

**Response to the BEIS call for evidence on the potential for marine energy projects in Great Britain**

30 September 2020

Dear Sir/Madam,

Scottish Renewables is the voice of Scotland’s renewable energy industry, working to grow the sector and sustain its position at the forefront of the global clean energy industry. We represent around 260 organisations working across the full range of renewable energy technologies in Scotland and around the world, from large suppliers, operators and manufacturers to small developers, installers and community groups and companies right across the supply chain.

We welcome the UK Government’s support for renewable energy, and in particular the recent consultation on changes proposed to the Contract for Difference auction regime, including the option of supporting more innovative technologies. Our members welcome this further consultation. We believe that support for floating offshore wind, tidal stream and wave energy must be part of wider UK Government action to diversify the mix of low carbon generation that supports a just energy transition, while also helping open up routes to decarbonisation for other ocean-nations. With global attention on the UK at COP26 next year, the UK has an opportunity to demonstrate ambition for accelerating the commercialisation of marine technologies, which can be an example and stimulus for countries around the world.

The key points that we wish to highlight are as follows:

1. Floating offshore wind has rapidly arrived at a point where it is able to deliver projects at commercial scale. By middle of this decade we expect 500MW+ projects to be ready to bid into a CfD auction process. Scotland and the UK are home to the world’s two largest floating offshore schemes, so we have experience of the availability and performance of such schemes. Further schemes are in development across the UK, and a significant volume of schemes is expected to come forward through the live Scotwind leasing round. Cost reduction potential and global export opportunity for this technology is significant.
2. Tidal stream power has proven reliability of the technology and is ready to scale up deployment. If offers the UK an ability to diversify generation, and using conservative assumptions offers cost reduction potential to below £90/MWh by 2030. It would be able to participate in a next auction round.
3. Wave power is further behind tidal stream as a sector but is receiving support through a number of cross industry & academic programmes. Access to future auction rounds would provide a route to market that would support investment flows into this technology.
4. Floating offshore, tidal stream and wave offers the GB electricity system an option to diversify its generation of power by location (increasing times when GB overall wind fleet can operate at high levels of capacity) and by type, helping build system resilience. These technologies also offer options for integration with energy storage and hydrogen production. There is a clear and reliable pipeline of projects that BEIS can rely upon to deliver new low-carbon generation, and of course can engage with to help ensure clarity on project costs etc so that the CfD can be effectively structured and directed.
5. The UK has world leading expertise in the deployment and operation of marine energy, learnt from the oil and gas sector and applied to marine power generation. This world-leading expertise, focused on higher level engineering equipment and expertise is highly exportable, subject to growth of the UK market providing early stage opportunities to learn and build up expertise specific to these technologies. The UK is well placed to capitalise on any such market growth.

We look forward to further engagement with UK Government on the role of marine energy. A full response to the questions set out in your call for evidence is set out below.

Kind regards,

**Ben Miller**

Senior Policy Manager - Offshore

bmiller@scottishrenewables.com

Submission written by Maf Smith on behalf of Scottish Renewables. For further correspondence please contact Ben Miller.

**RESPONSE TO CONSULTATION QUESTIONS**

**Question 1: We welcome views and evidence on which marine energy technologies have the most deployment potential through the 2030s to meet the UK’s net zero emissions commitments, and what trajectories for deployment are realistic and feasible, both in the UK and worldwide. We welcome views and evidence on the scope for wider benefits, or potential disadvantages, that specific technologies could bring to the energy system as a whole.**

Of the technologies covered in this consultation (floating offshore wind, tidal stream and wave), we see that floating offshore wind offers the most significant potential for the GB power market in terms of GW delivered, but all offer opportunities to diversify and decarbonise our power system and to secure wider economic benefits, including export opportunities. We will look at each in turn and throughout this consultation will seek to distinguish comments and be specific about which technology we are referencing and will seek to avoid talking in general about “marine energy” where possible. Where we highlight, change or move between technologies we will seek to flag this by bolding the first mention of the relevant technology.

**Floating offshore wind** has grown rapidly and is a technology seeking to deliver at significant scale. Scotland and the UK are home to the two largest floating schemes in the world (Hywind Scotland and Kincardine (phase 2 currently under construction)). The Crown Estate Scotland’s live Scotwind leasing process includes sites best suited to floating technologies, and there are also active considerations within the oil and gas sector over the role of floating offshore wind as a technology able to support energy transition.

