

**THE OCEAN ENERGY FORUM**

**Open Session,  
Bilbao, July 1 2015;**

**Workshop Outputs  
Word for Word report**

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# About the workshop and this report

## Purpose of the workshop

The purpose of this workshop was to bring together people with an interest in ocean energy to comment on and influence the draft messaging of the industrialisation 'Roadmap'.

## About this report

During this workshop facilitators wrote up the essence of everything said on flip charts, or participants directly contributed their points by writing on notes or forms. Following the event, all these outputs have been typed up 'word for word' as written.

Once typed, where possible, we have sorted and clustered the points within each conversation so that similar points are together and the main topics and themes of the conversation become clear.

The ideas could have been grouped differently or different titles chosen, so no weight should be attached to them.

This report serves as a record of what people discussed, and an *aide memoire* for those who took part in the workshop, but the contents are inevitably quite cryptic in places. We recommend it is not used as the main means of communicating with non-participants.

**Please note:** whilst we have done our best to decipher participants' hand writing and understand points, we know we may have not always been successful and this report may contain errors.

## Acronyms used in this report

Acronyms used in this report	Meaning
BI	British Isles
C6	CETO 6 wave buoy
CAPEX	Capital Expenditure
CWE	Carnegie Wave Energy
DG MARE	Directorate-General for Maritime Affairs and Fisheries
E+C	Environment and Consenting
EC	European Commission
EIA	Environmental Impact Assessment
EMODNet	European Marine Data Observation Network
FITs	Feed-in Tariffs
H+S	Health and Safety
H2020	Horizon 2020
HRA	Habitats Regulations Assessment
ICOE	International Conference on Ocean Energy
LCOE	Levelised Cost of Energy
M Scotland	Marine Scotland
MeyGen	A company working in Scotland
MRL	Manufacturing Readiness Level
MS	Member State
MSFD	Marine Strategy Framework Directive
MWh	Megawatt/hour

NER	New Entrants' Reserve - a funding programme
NER300	New Entrants' Reserve (300 emissions allowance)
NGO	Non-Government organisation
OE	Ocean Energy
OEM	Original Equipment Manufacture
OES	Ocean Energy Systems
OEC	Ocean Energy Converter
O&M	Operation and Maintenance
OTEC	Offshore Thermal Energy Conversion
PTO	Power Take Off
R&D/R+D/RD	Research and Development
RDDD (RD3)	Research, Development, Demonstration, and Deployment
REIF	Renewable Energy Investment Fund
SC	Steering Committee/s
SEA	Strategic Environmental Assessment
SG	Salinity Gradient
SI Ocean	Strategic Initiative for Ocean Energy
SRA	Strategic Research Agenda
TRL	Technology Readiness Level
WES	Wave Energy Scotland

# 1 Environment and consenting

## 1.1 Improving the content of the messaging

### 1.1.1 Discussion about the context

#### Needs to address the challenges for developers of securing licences

##### Limited experience of securing licences

- Technology developers struggling in terms of licensing
- Limited experience OK to rest on
- Few developments to date to show the way

##### Limited resources

- Limited resources to go to where the knowledge is
  - Not just a small company issue
  - Balance sheet
  - Lot of developers do not have deep pockets

##### Need to make the process easier to understand and navigate

- Simplified single body
- One stop shop
- Inform people of process
- Joined up approach
- Does the document reflect the process?
- Level of detail – who, when

#### Tension between green agenda for renewables and health of marine environment

##### Ownership of the green agenda

- No ownership of the green energy agenda
- Set of environmental NGO's concerned
- P10 green energy
- Scotland can't do it on their own
  - It's a global issue

##### Challenge that want renewables but consenting slows process

- Get to the issue of do you keep opposing projects so strategy makes no progress

##### Tough choices to make

- Choices to make
- Start now due to benefits
- Trade offs

##### Benefits need to be understood

- Benefits need to be explained
- Otherwise continue to have conflicts
- Harm in the longer term
- Keep challenging / commit / trade offs
- Oil too valuable to keep burning

##### Blue Growth Frame

- Must be focused in framework of Blue Growth
- Covered by the Blue Growth Strategy

#### Marine Spatial Planning and EIA

##### Marine spatial planning should help

- Marine spatial planning
  - Minimize the 'bun fight'
- Significant spatial requirement

## 1.1.2 What suggestions do you have for improving the messaging overall?

### It should work at EU and country level

#### Works at EU and country level

- EU level
- Broader message
- Transposed to regional level
- Specifics to be addressed in terms of recommendations
- Each country has different consenting specifications
- Lose value of the documents
- Generic to all member states but specific
- Comply with European directives but must be commonality
- Member states go their way as a group
- Assurance - not take away member states' autonomy
- More relevance to member states
- Manual developed at member state level
- Inform due process
- Level - regional / MS / EU/
- Section A3 (of the 3-pager) strategy - needs more detail but relevant to each EU state

### Consenting

#### Consenting and licensing

- Consenting system that will work
- Consenting is a bigger issue
- Feed back into licensing needs to be fast and efficient
- Don't make developers go through unnecessary loops
- Feedback loops

#### Flexibility in consenting

- Flexibility in consenting
- Right place for development
- Need to be allowed

#### EIA and SEA

- Looking at EIA make a consent decision
- EIA / HRA (Habitats Regulations Assessment) essential
- Challenge the decision/ court
- SEA (Strategic Environmental Assessment)

#### Assessment of whole life cycle

- Decommissioning
- Life cycle analysis

### Data, information and monitoring

#### Collecting information and data

- How data gathered and used
- Pan European method of capturing it
- European portal
- Research and monitor - understand what is going on elsewhere and what wasn't known - to communicate with others
- Embedding links to other databases
- What have we all learnt from all this monitoring
- Identify opportunities as a group / make recommendations
- Reasonable requirements for data collection

#### Data sharing

- Share across EU
- Baseline into share / impacts

- Environmental data sharing

#### **Dissemination of information**

- Dissemination of information
- Global information feedback
- More apparent in the document
- Formal/informal process for dissemination
- Disseminate info easily
- Flow of information
- Opportunities for disseminating info
- Reluctance to share info due to no benefit

#### **Proportional Monitoring**

- Proportional monitoring
- New EIA directive – monitoring to be proportionate to size of development
- Don't have to monitor everything
- Inform member states on their own monitoring

### **Lessons learned**

#### **Lessons Learned**

- Lessons learned about regulations leading to licence consents
- Formal mechanism
- Lessons learned useful – share at project level
- Document to include lessons learned
- More about specific projects in terms of lessons learned
- Lessons learned
- Lessons learned useful – share at project level

### **Arrays and small scale developments**

#### **10 Arrays**

- Do not mention 10 Arrays
- Not applicable to E+C
- 10 arrays identify best places left to consenting process = gap
- E+C to look at best places to put them
- How many sites are consenting across EU
- Target to make 10 arrays easier
- Other documents do not mention arrays

#### **Small scale developments**

- Should there be provisions for small scale developments
- Dispensation in the regulations that will allow for this
- Legally this group should not do
- Single devices / low risk
- Same across all areas?
- Can this be included in the manual?

