

H2OCEAN

(contract number: 288145)

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General Overview (1)

- Title: Development of a **wind-wave power** open-sea platform equipped for **hydrogen generation** with support for multiple users of energy
- Duration: 36 months (JAN/2012 - DEC/2014)
- Budget: EUR 6.046.627 (EC grant: EUR 4.525.934 - 74,85%)
- Partners:
 - DK (2), ES (6*), GE (2), IT (2), UK (5)
 - SME (10), RTD (6), Large Enterprise (1)
 - Renewables (5 SME, 1 RTD), RevOsm (1 SME, 2 RTD), H₂ (1 RTD), Aquaculture (3 SME), Maritime (1 LE, 1 RTD), ICT (1 SME, 1 RTD)

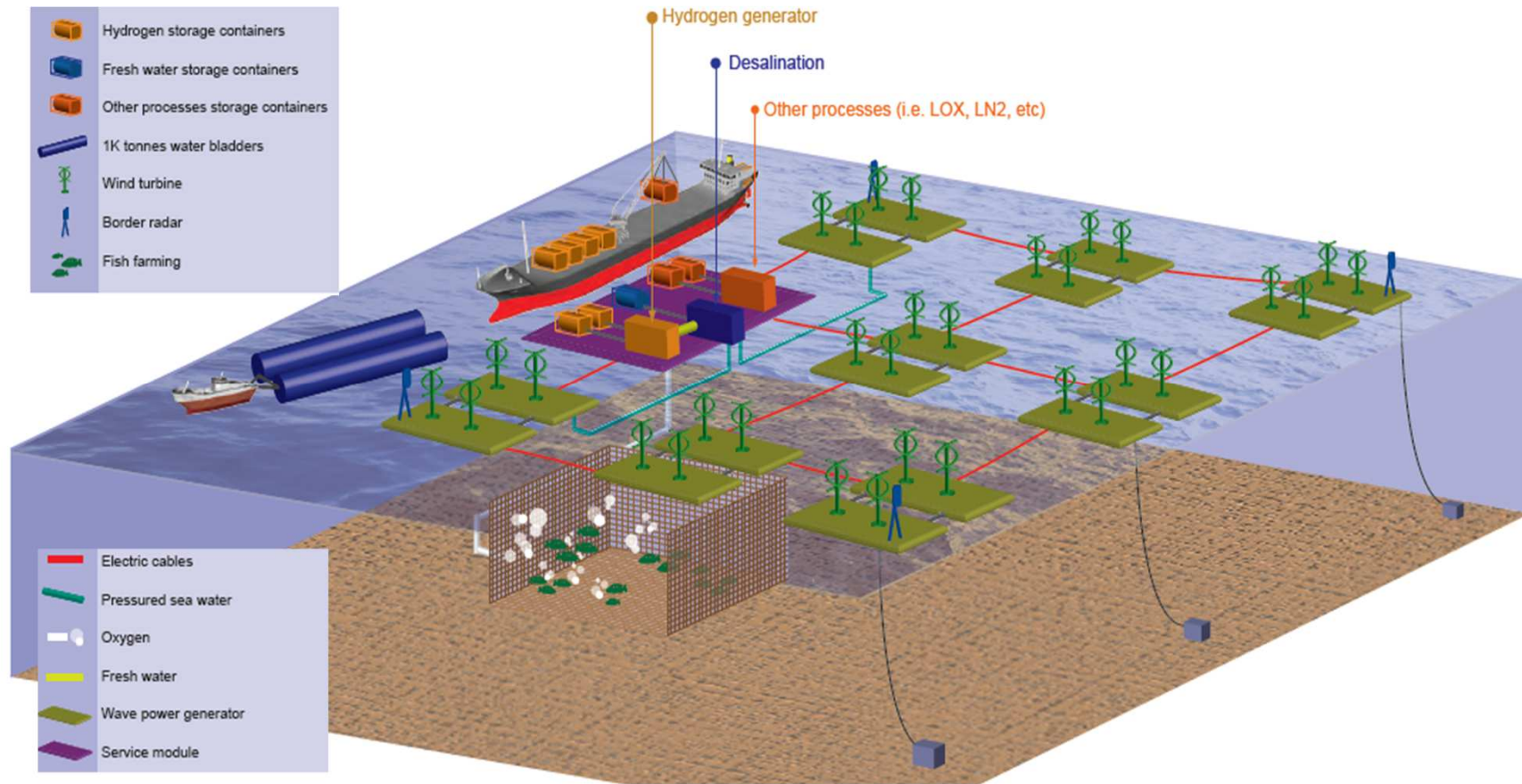


General Overview (2)



