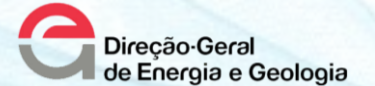


Strategic Research & Innovation Agenda (SRIA) and upcoming associated work

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OEE, Dublin, 30th September 2019



THE UNIVERSITY of EDINBURGH



Introduction

Prioritisation of Development Areas

SRIA structure and next steps





- Updates **key priority challenge areas** for research, technology development and innovation
- Defines specific objectives and actions to carve the path towards **Ocean Energy commercialisation**
- Audience: the whole ocean energy sector in general 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
 - Technology Working Group (+60 members)
 - **Steering Committee** will provide a final validation of the results.
- To be published in **January 2020**
- It will feed into **policy advice** documents and the **Ocean Energy Roadmap**



Strategic Research and Innovation Agenda (SRIA)



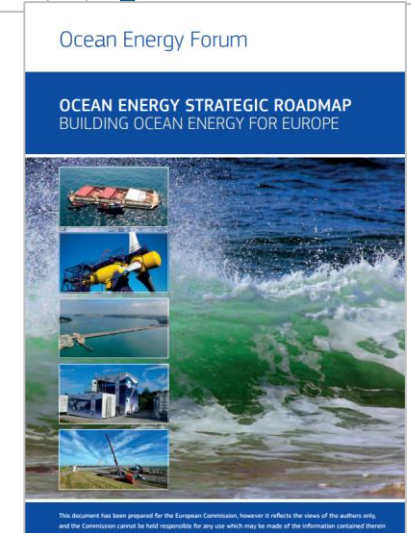
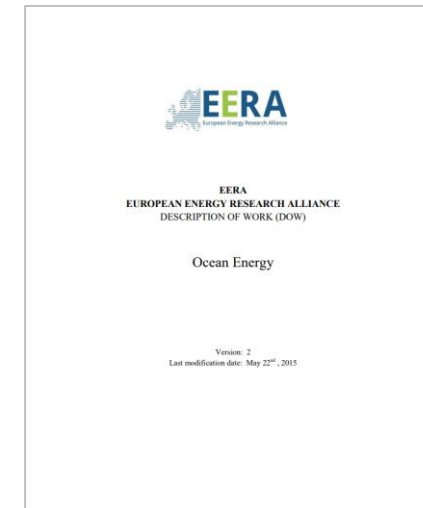
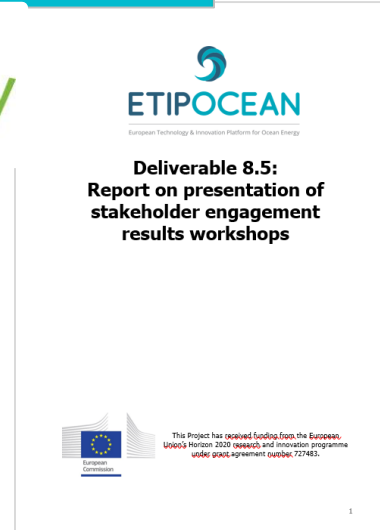
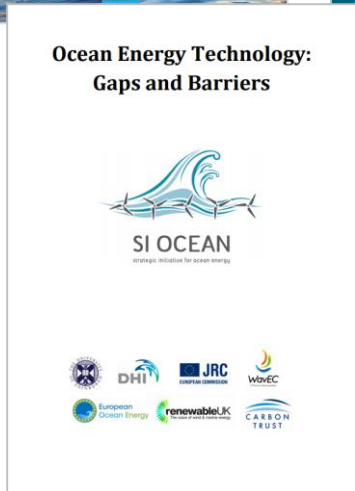
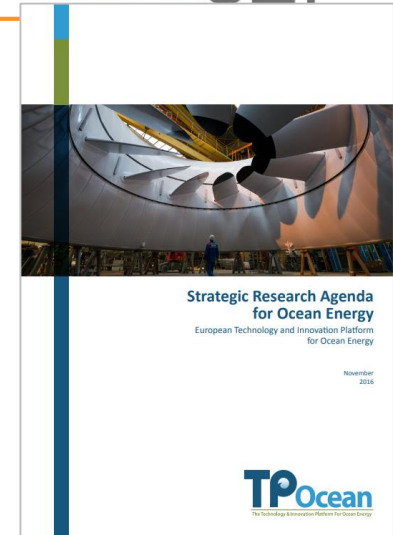
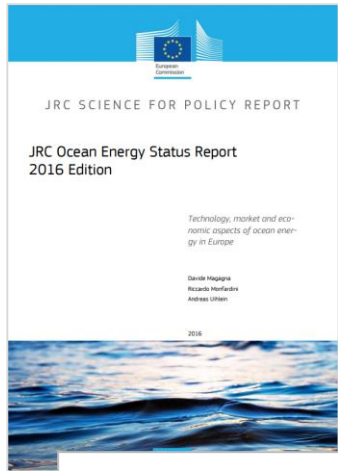

