment needed in the long term. These teams have not completed their assessments in the timeframe of the drafting of this paper. Further work will need to be done to assess the impact of any recommendations in respect of the architecture of the broader electricity market to the Severn Tidal Feasibility Study.

5.9 Detailed Assessment of Key Stakeholder Perspectives on Revenue Support

Stakeholder	Key Revenue Support Concerns
Finance Market	In general, 3rd party lenders are likely to be nervous about the scale of demand risk associated with a Severn Scheme and the security of its revenue when based on the electricity price risk and would require significant PPA support before they would consider lending to a project. A structure that removes demand risk and electricity price exposure would increase the interest from banks / bond markets for funding and infrastructure funds or construction companies for equity participation.
STP Generator	If the Severn generator is an electricity supplier, they would prefer exposure to electricity price risk provided this is manageable (i.e. for Smaller Schemes). For an infrastructure fund investor or a construction company, they have no operational business through which they can manage the off-take risk so they have a preference for a fixed price support structure e.g. Fixed FIT, Availability, NFFO-like structure.
Electricity Suppliers	Electricity suppliers in general will have concerns on the obligation that might be placed on them if a Fixed FIT or Availability payment was used, this obligation would mean Severn becomes a "must-run" asset and could displace elements of other electricity infrastructure asset generation which could have serious financial consequences. Further, it may delay new investments where the market effects of the obligation are being understood or yet to be clarified. One potential operating protocol may be to publish the periods of generation for a Severn Scheme in advance and allow suppliers to flex their generation around this as efficiently as possible. Suppliers will also be concerned about the protocol for switching on / off of generation in the event of an excess / shortage in supply and the effect that differential support mechanisms could have on the economics of such a decision. They would also be concerned where the relative support levels for a Severn Scheme could incentivise negative pricing of electricity in periods of over-supply.
Other Electricity Generators	Where the Severn Scheme revenue support was outside existing market mechanisms, other generators would be particularly interested in understanding the effect that it could have on their investments and the off-take risk for their generation. Where fixed price support mechanisms were adopted, the Severn Scheme could displace their generation and reduce performance of their investments.
Consumer	The consumer is obviously concerned on the impact of a Severn Scheme on their bills. Supporting a Severn Scheme through a mechanism that included electricity price risk exposure will attract a premium for this risk and arguably increases the prices paid by the consumer, however equally it places the risk in the hands of those best able to manage it . Ownership of electricity risk exposure incentivises the operator to generate in periods of higher electricity pricing to the extent that he can flex his generation to maximise the value of the output. The nature of the cost base of a Severn Scheme means that the marginal cost of generation is likely to be relatively low with the majority of scheme costs coming from the capital element. **a)** Mechanisms with **electricity price exposure** for the STP operator Where electricity off-take and price risk is transferred, if long term electricity prices rise, the payment to the STP operator will increase and this increase will be passed on to the consumer through the charges paid by suppliers. If long term electricity prices fall, similarly payments to the STP operator will fall and this decrease will be passed on to consumer. Given that Consumers bear the associated price risk in proportion to their spend on electricity arguably the premium paid for transfer of electricity price risk (to insulate the generator form a decrease in revenue when his cost base remains fixed) is not value for money. In conclusion, the Consumer picks up the underlying price risk of electricity price exposure.

Stakeholder	Key Revenue Support Concerns
	c) Mechanisms with **fixed price support** for the STP operator Use of a fixed price structure will reduce risks for the STP Operator. Where a **Fixed FIT or Availability payment** is used, it will fix the price for the STP Operator who will pass this price on to the electricity suppliers and in turn Consumers. Should electricity prices fall, there will be no way to capture that value for the Consumer as prices have been fixed. If electricity prices rise, the fixed price for the Consumer is unchanged so Consumers would be in a better position. The benefits of fixing costs would be to lock-in to a particular value or price, the downside is that should technological or other changes reduce electricity prices, the fixed payment remains unchanged. For a **NFFO-like structure**, the STP Operator will have a fixed price support payment, this is passed on to Consumers through a combination of the value the scheme generates on the electricity market and the levy payable. Assuming all the electricity is sold on the market, the effect on the Consumer is the same as the Fixed FIT or Availability payment. There is a residual risk that the electricity is not sold and the overall cost to the Consumer rises as they fund the Severn Scheme through the levy and they potentially source electricity from other sources instead. Where electricity prices exceeded the value of the fixed price support payment, the Consumer would benefit as there would be a net benefit to the scheme which could be retained.
Government	Government is concerned about the costs to the Consumer and the any additional costs to Government and the taxpayer.
National Grid	National Grid will have concerns about the balancing effort required to support a Severn Scheme. A fixed support mechanism will give the operator no incentive to flex demand which on the one hand means it is highly predictable in terms of profile, however the peakiness could case large issues across the electricity generation portfolio. An electricity price based regime provides an incentive for suppliers to balance demand / supply efficiently.

5.10 Summary Assessment against Constraints

Constraint	Assessment
State Aid	Because the RO is an existing mechanism supporting a range of existing schemes, it is unlikely to require additional state aid clearance. However the RO in its current form could not cater for the requirements of a Severn scheme and its extensions could require a further state aid clearance. A Severn Obligation as a new mechanism would require state aid clearance (this may be avoided if it is structured as a recycled buy-out fund). Where an availability payment was used within a PPP project and there had been demonstrated to be a competitive process followed, this should not constitute state aid, although in a PPP structure a Government equity investment would need to be on equal terms to the private sector to avoid it being a state aid. A Premium FIT, Contract for Difference, Fixed FIT, or NFFO-like structure could all require state aid clearance. The Commission has said that in principle it will allow certain types of operating (and investment) aid, within specified limits. If any of the mechanism above fit within those limits then the Commission will clear the aid (aid falling outside of the permitted limits may still be cleared, but the Commission would examine this in detail).
Administration Costs	The administration costs of the RO mechanism are covered through the buy-out fund where the proceeds from the buy-out fund are distributed to participants who have met their obligation net of administration fees. Post 2037, if there was only one scheme supported by the RO there would be a need to secure additional funds to support the administration costs of a scheme. The same issue would arise where a SO only supported one scheme. Administration costs for all the other market mechanisms would need to funded by Government. The Premium FIT is likely to have lower administration costs than other

Constraint	Assessment
	options as it is the simplest structure.
Timeframe for Delivery	In terms of the need to set up the required support mechanisms all have different levels of legislative change. Using the RO in its current form would require no change to legislation however amendments would be required to the Renewables Obligation Order to create a 'Severn' band, or to put the Severn into an existing band. Extension of the RO scheme would require legislation as would extending support for longer than the maximum 20 years. A SO would require additional primary legislation (and potentially both primary and secondary legislation). A Premium FIT or Fixed FIT would require primary legislation, it could be adapted based on the existing FIT mechanisms but is likely to require further changes. Availability regime would not require primary legislation as it is likely to be supported by a concession contract, however there would be significant time required to negotiate such a contract. A NFFO-like levy structure would require primary legislation (and potentially secondary legislation), it could be based on the previous NFFO legislation. It is difficult to put exact timeframes on the creation of legislation, since this is subject to parliamentary availability and timetabling. For primary legislation it can take a year or more to draft and pass (often more if done by way of hybrid bill), whereas secondary legislation can generally be passed in a slightly faster timeframe.
Balance Sheet	See Section 8 for detailed analysis. In general structures that transfer electricity price risk such as the RO are better for balance sheet position, however the treatment of other key risks such as the residual value of the asset are equally important.

SECTION 6 – COMPENSATORY MEASURES

6.1 Background to Compensation and Offsetting

There is a range of legislation and policy that supports the need to consider measures for offsetting or compensation of the adverse environmental effects of a development. The Strategic Environmental Assessment Directive requires consideration of measures to offset outstanding environmental effects. The designation of the Severn Estuary and several of the rivers draining into the Severn under the European Habitats Directive requires a specific definition of compensation to be applied. This stems from Article 6(4) of the Habitats Directive which requires that Member States take all necessary compensatory measures to protect the overall coherence of Natura 2000 is protected.

The SEA will identify measures that would prevent, reduce and as fully as possible offset any significant effects on the environment of implementing the plan or programme. The extent of offsetting measures that might be required by Government and their cost is not yet known.

The possible requirement for compensatory measures under the Habitats Directive has been the subject of specific studies. The remainder of this section deals with compensation under the Habitats Directive.

6.2 Compensatory Measures under the Habitats Directive

To protect the overall coherence of Natura 2000 guidance states that compensatory measures should address in comparable proportions the habitats and species negatively affected. There is a risk that it will not be possible to compensate for all impacts of all STP options following the approach within the Commission guidance. The extent to which compensatory measures outside Commission guidance might be necessary, feasible and acceptable remains to be determined.