Unable to place this comment:

- 2 phase share into Section A2 of the 3-pager

### **1.1.3 What suggestions do you have for improving the detail?**

#### **Specific challenges and barriers**

- Specific challenges missing
- Specific barriers
- Annex with challenges
- List of challenges



- Challenges re-working of the front page (?)
  - (?) No: add to them not reworking
- Identity challenge

#### **Environmental benefits**

- Environmental benefits
- Alignment of disbenefits and benefits
- Quantify the benefits
- Benefits / impacts

#### **Case examples and best practice**

- Identify case examples of benefits and challenges
- Outline core projects
- Disseminating best practice

#### **Link with other EU Projects**

- Link with other EU project: SI Ocean (Strategic Initiative for Ocean Energy) - don't do things in a vacuum
- Super group for the North sea already in existence
- North sea, sub-sea, pan European cable ring
- Offshore Europe is the owner of the portal

#### **Needs to set out resources**

- Resource stream needed
- Nothing assigned as yet
- Who takes forwards
- Who funds it
- Resources - work programme - research call in 2016
- Identity funding

#### **Strategy**

- Enough strategy in the document
- Need for a strategic plan

#### **Identifies aspirations**

- Identifies aspirations

#### **Specific plans and actions needed**

- Need to be more specifics on actions
- Report outlines things to be done
- But these are the things to work on = not who, when, resources = road map
- Actionable items rather than time line
- Work plan
- Not a route map
- Need to find a way of setting time scales without resources
- Road map needs to have this specific info
- How to facilitate the deliverables
- Actions to be prioritised
  - Mitigate by prioritising - must do, like to, if enough resources
  - Set of priorities. Difficult as each member state is at a different level
- Identify at what level thing should be done
- Guidance important - implementation of directives - Incorporated Ocean Energy
- Incorporate into local guidance
- Risk of making it too specific
- Not relevant
- Finalise implementation

#### **Prioritisation**

- Recommendations for work at EU level. Prioritisation
- Priorities
- Priority issue

#### **Information about how member states apply Directives**

- Organisation of directives from member states

- Fundamentals of directive are catered for **MSFD ( Marine Strategy Framework Directive)**

- MSFD NOT mentioned.
  - Is it relevant? – YES!
- MSFD descriptor

#### **Cross border issues**

- Cross border issues

#### **Diffuse sources**

- Harnessing diffuse sources

#### **Knowledge of future plans**

- Future plans

#### **Clashes and conflict**

- Clashes when getting down to the detail

#### **Section B1 of the 3-pager**

- B1 – rely on input from the finance group
- B1 – Raising contribution of member states in terms of infrastructure eg. Sub-sea cables
- Cost effective manner

#### **Tools and delivery**

- Tools
- Delivery method

## 1.2 Style of Document

#### **Reads like a manual**

- Not a route map
- Like the end of a manual
- Manual rather than guidance
- Manual developed 4 years ago

#### **Could be useful for others**

- Useful for terrestrial guys

#### **Need for more detail - but can't be longer document**

- Need to get to the detail
- Detail needed / more specifics
- Need to widen group to give the detail due to un-development in other projects
- More detail = longer document

#### **Useful structuring for readers**

- Need structure not more layers
- 4 plans in the doc- objective and challenge and targets for each
- Sub headings for each recommendations
- Pyramid
  - High level
  - Detail
- Individuals stop where they need to depending on requirements
- Standard subheadings
- Stijn subheadings
- Objectives

#### **Use evidence**

- Specific evidence
- Justify the issue using evidence

#### **Summary**

- Front page summary
- Summary for policy makers but needs substance behind it
- Group need it
- Summary to handover to who does the road map

#### **Explain the terminology**

- Energy / low cost energy

- The difference
- Language

#### Use Annexes

- One document supported by annexes
- Bulkier document to be the annex
- (next year's) expanded document can include more

### 1.3 Remaining gaps in evidence

What are the remaining gaps in evidence?	How can they be filled (eg, more examples, more literature)?	What can you do to help fill them?	When?
<ul style="list-style-type: none"> <li>- Justify specific projects and actions</li> <li>- examples</li> </ul>	<ul style="list-style-type: none"> <li>- Collate information</li> <li>- Level of detail</li> </ul>	<ul style="list-style-type: none"> <li>- Stakeholder brief - Marine Scotland</li> </ul>	<ul style="list-style-type: none"> <li>- Create a portal hosted by the EU</li> </ul>
<ul style="list-style-type: none"> <li>- Delivery method portal at EU level</li> <li>- Where does the portal live</li> <li>- Where does it live within the document?</li> <li>- Joined up - , tool box, portal, communication plan</li> </ul>	<ul style="list-style-type: none"> <li>- Connect up portals</li> </ul>	<ul style="list-style-type: none"> <li>- Request EU concession amalgamate portals</li> </ul>	<ul style="list-style-type: none"> <li>- Website update - by autumn</li> </ul>
<ul style="list-style-type: none"> <li>- Where things already exist</li> <li>- Joining up geographically Sections A1, A2, A3</li> </ul>	<ul style="list-style-type: none"> <li>- Geographical examples</li> </ul>	<ul style="list-style-type: none"> <li>- Fixed structure</li> <li>- Secretariat to fill in detail and collate</li> <li>- Design and capture - come in and disseminated</li> </ul>	<ul style="list-style-type: none"> <li>- ?</li> </ul>
<ul style="list-style-type: none"> <li>- Overacting website</li> </ul>	<ul style="list-style-type: none"> <li>- Creating portals</li> </ul>	<ul style="list-style-type: none"> <li>- Needs team of 5</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>
<ul style="list-style-type: none"> <li>- (1) bad practice (learning from) creating internal feedback</li> </ul>	<ul style="list-style-type: none"> <li>- Difficult to accept</li> <li>- Regulators guidance. Managing risk</li> </ul>	<ul style="list-style-type: none"> <li>- Recommendations</li> <li>- Lessons learnt</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>
<ul style="list-style-type: none"> <li>- Feedback to the group</li> <li>- (1) bad experience</li> </ul>	<ul style="list-style-type: none"> <li>- National monitoring</li> <li>- How to disseminate</li> </ul>	<ul style="list-style-type: none"> <li>- Difficult to advertise</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>
<ul style="list-style-type: none"> <li>- Necessity for implementation</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation plan</li> </ul>	<ul style="list-style-type: none"> <li>- Evidence map</li> <li>- Resource plan</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>
<ul style="list-style-type: none"> <li>- Collaboration with existing ongoing actions</li> </ul>	<ul style="list-style-type: none"> <li>- Sharing information eg. EMODNET</li> </ul>	<ul style="list-style-type: none"> <li>- Create pro-active approach + commitment</li> </ul>	<ul style="list-style-type: none"> <li>- Scottish stake holders meeting translate the briefing</li> </ul>
<ul style="list-style-type: none"> <li>- Multilingual</li> <li>- Making everyone at ease inclusive</li> </ul>	<ul style="list-style-type: none"> <li>- Translations</li> </ul>	<ul style="list-style-type: none"> <li>- Translate the information</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>
<ul style="list-style-type: none"> <li>- Identify more specifics for all ocean energy technologies</li> </ul>	<ul style="list-style-type: none"> <li>- Information needed</li> </ul>	<ul style="list-style-type: none"> <li>- More work required</li> </ul>	<ul style="list-style-type: none"> <li>-</li> </ul>