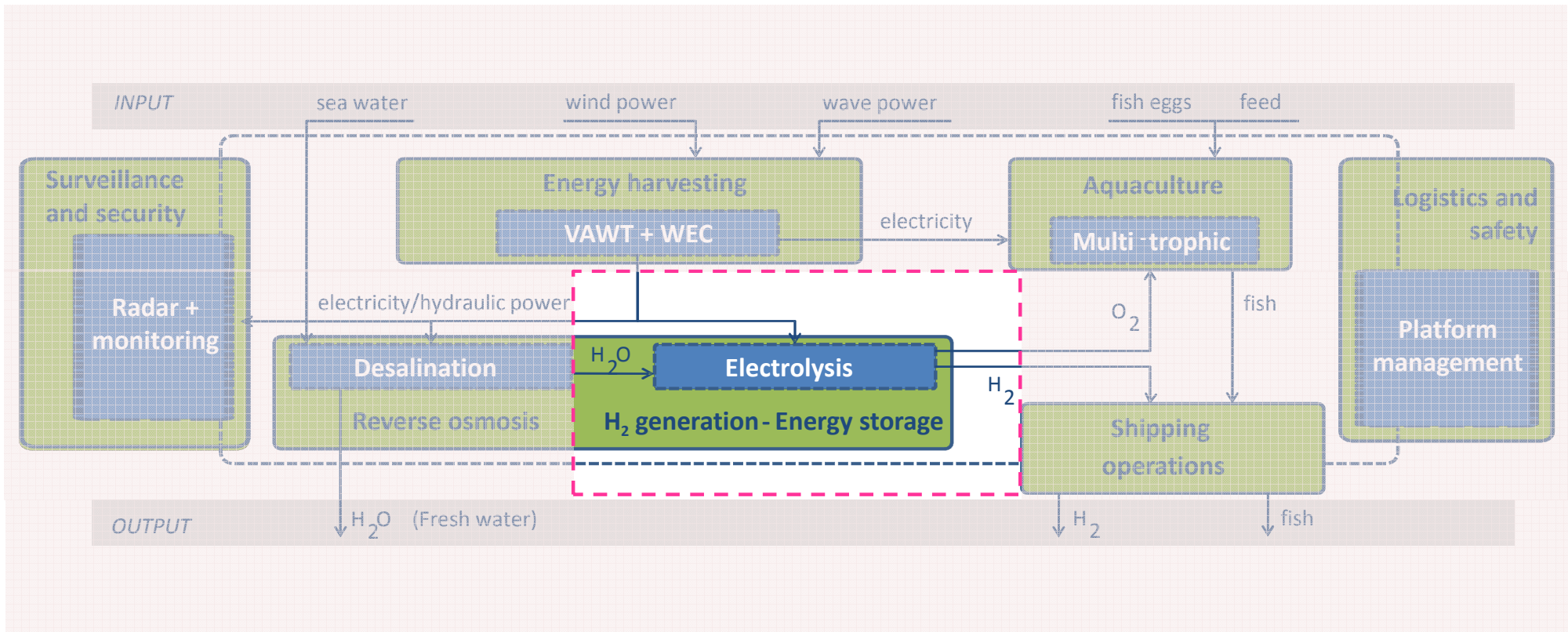


General Overview (3)