A range of possible measures that follow Commission guidance have been identified. These include creation of new inter-tidal habitats (saltmarsh and mudflat) through managed re-alignment, of coastal flood defences; stocking, habitat enhancement and translocation of migratory fish; and habitat creation and management for migratory waterbirds.

Managed re-alignment has received considerable attention because it is a technique that has become established as a way delivering compensation for losses of inter-tidal habitat, for example, in the case of ports developments or Environment Agency Flood Risk Management Strategies. It is assumed that inter-tidal habitat creation would be necessary to compensate for the loss of inter-tidal habitat caused by a scheme. In theory this may be met either through mitigation by modifying land within the Severn Estuary or by compensation by re-aligning coastal flood defences next to the Severn Estuary or at distance from the Severn.

This study has assumed that some managed re-alignment would be part of the Habitats Directive compensation for s Severn Scheme and that for some options these would be outside the scale of existing examples of coastal realignment. As part of the Feasibility Study the feasibility and impact of scaling up managed realignment and the likely issues that will arise is being considered.

That study will inform the feasibility of applying managed re-alignment to achieve different possible target amounts of inter-tidal habitat.

A key driver to the successful delivery of this form of compensation would be the identification and securing of suitable land in the quantity required to meet any potential target that might be specified. For very large habitat creation targets larger sites may be more efficient to construct and manage but it is more difficult to secure a larger site. This section explores the key commercial issues associated with this form of compensation should it be required.

6.3 Key Commercial Issues Associated with Compensatory Measures

6.3.1 Commercial Issues

From the private sector's perspective there are clear linkages between the delivery of the Compensatory Measures and the power project not least because the Compensatory Measures should be in place before the damage is incurred so delays in delivery of the Compensatory Measures will result in delays for the power project. A Severn scheme will need to show how, where and when Compensatory Measures would be achieved in order to secure planning approval for a scheme. The requirements of the Habitats Directive will drive the design of the Compensatory Measures themselves.

6.3.2 Market Testing Comments

In terms of commercial delivery options, the market testing looked to understand the private sector's attitude to the Compensatory Measures requirement and the optimal delivery structure. From the market testing responses of the traditional investors in the power project who would manage the overall project and subcontract the delivery of the Compensatory Measures, there were concerns about Compensatory Measures and their ability to both understand the requirement and design the Compensatory Measures. They were particularly concerned about the cost of such a process in the absence of planning approval and there were high levels of concern over the deliverability of planning approval. Respondents suggested this process should be Government led, Government sponsored or potentially Government underwritten in the event of failure to achieve planning approval.

There was a recognition that in order to fully scope the Compensatory Measures requirement, designs would have to reach a reasonable level of maturity and this would be expensive.

6.3.3 Technical Delivery

The environmental workstream have focused on the issues of technical feasibility of the Compensatory Measures requirement. The studies also consider timelines, cost and potential impacts. Key issues include the ability to scale up coastal realignment on a larger scale and the availability of suitable land.

6.3.4 Land Assembly

As part of the market testing, DECC met with coastal habitat creation experts to see how their experience in establishing large habitat creation projects could be applied to Compensatory Measures delivery, especially the issues associated with land assembly. A long term strategy involving early identification of suitable land, researching owner attitude, and developing relationships with them is an approach that has been found to be successful. Mention was made of the use of options to purchase at an agreed price within a set timeframe as one strategy in use. The use of options enables some time to gather resource together before projects are approved and secures land at an appropriate price. It also enables the owners of such land to plan changes to their businesses, for example relocating all or part of their activities to new areas of land. The use of land swaps was also mentioned as an additional mechanism that has been used. Land may have been identified up to 7 years in advance enabling it to be more speedily available to projects when funding and need arises.

Severn may consider the use of compulsory purchase orders as part of the land assembly but this needs to be considered as part of the wider planning and procurement strategy for the project. The procurement strategy would depend on which scheme was selected, the overall target set for this form of compensation and the criteria that were defined for site selection. For example, the extent to which land should be secured within the Severn itself.

In theory it might be possible to accelerate the procurement of land for an STP by involving third parties who have started on the early stages of developing a possible re-alignments. The extent to which this might be possible would need to be investigated further through a supply chain study.

6.3.5 Land register and bio-banking

There has been some discussion about the potential use of land banking or bio-banking. Individual parcels of land that could potentially be used for Compensatory Measures projects might be identified and put on a register. This would speed up the time taken for land assembly not just for a Severn Scheme but for a range of projects with this type of requirement. It would be an ideal platform to bring together willing sellers and potential buyers.

The scale of interest from sellers would need to be clear and the structure of the scheme needs to act as an appropriate incentive for land owners to both bring forward land but also to remove it from the database where circumstances change and there is no longer a desire to sell and ensure the database is a valid representation of interest.

There is considerable interest in the conservation sector about the possibility of developing a biodiversity banking approaches to environmental compensation. This is a system whereby a third party (the biodiversity banker) develops habitats on land that meets defined environmental criteria and then makes this available to developers as compensation for their schemes. A number of bio-banking models have been used in other parts of the world, notably North America and Australia. A Severn Scheme would benefit from the development of a bio-banking market in the UK however the extent to which a scheme itself could be a sufficient driver to set up the market would depend on the amount of compensation required and the timescales for delivery of a Severn Scheme and the appetite from the wider stakeholders to establish such a market.

6.4 Delivery Options for Compensatory Habitat

This investigation used habitat creation element of a possible compensation to test a number of approaches with the private sector. In broad terms there are likely to be several potential delivery options for compensatory habitats:

a) Private sector (which could be private landowners, business or the voluntary sector) manages the compensatory measures programme in its entirety taking ownership of defining the nature of compensatory measures required, identification of land assembly, planning, obtaining consent and establishing the compensatory measures and maintaining them. Government would define the criteria that the private sector would need to meet in order to comply with the Habitats Directive.

b) Public sector completes further work to establish the compensatory measures requirement. Once the requirement is defined, private sector takes on responsibility for identification of land and its requisition, establishing the compensatory measures and maintaining them.

c) Public sector completes further work to establish the compensatory measures requirement. Public sector also takes responsibility for identification of measures e.g. land parcels and their assembly. Private sector takes on responsibility for establishing the compensatory measures and maintaining them.

d) Public sector manages the compensatory measures project in its entirety.

e) Create a PPP (either integrated into the power scheme or separate from it) to deliver the compensatory habits.

The market testing results indicate that option a) is not deliverable and option d) is likely to create integration risk. Option e) with the creation of a separate PPP is unlikely, it would be better to be integrate the compensatory measures project with the power project. Options b) and c) are both possible.

6.5 Conclusions

There are some key concerns raised around the planning issues associated with Compensatory Measures. This led the market to raise the issue of planning being a potentially Government led or Government funded / underwritten process. However, there is a recognition of the interdependencies of the Power and Compensatory Measures projects. The market testing work indicated that ideally both projects should be delivered by a single supplier if the integration of delivery of the Compensatory Measures project and the power project are to be managed. Further, the market commented that while it was capable of managing the delivery risk of the Compensatory Measures project against the agreed plan, residual risk of challenge from the EU would not be something they could manage.

SECTION 7 – CAPITAL AVAILABILITY

7.1 Sources of Capital

There are a number of potential investors for a Severn Scheme. Key sources include:

- Electricity suppliers
- Construction companies with an interest in the construction contract
- Infrastructure funds who have an interest in the long term income from an asset of this nature that operates in a regulated industry
- Project bank / bond finance
- Other financial investors – e.g. EIB
- Whole business securitisations
- Green bonds.

In the current economic climate even the smaller of the Severn schemes has significant financing requirements at a time when there is reduced liquidity; with a shortage of capital supply, banks and other lenders are carefully reviewing the risk exposure on their investment options.

7.2 Perspectives of Investor Interest

7.2.1 Electricity Suppliers

Electricity suppliers are the owners of the majority of large scale generating plant in the UK. They are also currently investing heavily in both the nuclear new build and the off-shore wind programmes. Electricity companies generally like to keep their generating asset portfolio consistent with those of their competitors as over / under investment in any one technology could expose them to unusual performance if underlying prices in either the external markets or the cost of production change for a particular technology. For this reason they will be interested in participating in a Severn Scheme as they would be keen to consider investment in all electricity generating assets. There was some perceived exposure in owning a stranded asset i.e. one which was not owned by other participants in the market, this could heighten risk exposure for the company / companies that owned it.

Electricity suppliers tend to fund their investments in infrastructure through corporate bonds and on-balance sheet. Because of their scale and credit rating, the larger electricity suppliers can secure efficient finance through their corporate borrowing. Electricity companies are likely to have the funds to invest provided the balance of risk / reward is attractive in comparison to other investment opportunities. In the market testing exercise the electricity companies indicated that the scale of the smaller schemes (sub £5bn[5]) were manageable but the larger schemes could not be delivered by the private sector.

Post construction or post planning approval there has been some recent activity of electricity companies selling part of their investment in assets to a 3rd party, this helps to recycle capital for new investment.