## 1.4 Level of support for the document (after morning session)

Docket number	Level of support					What would need to happen for you to increase your support
	I have strong concerns	I have concerns	I can live with it	I can support it	I am very supportive	
1				x		
2				x		Stronger support from the secretariat
3					X	<ul style="list-style-type: none"> <li>- Provide a structure for each section</li> <li>- Circulate to the steering group for input</li> <li>- Make the document 'challenge' driven</li> <li>- Include actions and objectives</li> </ul>
5				x		Specific actions identified
6					x	Regulatory manual – needs EU, MS, region policy environment
7			x			Many of the improvements were operational not practical steps forward in terms of knowledge
8					X	<ul style="list-style-type: none"> <li>- Implementation plan</li> <li>- Evidence map</li> <li>- Resource plan</li> </ul>

## 1.5 Questionnaire

Please see Annex 2

## 1.6 Feedback points after morning session

### Inclusion

- Need to set up a common European database taking into account existing ongoing actions
- Inclusive approach
- Take into account the administrative specificities of each member state
  - Inclusion of all stakeholders

### Risk

- We need to find ways to handle uncertainty and risk within the consenting progress in a proportionate manner

### Communications and Sharing

- Need to ensure access to info across EU
- Elaborate inclusive documents (multilingual) and share information between state members
- Create information sharing portal
- Need to ensure more knowledge on impacts of OE not just baseline info
- Establish feedback mechanisms for continuous improvement for monitoring and regulation

### Information sharing

- Analyse experience
- Integration
  - Realise not every member state is at the same start point
- Regulatory manual to reduce industry's burden (cost and time)
- Update best practices (sharing info)
- Validation of models
- Learn more from experiences – not about more data (solely)

### Implementation

- Implementation plan

## 1.7 Process for firming up the document

### **Need inclusion and support**

- Joint ownership across EU
- Engagement by EU members
- People involved in government and planning to be included
- Right people behind it to be involved
- Real support
- Inclusive

### **Concerns about this process - cherry picking**

- Worry reactions will be cherry picked
- Cherry picking by EU not an issue
- EU can agree to do something but agreed by member states
- Process in place to avoid cherry picking

### **Tasks**

- Writing up of specific parts
- Mechanism to have it drafted
- Framework to hang the details
- Design framework by secretariat
- Secretariat to co-ordinate

### **Approach to collating info**

- Where it can come from
- Who can collate the info
- Secretariat to be asked if they can collate the info
- Info back to Phil/David
- Ian happy to help collation tasks

### **Actions**

- Steering group to take responsibility
- to expand certain elements
- Recirculating the document
- Re populate the document
- Production deadline show to investors – increased confidence
- Flag up issues

### **Timescale**

- Within a month?
- Existing work underway

### **Requirements**

- Lesser challenges
- What is required by September deadline? Smaller document and populate later
- 3 page by David and Phil. Needs steering group input
- Comprehensive document needs 'who and how'
- One liner for each of the plans (in the) 3 page workplan – no assignment of tasks
- Suggestions to overcome
- Pulling plan together: co-chairs ask people how issues can be tackled – previous conferences
- Majority view
- Responsibility needed now
- Terms of reference
- Pro-active in developing the document

### **Limitations**

- Can't provide detail for everything
- Prioritisation due to limited time
- Not all issues will be resolved
- Commitment to input is lacking

### **Implementations**

- Done externally / multi state member group
- Coherent plan how to tackle the issue
- Inclusive ownership
- Ian – first moderation
- Secretariat – responsible for final version
- Working group responsible for input
- Working group hand over to secretariat with caveats and feedback process
- Telephone conference community buy in
- Ian update final updated version
- Hand to secretariat
- Back to chair for sense check
- To the EU
- Secretariat to collate responses prior to telephone conference
- Responsibility taken by the steering group
- Additional responsibility to be handed over

**Questions for thought**

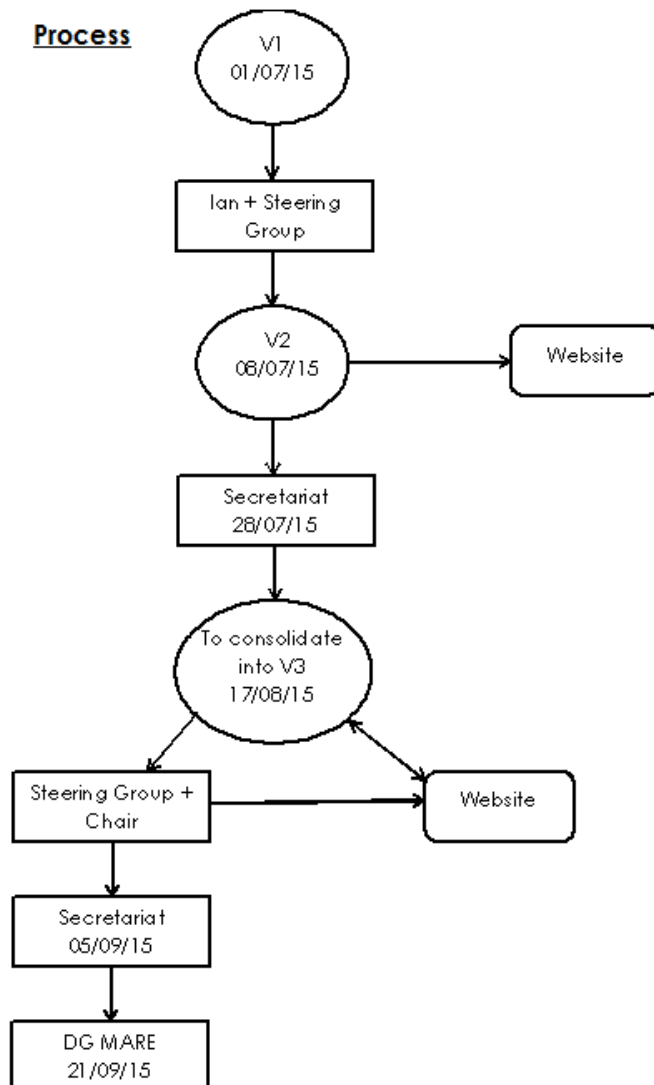
- How do you deliver further refinement with consensus

