Support to the realisation of the ocean energy implementation plan for the SET-Plan

Deliverable D6.6

Report on the first dissemination workshop

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Disclaimer

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Revision History

Revision	Date	Description	Reviewer
0.1	20/05/2020	Initial outline	All partners
1.0	28/05/2020	Final version	

EXECUTIVE SUMMARY

Dissemination and communication activities are a core part of the OceanSET project. Among these activities, one dissemination workshop per year is planned to ensure a wide dissemination of the key findings presented in the annual report. The first dissemination workshop was originally planned for June alongside with Seanergy, an international event dedicated to offshore wind and ocean energy. Due to the COVID-19 crisis, this event has been postponed by one year. As the European sanitary situation does not allow the organisation of any event and travelling is strictly limited even within Europe, it has been decided to organise a webinar in close collaboration with ETIP Ocean, the European Technology and Innovation Platform for Ocean Energy. The e-workshop was scheduled for 7 May 2020 from 11:00 AM to 12:00 PM CEST.

The workshop was organised to provide an update on the ocean energy sector, based on recent information on costs, technologies, revenue support and other facts across European countries as presented in the first annual report produced by the OceanSET project. After presenting the OceanSET project and its surveying activity, presenters discussed the conclusions from the annual assessment of the EU ocean energy sector and gave an update about the pre-commercial procurement programme for wave energy. The webinar ended by a Q&A session. It lasted a total of 1 hour and 18 minutes.

The webinar was a considerable success with 156 participants. Almost half of the audience belongs to the industry sector, which means that the original objective has been achieved. Another important aspect is that 40% of the participants came from the academic sector. Government sector and inter-governmental institutions represented 9% of the audience. Beyond the number of attendees, the participants' interest was reflected through the time spent in session. 63% of them attended the webinar for over an hour and 19% of them for a duration between 40 minutes and one hour. The number of questions asked during the Q&A session is also significant. Not all of them could be answered due to lack of time. A dedicated document that lists all the questions with the appropriate answers was prepared. The recording and the slides of the webinar are available on OceanSET and ETIP Ocean websites.

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ABBREVIATIONS AND ACRONYMS

CAPEX: Capital Expenditure
CEST: Central European Summer Time
ETIP: European Technology and Innovation Platform
EC: European Commission
FEM : France Energies Marines
GW: Gigawatt
IRENA: International Renewable Energy Agency
JRC: Joint Research Centre
LCOE: Levelized Cost of Energy
OECD: Organisation for Economic Co-operation and Development
OEE: Ocean Energy Europe
OPEX : Operational Expenditure
PCP: Pre-Commercial Procurement
Q&A : Questions and Answers
R&D : Research and Development
SEAI: Sustainable Energy Authority of Ireland
SET: Strategic Energy Technology
SIDS: Small Island Developing States
TRL: Technology Readiness Level
WES: Wave Energy Scotland

1. CONTEXT

Dissemination and communication activities are a core part of the OceanSET project. They aim to promote project outputs and provide easily accessible information to key players in the European ocean energy field and beyond. Among these activities, one dissemination workshop per year is planned to ensure a wide promotion of the key findings presented in each annual report.

The first dissemination workshop was originally planned for June 2020 alongside Seanergy, an international event dedicated to offshore wind and ocean energy. Due to the COVID-19 crisis, this event was cancelled and the organisation of any event and travelling has been strictly limited even within Europe for a multi-months period. OceanSET partners had to consider an alternative to disseminate the annual report's conclusions to the target audience who are industrial stakeholders as technology and farm developers, certification institutes, design offices…

As a solution, it was decided to organise a webinar in collaboration with ETIP Ocean, the European Technology and Innovation Platform for Ocean Energy. The webinar thus benefited from the promotion carried out both by the OceanSET project partners and ETIP Ocean (see Figure 1.1). It was scheduled for 7 May 2020 from 11:00 AM to 12:00 PM CEST. Registrations were made via the ETIP Ocean website.

FIGURE 1.1. PROMOTION OF THE WEBINAR ON SOCIAL MEDIA

2. THE E-WORKSHOP

2.1 OBJECTIVE

The workshop was organised to provide an update on the ocean energy sector, based on recent information on costs, technologies, revenue support and other facts across European countries as presented in the first annual report produced by the OceanSET project.

2.2 PROGRAMME

The programme of the workshop was defined as follows:
1 - OceanSET project and its surveying activity (Kelly Cayocca, FEM) – 10 min
2 - Annual assessment of the EU ocean energy sector (Patricia Comiskey, SEAI) – 20 min
3 - Pre-commercial procurement programme (Tim Hurst & Ruai Maciver, WES) – 10 min
4 - Q&A session – 20 min

2.3 CONTENTS

The webinar slides are in ANNEX I.

2.3.1 OceanSET project and its surveying activity

Context of the project

- The **European Strategic Energy Technology Plan (SET Plan)** which is the EU's main research and innovation policy. One of the aims is to position Europe as N°1 in renewable energy.
- The **Declaration of Intent for Ocean Energy** that indicates the levelized cost of energy targets for ocean energy technologies.
- The **Ocean Energy Implementation Plan** which is a collection of high-level actions for technology development in the ocean energy sector.
- **OceanSET** supports delivery of the SET Plan for ocean energy. This H2020 project aims to obtain a solid understanding of evolution in the European ocean energy sector in order to optimally tailor future funding for Member States, regions and the European Commission.

OceanSET methodology, an annual process with 4 key stages

- **Mapping** to gather information on the ocean energy sector across Europe.
- **Analysis** to compile and analyse the data collected from stakeholders and to conduct a gap analysis.
- **Monitoring** to assess the progress of the ocean energy sector by tracking key metrics and to consider other factors (identification of best practices, state-of-the-art…).
- **Review** to provide recommendations on the next steps required to progress the implementation of the SET Plan and suggest approaches to stimulate industry and research progress in key priority areas.

Mapping using a two sections survey

- The first section targeting the **Member States** to obtain high-level information on their ocean energy sector that will feed into the annual report for the European Commission.
- The second section targeting the **technology developers** to collect specific information on devices or projects to develop technology to a TRL 7 or above.

Survey using previously defined metrics

- **Policy and funding**: amount spent on ocean energy (total, percentage of budgeted amount spent), funding (by Government, European Commission, private sector, grants) and ocean energy policy (revenue support, licensing/consenting).
- **Supply chain, capacity and jobs**: development level of supply chain, newly installed capacity, jobs created.
- **Concepts and technologies**: TRL 1-6 projects (number of projects financed in each Member State), TRL 7-9 projects (number of projects financed in each Member State, technology, installation, capacity factor, availability, CAPEX, OPEX, lifetime, LCOE).

2.3.2 Annual assessment of the EU ocean energy sector

Key findings from mapping for year 2018

- A total of 90 ocean energy projects supported.
- €26.3M in public funding from Member States and Regions.
- 10 Member States have an ocean energy budget.
- 10 Member States had test site facilities.
- 6 Member States have an ocean energy policy.
- 7 Member States were funded ocean energy projects of TRL 7+.
- 12 projects were eligible to be considered TRL 7 or above and wave energy converters accounted for the majority.
- 200 jobs were created by the 12 projects.

Gap analysis conclusions

- Overall funding of technology development was well supported in 2018.
- There is difficulty in accessing accurate funding information and performance of technology.
- Industry partners are reluctant to provide accurate information.
- In tidal a significant number of concepts are being developed and 5 at or above TRL7.
- Wave showed a significant number of sub-TRL7 technologies in development.
- Actions to support standards through the development of agreed metrics for wave and tidal energy were on track to meet the targets of the Implementation Plan.

Monitoring and review conclusions

Regarding **Member States**:

- Overall the responses received were of good quality.
- Budget, average licensing and consenting times were questioned in terms of ranges to simplify it.
- Questions about TRL 1-6 projects were simplified in order to encourage consistent responses but some clarification required in coming years.
- Need to include more detailed questions on supply chain and standards.

Regarding **technology developers**:

- Respondents were happy to give high level information.
- Questions were answered by nearly all the respondents.
- Commercially sensitive information and questions on cost and funding were not as readily answered.
- Need to understand why questions aren't being answered and to build trust on why data being collected and how confidentiality is being handled.
- Other areas should be included in the second survey to widen the understanding on the development of the ocean sector as a whole.

Areas of improvement for OceanSET mapping activity

- **Technical** actions: Installation, logistics and testing infrastructure and supply chain development.
- **Finance** actions: creation of an investment fund for ocean energy farms, creation of an EU insurance and guarantee fund to underwrite project risks.
- **Environmental** actions**:** development of certification and standards to support the offshore renewable technology sector, de-risking environmental consenting through an integrated programme of measures.

2.3.3 Pre-commercial procurement programme for wave energy

Context and objective

- **European context**: Among financial actions of Ocean Energy Implementation Plan there is a pre-commercial procurement (PCP) action for development of wave energy technology.
- **Definition**: PCP is an approach to public procurement of R&D services which allows public procurers to drive innovation from the demand side by acting as technologically demanding customers that buy the development and testing of new solutions for mid- to long-term requirements.
- **OceanSET objective**: Definition of a strategic approach to a European PCP programme for wave energy technology and the development of a package of funding calls that could be used to drive technology development.

Review of strategies and priorities

- **Member State & Regional** support for the wave energy sector.
- **Technology roadmaps** identify and prioritise the requirements for achieving longer-term visions or targets and provide a framework for stimulating innovation in a technology area.
- **Strategic research priorities** like the ETIP Ocean's 2016 research agenda for ocean energy which presented the objectives required to achieve the levelized cost of energy goals subsequently enshrined in the SET Plan.

