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European Technology & Innovation Platform for Ocean Energy

Strategic Research & Innovation Agenda (SRIA) structure

Technology Working Group Webinar - 18 September 2019

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Ocean Energy Europe

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Introduction: general SRIA structure

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Strategic Research and Innovation Agenda (SRIA)

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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:
  - Update **key priority challenge areas** for research, technology development and innovation
  - Define specific objectives and actions to carve the path towards **Ocean Energy commercialisation**
  - Feed into **policy advice** documents and the **Ocean Energy Roadmap**
- Audience: the whole ocean energy sector but specifically **public funding organisations** (EC, member states and regional agencies) with the aim of inspiring research calls.
- Developed in close cooperation with sector stakeholders
- To be published in **January 2020**

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Methodology

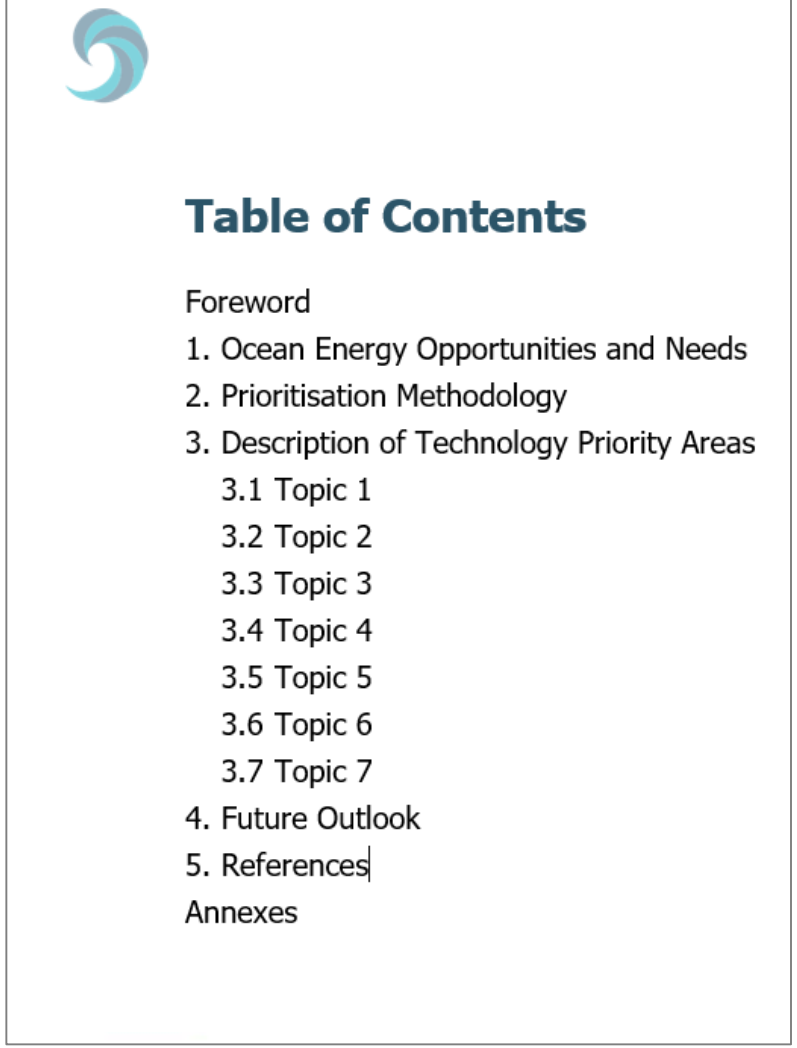
✓ Formation of **Technology Working Group**

✓ Identify priority technology development areas

✓ 1st webinar to validate the identification of priority areas (June)

Next milestones:

- **2nd webinar (today)** to validate the SRIA structure + **Feedback** from TWG before the end of September
- 3rd webinar on December 2nd to validate the draft content of the SRIA → Draft version validated by TWG and SC
- Final version (D2.2): end of December, to be approved by the EC
- Public version: January 2020, including editing and formatting
- 2020-2021: 9 webinars and up to 2 workshops to subsequently exchange on the identified technology development priority areas



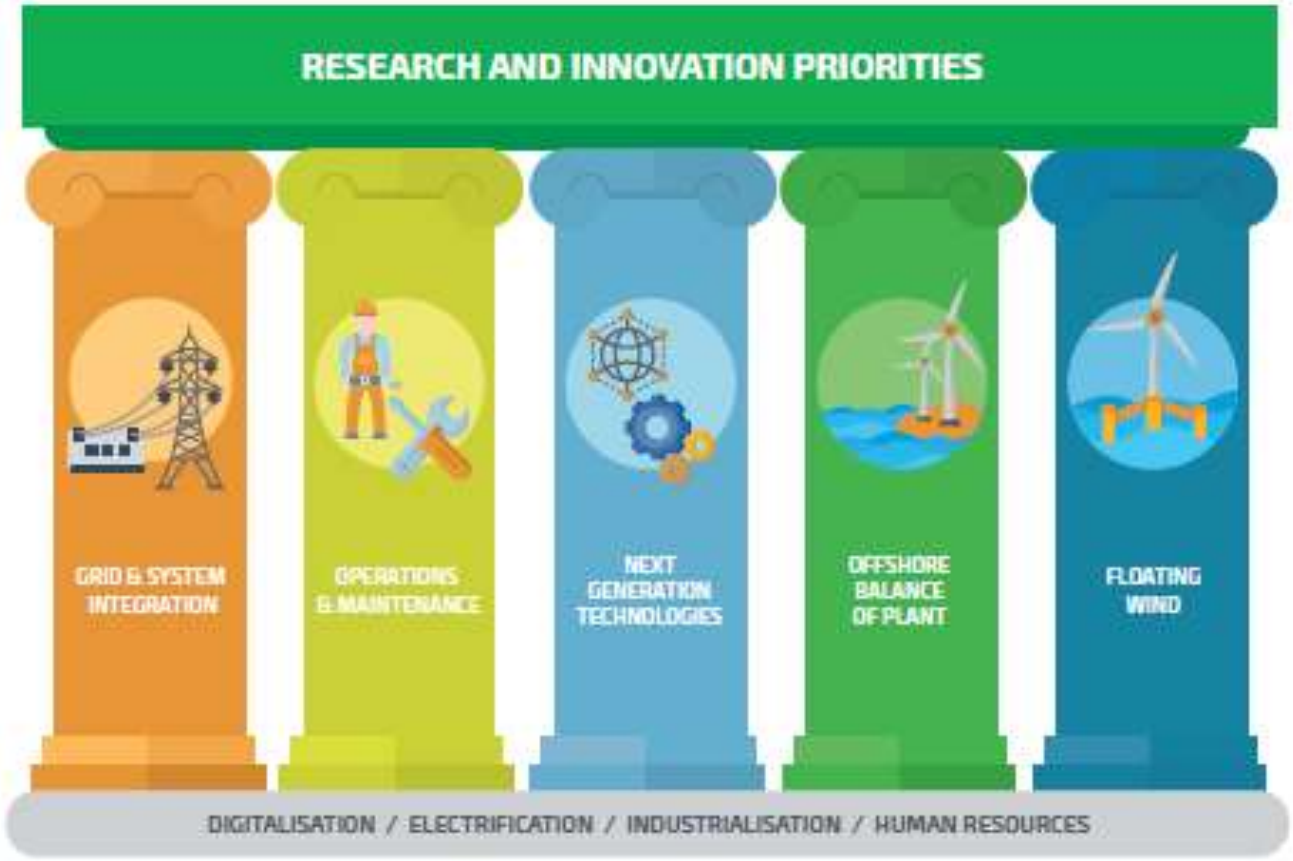
SRIA structure (validated by the Steering Committee)