**Positives**

- Lots of opportunities for input
- Additional control over 3-pagers

**Process for Review**

**Process**



## 1.8 Actions

- Tony will feed in document ideas
- Word for word report from facilitators + V1 sent to everyone for comments or on website?
- Please send us comments by 21/07/15
- Secretariat then collate comments
- Not V1-V2 which Ian will produce 08/07/15

## 2 Technology

### 2.1 Improving the Messaging

#### 2.1.1 What do you like about the messaging overall?

##### **Timescale**

- Clear objectives to meet in a reasonable timeframe
- Focus on 2020 – 2030

##### **Recognises differences between marine energy types**

- Each type is tailored

##### **Structure/style**

- Nice to have diagrams
- Positive messages
- Headlines short and concise

##### **Sections**

- State of play at the beginning
- Research priorities section
- Policy recommendations

##### **Collaboration**

- Increase collaboration

#### 2.1.2 Is anything substantive missing? If so what, and why is it important?

##### **Resources to develop technology**

- Missing amount of investment required to meet targets
- International collaboration and raising funds (development of technology)
- Main purpose is to attract funds but long time finance market, intensive cost development and clear path to economic competitiveness scalability (not in the document)
- Certain amount of the money available, do we need to talk about mechanism that assures funding is audited? Too many devices seeking money so we need to make sure the right ones are funded
- Enough money should be available to test devices
- Demonstration costs money but how else can we accelerate the technology

##### **Diagrams**

- Diagram could be more detailed

##### **Make the case for marine energy**

- Articulate macro level requirement and argument for marine energy. Why should tidal and wave be part of the mix?
- Need to mention jobs as per DG MARE comment
- Try to provide European added value

##### **Size of market**

- Size of the market is not identified

##### **Supporting infrastructure**

- Supporting infrastructure missing

##### **Links with other documents**

- How are the three documents going to fit together? Documents should interact

##### **Barriers**

- Clear statements of barriers and hurdles is missing (grid)
- Need to look at barriers and where generic across EU and all technology types and where specific region or technology type

##### **What do we need to do**

- What do we need to do between 2015 and 2020? Big picture is presented but not clear what we need to do now?

##### **Broader perspectives**



- What other ways can we use this technology?
- What other areas can we draw from?
- Looking to wider EU areas
- Research priorities should be wider. Focus on overall performance and reliability

#### **Technology development**

- Technology requirements based on sub systems and component level
- Phases are focussed on deployment so previous stages need to be present
- Framework for technology development – could be made stronger

#### **Wave Energy**

- Need a perspective of the complete wave installation and identify the 'golden nuggets' that are needed to complete this
- Focus on the stage that wave energy is at

#### **Lessons learnt – knowledge exchange**

- How do we get the most out of what is already going on? Bringing things together. Increase knowledge exchange and collaboration should be in the document. (very important actions)
- Mapping exercise to see where barriers have been overcome already (best practice)

#### **Competition**

- Balance between technology concentration and competition
- Competition needs to be present at high level but balancing collaboration – learning from each other

#### **Innovation**

- Should be open to innovation particularly game-changing (break through)
- Identify pieces in technology to bring something better together

### **2.1.3 What suggestions do you have for improving the messaging overall?**

#### **Draw on what has already been achieved**

- A lot has been done in Europe but it is not apparent in the document. This should be summarised
- Existing documents need to be considered

#### **Draw on existing marine data network**

- EMODNet already exists so why not draw on this?

#### **Reconcile the three documents**

- Three documents should agree with each other

#### **Research priorities**

- Research priorities are not clearly stated

#### **Finance/Funding**

- Should prove there is enough money to support development and the costs are acceptable/reasonable
- Financial comparison (historically) should be looked at

#### **Priorities for investment and research**

- Priorities in terms of market position. Which technology gets the investment in which order?
- Research priorities impacts should be made clear (against objectives)

#### **Case for marine energy**

- Clear identification of impacts (positive). Benefits of doing this

#### **Tailor to the audience**

- Remind ourselves it is a political document. Politicians need to be clear about requirements
- Needs to be clearly communicated: audience should be considered

### **2.1.4 What suggestions do you have for improving the detail?**

#### **Diagrams**

- Diagram (D2) phases could be changed to timeline. (D1) could be displayed differently
- Targets identified but not clear how we get there within the diagrams (D1 and D2). Not giving the right message

### Wave energy

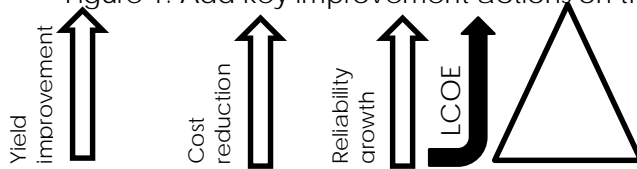
- Wave element, no synergy between the two so we should not be making that statement. (2)  
(convergence of concepts should not be in there)
- The choice of words more than the message (2)

### Strategic Research Agenda

- TPO Item 1 – cross references SRA which is weak against the other points. Some SRA detail is needed

## 2.1.5 Additional points

- Consider other sector approaches to enable acceleration of technology development e.g. automotive industry
- Main issue today is to attract investment to support technology development and we need to understand what the main barriers to this are. They seem to be:
  - Long term to market
  - Very cost intensive and risky development
  - Unclear path to economic competitiveness
  - Scalability: offshore windfarms are typically 400 MW; typical wave energy devices one 0.5 MW and so about 1000 devices are required to attain an installed power (500 MW) that offshore wind shows to be required for economic competitiveness. As each wave device requires about 500m of mooring lines and possibly 100m of electrical cables this results in something like 500km of mooring lines and 100km of electrical cables for one single wave farm.
- Figure 1. Add key improvement actions on the vertical LCOE arrow:



- Figure 2. Horizontal axis of Phases leads to a confused timeline. Re-draw the diagram so that horizontal axis is timeline

## 2.2 Ensuring the messaging is backed by sound evidence

### 2.2.1 What comments do you have on the evidence?

#### Lack of evidence

- Lack of evidence in the document
- Figures used came from previous discussions
- But a roadmap action must be to gather and establish relevant evidence
  - We have models, systems but not yet evidence of industrialization