Proposed technology priority areas

- **Scaled prototype testing**: Progression to open water testing of utility-scale generation technology at an appreciable scale with functional subsystems, demonstrating performance in representative and then operational wave climates, i.e. between TRL 5 and 7.
- **Technology for off-grid applications**: Product development for the blue economy sectors - Lower power requirements (a few hundred watts to a few hundred kilowatts) allow for smaller designs and faster design cycle iteration.
- **Mooring and anchoring systems**: Improved mooring and anchoring concepts to provide a cost effective sub-system in a wide range of seabed conditions and permit rapid installation and removal operations through improvements in connection and disconnection techniques.

Design of funding mechanism

- **Centralised approach to payments**: All payments to R&D Providers made by the Lead Procurer. Funding transfers from procurers in the buyers group to the lead procurer. EU contribution passed directly to lead procurer.
- **2 approaches to participations**:
  - **Simple**: It would have all procurers in the buyers group involved in all sub-challenge programmes with each procurer contributing equally to the total procurement budget for the PCP. It is an equitable approach without any significant complexity.
  - **Inclusive**: It has the potential to broaden involvement in the buyers group by lowering the financial commitment required to participate. The approach has the capacity to maximise the overall PCP procurement budget.

2.4 Q&A SESSION

There is a European vision of offshore wind energy of 450 GW installed by 2050. Is there a same vison for ocean energy by 2050?

In Europe alone, the ocean energy industry plans to deploy 100 GW of production capacity by 2050, meeting 10% of electricity demand. That's enough to meet the daily electricity needs of 76 million households.

The SET Plan Implementation Group Report shows that to achieve the wave energy 2025 targets requires an installed capacity of 1,000 MW by then. What recommendations with the OceanSET project be given to the European Commission to accelerate the installation of wave energy technology as this target requires 200 MW per year from today. The annual report shows 0.6 MW installed in Table 4.

This first year of the OceanSET project is primarily concerned with collecting information on the current status of projects and support. It is important to note that the 0.6 MW figure shown is for 2018. The OceanSET project will be exploring support measures and their effectiveness in future surveys.

There is a lot of mapping done in the past for marine energy. How much of this learning has been capture in this new endeavour? What is the difference between this new mapping and that done before?

The mapping that we refer to is on status of funding of projects across EU. There have been some earlier studies done by JRC that we have referred to and used in development of our metrics and analysis.

Given difficulty in obtaining data, should public funding be contingent on developers being required to provide data?

We would recommend that the provision of data to enhance our understanding of the progress of the sector should be routinely collated by public funders and considered as mandatory for all public funding.

Are you considering the possibility of including the response to a survey like this as an mandatory deliverable in all projects funded by public money? This could be requested by all European Commission and Member States funding programmes.

As above.

What was in the surveys for device developers in terms of TRL, LCOE, resilience (financial, technical…)?

Survey forms were included in the annual report. Please refer to appendices

Very interesting to see the figures for public sector investment in wave & tidal. Did you collect any information on other funding sources, what proportion they made up?

Private investment was also sought, however detail break down of this was not requested. Further information is required in future surveys to understand the make-up of projects.

Answer for The Netherlands is obviously incorrect, since this country has one of the highest density of offshore companies and capabilities.

The response reported was as per provided by the Member State. We will clarify with them to see if they wish to update in future surveys.

Are these technology roadmaps available in the report? Are they specific to the countries or geographical resource locations?
The roadmaps used in OceanSET Task 4.1 are public documents and are readily available, for example some are available at the IEA OES website. Roadmaps are almost exclusively specific to the country/region in which they are produced.

Can you offer a [hypothetical] example of Pre-Commercial Procurement (PCP) model at work?
As well as the model presented in the webinar, Wave Energy Scotland's programme, which has operated over the last 5 years, is a PCP. Details are available at: waveenergyscotland.co.uk

How soon will literature on the PCP model be publicly available?
The output for these deliverables was intended for EU Commission use. We will discuss with them on providing a public report.

Isn't this centralised EU approach to PCP going to be complicated with Brexit?
Brexit will certainly complicate the participation of a UK public procurer in a Buyers Group regardless of whether the centralised or decentralised approach is used. In the centralised approach the Lead Procurer handles all payments to the research providers and receives contributions from the budget from the other members of the Buyers Group and from the EU. The Buyers Group is free to select a Lead Procurer from any of its membership which best suits its needs.

Remazel is a provider of mooring solutions that can help to solve the issues mentioned about mooring and anchoring. How can we get involved with the companies involved in the development of wave and tidal energy? We are a provider of mooring solutions for oi l& gas floaters, floating wind turbine floaters, and are keen to be involved also in tidal and wave power generation.
The OceanSET project has recommended the challenges that would benefit from a multi-Member State PCP programme and is developing the framework for operating such a programme. It remains for public procurers in the Member States to form a Buyers Group and initiate any such PCP programme, the launch of which will be advertised widely, most likely via the OJEU.

Is there any plan on analysing ocean energy impacts on tourism sector during the project?
The focus of the OceanSET project is to track the 11 actions of the Set Plan Implementation Plan for Ocean Energy. Tourism is not indicated as a specific sector to focus on within these actions.

Does the EU OceanSET work has also an external dimension regarding developing countries and small island developing states (SIDS)? We are currently working with SIDS in the Caribbean, Pacific, Indian Ocean and Africa on the creation of a north-south ocean energy technology platform. The platform tries to build a bridge between international industry and research players and the interest of SIDS to get access to technology and expertise. The platform would promote technology cooperation, knowledge sharing and awareness raising, joint project development, capacity building and fund mobilisation. How we could cooperate on this?

The OceanSET work and the wider SET Plan have to focus primarily on coordinating efforts within Europe. But ocean energy is a global resource, SIDS are clearly an important market, and there are other potential between Europe and these territories that are worth exploring.

IEA-OES is an international intergovernmental collaboration between countries focused on ocean energy. Its membership is global, and its Annual Report has contacts for each country.

The International Renewable Energy Agency (IRENA) is another global intergovernmental organisation. It is quite focused on both non-OECD countries and ocean energy. Last autumn it organised a workshop for SIDS representatives on ocean energy. You can contact IRENA directly. Ocean Energy Europe (OEE) works closely with IRENA, so OEE members can also get in touch via OEE.

3. FEEDBACK ON THE EVENT

The workshop was a considerable success with 156 participants. The ETIP Ocean team told us that this is the most well attended virtual event since the creation of their webinar cycle. Almost half of the audience belongs to the industry sector, which means that the targeted audience has been reached. Another important aspect is that 40% of the participants came from the academic sector. Government sector and inter-governmental institutions represent 9% of the audience. These numbers are summarised in Figure 3.1.

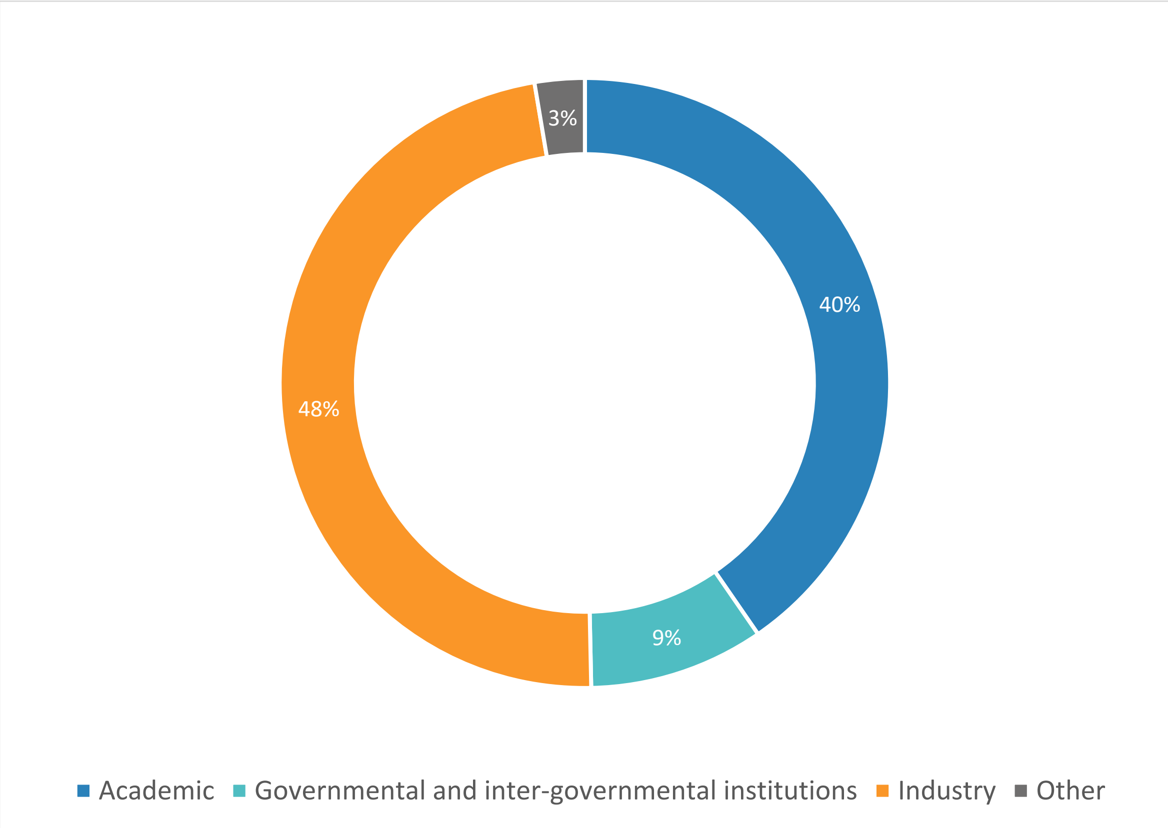


FIGURE 3.1. BREAKDOWN OF WEBINAR PARTICIPANTS BY ACTIVITY SECTOR

Beyond the number of attendees, the participants' interest was reflected in the time in session. 63% of them attend the webinar for over an hour and 19% of them for a duration between 40 minutes and one hour. The webinar lasted a total of 1 hour and 18 minutes. All these numbers are summarised in Figure 3.2.

