Tidal Range Alliance

Planning for new energy infrastructure: revisions to National Policy Statements
Closing date: 25th May 2023

1. Background to the Tidal Range Alliance

The Tidal Range Alliance (TRA) sits within the British Hydropower Association (BHA) which is the leading trade membership association solely representing the interests of the UK hydropower industry and its associated stakeholders in the wider community.

Our Mission is to drive growth in the sector by engaging, influencing and promoting Hydropower, Tidal Range and Pumped Storage Hydro, as firm, renewable power, providing critical infrastructure for achieving Net Zero and Energy Security.

The TRA is working to bring for 20GWs of Tidal Range Technology across 9 projects. With deliverability risk of the current Net Zero pathway, the TRA are suggesting to Government that the best way to manage and mitigate risk is to ensure a diverse portfolio of renewable technologies is deployed. Tidal Range technology must be given serious consideration by the UK Government.

- **Proven:** Tidal Range technology has been demonstrated in France and South Korea for 60 and 10 years respectively.
- **Resource adequacy:** We need non-weather and daylight hour dependent, low carbon energy generation assets that can be relied on when there is wind drought or anomalous weather patterns.
- **Grid Constraints:** Tidal range generation can be developed near demand centres, can load follow and fits well with the future charging of EVs, hot water storage and heat pumps.
- **British Energy:** As an Island nation, Tidal Range offers an extensive indigenous energy supply (at least 20GWs) from which the UK should be capitalising.
- **Intergenerational:** As with reservoirs and aqueducts, these infrastructures are permanent and can be the mainstay of Energy security for 120+ years.
- **Added value:**
    - **'Low cost' V 'Best value':** 'low cost' has been stated repeatedly within the strategy, however, 'best value' or 'enhanced' Levelised Cost of Energy that is inclusive of 'non-price barriers' must be considered if we are going to deliver a cost effective, whole system to consumers.
    - **Supply Chain:** Tidal Range has 60-80% of the supply chain within the UK and no reliance on Critical Earth minerals.
    - **Levelling up:** in areas where Tidal Range can offer economic growth opportunities growing localised green skills base.
    - **Flood defence:** Near densely populated areas, where flood defence will be.

2. Contents

3. Introduction

As set out in the National Audit Office Decarbonising the power sector, P5. The Government's task is:

- increasing the amount of electricity generated by clean energy sources;
- developing the networks that transmit electricity from where it is generated to where it is used;
- establishing new market arrangements for buying and selling electricity;
- and encouraging consumers to use electricity in different ways so demand is more synchronised with patterns of supply.

This all needs to be done whilst giving the best value to the consumer. It is key to reiterate that the language move away from 'Lowest cost' as this does not always mean 'best value'.

This all needs to be done whilst also considered the wider requirements of

1. Grid – systems benefits
    i. Managing Variability
    ii. Operability
    iii. Location
2. Building Economic capacity
    i. Developing supply chains
    ii. Industry initiatives
    iii. Collaboration
    iv. Investment in infrastructure
    v. Investments in assisted areas
3. Environment
    i. Sustainable decommissioning
    ii. Sustainable procurement
    iii. Decarbonisation

At a time when the imperative is to speed up deployment of renewables, the landscape for delivery is becoming increasingly challenging, not only due to grid constraints, but also due to global competition for investment (the industry is reporting that the USA's Inflation Reduction Act and EUs 'Green Deal Industrial Plan' is impacting on investment conversations), planning and consenting delays (through resource issues and covid backlogs).

The TRA suggests to Government, that the objective for dramatically lowering greenhouse gas emissions from electricity generation, while maintaining energy security cost-effectively must be shifted away from delivering the lowest cost kWhs (which does not mean 'best value') to meet the challenges we have, in delivering a decarbonised stable gird by 2035. The delivery of lowest cost, low carbon kWhs, regardless of when or where they're generated and consumed, is exacerbating the issue of grid congestion, increasing the costs of constraint and balancing, intensifying the bottle necks in transmission constraints, triggering huge costs in reinforcement (with risks around delivery of unprecedented workstreams to complete these upgrades), and now, the grid poses one of the biggest barriers to Net Zero. The current pathway to NZ does not adequately address the other issues of Net Demand or deliverability risk around scaling of emerging technologies.