In general larger electricity schemes are sponsored by more than one electricity supplier and this enables them to share the risk and the off-take from a scheme. Often the partnering enables to pooling both of cash resources and relevant skills to optimise scheme performance.

[5] In some cases the boundary was drawn closer to £3-4bn so £5bn may be optimistic but it would depend on the balance of risk.

As indicated in Section 5, electricity suppliers are likely to be interested in revenue support structures that include electricity price risk provided that risk was manageable. Equally ownership of electricity generating assets is a core business for them so use of a fixed price support mechanism would also be of interest and most market testing respondents indicated that the balance of risk may indicate this is appropriate.

Currently, electricity suppliers are under pressure to maintain their credit rating levels (as this directly impacts their underlying cost of capital) and consider the level of risk, strategic fit, capital requirements and cashflow impact of any new investment. The scale of investment in new nuclear projects showed the private sector could lead development of ca. £5billion energy projects[6]. It should be noted that this notional cap is close to the level of anticipated capital investment (pre-optimism bias adjustments) required for the schemes and indicates there are some questions about the deliverability of the investment[7].

7.2.2 Construction Companies

The scale of engineering works for a Severn Scheme is very large and will attract interest across the UK and European construction market. Many of the construction companies are used to taking both performance risk on a construction contract and equity stakes within delivery structures. Appetite for electricity risk was low from this source of investment as they do not have a method of managing their exposure. Further where they sponsor schemes construction companies rely on the external finance market to secure funding and it is likely that the finance market would be nervous about large exposure to electricity demand risk or significant construction risk.

7.2.3 Infrastructure Funds

In general institutional investors are interest in long term investments with relatively secure investment returns to match their exposure to future pension liabilities. This type of investor has invested heavily in the PFI / PPP market and in utilities markets in general. They are attracted to the secure return and would not have an appetite for electricity demand risk or significant construction risk.

7.2.4 Project Bank / Bond Finance

In terms of external funding for investment, there is limited liquidity in current debt markets and funders are as a result reducing the level of investments they are placing in projects and margins are increasing. In general, it is anticipated that the longest term of debt funding would be approximately 20 years with bond funding stretching to approximately 30 years (provided the funding is supported by acceptable commercial terms). While there is liquidity in the bond market for investment, liquidity in this market decreases markedly for investments over £3bn. Further bond finance holders would not be willing to accept a revenue support structure inclusive of electricity price risk. Bank finance is also likely to require a fixed price support mechanism.

7.2.5 Other Investors e.g. EIB

EIB are unlike other traditional lenders. They have three key tests before they would support funding projects:

[6] Based on cost estimates at the time of preparing this document, only the Beachley Barrage and Shoots Barrage would fall under this notional level of investment, using costs that are net of optimism bias but inclusive of contingency.

[7] Industry were given capital costs from the last Government Consultation on which to base their comments, these costs have been updated.

i. Is it eligible in terms of meeting the terms that govern whether EIB can offer support – a Severn Scheme is likely to meet this remit.
ii. Is it "doable" technically (due diligence will confirm this) and is it economically efficient
iii. Does it pass the credit test – i.e. can it repay the loan.

It is likely that they would be interested in providing finance. The project is of a scale that interests them and they are investing heavily in the energy market.

7.2.6 Revolving Bond / Securitisation

Given the long term nature of the asset life, ideally it would be beneficial to match the asset with a funding source of similar longevity. One way of doing this would be to finance the Severn Scheme over the longer term through a series of revolving bonds which would amortise only to the extent of the residual enterprise value of the generating asset.

Such a structure would assume that at the end of a 30-year period the residual value of the asset in terms of the future generational value could be matched with finance. On discussion with the lending community, while the potential value was recognised the risk of changes to the electricity market prices and underlying generational costs of other technologies eroding the perceived value long term is not something lenders would be willing to take risk on.

The Government could underwrite the value of the asset in the future and secure lending on this basis, however such a commitment may need to be recognised on its balance sheet particularly if there is a reasonable risk it could be called upon.

7.2.7 Green Bonds

There have been a number of proposals to use green bond solutions to fund a Severn Scheme. The premise is to leverage a market with an interest in sustainable green investment. A long dated low-yield self amortising bond could deliver the up-front capital and match the repayment over the longer term.

A green bond for Severn could be marketed at the UK consumer or UK investment community to draw in support for the project and finance it in a long-term way. Ownership of the asset by an influential consumer based group could change the nature of operation of the asset.

It is fair to say that the use of green bonds for large infrastructure finance is an emerging rather than a developed market. Where a large Severn Scheme was recommended it may be the platform against which a green bond could be launched. Equally use of a green bond structure would require the investor community to be informed of the detail of the potential investment risks, it is questionable whether the first of a kind investment coupled with the significant construction risk would naturally be the kind of investment the average consumer is willing to invest in. The deliverability of such a finance structure would be questionable given it is unproven in the market.

7.2.8 UK Consumer Trust Structure

Rothschilds have proposed the use of a UK Consumer Trust to provide part of the capital funding requirement for a scheme - this is likely to be particularly relevant for a larger scheme. This Trust would be a majority shareholder in the Severn Scheme though it is likely there would also be a significant shareholders from the electricity

companies also. The Trust would be set up as a consequence of placing a renewable levy on all consumers for a period of 30 years. The revenue from this levy would be used to raise external finance and the UK consumer would receive dividends through the UK Consumer Trust's shareholding.

The advantage of this option would be the ability of the UK consumer to potentially receive benefits in any upside in the value of the asset or the electricity it generates through its shareholding. Given the linkage between costs of the scheme and costs to the Consumer, this is a sensible linkage.

An obvious downside would be the need for the UK consumer to take equity risk through its participation in the Trust. The participation of major electricity suppliers in the shareholdings should give confidence that the project is relatively robust and downside risk appropriately managed. The levy structure may necessitate a guarantee by Government to pay on behalf of the Consumer which may give rise to balance sheet issues or lead the structure to be treated as a tax. Further examination of the deliverability of this structure should be considered with particular reference to a larger scheme.

7.3 Conclusions

In terms of a commercially deliverable finance source for a Severn Scheme, the electricity suppliers are the most obvious source of funding given their familiarity with the market and their ability to price and understand the associated risks. Further they have access to capital at efficient pricing and an ability to manage electricity price risk.

The external finance market is currently hit by issues of liquidity and would require the project to be structured with a fixed price support mechanism. EIB is a source of funding that should be explored further.

SECTION 8 – BALANCE SHEET ASSESSMENT

8.1 Relevant Guidance

8.1.1 Introduction

This section summarises the likely balance sheet treatment for Severn Schemes. The assessment covers two relevant standards.

- International Accounting Standards ("IAS") – this governs the accounting for departmental resource accounts[8].
- Eurostat Accounting 95 ("ESA 95") which governs the treatment for departmental budgets.

The two standards adopt differing approaches to determining the balance of ownership.

Both ESA95 and IAS/IFRIC12 standards are important in considering the balance sheet assessment of such projects. In assessing the public finances, the Government uses measures of debt and borrowing that are based on, and consistent with, National Accounts definitions and methodology. Hence in light of the wider fiscal and economic environment, the Government will be paying particular attention to the balance sheet assessment under ESA95.

8.1.2 IAS

IAS focuses on control over assets. Its key tests (as defined in IFRIC 12) are if:

- The grantor **controls or regulates** what services the operator must provide with the infrastructure, to whom it must provide them, and **at what price.**
- The grantor controls through ownership, beneficial entitlement or otherwise – any **significant residual interest in the infrastructure** at the end of the term of the arrangement.

8.1.3 ESA 95

ESA 95 approaches ownership by looking at the extent to which each party would bear any variations in asset related profits or losses. Its key tests are:

- If the public sector carries **construction risk**, the assets are viewed as being on the public sector balance sheet for the purposes of the National Accounts.
- Where the private sector holds construction risk, and one of either demand or availability risk, the assets are not considered to be on the public sector balance sheet for the purposes of National Accounts.

Where results are borderline then other risks and in particular residual value risk should also be considered.

[8] PWC prepared an indicative accounting opinion for the likely treatment of potential Severn Schemes under International Accounting Standards as part of their "Financing and Ownership Options" paper prepared as part of the Phase One Consultation. This paper draws on their assessment to support its conclusions.