- Foreword by SC chairperson
- Ocean energy opportunities and needs (context)
  - Ocean energy technologies (brief state of the art)
  - Opportunities: Steering Committee vision (coordinated by OEE)
  - Needs: references to the SET Plan implementation plan and other previous documents: Ocean Energy Forum Roadmap, previous SRIA, DG-MARE report…
- Short summary of the prioritisation exercise
- **Description of prioritised Challenge Areas**
- Description of a number of **selected topics**
  - The description will be made in the format of “funding research topics” for EC and member states.
- Future Outlook (indications for future updates)

Focus of today’s webinar

SRIA wind example

Reference [ETIPWind SRIA]



Today's objective

- The purpose of this webinar is to present a structure for the Strategic Research and Innovation Agenda on ocean energy to get feedback from TWG and to ensure it covers the sector needs
- Why we are bringing this work to the TWG
  - The TWG has a broad, diverse base of knowledge and experience with which to validate the SRIA structure

- What we need from you (<u>after the webinar</u>)
  1. Please review the global SRIA structure
  2. Please review the challenge areas proposed
  3. Please review the description of each challenge area and the selected technology challenges

  You will receive an email directly after the webinar with this presentation and feedback questionnaire.

Review of the prioritisation (D2.1)

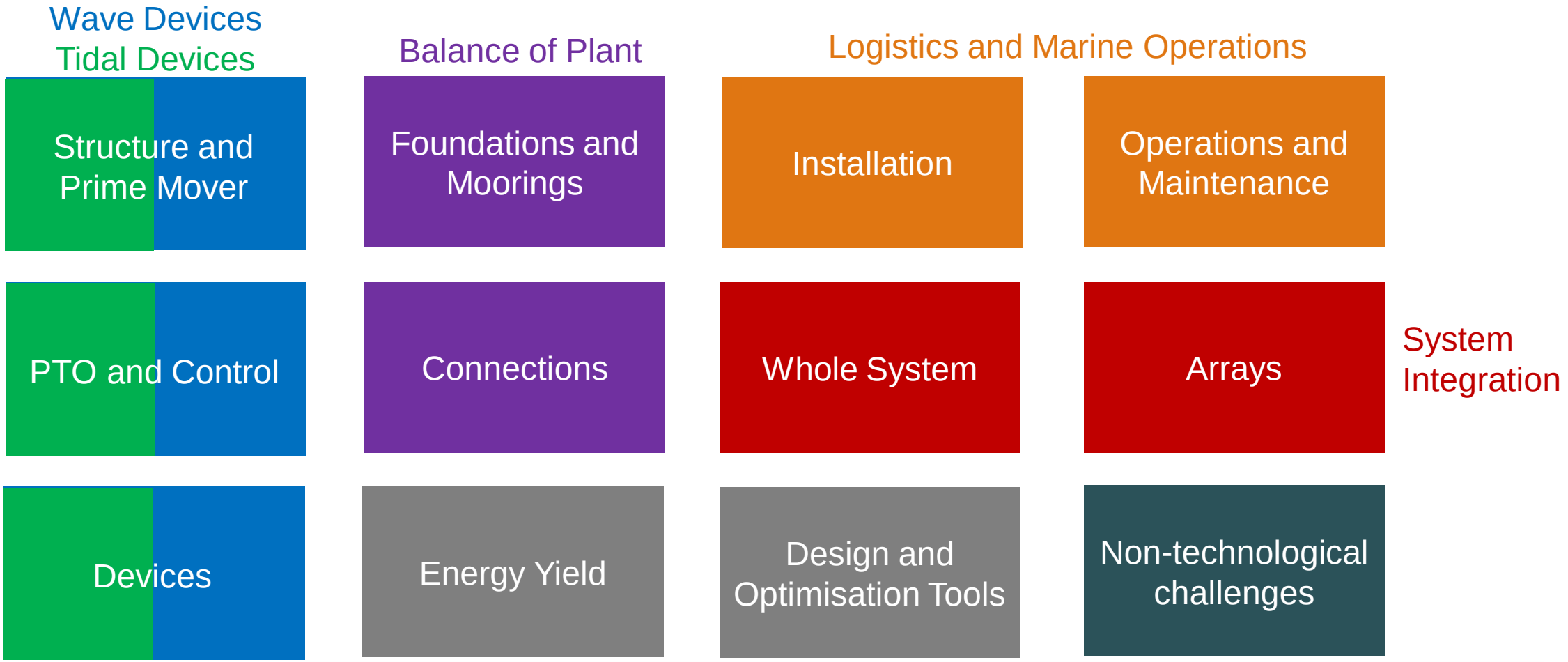
D2.1 → **11** Challenge Areas & **61** Technology Challenges

Structure and Prime Mover	Foundations and Moorings	Installation	Operations and Maintenance
PTO and Control	Connections	Whole System	Arrays
Devices	Energy Yield	Design and Optimisation Tools	

Analysis of the prioritisation exercise

- There might be **too many challenge** areas and they could be regrouped.
- **Challenge areas are "unbalanced"**: some have more content (with several technology challenges) while others are more specific (2 or 3 technology challenges).
- Some technology challenges can be applied for wave and tidal but others are **specific for wave or tidal**: could it be a specific challenge area for wave and another for tidal?
- The description of challenge areas could combine a wide approach but at the same time **focus on some technology challenges** with higher both importance for the sector and opportunity to Europe.
- We have missed a challenge area on "**non-technological issues**" including challenges such as minimise environmental impacts or certification and standards to reduce risk.