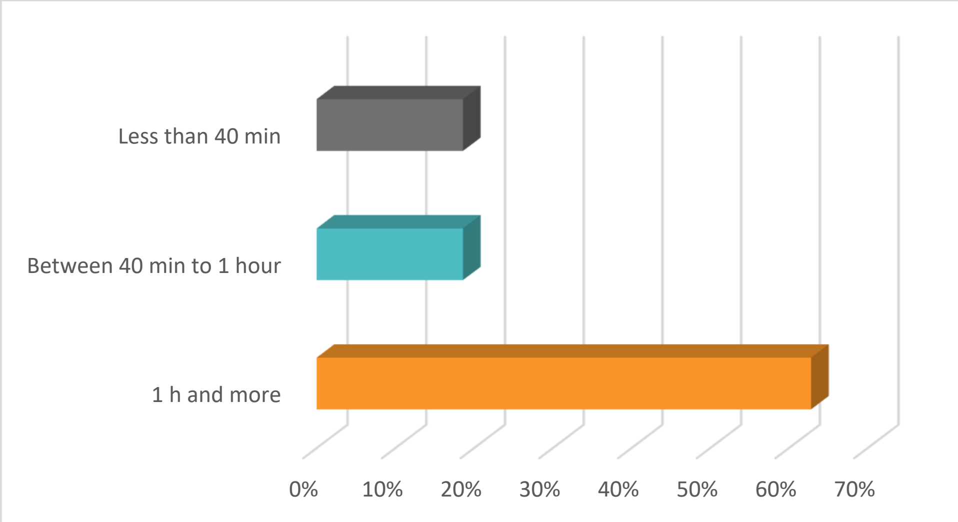


FIGURE 3.2. BREAKDOWN OF AUDIENCE DURATION OF WEBINAR PARTICIPANTS

Another indicator of the participants' interest is reflected through the significant amount of questions asked during the Q&A session. Not all of them could be answered due to lack of time. A dedicated document is in preparation: it will list all the questions with the appropriate answers.

The questions asked by the participants focused mainly on:

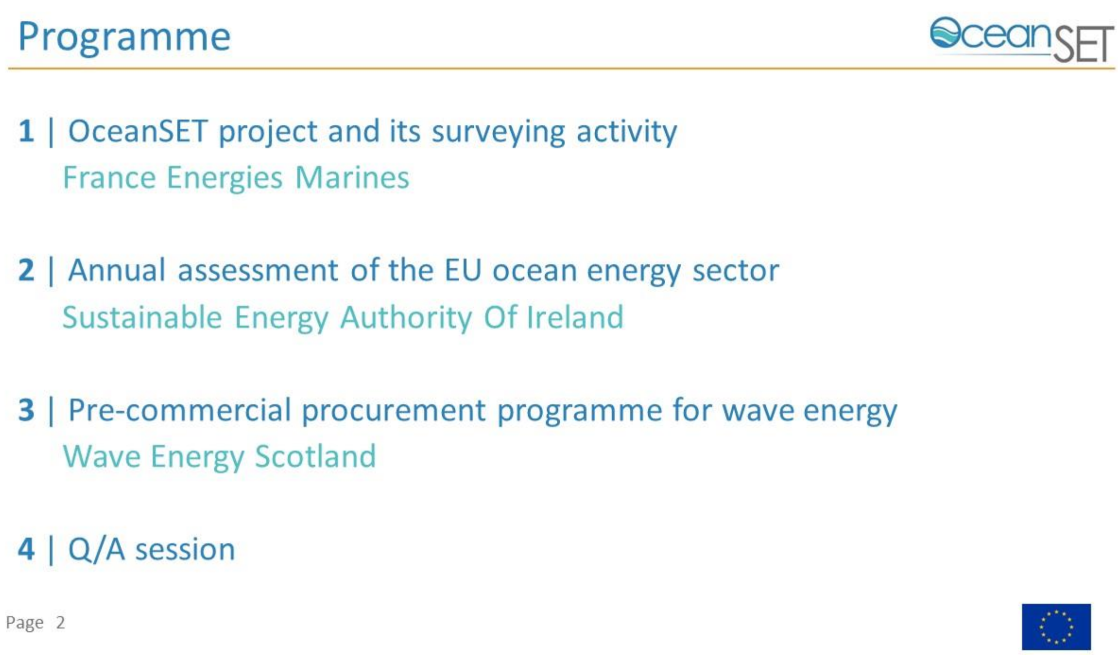
- positioning of OceanSET mapping activity compared to other work done or in progress;
- propositions to obtain all data needed for the mapping activity;
- information about non-public funding sources;
- public and available documents on the pre-commercial procurement;
- possible influence of Brexit on a centralised EU approach to pre-commercial procurement.

The recording and the slides of the webinar are available on OceanSET and ETIP Ocean websites to further improve the dissemination of the contents and the conclusions of the first OceanSET annual report.

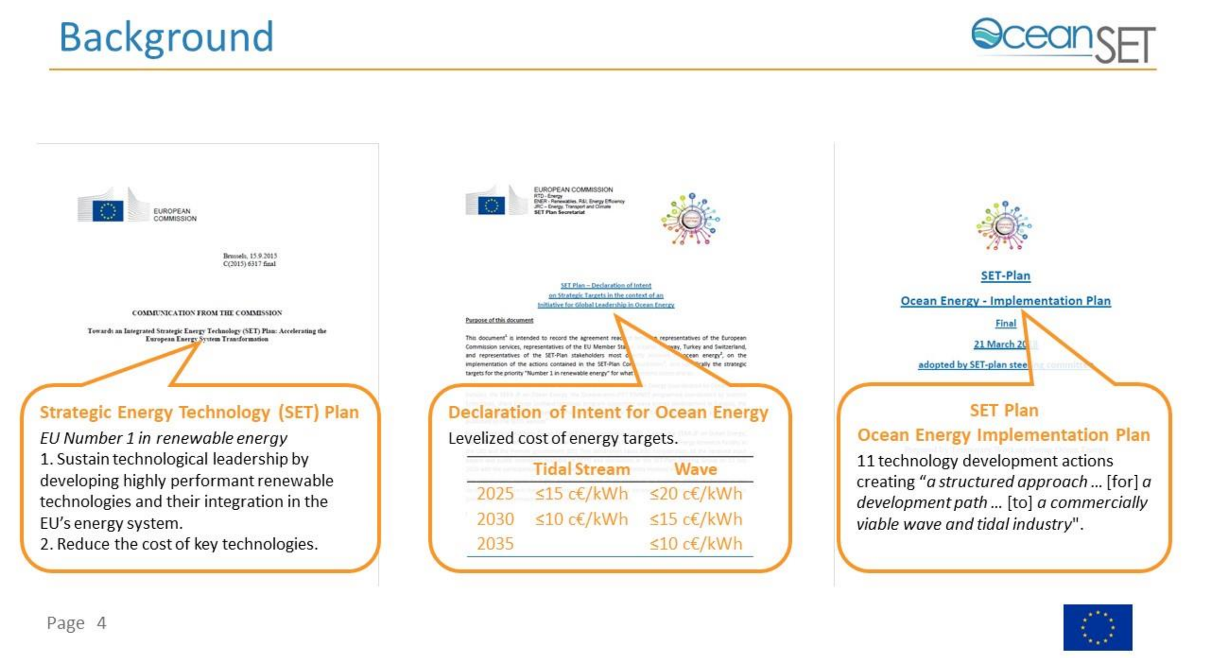
4. ACKNOWLEDGMENTS

The partners of the OceanSET project would like to sincerely thank the ETIP Ocean team, especially Lotta Pirttimaa for her availability before and on D-day regarding the organisation of the webinar.

ANNEX I: WEBINAR SLIDES




OceanSET
1 | OceanSET project and its surveying activity
France Energies Marines
© Hans / Pixabay


