4.1 General energy and economic context

**When it comes to energy investments is there a trade-off between the economy, energy security and the environment?**

Renewable energy (RE) investment is *environmentally and economically sustainable*. By cutting general pollution and carbon emissions, it is clear that RE investment makes a positive environmental contribution. Exploiting Europe’s indigenous RE resources will also *increase energy security*; and create *sustainable jobs* by acting as an engine for *growth and competitiveness*.

The EIB has invested in commercially mature and emerging renewable energy technologies in the last 7 years and should continue to do so. EIB support has also been available for a third category of “highly innovative renewables technologies”. This category includes ocean energy technologies. These are designed to harness *untapped European Ocean energy resources*; including ocean waves, tides, thermal energy conversion and salinity gradients. This unused capacity is estimated at 334GW for wave & tidal power\(^1\), and around 50GW for salinity gradient\(^2\) in Europe alone. Ocean Thermal Energy Conversion technology (OTEC) also offers significant export and development potential for tropical coastal areas, including many Cotonou agreement countries.

Tapping into this significant resource will reduce risk by diversifying the sources of renewable energy available to European utilities. Investing in bringing ocean energy online will also boost the energy security, environmental and economic benefits provided by all renewables.

As the majority of ocean energy supplies will be generated from the Western Atlantic coasts of Europe, ocean energy projects will create 1000s of jobs in peripheral maritime communities. Recent research by the EU Ocean Energy Association also demonstrates that the ocean energy supply chain is pan-European – economic returns will flow to several member states and not just those with ports, harbours, ocean energy resources and/or a traditional maritime skills base. Ocean energy projects will also exploit supply synergies with more advanced sectors such as off-shore wind.

Ocean energy supplies are also more predictable and out-of-synch with wind and other renewable energy resources. Therefore, importing utility-scale power from these new locations will also provide *new benefits* – such as improved grid resilience, stability of electricity supply and maximising the strategic value of offshore grid investments.

**Growth and Employment**

*Are investments in all energy sub-sectors equally valuable? And how does investment in the energy sector rank relative to other investments in the economy which support growth and employment?*

High energy prices or insecure supplies have a negative effect on growth in all industrial sectors. Energy investments fuel growth in the wider economy.

Recent results from the European Energy Programme for Recovery (EEPR) demonstrate that all energy investments are not equal. Of the €4bn invested in energy projects, investment in the offshore wind sector created 10 times more jobs with half the level of funding invested in CCS projects\(^3\).

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1. 2011. Source: IEA-RTD
2. 2011, Source: Statkraft.
There is evidence that ocean energy investment will also generate higher returns when it comes to jobs – particularly for peripheral communities and for traditional maritime industrial sectors in decline. One study estimates a 200MW wave farm in Orkney would create £38.3 million gross value added (GVA) to the local economy and would create an average of 52 additional local jobs per year over the project lifetime. This compares with six local jobs per year in the rest of Scotland for the same project – demonstrating clearly that the majority of the direct economic benefit of ocean energy development will remain in the peripheral community.

In its latest report on Blue Growth, DG MARE believes ocean energy employment will increase from 1000 in 2010 to potentially 20,000 in 2035. This ties in closely with figures from trade body RenewableUK which estimates the UK ocean energy sector currently has around 800 permanent jobs a with potential to create around 10,000 jobs by 2020 and up to 20,000 by 2035, generating a gross value added of around £800 million pounds per annum. In France, the Senate has estimated 18,000 jobs will be created in marine energy by 2020.

Decisions made now will result in Europe becoming the global hub of a new export economy with the associated energy security and tax-take benefits for Member States. Capitalising on Europe’s first mover advantage will secure high value jobs as we move beyond 2020 towards a low carbon economy.

In the context of significant investment by major European utilities (e.g. E.ON, EDF, Iberdrola, Vattenfall), a number of major European industrials (e.g. Alstom, Siemens, ANDRITZ Hydro, DCNS) have invested in projects or device technology companies with the intention of securing first mover advantage for global export.

However, EIB support will be critical in the next 7 years as European utilities and large industrials will need support to manage risk if they are to build the foundations for a new industry.

A relatively small amount of EIB support will be game-changing for this sector and will help Europe secure first mover advantage for its member states.

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**Impact of the current economic crisis on the energy sector (demand, policies, supply)?**

Pre-crisis funding for ocean energy technology development was typically provided by VC or angel investors. Strategic investments from utility and original equipment manufacturers (OEM) were previously limited to a small number of companies. These companies were driven by strategic goals to de-risk their renewables portfolio by diversifying the mix and meeting increasing demand for renewables.

The economic crisis reduced the financial markets’ appetite for high-risk/high-return investments in early-stage technology development. VC and angel funding for this sector all but dried up.