Regrouping Challenge Areas



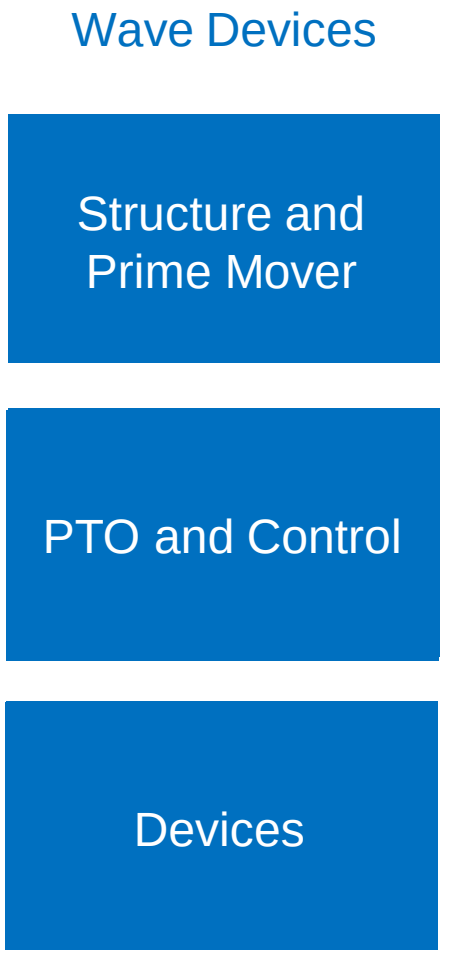
Description of challenge areas

How to describe each challenge area

- **General description** of the challenge area
  - Main challenges
  - Very brief state of the art
  - Expected impact of the whole challenge area
  - Note: This general description would cover the whole range of technology challenges. This section would be “inclusive” and the prioritisation wouldn’t affect too much.
- **Specific technology challenges** under each area (**prioritised** technology challenges)
  - Description of the specific technology challenge
  - Applicability to wave/tidal/both
  - Expected impact
  - Funding instrument adequacy → TRL entry/exit

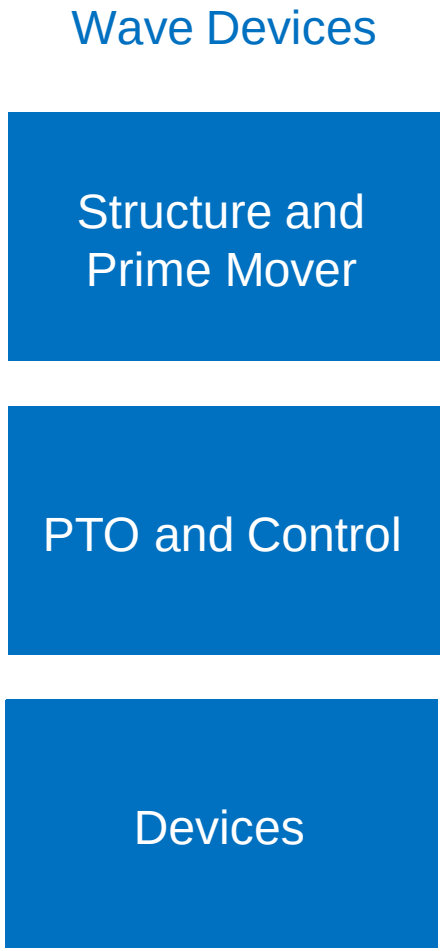
Wave energy devices (1)

- **General description** (not comprehensive in this slide)
  - Wave energy devices still lack of enough survivability and reliability leading to high costs
  - PTO & Control systems can improve efficiency
  - New material can reduce CAPEX while improving reliability
  - Multiple concepts under development, several tested in real conditions but lack of reliable performance data
  - Lack of common, recognised and open access dry and wet testing facilities
- **Expected impact** of the whole challenge area**:** reduce CAPEX, improve efficiency but also gain in real operation experience to reduce uncertainties and risks (improving reliability and survivability)



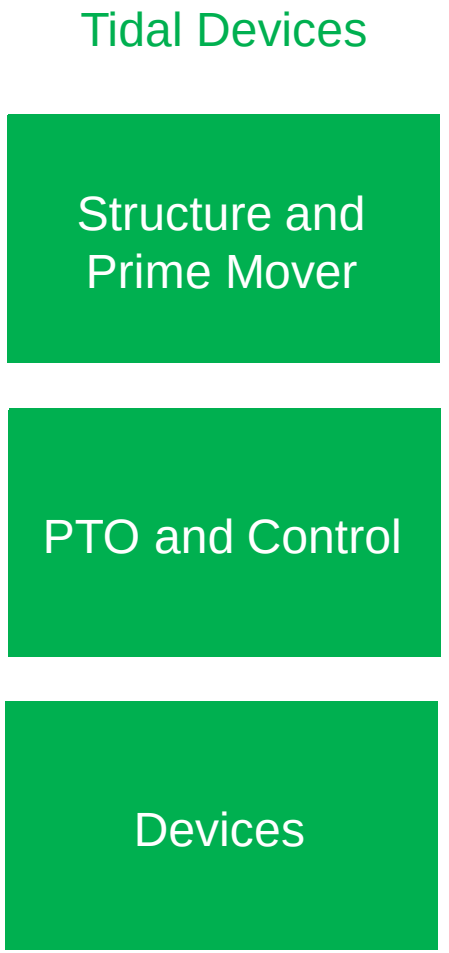
Wave energy devices (2)

- **Specific technology challenges:**
  - Cost, performance and reliability improvements to existing devices
  - Demonstration and improvement of current PTO technology e.g. control systems, gearbox, direct drive, power electronic conversion
  - Novel materials to reduce biofouling, corrosion and extend lifetimes (shared with tidal devices).
  - Development of novel devices at TRL 3-6 and investigation into alternative generation methods



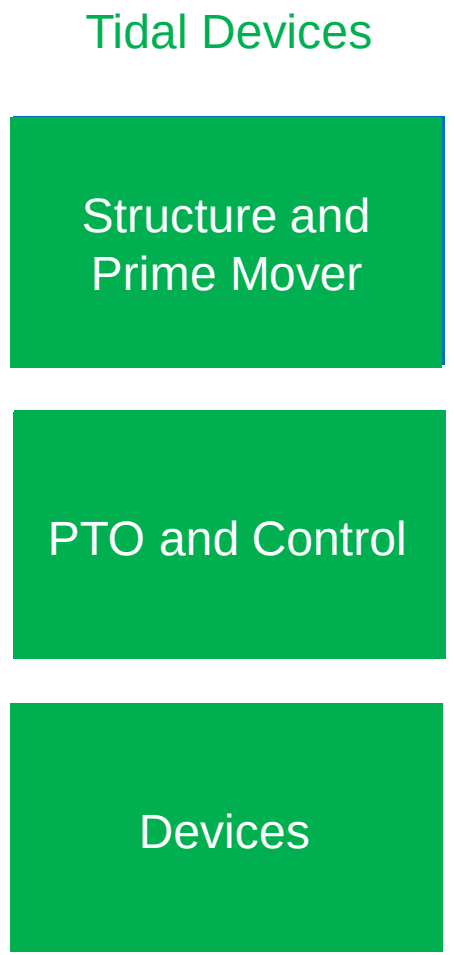
Tidal energy devices (1)

- **General description** (not comprehensive in this slide)
  - Tidal energy devices need to gain experience in real conditions to reduce risks
  - Some uncertainties about reliability of blades
  - Efficiency and availability can continuously improve
  - New material can reduce CAPEX while improving reliability
  - Lack of common, recognised and open access dry and wet testing facilities
- **Expected impact** of the whole challenge area**:** reduce CAPEX, improve efficiency but also gain in real operation experience to reduce uncertainties and risks (improving reliability and survivability)