Background
OceanSET
COMMUNICATION FROM THE COMMISSION
SET-Plan
Ocean Energy - Implementation Plan
Final
Strategic Energy Technology (SET) Plan
EU Number 1 in renewable energy
1. Sustain technological leadership by developing highly performant renewable technologies and their integration in the EU's energy system.
2. Reduce the cost of key technologies.
Declaration of Intent for Ocean Energy
Levelized cost of energy targets.
Tidal Stream
Wave
2025 ≤15 c€/kWh ≤20 c€/kWh
2030 ≤10 c€/kWh ≤15 c€/kWh
2035 ≤10 c€/kWh
SET Plan
Ocean Energy Implementation Plan
11 technology development actions creating "a structured approach ... [for] a development path ... [to] a commercially viable wave and tidal industry".
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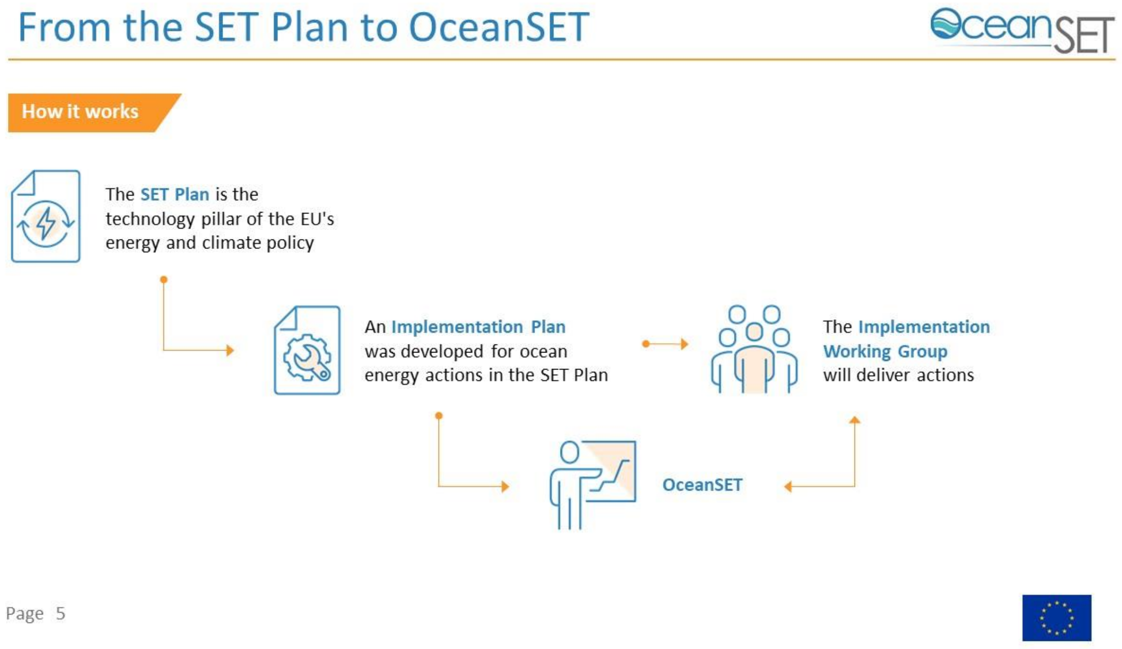
From the SET Plan to OceanSET
How it works
The SET Plan is the technology pillar of the EU's energy and climate policy
An Implementation Plan was developed for ocean energy actions in the SET Plan
The Implementation Working Group will deliver actions
OceanSET
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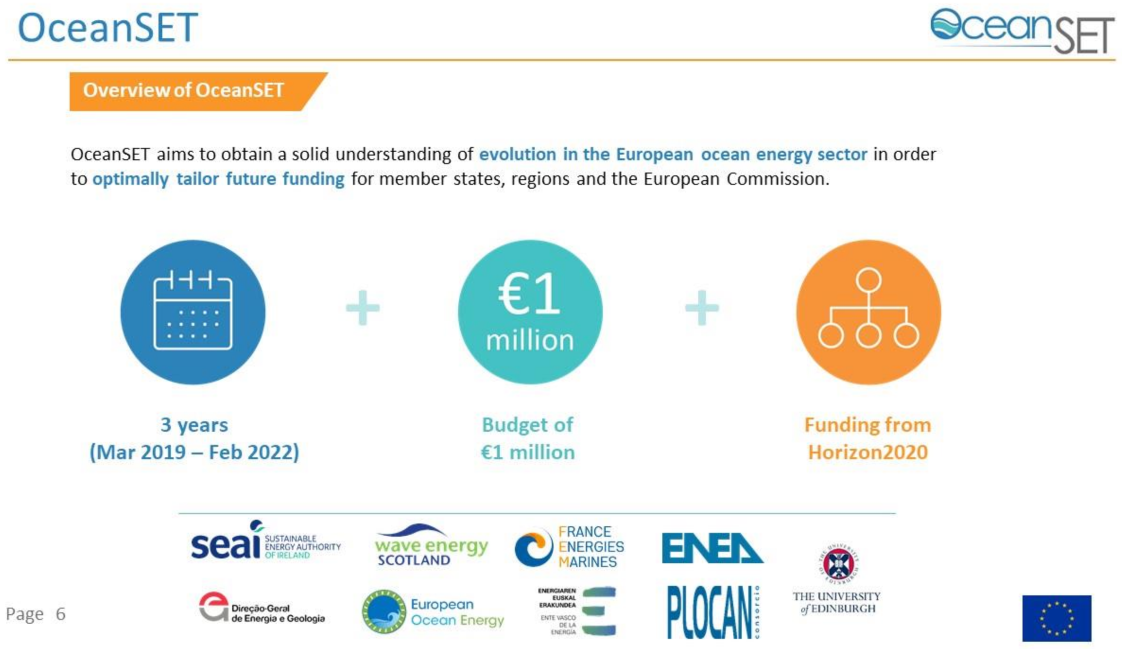
OceanSET
Overview of OceanSET
OceanSET aims to obtain a solid understanding of evolution in the European ocean energy sector in order to optimally tailor future funding for member states, regions and the European Commission.
€1 million
3 years (Mar 2019 – Feb 2022)
Budget of €1 million
Funding from Horizon2020
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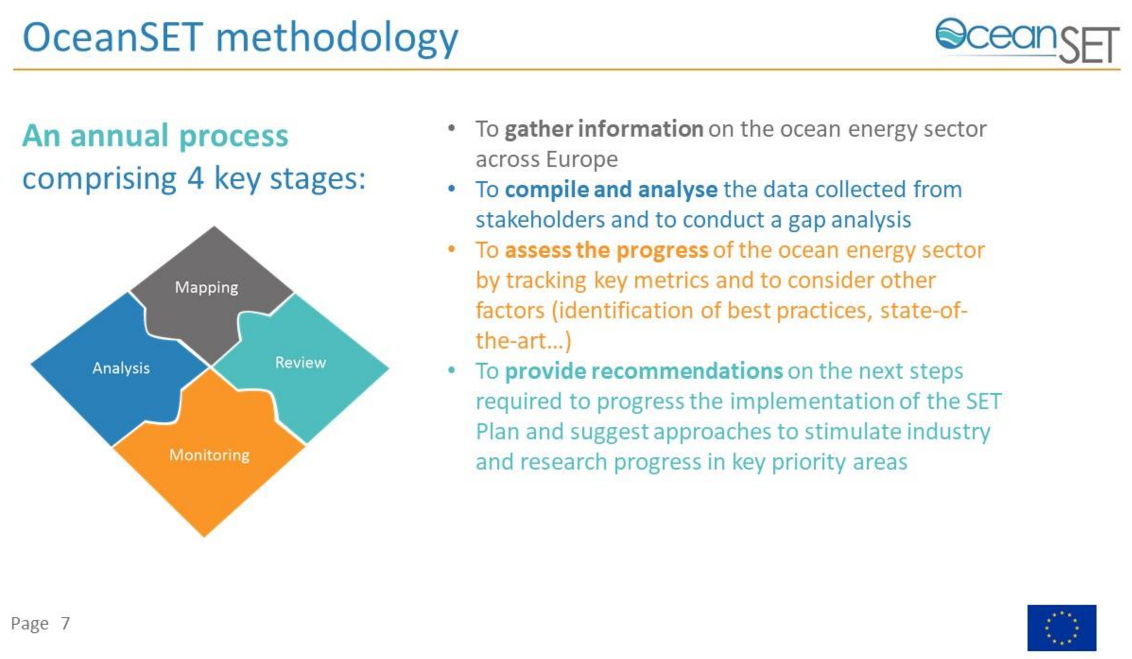
OceanSET methodology
An annual process
comprising 4 key stages:
Mapping
Analysis
Review
Monitoring
To gather information on the ocean energy sector across Europe
To compile and analyse the data collected from stakeholders and to conduct a gap analysis
To assess the progress of the ocean energy sector by tracking key metrics and to consider other factors (identification of best practices, state-of-the-art…)
To provide recommendations on the next steps required to progress the implementation of the SET Plan and suggest approaches to stimulate industry and research progress in key priority areas
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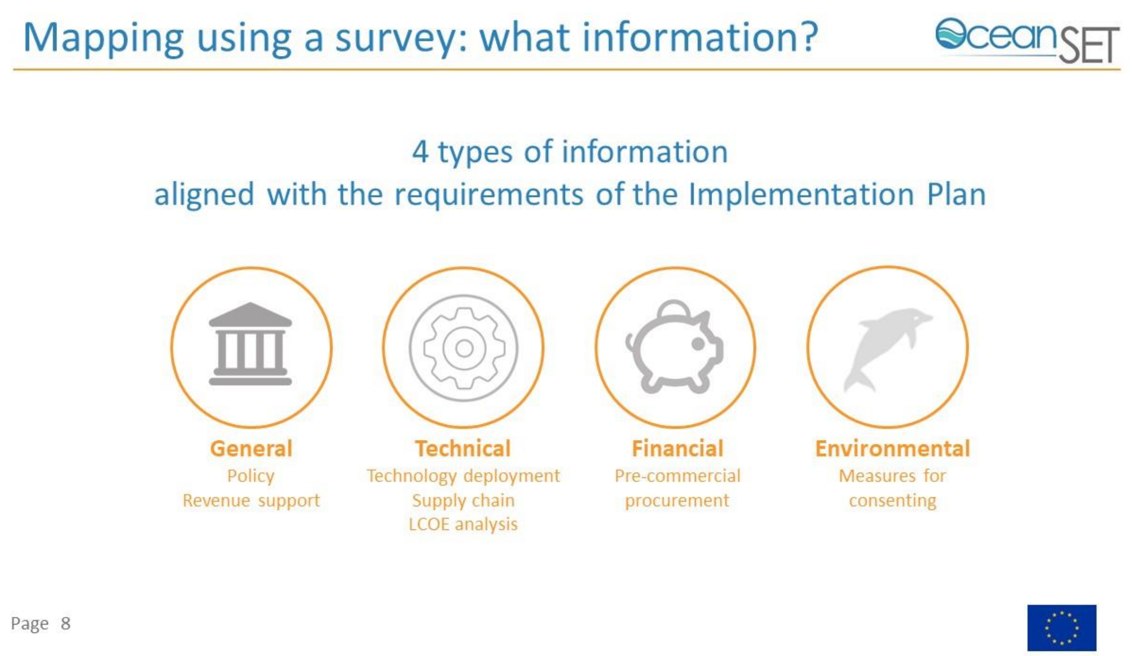
Mapping using a survey: what information?
4 types of information
aligned with the requirements of the Implementation Plan
General
Policy
Revenue support
Technical
Technology deployment
Supply chain
LCOE analysis
Financial
Pre-commercial
procurement
Environmental
Measures for
consenting
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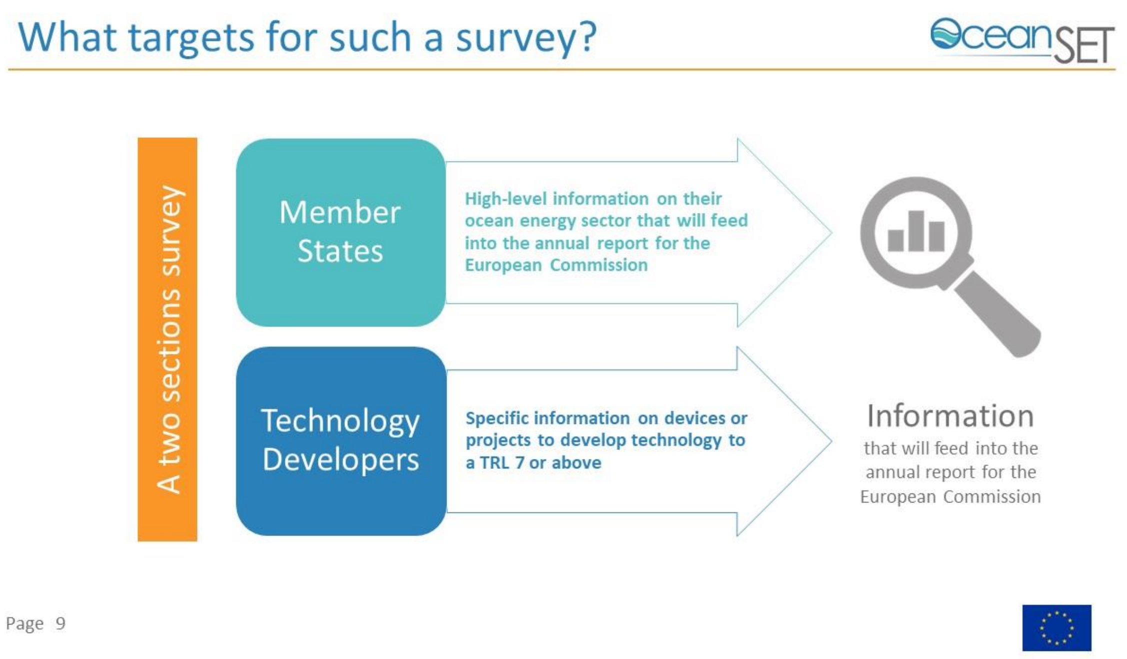
What targets for such a survey?
OceanSET
A two sections survey
Member States
High-level information on their ocean energy sector that will feed into the annual report for the European Commission
Technology Developers
Specific information on devices or projects to develop technology to a TRL 7 or above
Information
that will feed into the annual report for the European Commission
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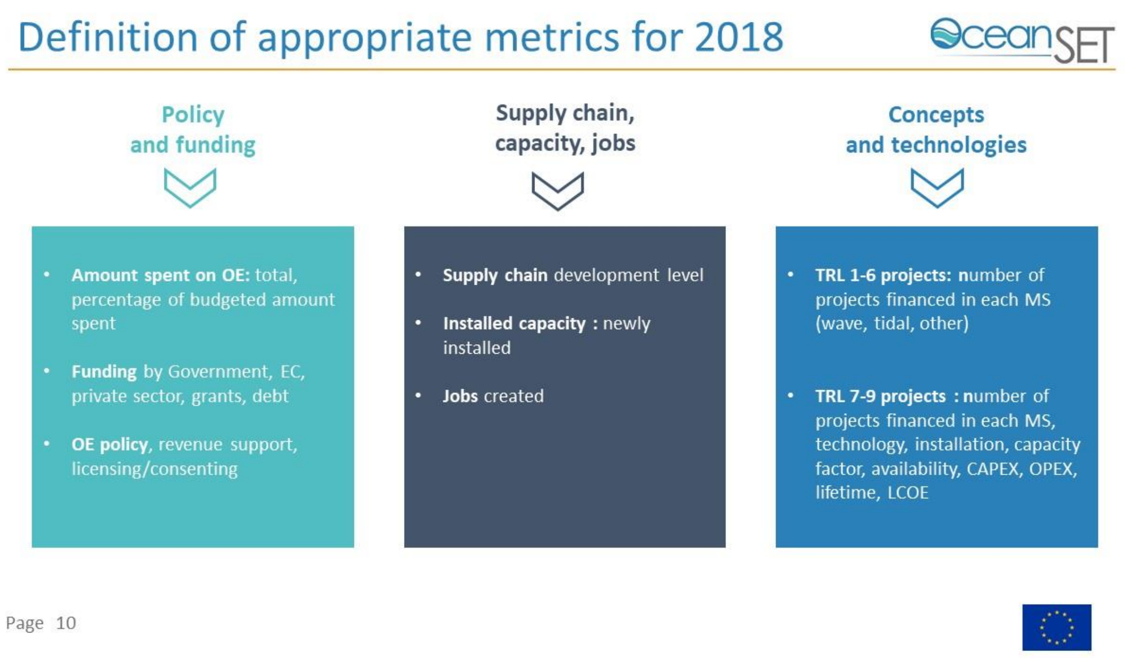
Definition of appropriate metrics for 2018
OceanSET
Policy and funding
Supply chain, capacity, jobs
Concepts and technologies
Amount spent on OE: total, percentage of budgeted amount spent
Funding by Government, EC, private sector, grants, debt
OE policy, revenue support, licensing/consenting
Supply chain development level
Installed capacity : newly installed
Jobs created
TRL 1-6 projects: number of projects financed in each MS (wave, tidal, other)
TRL 7-9 projects : number of projects financed in each MS, technology, installation, capacity factor, availability, CAPEX, OPEX, lifetime, LCOE
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OceanSET