8.2 International Accounting Standards Assessment

8.2.1 Smaller Schemes

8.2.1.1 Private Sector Led – Where the private sector finances, constructs and manages the operation of the asset for its useful life, the schemes could be treated as off balance sheet. The nature of revenue support could potentially be an issue. Where a support payment becomes predictable, there would be a need for the public sector to recognise a liability for the level of support it offers. This could be a material liability.

a) **RO Support** – The RO is a market based mechanism and its price varies over time, this would support an off-balance sheet assessment under IAS. There may be some issues of classification where the Severn Scheme was the only scheme covered by the RO (i.e. post 2037) and the payment is likely to become relatively fixed potentially, where this was the case the liability would need to be recognised.

b) **Severn Obligation Support** – Where a Severn Obligation regime only included one scheme, it is likely that the payment would become relatively fixed, where this was the case the liability would need to be recognised.

c) **Premium FIT** – A premium FIT would include a large fixed price element alongside the electricity price exposure. Liability for the fixed payment would need to be recognised under IAS.

d) **Fixed Price Support Mechanisms (Fixed FIT, Availability or NFFO-like structure)** – all of these would be on-balance sheet under IAS because of the fixed price.

8.2.1.2 PPP Structure – A PPP Structure would be on balance sheet under IAS because of the retention of residual interest in the infrastructure.

8.2.1.3 Regulated Concession Structure - A regulated concession structure would be off balance sheet under IAS as the pricing would be reviewed by the independent regulator over time and the residual value of the asset is transferred. This would not be relevant where Government provided significant funding to support the project or provided significant guarantees to support the finance.

8.2.2 Larger Schemes

PWC's assessment under IAS[9] indicated that the only Cardiff Weston scenario that could potentially achieve an off-balance sheet assessment was the use of a limited company responsible for financing and procurement with Government guaranteeing the finance. However Government would need to account for the fair value of any guarantees it grants to the limited company and to account for any control it has over the company as an associate or Joint venture. The market testing exercise indicated that a fully private sector funded C-W solution is not deliverable in current market conditions for this reason it is likely that Government would need to provide funding either in the form of loans, equity or commitments to support funding, Government would have to recognise its financial obligation in respect of this structure. In summary, all larger scheme structures would be on balance sheet.

[9] See previous footnote.

8.3 Eurostat Accounting 95 Assessment

8.3.1 Smaller Schemes

Under ESA 95 an off balance sheet position may be achieved where it could be demonstrated that all of the construction risk lay with the private sector with no "carve outs". At this stage in development there are a number of uncertainties that indicate such levels of risk may not be transferable or value for money to transfer. At any point where the assessment is deemed marginal, the guidance points to the need to consider the residual value risk. The residual value of the asset is material at the end of the concession with a likely remaining useful life of 90 years and an asset with a very low marginal cost of electricity generation. This evidence would not support an off balance sheet assessment and undermines any attempt to present the structure as off balance sheet.

8.3.1.1 Private Sector Led – Where the private sector finances, constructs and manages the operation of the asset for its useful life, the schemes could be treated as off balance sheet. The critical tests that will need to be met will be the transfer of construction risk and residual value risk and one or other of demand or availability risk.

a) **RO Support** – The RO mechanism transfers both demand and availability risk – provided construction risk is transferred this should be treated as off-balance sheet.

b) **Severn Obligation Support** – The SO mechanism transfers both demand and availability risk – provided construction risk is transferred this should be treated as off-balance sheet.

c) **Premium FIT** – The RO mechanism transfers availability risk for all elements of the payment stream and demand risk for the electricity element of the payment stream – provided construction risk is transferred this should be treated as off-balance sheet.

d) **Fixed Price Support Mechanisms (Fixed FIT, Availability or NFFO-like structure)** – Provided these structures transfer availability risk and construction risk, this structure is likely to achieve an off-balance sheet assessment.

8.3.1.2 PPP Structure – A PPP Structure would be on balance sheet under ESA 95 because of the retention of residual interest in the infrastructure.

8.3.1.3 Regulated Concession Structure - A regulated concession structure would be off balance sheet under ESA 95 provided construction risk and one or other of demand or availability risk was transferred.

8.3.2 Larger Schemes

Under ESA 95 the difficulty transferring construction risk because of the scale would make it very difficult to achieve an off balance sheet position.

8.4 Summary

Private sector led development of the asset could result in an off balance sheet assessment. A regulated structure may also result in an off-balance sheet assessment for a smaller scheme. A PPP would probably result in an on balance sheet assessment because of the retention of residual value in the asset by the Government.

The likely balance sheet assessment under the applicable guidance is summarised below:

Project Options	Procurement Structures	IAS	ESA 95
Smaller Schemes	Fully private sector led supported by Renewables Obligation for 25-35 years	Potentially Off	Off
	Fully private sector led supported by Severn Obligation for 25-35 years	Probably On	Off
	Fully private sector led supported by Premium FIT	On	Off
	Fully private sector led supported by fixed price support mechanism for 25-35 years	On	Off
	Public-Private Partnership ('PPP'), with fixed price support mechanism, reverting to Government ownership after 25-35 years	On	On
	Regulated Concession: fully private sector financing, construction, and operations, with level of FIT determined by regulator	Potentially Off	Off
Larger Schemes	Public-Private Partnership ('PPP'), with fixed price support mechanism, reverting to Government ownership after 25-35 years	On	On
	Regulated Concession: likely to be a mix of public and private sector financing with level of fixed price support mechanism determined by regulator	On	On
	Public Sector led	On	On

SECTION 9 – KEY CONCLUSIONS

9.1 Key Issues Identified by Market Testing

The market testing exercise indicates a general reluctance from the market to invest in a Severn Scheme in immediate timescales for the following reasons:

9.1.1 Capital Availability – In the current economic climate even the smaller of the tidal projects has significant financing requirements at a time when there is reduced liquidity; with a shortage of capital supply, banks and other lenders are carefully reviewing the risk exposure on their investment options. While the electricity suppliers have traditionally funded infrastructure assets on their balance sheet via corporate bonds, they are under increasing pressure to maintain their credit rating levels (as this directly impacts their underlying cost of capital) and consider the level of risk, strategic fit, capital requirements and cashflow impact of any new investment. The scale of investment in new nuclear projects showed the private sector could lead development of ca. £5billion energy projects[10]. It should be noted that this notional cap is close to the level of anticipated capital investment (pre-optimism bias adjustments) required for the schemes and indicates there are some questions about the deliverability of the investment[11].

9.1.2 Construction Risk - While the solution itself may not be considered technically complex and relies on proven engineering techniques, the size of the project may be a barrier to the transfer all of the construction risk, and there is a natural nervousness in the market given the limited examples of similar schemes across the world, even at limited scale. It should be noted however that comparisons can be drawn to large hydro schemes which rely on similar technology. The logistical coordination required to manage the supply chain to deliver these projects will also be material and the level of construction resource required is likely to require mobilisation of a major part of the UK and European construction industry.

9.1.3 Planning and Environmental Issues – There is a wide understanding of the complex environmental risks associated with delivering a Severn Scheme and a concern that these issues may not be overcome easily for a project spanning two countries. The market believes this is likely to lead to a protracted planning process and while the establishment of the Independent Planning Commission ("IPC") was recognised as a potential accelerator for this process, as a newly established body it has yet to deliver on its remit and is subject to an element of political uncertainty. Sponsoring schemes through planning approval is an expensive process, affects the competitive procurement process and may require bid cost support if the scheme is eventually aborted. The feedback from the market is that they would like this process to be Government led or Government funded because of the concern over the scale of planning risk for a Severn Scheme. De-commissioning policy for the scheme also needed to be clarified[12].

9.1.4 Competitive Technologies – Nuclear and offshore wind schemes would compete for capital with a Severn Scheme. The market testing indicates that the scale of the construction, the long pay-back period and its relatively unique nature compares less favourably to nuclear new build where there are recently constructed examples to draw on, or offshore wind where there are many projects and where the modular nature of the construction reduces risk and capital drain. Further, the relatively limited market for further tidal range schemes (because of their particular geographical requirements) will reduce interest levels

[10] Based on cost estimates at the time of preparing this document, only the Beachley Barrage and Shoots Barrage would fall under this notional level of investment, using costs that are net of optimism bias but inclusive of contingency.

[11] Industry were given capital costs from the last Government Consultation on which to base their comments, these costs have been updated.

[12] It is envisaged that the nature of the construction would mean that the removal of the structure at the end of its useful life would cause significant environmental impact so the decommissioning regime is likely only to include removal of the mechanical and engineering equipment from a safety perspective rather than removal of the structure itself. The only exception to this would be early termination where the scheme was aborted for any reason that necessitated the removal of a substantial part of/ the entire structure.

for investment in the sector because it is not readily replicable for other schemes, unlike both offshore wind and nuclear new build where there is a global market to exploit. The relative merits of tidal range technology investment compared to alternative investments will need to be clearly articulated to ensure market interest should a scheme be sponsored.

