European Commission

Blue Energy

Maritime Affairs

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Blue Energy

Action needed to deliver on the potential of ocean energy in European seas and oceans by 2020 and beyond

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions
and
Impact Assessment Synopsis

Directorate-General for Maritime Affairs and Fisheries

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Impact Assessment Synopsis

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(COM(2014) 8)

1. Contribution to Employment, Innovation, Climate and Energy Objectives

Our seas and oceans have the potential to become important sources of clean energy. Marine renewable energy, which includes both offshore wind and ocean energy (1), presents the EU with an opportunity to generate economic growth and jobs, enhance the security of its energy supply and boost competitiveness through technological innovation. Following the 2008 Communication on offshore wind energy (2), this Communication considers the potential of the ocean energy sector to contribute to the objectives of the Europe 2020 Strategy (3) as well EU's long-term greenhouse gas emission reduction goals. It also looks over the horizon at this promising new technology and outlines an action plan to help unlock its potential.

Harnessing the economic potential of our seas and oceans in a sustainable manner is a key element in the EU's maritime policy (4). The ocean energy sector was recently highlighted in the Commission's Blue Growth Strategy (5) as one of five developing areas in the 'blue economy' that could help drive job creation in coastal areas. Other Commission initiatives, such as the Communication on Energy Technologies and Innovation (6) and the Atlantic Action Plan (7), have recognised the importance of ocean energy and aim to encourage collaborative research and development and cross-border cooperation to boost its development.

Research and consultation work conducted as a part of the impact assessment accompanying this Communication shows that additional

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1. Ocean energy can be harvested in many forms. Wave energy depends on wave height, speed, length, and the density of the water. Tidal stream energy is generated from the flow of water in narrow channels whereas tidal range technologies (or 'tidal barrages') exploit the difference in surface height in a dammed estuary or bay. Ocean energy can also be generated from temperature differences between surface and sub-surface water while salinity gradient power relies on the difference in salinity between salt and fresh water.
2. COM(2008), 13.11.2008.
3. COM(2010) 2020, 3.3.2010.
4. COM(2007) 575, 10.10.2007.
5. COM(2012) 494, 13.9.2012.
6. COM(2013) 253, 2.5.2013.
7. COM(2013) 279, 13.5.2013.

support for this emerging sector could enable the EU to reap significant economic and environmental benefits. The impact assessment particularly highlights the following issues:

- The ocean energy resource available globally exceeds our present and projected future energy needs. In the EU, the highest potential for the development of ocean energy is on the Atlantic seaboard, but is also present in the Mediterranean and the Baltic basins and in the Outermost Regions. Exploiting this indigenous resource would help to mitigate EU dependence on fossil fuels for electricity generation and enhance energy security. This may be particularly important for island nations and regions, where ocean energy can contribute to energy self-sufficiency and replace expensive diesel-generated electricity.

- The ocean energy sector can become an important part of the blue economy, fuelling economic growth in coastal regions, as well as inland. Pan-European supply chains could develop as the industry expands involving both innovative SMEs and larger manufacturing companies with relevant capabilities in, for example, shipbuilding, mechanical, electrical and maritime engineering but also environmental impact assessment or health and safety management. Increased demand for specialised ships is also to be expected, for instance. These are likely to be constructed in European shipyards.

- The position of European industry in the global ocean energy market is currently strong. This is evidenced by the fact that most of the technology developers are based in Europe. Growing competition from China, Canada and other industrialised nations is, however, expected. The UK's Carbon Trust estimated that the global wave and tidal energy market could be worth up to €535 billion between 2010 and 2050 ([8]). Creating the conditions under which the sector could prosper now would enable the EU to capture a sizable share of the market in the future. Innovation through research and development can allow the EU to generate export opportunities for both technology and expertise. It is critical, therefore, to ensure that the EU can maintain its global industrial leadership.

- Ocean energy has the potential to create new, high-quality jobs in project development, component manufacturing and operations. Indicative job estimates from the impact assessment show that 10,500-26,500 permanent jobs and up to 14,000 temporary jobs could be created by 2035. Other, more optimistic sources estimate 20,000 jobs by 2035 in UK alone ([9]) and 18,000 in France by 2020 ([10]). A substantial proportion of these employment opportunities will arise in the Atlantic coastal areas, which currently suffer from high unemployment.

- Scaling up the deployment of ocean energy could contribute to Europe's decarbonisation goals. Developing all sources of low-carbon energy in a cost-effective manner will be important to deliver on the EU's commitment to reduce its greenhouse gas emissions by 80-95% by 2050.

- Ocean energy electricity output is different to that derived from other renewable energy sources. This means that ocean energy could help to balance out the output of other renewable energy sources such as wind energy and solar energy to ensure a steady aggregate supply of renewable energy to the grid. Ocean energy would therefore be a valuable asset in the EU's energy portfolio.

- Ocean energy devices tend to be entirely or partially submerged and therefore have a low visual impact. As the scope for expansion of land-based renewable energy generation becomes constrained, the marine space offers a potential solution to public acceptance issues related to visual impact, which may hinder renewable energy developments on land.

8. Carbon Trust (2011), Marine Renewables Green Growth Paper
9. Renewable UK (2013), Wave and Tidal Energy in the UK at: http://www.renewableuk.com/en/publications/reports.cfm/wave-and-tidal-energy-in-the-uk-2013
10. French Senate (2012), Report on Maritime Affairs at: http://www.senat.fr/rap/r11-674/r11-6741.pdf

2. Marine Renewables Today

Parallels are sometimes drawn between the ocean energy sector today and early offshore wind power development in the 1980s and 1990s. Since that time, the wind sector, including offshore wind, has grown exponentially having benefitted from targeted policy support at both Member State and EU level. Offshore wind capacity grew by 33% in 2012, a faster rate of growth than the onshore wind sector.([11]) At the end of 2012 the offshore wind energy sector consisted of nearly 5GW of installed capacity in 55 offshore farms in 10 European countries, producing enough electricity to cover 0.5% of the EU's total electricity consumption. In the first six months of 2013, 277 new offshore wind turbines were connected totalling a further 1GW. By 2020 total installed capacity is projected to reach 43GW, producing approximately 3% of the EU's total electricity consumption.