Since then equity investment in the sector has come predominantly from member states (notably the UK and Scottish Governments), large European Utilities and OEMs – who continue to see the strategic advantage of bringing a wholesale renewable energy source online.

As a result of this strategic support many frontrunners have survived despite the difficult financial climate. For example, Siemens, ABB, DCNS, and Alstom have all put equity into wave and tidal power technology developers during this time. This month, Fred.Olsen, Totale and the Scottish Government announced a further £7.6m investment in tidal technology. This deal illustrates that in almost every single case, risk has been

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shared – and private investment leveraged – by public funding from member states. It is also worth noting that almost all of the front-running technology development and demonstration programmes have been stalled at some point since the crisis whilst management teams focused on securing funding.

Whilst equity investment in technology development has continued, the real challenge for the sector is moving to the next stage of demonstrating small arrays. Even with significant backing from large utilities who have invested financially and indicated a willingness to accept a lower IRR for these first projects; without public sector support it has proved impossible to secure project finance for small arrays in the current climate.

Strategic investment in small arrays by the EIB would maintain momentum and build the confidence needed to take risk on these first projects.

4.2 Renewable Energy

Continued investments in renewable energy technologies will eventually lead to cost reductions and will ultimately be the least-cost approach to meeting the EU’s renewable energy targets. Do you agree with this approach?

The evolution of costs of onshore wind is a good example of a steady downward path as a result of economies of scale and technology learning curves. The European Commission, in its Communication “Renewable Energy: a major player in the European energy market” highlights that “Onshore wind investment costs fell by 10% between 2008 and 2012.” In addition, according to Bloomberg New Energy Finance, the average O&M costs since 2008 saw a cumulative decrease of 38%, or just over 11% per year.

Of the three categories of RE technology supported by the EIB, mature technologies - onshore wind, hydro power, conventional geothermal - have taken off in the last decade.

Despite prolonged financial crises, not only have costs fallen but investment in these technologies has yielded successful results when it comes to job creation. For example, between 2007 and 2010, the number of jobs in the wind sector grew by nearly 30%, whilst EU unemployment rose by 9.6%8. This recession-busting performance makes a strong case for continuing to prioritise RE investment in the next multi-annual financial framework (2014-2020).

Continued investment in the second category – emerging technologies – will help to make sure sub-sectors such as offshore wind & solar PV achieve the rates of learning and volume production they need to slide down the cost curve.

The EIB should continue to invest in creating a sustainable pipeline of renewable energy technologies and prioritise investment in Ocean Energy projects to demonstrate small arrays. Between 2020 and 2030 this approach will pay off by adding a new group of clean and economically competitive technologies to the European energy mix – to follow in the wake of more advanced technologies such as onshore and offshore wind. The long-term target is to reduce risk by creating a diverse range of renewable power supplies at the lowest cost.

The short term goal for ocean energy is to make sure the sector progresses down the cost curve by moving onto the next stage of cutting costs scaling up to the first small arrays.

Not only will continued investment drive down the ultimate cost to the consumer, but adding Ocean Energy to Europe’s power supply will deliver additional economic benefits. These include export opportunities and the creation of new jobs.

The Commission’s 2050 Energy Roadmap predicts that Ocean Energy has the potential to make a significant contribution to Europe’s electricity supply in the medium term. To make this happen - now is the time to **step up investment & practical support for Ocean Energy**. This is the only way to guarantee that Europe can capitalise on its global lead and maximise returns by putting Ocean Energy on track to deliver significant power to the mainstream mix by 2030.

**What evidence is there that the cost of emerging renewable technology is falling?**

The Ocean Energy sector is currently prototyping machines with a target retail value of €4-5m. Increasing the reliability of devices and driving down the cost of energy is a universal goal for all ocean energy developers. Various estimates of costs have been made by the industry and other observers. For example, the Carbon Trust has made some estimates of the cost of 10MW-scale farms (assuming that the first 10 MW of similar devices have been installed previously). For tidal technologies the levelised cost of energy (LCOE) of these farms was in the range £290-330/MWh and for wave technologies the range was £380-480 MWh9 (assuming a 20 year life and a 15 per cent discount rate).

Many analysts expect the range of cost reduction for marine energy to be 15-18%10, which compares well to the historic learning rate for onshore wind.

With the right support it is anticipated Ocean Energy will follow a similar cost reduction route to onshore wind, based on progress in the three areas which are known to contribute to cost reduction:

1. R&D
2. Learning-by-doing: scaling up development from individual machines
3. Economies of scale: small arrays and market-entry farms

Some of the most advanced Ocean Energy technologies have now reached the stage where they can deliver technology at a levelised cost of energy (LCOE) low enough to secure in principle commitment to financing the first small arrays (2-10MW) from utilities. This has only been possible where projects have secured significant capital and/or revenue support from member states and the European Commission.

