ETIPOCEAN

European Technology & Innovation Platform for Ocean Energy

Strategic Research & Innovation Agenda (SRIA)

ETIP Ocean Webinar - 28 November 2019

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THE UNIVERSITY of EDINBURGH

Ocean Energy Europe

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Introduction

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THE UNIVERSITY of EDINBURGH

Ocean Energy Europe

European Commission

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 826033.

Objectives

- A reference document for the whole ocean energy sector and specifically for **public funding organisations** (EC, Member States and Regional Agencies) with the aim of inspiring research calls.
- Updates **key priority challenge areas** for research, technology development and innovation
- Defines specific objectives and actions to carve the path towards **Ocean Energy commercialisation**
- Developed in close cooperation with **sector stakeholders**
- To be published in **January-February 2020**

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Methodology

- Formation of **Technology Working Group**
- Identification of **priority technology development topics**
- A series of webinars and workshops to **collect feedback**:
  - Validate the identification of priority areas (June)
  - Validate the SRIA structure (September)
  - Validate the draft contents of the SRIA (November, December)
- Final document to be **approved by the EC** (Dec-Jan)
- **Public version**, including editing and formatting (Jan-Feb)
- Further webinars and workshops **to subsequently exchange on the identified priority topics** (2020-2021)

Today's objective

- The purpose of this webinar is to present a **preliminary content** of the Strategic Research and Innovation Agenda **focused on tidal energy** to get **feedback from ETIP Ocean members** and to ensure it covers the sector needs
- **Why** we are bringing this work to the ETIP Ocean members?
  - The ETIP Ocean members has a broad, diverse base of knowledge and experience with which to validate the SRIA

- **What** we need from you (<u>after the webinar</u>)

  You will receive an email directly after the webinar with this presentation, a draft version of the SRIA and a feedback questionnaire.

  1. Please review the draft SRIA.
  2. Please complete the questionnaire by 12 December.

Feedback questionnaire

Please take a look at the Priority Topics <u>for your area of expertise</u> under each Challenge Area and answer these questions:			
Please indicate which Priority Topic you refer to:		Mark your answer with an X	Justification for your answer
1. Are the proposed actions sufficient to cover the needs of the sector?	Yes		
	No		
2. Is the proposed TRL realistic?	Realistic		
	Too high		
	Too low		
3. Is the indicated budget sufficient to tackle this challenge? *Please choose all that apply.*	Sufficient		
	More actions needed		
	Bigger actions needed		
	Smaller actions needed		
	Fewer actions needed		