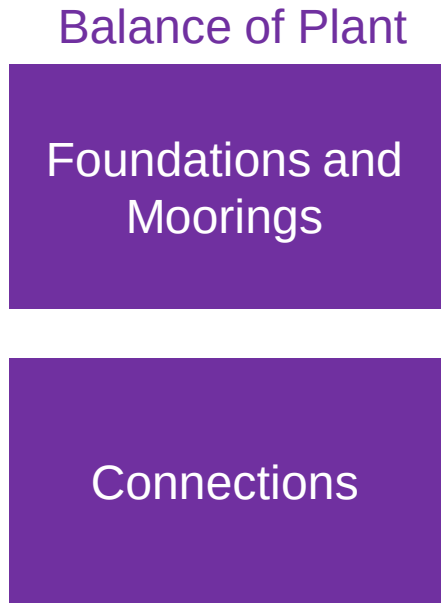
Tidal energy devices (2)

- **Specific technology challenges:**
  - Cost, performance and reliability improvements to existing devices
  - Novel materials to reduce biofouling, corrosion and extend lifetimes (shared with wave devices)
  - Need for improved pitch and yaw technology investigation & demonstration
  - Improved tidal blade technology investigation



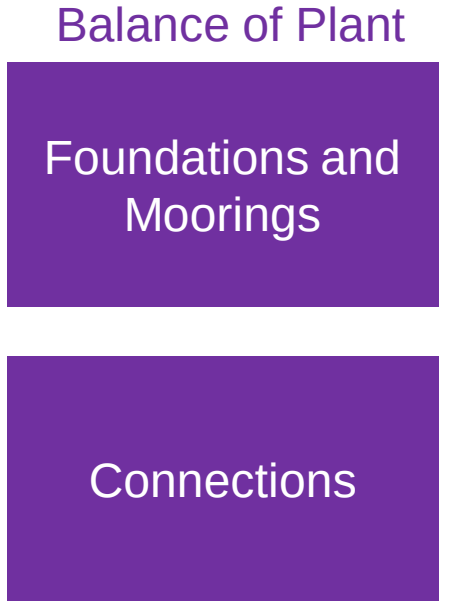
Balance of plant (1)

- **General description** (not comprehensive in this slide)
  - Standardised solutions: combined solutions for mooring and connection?
  - Reliability of dynamic cables
  - Lack of real sea experience
  - Installation in high energy areas
  - …
- **Expected impact** of the whole challenge area: reduce CAPEX, improve operations (installation and maintenance), gain in real operation experience to reduce uncertainties and risks (improving reliability and survivability)



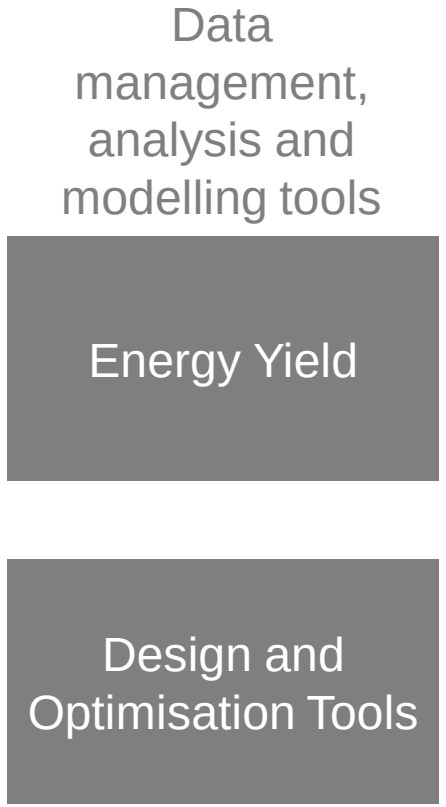
Balance of plant (2)

- **Specific technology challenges**
  - Advanced mooring development & demonstration for wave energy devices
  - Improvements to wet mate and dry mate connectors
  - HV sub-sea hub



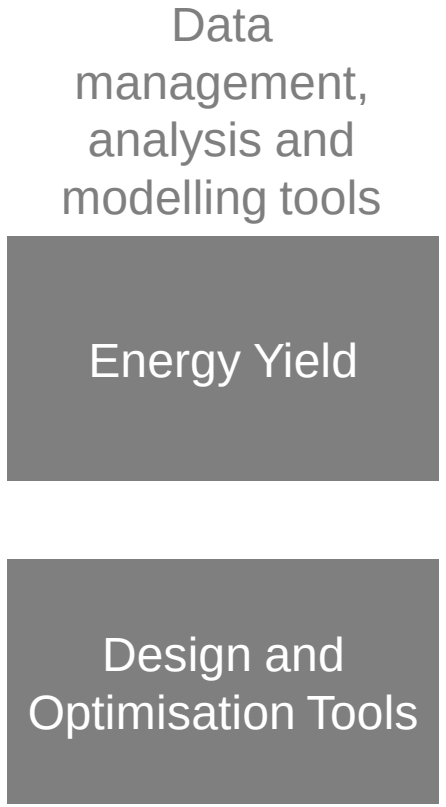
Data management, analysis and modelling tools (1)

- **General description** (not comprehensive in this slide)
  - As the sector progresses with more demonstration projects more data is available
  - Data management can help to optimise designs, installation procedures, reduce uncertainties…
- **Expected impact** of the whole challenge area: improve wave & tidal performance and reliability optimising designs and procedures by means of analysing data



Data management, analysis and modelling tools (2)

- **Specific technology challenges**
  - Wave resource modelling: Better near-field wave forecasting and measurement to improve controllability and yield of devices as well as survivability.
  - Tidal resource modelling: its impact on yield as well as on reliability –blades and PTO loading
  - Limitations to research in gathering, distributing, employing and protecting data within tools



Logistics & Marine Operations (1)

- **General description** (not comprehensive in this slide)
  - Installation of wave & tidal energy devices can learn from other sectors (in particular offshore wind) but bespoke installation methods might be required
  - Operation can lead to improve efficiency and availability using new techniques and instrumentation
  - As the sector gains experience with demonstration projects maintenance of wave & tidal projects can be improves with new technologies
- **Expected impact** of the whole challenge area: reduce CAPEX by means of improving installation methods and reduce OPEX with optimised O&M techniques

Logistics and Marine Operations

Installation

Operations and Maintenance

Logistics & Marine Operations (2)

- **Specific technology challenges**
  - Design and demonstration of improved physical maintenance procedures
  - Predictive maintenance techniques
  - Instrumentation for condition monitoring

