THE UNIVERSITY of EDINBURGH

DTOcean

DTOcean

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ICOE Halifax 2014

University of Edinburgh

Goals

The DTOcean overriding goal can be specified further into three major objectives:

1. **Full suite of whole-system software design tools**

2. **Identification of enabling technologies (such as for the optimisation of resource analysis, installation methods or control procedures) to reduce deployment costs and increase the performance of ocean energy arrays.**

3. **Well validated guidelines for accelerating decisions by means of reducing risks and uncertainties.**

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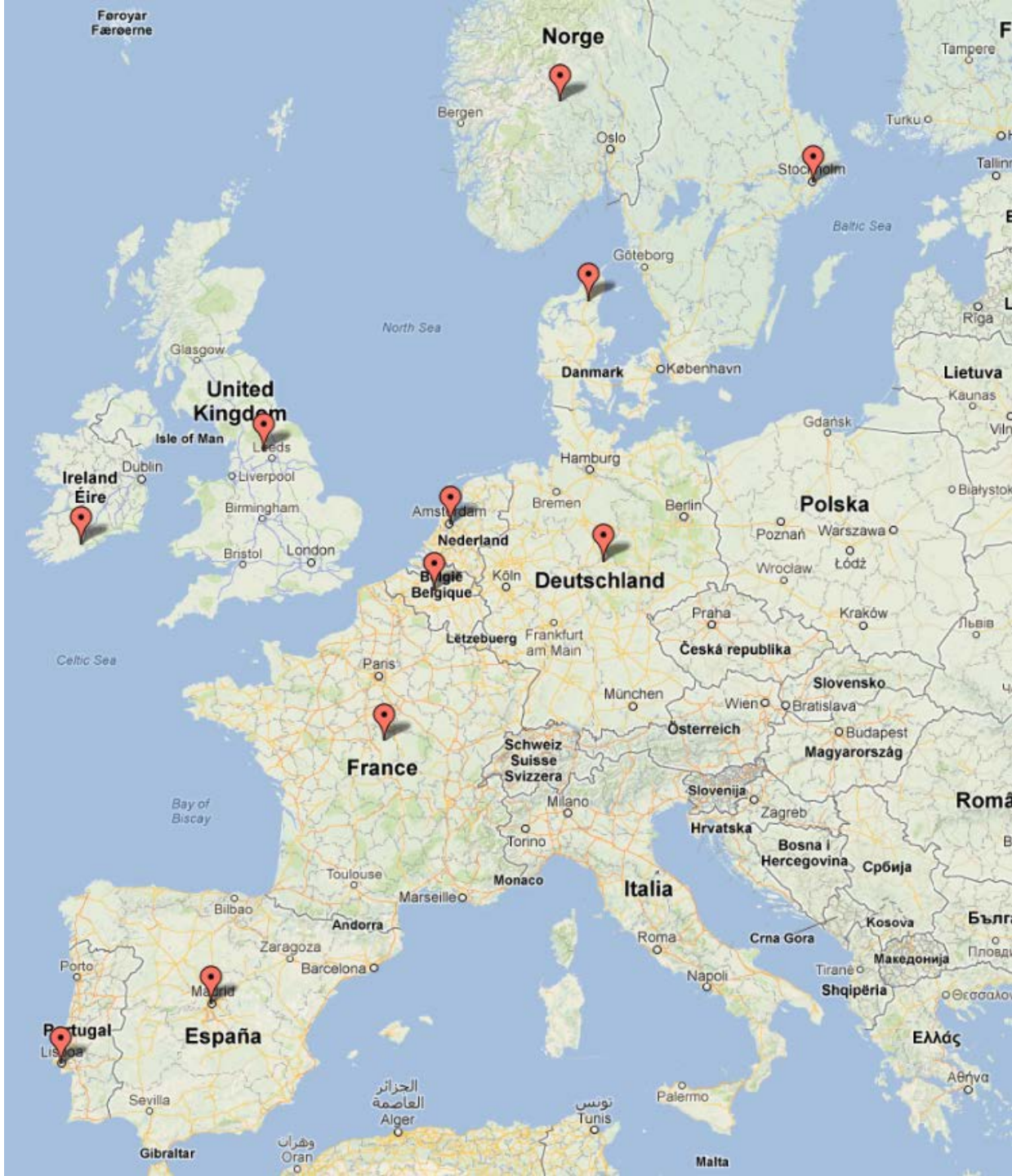