- The OceanSET project has the overall goal to support the realisation of the ocean energy SET-Plan IP
- OceanSET will focus on assessing the **progress of the Ocean Energy sector** and will monitor National and European Union (EU) funded projects in delivering successful supports.
- Relevant data will be collected annually and will be used to inform MS and the EC on the progress of the sector.
- **3 annual reports** will be published

Work Package	Code	Leader
Ethics requirements	WP1	SEAI
Mapping & Analysis	WP2	SEAI
Finance	WP3	WES
Pre-Commercial Procurement Programme Development	WP4	WES
Monitoring & Review	WP5	DGEG
Communication & Dissemination	WP6	FEM
Management	WP7	SEAI

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OceanSET methodology

An annual process
comprising 4 key stages:

- To **gather information** on the ocean energy sector across Europe
- To **compile and analyse** the data collected from stakeholders and to conduct a gap analysis
- To **assess the progress** of the ocean energy sector by tracking key metrics and to consider other factors (identification of best practices, state-of-the-art...)
- To **provide recommendations** on the next steps required to progress the implementation of the SET Plan and suggest approaches to stimulate industry and research progress in key priority areas

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Mapping and Analysis (WP2)

The survey was laid out in two sections:

- **Section 1** captured high-level information from Member States on their OE sector
- **Section 2** gathered detailed information on developers who have devices with a TRL 7

Survey responses:

Section 1 – for Member States

- 11 out of 14 MS responded
- A total of 90 Ocean Energy projects are reported as being supported in 2018:
  - 57 wave projects, 22 tidal projects, and 11 projects categorised as "other".
- 7 MS said they funded Ocean Energy projects of TRL 7+ in 2018 (20 in total)

Section 2 – for Ocean Energy developers

- These 20 ocean energy developers were sent survey section 2.
- 15 out of the 20 responded. An additional 10 responses were received (25 total)
- Only 12 projects were eligible for use in the mapping and analysis

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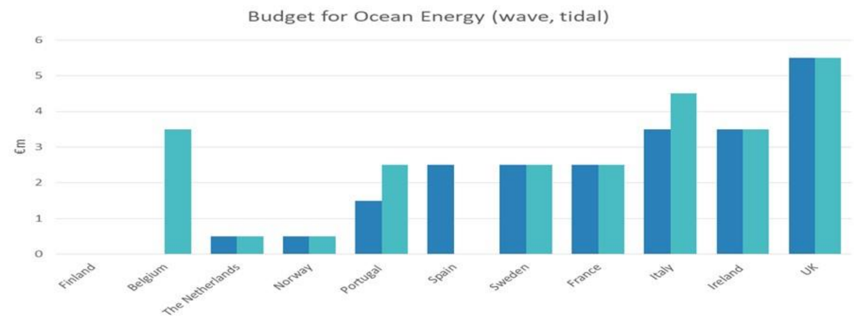
Policy & Budget support

Policy:

The mapping exercise shows that 6 out of 11 MS have an Ocean Energy Policy

No (5)	Yes (6)
	Belgium
Finland	Ireland
France	Italy
Norway	Portugal
Sweden	Spain
The Netherlands	United Kingdom

Budget:



Annual pipeline of wave and tidal projects in each MS

The table shows the annual pipeline of wave and tidal stream projects.

Country	How many projects funded in 2018?	Projects you supported in 'wave'	projects you supported in 'tidal stream'	projects you supported in 'other'	Budget
Italy	5	4	1	-	€3m - 4m
Spain	3	2	1	-	€2m - €3m
Ireland	10	3	3	4	€3m - 4m
Sweden	30	21	6	3	€2m - €3m
Portugal	10	5	1	4	€1m - €2m
France	9	4	5	-	€2m - €3m
UK	**23**	18	5	0	more than €5m

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Commercial status of WEC and TEC technologies

In total 12 projects were eligible to be considered TRL 7 or above. WEC's accounted for the majority for projects at TRL 7 or above that occurred during 2018

Tidal energy system demonstration in operational environment (TRL 7-9)

- 5 tidal project were at TRL 7+
- Developers identify "Increasing device reliability and survivability" as there development area.
- Horizontal axis turbine is most predominant in tidal technology systems that have reached TRL 7 or above
- As for installation types, it was split. Three are using fixed gravity-based installations and two are using floating Semi-taut mooring.