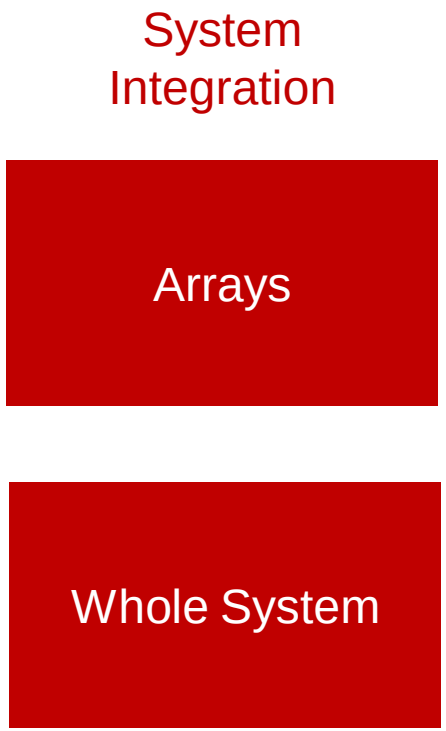
Logistics and Marine Operations

Installation

Operations and Maintenance

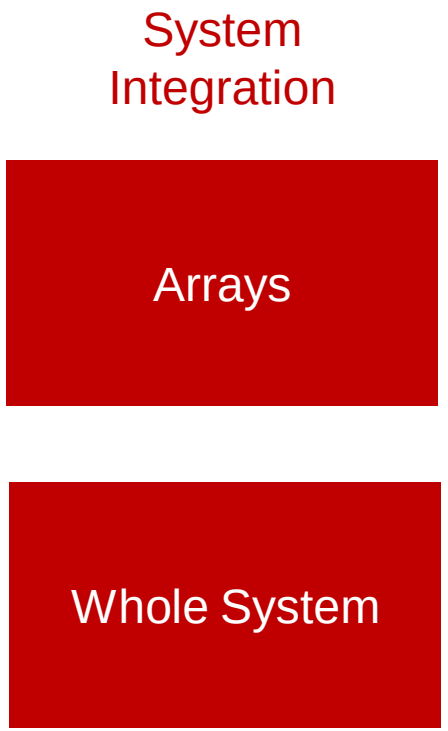
System integration (1)

- **General description** (not comprehensive in this slide)
  - The use of wave & tidal energy at utility scale will require some investigation about how this energy can be integrated into the electrical grid, understanding benefits and barriers
  - Other uses of wave & tidal energy (weak grids of islands and remote areas, non-grid installation…) will have different requirements in comparison to the utility scale use
  - Array configurations can lead to unknown effects
- **Expected impact** of the whole challenge area: Efficiency improvement. Reduction of uncertainties/risks while understanding benefits and barriers to attract investors.



System integration (2)

- **Specific technology challenges**
  - Improving integration with the wider energy system from the nascent design stage through to array deployment to provide added value.
  - Developing grid-level system balancing benefits from wave and tidal electricity generation
  - Turbulence intensity and wake effects investigation



Non-technological challenges (1)

- **General description** (not comprehensive in this slide)
  - Wave & Tidal energy lack of standards and certification processes in comparison to other more mature sectors.
  - As the sector progresses with more open sea projects, environmental impacts need to be monitored and this experience can be used to define appropriate mitigation measures.
- **Expected impact** of the whole challenge area: reduction of uncertainties and risks to reduce costs and attract investors.

Non-technological challenges

Non-technological challenges (2)

- **Specific technology challenges**
  - Certification and standards to reduce risk
  - Minimise environmental impacts

Non-technological challenges

Next steps

Next steps:

18 Sep
Webinar

27 Sep
Your
feedback

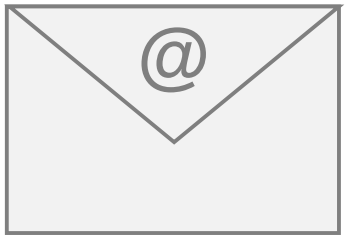
~ 1 Nov
Comments
on SRIA draft

Focused on description of challenge areas and specific technology challenges

2 Dec
Webinar
SRIA content

10 Dec
Final
comments
on SRIA

- Your feedback (**by September 27th**) on:
  - Do you miss any important aspect in the general SRIA structure? (slide #6)
  - Do you agree with regrouping challenge areas as presented? (slide #12)
  - What do you think about the area on “non-technological issues”?
  - Do you agree with the prioritised specific technology challenges per area?



Thank you – Questions?

Jose Luis Villate, Pablo Ruiz-Minguela – TECNALIA

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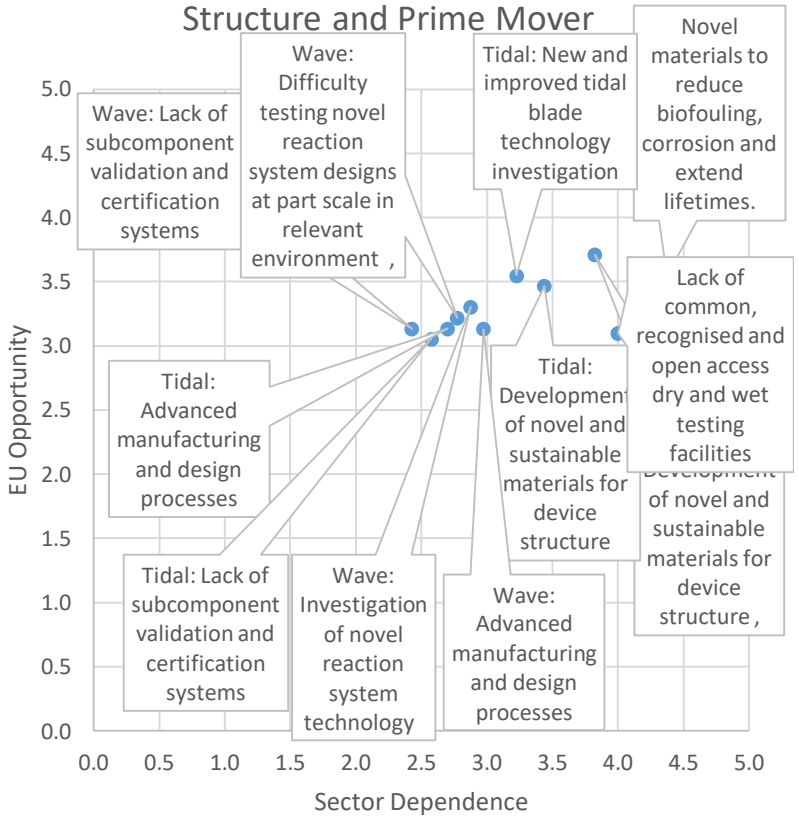
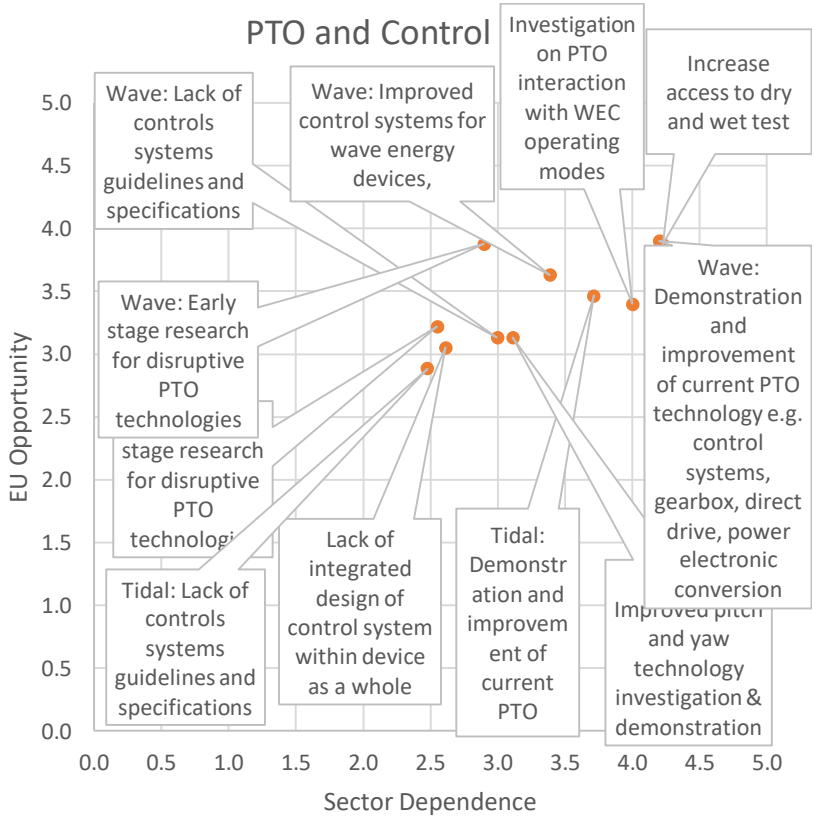
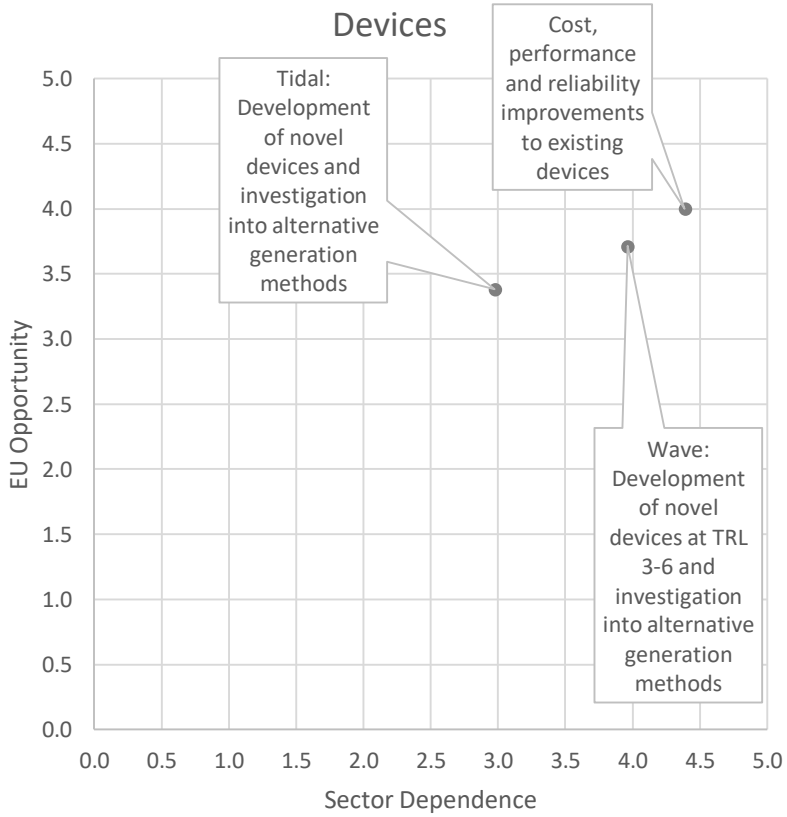
Annex: reorganising challenge areas