With technological improvements and additional public support for early stage development, the ocean energy sector may be able to develop to a similar scale as offshore wind over time. Ocean energy currently is an infant industry, within which wave and tidal stream technologies are relatively more developed than other technologies. There are currently 10MW([12]) of installed wave and tidal stream capacity in the EU, which is almost a three-fold increase from 3.5MW four years ago. Located in the UK, Spain, Sweden and Denmark, these projects are mostly pre-commercial, demonstrating the reliability and survivability of tested devices. Huge growth is already predicted, however, with some 2GW of projects in the pipeline (predominantly in the UK, France and Ireland). If all of these projects are implemented, they could supply electricity to more than 1.5 million households.

A further promising concept is offshore floating wind power. The deepening offshore coastal areas on the Atlantic seabed make offshore turbines with fixed foundations too expensive. A floating platform that is anchored to the seabed could be a more cost-effective solution in those waters. There are currently two offshore wind floating demonstration projects in operation, in Portugal and Norway. Ocean Thermal Energy Conversion (OTEC) technology has a strong potential in the Outermost Regions due to their location in the tropics, where the temperature difference between surface and deep waters is the greatest. Local deployment can provide for the islands' drinking water, cooling and electricity needs. Feasibility studies are currently underway in Martinique and La Reunion.

Although ocean energy deployment figures are modest compared to the offshore wind sector, commercial interest in the sector is increasing, as evidenced by the growing involvement of large manufacturers and utilities. The recent ocean industry "Vision Paper" provides an additional signal that the sector is better able to identify its needs and constraints as well as outlining solutions to address these. Over €600 million have been invested by the private sector over the last seven years and this is set to increase further, provided that there are favourable conditions for the development of these devices.

11. European Wind Energy Association (2013), Wind in power: 2012 European statistics
12. The current installed capacity rises to 250MW if the La Rance tidal range system, in operation since 1966, is included. Tidal range systems are a mature technology but the scope for increasing their deployment is limited due to a lack of suitable locations and high environmental impact.

3. Existing Support

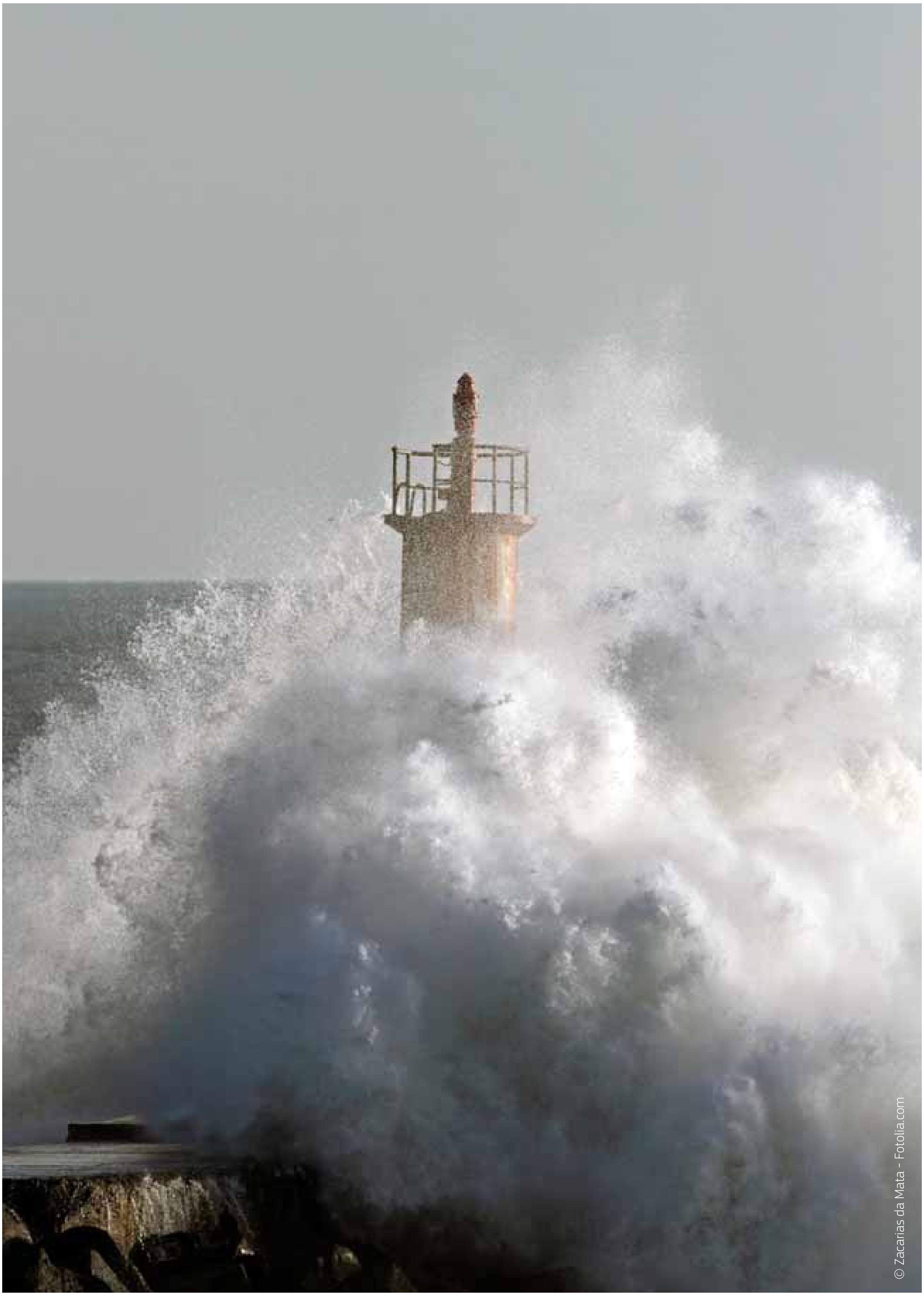
The growth of the wind and solar energy sectors in recent years clearly demonstrates that concerted efforts to put in place appropriate policy and funding frameworks can provide the incentives required by industry to deliver results. At national level, Member States have aimed to encourage investments in renewable energy technologies through revenue support schemes, capital grants and research funding, but only a few have dedicated support in place for ocean energy.