Wave energy system demonstration and deployment TRL 7-9

- 7 wave projects were at TRL 7+
- Developers identified "Increasing device reliability and survivability" as the development area
- Unlike tidal stream, wave technology types that have reached TRL 7 or above does not show a clear front runner. The technology types are mixed between point absorbers, Oscillating water column, and others.
- This has resulted in a high mix of installation types: 2 fixed gravity based, 3 floating Slack moored, 1 floating Semi-taut moored,1 'other' - Pre-tension with technical anchors

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Test Facilities and Supply Chain

Test Facilities: Nearly all Member States (10 of 11) had test site facilities in their country.

Supply Chain: 50% chose *Part of the supply chain well complemented by suppliers from other sectors* to best describe the supply chain in their country. Only the UK classified their supply chain as Dedicated/self-sufficient.

How would you classify OE?	Country
Dedicated/self-sufficient	UK
Part of the chain well complemented by suppliers from other sectors	Finland, Italy, Spain, France, Belgium (Ghent), Portugal
Part of the chain hardly complemented by suppliers from other sectors	The Netherlands and Ireland
Partial lack of supply	Sweden and Norway

It is recommended that more detail is sought during the next survey to get a better understanding of the gaps in the supply chain across Member States.

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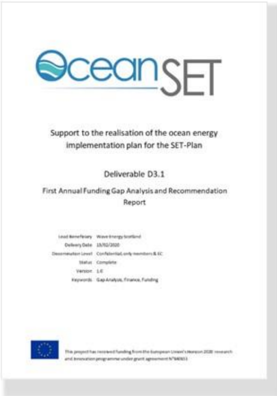
Gap Analysis (WP3)

- Overall funding of technology development was well supported in 2018
- Overall public funding from MSs and Regions of around €26.3M. Aligns well with the estimated requirements of the Ocean Energy IP of €21.25M
- There is difficulty in accessing accurate funding information and performance of technology
- Industry partners are reluctant to provide accurate information


Support to the realisation of the ocean energy implementation plan for the SET-Plan

Deliverable D3.1

First Annual Funding Gap Analysis and Recommendation Report

Page 19

Gap Analysis (WP3)

- In tidal a significant number of concepts are being developed and 5 at or above TRL7. First array scale demo is underway and progressing ahead of the expectations of the IP
- Wave also showed a significant number of sub-TRL7 technologies in development. Demonstration of full-scale wave energy technology was progressing broadly in line with the expectations of the IP
- Actions to support standards through the development of agreed metrics for wave and tidal energy were on track to meet the targets of the IP

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Monitoring and Review (WP5)

- The main objective of the first monitoring and review report was to provide a baseline against which future data can be tracked
- Quantitative metrics were set to track the level of development towards these objectives, known as the **key metrics**
- Data collected in the mapping exercise was analysed where possible to track the evolution of the sector
- Lesson learned were also captured

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Monitoring and Review – Survey Section 1

- Overall the responses received from MS were of good quality and allowed us to map, analysis and create a monitoring baseline for the OE sector.
- In the budget question several respondents answered that their MS have not a defined support for OE.
- Budget and average licensing and consenting times were questioned in terms of ranges to simplify the effort required from MS representatives.
- Questions about TRL 1-6 projects in survey Section 1 were simplified, in order to encourage consistent responses. Some clarification required in Year 2
- Need to include more detailed Qs on supply chain and standards

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Monitoring and Review – Survey Section 2

- Overall, respondents were happy to give high level information and these questions were answered by nearly all the respondents.
- Commercially sensitive information and questions on cost and funding were not as readily answered. The metrics set out in Q13 requested about technical characteristics of TRL 7+ devices including:
  - Electrical energy production
  - Capacity factor
  - Availability (h/year)
  - CAPEX
  - OPEX (€/W/year)
  - LCOE (€/MWh) etc.
- Of the 12 respondents, 2 developers skipped these questions entirely and a further 2 only provided information on the number of jobs or technical lifetime and several respondents provided values which did not align with unit of measurement provided.

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Monitoring and Review – Survey Section 2

- Need to understand why questions aren't being answered and to build trust on why data being collected and how confidentiality is being handled
- Other areas should be included in the 2nd survey to widen the understanding on the development of the ocean sector as a whole, including:
  - Infrastructure development and capacity of the supply chain
  - Development of environmental standards, safety standards and best practice

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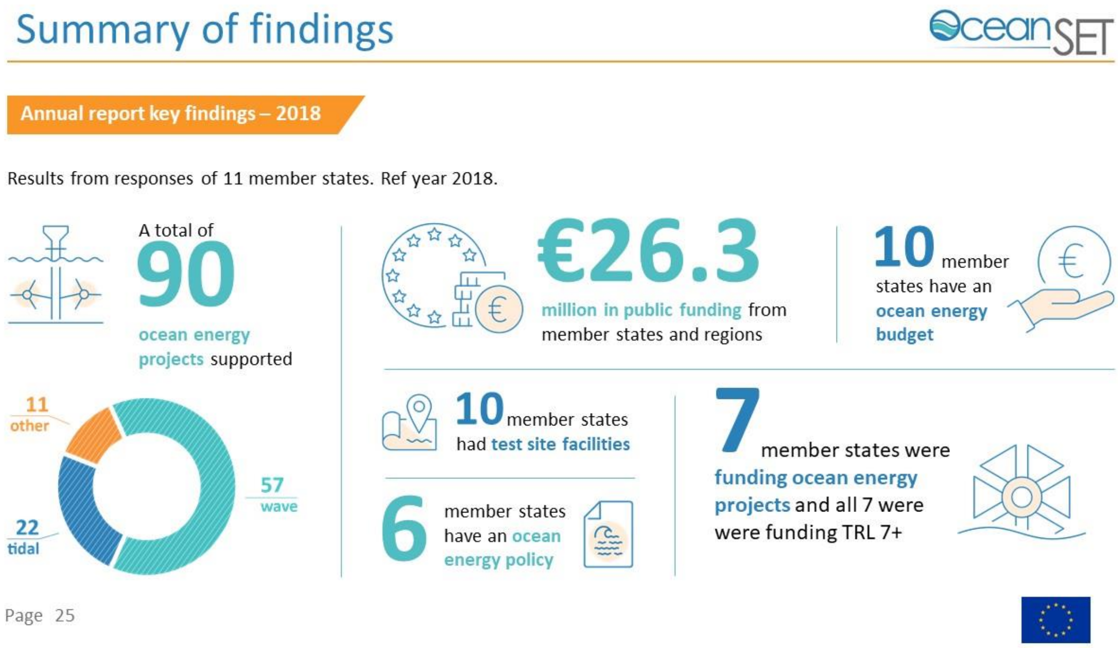
Summary of findings
Annual report key findings – 2018
Results from responses of 11 member states. Ref year 2018.
A total of 90 ocean energy projects supported
11 other
22 tidal
57 wave
€26.3 million in public funding from member states and regions
10 member states have an ocean energy budget
10 member states had test site facilities
6 member states have an ocean energy policy
7 member states were funding ocean energy projects and all 7 were were funding TRL 7+
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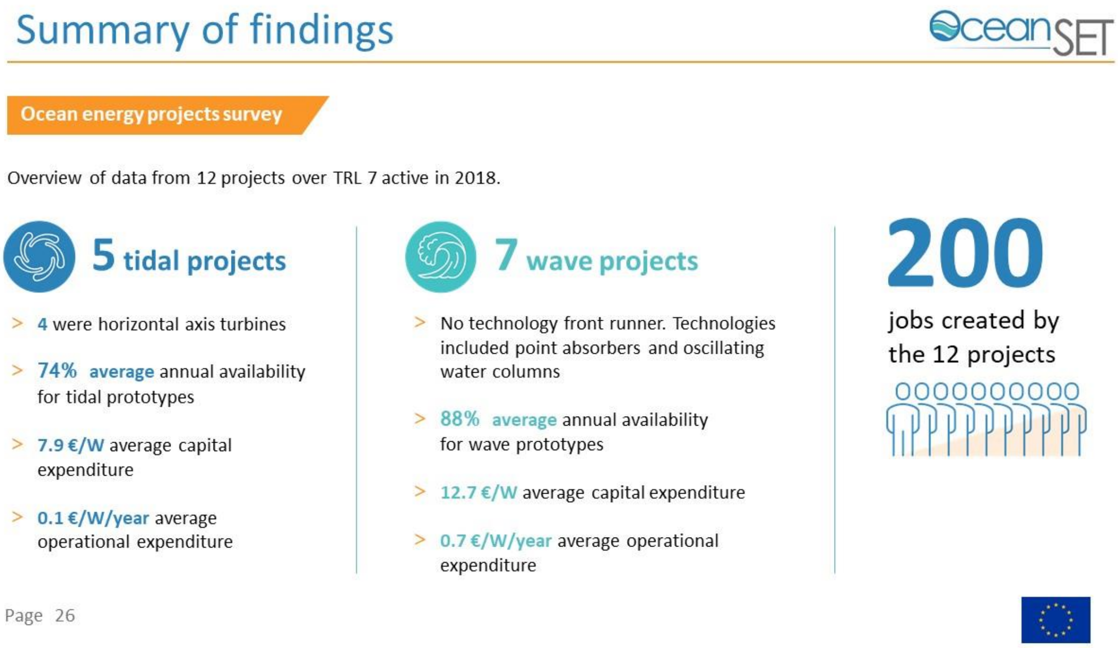
Summary of findings
Ocean energy projects survey
Overview of data from 12 projects over TRL 7 active in 2018.
5 tidal projects
> 4 were horizontal axis turbines
> 74% average annual availability for tidal prototypes
> 7.9 €/W average capital expenditure
> 0.1 €/W/year average operational expenditure
7 wave projects
> No technology front runner. Technologies included point absorbers and oscillating water columns
> 88% average annual availability for wave prototypes
> 12.7 €/W average capital expenditure
> 0.7 €/W/year average operational expenditure
200 jobs created by the 12 projects
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OceanSET Progress

SET Plan IP 11 Technology Development Actions are outlined below by using a traffic light system to identify the progress OceanSET has made during the first year of the discovery phase. This is a review of the progress OceanSET have made in mapping the Ocean Energy sector against these 11 actions, not of the fulfilment of these actions.

