INDUSTRY VISION PAPER
2013
Representing a Fast Growing Sector:

- **Over €600m** private sector investment in the last 7 years
- EU installed capacity has tripled in 4 years – over **10MW in 2013**, 3.5 in 2009
- **2GW** of projects in planning pipelines

Wave, tidal, OTEC and salinity gradient...
Wave Energy Structured Development Protocol

**STAGE 1**
Concept Model; [TRL 1 - 3]
- Design Validation Testing in Regular Waves
- Device Optimisation Trials in Irregular Waves
- Scale Guide: 1:25 – 100 (Small)

**Stage Gate 1**
- Performance Review
- Technical Analysis
- Exit?

**STAGE 2**
Design Model; [TRL 4]
- Performance Verification in Realistic Seaways
- Component, Power Take-Off & Control Monitoring
- Scale Guide: 1:10 – 25 (Medium)

**Stage Gate 2**
- Performance Review
- Design Analysis
- Exit?

**STAGE 3**
Sub-Systems Model; [TRL 5 - 6]
- Fully Operational Converter Sea Trials
- Evaluate Energy Production in Real Seaways
- Scale Guide: 1:2 – 5 (Large)

**Stage Gate 3**
- Performance Review
- Components Analysis
- Exit?

**STAGE 4**
Solo Device Proving; [TRL 7 – 8]
- Full Size Power Plant; Technical Deployment
- Advance Pre-Production to Pre-Commercial Unit
- Scale Guide: 1:1 – 2 (Prototype)

**Stage Gate 4**
- Performance Review
- Operations Analysis
- Exit?

**STAGE 5**
Multi-Device Demonstration; [TRL 9]
- Final Commercial Unit; Economic Deployment
- Small Array Trials of 3 – 5 Devices; Grid Issues
- Scale Guide: 1:1 (Full)

**Stage Gate 5**
- Performance Review
- Economic Analysis
- Commercial Readiness
Tidal Stream Turbines – Development Path

<table>
<thead>
<tr>
<th>Year of Installation</th>
<th>Device</th>
<th>Maturity</th>
<th>Rated Power</th>
<th>Location</th>
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<tbody>
<tr>
<td>1994</td>
<td>Proof of concept</td>
<td>Proof of concept</td>
<td>15 kW</td>
<td>Loch Linhe, UK</td>
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<tr>
<td>2003</td>
<td>SeaFlow</td>
<td>Part-scale prototype</td>
<td>300 kW</td>
<td>Lynmouth, UK</td>
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<td>2008</td>
<td>SeaGenS-1.2MW</td>
<td>Full-scale prototype</td>
<td>1.2 MW</td>
<td>Strangford Lough, UK</td>
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<td>today 2014/15</td>
<td>SeaGenS-2MW</td>
<td>Commercial arrays</td>
<td>Arrays of 2.0 MW turbines (&gt;10 MW)</td>
<td>UK</td>
</tr>
</tbody>
</table>
European Test Centres and Demonstration Sites
UK Industry Demonstrators 2013
Irish Developments

Ocean Energy Ltd
Wave Energy Device

Open Hydro Ltd
Tidal Stream Turbine
INDUSTRY VISION

2015
RELIABLE
Several arrays up to 10MW

2020
COST CONFIDENCE
Front-runners installing up to 50MW arrays

2025
MARKET-ROLLOUT BEGINS
Cost-competitive commercial farms

2050
MAINSTREAM – 100GW
Renewable Energy Supplier
Offshore Renewables in an All Islands Market

Current “Best New Entrant” Renewable:
- Onshore Wind
  - UK O/Wind Operational
    - 2.6 GW Operational
    - ~7GW planning / approved

Future Offshore Options:
- UK O/Wind Options to R3
  - ~ 50 GW
- Wave Resource Regions
- Tidal Resource Regions
EUROPEAN OCEAN ENERGY – the benefits

Physical balancing & Price
- power from new locations
- out of synch
- Higher penetration of renewables on grid
- Maximising asset value of grid infrastructure

Energy Security
- Untapped indigenous resource
- Increases geographic & technical choice for utilities

Industrial Growth & Jobs
- 1000 jobs today to 20,000 in 2035
- Export & internal trade
A 3-Point plan for unlocking growth

**Technology Advancement**
- Deliver reliable and affordable technology
- Cost reduction pathway

**Project Pipeline**
- Supply chain
- Infrastructure
- Leasing, planning & consents
- Public acceptance

**Finance & Market Mechanisms**
- Market pull – grants
- Market push – revenue support
- Private & public investment strategy to manage risk and increase investor confidence
1. Technology Advancement

**Goals**
- Accelerate delivery of low-cost solutions to the market-place
- A strategic plan for HORIZON 2020, MS & private sector funding.

**Deliverables**
- Commercial priorities:
  ✓ Cost reduction pathway
  ✓ Technical innovation plan
- Engage supply chain

**Structure & Partnerships**
- DG RTD to chair TIP
- SI Ocean: cost reduction & technology agenda
2. PAN-EUROPEAN Project Development Pipeline

Goals
- EU gold-standard model policy framework
- Identify and adopt best practice

Deliverables
- Expert assessment of viable EU projects & recommendations on reducing risk in each area.

Structure & Partnerships
- DG RTD, DG MARE, DG ENER & DG Enterprise to chair relevant work groups.
- SI Ocean – policy report.
3. Financing & Market Mechanisms

Goals
- Accelerate market entry & roll-out
- Maximise private-public investment & risk sharing
- Funding stream for project development – at all stages

Deliverables
- Pro-investment policy frameworks
- Project bankability
- Level playing field
- NER 300 & beyond
- Viable project assessment & timeline for Europe

Structure & Partnerships
- EIB, DG ENER to be invited chair
- SI Ocean: market entry strategy
WestWave Project

- Opportunity for first wave energy project in Ireland: 5 MW
- Up to €19.8 Funding awarded under EU NER300: Wave Energy category
- Project consortium includes four of the leading technologies
- Project supported by industry via a number of Associate Partners
- Opportunity to develop the Supply Chain for Ocean Energy in Ireland

Cooperation, Coordination & Collaboration

SET Plan inclusion & European Industrial Initiative
ERA-NET Coordination
SI OCEAN & Industry leadership

Programme Board
European Ocean Energy Hub
Chair: Industry Representative

Technology Innovation Programme
Chair: DG RTD

Project Development Programme(s)
Chair: Industry Rep
Subgroup chairs: DGs ENER/RTD/MARE/Enterprise

Finance Programme
Chair: DG ENER / EIB
Over €600m private sector investment in the last 7 years

Large industrials and utilities now moving in

EU installed capacity has tripled in 4 years – over 10MW in 2013, 3.5 in 2009

2GW of projects in planning pipelines

Thank you for listening