9.1.5 Off-take risk – The relatively limited flexibility over energy generation profiles may be problematic in terms of the management of off-take risk for a Severn Scheme. While the generational profile will be intermittent it will be predictably intermittent which, in terms of forward selling of power generation, will be less problematic than wind investments provided there is a market for the power generated. It is unlikely off-take risk will be a problem for the Smaller Severn Schemes[13] but could be a large problem for a Cardiff-Weston scheme ("C-W") and potentially a Bridgwater Bay Lagoon ("BBL") for particular generational periods where supply may outstrip demand (for example 3am on a June morning). The supply also needs to be seen in the context of the future generational profiles where, as a technology, it will generate: nuclear will be expensive to flex generation, CCS is also predicted to have limited flexibility and wind assets will also be expensive to displace. The key question will be what the priority order and protocol of "turning on / off" will be. The market testing indicated that in some ways it could be easier to switch off a tidal scheme at limited cost than some of the other technologies but the implications of this for the operator would need to be agreed.

9.2 Commercial Structure

The market testing brief asked respondents to comment specifically on the commercial structures outlined below and indicate their preference and why. The Feasibility Study considered four main commercial structures for ownership and delivery of a Severn Tidal scheme.

9.2.1 Private Sector led option – private sector own, finance, construct and operate the asset for its useful life under the terms of a licence.

Feedback from the market testing indicates that this option would only be possible for a Smaller Scheme and would not work for a C-W or BBL because there is a limit on the level of capital that the private sector is willing to commit to a scheme. To be delivered in the market, this would probably need to be led by the electricity companies who are the only corporates with sufficient balance sheets to take on the finance requirement. A private sector-led option would leave the residual value of the asset with the private sector after an initial revenue support period of 30-35 years particularly during construction where securing construction where securing finance from the external lending community will be difficult. Given that the asset has a design life of 120 plus years, this could be problematic once the debt has been repaid and the marginal cost of generation is particularly low; a Severn Scheme could undermine the market pricing depending on where electricity prices are at this stage, and/or deliver excessive returns.

9.2.2 Public Private Partnership ("PPP") concession – private sector finance, construct and operate the asset for a term under the terms of a concession.

Feedback indicates this would be possible for all schemes, though for a C-W or BBL scheme this would only be possible if there was Government participation either in the form of capital commitments or equity shareholding because of the scale of capital investment required would exceed the level of investment that the private sector have indicated they could deliver. Use of a concession structure gives clarity on the allocation of risks and clear definition on the implications should they arise.

[13] Smaller Schemes are the Beachley Barrage, Shoots Barrage and Welsh Grounds Lagoon.

9.2.3 Regulated Structure – arms-length body which could be publicly or privately owned (or a combination of the two) owns, finances, constructs and operates the asset under a regulated structure.

The cost of setting up a regulatory framework would be high and for that reason is probably only value for money for a C-W or BBL scheme. Feedback on the regulated concession model indicated two critical elements that need to be in place for this structure to work:

- Regulators need something to regulate; given the anticipated low level of maintenance in-year the "teeth" of a regulator may be limited unless geomorphology indicates need for significant dredging in the operational period and that risk is difficult to predict or price.

- Regulated models are best designed for an operational technology with performance data available;

It may be more appropriate to consider the use of this model post construction when the terms of regulation could be better designed.

9.2.4 Public Sector-led Option – this option would be public sector sponsored and led.

There was some concern that under this option Government would be intervening in the market and owning electricity assets. However there was also recognition that the scale of construction risk, particularly for the larger schemes i.e. C-W and BBL, may necessitate Government involvement. It is likely that this structure would include private sector delivery where possible and where efficient, potentially managed by an integrator. Most respondents said that post construction, provided the asset was working reliably, it could be an attractive investment for a purchase or for a concession structure.

9.2.5 Commercial Structure Conclusions

The level of commercial risk retained by the public sector increases as the commercial structure moves from private sector delivery to public sector delivery. The scale of delivery risk increases in proportion to the capital cost of the project itself as it influences the ability of the private sector to manage the financial penalties associated with failure to deliver. Where the delivery risk is high, the level of commercial risk that can be transferred to the private sector will be lower and this will influence the choice of commercial delivery structure. In conclusion it is likely that a Smaller Scheme could be delivered either through a Privately-led option or a PPP structure. A C-W or BBL scheme could be delivered through a PPP (with Government participation), a Government-led option or a Regulated Concession structure (albeit this would probably be established post construction).

9.3 Revenue Support

9.3.1 The market testing indicated a divergence of opinion in respect of the revenue support structure that should underpin a Severn Scheme. The merits of each structure proposed varies by scale of scheme.

9.3.2 In general there was a recognition that the revenue support structure should be efficient and minimise the cost to the Consumer / taxpayer while recognising that the structure should also incentivise the appropriate level of risk transfer.

9.3.3 The lending community, construction companies and technical advisors broadly recommended support structures that would limit the exposure to electricity price risk – e.g. availability payments or a Fixed Feed-in-Tariff. They felt these structures would broaden the horizon of investment interest beyond the electricity supply base and enhance the potential

competition. Further, if structured appropriately, it could attract interest from the bond market (albeit they may not be willing to take on construction risk exposure so it may only be a refinancing option). On the other hand the electricity suppliers raised concerns over the impact of fixed pricing for a Severn Scheme (where availability or Fixed Feed-in-Tariffs were to be adopted) that could undermine the market mechanism and result in negative pricing. They were also concerned about how an obligation to purchase would be transferred to them.

9.3.4 The electricity suppliers in general preferred structures that included electricity price risk exposure (e.g. Premium Feed-in-Tariff, Renewables Obligation, Severn Obligation) because that is their core business, although some recognised that this may not be attractive to other market players. The electricity companies also recognised that including electricity price risk in the structure (and the associated premium for this) may not be the most efficient pricing structure for the Consumer particularly where the operator's ability to manage this risk through flexing generation is relatively limited. There was some recognition that where the market was told in advance about the level and timing of generation of the Severn Scheme they could, where possible, flex their generation around this and avoid scenarios of over-supply. There was a recognition that off-take risk would be higher for a C-W or BBL scheme and concerns were raised on the market effects of a larger scheme in particular in periods of low demand where a larger scheme would potentially drive oversupply in a generational period.

9.3.5 Use of the Renewables Obligation ("RO") regime would be problematic for a number of reasons. The current RO scheme end date is 2037. Where the Government concluded it could support a Severn scheme, it would be unlikely to be generating before 2020, it means that the support could only be offered for a maximum of 17 years (RO support for projects is envisaged to be a maximum of 20 years). Reducing the term over which the debt can be paid will increase the level of support required in each year. Further, including a C-W or BBL scheme in the Renewables Obligation would change the dynamics of the market mechanism particularly if they attracted a higher multipliers through the banding mechanism. Where the scheme duration was extended for a Severn Scheme it could be a market mechanism with only one participant – in which case the headroom mechanism would no longer be appropriate.

9.3.6 Revenue Support Conclusions

For a Smaller Scheme, because the scale of off-take risk is manageable it is likely that a revenue support structure that transfers electricity price risk would be appropriate i.e. a Premium Feed-in-Tariff / Renewables Obligation[14] / Severn Obligation approach. Use of this approach may limit participation to utilities (though Power Purchase Agreements could be negotiated by a non-utility), and may not be the cheapest pricing structure for the Consumer because of the premium payable for the electricity price risk transfer. An fixed price support structure would also be possible but the market effect of such a structure would need to be understood.

The off-take risk associated with the C-W and BBL schemes is significant so it is unlikely that the operator could manage the off-take risk. This indicates the need to use an availability / fixed FIT approach. The off-take would need to be managed through placing an obligation on the suppliers to take the electricity generated in proportion to their participation in the market at a fixed price. This could cause market issues as the Severn Scheme becomes a "must run"[15] asset. It is possible for Government to retain the off-take risk and sell the electricity through shorter term contracts funding the difference between the price paid to the operator and the market sales through a levy on suppliers. This would allow

[14] Where the Renewable Obligation was used, it would need to be amended to extend the term of support available.

[15] The Severn would be a must-run asset because the suppliers are under an obligation to take and pay for the generation.

the sale of electricity to happen within existing market structures but the residual risk of off-take would remain with Government.

9.4 Conclusions

The market concerns raised through the market testing exercise indicates that there isn't a ready supply of investors waiting to step forward should the Feasibility Study recommend sponsoring a scheme. Equally as electricity suppliers increasingly wish to match their generation profile with that of the market, it is likely that a scheme sponsored by investors will come forward. However the perceived risk may require Government to make the scheme attractive if it is to secure the appropriate level of competition. Key risks such as construction, compensatory habitat and planning will require support or underpinning from Government which will place material risk and cost exposure on Government, the concerns raised by the market reflect the scale of risk involved.

Ideally any revenue support mechanism would need to be structured to avoid excessive cost to the Consumer while also not distorting the electricity market; this will be a difficult balance to achieve for a larger scheme where off-take risk is high. Further, high levels of revenue support for a scheme could distort the market if there were incentives to sell at a sub-market or negative price. A larger Severn scheme may therefore likely require alteration to the current market arrangements in order to be viable.

There is also an emerging need for a protocol on the switching off of low marginal cost base load power in the context of the changing electricity supply base. The effect of this protocol on revenue support would need to be considered so that investment decisions are appropriately informed.