- Green: on track
- Orange: behind progress
- Red: no activity or progress

	Technical Actions	Progress
1.1	Tidal Energy technology device development and knowledge building up to TRL 6	
1.2	Tidal energy system demonstration in operational environment (TRL 7-9)	
1.3	Wave energy technology development and demonstration up to TRL 6	
1.4	Wave energy system demonstration and deployment TRL 7-9	
1.5	Installation, logistics and testing infrastructure [and] supply chain development.	
1.6	Co-ordinate the development of standards and guidelines for technology evaluation and LCOE analysis.	
	Finance Actions	
2.1	Creation of an investment fund for Ocean Energy farms	
2.2	Creation of an EU insurance and guarantee fund to underwrite project risks.	
2.3	Pre-Commercial Procurement (PCP) action for development of wave energy technology.	
	Environmental Actions	
3.1	Development of certification and standards to support the offshore renewable technology sector	
3.2	De-risking environmental consenting through an integrated programme of measures	

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OE Implementation Plan – Financial Actions

Action 2.3: Pre-Commercial Procurement action for development of wave energy technology

Implementation of an EU-wide innovation programme to develop innovative solutions to the technical challenges in key sub-systems, systems and devices in the wave energy sector.

The innovation programme based on the EU's pre-commercial procurement (PCP) of research services model.

Action 2.3 Wave Energy Europe Pre Commercial Procurement (PCP) action for development of wave energy technology.

Description of each R&I Activity (repeat as many times as the number of R&I Activities)	
Title: **Wave Energy Europe Pre Commercial Procurement (PCP) action for development of wave energy technology.**	
Targets: Reduction of LCOE for wave energy to 15 cEUR/kWh by 2030	**Monitoring mechanism:** Annual progress reports
Scope: Driving the development and the convergence of emerging wave energy technology to full device stage through the adoption of an EU-wide innovation programme.	
Description: Wave Energy Europe (WEE) will drive the search for innovative solutions to the technical challenges facing the wave energy sector up to TRL8. Through a competitive procurement programme key sub-systems, systems and devices, as identified requiring support in Actions 1.5, will be selected and given up to 100% funding support to progress. Development is carefully managed and controlled using the stage gate metrics system (Action 1.7). The ultimate aim is to produce reliable technology which will result in cost effective wave energy generation. The WEE programme approach requires a dedicated, informed and capable organisation and team to operate the programme. Sufficient technical expertise to be able to specify what is required, assess applications against key metrics, select best projects, manage project delivery and integrate solutions is a vital. WEE will build on the model and experience within the Wave Energy Scotland programme (WES), which uses European Pre-Commercial Procurement (PCP), provides a clear demonstration of a potential delivery model. WES has demonstrated that it can stimulate significant innovation activity and attract interest from out with the marine energy sector leading to good examples of technology transfer from more mature sectors. In addition such a concentrated and focussed programme has led to high levels of collaboration and partnership between organisations across Europe and has led to greater levels of innovation and progress. Specific technology specialists have the opportunity to focus on what they are good at and others specialists can provide other solutions leading a stronger overall WEC solution.	
TRL: Advanced research /Industrial research & demonstration -> TRL 1-8	
Total budget required: 24M EUR (including programme management costs, R&D budget covered in action 1.5)	
Expected deliverables	**Timeline**
	01/2018 – 12/2019
Portfolio of stage 1, 2, 3 projects awarded, and progressed to stage 4 in participating MS	01/2019 to 12/2024

Party / Parties EU, IE, UK ← countries already involved	**Implementation instruments**	**Indicative financing contribution**
EU, MS	National funding programmes (incl. public & private contributions) combined in bi- or multilateral projects.	Included in national programs. 18M EUR from MS 6M EUR EC Contribution

Fiche Curator (initials):	Date:	Revised by (chair initials)	Date of revision:
TWG	23/02/2018	DM	23/02/2018

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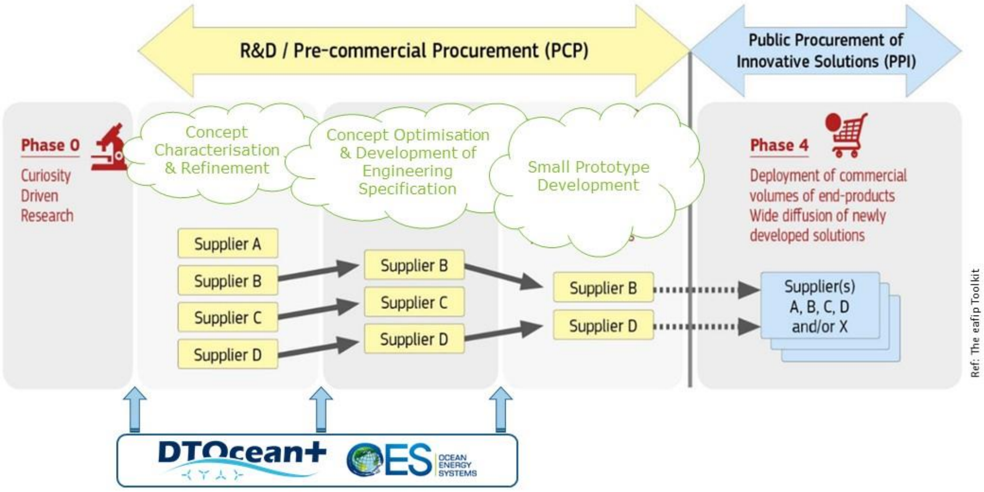
Pre-Commercial Procurement (PCP)



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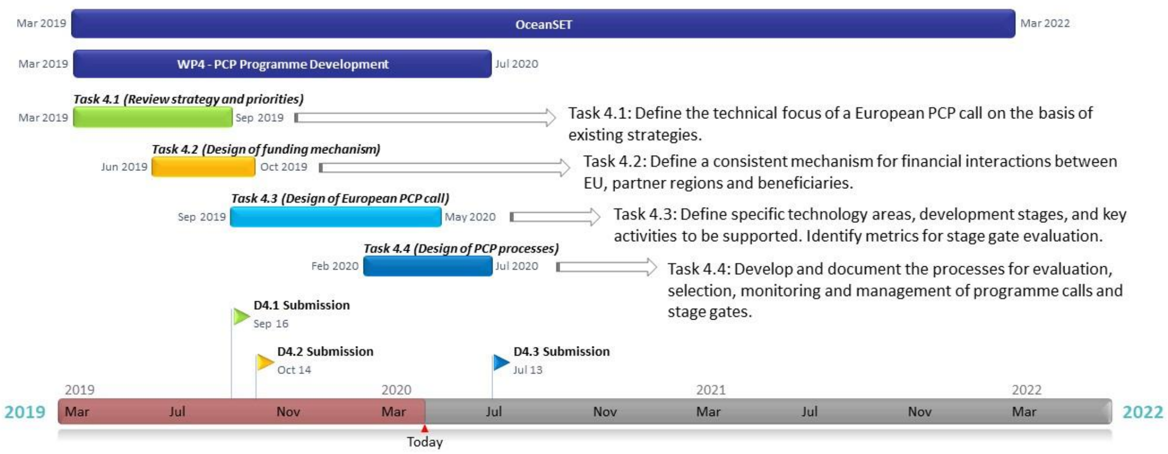
OceanSET WP04



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Task 4.1 - Review Strategies and Priorities

Member State & Regional priorities

- Spain / Basque Region / Canary Islands
- UK / Scotland / Wales
- Ireland
- Portugal

Technology roadmaps

- Ireland
- UK
- France
- Denmark

ETIP Ocean – Strategic research priorities

- Strategic Research Agenda (2016)
- Strategic Research & Innovation Agenda (2020)