Methodology:

1. Formation of Technology Working Group – Done
 - 63 members including device developers, project developers, OEMs, funders, regulators, research community and academia
2. Identify priority technology development areas – Done. More details next
3. Series of webinars and workshops
 - 1st webinar with TWG in June to validate the identification of priority areas
 - 2nd webinar in September to validate the SRIA structure
 - Workshop in December to validate the draft content of the SRIA
 - 2020-2021: 9 webinars and up to 2 workshops to subsequently exchange on the identified technology development priority areas
4. Strategic Research and Innovation Agenda (SRIA)
 - SRIA structure in September, draft version to be validated with TWG in December, formatting and publication in January 2020

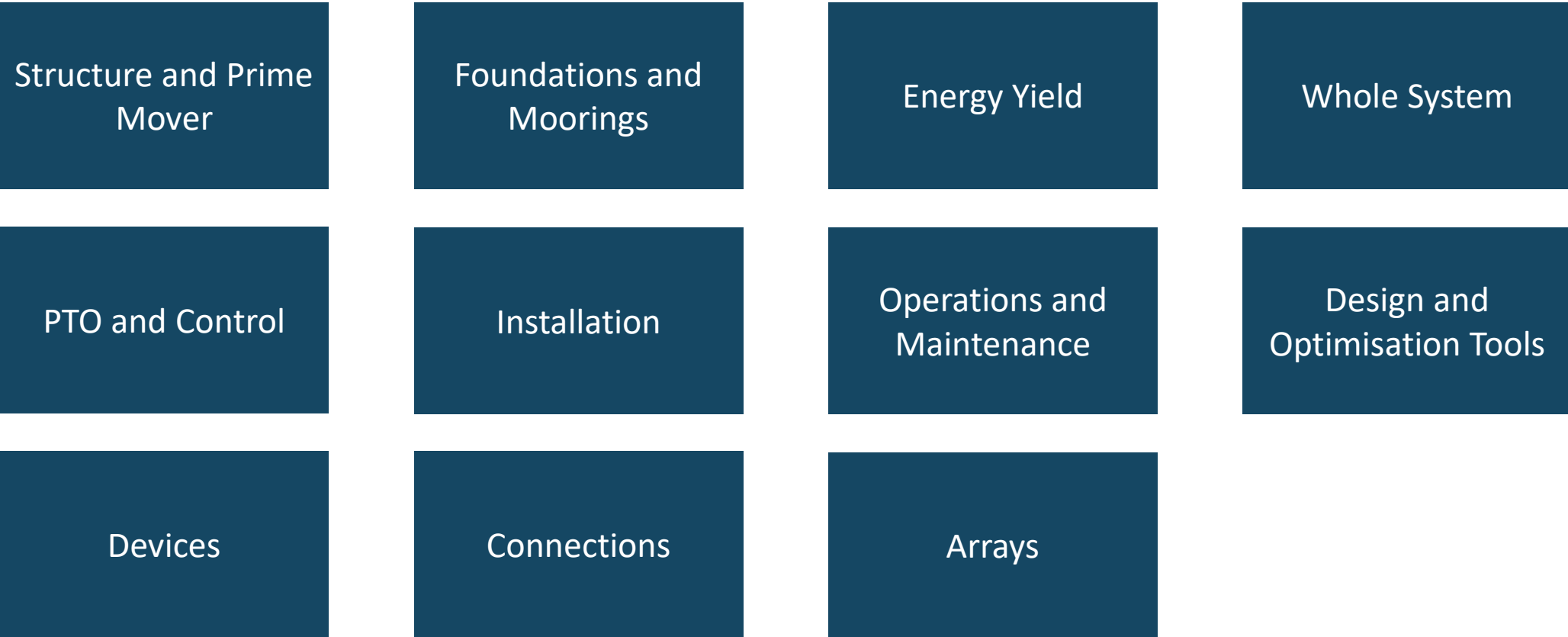
Prioritisation of Development Areas



Source material



11 Challenge Areas



58 Challenges (Unprioritised) 1 of 2

Challenge Area	Technology Development Challenge	Technology
Structure and Prime Mover	Wave: Advanced manufacturing and design processes	Wave
Structure and Prime Mover	Tidal: Advanced manufacturing and design processes	Tidal
Structure and Prime Mover	Investigation of novel reaction system technology	Wave
Structure and Prime Mover	New and improved tidal blade technology investigation	Tidal
Structure and Prime Mover	Wave: Development of novel and sustainable materials for device structure	Wave
Structure and Prime Mover	Tidal: Development of novel and sustainable materials for device structure	Tidal
Structure and Prime Mover	Difficulty testing novel reaction system designs at part scale in relevant environment	Wave
Structure and Prime Mover	Novel materials to reduce biofouling, corrosion and extend lifetimes.	Both
Structure and Prime Mover	Lack of common, recognised and open access dry and wet testing facilities	Both