By working with utilities to share risk on financing these first small arrays, the EIB could have a significant impact on accelerating cost reduction by driving learning and economies of scale.

**What level of investment in RE do you expect in the short and medium term?**

In the last 20 years, the Commission has provided around €135m for Ocean Energy research and development. In the last 10 years, the private sector has invested over €500m. Risk-sharing and investment will have to step up significantly in the next multi-annual framework if Ocean Energy is to meet the target of providing mainstream power by 2030.

Current research by EU Ocean Energy Association indicates that [private companies in Europe have invested over €500m in different ocean energy technologies in the last 10 years](http://www.carbontrust.com/resources/reports/technology/accelerating-marine-energy). A recent study by RenewableUK found that every £1 of public investment had leveraged £6 of private investment in the UK.

In the past 20 years, the European Commission has provided around €75m for Ocean Energy research and demonstrations, through the framework of energy research programmes11. In 2012, this level of support

9 http://www.carbontrust.com/resources/reports/technology/accelerating-marine-energy
10IEA - developed learning rate curves for emerging energy technologies (2000) – 18%
Carbon Trust - developed learning rate curves for marine renewables (2006) – 15%
almost doubled when the NER 300 results announced a total of €60m to three small ocean energy arrays (5-10MW). It is anticipated that further small arrays will secure revenue support in the second NER 300.

There is good evidence that the private sector will continue to invest. In the UK, the first commercial sites are already under development in advance of technologies being scaled up for commercial deployment. The UK Crown Estate has awarded over 1.6GW of commercial leases in Scottish waters - for marine energy projects backed by the largest utilities in Europe. Recently, the French engineering giant, Alstom joined forces with UK Utility SSE to develop one of these 200MW sites. In France, Norway, Ireland, Spain and Portugal full scale prototypes have been tested in real conditions. The Siemens-owned Marine Current Turbines’ device was deployed in Northern Ireland in 2008 and has been exporting electricity to the grid ever since.

However, all of these projects – from single demonstrations to the first planned small arrays – have only gone ahead when public sector support has been provided to reduce the investment risk to the private sector. This demonstrates that rate and pace of investment will be determined by the level of risk shared by the commission and member states.

There is significant scope for the EIB to start to share risk with the private sector by providing project finance and technical support for small arrays in the short term, as a precursor to financing larger arrays by the end of this decade. This is evidenced by the quality and volume of bids ocean energy bids submitted to the NER 300 competition. With backing from member states, large industrials and multinational utilities - five ocean bids were shortlisted or placed on the reserve list.

The EIB should consider setting a target of financing or providing technical support to at least 15 small arrays between now and 2020. It should also set a target of financing at least 5 larger arrays in the same timeframe.

**What are the barriers to investments in this sector and how might these be overcome?**

**A strong post 2020 European renewable energy policy** will be the key to investor security and thereby the renewable energy industry's future. Any fall in overall confidence in the renewables sector hits early-stage technologies hard – as investment naturally moves away from innovative but higher risk options.

Whilst the private sector has put €500m into the sector in the last decade, a key barrier to continued investment is the level of investment required to scale up these technologies as the next logical step down the cost curve. Avoiding private sector “risk fatigue” and keeping the momentum going will require concerted EU support three areas: policy, coordination & funding.

**Policy & Member State Coordination**

By balancing “market push” grants with the right “market pull” support schemes, the Commission and some member states have boosted investor confidence in the Ocean Energy sector. By differentiating between different technologies and offering higher levels of support for earlier technologies; support schemes can leverage significant inward investment very early in the development process for new renewable technologies. For example, the UK Government has followed the Scottish lead; and is now offering the equivalent of 5 ROCs (£250/MWh) for wave and tidal energy generation.

The **EIB has a clear role to play in providing advice to Member States on designing pro-investment policy environments** – as well as advising on the impact of grid-access; planning and leasing policies on project bankability.

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11 2012 Blue Growth, DG MARE.
Finally, the EIB is currently supporting an EACI-funded project, *Strategic Initiative on Ocean Energy (SI Ocean)* by sitting on the Advisory Board. The Advisory Board is steering progress toward delivering resource, technical assessments, and policy analysis & market entry strategies for Ocean Energy by 2014. The EU OEA welcomes this practical support and looks forward to engaging further EIB advice to help deliver a strategic *Ocean Innovation Programme*. The goal of this industry-led Programme would be to set out a technical pathway – to deliver improved reliability and performance at a lower cost; as a lead-in to standard cost reduction from learning-by-doing and volume production. Key milestones for this programme would be set for 2020 and 2030.