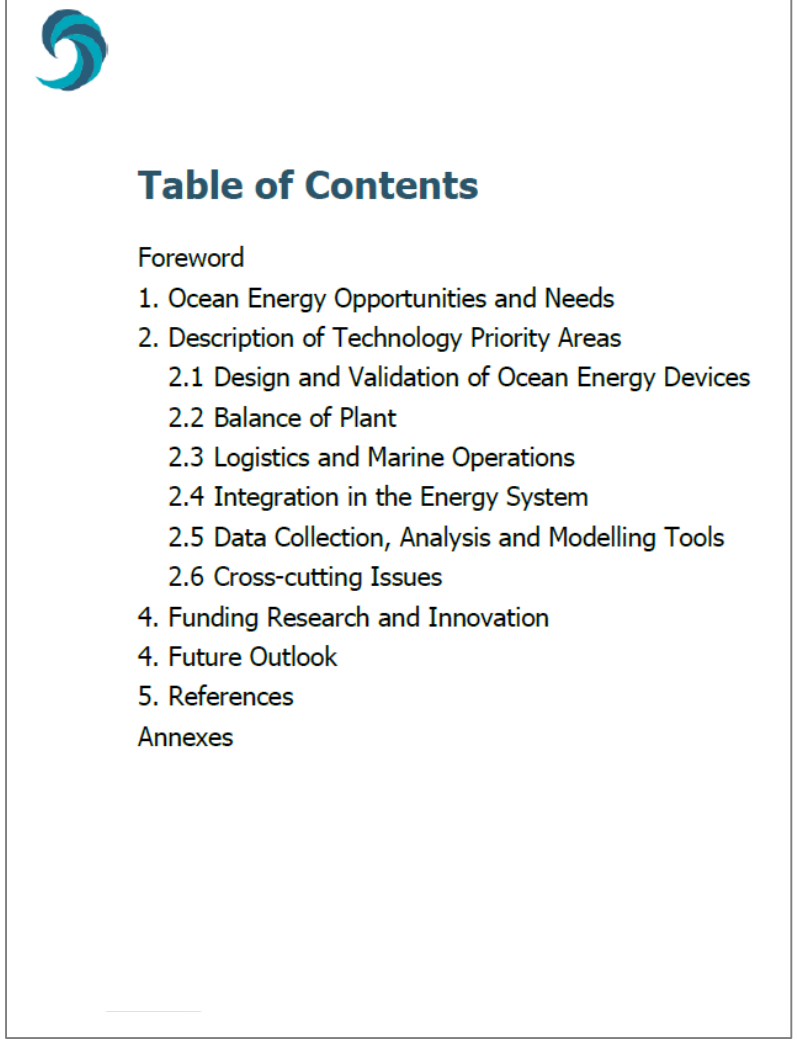


Table of Contents

SRIA Structure

- **Foreword** by the Steering Committee chairperson
- Ocean energy **context**
  - Brief state of the art on ocean energy technologies
  - Main opportunities for the ocean energy sector
  - Needs and obstacles to overcome
- Description of the prioritised **Challenge Areas**
  - Selected **priority topics**, their applicability and scope
  - **Actions**, expected impact, TRL and budget required
- **Instruments for funding** research & innovation actions
- **Future Outlook**, i.e. indications for future updates
- Annex: Summary of the prioritisation **methodology**

Opportunities and Needs in Tidal Energy

Opportunities

- Highly **predictable** energy to complement other renewables
- 100 GW of ocean energy could meet **10% of Europe's energy needs** by 2050
- 400,000 **skilled jobs** and economic development in costal areas
- European **export leadership** of a market worth €53bn/year
- **Security of supply** and avoided imports bill for fossil fuels
- **Benefits for the EU islands** (e.g. local source, cheaper, little or no visual impact)

Needs

- **Financing innovation** across the stages of development
- **Real sea demonstration** to remove technology risk, lower capital costs and provide market visibility
- Financial instruments to help projects **reach financial close**.
- **Reducing costs** through economies of scale
- Streamlining **licensing and consenting** processes