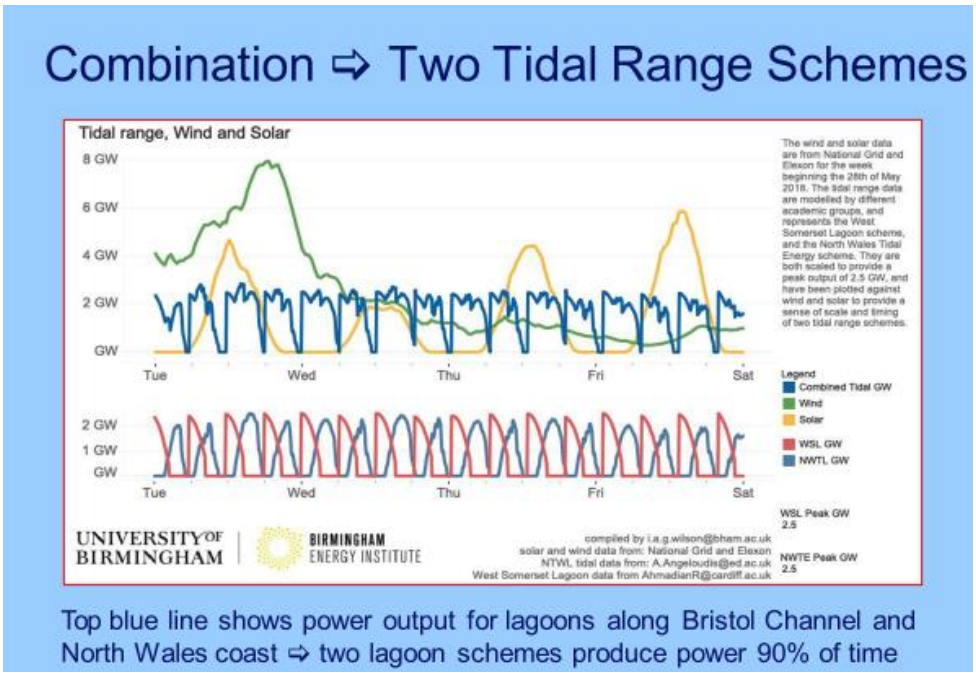
The TRA suggests that the Government urgently considers how an industry and Government partnership can help deliver the prodigious, indigenous timetabled energy generation potential from Tidal Range projects across the UK.

4. The path to NZ and deliverability risks

The TRA wishes to raise the issues that the delivery of the NZ pathways has significant risk within its current format.

As with investments, the best way to mitigate risk, is to have a board portfolio, this applies to the energy sector and should be considered when we're looking at the Net Zero Transition. We need all technologies to be mobilised towards deployment as rapidly as possible. Many will face long delays as they face the barriers of grid, planning, investment etc, so we need to start with as boarder a mix as possible, with the knowledge that only some of them will reach deployment. The queues for the grid give a false sense of security and certainly don't represent the reality of what will be delivered, nor how those technologies will deliver a secure, stable low carbon grid. Tidal Range deployment, utilising indigenous, timetabled energy generation, near demand centres and also providing added value of reducing flood and coastal erosion risk, should be a serious consideration to Government. As with Off-shore wind, an industry /Government partnership, could bring forward a new industry with many benefits beyond the low carbon electricity remit.

As stated in the Environment Audit Committee report: Accelerating the transition from fossil fuels and securing energy supplies, January 2023: " Tidal and other marine energy projects should be a vital component of the Government's strategies for delivering both net zero and energy security".