At the EU level, there are a number of provisions to facilitate the development of renewables. The Renewable Energy Directive and the Emissions Trading Scheme have provided the necessary regulatory framework. Since 2008 the Strategic Energy Technology (SET) Plan ([13]) has been instrumental in accelerating the development and deployment of low carbon energy technologies. The Regulation on guidelines for trans-European energy infrastructure([14]) seeks to tackle the infrastructural challenge by defining integrated offshore electricity grid development as a priority. It also establishes a process to identify and monitor the selected infrastructure projects, which then benefit from preferential regulatory treatment, such as accelerated permitting procedures, and financial support. However, currently there are only few projects which are planning meshed offshore grid solutions.

The EU has also made funding available for actions benefiting ocean energy technologies. For instance, a joint programme for ocean energy has been set up within the European Energy Research Alliance (EERA). Member State involvement is being encouraged through a new European Research Area network (ERA-net) of national and regional research programmes that has been established specifically on ocean energy. This will support coordination of research activities, encourage wider cross-border participation in research, identify priorities and build scale within the EU. Three ocean energy projects were awarded around €60 million in total under the first round of the NER300 programme, which will enable the demonstration of arrays from 2016. Some projects have also been supported through structural funds. The development of ocean energy has been highlighted in the recent Commission Communication entitled "Action Plan for the Atlantic Ocean area"([15]) which encouraged national and regional governments to consider how they could use EU structural and investment funds as well as research funds or European Investment Bank funding to support the development of the sector.

The EU has also funded various projects under Research Framework Programmes and the Intelligent Energy Europe Programme for an amount of up to €90 million since the 1980s. Horizon 2020, the EU's new research and innovation programme, will aim to address important societal challenges including clean energy and marine research. As such, it is a powerful new tool that can be harnessed to drive the ocean energy sector towards industrialisation, creating new jobs and economic growth.

13. COM(2009) 519, 7.10.2009
14. Regulation 347/2013, 25.4.2013
15. COM(2013) 279, 13.5.2013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4. Challenges Remaining

Some of the challenges faced by the ocean energy sector are similar to those for offshore wind. This concerns notably grid connection issues, supply chain developments and operation and maintenance under harsh weather conditions. However, ocean energy is now at a critical stage. Moving from prototype demonstration to commercialisation has always been difficult for emerging technologies. In the current economic climate, it is a particular challenge. Like other renewable energies, ocean energy will benefit from a clear, stable and supportive policy framework to attract investment and develop to its potential. Based on its stakeholder consultation and impact assessment, the Commission has identified the following issues that require attention over the short to medium term to help the sector to scale up and become cost-competitive with other forms of electricity generation.

- Technology costs are currently high and access to finance is difficult. Most of the existing technologies still need to demonstrate their reliability and survivability in the marine environment. The cost of generated electricity is therefore currently high but is set to decrease as the technologies advance along the learning curve. Demonstration of devices at sea is costly and risky and SMEs are often short of the necessary resources to deploy their prototypes. The diversity of the technologies currently being tested means that progress toward capital cost reduction is taking time.

- Expanding and strengthening the EU's transmission grid infrastructure, offshore but also on land and across borders, is necessary to accommodate future volumes of ocean energy and transport it to centres of demand. Whilst the recent TEN-E guidelines ([16]) may yield improvements in the future, concerns about timely grid connection remain. Other infrastructural issues including inadequate access to suitable port facilities and the lack of specialised vessels for installation and maintenance also need to be addressed.

- Complex licensing and consenting procedures can delay projects and raise costs. Uncertainty about the correct application of environmental legislation may further prolong consenting processes. Integrating ocean energy into national maritime spatial plans is therefore important.

- Some of the environmental impacts of ocean energy installations are not fully understood at this stage. More research and a better exchange of information on the environmental impacts will be required to understand and mitigate any adverse effects ocean energy installations may have on marine ecosystems. Cumulative impacts with other human activities also need to be assessed in the context of achieving good environmental status under the Marine Strategy Framework Directive and good ecological status under the Water Framework Directive. The integration of ocean energy into national maritime spatial plans is also important for addressing maritime safety concerns.

- Due to the current economic climate, several governments have substantially scaled back grant and revenue support for renewables, in some cases even introducing retrospective changes. Such developments can erode investors' confidence and put further development of the sector at risk. A lack of stable financial support, reflecting the position of the technologies in the development cycle, can lengthen the time necessary for projects to move towards profitability.

16. Regulation 347/2013, 25.4.2013.

5. Action Plan for Ocean Energy

Overcoming these challenges will be key to the future development of the ocean energy sector and its ability to deliver high volumes of low carbon electricity to Europe. The EERA joint programme, ocean energy ERA-Net and Horizon 2020 will be instrumental in reaping the benefits of pan-European cooperation in research and development, helping in particular to tackle the remaining technical issues. For pre-commercial ocean energy technologies, however, a stable and low risk framework of support is crucial as it ensures the bankability of projects and thus allows for the growth of installed capacity. The Commission has recently issued guidance on best practice for renewable energy support schemes. ([17]) While arguing for a stronger emphasis on the principle of cost-effectiveness, the guidance also stresses that support scheme design should foster technological innovation. The guidance therefore allows for projects of first commercial scale deployment and thereby recognises the need for a targeted support framework for technologies such as ocean energy.

Nevertheless, additional targeted actions at EU level are necessary to complement these initiatives and others undertaken at national level to overcome the bottlenecks to the development of the ocean energy sector outlined above. This Communication therefore sets out a two-step action plan that will assist this promising industrial sector in developing its potential, building to the greatest possible extent on existing work and projects such as ORECCA, SI OCEAN or SOWFIA. Based on the findings of the impact assessment, several cost-effective actions have been identified. Some of these have been designated as an initial 'call for action' that could be complemented with additional measures at a later stage, should further steps be required. The benefit of this two-step approach is that it will allow for the accumulation of a critical mass of actors and development of a shared response to the issues at stake in a bottom-up manner, thus creating a sense of ownership among involved stakeholders.