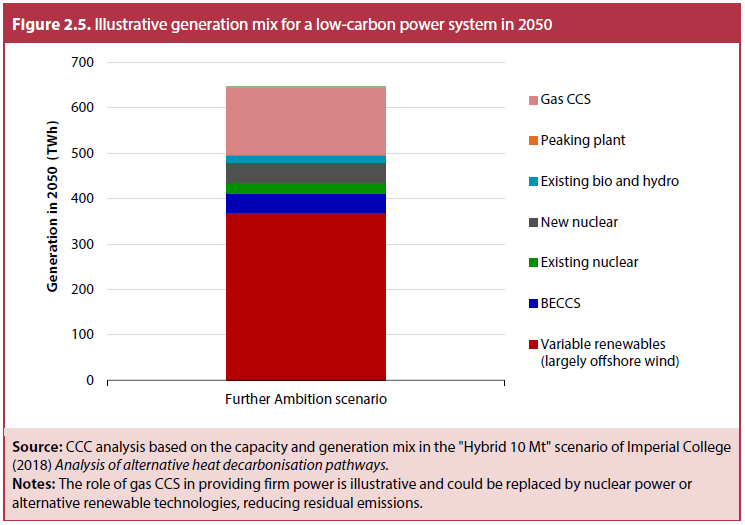
We expect rapid growth of floating offshore wind in Scotland, primarily thanks to the Scotwind process, but a CfD in support of floating offshore wind will be required to help the sector grow. There remains an important role for demonstration, including to support new technology concepts. However, the priority for the sector is increased scale, allowing it to commercialise and bring costs down rapidly.

During the 2nd part of the 2020s the focus for floating offshore wind support should be on technology commercialisation. We expect to see a number of 500MW projects come forward in addition to currently known projects in the development cycle, as well as potential demonstration projects with up to 2GW potential by 2030, based on an expectation that the first Scotwind floating offshore projects will be able to deliver by this point. Post 2030, we expect the installation of floating offshore wind to ramp up significantly. To maintain a pathway to net zero, the UK would require 75GW of offshore wind based on Committee on Climate Change modelling and advice to Government and Parliament on the route to net zero. Below is an illustrative generation mix set out by the CCC for a low carbon-power system in 2050, with offshore wind and other variable renewables delivering the bulk (369 out of a total of 645TWh) of power sector needs.

A similar picture of the growth of offshore wind comes from the latest National Grid Future Electricity Scenarios work. Modelling in this sets out 3 net zero compliant scenarios delivering between 82-108MW of offshore wind by 2050. Clearly, a net zero system will require significant volume of floating offshore wind of at 1GW+ per year in the 2030s and potentially 2GW+ in the 2040s.

**Tidal stream** technologies have been proven at full scale in locations around the UK, with a strong focus at Scottish sites around Orkney and the north Scotland coastline. The sector has delivered a number of first array projects and through these generated 30+GWh of power into the GB grid. The sector is building its experience and seeking to grow to develop and deliver larger scale projects.

The tidal stream sector has also broadly settled on a turbine type with the focus now on deployment of floating and bottom mounted technologies. This helps assure investors re. closeness to commercialisation. However, there are a multitude of players in the market seeking to improve on this design so next generation turbines based on different types cannot be ruled out.



Source: Committee on Climate Change (2019) Net Zero Technical Report

ORE Catapult’s 2018[[1]](#footnote-1) report on the cost reduction potential for tidal and wave energy concluded that the UK has a practical resource of 15GW for tidal stream and that cost reduction to below £90/MWh can be secured, supported by deployment across the 2020s and 2030s.

ORE Catapult assumed a 10-year lag in technology deployment for **wave energy**. It concluded that wave energy has a practical resource of 23GW with deployment focused in the 2030s.

There is an emerging global market for **tidal stream** energy, with developers such as Nova Innovation active in markets such as SE Asia and Canada.

Regarding the benefits, or potential disadvantages of specific technologies; **floating, wave and tidal stream** technologies can all support diversification of low carbon electricity generation, and offer a geographically dispersed energy source, with projects in or able to deploy on the south and SW coasts of England, west Wales and northern Scotland. Floating offshore wind in particular offers an ability to deploy a significant volume of low carbon power across different weather systems, helping to increase power availability of this sector as a whole.