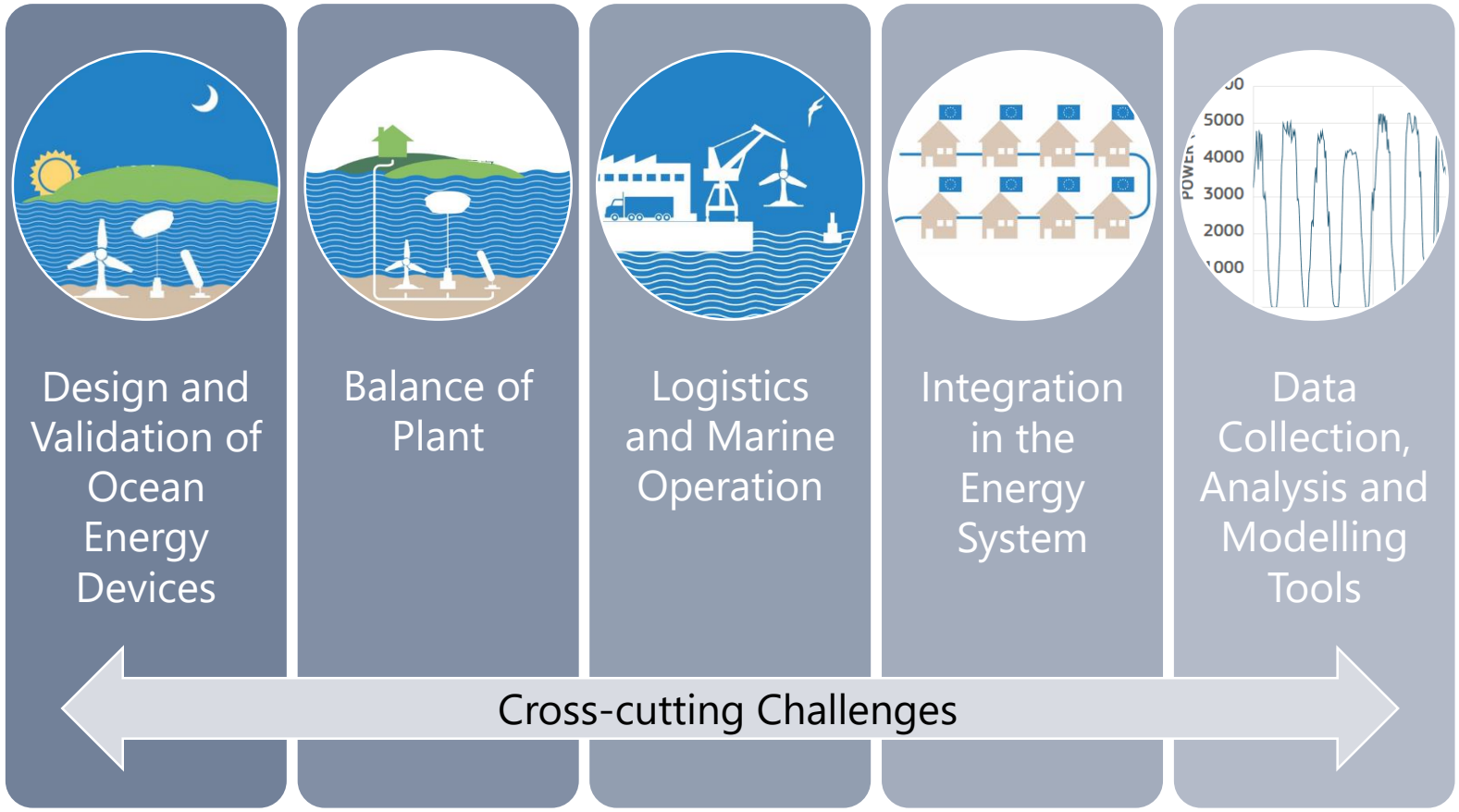
Tidal Energy Context

Brief State-of-the Art

- Tidal technologies are **approaching commercialisation**, with the deployment of full-scale devices in real conditions at sea.
- With a suitable market mechanism, European developers are now **ready to build out arrays** in Europe.
- Tidal energy is **approaching design convergence**. Successful designs generally comprise horizontal axis turbines, both bottom-mounted and floating.
- Through demo projects, tidal devices are **gaining real sea experience**, but to de-risk the technology further maturity in arrays is required.
- An **industrial supply chain** is growing, adapting existing practices and creating new knowledge.

Challenge Areas and Specific Priority Topics

Challenge Areas: Research and Innovation Priorities



Description of each Challenge Area

- **General description** of the challenge area
  - Main challenges
  - Very brief state of the art
  - Expected impact of the whole challenge area

- **Specific priority topics**:
  - Applicability to wave/tidal/other
  - Scope of the specific priority technology development topic
  - Actions
  - Expected impact
  - Funding instrument adequacy: TRL, budget required

Design and validation of tidal energy devices (1)

- **Scope**:
  - Research, design, development and validation of devices and subsystems.
  - Real sea testing provides invaluable learnings and can lead to validating the technology.
  - Demonstration of the potential benefits of innovative materials from other sectors.
  - Improving the seaworthiness of turbine blades to reduce the likelihood of failures.
  - Control of tidal turbine blades and rotor.
- **Expected impact**:
  - Improve performance, reliability and survivability.
  - Reduce fatigue, unexpected failures, unplanned maintenance and thus increase availability.
  - Achieve design convergence and simplification to lower maintenance costs.
  - More efficient manufacturing processes.
  - Contribute to LCOE reduction approaching SET-Plan targets.

Devices

Structure and Prime Mover

PTO and Control

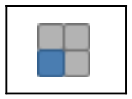
Design and validation of tidal energy devices (2)

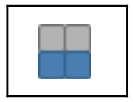
Specific priority topics	TRL			Size/no. of Actions		
	Low	Medium	High	Small	Medium	Large
Demonstration of existing ocean energy devices to gain experience in real sea conditions			✓			
Application of material innovations from other sectors			✓			
Improvement of tidal blades, including pitch and yaw technology investigation & demonstration		✓	✓			

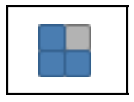
Small: <2M€

Medium: 2 to 8 M€

Large: > 8M€

 A few actions (2-3)

 Around 5 actions

 Several actions (> 7)

Balance of plant (1)

- **Scope**:
  - Physical balance of plant such as device mooring and foundation and electrical balance of plant including cabling, substations and connections.
  - Real sea operating experience to validate the solutions.
  - Optimisation and standardisation of designs.
  - Innovative concepts (e.g. combined mooring and electrical connectors, wet- and/or dry mate connectors tailored to ocean energy applications)
- **Expected impact**:
  - Increase reliability, availability and survivability of solutions.
  - Improve installation, operation and maintenance of devices
  - Reduce uncertainties and risks.
  - Contribute to LCOE reduction approaching SET-Plan targets.

Foundations and Moorings

Connections

Balance of plant (2)

Specific priority topics	TRL			Size/no. of Actions		
	Low	Medium	High	Small	Medium	Large
Advanced mooring and connection systems for floating ocean energy devices.		✓				
Improvement and demonstration of foundations and connection systems for bottom-fixed ocean energy devices.		✓	✓			

Small: <2M€

Medium: 2 to 8 M€

Large: > 8M€

A few actions (2-3)

Around 5 actions

Several actions (> 7)

Logistics & Marine Operations (1)

- **Scope**:
  - Technology development and demonstration of marine operations related to installation, operation, maintenance and decommissioning of both single devices and arrays.
  - Adapting good practices from other sectors, developing bespoke operations and tools, and documenting and sharing experience.
  - Applying latest sensor technology and recent advances in condition monitoring.
  - Predictive maintenance techniques.
- **Expected impact**:
  - Improve know-how and data available to industry and future projects.
  - Reduce uncertainties, risks and costs.
  - Improve survivability by early detection of failure risk.
  - Contribute to LCOE reduction according to SET-Plan targets.