The STP Feasibility Study is considering a range of issues associated with the need to bring forward large scale energy infrastructure investment in the UK. It is clear that the market in which a Severn Scheme will be delivered is changing both from a demand perspective (with potential growth in electric cars, changes in energy storage technology, introduction of smart grid) and from a supply perspective (i.e. the move to a low-carbon economy and potential increase in interconnector capability).

The DECC 2050 team is reviewing the likely demand scenarios for energy in the future and the support structures and frameworks required to deliver future electricity infrastructure to support the growing demand. DECC together with Infrastructure UK are supporting the Government in its work to ensure the energy market framework can most effectively deliver a fair deal for the consumer and the low-carbon investment needed in the long term.

These teams have not completed their assessments in the timeframe of the drafting of this paper. Further work will need to be done to assess the impact of any recommendations in respect of the architecture of the broader electricity market to the Severn Tidal Feasibility Study.

APPENDIX A – MARKET TESTING EXERCISE – SUMMARY OF RESULTS

A.1 Introduction

This section summarises the comments from the market testing exercise. The comments from this section where relevant have been incorporated in the main body of the text but are summarised together in this section.

A.2 Key Messages for Severn Tidal Scheme

A.2.1 Capital Availability - In the current economic climate even the smaller of the tidal projects has significant financing requirements at a time when there is reduced liquidity; with a shortage of capital supply, banks and other lenders are carefully reviewing the risk exposure on their investment options. While the electricity suppliers have traditionally funded infrastructure assets on their balance sheet via corporate bonds, they are under pressure to maintain their credit rating levels (as this directly impacts their underlying cost of capital) and consider the level of risk, strategic fit, capital requirements and cashflow impact of any new investment. The electricity suppliers indicated that investment in private sector led projects up to £5 billion was possible for commercially attractive projects, as indicated by involvement in offshore wind and nuclear projects.

In terms of external funding for investment, there is limited liquidity in current debt markets and funders are as a result reducing the level of investments they are placing in projects and margins are increasing. In general, it is anticipated that the longest term of debt funding would be approximately 20 years with bond funding stretching to approximately 30 years (provided the funding is supported by acceptable commercial terms).

The level of investment required to deliver 2020 renewable targets in particular for offshore wind investment combined with new build nuclear investment to replace the existing fleet has meant that there is an excess of investment opportunities and corporate funders are comparing opportunities and their relative attractiveness.

There is a clear desire from the electricity companies to match their generational asset portfolios with the rest of the market and the perceived exposure in owning a stranded asset i.e. one which was not owned by other participants in the market, this could heighten risk exposure for the company / companies that owned it.

A.2.2 Construction Risk - While the solution itself may not be considered technically complex and relies on proven engineering techniques, the size of the project may be a barrier to the transfer of all construction risk and there is a natural nervousness in the market over the level of risk given the limited examples of similar schemes across the world. It should be noted however that comparisons can be drawn to large hydro schemes which rely on similar technology.

While the scale of some of the Round 3 offshore wind farms is comparable to the level of investment required by a larger Severn Scheme, the offshore wind investments themselves are seen to be more modular and the assets could be built and funded in phases. Further, the right to build out the windfarms could be sold on to another party where cash constraints limited investment in the future. The nature of the technology allows for sites to be sub-divided and operated by different owners with groups of connections and associated assets operated independently. A Severn Scheme by contrast will need to be funded through a construction period of 4-8 years with limited opportunity to generate cash during this period until the barrage / lagoon has been constructed and the first turbines are put in position. The term of construction and the level of cash required for funding a Severn Scheme is likely to be higher than for offshore wind because of cost of funding construction and the limited opportunity to

offset revenue. Nuclear construction is likely to have similar issues to a Severn Scheme in terms of needing to fund an expensive construction prior to being able to generate.

Both offshore wind and nuclear new build have several examples of recently completed constructions, which gives the market greater confidence about the construction issues that may arise and the scale of the estimated construction costs. While there are precedents for other tidal range schemes across the world, the scale of these are much smaller (La Rance is 240MW and Sihwa in South Korea which is under construction will be 254MW compared to 625MW for the smallest Severn Scheme Beachley Barrage). However, similarities to large hydroelectric schemes also improved confidence. Further, the nature of the Severn Estuary and its turbid environment could make the construction issues rather different and may give the market concerns. Several times during the market consultation, the issue of potential pilot schemes was raised to uplift confidence levels of the market in the technology.

The logistical coordination required to manage the supply chain to deliver these projects will be material and the level of construction resource required for the largest scheme is likely to require mobilisation of a major part of the UK and European construction industry.

A.2.3 Planning and Environmental Issues – There is a wide understanding of the complex environmental risks associated with delivering a Severn Scheme and a concern that these issues may not be overcome easily. The market believes this is likely to lead to a protracted planning process and while the establishment of the IPC was recognised as a potential accelerator for this process, as a newly established body it has yet to deliver on its remit. Sponsoring schemes through planning approval is an expensive process particularly if a scheme is eventually aborted. The feedback from the market is that they would like this process to be Government led or Government funded / underwritten because of the concern over the scale of planning risk for a Severn Scheme.

The nature of the habitat and biodiversity in the Severn and the need to provide Compensatory Measures on a large scale left the market with a nervousness about how this would be delivered and the associated risks in both meeting the Habitats Directive tests and complying with other environmental legislation. Decommissioning was also raised as an issue to be addressed. They felt that Government were best placed in terms of ability to achieve clearance.

A.2.4 Competitive Technologies – Nuclear and offshore wind schemes are competing for capital with a Severn Scheme. The market testing indicates that the scale of the construction and its relatively unique nature compares less favourably to nuclear new build or offshore wind. Further, the limited market for further tidal range schemes (because of their particular geographical requirements) will reduce interest levels for investment in the sector because it is not readily replicable for a significant number of other schemes, unlike offshore wind, nuclear new build and other marine technologies where there is a global market to exploit. The relative merits of tidal range technology investment compared to alternative investments will need to be clearly articulated to ensure market interest should a scheme be sponsored.

While other tidal range opportunities have been identified in the UK including Mersey, Solway, Duddon and Wyre, the scale of these schemes are much smaller in terms of generating capacity than the Severn Schemes. Offshore wind and nuclear are rapidly expanding markets with deep opportunities both in the UK, across Europe and globally; in the dash for low carbon opportunities both are readily exploitable technologies.

A.2.5 Off-take risk – The limited flexibility over energy generation profiles may be problematic in terms of the management of off-take risk for a Severn Scheme. While the generational profile will be intermittent it will be predictably intermittent which, in terms of forward selling of power generation, will be less problematic than wind investments provided there is a market for the power generated. It is unlikely off-take risk will be a problem for the Smaller Schemes

but could be a large problem for a Cardiff-Weston scheme ("C-W") for particular generational periods where supply will outstrip demand. The demand also needs to be seen in the context of the future generational profiles where, as a technology, it will generate: nuclear will be expensive to flex generation, Carbon Capture and Storage ("CCS") is also predicted to have limited flexibility and wind assets will also be expensive to displace. The key question will be what the priority order of "turning on/off" will be. The market testing indicated that in some ways it could be easier to switch off a tidal scheme at limited cost than some of the other technologies but the implications of this for the operator would need to be agreed.

A.3 Commercial Structure – Key Comments

A.3.1 Private Sector led option – feedback from the market testing indicates that this option would only be possible for a Smaller Scheme and would not work for a C-W or larger Bridgwater Bay Lagoon ("BBL"). To be delivered in the market, this would probably need to be led by the electricity companies who are the only corporates with sufficient balance sheets to take on the finance requirement. Concerns were raised by some construction companies and finance providers about the level of construction risk involved and their ability to provide finance.

A.3.2 Public Private Partnership Structure – feedback indicates this would be possible for all schemes, though for a C-W or BBL this would only be possible if there was Government participation either in the form of capital commitments or equity shareholding.

A.3.3 Regulated Concession Structure – feedback on the regulated concession model indicated two critical elements that need to be in place for this structure to work:

a) Regulators need something to regulate; given the anticipated low level of maintenance in-year the "teeth" of a regulator may be limited unless geomorphology indicates need for significant dredging in the operational period.

b) Regulated models are best designed for an operational technology with performance data available;

It may be more appropriate to consider the use of this model post construction when the terms of regulation could be better designed.

A.3.4 Government-led Option – there was some concern that under this option Government would be intervening in the market and owning electricity assets. However there was also recognition that the scale of construction risk, particularly for the larger schemes i.e. C-W and BBL, may necessitate Government involvement. It is recommended that this structure would include private sector delivery where possible and where efficient, potentially managed by an integrator. Most respondents said that post construction, provided the asset was working reliably, it could be an attractive investment for privatisation or for a concession structure.

