EUROPEAN COMMISSION
RTD - Energy
ENER - Renewables, R&I, Energy Efficiency
JRC – Energy, Transport and Climate
SET Plan Secretariat

SET Plan – Declaration of Intent on Strategic Targets in the context of an Initiative for Global Leadership in Ocean Energy

Purpose of this document

This document[1] is intended to record the agreement reached between representatives of the European Commission services, representatives of the EU Member States, Iceland, Norway, Turkey and Switzerland, and representatives of the SET-Plan stakeholders most directly involved in ocean energy[2], on the implementation of the actions contained in the SET-Plan Communication[3], and specifically the strategic targets for the priority "Number 1 in renewable energy" for what concerns ocean energy.

The issues paper has been sent for consultation to the ETIP on Ocean Energy (coordinated by Ocean Energy Europe), the EERA JP on Ocean Energy, the Oceaneranet (FP7 ERANET programme coordinated by Scottish Enterprise), Wave Energy Scotland (strategic program supporting wave energy development in Europe), the Ocean Energy Forum and finally to the IEA Ocean Energy Systems Executive Committee and has been published on the SETIS website[4].

Inputs were received from Ocean Energy Europe (representing ETIP Ocean), the EERA JP on Ocean Energy, the EUA-EPUE, Atlantis Resources (tidal stream company in UK), Flowave (Ocean Energy Research Facility in the UK) and the Flemish government (BE). This declaration takes into consideration all the received input papers and public comments available on SETIS and discussions in the SET-Plan Steering Group on 12 July 2016 with the participation of the SET-Plan stakeholders most directly involved in ocean energy.

The stakeholders agree to highly ambitious targets in an endeavor to maintain global leadership in the sector, to put forward their best efforts in a coordinated way between public and private sectors, and to jointly address all relevant issues in order to attain these targets.

Brussels, 14 September 2016

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1 This document has no legally binding character, and does not prejudge the process or final form of any future decisions by the European Commission.

2 The ETIP Ocean Energy, the EERA JP on Ocean energy

3 Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation" (C(2015)6317).

4 Strategic Energy Technology Information System website https://setis.ec.europa.eu/

Introduction Ocean Energy

Ocean energy is abundant, geographically diverse and renewable. Ocean energy can play an important role in the energy mix in a low-carbon economy as it is very predictable. This means it has the potential to contribute substantial value to the energy system. Under the right conditions for both technological development and project deployment, 100 GW of ocean energy capacity could be installed by 2050, feeding around 350 TWh of power to the grid.[5] The potential contribution of ocean energy is estimated to be of around 10 % of EU power demand by 2050; with ocean energy thus playing a significant role in the future EU energy system. Ocean energy has the potential to create new, high-quality jobs in project development, component manufacturing and operations. A substantial proportion of these employment opportunities will arise in the Atlantic coastal areas, which currently suffer from high unemployment. Ocean energy can also contribute to Europe's decarbonisation goals.

There are five main ocean energy sources: tidal stream, wave, tidal range, salinity gradient and ocean thermal gradient (OTEC). Currently, the different technologies to capture these resources are at varying stages of development in Europe.[6]

Tidal stream and wave cover both different technologies, depending on the type of resource and whether the devices are intended for deployment far-shore, near-shore, close to shore, or co-located on existing marine infrastructure such as dams, harbour walls or breakwaters. Over the past ten years, over 20 MW of tidal stream and wave devices on different scales have been tested in European waters.

A number of MW-sized tidal stream turbines have been deployed and grid connected, whilst the first multi MW array is expected to be grid connected by the end of 2016.

Technological development and deployment of wave energy is a few years behind that of tidal stream. The difficulty in attracting investor capital for emerging technologies has compromised a number of wave energy projects over the past years, numerous prototypes and demonstrators have been deployed and tested in both the high-resource Atlantic arc and in the lower-resource North and Mediterranean seas. Between 2016 and 2018, the first MW-size arrays are expected to be deployed.