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Bergen
Oslo
Stockholm
Baltic Sea
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Danmark
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Kaunas
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Berlin
Polska
Poznań
Warszawa
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Wrocław
Kraków
Glasgow
United Kingdom
Isle of Man
Leeds
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Deutschland
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Frankfurt am Main
Praha
Česká republika
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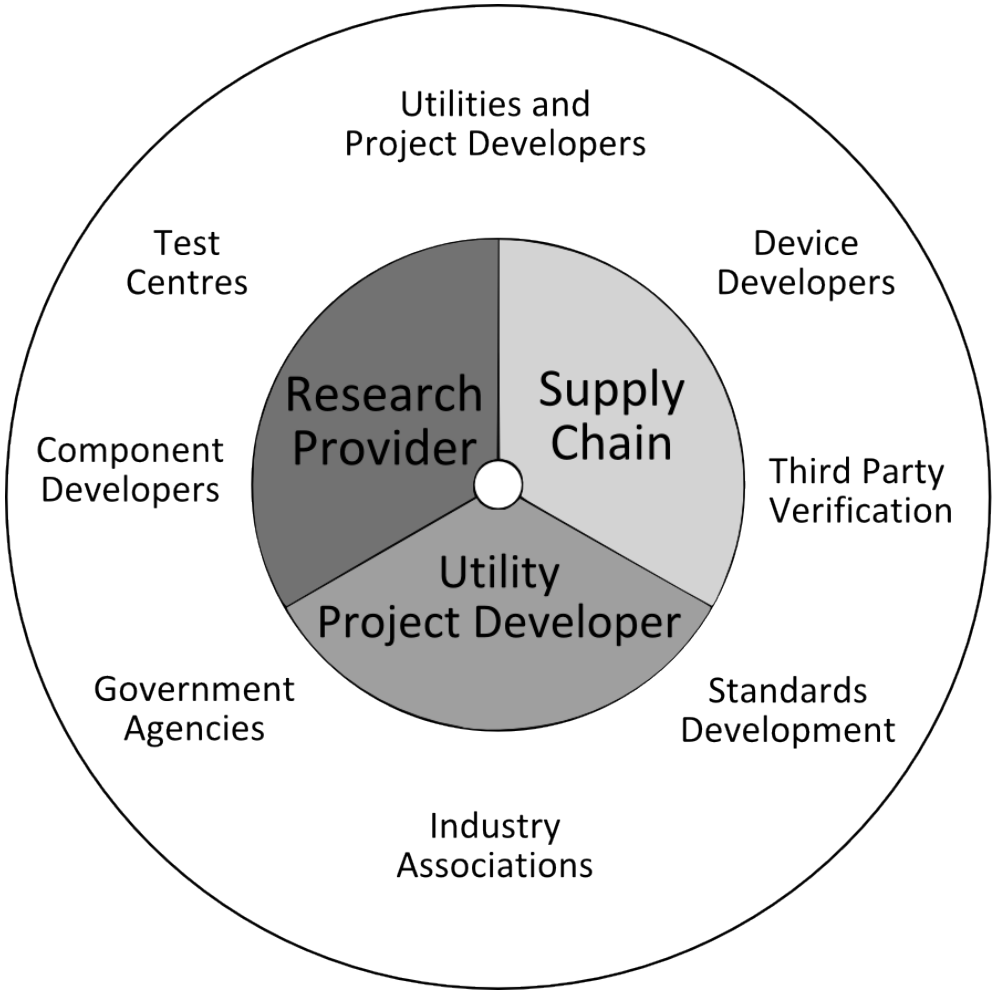
Oran
Tunis
Malta