5.1 First phase of action (2014 – 2016)

I. Ocean Energy Forum

An Ocean Energy Forum will be set up, bringing together stakeholders in a series of workshops in order to develop a shared understanding of the problems at hand and to collectively devise workable solutions. It will be instrumental in building capacity and critical mass as well as fostering cooperation through the involvement of a wide range of stakeholders. The forum will also explore the synergies with other marine industries, particularly offshore wind, in matters relating to supply chains, grid connection, operations and maintenance, logistics and spatial planning. Representatives from relevant industries could be invited to participate as appropriate depending on the issues discussed. The Commission will play a facilitating and coordinating role in the forum. The forum will be organised into three workstreams:

a) Technology and Resource Workstream

The commercialisation of the ocean energy sector will require additional technological advancement as well as further improvements in grid connections and other offshore supply chain infrastructure.

Improving the affordability, reliability, survivability, operability and stability of ocean energy devices ([18]) is essential. There is already some consensus on the priority areas of technology research including, for example, the need for better mooring systems or new materials. Possibilities for collaborative working could also be identified in order to use resources more efficiently and to facilitate technological convergence. A clear timeframe, including key technological milestones will be set out.

17. Regulation 347/2013, 25.4.2013
18. SWD (2013) 439 final, 5.11.2013

This workstream will include a detailed assessment of ocean energy resources and offshore infrastructures such as ports and vessels, as improvements in these areas would help to optimise the management of ocean energy devices and thus trigger corresponding cost reductions.

This workstream would also seek to trigger further improvements in the integration of offshore renewables into the energy system. The industry would have the opportunity to voice its needs on issues such as the research and development needs related to grid technology, energy output forecasting and storage technologies could also be explored. The outcomes will then be transmitted to relevant actors such as regulatory authorities, transmission system operators and relevant fora such the North Seas Countries' Offshore Grid Initiative.

b) Administrative Issues and Finance Workstream
Long lead times caused by lengthy permitting and licensing procedures and difficulty of access to finance have been identified as pressing challenges.

The aim of this workstream will be to examine the administrative procedures relevant to ocean energy installations in Member States and the effects that ocean energy installations may have on shipping. These administrative and safety issues need to be reviewed collaboratively between Member State authorities and industry in this workshop, in order to lead to a common understanding of the challenges faced on all sides, and how to tackle them. The information gathered in the discussions will be used to compile a catalogue of best practice, complemented with case studies.

The issues relating to finance will also be examined. Given the novelty and the complexity of the technologies, investors may be unaware of the opportunities that this industry offers. This workstream should involve national authorities, development banks, private financiers and project developers to discuss how best to trigger the necessary investment. The suitability of different risk-sharing mechanisms such as soft-loans, co-investment and public guarantees will also be assessed. The funding opportunities available within EU research and innovation programmes such as Horizon 2020, the NER300 programme and the European Investment Bank's renewable energy funding programme will be specifically highlighted.

c) Environment Workstream
Environmental Impact Assessments are key to ensure the sustainable development of this emerging industry. Collecting baseline environmental data, however, places a major burden on individual project developers relative to the size of single projects. This workstream will encourage collaborative working on the monitoring of the environmental impacts of existing and planned installations and on innovative ways of mitigating the impact of ocean energy on the marine environment. The data on environmental impacts and monitoring need to be fed into national authorities as a matter of routine, under the Water Framework Directive and Marine Strategy Framework Directives purposes.

A comprehensive framework of EU legislation covering nature conservation, environmental impact assessment and renewable energy already exists, complemented by the Commission's proposal for a Directive on Maritime Spatial Planning (MSP). However, this workstream should assess the need for sector-specific implementation guidelines, similar to those already developed for wind energy, to complement the Habitats and Birds Directives, Article 13 of the Renewable Energy Directive and a possible future Directive on MSP.

II. Ocean Energy Strategic Roadmap
Based on the outcomes of the Ocean Energy Forum, a Strategic Roadmap will be developed setting out clear targets for the industrial development of the sector as well as a timeframe for their achievement. In setting technology priorities, it will take into account the key principles and developments announced by the Communication on Energy Technologies and Innovation ([19]) and will provide input and become part of the "Integrated Roadmap". ([20]) This roadmap will be elaborated jointly by industry, Member States, interested regional authorities, NGOs

19. COM (2013) 253
20. The implementing measure proposed by the COM (2013) 253

and other relevant stakeholders through a structured and participative process, as outlined above. The roadmap will bring together findings from all areas relevant to the development of the industry and provide an agreed blueprint for action in order to help the ocean energy sector move towards industrialisation.

5.2 Second phase of action (2017-2020)

III. European Industrial Initiative

A European Industrial Initiative could be developed based on the outcomes of the Ocean Energy Forum. Several European Industrial Initiatives (EIIs) have already been established under the SET-Plan. EIIs are public-private partnerships that bring together industry, researchers, Member States and the Commission to set out and achieve clear and shared objectives over a specific timeframe. They can enhance the effectiveness of innovative research and development and provide a platform for sharing investment risk. The European Wind Initiative, for example, has already provided input for the EU's research and development efforts on wind energy and encouraged better alignment of relevant EU and national public funds on identified priorities.

In order to establish a viable European Industrial Initiative, however, the industrial stakeholders must first have a clear strategy for the development of the sector and they must be well organised in order to be able to deliver on its objectives. The initiative would be the result of a shared process, with the participation of the Commission, Member States, and industry and research organisations. The precise form of this cooperation will need to be determined at a later stage, however, as the current arrangement under the SET-Plan may be subject to change as announced in the Communication on Technologies and Innovation. ([21])

Given the early stage of development of ocean energy technologies, building large-scale public-private partnerships could be an effective means of sharing risk and leveraging private investment. As discussed in the impact assessment, the establishment of a European Industrial Initiative or other appropriate form of public-private partnership is likely to constitute an important stepping-stone on the path to a full industrial roll-out. It would help in formalising cooperation between stakeholders, facilitating access to finance and in implementing the Strategic Roadmap announced in this Communication.