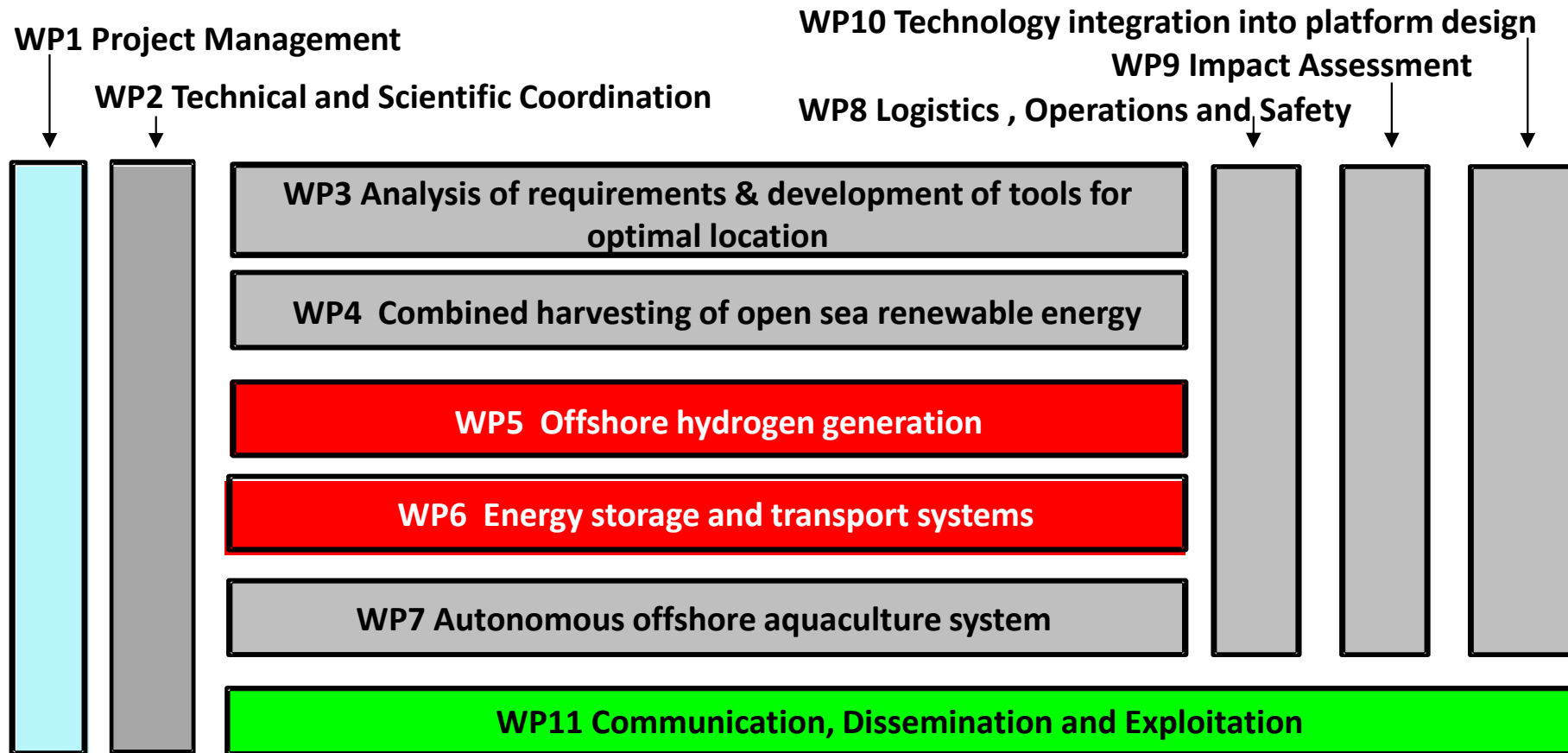
H2OCEAN concept ©2011 VirtualPiE Ltd

General Overview (4)





General Overview (5)



Objectives

Offshore hydrogen generation (WP5)

1. Development and dimensioning of hydrogen generator for installation on the 3 different platforms
2. Design of a NanoMembrane-based system for production of water for the hydrogen generator and secondary uses
3. Development of an advanced control system to minimize energy consumption and balance production and consumption of energy

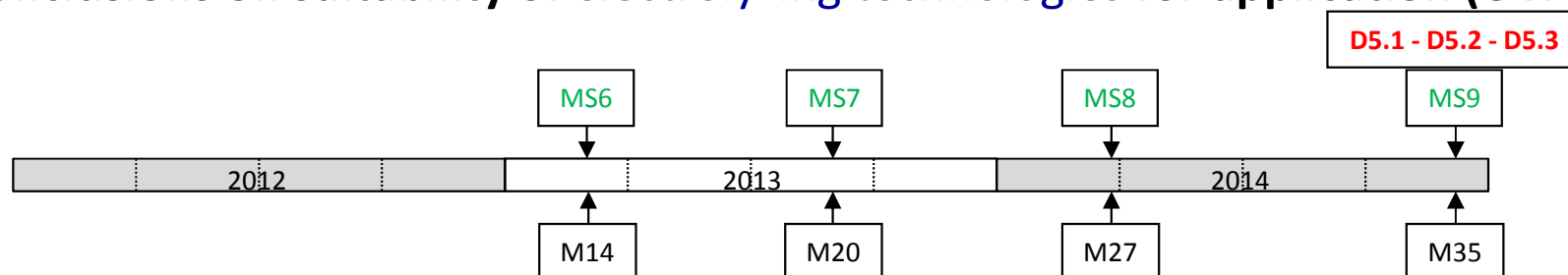
Energy storage & transport systems (WP6)

1. Develop modularised product and raw material handling systems
2. Assess the safety risks related to the platform operating environment
3. Development of appropriate safety measures, devices and procedures aimed at securing the safe performance of the production, storage, distribution and consumption systems and satisfy the safety standards of the offshore platform sector

Deliverables and Milestones

Offshore hydrogen generation (WP5)