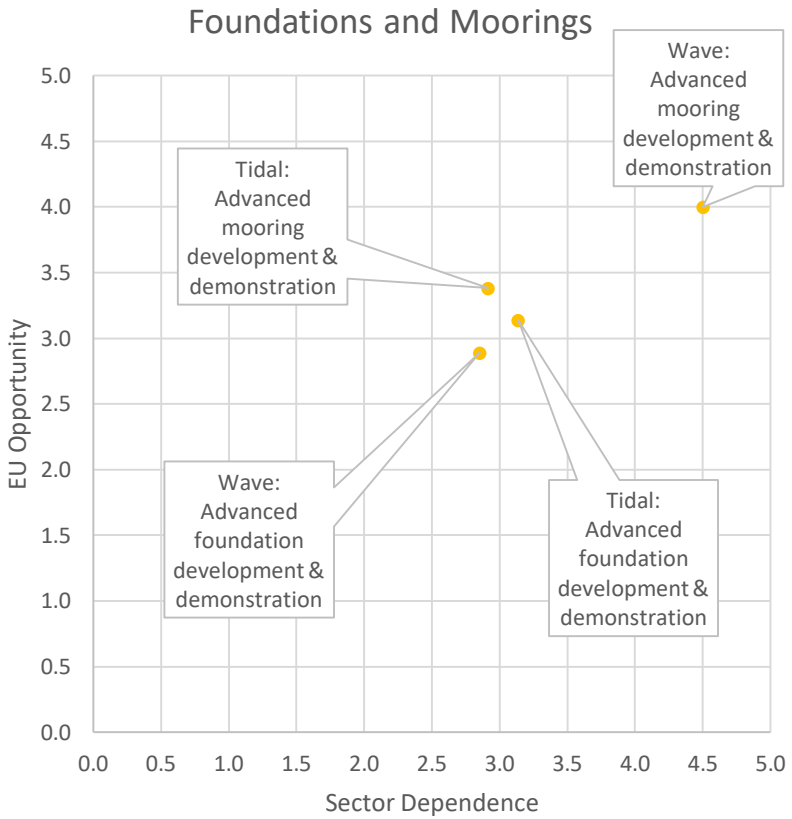
Tidal Devices (12) / Wave Devices (13) (including structure, prime mover, PTO & Control)