IV. Sector-Specific Guidelines for the Implementation of Relevant Legislation

Based on the experience gathered in the administrative issues and finance workstream and the environment workstream, guidelines could be developed to streamline and facilitate the implementation of the Habitats and Birds Directives and Article 13 of the Renewable Energy Directive as well as to assist with maritime spatial planning processes. The aim of these guidelines will be to reduce uncertainty through the provision of clearer and more specific guidance for the licensing of relevant projects and thus ease the burden faced by public authorities and project developers.

21. COM (2013) 253, 2.5.2013

6. Taking Stock of Progress

Once the above actions are initiated and firmly in place, it will be important to monitor the progress made by the ocean energy sector in fulfilling its potential as a strategic energy technology. This could be done, for example, by measuring the level of installed capacity and power generation, the number of projects deployed and planned, the scale of investment, the extent of capital cost reduction or the number of collaborative undertakings. It will also be important to assess the extent to which the sector is contributing to the EU's wider jobs, growth and sustainability objectives.

The Commission will undertake an initial evaluation of progress in 2017 and a more comprehensive evaluation of the state of development of ocean energy at the latest by 2020. The review process will have to take into account the evaluation and further development of the EU's general policy towards renewable energy development and energy technology policy.

7. Conclusion

As the EU contemplates its energy and climate change policy beyond 2020, it is timely to explore all possible options in a sustained and collective effort to mitigate the effects of climate change and to diversify Europe's portfolio of renewable energy sources. Supporting innovation in low-carbon energy technologies can help to tackle these challenges. No stone should be left unturned. For ocean energy to deliver on its potential, the time is ripe to bring Member States, the industry and the Commission together to work in a collaborative manner to accelerate its development. This Communication therefore sets out an action plan to guide further development of the ocean energy sector. Completion of this action plan in the period 2014-2017 should help the industrialisation of the sector, so that it can provide cost-effective, low-carbon electricity as well as new jobs and economic growth for the EU economy.

Common goals are best served through a coordinated and inclusive approach. Although today the ocean energy sector is relatively small, it could scale up in order to be in a position to contribute to economic growth and job creation in the EU. The sector could also contribute to the EU's 2050 greenhouse gas reduction ambitions if the right conditions are put in place now. By providing the necessary political impetus to this emerging sector, through the measures outlined above, ocean energy should, in the medium to long term, be able to achieve the necessary critical mass for its commercialisation and become another European industrial success story.

Annex 1: Summary of Measures Proposed

Deliverables	Timeline
Phase 1	
Setting up of an Ocean Energy Forum, involving the industry and other stakeholders • Technology and Resource Workstream • Administrative Issues and Finance Workstream • Environment Workstream	2014 - 2016
Drafting of a Strategic Roadmap	2016
Phase 2	
Possible setting up of European Industrial Initiative	2017 - 2020
Possible drafting of guidelines to facilitate the implementation of relevant legislation and to assist with maritime spatial planning	2017 - 2020

Blue Energy

Action needed to deliver on the potential of ocean energy in European seas and oceans by 2020 and beyond

Impact Assessment Synopsis

1. Introduction

The energy potential of our seas and oceans well exceeds our present energy needs. A variety of different technologies are currently under development to harness this energy in all its forms:

- Wave energy convertors (WECs) vary substantially in design depending on the way energy is absorbed, on water depth and location. The wave resource is the best along the length of the European Atlantic coast, e.g. in Ireland, Portugal and Spain.

- Tidal stream technologies tend to be similar in principle and design to wind energy turbines. Energy is generated from the flow of water so the technology is best placed in high velocity currents in narrow channels. Potential to deploy tidal stream devices exists in the UK, Ireland, France, Greece and Italy.

- Tidal range technologies (or 'tidal barrages') operate on principles similar to conventional hydro-power installations. Tidal water is captured in a damn across an estuary or a bay and is then forced through a hydro-turbine during low tide.

- Ocean thermal energy conversion technologies ('OTEC') generate electricity from the temperature difference between surface and sub-surface water. It has the greatest potential in tropical areas, including the Outermost Regions.

- Salinity gradient power (or 'osmotic power') relies on the difference in salinity between salt and fresh water, which can be exploited for the production of energy through osmosis. Favourable locations include Norway and the Netherlands. OTEC and salinity gradient technologies are less developed than wave and tidal energy.

As the EU steps up its effort to reach the objectives of the Europe 2020 Strategy ([1]) and contemplates its energy and climate policy beyond 2020, it is opportune to explore all possible avenues to stimulate innovation, create economic growth and new jobs as well as to reduce our carbon footprint. Given the long-term investments required, action needs to be taken now in order to ensure that the ocean energy sector can play a meaningful part in achieving our objectives up to 2020 and beyond. This impact assessment looks over the horizon at a promising new technology and considers the various options available at the EU level to support its development.

1. COM(2010) 2020, 3.3.2010

2. Problem Definition

The development of this promising sector is currently hampered by several technological and non-technological barriers. These will have to be addressed if the sector is to reach its full potential.

Cost reduction, financial and profitability issues

The cost of exploiting ocean energy is currently high compared to conventional but also other renewable energy sources, which have long benefitted from strong public support. Most of the existing ocean energy technologies are still in the demonstration phase and the progress towards capital cost reduction remains obstructed by residual technical challenges. The relative novelty of these technologies and perceptions of high risk can deter investors. Moreover, the complexity of the technological landscape leads to a diffusion of research and development efforts, which makes for a slower progress along the learning curve.