A.3.5 Summary Assessment - Smaller Schemes – For Smaller Schemes, the electricity market would prefer a structure that was private sector led. They felt that the scale of investment less that £5bn would be manageable for a consortium of electricity companies (provided the commercial terms were appropriate) and they preferred an approach with limited involvement from Government. Construction companies were divided on whether they felt that the private sector could deliver the Smaller Schemes without public sector involvement, there were some concerns over the level of planning and construction risk involved and their ability to manage the risk for the scale of construction programmes that are being considered.

A.3.6 Summary Assessment - Larger Schemes – Cardiff Weston and Bridgwater Bay Lagoon - For Cardiff-Weston or ca. £10 billion Bridgwater Bay Lagoon, the scale of the

investment required would be too large for the private sector to lead. Electricity suppliers expressed a preference for either a PPP or Regulated Concession structure. Some of the construction companies preferred a public sector led scheme because of the scale of construction risk. They mentioned the use of an integrator to help manage letting of construction contracts and incentivising performance and cost management.

A.4 Impact of Scheme on Energy Market - Revenue Support Structures

A.4.1 Smaller Schemes - For Smaller Schemes, the electricity market believed the scale of off-take risk would be manageable by a few suppliers.

A.4.1.1 Electricity companies were not overly concerned by the electricity price exposure for a Smaller Scheme and would in general prefer a revenue support structure that included off-take and electricity price exposure in its payment stream i.e. the use of a Renewables Obligation, Premium feed-in-tariff or Severn Obligation. They had some concerns over the impact that a Severn Scheme could have on the Renewables Obligation regime were it to be included today, but accepted that by the time a Severn Scheme would be operational the scale of the Renewables Obligation regime would be much larger given the level of planned off-shore wind investment over the next few years. There were some concerns over further changes to the Renewables Obligation regime that would be required if a Severn Scheme were to be included (i.e. extension of the timeframe and removal of potentially redundant headroom mechanism where it is only supporting one technology) but this was primarily as a result of the number of changes that have been made to the regime already and the nervousness of funders and investors over further changes that could impact existing investments. One respondent raised the issue of the potential effect that inclusion of a Severn Scheme could have on ROC pricing in the event that there was a delay in its first year of operation.

A.4.1.2 Electricity companies recognised that the use of a Fixed Feed-in-Tariff may attract wider investment interest but many indicated that they would prefer to include power price exposure in the payment stream. While ownership of an electricity generating asset is an attractive proposition and arguably a core business for them, part of the rationale for owning the asset is to match its ongoing demand from customers for electricity, use of a Fixed FIT would therefore divorce the ownership of the asset and the beneficial use of its electricity which could make it a less attractive investment. Equally most respondents saw that ownership of an asset that had a regulated or fixed pricing mechanic was attractive where the balance of risk or the uniqueness of the asset required such a support structure.

A.4.1.3 By contrast the finance community and construction companies preferred the use of a revenue support structure without exposure to electricity price and off-take risk. This position was maintained in part because of the natural nervousness of these participants over the scale of risk exposure in a market which they do not ordinarily operate but also because inclusion of the electricity price risk is likely to reduce the appetite of lenders to fund such a scheme unless the scheme is supported by a long term Power Purchase Agreement ("PPA") from reputable companies. They felt that the deliverability of external funding would be more achievable through the use of a Fixed FIT.

A.4.1.4 There was a general concern about investments operating outside of the "normal" market and the potential this raises for it to cause pricing issues. Where a Severn Scheme secured a higher level of support than other technologies, it could potentially afford to sell its power at negative pricing which could have perverse effects on the market. Further where a Severn Scheme was supported by a Fixed FIT combined with an obligation on the supply base to take the electricity at the agreed price it would be a "must-run" asset and would displace other forms of generation in periods of over-supply, this could have a negative effect

on the investment in other technologies whereby their business case could be effected by the support package for a Severn Scheme.

A.4.2 Larger Schemes – Cardiff Weston and Bridgwater Bay Lagoon - For Cardiff-Weston or Bridgwater Bay Lagoon, there was consistent feedback that the scale of the off-take risk would be too large for a small group of suppliers

A.4.2.1 The electricity companies in general accepted that they could not manage the off-take for a larger scheme and it would need to be shared across the market in an appropriate manner. The allocation of any obligation would need to have regard both to the market share / portfolio of each participant and the half-hourly availability. There were concerns about the impact of an obligation on the rest of the market because structuring a Severn Scheme as a "must-run" scheme would displace other generation in periods of oversupply and it could affect the rest of their investment portfolio.

A.4.2.2 There was some discussion of the use of a Non Fossil Fuel Obligation ("NFFO")-like structure whereby the Severn Operator would be paid a Fixed FIT but the off-take risk would be passed on to an intermediary and the electricity sold independently into the market via a series of contracts probably of differing terms and quantities of electricity. This structure would ensure that the electricity was sold via the existing market structures and suppliers would be able to bid for the power in the normal way in accordance with their demand profile. The difference between the revenue generated from the sales and the Fixed FIT payment would be levied on the supplier base. There is a risk that suppliers protect their own investments first if there is no obligation to purchase the electricity generated, this would mean levies passed on to the Consumer would rise. The intermediary would need to be heavily incentivised to package its sales to ensure the efficient sale of the generation and limit the unsold electricity. The residual risk of changing energy price risk will be passed onto Consumers via the levy.

A.5 Compensatory Measures

As referred to in A.2.3, there were some key concerns raised around the planning issues associated with Compensatory Measures. This led the market to raise the issue of planning being a potentially Government led or Government funded / underwritten process. However, there was a recognition of the interdependencies of the Power and Compensatory Measures projects. The market testing work indicated that ideally both projects should be delivered by a single supplier if the integration of delivery of the Compensatory Measures project and the Power project are to be managed. Further, the market commented that while it was capable of managing the delivery risk of the Compensatory Measures project against the agreed plan, residual risk of challenge from the EU would not be something they could manage.

A.6 Conclusions

Industry is broadly supportive of investing in a Severn Scheme so long as it is structured to be appropriately commercially attractive and it does not distort the existing and planned investment or the pricing of electricity in the wider market.

Investment in a Severn Scheme will be benchmarked against competing investment opportunities. The market testing indicates that the scale of the construction and its relatively unique nature compares less favourably to nuclear new build where there are recently constructed examples to draw on, or offshore wind where there are many examples and where the modular nature of the construction reduces risk and capital drain based. Further, from the electricity companies' perspective, the limited market for further tidal range schemes (because of their particular geographical requirements) will reduce interest levels for investment in the sector because it is not readily replicable for other schemes. The relative merits of tidal range technology investment compared to alternative

investments will need to be clearly articulated to ensure market interest should a scheme be sponsored. There is a desire from the electricity companies to match their generational portfolios with the rest of the market and the perceived exposure in owning a stranded asst which could heighten exposure for the company that owned it.

Ideally any revenue support mechanism would need to be structured to avoid excessive cost to the Consumer while also not distorting the electricity market; this will be a difficult balance to achieve for a larger scheme where off-take risk is high. Issues such as managing the risk of over / under supply and negative pricing will be important for all schemes. There is also an emerging need for clarity on the priority of switching on / off of generation in the event of over/ under-supply particularly in the context of the changing electricity supply base. The effect of this protocol on revenue support would need to be considered so that investment decisions are appropriately informed. Industry asked for further clarity on the route-map to 2050 and the impact Severn Scheme would have on the landscape of generation that will exist at that point.

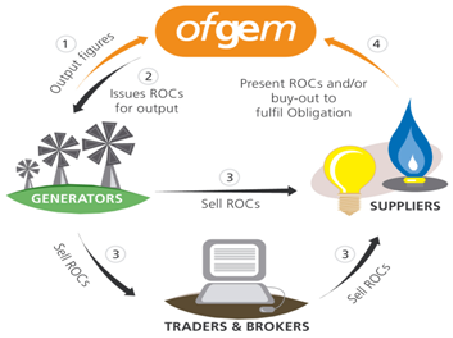
Planning risk is considered particularly high for this project because of environmental legislation and the scale of compensatory measures envisaged. Further clarity is required on the planning process and the level of support Government will give the market to ensure planning approval is secured.

Construction risk is considered higher than other investment options and further design work and ground condition assessment will be required before the market can assess better the risk involved.

APPENDIX B – DETAILED DESCRIPTION OF REVENUE SUPPORT OPTIONS

B.1 Description of RO Regime

The RO is the primary support mechanism for large scale renewable schemes in the UK. The RO was introduced in 2002 and is the main tool for increasing the level of renewable investment in the UK. It is paid by suppliers but ultimately consumers. The RO is banded to reflect different technologies with emerging technologies accruing higher banding.