#### ACTION

- Mapping success + best practice
- Evidence collection

### 2.2.2 Facts and Figures

- LCOE is important. Availability and yield but a blanket capacity factor is not appropriate
- Targets are too high
- Other elements need to be shown, not just the percentages. Show or remove.
- ETI roadmap has some of these figures
- Reliability, capacity and available for each technology - figure for each
- Capacity factor to be removed?
- Target 10/Kwh needs to be there

## 2.2.3 What are the remaining gaps in evidence and how to fill them

	What are the remaining gaps in evidence?	How can they be filled (eg, more examples, more literature)?	What can you do to help fill them?
	- LCOE -1	- LCOE – OES report June 2015 (plus Brussels event)	-
	- Support mechanisms to support financing of the roadmap	-	-
	- Evidence of capital needs and support	- By bringing Project developers together and building consensus – though this is technology and site specific	-
	- Inspect spot market prices (electricity)	-	-
	- 1 <sup>st</sup> line 2 <sup>nd</sup> page – we don't know how to support this	-	-

Other potential sources of evidence:

- Wave business plans
- MEYGEN

Other comments:

- High resource sites to be exploited first followed by medium and then low
  - Maybe this is correct for tidal but not for wave - Inspect "spot"
- Percentages do not apply for all technologies

## 2.2.4 Level of support

Docket number	Level of support					What would need to happen for you to increase your support
	I have strong concerns	I have concerns	I can live with it	I can support it	I am very supportive	
1			x			
2				x		There is a linked space (3 pages) to reflect and provide evidence of the most important topics, so I suppose that it is quite difficult to summarise and prioritise
3				x		
4					x	Reference relevant international reports with further technical details/evidence
5				x		
6				x		Additional reference to what had been achieved and what the strengths at European/national level are, and how these strengths can be leveraged to develop the industry
7					x	Many of the people are also involved on current calls and projects. This can represent some kind of conflict of interest, so some opinions should be

						discriminated to bring this into account. Maybe some technical recommendations and discussions would be positive.
8				x		Three different audiences need to be met – government, utilities, technology
9				x		
10					x	
11				x		More focused on specific actions aiming at explaining how technologies can be improved and derisked. Clear actions per technology (wave, tidal, etc...)
12				x		To feel that all the efforts in general and the document in particular are taken into account by the politicians
13				x		Improvement of vision with realistic step changed and clear technology development targets
14					x	Clear political messages
15					x	Points raised need to fit in a 3 pager and need to be over arching and have a clear political message.
16		x				Different technologies at very different TRL levels are put together in a roadmap. Even where it may be inevitable for tidal, wave energy need for more details at lower TRL level. Therefore, technology development should be highlighted in the roadmap at lower TRLs. This might be also be true for salinity and OTEC
17				x		More concrete actions which can speed-up the timing of the roadmap
18			x			Further review
19				x		More focus on the testing and demonstrations of technologies and prototypes
20				x		Wider European involvement. Too much concentration of actors in a reduced number of countries, in particular in the steering committees

### 2.2.5 Feedback points

#### Collaboration

- Ocean energy sector need technology development through collaboration and healthy competition for best value for money of support. How can we police ourselves?
- Sharing data
- Collaborating
- Create common infrastructure for test and pre-commercial deployment
- Knowledge sharing
- Leverage what had already been achieved in Europe, identify best practice and where gaps exist and need to be addressed

- Deliver complete array systems in a joint effort by picking the best sub-systems “golden nuggets” and put them together.

#### **Wider Use**

- Ocean energy technologies have a primary application for electricity generation, but other applications/benefits should be considered (such as water desalination, employment creation, ...)
- Islands

#### **Funding**

- Different ocean technologies are at different stages of development and need specific actions and figures, free ICOE reduction with installed capacity and R&D priorities
- Important to understand the level of investment to attain 1GW of installed capacity in the different ocean technologies
- Disruptive innovation needs to be supported both at component level and device level
- Investment and funding in the first stage
- Technology is not mature enough to start thinking of project/market deployment. Cost is “unknown” more than high!
- Who is going to pay for technology and how?

#### **Details**

- Need to present clearly what we can achieve in 2015–2020 time frame and how this needs to be supported
- More evidence needed
- More technical recommendations in the case of wave energy
- How to speed up the industrial roll-out? (new ideas and possibilities)

#### **Clear messages**

- We need to better articulate a clear “macro level” vision for why Europe needs ocean energy
- Realistic development plans with ambitious targets to realise industrial breakthrough of technologies

#### **Technology specific**

- General and specific barriers of the different technologies
- Finding overarching issues (i.e. watt technology / is close to impossible issues, actions and support should be technology specific)
- Each technology (wave, tidal, ...) has its own requirements and hence some figures should be technology dependent
- Different road map for each technology

## **2.3 Points for inclusion in afternoon discussion**

At the end of the morning session participants were asked what they wanted to be discussed in the afternoon. The points relevant to technology include:

#### **Standardise standard components**

- Industry standard components -> PTO, mooring, foundation etc...
- reduce expertise burden from device developers and potentially reduce Capex and improve reliability

#### **Technology specific - Wave**

- the document should be more specific about technologies - in particular in wave energy where diverse concepts exist, some guidelines would be welcome
- Support the research and development in wave technologies

#### **Reliability /de risking**

- Reliability – de-risking

#### **Route to market**

- Grid - Route to market
- How do we get the power from the devices to the grid?
- Route to market - Grid

#### **Getting technology ready - implementation**

- How to get the technology ready?
- Implementation - who will do what and when

- Supply chain

#### **Research funding**

- Research funding

#### **Demonstration Projects**

- Development of demonstration projects in Islands and isolated coastal regions with wider cost thresholds

## 2.4 Short term issues 2015 – 2020

#### **Cluster header**

- Waves – divided into pre-commercial and R+D. different technology streams
  - I question this – I agree with division but not sure about two (as above)
- Very different considerations between the two streams

#### **Pushing forward the pre-commercial and R&D**

- 2015 – 2020 timeframe: What do we need to do today to push forward the pre-commercial and R+D?
  - A number of devices need to be deployed in order to answer this question.
  - Then 2 years of trouble-free working.
  - Project R+D – large scale

#### **Accommodating the different stages of different technologies**

- Not everybody is at the stage to guarantee reliability and availability to do this
  - If this is the case it dismisses all technology that is not at this stage

#### **Cost-effective development and commercialisation**

- Looking for more cost-effective technology development
- Commercialisation could be made more efficient

#### **Scaling up testing by having different technologies in the same site**

- Cooperation within a single site. (single farm) for different technologies, devices and manufacturers
- Test sites for multiple devices with a greater spread so different environmental conditions are considered. Some countries do have suitable locations (Portugal)
- Development of technology neutral array scale test sites for wave and tidal
  - Timing of the wave and element of this is questioned