Infrastructure issues

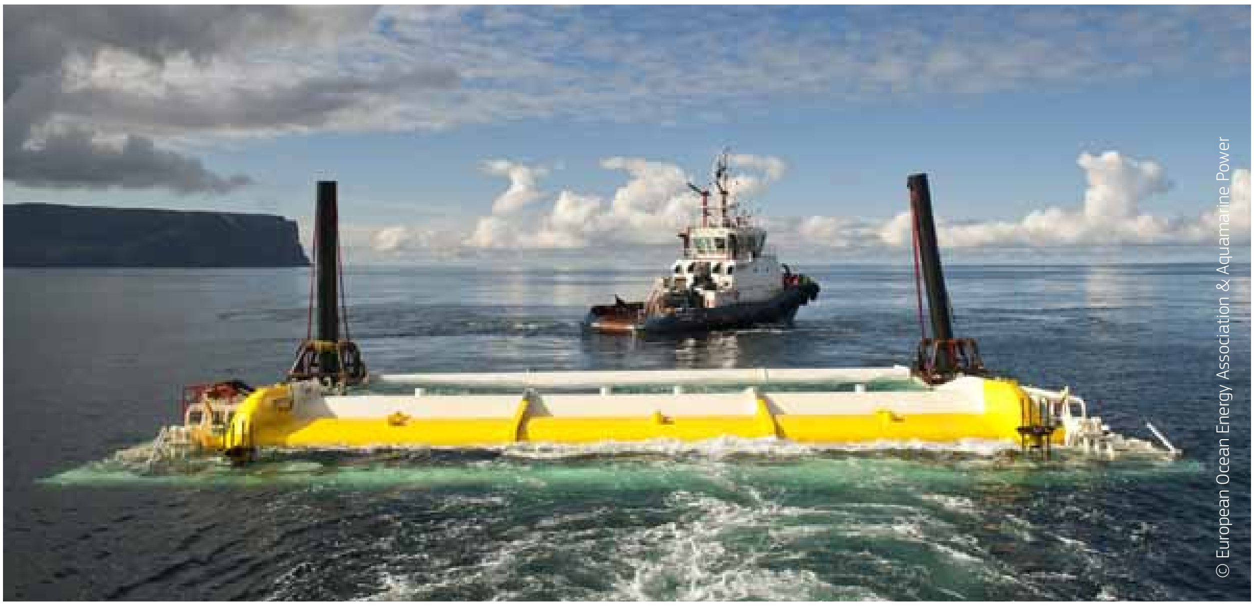
The lack of certainty in the grid planning process, long connection lead times and prohibitive transmission costs can deter investment into ocean energy. Network reinforcements offshore but also on land and across borders are a fundamental condition for ocean energy development. The availability of access to suitable port facilities and specialised vessels also needs to be addressed.

Administrative & regulatory issues

Lengthy and excessively complicated licensing and consenting procedures have been flagged up as a major barrier to the development of ocean energy projects. The deployment of ocean energy is hampered by uncertainty about the proper application of environmental legislation which may further prolong the consenting procedures and place an additional administrative and financial burden on project developers.

Environmental issues

At present, data on the environmental impacts of ocean energy is limited. Research is often too costly for project developers to undertake individually. More research and development along with a better exchange of information will be required to understand and mitigate the adverse environmental impacts of ocean energy installations.

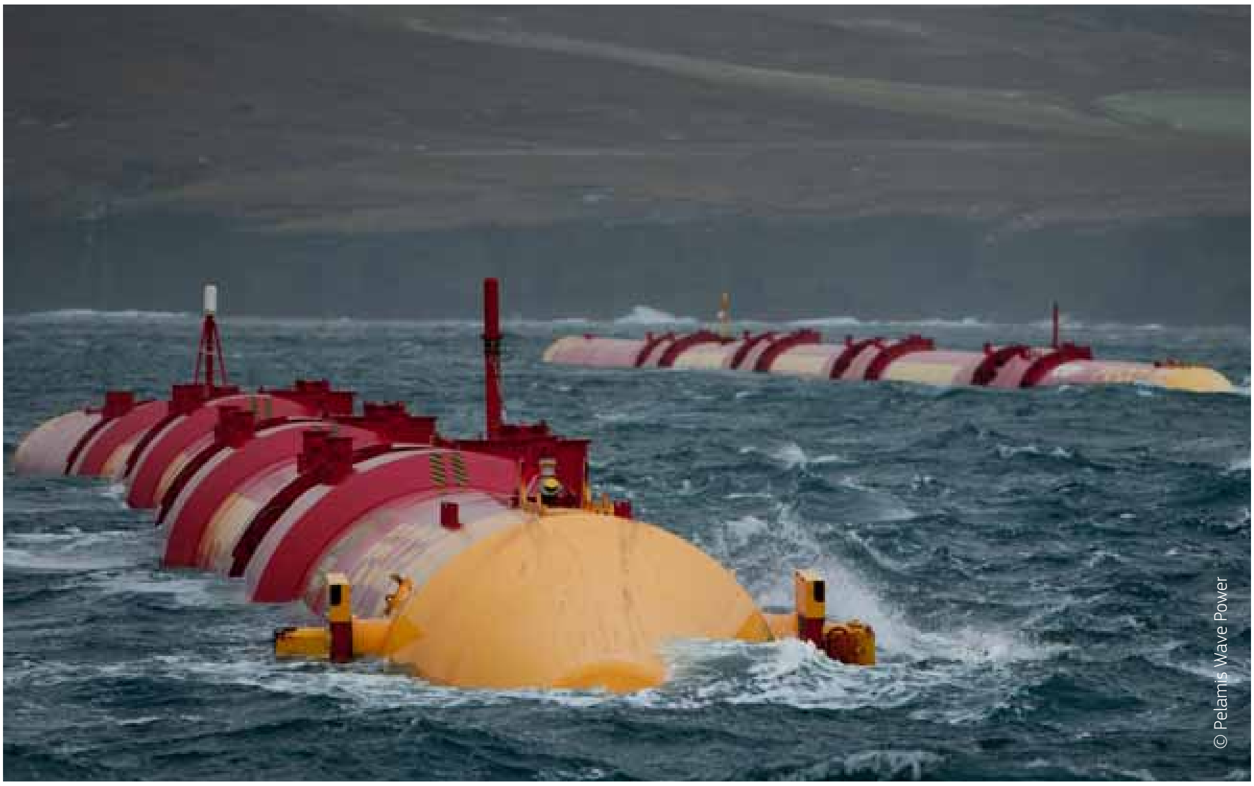


3. Analysis of Subsidiarity and EU Added Value

The EU's competence in the area of ocean renewable energy is set out in the objectives of the Treaty on the Functioning of European Union relating to energy, the internal market and the environment. When compared to separate Member State initiatives and budgets, coordination of activities related to research but also other non-technological issues at European level would accelerate the development of the sector.