A 240 MW tidal range power station has been in operation in France since 1966, and there are ideas about building on the same principle similar type of projects, of which one is at an advanced stage of development[7]. The technology is considered to be mature, but the market potential is geographically limited and requires large infrastructural works which can have an impact on the environment. Small scale prototypes of Ocean Thermal Energy convertors have been built already, and a large scale OTEC plant is planned in Martinique. A small-scale demonstration salinity gradient plant is in operation in the Netherlands. A relatively small number of actors are working on tidal range, OTEC and salinity gradient energy. The replicability potential of these technologies and their potential contribution to the EU energy system needs further investigation.

Today 45 % of wave energy companies and 50 % of tidal energy companies are from Europe, but ocean energy is still at pre-commercial stage and considerable progress is required in research, development, demonstration and validation of the technology to improve performance and reduce the cost of energy, to allow the sector to realise its potential contribution to energy supply, industrial leadership, economic growth

[5] DRAFT Ocean Energy Strategic Roadmap - Building Ocean Energy for Europe, Ocean Energy Forum 2015
[6] JRC Ocean Energy technology status report 2014 and 2016 (to be published).
[7] http://www.tidallagoonswanseabay.com/

and mitigation of climate change. Wave and tidal energy technologies could provide up to 15% of the EU electricity potential in the long term[8].

Targets

The high level targets for the ocean energy sector are to bring ocean energy to commercial deployment, to drive down the levelised cost of energy (LCoE), to maintain and grow Europe's leading position in ocean energy and to strengthen the European industrial technology base, thereby creating economic growth and jobs in Europe and allowing Europe to compete on a global stage.

Ocean energy technologies need to demonstrate now their reliability and capacity to survive in aggressive sea conditions ensuring, thus, device availability to reduce risk for project developers and investors. They need to demonstrate their market potential and they should be cost-competitive in comparison with other energy technologies.

In order to speed up the time to market of ocean energy technologies it is important to prioritise and concentrate efforts for a limited number of technologies. Priority will be given to tidal stream and wave energy which have a high market potential for Europe and sufficient scale on a European level.

Proposed targets in ocean energy

Development of cost competitive ocean energy technologies with high market potential for Europe.

The LCoE for tidal stream energy should be reduced to at least 15 ct€/kWh in 2025 and 10 ct€/kWh in 2030. Wave energy technology should follow the same pathway and reach at least the same cost targets maximum 5 years later than tidal energy: 20 ct€/kWh in 2025, 15 ct€/kWh in 2030 and 10 ct€/kWh in 2035.

The costs for delivering the electricity to onshore substations are taken into account within the LCoE.

To realise these targets it is expected that there will it will be important to improve the reliability and survivability of the ocean energy converters. The device availability and capacity factor should be increased as much as possible. For the availability at least 80% in 2025, 90% in 2030 and 95% in 2040 should be targeted.

To realise the cost targets a facilitating research and innovation framework needs to be accompanied by sufficiently large deployment volumes and by consolidation of the supply chain at EU level. A projected relation between cost reductions and volumes deployed can be seen in the figure below. Higher deployment rates would definitely lead to higher cost reductions.