Installation

Operations and Maintenance

Logistics & Marine Operations (2)

Specific priority topics	TRL			Size/no. of Actions		
	Low	Medium	High	Small	Medium	Large
Optimisation of maritime logistics and operations		✓	✓			
Instrumentation for condition monitoring and predictive maintenance including digital tools		✓	✓			

Small: <2M€

Medium: 2 to 8 M€

Large: > 8M€

A few actions (2-3)

Around 5 actions

Several actions (> 7)

Integration in the Energy System (1)

- **Scope**:
  - Knowledge generation about barriers and benefits of the integration of tidal energy arrays i the European energy system (continental grid and islands).
  - Identifying niche applications for first near-commercial deployment of tidal energy.
  - Demonstration of grid-level system balancing benefits.
  - Combining multiple renewable energy sources to be included.
- **Expected impact**:
  - De-risking commercial development of tidal energy.
  - Quantify benefits and additional value to the grid.
  - Identify remaining issues on pathway to grid-scale integration (e.g. power quality, predictability, intermittency, market prices fluctuations, and costs of curtailment/under-production).
  - Contribute to LCOE reduction according to SET-Plan targets.

Arrays

Whole System

Integration in the Energy System (2)

Specific priority topics	TRL			Size/no. of Actions		
	Low	Medium	High	Small	Medium	Large
Developing and demonstrating near-commercial application of ocean energy in niche markets			✓		■■	■■
Quantifying and demonstrating grid-scale benefits of ocean energy			✓	■■		

Small: <2M€

Medium: 2 to 8 M€

Large: > 8M€

■ A few actions (2-3)

■■ Around 5 actions

■■ Several actions (> 7)

Data collection, analysis and modelling tools (1)

- **Scope**:
  - Generation of information and tools that are critical for other challenge areas, and facilitating information sharing through standardised data management and storage.
  - New technologies allowing better collection, analysis and processing of large datasets
- **Expected impact**:
  - Improve performance, reliability, availability and survivability through better designs and more efficient operations.
  - Access to open-data repositories
  - Contribute to LCOE reduction according to SET-Plan targets.

Energy Yield

Design and Optimisation Tools

Data collection, analysis and modelling tools (2)

	TRL			Size/no. of Actions		
Specific priority topics	**Low**	**Medium**	**High**	**Small**	**Medium**	**Large**
Marine observation, modelling and forecasting to optimize design and operation of ocean energy devices		✓	✓		■	
Open-data repository for ocean energy			✓	■		

Small: <2M€

Medium: 2 to 8 M€

Large: > 8M€

■ A few actions (2-3)

■ Around 5 actions

■ Several actions (> 7)

Cross-cutting Challenges (1)

- **Scope**:
  - Demonstrating and quantifying environmental and socio-economic benefits to better inform policy and financial decisions.
  - Dissemination of good practices to reduce or eliminate negative environmental impacts.
  - Quantify the job creation potential of various scenarios of tidal energy deployments.
  - Consolidation of guidelines, specifications and standards with experience from the learning from laboratory testing and real-case applications.
- **Expected impact**:
  - Reduced negative environmental impacts.
  - Increase employment and biodiversity benefits of wave energy deployment (longer term).
  - Contribute to the establishment of widely accepted standards.
  - Increase insurability and bankability of projects.

Environment and socio-economics

Standardisation

Cross-cutting Challenges (2)

Specific priority topics	TRL			Size/no. of Actions		
	Low	Medium	High	Small	Medium	Large
Improvement of the environmental and socioeconomic impacts of ocean energy		✓	✓	▪	▪	
Standardisation & certification			✓	▪		

Small: <2M€

Medium: 2 to 8 M€

Large: > 8M€

▪ A few actions (2-3)

▪ Around 5 actions

▪ Several actions (> 7)

Thank you – Questions?

Pablo Ruiz-Minguela, Joannès Berque, Jose Luis Villate – TECNALIA

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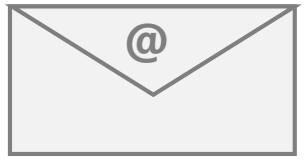
Next steps

Next steps

28 Nov
Webinar

2 Dec
Webinar with TWG

12 Dec
Your feedback



Dec/Jan
SRIA submission

Jan 2020
EC officer revision

Feb 2020
Final publication

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