The RO works by placing an obligation on licensed electricity suppliers to produce a specified number of ROCs per MWh which increases annually, or pay a penalty. The obligation for 2009/10 is 9.7% currently rising to 15.4% in 2015/16. The RO is administered by Ofgem who issue Renewables Obligation Certificates (ROCs) to renewable electricity generators. Generators receive different numbers of ROCs depending on the technology. Generators sell their ROCs to suppliers or traders which allows them to receive a premium in addition to their electricity. ROCs can be sold with or without the associated electricity. Suppliers present ROCs to Ofgem to demonstrate their compliance with the obligation. Where they do not present sufficient ROCs they have to pay a penalty known as the buy-out price. This is set at £37.19/MWh for 2009/10 (and linked to RPI). Money from the buy-out fund is recycled to suppliers who presented ROCs on a pro-rata basis, this effectively gives an additional premium for the ROCs purchased where obligation levels are met.

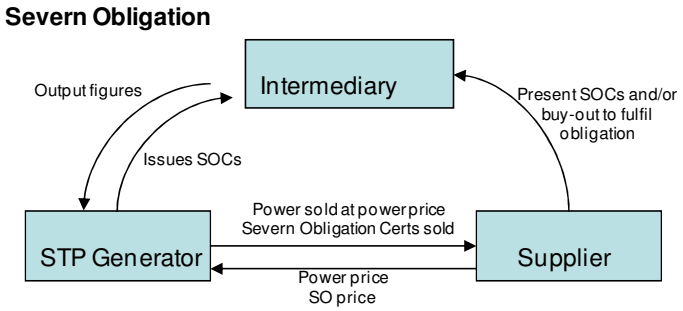
A headroom mechanism was introduced on 1 April 2010 to ensure that the level of the obligation remains above the level of actual generation. This will provide greater long-term certainty to investors by helping to make the ROC price more stable and predictable.

Generators sell their power in the market in the normal ways (i.e. through suppliers or traders/brokers). They also sell the ROCs, on the ROC market. Because the RO market operates independently to the electricity market, the RO scheme allows for exposure to power price and off-take risk in respect of the electricity generated. Exposures to these risks may result in a higher cost of capital for a Severn Scheme, however this is in line with other renewable schemes and would incentivise the STP generator to flex generation to maximise market value of the energy output.

APPENDIX B – DETAILED DESCRIPTION OF REVENUE SUPPORT OPTIONS

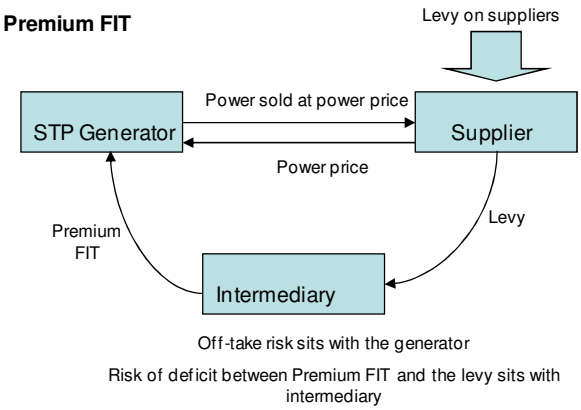
B.2 Description of SO Regime

This would be designed in the same way as the RO, the operator would sell their output on the wholesale market and all suppliers would be obliged to purchase either a proportion of their output from Severn Tidal power or Severn Obligation Certificates or pay into a buy-out fund. The buy-out price and obligation level would be set to ensure a certain level of subsidy per MWh.



B.3 Description of Premium Feed-in-Tariff

Under a premium FIT arrangement, the operator would sell their power in the market under normal trading arrangements and receive in addition a fixed price premium per unit output. The cost of this subsidy would be levied on suppliers and subsequently passed on to consumers. A premium FIT would give the operator a fixed rate payment in addition to the energy value sold on the market. Because the FIT element of the revenue would be guaranteed, this could secure a lower cost of capital than an RO would achieve.



The off-take risk under this arrangement sits with the generator. There is a residual risk of a deficit between the agreed premium FIT and the revenue raised from the levy. This would be retained by Government but managed by flexing the levy.

APPENDIX B – DETAILED DESCRIPTION OF REVENUE SUPPORT OPTIONS

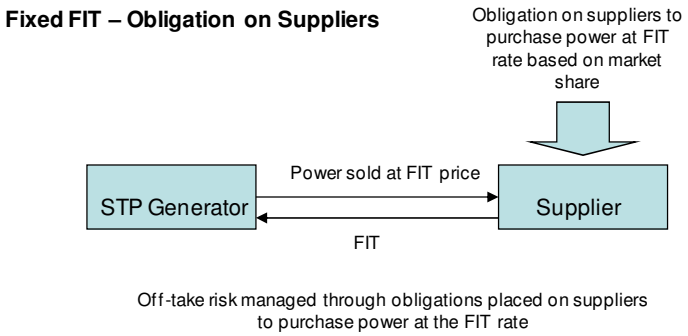
B.4 Description of Contract for Difference structure

Under this scheme a commitment for an operator would be achieved through financial contracts rather than off-take agreements. A long term 'Contract for Difference' would be provided to operators between a wholesale electricity price index and a 'strike price' (determined by tender process). A difference payment (or receipt) between the strike price and the wholesale price would be levied on all suppliers. However the operator would still sell their output in the wholesale market and thus be exposed to price and off-take risk between when the CfD is settled (which might be against a day- or month-ahead index) and the delivery of electricity, i.e. they are exposed to the risk that they are unable to achieve a wholesale price equal to the index price.

B.5 Description of Fixed Feed-in-Tariff

This subsidy would provide the operator a fixed price off-take commitment for a pre-defined period. The UK Energy Act 2008 provided broad enabling powers for the introduction of feed-in tariffs (FITs) for small-scale low-carbon electricity generation, up to a maximum limit of 5 megawatts (MW) capacity - 50 kilowatts (KW) in the case of fossil fuelled CHP. The FITs will be introduced through changes to electricity distribution and supply licences. These provisions are intended to encourage the uptake of small-scale low-carbon energy technologies while the Renewables Obligation (RO) continues to be the main support mechanism for large scale renewables deployment.

A fixed FIT would insulate the STP generator from all power and off-take risk and would therefore secure a low cost of capital for financing a Severn Tidal Scheme. The cost of the Fixed FIT would be passed on to the consumer by placing obligation on suppliers to purchase electricity at the fixed FIT rate based on market share.



B.6. Description of Availability Payment

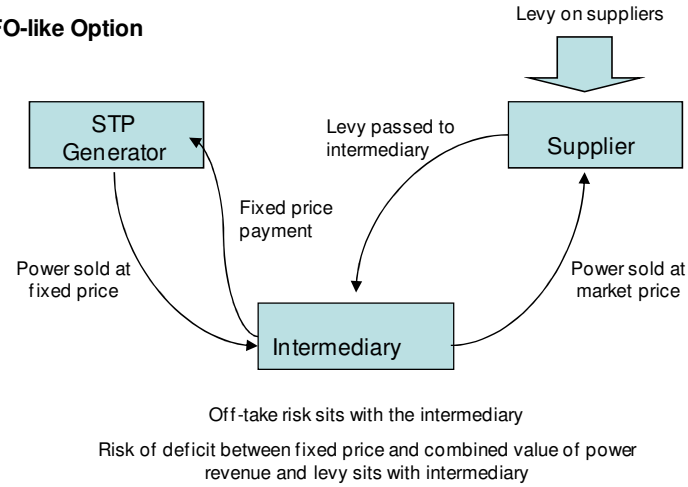
An availability payment would be a payment which was dependent on criteria of the asset being available to generate power and is a structure used in PPP type contracts. Because the payment is made based on asset availability, there is no incentive to operate the asset when output is demanded and as such may not incentivise the value maximisation of the generational capacity. Further where all payments were based on availability, the operator would be insulated from off-take risk and power price risk. The availability fee structure would be passed through the supply chain to the consumer via a levy / obligation on suppliers to fund it. This structure is not used in the energy market at the moment but the commercial effect would be the same as a Fixed FIT.

APPENDIX B – DETAILED DESCRIPTION OF REVENUE SUPPORT OPTIONS

B.7 Description of NFFO-like Structure

A structure similar to the NFFO levy could be adopted for a Severn Scheme. This structure would provide a fixed price off-take commitment for a pre-defined period but the off-take risk would be managed through the appointment of an intermediary body to purchase power and sell to the market; and separately levy suppliers to recover the difference between the value of energy generated on the market and the NFFO fixed price. The cost of the NFFO should always exceed the value generated on the energy market unless power prices rise significantly.

NFFO-like Option



This option flexes the levy on suppliers to allow for changes in long term energy power prices. Off-take risk would be retained by the intermediary and therefore residually by Government or the Consumer. There is a risk that the combined levy and power revenue may not match the fixed cost payable to the STP Generator, this is a residual risk for Government which could be managed by flexing the levy in the longer term.

APPENDIX C – LEGAL REVIEW OF COMMERCIAL OPTIONS

Department of Energy and Climate Change. www.decc.gov.uk