**Wave** is a complementary resource to wind power, essentially extending and flattening out the variability of wind power (wave power being the result of “stored wind energy”) that reaches the UK after prevailing westerly winds blow through[[2]](#footnote-2). **Tidal stream** energy is of course a predictable, variable power source with resource levels linked to the moon’s regular cycle, and ORE Catapult is currently looking at the value of predictability of tidal stream energy as part of the TIGER project.

With the advent of storage technologies, and growth of fuel vectors such as hydrogen, there are also opportunities for deployment and fuel generation as a supplementary commercial model alongside export to the GB grid system. In particular, the predictable nature of tidal stream creates a more stable and efficient match with battery storage and green hydrogen production, and the UK already has experience of tidal stream linked to hydrogen production via work at the European Marine Energy Centre.

**Question 2: We welcome views on how the CfD competitive allocation process would most effectively support early commercial deployments of innovative marine technologies. We welcome suggestions for approaches that could deliver a clear path towards commercialisation - while also focusing on the more cost-effective technologies and projects? At what stage are technologies ready to seek the support offered by the CfD scheme and bid competitively for contracts? How can competitive processes best be used to drive cost reductions?**

We support the approach outlined in BEIS’s earlier consultation for the creation of a Pot 3 for offshore wind, linked to allocation of sufficient capacity for the remaining technologies in Pot 2. We see that there will be a need to arrangements within the design of this (revised) Pot 2 to support and bring forward **floating offshore wind, tidal stream and wave energy** in future auction rounds, associated with a clear associated strike price that would be reduced over time. Tidal stream and potentially demonstration scale floating offshore projects should be ready to bid into the next auction round in 2021. Smaller commercial floating offshore wind as well as tidal and potentially wave energy projects will wish to access to any 2023 auction round. Future auction rounds after 2025 would be expected to see significant interest from floating offshore wind bidders as Scotwind projects become ready/eligible to bid, with ongoing interest from tidal energy schemes and potentially interest from wave energy projects for auction rounds later in the 2020s.

In terms of scale of projects, we expect to see demonstration or initial commercial **floating offshore wind** projects (up to 100MW) between 2021 & 2023, but larger (500MW+) projects for subsequent rounds (2025 onwards).

For **tidal stream** projects, scheme size will be smaller, but we note that the Marine Energy Council (of which Scottish Renewables is part of) has worked with marine energy companies to set out a clear industry position on how to structure CfD auctions that work for the majority of tidal stream projects. We commend this work, and direct BEIS to this and further engagement with MEC. Scottish Renewables supports the work of MEC and is involved in its discussions. Like MEC we also note that in tidal stream, there are different commercial models with some developers seeking to deploy smaller scale arrays utilising more of a decentralised model.

The level of actual bidding activity will, of course, depend on the structure and parameters of such a revised Pot 2. Commercial scale projects would be expected to bid in for auctions from 2025 onwards. Depending on what Government decides re. eligibility for different technologies to bid there could be a range of technologies bidding in. As such the use of auction design tools such as minima, maxima and administrative strike price become important. But most important is the need to set aside sufficient budget across multiple auction rounds so that activity is not constrained while industry is seeking to ramp up activity in the late 2020s and early 2030s.

**Question 3: The government welcomes evidence on how specific technologies expect to reduce costs to the point where they can be commercially competitive with other renewable and low carbon generation options. Where does the scope for cost reductions arise, and what scope for innovation exists in the sector? What trajectories for cost reduction are realistic and feasible – at a project level but also across the relevant sector? We also welcome evidence of any successful approaches to cost reduction that have already been adopted.**

Cost reduction will come from economies of scale and volume, accelerated learning, learning by doing and innovation. In particular an ability to grow a market offers opportunity for manufacturing at volume for a number of manufacturers, as well as the ability to scale projects and develop large sites with opportunities for cost reduction, for example lower development and infrastructure costs per MW developed. These factors are clear and generally shared across different innovations and technologies.

**Floating offshore wind** development in particular is accelerating in different markets around the world, offering an opportunity for sharing additional costs that go to helping this technology commercialise. This provides greater surety in the presence of export markets to supply into as well. Floating offshore markets are emerging in Scandinavia, France, Spain and Portugal, in California and in Japan and South Korea.