4. Policy Objectives

The general objective of the policy intervention is to enable the ocean energy sector to make a meaningful contribution to Europe's employment, innovation, climate and environmental objectives in the medium term, alongside more established renewable energy technologies. More specifically, the aim is to tackle the aforementioned barriers by encouraging collaboration between the technology developers, policy makers, investors and other stakeholders so as to bridge the gap between research and the market.



5. Policy Options

Option 1 (current policy framework) entails a continuation of current policy initiatives at EU level which affect ocean energy either directly or indirectly. An ERA-Net on ocean energy will contribute to the strengthening of research coordination amongst Member States. The Commission and stakeholders will continue to explore ways to reinforce ocean energy funding under the new Horizon 2020 programme. Offshore grid developments will continue to be discussed in existing initiatives such as the North Seas Countries' Offshore Grid Initiative (NSCOGI). Discussions will continue on the proposal for a Directive on Maritime Spatial Planning (MSP) and on the proposal amending the Environmental Impact Assessment Directive, which is intended to simplify procedures so as to reduce unnecessary administrative burdens.

Option 2 (enhanced political and industry coordination) involves the setting up of a forum bringing together all relevant stakeholders. Its objective would be to devise viable solutions to the challenges outlined above and develop a strategic roadmap, which would set out industrial development milestones within a clear timeframe as well as an indicative implementation plan. Active engagement by Member States and the European Commission in this process would send a clear political signal of support.

The infrastructure bottleneck would be tackled by fostering a more pro-active dialogue between the industry and the parties responsible for grid planning. It is also foreseen that other infrastructural needs (port services and supply chain) would be identified within the stakeholder forum. Uncertainty about environmental impacts will be addressed by the promotion of voluntary data-sharing.

Differentiated revenue support is key for ensuring that less mature renewable energy technologies can compete on a level playing field. The recognition of the specific needs of less mature technologies within the forthcoming Commission's guidelines on revenue support is therefore an important component of Option 2.

Option 3 (targeted structural actions) builds on Option 2. It seeks to consolidate the cooperation between stakeholders and give it a robust institutional support framework. In addition to the measures outlined under option 2, a European Industrial Initiative (EII) would be set up to leverage investment and implement the strategic roadmap.

A dedicated grid planning platform to advance the interests of the offshore renewable industry in the grid planning domain would be set up. To address other infrastructural bottlenecks, a sector-specific body will be tasked with identifying and assessing the specific needs of the sector with respect to the supply chain and to explore possible synergies with other sectors, notably offshore wind, in a bid to reduce costs and exploit synergies.

This option foresees the elaboration of a guidance document to assist with the implementation of Article 13 of the Renewable Energy Directive, which requires Member States to ensure that national authorisation and licensing rules applied to renewable energy installations are "proportionate and necessary". In view of the potential development of ocean energy, this option explores the possibility of developing sector-specific guidelines for maritime spatial planning as well as guidance to assist with implementation of the Habitats and Birds Directives.

6. Assessment of Impacts

Economic impacts

Unlocking the identified bottlenecks is likely to stimulate the market uptake of ocean energy. The net economic impact is the result of a variety of interlinked and sometimes counter-acting effects: (1) a higher rate of market uptake is likely to stimulate economic activity in the sector itself but also in other industries along the supply chain; (2) a higher installed capacity can deliver technology cost reductions through learning-by-doing; (3) savings could be reaped through displaced fossil fuel imports; (4) a diversified mix of renewable energies including ocean energy would help to smooth out the supply curve and therefore facilitate the balancing of supply and demand; (5) stimulating innovation in this sector will enable the EU to seize a greater share of the estimated total market for marine energy that, in a high scenario, could be worth €575bn up to 2050 and (6) higher installed ocean energy capacity could be associated with a rise in electricity prices.

Under option 1, ocean energy is likely to only make a marginal contribution to the future EU energy mix. The decrease in the levelised cost of electricity is likely to be relatively slow. As a result, the economic benefits in terms the growth of the sector itself and stimulation of economic activity along the supply chains are likely to be correspondingly low. Moreover, with no additional support the EU's competitive edge may be lost to third countries, withering away the growth and jobs already delivered by the industry. Increased cooperation among stakeholders stimulated by option 2 could enhance the impact of public and private investment into the sector and deliver cost reductions. The market uptake would, therefore, likely be above that assumed for option 1 but its magnitude is uncertain as many of the instruments are voluntary in nature.

Recognition of ocean energy as a strategic energy technology and creation of a European Industrial Initiative, as proposed under option 3, is likely to facilitate the project developers' access to finance and strongly stimulate innovation. The guidance documents proposed could yield further savings through avoided transaction costs. On the other hand, options 2 and 3 are likely to be associated with proportionally higher electricity costs, and entail a certain degree of administrative burden.

The Ecorys study commissioned to support this impact assessment estimates the gross value added (GVA) that could be associated with an increased market uptake of ocean energy up to 2035. Increased market uptake is itself contingent on the level of policy intervention to support the ocean energy industry. The estimated GVA under a low policy intervention scenario is €1.3 to 2.8bn while a higher policy intervention scenario is estimated at €4.2 to 8.2bn. These figures should be treated as illustrative.