[8] COM(8)2014

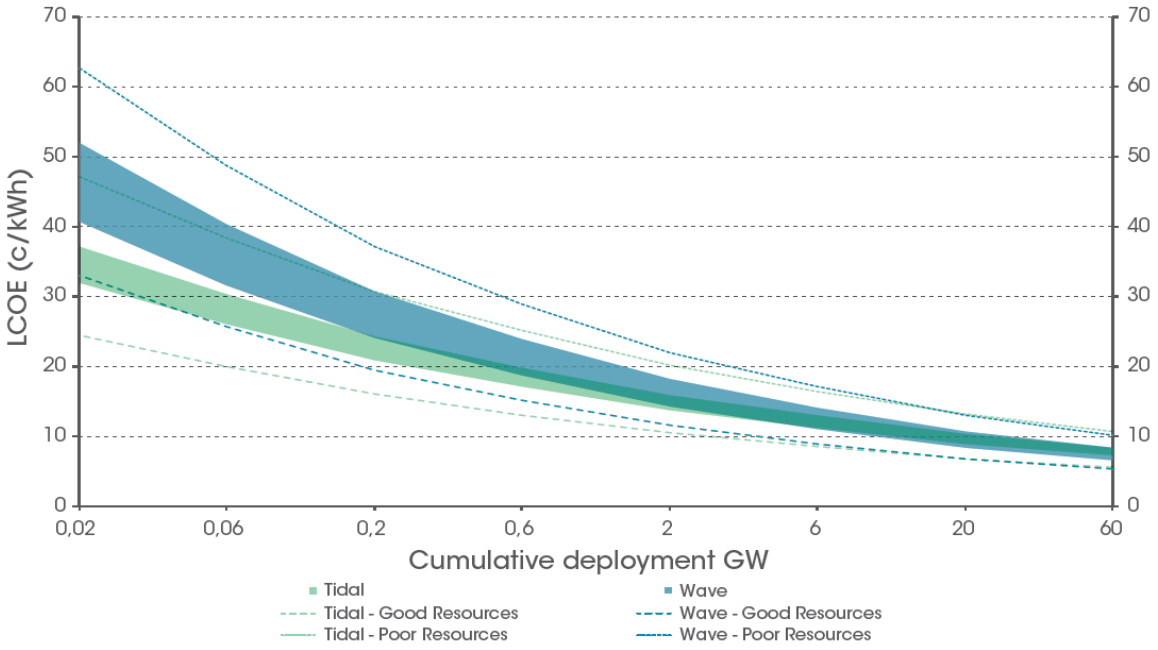

Figure 1: LCoE predictions for 10 MW early arrays, after 10 MW already installed assuming a learning rate of 12%.[9]

[9] SI Ocean report -Wave and Tidal Energy Market Deployment Strategy for Europe - June 2014

Relevant actions to realise the targets can come from the 'Towards and integrated Roadmap' document of the SET Plan which have been published in 2014 and the Ocean Energy Strategic Roadmap. This Strategic Roadmap is in preparation by the Ocean Energy Forum and will be published in autumn 2016).

To realise the targets the actions should possibly involve the following elements:

Development of cost competitive technology:
Deliver technologies that: 1) generate effectively and reliably and 2) meet or exceed project investment criteria. Achieve LCOE targets through the deployment of wave or tidal stream technologies and associated cost reduction through volume, economies of scale and continued innovation. Research, development and innovation efforts should also focus on technologies and processes necessary to develop and optimise farms, such as subsea power hubs, lay-out optimisation, and characterisation of the environment.

Supply chains:
Ensure a sufficient pipeline of project sites to encourage supply chain investment. Develop standards and standardise operating procedures, vessels, components and subsystems. Increase system lifetime, maintainability, reliability and accessibility offshore. Improve logistics and create supply chains for progressively larger projects. Make anticipatory investments in infrastructure such that grid links, ports and harbours are built in advance of projects. Possible synergies with other offshore sectors will be explored.

System integration:
Ensure that the development of European grid infrastructure anticipates the use of large scale ocean energy. Ensure that benefits from reduced system costs of integrating temporally diverse ocean energies with other renewables such as wind and solar, but also with energy storage options are recognised and captured in decisions made about the energy mix and energy system investments.

Non technological aspects:
Achieve a robust business model and effective monitoring of technology development and markets. Ensure the availability of finance to match market demand and support for global uptake of European ocean technologies. Engage banking and insurance sectors to accelerate market uptake. Remove uncertainties from the potential environmental impact of ocean energy technologies to accelerate consenting.

Societal issues:
Ensure that the increase in knowledge and economic benefits associated with the advancement of ocean energies are recognised and factored into decision making (e.g. benefits to remote communities, potential for skills transfer from fishing and other maritime activities, manufacturing benefits, potential for technology transfer to other sectors). Increase public awareness of ocean energy and share knowledge of impacts (or lack of impacts) on the environment to reduce consenting timelines.

Next steps

The stakeholders agree to develop a detailed implementation plan for the delivery of these targets, determine joint and/or coordinated actions, identify the ways in which the EU and national research and innovation programs could most usefully contribute, identify the contributions of the private sector, research organizations, and universities, identify all issues of a technological, socio-economic, regulatory or other nature that may be of relevance in achieving the targets, and report regularly on the progress with the purpose to monitor the realisation of the targets and take rectifying action where and whenever necessary.
The stakeholders intend to use the Declaration as the main vehicle for discussing and agreeing on the implementation plan.