Our sector is confident that with deployment at scale in critical markets like Scotland and the UK, as well as globally, rapid cost reduction can be realised. At a European level, the sector is forecasting an LCOE of 40-60 Euros by 2030[[3]](#footnote-3).

While the sector has proven the technology, and there are commercial platforms on the market and available, there remains significant interest in alternative platform variations, new turbine variants and of course innovations in methods of construction, installation and operation. The Carbon Trust’s Floating Joint Industry Project[[4]](#footnote-4) is a very good example of coordinated work to look at challenges in the sector. Its Phase 2 report looked at innovation needs in electrical systems, moorings, logistics, platform–turbine integration, dynamic cabling, lifting solutions, monitoring and inspection.

Recent analysis by ORE Catapult estimates that the LCOE of a next generation of floating offshore wind demonstration projects (either at WaveHub or Pembrokeshire Demonstration Zone) would be approx. £120/MWh (2012 real pre-tax) but decline to £80/MWh for a modelled 300MW site and £64/MWh for a modelled 500MW site. These different cost projections clearly demonstrate the importance of scaling on project size[[5]](#footnote-5).

Regarding **wave and tidal stream**, ORE Catapult has identified the following innovation work taking place in the market to drive cost reduction:

* Improved reliability and availability
* Improved structures and moorings
* Reduced offshore operational costs
* Improved electrical connectors.

ORE Catapult forecasts that as tidal stream technology matures, cost will continue to fall with incremental innovation and continuing learning, with forecast LCOE of £150 per MWh by 100MW installed, £130 by 200MW and £90 by 1GW, with further opportunities for cost reduction linked to further reductions in cost of capital.

As noted above, ORE Catapult’s 2018[[6]](#footnote-6) report on the cost reduction potential for **tidal stream and wave energy** concluded that the UK has a practical resource of 15GW for tidal stream and that cost reduction to below £90/MWh can be secured, supported by deployment across the 2020s and 2030s. ORE Catapult assumed a 10-year lag in technology deployment for **wave energy**. It concluded that wave energy has a practical resource of 23GW with deployment focused in the 2030s.

**Question 4: If specific emerging marine technologies are unlikely to be able to compete with other marine technologies for income based on the electricity they generate; what forms of support could move the technology towards commercialisation in the short term? We particularly welcome evidence on why any proposed approaches are likely to be effective, how they can be designed to minimise costs to consumers, and how long before the technology will be able to compete against other technologies.**

Industry has been developing alternative support mechanisms to look at options for financing early stage projects relating to **tidal stream and wave** power. This work has been led by the UK’s Marine Energy Council. MEC has developed a proposal for the creation of an *Innovation Power Purchase Agreement* (IPPA) that would allow early stage technology developers to attract investors to commercialise the technology. Further details are set out in MEC’s own response.

**Question 5: We welcome views on which areas of industrial potential the UK has specific strengths in. If there a natural pathway from one sector to another as we transition to a low carbon society? What particular strengths does the UK bring to the development of specific marine technology sectors or projects, and what opportunities and risks are present? What wider benefits to UK, or to particular regions, do you expect to emerge from particular technologies?**

The UK has a clear global advantage in the development of marine energy, and different strengths and opportunities relating to floating offshore wind, tidal stream and wave technology.

For **floating offshore wind**, Scotland and the UK has an opportunity to secure advantages relating to the wider supply chain, including advanced level engineering design and consultancy, as well as specific high value components relating to mooring and anchoring systems, connectors, dynamic cabling, subsea engineering, shipping and advanced O&M strategies.

Furthermore, while the international fabrication market is highly competitive, growth of a floating sector in the UK does create opportunities for fabrication yards and dry dock facilities in the UK for fabrication and secondary assembly of steel or concrete platforms. The likely volume of work coming through Scottish and other UK ports as the Scotwind process leads to construction of projects, means significant opportunities shared around a number of different port sites. Platform fabrication and/or assembly and onshore construction/erection of floating turbines onto platforms will require significant port capacity, with access to deepwater ports and quaysides, reinforced quays and significant laydown areas. UK and Scottish Government support for investment in ports will be critical. We would point to the recent Arup study for Crown Estate Scotland and its review of port capability throughout Scotland[[7]](#footnote-7).