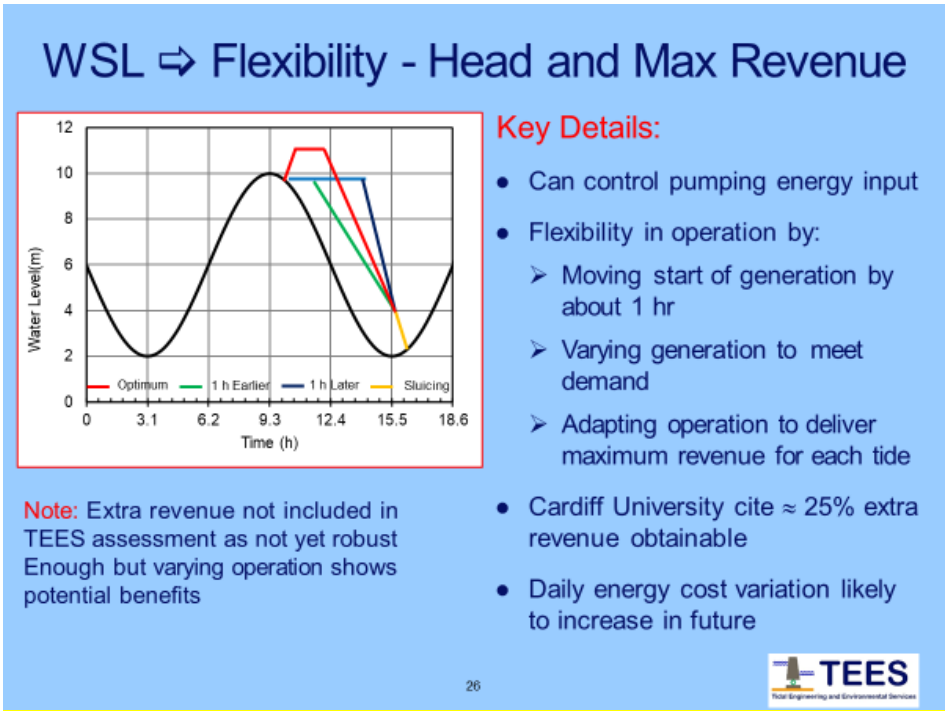


Figure 1 – the flexibility benefits of Tidal Range

The aspiration is to create a decarbonised grid by 2035, that is stable. It will need to be more flexible and have the ability to cover 3 week periods of low wind. Resource adequacy is met through the Capacity Market and is currently met with a mix that includes 57% gas. Technologies that can reduce this, such as Tidal Range, will have a much lower cost than deploying expensive peaking plant. As load factors of peaking plant decrease, the costs to meet this peaking demand will go up. It is also worth noting that tidal range schemes also offer a wide range of additional benefits; e.g., reduced risk of flooding and coastal erosion.

"2.15 DESNZ considers that achieving its 2035 ambition requires all currently known technologies, including offshore wind and nuclear power, to deploy at or close to the maximum level technically feasible in that time. This approach does not build resilience into the portfolio to take account of potential setbacks, disruption and future uncertainty." This deployment risk must be countered through the Government seriously considering all indigenous energy resources in the UK, including Tidal Range. Without strategic Government policy support this industry cannot bring forward the immense capacity and opportunity that will benefit the Net Zero Grid ambitions and UK PLC more broadly. Tidal Range must be championed if we are to deliver the broad mix of technologies that will be the backbone of a decarbonised and energy secure UK.

The whole systems costs and benefits need to be factored into projects that are going to add additional value to society over and above those that will just deliver low carbon kWhs.

5. Response to Appendix C

It is reassuring to see the Government's response to the consultation on the Draft National Policy Statements – Planning for new energy infrastructure has recognised the responses that related to tidal range projects. In particular, it is encouraging to see Government has

gone as far as to provide a specification of the kind and quality of evidence Government expects to see before giving any consideration to a specific tidal range proposal and the TRA Welcomes the Government's publication for a 'well-developed' Tidal Range Proposal' within the Planning for New Energy Infrastructure: government response to consultation on draft National Policy Statements for energy infrastructure (publishing.service.gov.uk)

The TRA would like to suggest that review of Appendix C could be used as roundtable discussion.

5.1. Guideline Criteria for a 'well-developed' Tidal Range Proposal

Table 1 - Guideline Criteria for a 'Well-Developed' Tidal Range Proposal

Thematic Criterion Evidence Required	Thematic Criterion Evidence Required	Notes
1. Demonstration of Energy System Benefits.	Detailed modelling of energy system costs/benefits, including e.g., any effect on electricity system balancing costs, transmission costs, system inertia, and security of supply.	To do "detailed modelling of energy systems" one first has to commission detailed hydrodynamic modelling to predict the energy output of the scheme for a range of different designs and sluice turbine sites. (This will be done as part of the business case for the project) This is not cheap and just the hydrodynamic modelling can typically cost £100+k. This then leads to energy system grid studies etc., which can also be an appreciable cost. Some data is held by NG or Ofgem and not by a project developer or the TRA.
	Detailed information on the expected generation profile of the station, to be verified by an independent engineer. This should be expressed in terms of a high/low range of outputs and should be periodised to the smallest useful time-interval. The expected average output plus expected standard deviation should also give.	This follows on from the previous point. Furthermore, the "independent engineer" in this field would need expertise in a rather specialised area. For large projects with a high potential impact, e.g., a barrage across a major estuary or a large lagoon project there are not that many specialist engineers around. Energy generation profiling can be incredibly accurate for Tidal Range due to known tides times and heights, this detail cannot be known for wind and would not have been a requirement when the