Structure of the consortium



Advisory Board

Research Providers (Universities and Applied Research Centres)

Utilities and Project Developers

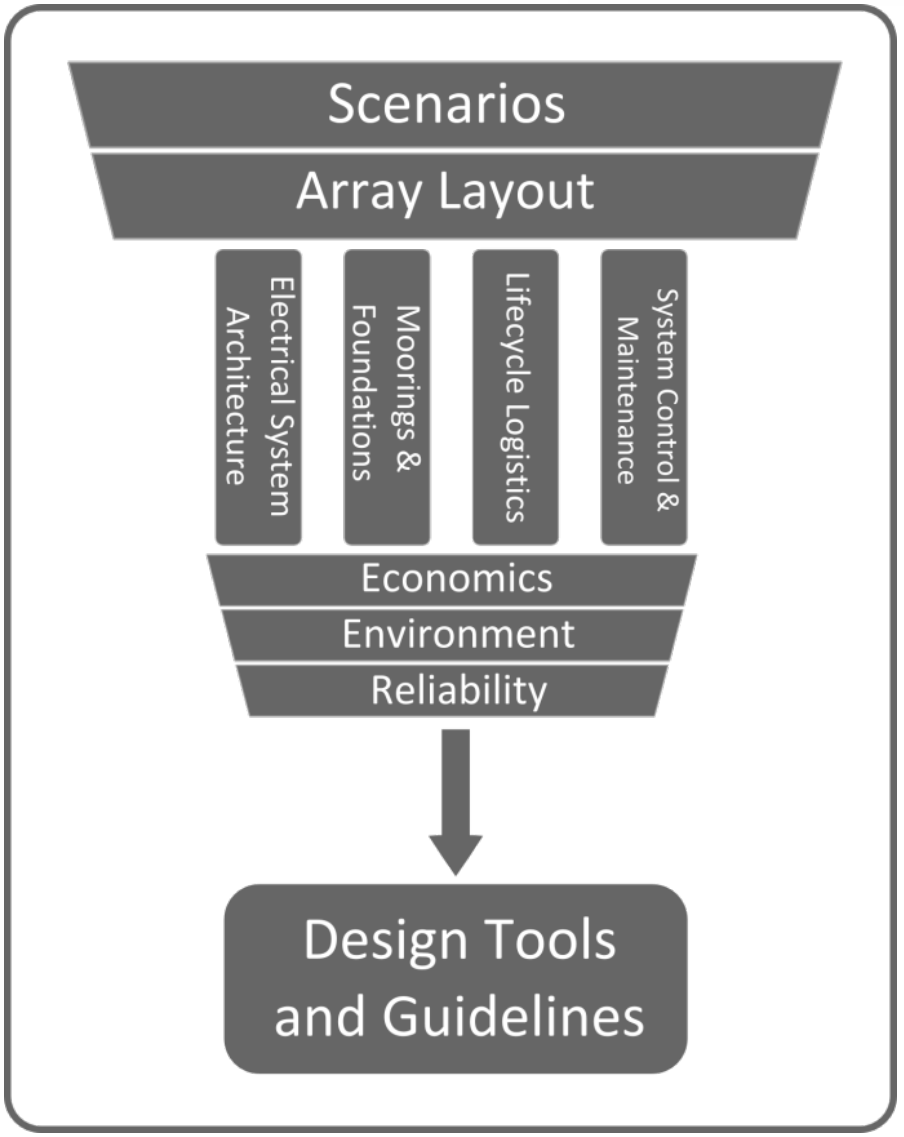
Supply Chain

Illustration of the overall work-flow of the project

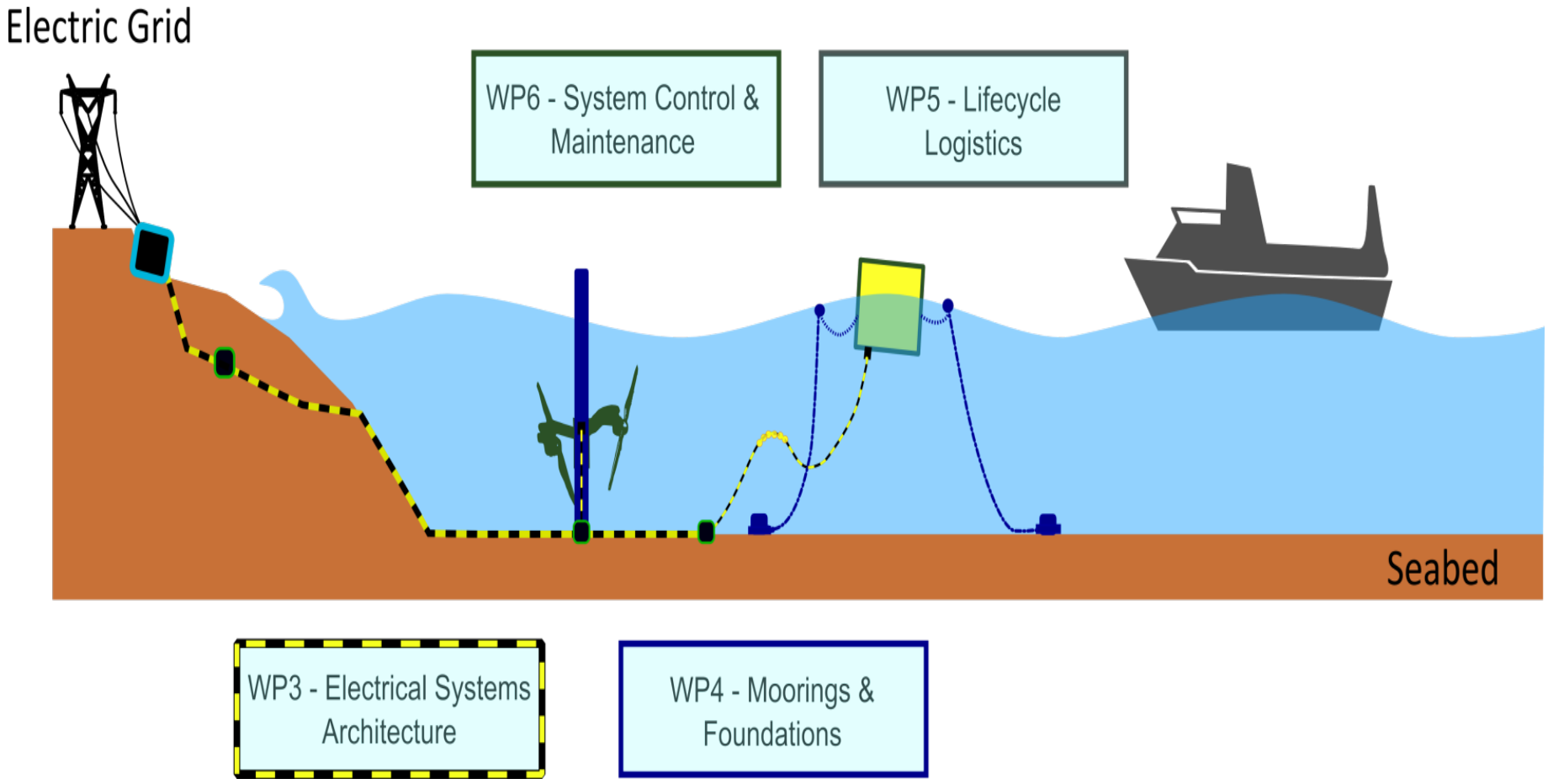
- Scenarios
- Array Layout
- Electrical System
- Moorings and foundations
- Lifecycle logistics