Regarding **tidal stream and wave,** IP and expertise is clustered in the UK. Underpinning the industrial knowledge held by a number of wave and tidal companies is expertise in the supply chain as well as testing and certification expertise, all underpinned by world leading academic research and knowledge.

We understand that a critical issue for Government is the ability to deliver secure export value that follows from supporting UK projects that cement UK capability and expertise. The global market for tidal stream and wave energy is real, though as in the UK this market has taken time to evolve and reach maturity. Technology advancements we see in this market of course can be applied to this market, and there are opportunities abroad opening up as part of ongoing work to decarbonise our energy system.

The UK supply chain brings strength to the tidal stream and wave energy industry in five ways:

* the items that will almost always be fabricated locally to a project deployment location
* shipping and operational services
* the high value readily exportable sub-systems
* consultancy works in the development of projects
* remote O&M bases.

The items that will most likely be fabricated locally include the steel super structure, the moorings, the anchors and the final assembly. Within tidal stream and wave energy the UK is well positioned to secure the high value readily exportable subsystems, including power take-off or nacelle, the blades and the electrical control systems.

**Question 6: We welcome information on the potential development of the supply chain. What activities can be undertaken as part of the development of early projects to further strengthen the supply chain for marine technologies? Are there opportunities for early knowledge sharing and standardisation in the industry, and how could they be maximised?**

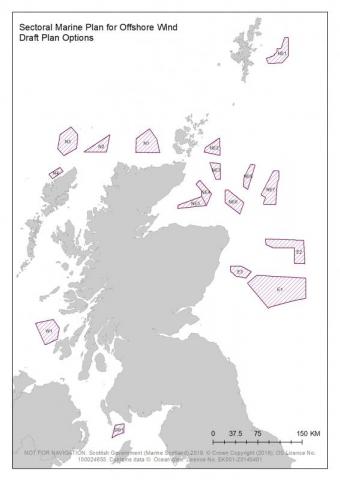
In **floating offshore wind** there are already significant and well organised programmes to coordinate activity, including Carbon Trust’s Floating JIP and ORE Catapult’s Floating Offshore Wind Centre of Excellence. To support the supply chain grow further, we would recommend BEIS looks to firstly support and help extend such valued programmes, including the industry established Offshore Wind Growth Partnership. Action to help underpin investment in UK ports will also be valuable. We note the Scottish Government’s recent programme seeking to secure investment into low carbon infrastructure, including sites such as Hunterston port. There is also investment work in ports such as Ardersier and Orkney. Such port activity and investment will rightly be led by the private sector, but Government backing alongside this can be used to support inward investment as well as domestic supply chain growth.