		offshore wind industry was at this early of development.
	Detailed information on the turbines to be used, including likely manufacturer and/or supplier.	This statement is rather vague; what is meant by "Detailed information"? For example, over the past 5 years there has been work on the design of a bi-directional turbine for rivers and small lagoons. Much specific "detailed information" is either not available or commercial-in-confidence. For example, any energy model predictions from a turbine are highly dependent on the Hill chart. However, the TRA is unaware of a Hill chart available for a triple-regulated bulb turbine, which is the current main turbine proposed for future schemes.
	Where the proposal depends on commercially unproven technology, developers should provide: 1. Evidence of commitment from a turbine manufacturer and any associated information of relevance concerning patents and intellectual property. 2. Evidence of plans to move from concept stage to commercialisation, including in-situ testing. 3. Information from testing, including on a full size prototype in a comparable environment (for example with the range of fish species expected), to inform realistic predictions of turbine operations, including energy output. 4. Detailed summary of lessons on viability and feasibility of the technology gleaned from testing, such as lessons on blade survivability in the marine environment. 5. Evidence of contingency plans for system failing to meet predicted performance after full scale testing	The TRA are particularly concerned with this section which is going to be virtually impossible to deliver. The implication is that a new bi-directional, counter-rotating turbine, to reduce environmental and fish mortality concerns at a site in, for example a barrage/bar, then having to first test one turbine, at full scale (e.g., 9-10 m), near the site of interest, with similar hydrodynamic conditions will pose a major challenge. Furthermore, fish passage through some existing sites may indicate that the fish survive passage through the turbines, but then are vulnerable to predations upstream due to exhaustion. Many of these points could be met through Computational Fluid dynamic modelling utilising existing models of fish strike/ shear and pressure damage taken from electronic fish testing. "3. testing a full size prototype in a comparable environment." Testing a full size tidal range turbine would require not only making the turbine but also obtaining permission and constructing a substantial lagoon in

		which to test it, an expensive and time consuming task. Imposing that criteria before any consideration would appreciably stifle tidal range turbine development.
	Detailed assessment of the whole-life carbon impacts of the project.	
2. Demonstration of Credible Environmental Impact Mitigation Strategy	Evaluation of potential flood impacts throughout the lifecycle of the project. (Impacts should be quantified in absolute terms, and also expressed in terms of impacts on standards of protection and life of existing defences, so as to enable third parties to make judgements on the significance of the impacts.)	This can be delivered but again at a considerable cost. Furthermore, the major benefits of a tidal range scheme relate to coastal erosion, which is somewhat different from coastal flooding due to high surface waters. For coastal erosion one arguably needs to model wave interactions and groundwater effects. This again would add further upfront costs to the modelling and particularly when the validation data is collected.
	An environmental scoping and impact report to include the following: 6. A description of the proposed development, including the physical characteristics, land use requirements and build materials. 7. A specification of the site selection criteria and the main alternatives considered, taking into consideration the potential environmental impacts. 8. Realistic modelling of potential environmental impacts, including detailed assessment of likely impacts on fish populations; habitats and fisheries; birds; and water quality. 9. Assessment of the above impacts, as well as impacts on wider fauna and flora, air, water, soil, climate, heritage, landscape, and any interrelationship between these receptors. 10.Assessment of any pertinent indirect, secondary, and/or cumulative impacts	There are some characteristics given which need more guidance. For example (i) water quality – some renowned detailed models in this area include ca. 64 water quality and ecological modelling parameters, guidance on the key water quality parameters necessary would be helpful. (ii) soil? – presumably this relates to changes in groundwater conditions on surrounding agricultural and rural land? (iii) air? – clarification of how 'air' is going to be affected by a tidal range scheme? (iv) 'Assessment of any pertinent indirect --- impacts' – again this could have substantial upfront costs without some clarity.
	In light of the above, detailed plans on how environmental impacts will be avoided, reduced,	More clarity is needed and some guidance on biodiversity net gain would be helpful. For example, a