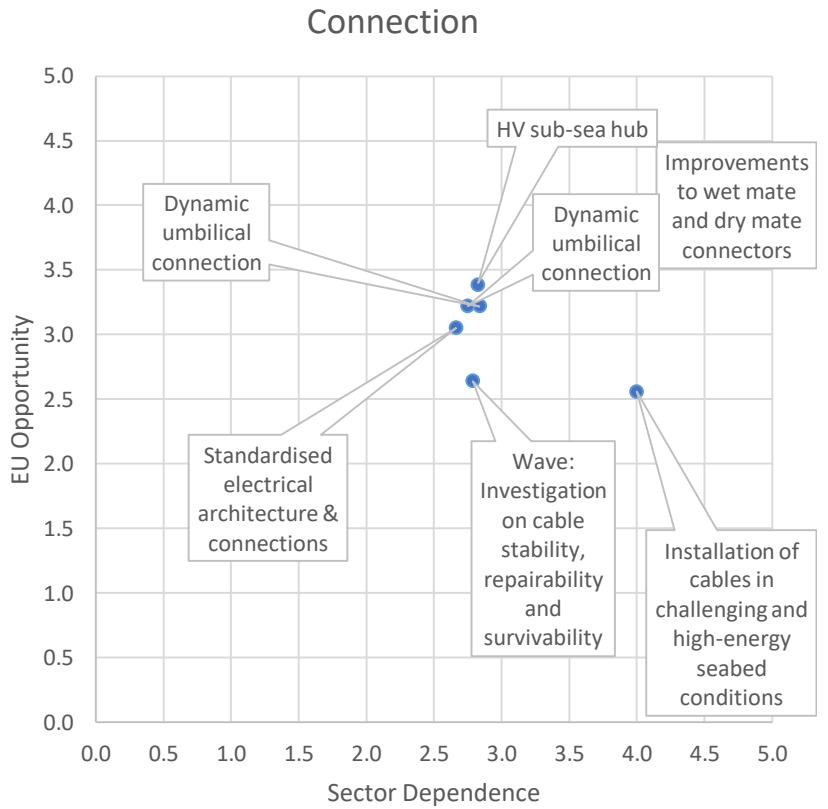




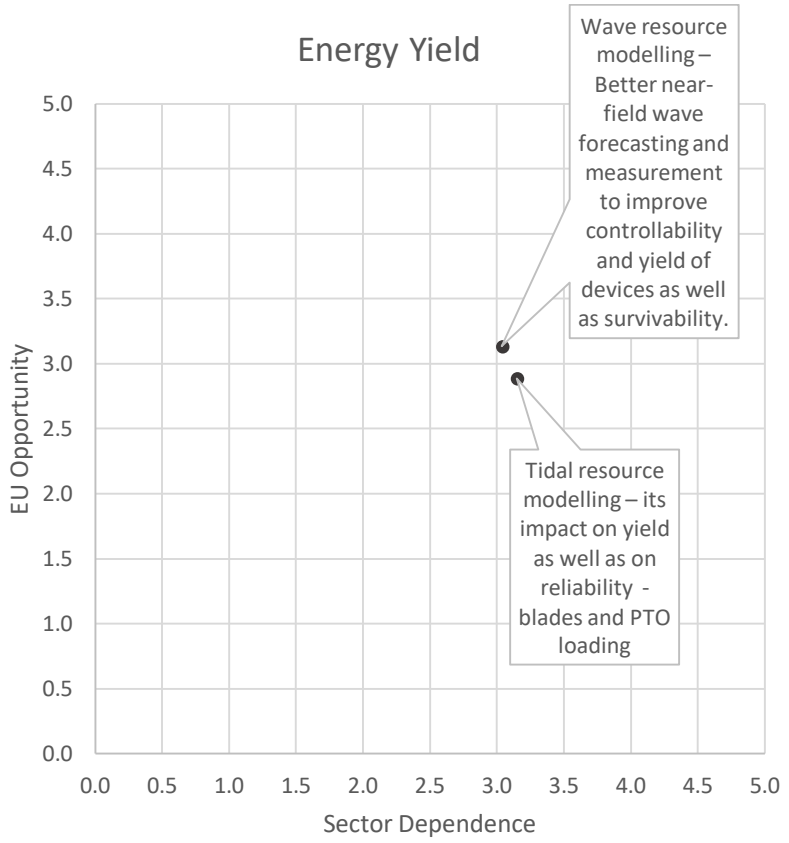


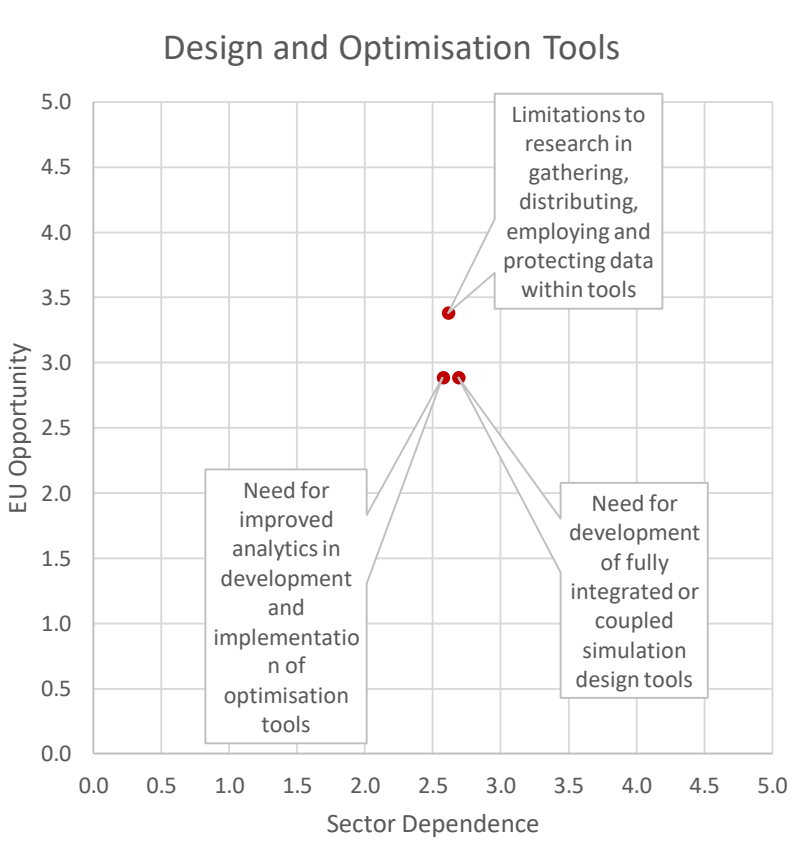
Balance of Plant (11)