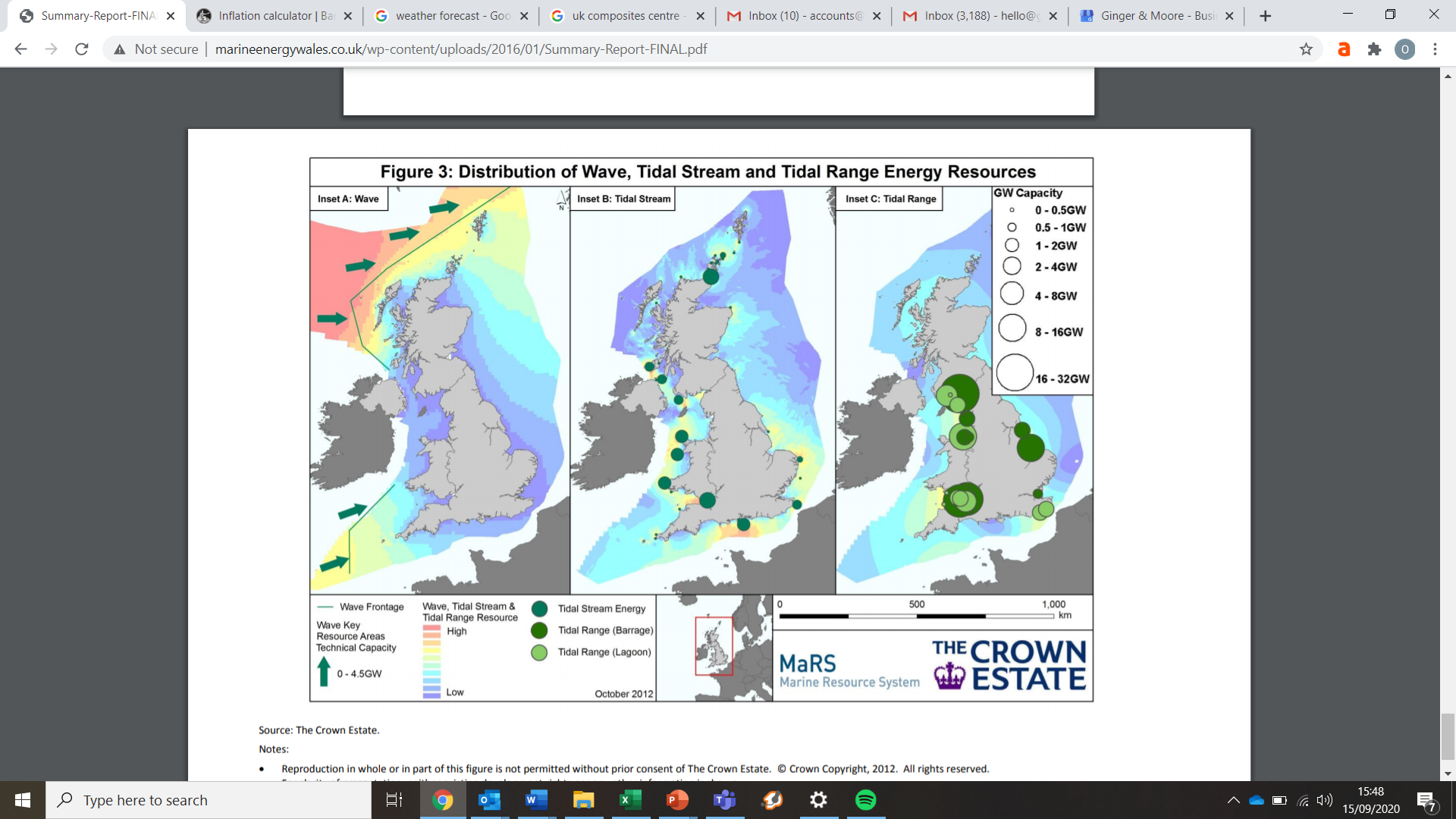
We also note the critical role of industry coordination and joint work with Government. The UK’s Offshore Wind Sector Deal will play an increasingly important role supporting floating offshore wind industrialisation: for example OWIC has funded the Offshore Wind Growth Partnership programme within ORE Catapult which is supporting supply chain companies diversify into fixed *and* floating offshore wind. In Scotland, the Scottish Offshore Wind Energy Council (SOWEC) is playing a critical role. It coordinates with UK wide action, engaging with the UK Offshore Wind Industry Council. It works closely with the Scottish Government and Crown Estate Scotland and is helping coordinate industry activity on understanding Scottish supply chain capability.

As **tidal stream** and then **wave** projects come to fruition, we would recommend adaption and application of such programmes to these sectors.

Support from agencies such as Highlands & Islands Enterprise and Wave Energy Scotland, as well as UK programmes coordinated by groups such as ORE Catapult, the National Composites Centre, the Advanced Manufacturing Research Centre and the National Manufacturing Institute Scotland can all support a growing marine energy sector, as well as assist companies through innovation and supply chain “tool up”.

**Questions 7 onwards**Our members will respond directly on these project specific questions, though we have provided input into Qs 11 and 12. We would wish to highlight though the live Scotwind process for floating offshore wind (see map of draft areas established by Marine Scotland[[8]](#footnote-8)), and that there are a number of tidal stream projects with secured leases from The Crown Estate or Crown Estate Scotland which can progress. Finally, there has been significant mapping of resource and potential lease areas by these organisations.These are documented in a Crown Estate report that was produced in 2012 and the key figure is extracted below.[[9]](#footnote-9)





**Question 11: What is the appetite for investing in this area at present? What types of investor are you engaging with? Are there sufficient private sector investment opportunities available? What types of issues are being raised by potential investors? How do you anticipate investor engagement evolving as the project/sectors mature?**

A range of Scottish Renewables members have an interest in **floating offshore wind** technology. We are seeing that the Scotwind bid process is widening interest in development and utilisation of floating offshore wind technologies, and see that the focus has clearly shifted from initial demonstration projects to a developer-led approach focused on scaling projects. We also see a wide range of Scottish supply chain companies with a traditional focus in marine and oil and gas applications demonstrating growing interest in this new technology. The application of Scottish marine expertise will of course help deliver a rapid transition from oil and gas into this new market, helping us to apply this significant knowledge base to build better projects, and supporting wider aspirations of a just transition.