#### **Knowledge sharing**

- Developers are secretive about results so knowledge sharing is required
  - The will also assist in reducing costs

## 2.5 Measuring target

#### **Suggestions and discussion around measures**

- Cross technology, measurable
- Levelised Cost of Energy?
- Increase availability at eg 80%
  - Be careful - whatever is written will control your fate!
- €10c/Kwh
- Needs to address in different tech:
  - wave / tidal or
  - OTEC / salinity
- What are target values?
- Measure - examples of ETI - based on breakthrough
- Credible approach to targets

## 2.6 What are the overarching issues for the market as a whole across technology?

#### **Confidence for investors**

- What is the need if low carbon targets are not signed up to

- Cost reduction, reliability improvement and yield improvement
  - All technologies broken down by component, device and array
- Ensuring performance and reliability is a cross cutting issue (generic theme)

#### **Convincing roadmap**

- Roadmap as a whole to show the (positive) impacts of the sector.
- Harmonisation with other documents

#### **Supporting 'hard' infrastructure**

- Need for infrastructure developments
- Power cables and grid infrastructure
- Moorings? Should these be considered with other actions?
- The dynamic power cables for subsea connections (?)
  - (?) That level of detail is not feasible (1)

#### **'Soft' infrastructure**

- 'Soft' infrastructure (eg skill sets, Health and Safety)
- Get technology ready to request funding if needed

#### **Installation**

- Installation + commissioning

#### **Efficiencies in supply chain**

- Wider supply chain for other industries should be considered: identify synergies and where bespoke solutions are needed

## 2.7 Action

#### **Short Term Actions:**

- 2020 tidal farms in the water
- Engage supply chain
- 5 pilot projects

#### **Mapping supply chains**

- Mapping exercise of supply chains. Essential or nice to have?
  - Supply chain is different for every technology so this statement should be mitigated

#### **Alignment of innovation programmes and centres**

- Alignment of innovation programmes and centres
- More cooperation between industry and academia
  - What are we ready to collaborate on? What are we ready to share?

#### **Finance and framework demonstrated at large site**

- Finance and framework required – demonstrate at one site? Needs to be large
- State can support if everything required is in place

#### **Recommendation 3 in the 3-pager**

- Recommendation 3 needs to be re-worded to take this into account
- Framework suggested is sensible but risk can't be loaded directly into the project

#### **Efficiencies by testing components ( not just full arrays)**

- There can be testing at component levels not just at array scale. More efficient to improve reliability

### 2.7.1 Cross Cutting themes

#### **Harmonization between work streams**

- Harmonization between work streams

#### **Alignment between research and industry**

- Alignment between innovation programs and centres in different countries
- Alignment / co-operation between research centres, and industry, and universities

#### **Reengaging big company utilities**

- None of commercial farms will happen until we have big company utilities funders come back into sectors
  - need to get them back
  - We need to understand why they've walked away and address it

- Understanding what big companies would accept as targets to re-engage - need a coherent approach. Need to find out how they would like to take it forwards
- Big companies will join if there is
  - A clear framework
  - Clear technology
  - Tariffs sorted
  - And then banks will come and finance
- Incentivise private investors in to fund technology development E.g. tax breaks



# 3 Financing

## 3.1 Review of the messaging - morning discussion

### 3.1.1 What do you like about the messaging overall?

- Tidal – Gives repetition, this is good, common message
- Scope, local, national, what scope do we have / focus on to access finance
- Specific recommendations, good to be upfront

### 3.1.2 Suggestions for improvement

#### Style of the document

##### Style of document

- Clarification on how documents are packaged and presented to people
  - will not be standalone document will be made coherent, need to link together
- Must be concise and practical
- Less technocratic, more like a chairman's report
- Identifying target audiences, tailoring messages and actions for each

##### Summary

- Needs executive summary
- First paragraph needs to sum it all up

##### Links between technology and finance stream docs

- Figure 2 in technology stream – match with financial needs
- Not linked technology development with investment requirements

#### Making the case

##### Set out the need and what success looks like

- Needs to be introduction on need for marine energy
- Show what success looks like, describes 2025, what it all looks like on various topics, and how we finance that
  - 2025 is very soon, important to take into account all this is required
- Decide what is our success story and be clear on this when including this
  - The when and the what, what we can achieve and the business plan
- Need for 'what does success look like' approach
- Success is to reach objectives in road map and not to wait 5 more years

##### Urgency

- Need to cover urgency in document
- Sense of urgency and clarity needed

#### Finance

##### Tariffs

- EU work on tariff needed
- Tariffs – need for discussion on this
  - Up to individual countries?
  - more support from EU system
- Cautious on raising issue of FITs ( Feed-in Tariffs)
- European approach allocating tariffs
- European input to developing tariffs
  - ring fencing of funds is important
- Difficult to show income due to tariffs, before investment can come

##### Public funding

- Need more information on innovative public procurement
- Pushing projects which require public money is dangerous

- Specifics on ability to deliver, state aid rules must be understood, they are transformative

#### **Packages and project finance**

- Need for detail on packages and how they meet finance requirements
- Describing more towards project finance, to give information on timeline

#### **Business approach**

- Needs to be more explicit on business approach and opportunities, to attract investment, develop a business model
- Need for market driven approach unrealistic
- Need approval from financiers to generate more support

### **Issues, barriers and Solutions**

#### **Issues/barriers**

- Understand the barriers and share this information
- What are the issues at different levels, what is needed, explore the different options
- Identification of main hurdles, EU can then facilitate solutions and developing framework
  - need clear overview from sector in order to assist effectively

#### **Section on Solutions**

- Section that sums up solutions to deliver technology before just farms
  - we do have instruments, but demonstration phase is where issues are found
  - Mechanisms are there but we need consistency in technology support.

### **Progress**

#### **Current progress**

- Technology development, going well but must include it in report

#### **Future progress/action**

- Describe the small steps on what can be done
- Explicit and concrete steps at different levels
- Need entry and exit gates identified
- List of 5 actions undertaken by target groups
- Actions targeted as specific people can assist prioritisation
- Identity priorities and who will do what
- Precision efforts on focussing document

#### **Key actors**

- Who are the key actors and players
- Cautious to identify different actors, passing the buck by governments
- What EU can do, their responsibility
- EU searching for solutions from sector from different levels
- Identifying levels that should / need to be involved
- Audience is anyone with a solutions
- Identifying clearly who key actors are is important element

#### **Prototype development**

- Content must include prototype development, policy and government practices
- Need demonstration and EU need to advise on how sector organises
- more space to development towards the first farm and then the next farm.