Environmental impacts

The deployment of ocean energy has a potential to reduce greenhouse gas emissions. Assuming that with each unit installed an equivalent unit of conventional generation is displaced, the climate change mitigation benefit is assumed to be low under option 1 and relatively higher under options 2 and 3. A similar pattern is likely to be observed for SO2, NOx and particulate matter emissions. The potential contribution of ocean energy to greenhouse gas reductions until 2035 has been estimated under each of the policy options and is shown in the table below:

Table 1: CO2 reduction in million tons from 2012 until 2035

	2012	2020	2025	2030	2035
Option 1	0.01 - 0.02	3.5 - 4.9	9.5 - 13.5	16.5 - 23	23.5 - 33
Option 2	0.01 - 0.02	3.5 - 4.9	10 - 14	18 - 25.5	28 - 39
Option 3	0.01 - 0.02	3.5 - 4.9	10.5 - 15	21.5 - 30	37 - 51.5
Difference 1&2	0	0	0.5	1.5 - 2.5	4.5 - 6
Difference 1&3	0	0	1 - 1.5	5 - 7	13.5 - 18.5

Ocean energy installations have a wide range of local environmental impacts, which can be both positive and negative. Taking a precautionary approach, it is estimated that option 1, with a relatively small area taken up by ocean energy installations, will result in a low negative local impact and options 2 and 3 involve a correspondingly higher local negative impact. This could however be counterbalanced by the positive local environmental impact through, for example, trawling exclusion and the fact that with increasing installed capacity, the accumulated experience could lead to a development of effective environmental impact management instruments and practices.

Social impacts

The commercialisation of ocean energy is likely to deliver high quality jobs especially under option 3, where deployment levels are the highest. In the Ecorys study it has been estimated that up to approximately 27,000 permanent (direct and indirect) jobs in operation and maintenance could be created by 2035 if the industry is supported; this is a rather conservative estimate compared to figures supplied by the industry . Jobs created in construction and installation (which are considered to be more temporary and tend to decrease in magnitude due to scaling up of technology and efficiency gains) are estimated at 2,000 to 3,000 under option 1 and between 10,000 to 14,500 under option 3.

Most of the job creation is likely to take place in the Member States and regions where ocean energy will be deployed; coincidentally these Member States currently suffer from relatively high unemployment rates (e.g. Ireland, Portugal, Spain). Manufacturing and other economic opportunities are likely open in other countries involved in the supply chain. As the sector develops, the demand for highly skilled labour will increase. Under Option 2 and especially Option 3, this growth in demand for skilled engineers may tighten the competition with offshore wind in particular and possibly even oil and gas.

The commercialisation of ocean energy is likely to deliver high quality jobs especially under option 3, where deployment levels are the highest. Most of the job creation is likely to take place in the Member States and regions where ocean energy will be deployed although manufacturing and other economic opportunities are likely open in other countries involved in the supply chain. As the sector develops, the demand for highly skilled labour will increase. Under Option 2 and especially Option 3, this growth in demand for skilled engineers may tighten the competition with offshore wind in particular and possibly even oil and gas.

Public acceptance issues could arise with increasing deployment. Higher proliferation of ocean energy under options 2 and 3 could proportionately increase the potential for conflicts with other users of the marine space. This impact could however be mitigated through an early involvement of all stakeholders.

7. Comparison of Options

Effectiveness

Option 1 fails to deliver on this objective as it would do little to accelerate the commercialisation of ocean energy. Option 2 may stimulate greater cooperation and avoid duplication of efforts however the results will depend on the willingness of stakeholders to engage and are therefore uncertain. While option 3 cannot be expected to fully tackle the identified bottlenecks, it is most likely to alleviate them, giving the industry a tangible stimulus.

Efficiency

Option 1 fails against the criterion as it would entail forgoing a substantial part, if not all, of the economic benefits, which development of the ocean energy industry could bring about. The establishment of a forum under option 2 requires a certain effort but is likely to deliver improvements. Its impact would be however highly dependent on stakeholders' willingness to participate. The creation of a European Industrial Initiative for ocean energy (option 3) would involve a greater commitment on the part of the involved stakeholders. Weighed up against the costs, option 3 is judged to be most efficient, with the exception of a creation of a dedicated body to advance ocean energy interests in grid planning as it would overlap with existing initiatives.

Coherence

All policy options are coherent with EU long term policy objectives, including those related to climate, energy, environment and economic growth.

Feasibility

Whilst some measures are feasible in the short-term; certain measures from option 3 are only viable in the longer-term. For instance, the industry must have established a strategic research agenda to establish an industrial initiative. Guidance documents to complement the environment-related directives require the availability of data on the environmental impacts. The sector-specific guidance to complement the Maritime Spatial Planning Directive would only be possible once the directive is implemented and its impacts are known. Rather than deciding between option 2 and 3, it might therefore be more appropriate to adopt the option 2 measures as a first step to form a basis for option 3 measures, which will help the industry to advance further.

The comparative analysis of the three options assessed can be summarised as follows:

Option 1 (Current policy framework)

Certain initiatives, relevant to the development of the sector are underway; however, they do not address some of the specific needs of the sector. With no specific action taken to support ocean energy, technology developers will come under a strong competitive pressure from more advanced renewable and conventional electricity generation technologies, which have already benefited from favourable policy and large amounts of private and public investment in the past.

Option 2 (Enhanced political and industry coordination)

Supporting the sector through stakeholder networking, voluntary information exchange and its greater integration within existing funding mechanisms is likely to alleviate the bottlenecks to some extent and hence deliver improvements. Nevertheless the extent of the positive impacts is uncertain due to the voluntary nature of the initiatives.

Option 3 (Targeted structural actions)

In addition to option 2 instruments, option 3 includes effective tools to raise the profile of the industry, enhance R&D and stakeholder cooperation and mitigate some of the administrative barriers encountered by project developers. It is likely to deliver a strong political signal but some of the measures may only be feasible in the longer term.

8. Monitoring and Evaluation

It is proposed that the Commission monitors and evaluates the progress of the ocean energy industry on the basis of the indicators shown in Table 2. The data will be acquired through surveys distributed to relevant stakeholders including technology developers, project developers, investors and targeted research institutions. A first comprehensive evaluation would take place at the latest by 2020.

Table 2: Core indicators to assess development of ocean energy

Indicator	Relevance
Installed capacity	Technology commercialisation
Magnitude of investment into the sector	Perceived reliability, efficiency and cost-effectiveness of the technologies
Number of collaborative undertakings	Industry cooperation and collaboration, synergies
Lead time length (i.e. the total time taken to get building consent and grid connection permits)	Efficiency of planning and licensing procedures

European Commission

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