- System control

- Economics
- Environmental
- Reliability

- Design tools



DTOcean Schematic



Scenarios

DTOcean is guided by, dedicated to and makes reference to some first-generation array projects

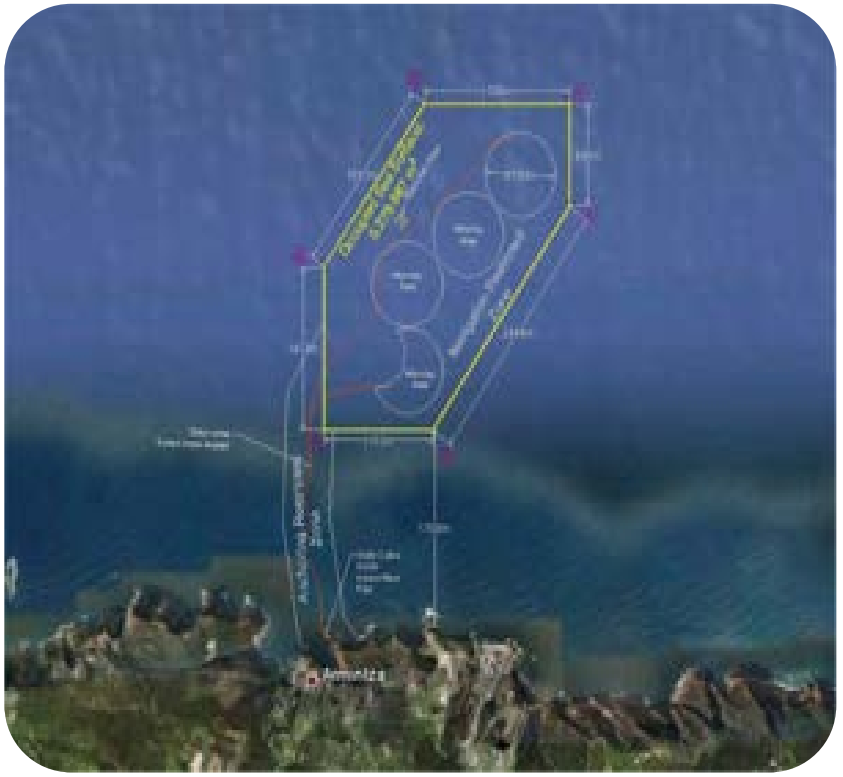
Sound of Islay: Iberdrola has received consent for a 10MW Tidal Array in the Sound of Islay, between Islay and Jura on the west coast of Scotland.