	mitigated and (if required) compensated for, including statement of approach to biodiversity net gain	barrage operating under ebb-only would generally reduce suspended sediment (SS) levels and turbidity, thereby increasing light penetration and benthic biodiversity etc. Thus, one could argue that this scheme operation would give considerable biodiversity net gain. However, this proposed operation of the original Severn Barrage was bitterly opposed by the NGOs, who wanted to keep the high levels of turbidity and SSs in the estuary. All Tidal Range projects will require a mandatory Environmental Impact Assessment that will include a Habitats Regulations Assessment therefore all these issues will be dealt with in the consenting process.
	Evidence of extensive environmental stakeholder engagement, ideally including letters of support from relevant stakeholders	Fully support this important point. Any project must ensure the regional community are in favour of a tidal range project.
3. Demonstration of Value for Money.	Detailed funding strategy including specific information on expected sources of debt and/or equity during the design, construction and operation phases. Ideally to include views and feedback from specific potential investors.	Until the Government shows more commitment towards developing tidal range schemes, it will be hard to bring along investors and gain serious commitment.
	Where the project depends on commercially unproven technologies, an analysis of how project costs could vary as those technologies move from concept to commercialisation	This is a contradiction to Point 1 – 4 above, where detailed requirements are necessary at the prototype scale.
	Visibility of the project's financial model on an open book basis in order to test all relevant assumptions.	Developers would be prepared to make high-level figures available, but detailed figures may well be commercial-in-confidence.
	Supply chain management strategy including critical path analysis and information on how inputs have been cost benefit evaluated and will be secured throughout project life. This should include a construction plan describing in detail the necessary programme of works, associated	This level of detail will be delivered in any project.

	risks, and timeline for their completion	
	End of asset life strategy, including rationale for leaving infrastructure in situ or costed plans for decommissioning. Where applicable to include statement of options for repowering.	This level of detail will be delivered in any project.
	Evidence that relevant data can be made available to enable a value for money assessment to be undertaken, according to the relevant value for money framework.	This detail should be available
4. Demonstration of Socio-Economic Impacts and Benefits.	Substantiation of the project's claimed economic benefit, including e.g., a statement of expected capital and operational spend in the UK, and independently audited net and gross job creation projections.	One of the key issues is the inability to plan for the UK supply chain without Government setting a target and creating a partnership with the Tidal Range Industry. Much of the offshore wind industry & Hinkley C supply chain have not been anchored in the UK. The Tidal range industry will need 100s of Turbines and without the necessary forward planning, the UK will NOT have the manufacturing capability to maximise this opportunity. that concerns me about this point is the reference to operation spend in the UK's manufacturing base has declined considerably over the past 50 years, without sufficient Government support and the industry may well find that the bulk of the turbines are going to need to be built in the Asia-Pacific region, where manufacturing is still very prevalent.
	A cost-benefit report to include: 11.Analysis of impacts on relevant local industries (such as commercial and recreational fisheries; aggregates). 12.Analysis of impacts on ports and navigation. 13.Plans for any mitigation or compensation required in light of the above	This would be undertaken.
	Evidence of extensive stakeholder engagement (including with local communities and any affected industries). Letters of support from	This would be undertaken.

	relevant stakeholders should ideally be included.	
	Evidence and accounting of any additional benefits, including e.g., coastal erosion protection, flood defence, recreation, tourism and broader community benefits.	This would be undertaken and other benefits such as potential for aquaculture etc.

1.5 Additionally, developers should provide a detailed project delivery plan including the anticipated timetable for securing all necessary leases, consents and grid connections. A post-construction plan for operational monitoring and maintenance should also be given. *This would be undertaken.*

1.6 Such a plan should also include documentation of the potential delivery risks and associated mitigation actions, as well as a summary of the project's governance arrangements. A holistic assessment of delivery confidence in the project as a whole should also be given. *This would be undertaken.*

5.2. Summary of Appendix C

It is noted that the criteria specific "only the minimum level of detail necessary for Government to give initial consideration to a proposed development". Given the nature of the consultation, it is presumed that these criteria are intended for tidal range projects that would be of a scale that constitutes a 'Nationally Significant Infrastructure Project' and not any smaller tidal range developments that may fall outside of this scope?