Structure and Prime Mover	Wave: Lack of subcomponent validation and certification systems	Wave
Structure and Prime Mover	Tidal: Lack of subcomponent validation and certification systems	Tidal
Energy Yield	Tidal resource modelling – its impact on yield as well as on reliability - blades and PTO loading	Tidal
Energy Yield	Wave resource modelling – Better near-field wave forecasting and measurement to improve controllability and yield of devices as well as survivability.	Wave

Challenge Area	Technology Development Challenge	Technology
PTO and Control	Wave: Demonstration and improvement of current PTO technology e.g. control systems, gearbox, direct drive, power electronic conversion	Wave
PTO and Control	Tidal: Demonstration and improvement of current PTO technology e.g. control systems, gearbox, direct drive, power electronic conversion	Tidal
PTO and Control	Wave: Early stage research for disruptive PTO technologies	Wave
PTO and Control	Tidal: Early stage research for disruptive PTO technologies	Tidal
PTO and Control	Improved pitch and yaw technology investigation & demonstration	Tidal
PTO and Control	Improved control systems for wave energy devices, particularly for extreme conditions	Wave
PTO and Control	Increase access to dry and wet test facilities	Both
PTO and Control	Wave: Lack of controls systems guidelines and specifications	Wave
PTO and Control	Tidal: Lack of controls systems guidelines and specifications	Tidal
PTO and Control	Lack of integrated design of control system within device as a whole	Both
PTO and Control	Investigation on PTO interaction with WEC operating modes	Wave
Whole System	Developing grid-level system balancing benefits from wave and tidal electricity generation	Both
Whole System	Improving integration with the wider energy system from the nascent design stage through to array deployment to provide added value.	Both