**Funding**

By definition projects deploying new technologies cannot offer competitive IRRs or warranties to utilities or traditional sources of energy project finance. Whilst many utilities have accepted that the IRR on first projects will be relatively low. This is still a very daunting hurdle for developers seeking to secure project finance for pre-commercial small arrays.

Beyond this hurdle, a key barrier to progress is the complex and often patchy nature of the financial packages that have been put together so far. Delivering an IRR which utilities can accept involves putting together various components from grant funding, corporate equity, revenue support mechanisms, etc. Securing finance from several different sources can be time-consuming and frustrating.

By making a commitment in principle to join existing investors, the EIB could play an important part in unlocking greater investment from the private sector by sharing the risk through co-investment, co-lending and by considering other potentially catalytic intervention models.

4.4 Security of supply

**Is the traditional model for electricity transmission and distribution changing?**
**What implications does this have for future investments in electricity networks?**
**What is the future role of smart grids, offshore grids and energy storage solutions?**

Many of Europe’s energy networks are near to the end of their operational life. Billions of euros of investment are required to ensure that we develop a new system that will facilitate lower cost, cleaner power for future generations.

Power generated from Ocean Energy is out-of-synch with other sources, which will automatically help balance variable output from RE resources.

Ocean Energy will also be imported to the EU transmission networks from new geographic locations – maximising the strategic value of offshore grid infrastructure investments.

4.7 RDI

**Which are the key innovative energy technologies under development?**
**The development of which key innovative low-carbon energy technologies should receive most financial support?**
**Which barriers are hindering the deployment of innovative, low-carbon energy technologies most significantly?**
**Should financial support be spread across a large number of small research projects or be selective and concentrated on a few promising large research projects?**
The most advanced technologies have already put in place step-by-step progress plans for delivering the first small arrays (2-10MW). However, technologies at various stages share a **universal need to reduce technical risk through innovation**.

These are complex systems operating in a harsh environment; whilst the fundamental concept may be proven – significant technical innovation is will be required to deliver reliable technical solutions and drive down costs.

EU OEA Members have identified the following broad priority areas for technical innovation to deliver increased reliability, performance and cost reduction:

- **Demo & Array funding:**
  Get scale / full-scale machines into the water. Keep them operational for as long as possible – to generate performance and environmental data;

- **System & Component Reliability:**
  R&D to improve individual component reliability; onshore & offshore sub-system & component testing; and design to improve system integration & performance;

- **Supply Chain, Enabling Technologies and Materials:**
  R&D and testing of materials; supply chain solutions and a wide range of maritime enabling technologies; and

- **Cross-Cutting Enabling Technologies:**
  R&D and demonstration of enabling components and technologies with wider application across Ocean Energy technologies and other sectors.

The EIB can play a direct role in removing the first barrier by co-financing small arrays. The EU OEA would also welcome the opportunity to explore opportunities for the EIB to support progress in the other three areas by supporting relevant research infrastructures and industry-wide RDI initiatives.

4. **Fossil fuel energy projects**

   Between 2005 and 2011, 15% of the total value of EIB loans went to conventional generating technologies. The EU Ocean Energy Association supports EWEA’s position that the EIB should end the provision of low cost public finance to conventional technologies. This will facilitate an increase in future loans to emerging and highly innovative RE technologies, the.

   **Renewable technologies are better suited to meet targets, create jobs and build a vibrant European economy.**

5. **Nuclear power**

   Maintain the policy as it is. There have been no recent developments which have created any argument for increased EIB investment in nuclear power projects.

   Between 2005 and 2011, 15% of the total value of EIB loans went to conventional generating technologies. The EU Ocean Energy Association supports EWEA’s position that the EIB should end the provision of low cost public finance to conventional technologies. This will facilitate an increase in future loans to emerging and highly innovative RE technologies, the.

   **Renewable technologies are better suited to meet targets, create jobs and build a vibrant European economy.**
6. Research and Development

**Which are the key innovative energy technologies under development?**

The development of which key innovative low-carbon energy technologies should receive most financial support?

The EIB should focus research and development investment on projects offering a credible pathway to commercial maturity. Priority should therefore be given to RDI projects offering the highest % reduction in LCOE per project.

Investment criteria should also prioritise technologies such as Ocean Energy, which has the potential to make a significant contribution to the mainstream European Energy mix in the future.

As well as financing small arrays, the EIB could consider coordinating with the Commission by offering non-financial support such as expert advice to technology promoters on how best to structure their projects into bankable and eligible operations. This advice could be automatically open to applicants who have successfully secured funding from any other Commission initiative, including SET Plan, Horizon 2020 and others.