### **Regulation**

#### **Regulatory systems**

- Regulatory system must be serious, EU perspective must be above systems in countries

### **Who will do what**

#### **Insurance**

- Insurance create a group and framework to make development insurable

### 3.1.3 Parking Place from morning discussion

- Committee of regions
- EC 4<sup>th</sup> communal meeting 30 June 2015
- Rhodri Glyn Thomas
- Wrong timeline / Should be looking at the 'now'
- None of the 3 papers capture need for marine energy to EU

## 3.2 Evidence

### 3.2.1 What are the remaining gaps in evidence and how to fill them

What are the remaining gaps in evidence?	How can they be filled (eg, more examples, more literature)?	What can you do to help fill them?
- Difficult to be flexible	- Involve insurers (E)	- Learn from other projects
- Need concrete legal framework (A)	- Publicly funded projects have an obligation to share data with industry (F)	- Don't require re-qualification when applying for similar project funding
- Demonstration of single device does not understand installation or O&M costs	- Simpler finance projects – eg. Not H2020	- Intervention from government
- Delivering 1 <sup>st</sup> farm is R&D Phase 2 or RDDD (RD3) (B)	- Specific fund for marine, tidal, wave, rather than general 'renewable'	- Ensure people are incentivised when going into testing
- Is there enough public funding to cover costs (C)	- Examples from successful grant funders (G)	- Unrealistic to ask EU to amend (H)
- New section needed with regard to making technology ready for first arrays section (D)	- Amount available in NER300 good, but application process to be simplified	- Request EC
- O&M and installation for first farms to demonstrate (B)	- Focus on next 4 year period(B)	- Clear move away from specific sectors
- Only parts of arrays are insurable	- Prove 'power train' (B)	- avoidance of competition within sectors
- Part of first farms to help finance (E)	- Feasible for industry / Europe to have (eg.) 4 forms to prove concept (B)	- Create a portal hosted by the EU
- Data – public funding needs data sharing to avoid paying more than once for data gathering (F)	- Certification is needed	- Website update – by autumn
- Funding gap description	- Certify elements, eg. Moorings (D)	-
- Instruments for phase 1 need to be simpler	- Rigorous testing – European industry standards	-
- Funding instruments (1) (G)	- Request to E+C (J)	-
- Amending H2020 for renewable (H)	-	-
- Separation of budgets for each technology (I)	-	-
- Platform for investors to talk	-	-
- Request specifically for a fund for the technology (J)	-	-

### 3.2.2 Level of support

NB: The level of support dockets were not used by this group

Docket number	Level of support					What would need to happen for you to increase your support
	I have strong concerns	I have concerns	I can live with it	I can support it	I am very supportive	

### 3.2.3 Feedback points

#### Get early technology right

- Wave, especially, still needs more technology-push support
- Focus needs to be
  1. Initial demonstration to achieve defined criteria
  2. Pilot farm as R+D3 phase in pilot farm is R+D for all not covered in demonstration phase
- Obtain specific incentives to overcome the R+D stage from the EU
- Too much focus on project finance, the main gap is it needs a section on ensuring the technology is ready for arrays
- Link financing and technology
  - Focus on financing and developing the "proper" technology, so as the sector can start talking about financing – don't forget to consider the sector as an 'R+D sector'
- Finance still required for full scale technology demonstration and importantly operation. This needs to be flexible and consistently provided over a five year period
- To enable de-risking need as much information as possible at testing stages – use of pre-consented test sites – data on technology and environment

#### Upfront finance for first farms

- I think we cannot talk about farms yet (how to finance farms). We are in a previous stage. I think the EU has to help the sectors to develop the technology
- Focus on financing first farms – they are R+D phase 2 not commercial projects
- Specific. European fund need to provide up front grant support for initial / first arrays

#### Realistic timeline

- Focus on the roadmap to reduce the timeline to achieve LCOE around €100/Mwh and compete with other clean energy
- Match fig.2 technology work-stream recommendations with financial work-stream documents and state budgets for each technology
- What we need to achieve by when and how (financing before)?
- Concentrate on next period 2015-2020, first farms demonstration, how to finance them (ECMS private)?

#### Balance medium and short term

- Need to balance short term EC grant support with long term EC grant finance instruments
- Financing is different for research and business, requires better knowledge of some issues; in the future it is unclear what will succeed in launching a new industry by itself

#### Simplified aid programs and fit for purpose

- Requirement for simplified, non-contradicting aid / grant programs through a dedicated fund for marine renewable investment financing for R+D
- Broad, flexible and accessible financing support for the first commercial demonstration projects is critical to gather data and industry best practice specification
- Right money and right time into the right technology and the right projects: free sector from state aid issues; a Euro REIF funding platform will attract co-investment
- At national jurisdiction level consider usefulness of R+D tax credit schemes and suggest improvements. This scheme was critical to CWE's success in funding its C6 project in Australia
- The roadmap needs to include actions that assures specific challenges to meeting the objectives of the Ocean Energy Forum

### 3.3 Finance points for inclusion in afternoon discussion

At the end of the morning session participants were asked what they wanted to be discussed in the afternoon. The topics relevant to Finance are as follows:

#### **Matching finances with technology type**

- Match financial work stream with technology roadmap and separate funding budgets for each technology
- Support financial developments of R+D manufacturing devices

#### **Financing technology development**

- Effective ways of financing technology development
- Ensuring that adequate finance is provided to properly prove and de-risk technology at full scale demonstration
- Cost of developing first 1GW of any ocean technology, availability of the required investment and role of distributive innovation in bringing these costs down

#### **Investment fund**

- Cross cutting theme: A (grant) funding solution to help keep the industry funded to 2020
- The need for simple, non-contradicting or conflicting aid program and a central dedication marine renewable energy investment fund

#### **Match finance timeline with delivery timeline**

- Match the timeline with the finance timeline focus on 2015 – 2020 what we need to do to deliver

#### **Appropriate use of public and private finance**

- How can private and public finance be appropriately used to enable OE targets; how can regulations support demonstration

#### **Costs Effectiveness**

- Finance - Cost effective LCOE (at a reasonable term)
- Finance - Cost effective LCOE (3 years)

### 3.4 Afternoon discussion

#### **Clarify definitions**

- Quantify the term 'first farm'
- There is no clarity on the definition
- Is an array 3 units?