58 Challenges (Unprioritised) 2 of 2

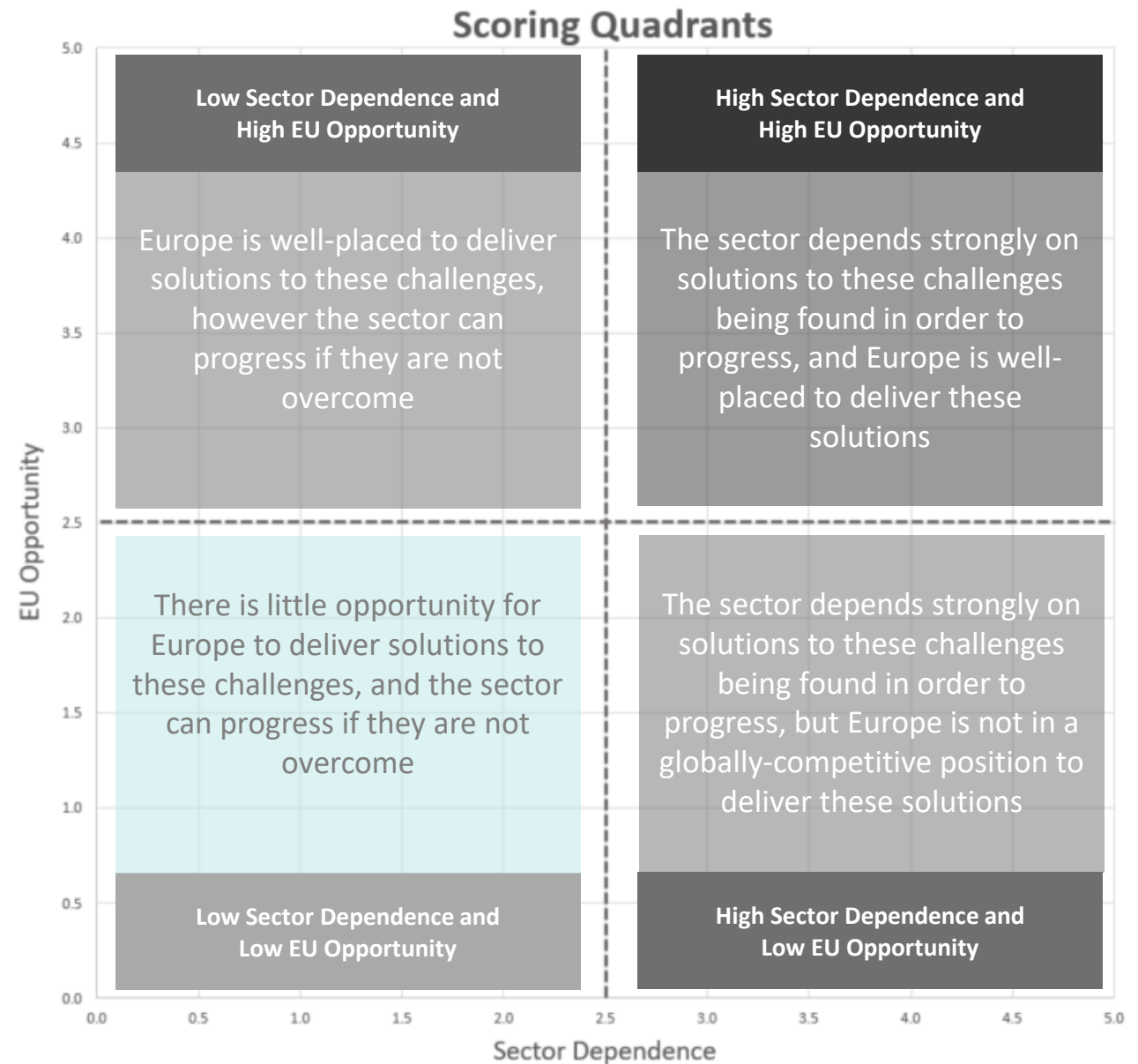
Challenge Area	Technology Development Challenge	Technology
Devices	Cost, performance and reliability improvements to existing devices	Both
Devices	Wave: Development of novel devices at TRL 3-6 and investigation into alternative generation methods	Wave
Devices	Tidal: Development of novel devices and investigation into alternative generation methods	Tidal
Foundations and Moorings	Wave: Advanced foundation development & demonstration	Wave
Foundations and Moorings	Tidal: Advanced foundation development & demonstration	Tidal
Foundations and Moorings	Wave: Advanced mooring development & demonstration	Wave
Foundations and Moorings	Tidal: Advanced mooring development & demonstration	Tidal
Connection	Standardised electrical architecture and connections	Both
Connection	Dynamic umbilical connection	Both
Connection	Standardised subsea hubs	Both
Connection	Wave: Investigation on cable stability, repairability and survivability	Wave
Connection	HV sub-sea hub	Both
Connection	Installation of cables in challenging and high-energy seabed conditions	Both
Connection	Improvements to wet mate and dry mate connectors	Both
Arrays	Wave: Understanding farm-level wave device interaction	Wave
Arrays	Wave: Array planning & modelling	Wave
Arrays	Tidal: Array planning & modelling	Tidal
Arrays	Wave: Array design and impact on cable layout and avoided hub cost	Wave
Arrays	Tidal: Array design and impact on cable layout and avoided hub cost	Tidal
Arrays	Tidal: Turbulence intensity and wake effects investigation	Tidal