Aegir: Vattenfall have a partnership with Pelamis Wave Power to develop the first wave power array off the Shetland Islands, Scotland.

Rhinns of Islay: DEME Blue Energy is involved in the development of a tidal energy array on the west of Islay, Scotland.

Array layout

- Identification of parameters for array descriptions for the identified scenarios and technologies
- Assessment of capabilities of available tools
- Hydrodynamic array evaluation and definition of relevant parameter ranges



Electrical System Architecture

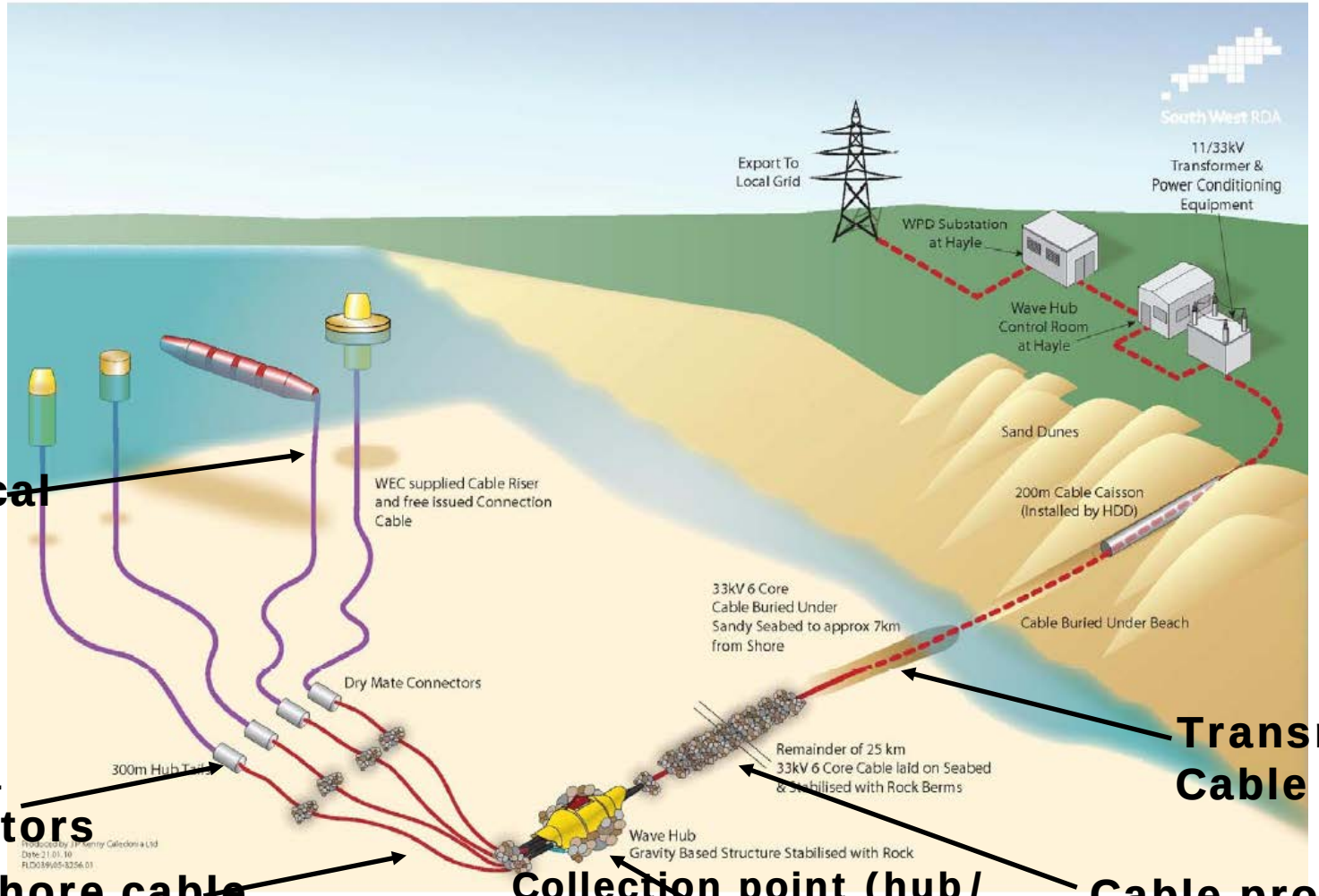
- The tool will provide algorithms to identify:

- Optimal inter array as well as the array grid connection and integration into the onshore grid.

- Innovative features e.g. enabling the grid voltage and frequency control

- the developed tool will be able to be continuously updated and extended in order to include new electrical infrastructure technologies.

Network topology – Components



Umbilical

Subsea connectors

Offshore cable (offshore network)

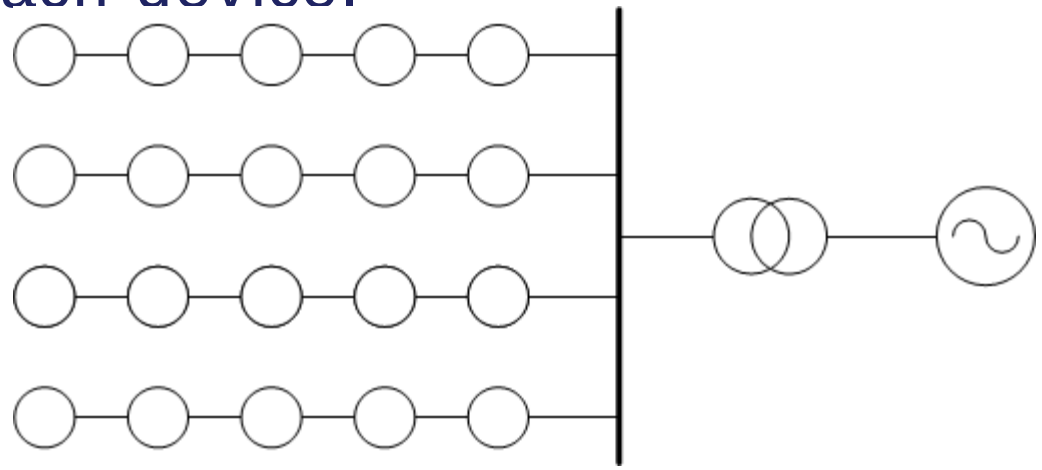
Collection point (hub / offshore substation with a transformer)

Cable protection

Transmission Cable

Network topology – Radial

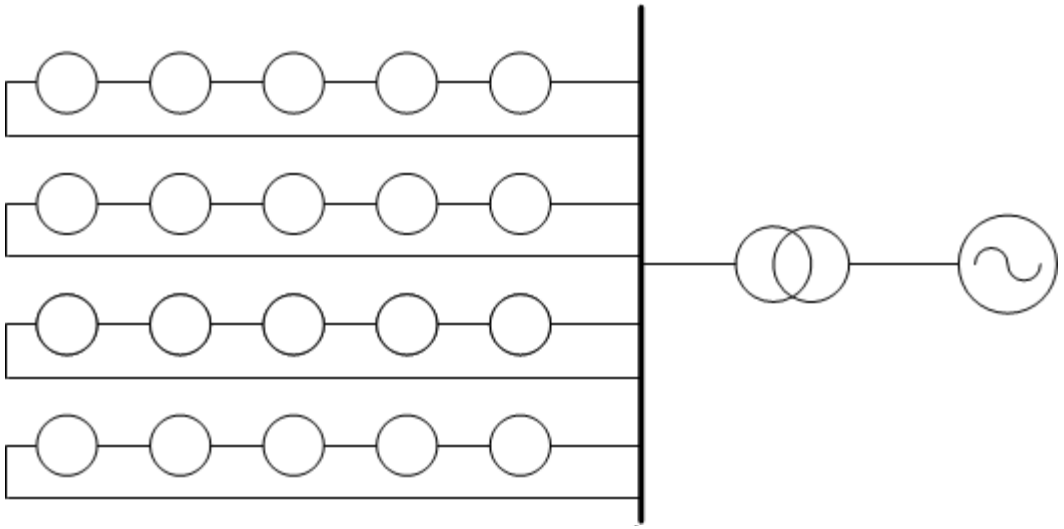
- Each OEC connected to a single feeder
- Cable rating is determined by the number of MECs in each string and the individual power rating of each device.