The information in Appendix C is in-line with that which would be required before the submission of a DCO application. However, it is required" *before government would provide any consideration*".

With respect to Criterion 1 (demonstration of Energy System Benefits), we would suggest that some of this evidence should be developed in collaboration between Government and Tidal Range Developers, particularly the detailed modelling of energy system costs/benefits.

Also, in support of Criterion 1, the industry will require stronger policy signals from Government relating to tidal range, before a turbine manufacturer/supplier will commit the investment needed to produce the evidence. We suggest that collaborating in assessing the system costs/benefits would help to support Government in assessing whether policy signals in support of tidal range should be made.

With respect to Criterion 2, such provision is not unreasonable for any major project, but it is another area that would require significant investment by developers. This is to be expected as part of any Tidal Range projects development cost, but as with Criterion 1, developers are unlikely to be able to commit such investment until there is a signal from government that it accepts the strategic and economic case for tidal range as part of the UK's renewables mix.

With respect to Criteria 3 and 4, the TRA would again suggest that both areas would benefit from some level of Government and Developer collaboration, particularly as tidal range projects can deliver benefits beyond just green energy.

Page 36 para 3 "We include at Appendix C a detailed specification of the kind and quality of evidence that the government expects to see before giving any consideration to a specific tidal range proposal".

This evidence would cost many millions to produce, maybe £20M to £30M. and would not be fundable by the private sector prior to any government consideration.

6. Conclusion

It has been suggested that at this early stage, the Government could offer various options for support, including non-financial support such as a Tidal Range task force, similar to those set up at the outset of the Off-shore wind task force and more recently with the floating off-shore wind industry.

A similar catalogue of support afforded to the nuclear power industry could be duplicated for the Tidal Range Industry, as set out In Appendix A.

Tidal Range should become a significant contributor to the stable, secure low carbon energy generation mix for the UK. The industry is keen to collaborate and partner with the Government to help the progression of this key energy generation infrastructure.

7. Appendix A: the Great British Tidal Range

The TRA are calling for the same comprehensive support offered to the Nuclear Industry, for the progression and development of the existing pipeline of Tidal Range projects (13GWs).

- Government commitment to a programme of new Tidal Range projects, giving industry and investors the confidence, they need to deliver projects at speed, reducing costs through learning and replication. To deliver this, we ask Government to launch Great British Tidal Range (GBTR), which will be an arms-length body responsible for driving delivery of new Tidal Range projects, backed with the funding it needs.
- Government to work towards bringing forward legislation setting out a statutory role for GBTR, when parliamentary time allows. In the meantime, Government will work to continue at pace to achieve this stated ambition within the existing legal framework to support delivery of the Government's ambitions to Tidal Range.
- The first priority for GBTR would be to launch a competitive process to select the best Tidal Range technologies. This would commence with market engagement as the first phase. The second phase – the down selection process – with an ambition to assess and decide on the leading technologies.
- The Government will provide co-funding that will be deployed by GBTR to support the development of these selected technologies and will work with successful bidders on ensuring the right financing is in place, in line with its commitment to take two Final Investment Decisions next parliament. The total level of development funding will be subject to future Spending Reviews.
- In addition, GBTR will work with wider Government on access to potential sites for new Tidal Range projects to achieve our long-term ambition. GBTR will also support the Government's consideration of further large gigawatt-scale projects to help us deliver on our net zero ambitions.
- The Government will launch the Future Tidal Range Enabling Fund of up to £120 million to provide targeted support for Tidal Range to address barriers to entry and will announce a shortlist of applications to begin pre-grant award due diligence.
- The Government will produce a roadmap, following the establishment of GBTR and the launch of the competitive technology selection process.
- The Government will work closely with the Tidal Range Alliance to deliver the Tidal Range Skills Strategic Plan to provide the future roles and jobs the sector needs. Supporting the development of Tidal Range technologies and projects.
- Government will also support the development of Tidal Range Turbines through the Advanced Tidal Range Fund to support a Tidal Range demonstration by the late 2020s.
- The development of the Tidal Range roadmap will support further action to ensure a resilient supply chain and identify opportunities to develop UK capabilities.