Challenge Area	Technology Development Challenge	Technology
Operations and Maintenance	Wave: Design and optimisation of systems to ease design for maintenance	Wave
Operations and Maintenance	Tidal: Design and optimisation of systems to ease design for maintenance	Tidal
Operations and Maintenance	Condition monitoring of wave devices and predictive maintenance techniques	Wave
Operations and Maintenance	Condition monitoring of tidal devices and predictive maintenance techniques	Tidal
Operations and Maintenance	Wave: Design and demonstration of improved physical maintenance procedures	Wave
Operations and Maintenance	Tidal: Design and demonstration of improved physical maintenance procedures	Tidal
Operations and Maintenance	Development of bespoke support vessels	Both
Design and Optimisation Tools	Need for improved analytics in development and implementation of optimisation tools	Both
Design and Optimisation Tools	Need for development of fully integrated or coupled simulation design tools	Both
Design and Optimisation Tools	Limitations to research in gathering, distributing, employing and protecting data within tools	Both
Installation	New and improved installation techniques (e.g. devices, cabling, foundations, anchors)	Both
Installation	Development of bespoke installation vessels	Both

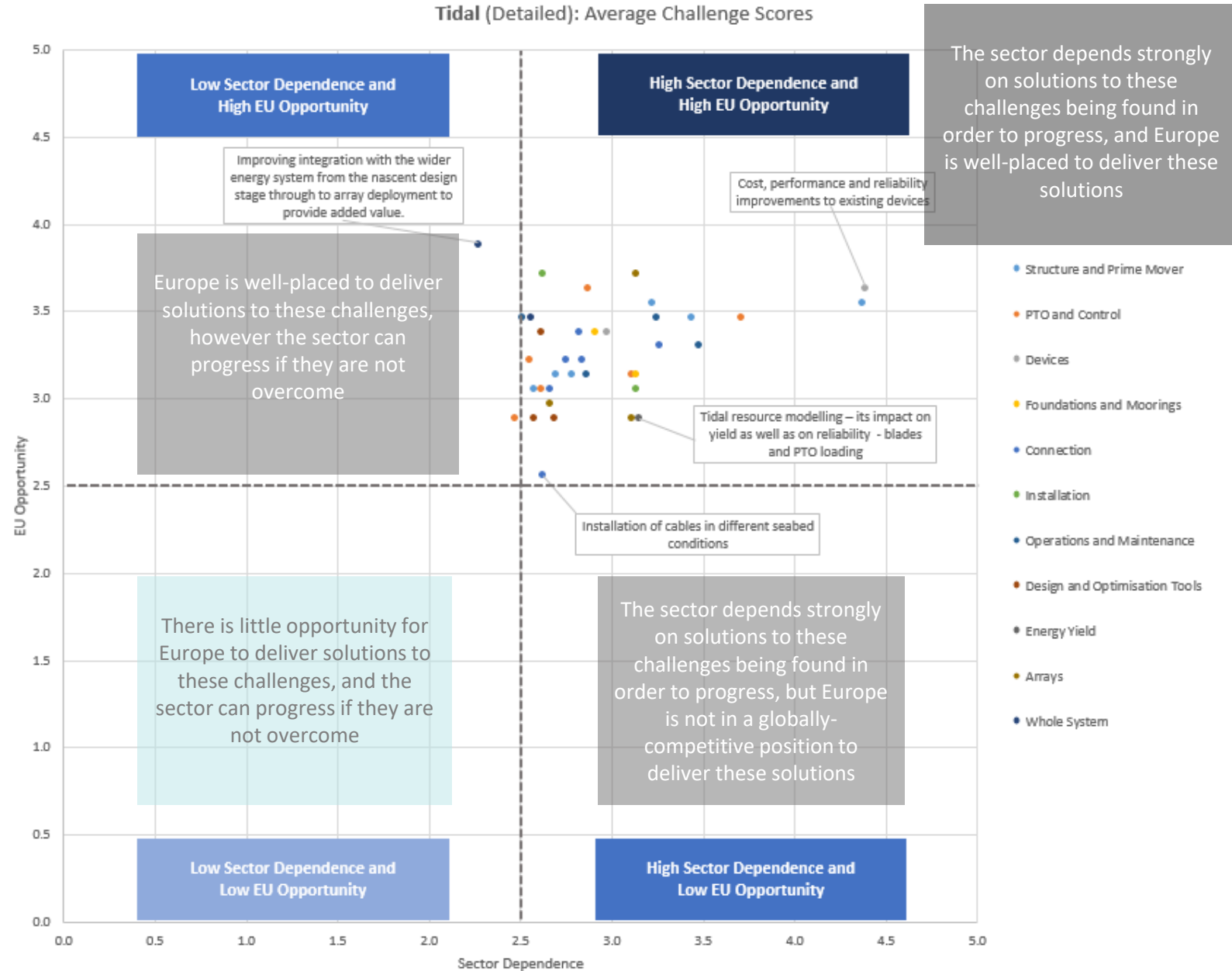


Scoring Methodology

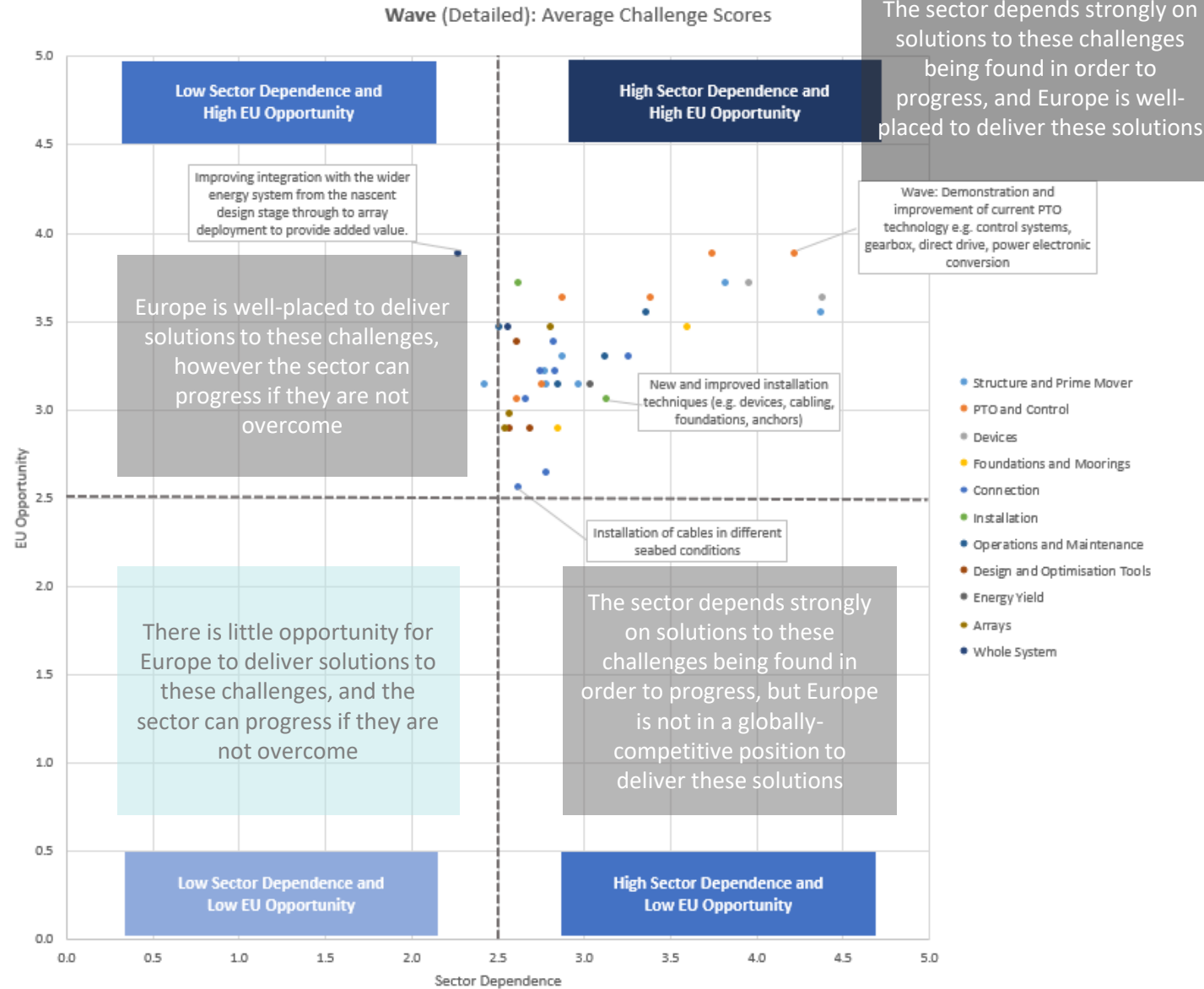
- Challenges were scored from 1 to 5 on questions within two criteria: the dependence on the sector on this challenge being overcome, and the opportunity afforded Europe to play a significant role in overcoming the challenge
- The two scores were then plotted on two axes (right) to show the distribution of challenges across each level of prioritisation
- The chart was split into four equal quadrants of the top and bottom 50% score on each axis (right)