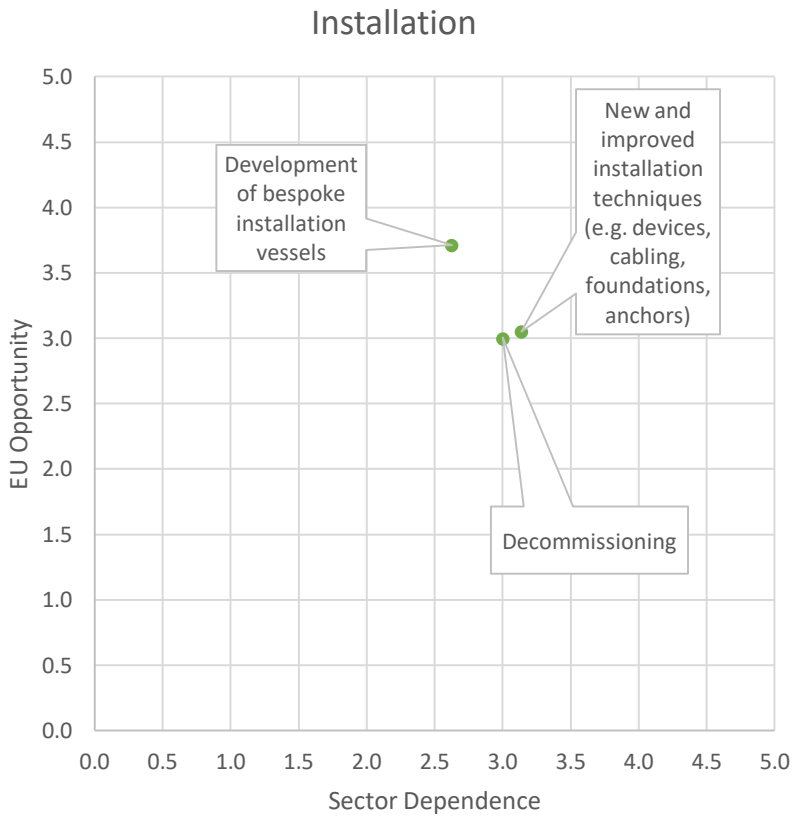


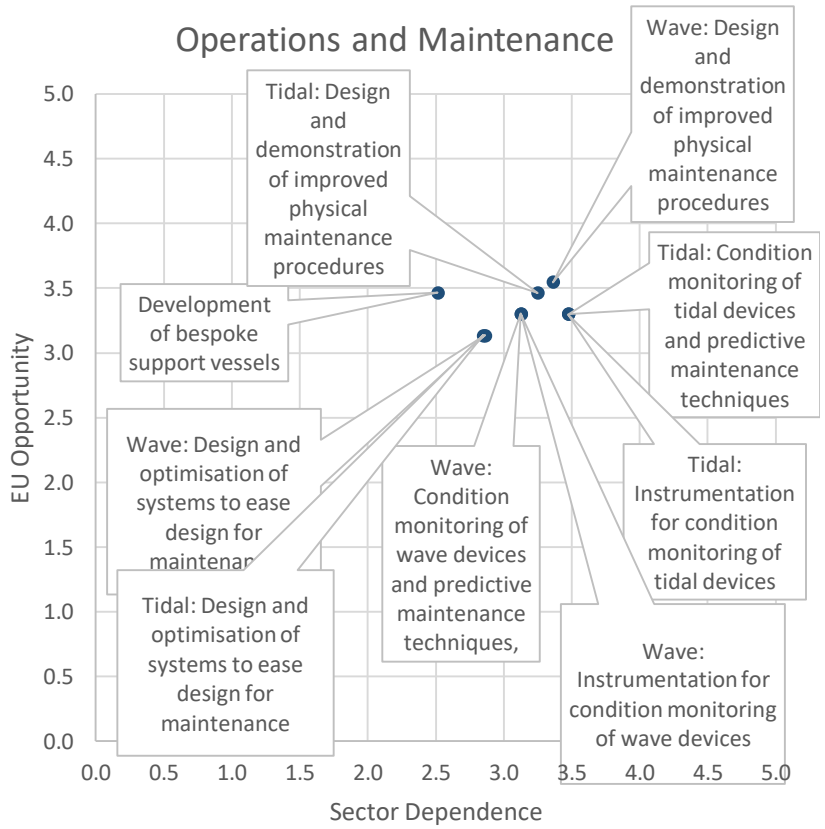
Data management, analysis and modelling tools (5) (resource, design, optimisation…)



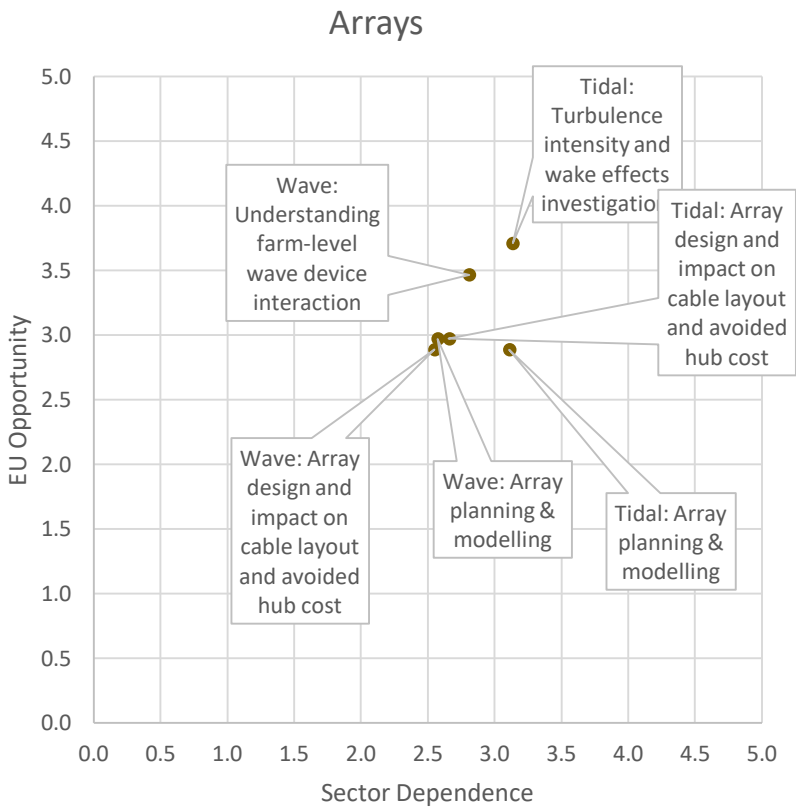


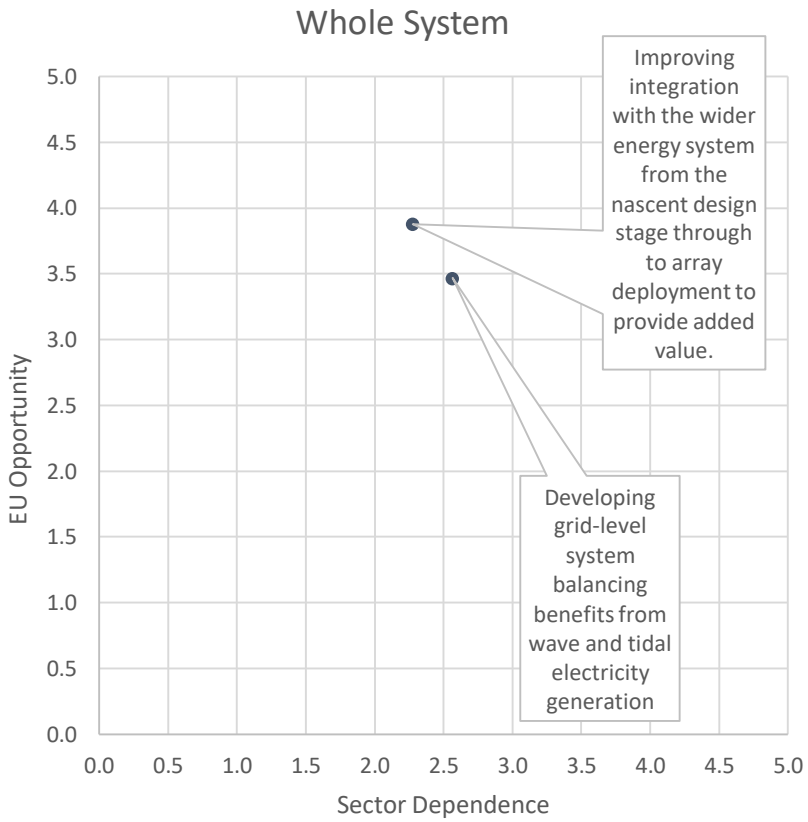
Logistics & Marine Operations (11)





System integration (8)





Regrouping challenge areas

Nº of challenges	New challange area	Previous Challenge Area	Nº of challenges
12	Tidal Energy Devices	Structure and Prime Mover (Tidal)	5
		PTO and Control (Tidal)	5
		Devices (tidal)	2
13	Wave Energy Devices	Structure and Prime Mover (Wave)	6
		PTO and Control (Wave)	6
		Devices (Wave)	1
11	Balance of plant	Foundations and Moorings	4
		Connection	7
5	Data management, analysis and modelling tools	Design and Optimisation Tools	3
		Energy Yield	2
12	Logistics & Marine Operations	Operations and Maintenance	9
		Installation	3
8	System integration	Arrays	6
		Whole System	2
61			61