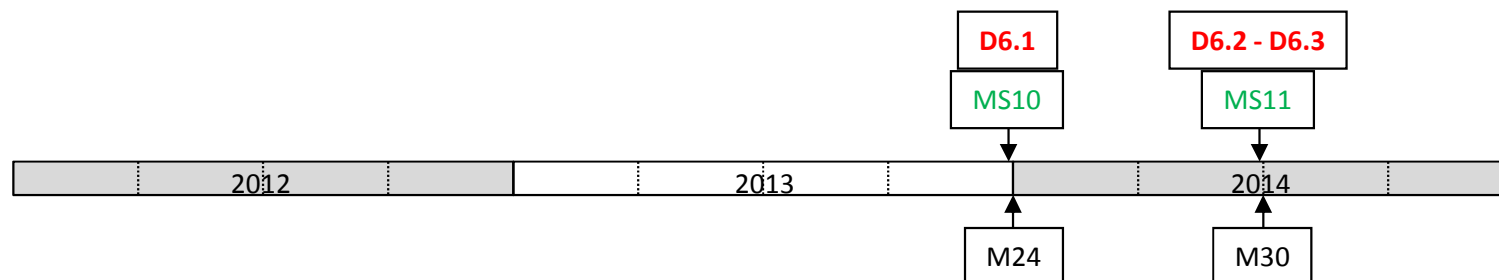
- **D5.1** Report on expected marinised **hydrogen generator** performance (DTU, R/CO)
- **D5.2** Report on desalination unit performance (UVA, R/CO)
- **D5.3** Report on advance control system performance (UVA, R/CO)
- **MS6** Selection of the **electrolysing technology** for design phase based on preliminary results (DTU, Doc)
- **MS7** Process diagram of integrated desalination and **hydrogen generation** (BHR, R-Des)
- **MS8** Test results of nanomembranes for desalination (UVA, R)
- **MS9** Conclusions on suitability of **electrolyzing technologies** for application (UVA, Val)



Deliverables and Milestones

Energy storage and transport systems (WP6)

- **D6.1** Design outline for gas compression, storage & fluid handling systems (DAP, R/CO)
- **D6.2** Report identifying risk analysis requirements for integration of packages into service module (DAP, R/PU)
- **D6.3** Safety systems and procedures compilation including emergency response (DTU, R/PU)
- **MS10** Outline design of storage and product handling system including connection and unloading concept (DAP, Rev-Val)
- **MS11** Production of HAZOP procedures for notional design of platform (DAP, R-Des)



Production (electrolysis technologies)

- Alkaline electrolyser (AEC, available at industrial scale but other applicat.)
- Proton exchange membrane (PEM, available at small scale)
- High temperature solid oxide (SOEC, development)

Electrolyzers (H₂ as energy carrier):

- Conversion efficiency
- Life-time/durability
- Power density
- Materials cost

Operation in marine environment:

- Motion
- Harsh corrosion
- Design to adapt electrolysis offshore
- Risks and Safety (devices, procedures)

Quality of hydrogen produced (target: requirements for PEM fuel cells):

- ISO/DIS 14687-2: Applications for road vehicles (see table)
- ISO/DIS 14687-1: *All applications except PEMFC for road vehicles*
- ISO/DIS 14687-3: *H₂ fuel specifications applicable to stationary applications*



Storage

- Gas (presurized, available)
- Liquid (liquefaction, expensive)
- Solid (metal hydrides, development)

Transport:

- Development of new modular vessels (similar to conventional containers)
- Possibility as fuelling station for ships

Risks and Safety (devices, procedures):

- HAZOP analysis (hazard and operability)

Energy produced:

- 20%-25% for platform consume (80%-75% for exploitation)



- Application Area: - Hydrogen Production and Distribution
- Mid-term targets: - *Up to 50% from renewable sources by 2020*
- Production:
 - centralised (large scale) plant,
 - new hydrogen production pathways
- R&D:
 - mature production and storage technologies
 - *new generation of HT electrolysers (2012)*
- Distribution:
 - large capacity storage based on solid & liquid materials,
 - high capacity transport,
 - new supply pathways,
 - RCS (design and installation)



- Project contribution to:
 - Dissemination & public awareness: **YES**
 - *Presentations (Conferences, workshops, etc): 10*
 - *Publications: n.a.*
 - *Patents generated: n.a.*
 - Safety, Regulations, Codes and Standards: **YES**
 - Training and Education: **NO**



- Technology Transfer / Collaborations

- MERMAID, TROPOS (multiuse platforms projects “The Ocean of tomorrow”)
- MARINA, ORECCA,... (projects “The Ocean of Tomorrow”)
- TBD (projects “FCH JU”)

- Project Future Perspectives

- Future research: Hydrogen Production and Distribution (AA)
- *Cooperation at EU/MS/Reg. level, and/or for PP alliances:...*
- *International collaboration:...*
- Possible contribution to the future FCH JU Programme:...
Mid-term target (1), Up to 50% from renewable sources by 2020