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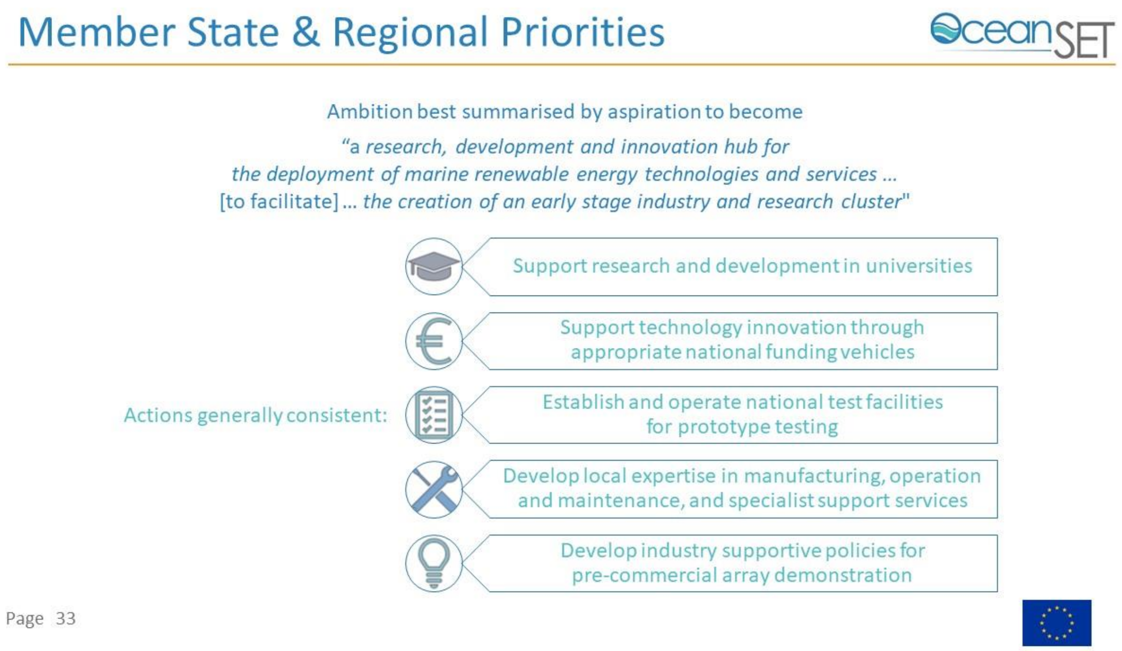
Member State & Regional Priorities
Ambition best summarised by aspiration to become
"a research, development and innovation hub for
the deployment of marine renewable energy technologies and services ...
[to facilitate] ... the creation of an early stage industry and research cluster"
Actions generally consistent:
Support research and development in universities
Support technology innovation through appropriate national funding vehicles
Establish and operate national test facilities for prototype testing
Develop local expertise in manufacturing, operation and maintenance, and specialist support services
Develop industry supportive policies for pre-commercial array demonstration
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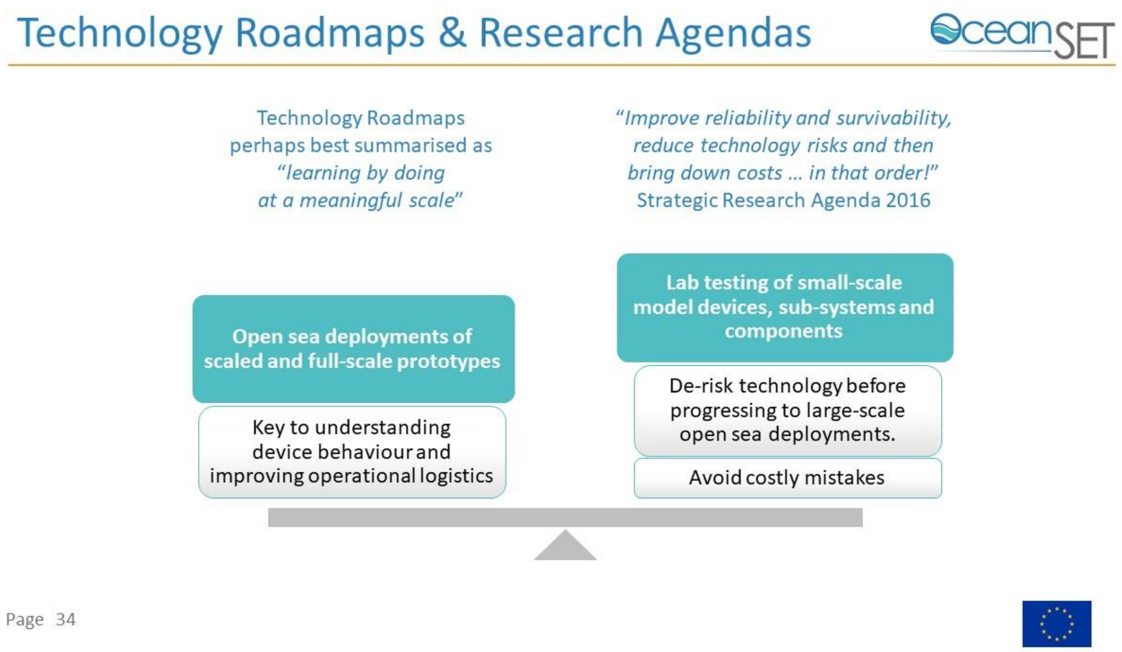
Technology Roadmaps & Research Agendas
Technology Roadmaps perhaps best summarised as "learning by doing at a meaningful scale"
"Improve reliability and survivability, reduce technology risks and then bring down costs ... in that order!" Strategic Research Agenda 2016
Open sea deployments of scaled and full-scale prototypes
Key to understanding device behaviour and improving operational logistics
Lab testing of small-scale model devices, sub-systems and components
De-risk technology before progressing to large-scale open sea deployments.
Avoid costly mistakes
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Proposed Technology Priority Areas

Scaled prototype testing	Progression to open water testing of utility-scale generation technology at an appreciable scale with functional subsystems, demonstrating performance in representative and then operational wave climates, i.e. between TRL 5 and 7.
Technology for off-grid applications	Product development for the blue economy sectors – Lower power requirements (a few hundred watts to a few hundred kilowatts) allow for smaller designs and faster design cycle iteration.
Mooring and anchoring systems	Improved mooring and anchoring concepts to provide a cost effective sub-system in a wide range of seabed conditions and permit rapid installation and removal operations through improvements in connection and disconnection techniques.

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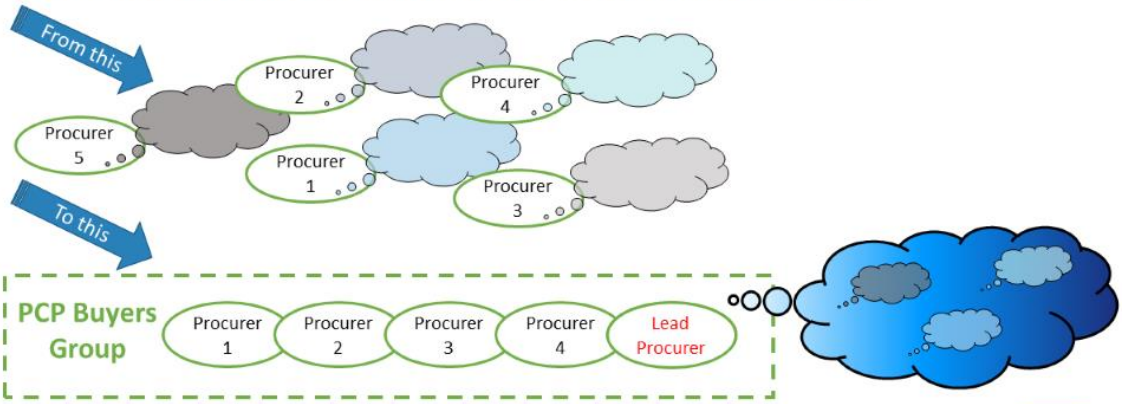
Task 4.2 - Design of funding mechanism

Develop an approach for cross-border multi-partner PCP programme for wave energy technology compliant with EU PCP model.



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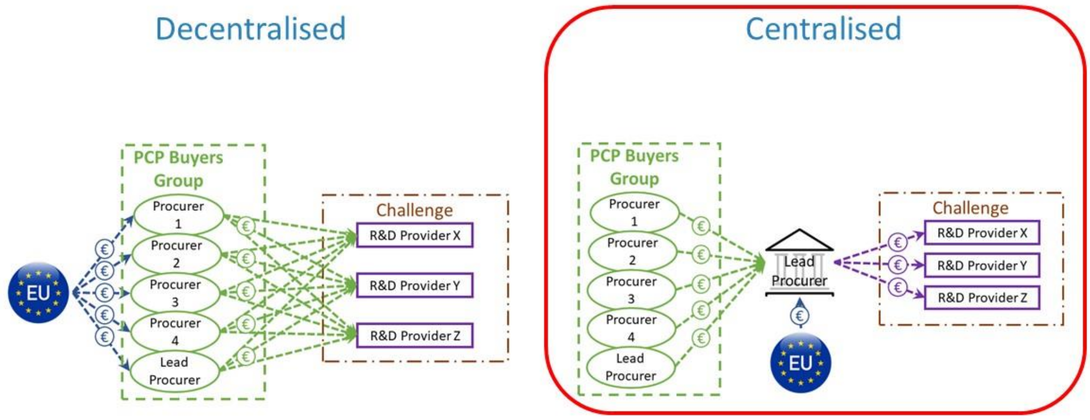
Approaches to Payments



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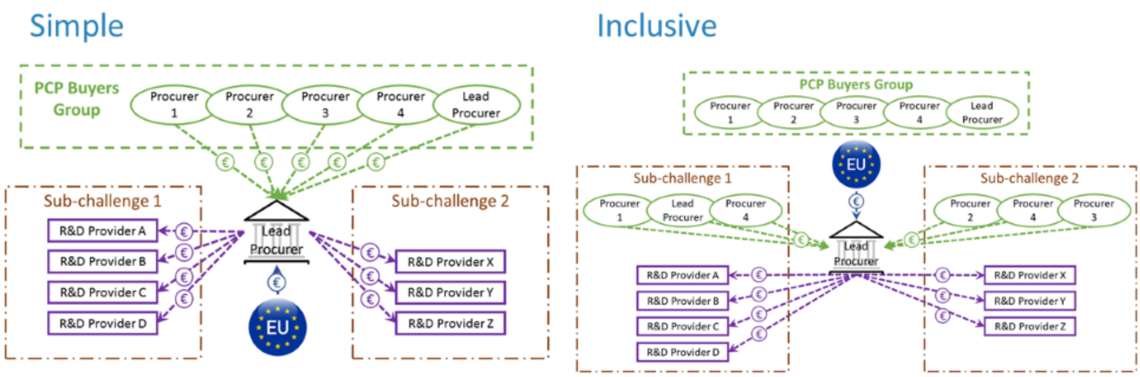
Approach to Participation



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Concluding WP04
• Task 4.3
Add detail to the priority technology areas (Task 4.1)
• Task 4.4
Develop the approach to the delivery and operation of PCP programmes.
Define common processes for:
• Call release and publication
• Evaluation and selection of proposals
• Management of technology development programmes including stage gate methodology
• Intellectual property management
• Reporting and dissemination
Produce template call documents.
Completion expected July 2020
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Support to the realisation of the ocean energy implementation plan of the SET-Plan
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