However, floating offshore wind will not be financeable without a time limited support to drive pre-commercial projects down the cost curve, including looking at options to invest in shared infrastructure, as well as providing revenue stability via the CfD. We note dedicated funding for floating offshore wind has been enacted, or is under consideration, in France, Ireland, Norway, Japan and South Korea and a similar approach is needed here in the UK.

**Question 12: Are there any non-financial barriers to realising projects? We would welcome an outline of the issue, and any thoughts on how the barriers could be overcome.**

Transmission network charging is likely to be a significant cost as projects move into deeper waters. A streamlining of the planning and grid connection processes is urgently required. We welcome the recent Offshore Transmission Network Review and await next steps. Coordination between UK policy activity in hydrogen and offshore wind will also be critical if we are to benefit from synergies between offshore wind and a ramp up in UK hydrogen capabilities.

1. [https://www.marineenergywales.co.uk/wp-content/uploads/2018/05/ORE-Catapult-Tidal stream-and-Wave-Energy-Cost-Reduction-and-Ind-Benefit-FINAL-v03.02.pdf](https://www.marineenergywales.co.uk/wp-content/uploads/2018/05/ORE-Catapult-Tidal-Stream-and-Wave-Energy-Cost-Reduction-and-Ind-Benefit-FINAL-v03.02.pdf) [↑](#footnote-ref-1)
2. A study by DeSolve, an energy systems consultancy company, showed that the lowest energy system cost for California, Pacific West and the Interior West of the USA would include 40GW of wave energy by 2040 and 55GW by 2050 (Future power systems on the US West Cost, Jenkins-Sepulveda Systems study Jan-2020, CorPower Ocean AB). Similarly, Seabased AB, a Swedish wave technology developer studied the weather systems of Galway Bay in Ireland. Historical data from wind and wave conditions showed how combining wave and wind could more than double the baseload available to the grid from a single location. Wave and wind peaked at different times meaning that wave peaked when wind waned, and vice-versa. [↑](#footnote-ref-2)
3. WindEurope (2018) Floating Offshore Wind Energy – A Policy Blueprint for Europe, <https://windeurope.org/wp-content/uploads/files/policy/position-papers/Floating-offshore-wind-energy-a-policy-blueprint-for-Europe.pdf> [↑](#footnote-ref-3)
4. Carbon Trust (2020) Floating JIP Phase II Summary Report. <https://prod-drupal-files.storage.googleapis.com/documents/resource/public/FWJIP_Phase_2_Summary_Report_0.pdf> [↑](#footnote-ref-4)
5. ORE Catapult (2020) Benefits of Floating Offshore Wind to Wales and the South West, <https://www.marineenergywales.co.uk/wp-content/uploads/2020/01/Benefits-of-Floating-Offshore-Wind-to-Wales-and-the-South-West.pdf> [↑](#footnote-ref-5)
6. [https://www.marineenergywales.co.uk/wp-content/uploads/2018/05/ORE-Catapult-Tidal stream-and-Wave-Energy-Cost-Reduction-and-Ind-Benefit-FINAL-v03.02.pdf](https://www.marineenergywales.co.uk/wp-content/uploads/2018/05/ORE-Catapult-Tidal-Stream-and-Wave-Energy-Cost-Reduction-and-Ind-Benefit-FINAL-v03.02.pdf) [↑](#footnote-ref-6)
7. Crown Estate Scotland (2020) Ports for offshore wind: A review of the net-zero opportunity for ports in Scotland, <https://www.crownestatescotland.com/media-and-notices/news-media-releases-opinion/new-research-on-net-zero-opportunities-for-scotlands-ports>. [↑](#footnote-ref-7)
8. <http://marine.gov.scot/information/sectoral-marine-plan-offshore-wind-energy-2019-draft-plan-options> [↑](#footnote-ref-8)
9. <http://www.marineenergywales.co.uk/wp-content/uploads/2016/01/Summary-Report-FINAL.pdf> [↑](#footnote-ref-9)