- ✓ Simple
- ✓ Cable can be tapered
- ✗ No redundancy

Network topology – Single-sided

- Each OEC connected to a single feeder
- Cable rating is determined by the number of MECs in each string and the individual power rating of each device.

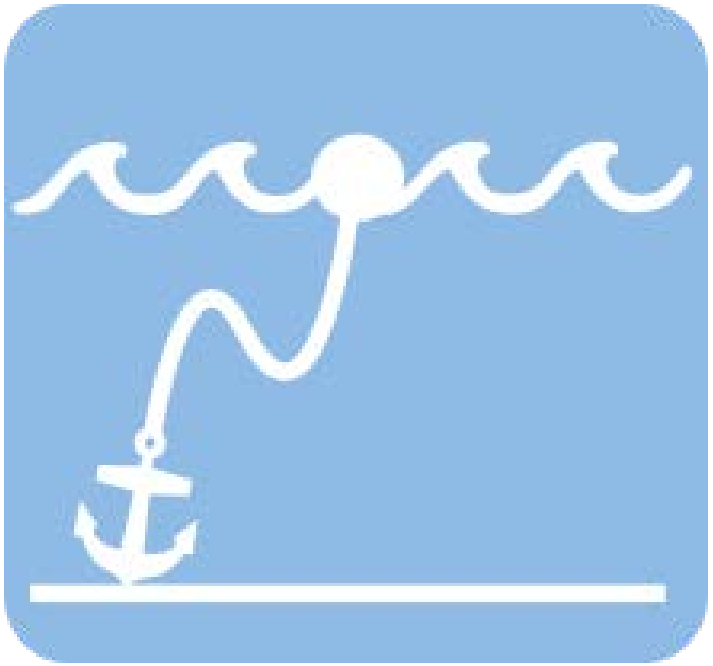


✓ Redundancy

✗ Cable cannot be tapered

Moorings & foundations

- DTOcean will investigate suitable design tools and develop mooring and foundation assessment tools
- this project will enable an assessment and development of tools to inform about mooring networks and foundation requirements.
- Inform mooring and foundation designs for ocean energy arrays



Lifecycle Logistics

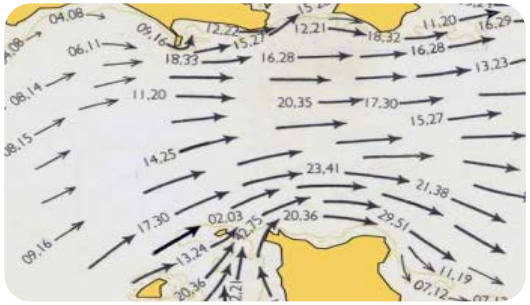
- Design tools to be developed will allow to analyse different installation methods and their impact on the project cost and risks
- specify accurately the infrastructure needs with regard to ports and vessel for entire lifetime of the project to be installed.
- This will inform investment into such infrastructure at regional as well as EU level.

System Control

- Maintenance strategies
- Modelling of impact of array options within the scenarios on O&M strategies
- Optimisation of array control
- Advanced Monitoring techniques and fault

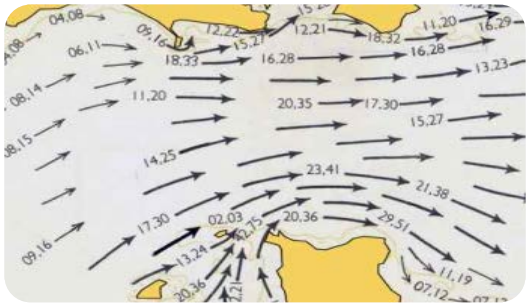
Parallel analysis

- **Economics**
- **Reliability**
- **Environment**



Design Tools

- Requirements and design criteria
- Design of the software interface for the design
- Implementation of a multi-objective tool
- Validation against a predefined set of case studies



Overall deliverables:

- Suite of array design tools for wave and tidal energy arrays in conjunction with array developers and utilities already involved in development of European ocean energy array projects
- Test the design tools using the three real EU planned array projects.
- To build upon existing EU and Member State projects
- To ensure the design tools have legacy effect.

Thank you for your attention!

Questions?

- http://www.dtocean.eu/