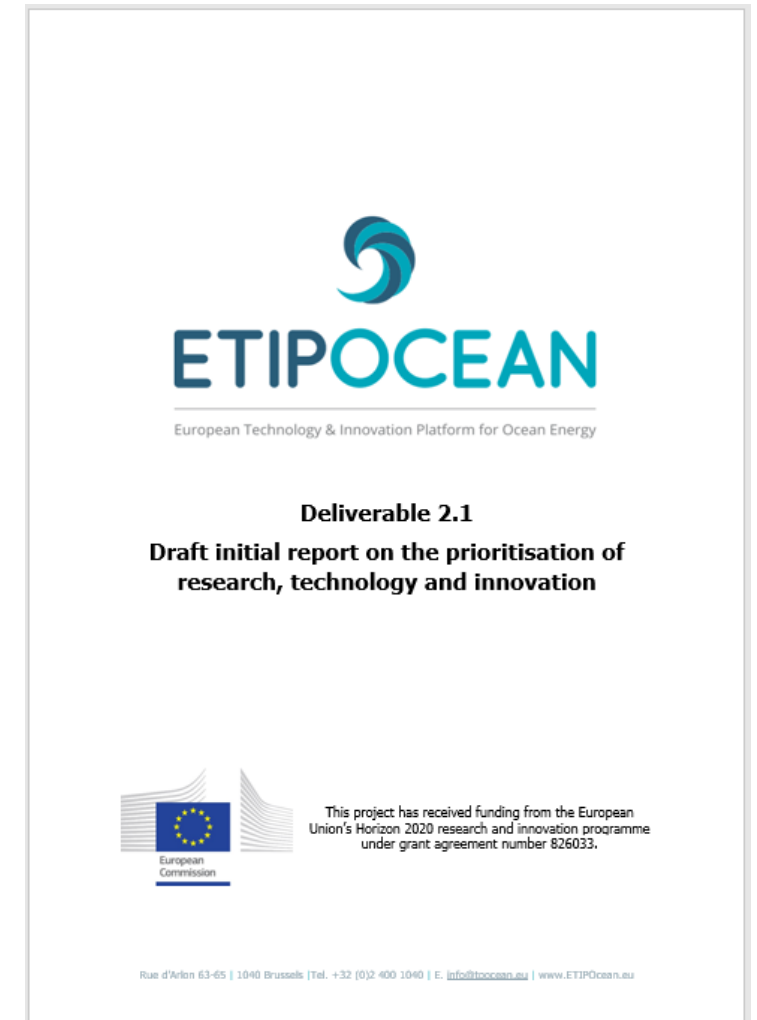
Tidal



Wave



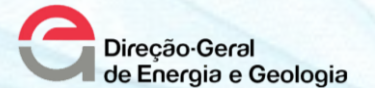
- 58 Technical challenges have been identified.
- All challenges lie in the top right-hand corner of the charts, with an overwhelming majority (53 of 58) in the high sector urgency/high EU opportunity quadrant.
- Feedback from the TWG has been taken into account.
- This list of challenges will feed into the SRIA.
- ETIP Ocean 2 will host webinars on a selection of the challenges identified here.



Thank you for your attention!

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