#### **Focus**

- A focus on units would be helpful – 3 minimum
- Limits to arrays

#### **Testing**

- Pre-testing
- Technology testing, pre-commercial

#### **Section 2**

- Section 2 misnamed: "getting sector to commercial debt"
- Whole section answered in part 4
- Section 2: not get commercial debt until costs down
  - cross-cut with technology

#### **Funds**

- Loan guarantees (at sec 2.4) at any acceptable price only come down the road
- Guaranteeing a loan needs same as getting a loan
- Could independent fund provide contingent revenue short falls
- Forget about guarantees
- Useful to have common reserve fund?
- If someone willing to provide contingent funding, better to get within the project rather than outside
- If the technology works, will get investment

#### **Transferable learning**

- Transferable learning

### **Sharing Risk**

- Sharing risk good model
  - Way to share is across range of projects

### **Tidal exemplar for wave**

- Tidal is exemplar for wave
- Debt resource coverage ratio

### **Warranty and insurance**

- OEM prepared to provide warranty
- OEM not prepared to provide MWh
- Some form of secondary cover to provide an ideal opportunity
- Additional support above the cap provided by the OEM
  - If not, only other option is parent company guarantee
  - additional burden
- Insurance – info sharing should be at an early stage
- Loss due to equipment failure
- Potentially subject to an additional support mechanism
  - manufacture warrants this equipment
- In mature project finance project machine breakdown covered
- Business interruption needs described interruption?
- More flexible insurance
- How successful has wind industry been on BI?
- Need an insurance forum
- Topic less important than believed at Brussels meeting?

### **Loan Guarantee**

- Loan guarantee comments
- Timing for guarantees
- Role for EU intervention?
- Timeline issue
- Market will solve the issue and provide loan guarantees
- Fund for grant rather than loan guarantee
- Not fully captured in document
- Need early thinking so ready when get to first farms
- Feedback from EC – moving away from grants to loan guarantees, etc
- Do we need to fight this
- First farm is RD3 project
- Grant equity at the moment for RD3
- How is the EC going to price it

**Note:** this next section was recorded in blocks under specific titles so we have left that formatting in place

### **Public Funding**

- Integrate public sector funding section?
- Items 1 – 5 (here and now to exotic solutions)
- Need to be smart – fighting corner for grants whilst recognising politics of other funding
- Soft loans – include ‘sculpted’
- Need to fit repayments to income generation
  - Eg. Councils borrow cheaply but have to repay early – banks have scheme allowing repayment once scope to repay
- Don’t be frightened to structure products specific for the industry
- Don’t be constrained by the product
- Repackage 3 into other 2 sections
- Every investment made has to be state aid compliant

- Advisers on state aid ask what commercial provider would 'change'
  - leads to EC being more careful / nervous and asking for 'more'
- State aid rules complex
- National governments may be reluctant to act because state aid rules unclear
- Exemption from state aid rules too big a request
- Place for legal advice
- Need EC to say "public equality investment can be..."
- Clear advice and guidance from EC
- Not changing policy; improving guidance and clarity of guidance

## Case Studies

- Applicable?
- Group happy with CEW case study
- wording - first time 'major' to 'one of first at scale'
- How to raise money from stock exchange?
- Could focus on sites with ability to support RD3 project and also the full project
- The equality becomes more interested
- Term 'project finance' needs to be more explicit
- 'fully financed'
- Is it a case study or a template
  - Example, not a template
- How many are the first farms
- Difficult to replicate
- Careful MEYGEN doesn't "cloud the water"

## 80:20

- Do we seek to replicate 80:20 public private funding?
- How many MWh to go to 80:20 or 60:40
- Is 80:20 the gold standard?
- Finance ministers say 80:20 never be repeated
- NER300 offers €23M
- Message of 80% public money gives bad message to market
- 'Commercially priced' money
- Grant money is the enabler to build the project to service the debt
- Flexible mix of grant, commercially - provided money and private sector to produce the project
- "Coalition of the willing"?
- Need work on how many turbines do we need?

## Action

- Euro 1bn to produce 10 arrays ? entire cost?
- need discussion with technology work stream
- would expect equality pay-back when successful
- creates jobs and spending, not throwing away €16M
- Across what timeline? Progressive payment / environment / spend?
- What does private funding need to see before they invest?
- If don't find this money for the industry, there will be no industry
- What process do we have to make credible case for the cost?
- Need to say what it will buy
- Spend profile for investment
- How to package investment requirement?
- Timeframe - 2025?
- Selling pitch - if stop now, all invested so far is lost
- Opportunity cost: EU becomes exporter; if doesn't step up, become an importer of the expertise/services
- Front of doc will have 'why we need to do this'

## First Farms from this morning

- This is focus
- Providing up-front capital
- Government banking
- Flexible finance schemes
- How to package public money differently
- Definition
- First farms need to be exempt from state aid rules

### Action

- Steering committee to consider first farms definition?
- How was nuclear funded
- Can this be drawn into the document
- financiers would ask where will you get the 'fuel'
- need to get the technology right because have the 'fuel'
- first farms for tidal first
- as an exemplar
- need to see they are at different stages of development
- need arrays in the water
- 3 minimum for wave
- Working on strategic roadmap for many technologies
- Need to take account of where each technology is at
- Difficult to accept first farms for anything except tidal
- Need distinction between 'ocean energy' and specific technologies
- Also different fuel types and physics
- At EC and State level may not understand or know these technical niceties
- Tidal issues concentrated in some areas, and wave in others
- Need to say something about other techs to persuade, eg. MS which is only interested in, eg. wave
- Phase 1 simple device deployment, next is phase 11 where it qualifies for RD state aid exemption
- Focus on phases of technology not the technology itself
- Finance could look for general view not by tech
- American model – analysis of different techs and select 8 or 9 projects to take forward
  - Competition model
- <Francesco> to provide information to Finance SC chair
- About the:
  - Right money
  - Right time
  - Right project
  - Right technology
- Likely first arrays will be tidal
- Successful tidal arrays will help in terms of finance
- 28 MS, need every one; balances the arrangement for support either wave, or tidal
- Both needed
- Clearly define 'first farm'
- Thresholds – some may come from tech group
- How far to go with financing of first farms before move to next phase?
- 1.2 in first farm: can be insured, should be "cannot be fully insured"
- Who is going to talk about financing technology development (for wave particularly)
- Should talk about technology development, not just project development
- Tidal can help wave because already working machines ready to look at how to move forward
- Scotland is funding wave technology development – taking forward manual development
- Is there financing model currently for tidal which may be applicable for wave?



- Is wave model another case study?
- Governments want to see progress for their money, regardless of the technology
- What to discuss with other work steam chains:
- TRL level: thresholds
- What to finance and how much money
- Priorities
- Timing
- Risk: planning through to unsustainable
- Speed consenting process is key risk
- Collaboration – spreading understanding and sharing development costs
- Next steps
- Integrate to new versions which may go to drafters for specific points first
- Content for SC to validate draft

## 4 Cross-Cutting issues

At the end of the morning people were asked to suggest cross cutting themes for the afternoon discussion; however the Work Stream Chairs felt it was more important to stay in Work Streams.

As a result the 'cross cutting issues' most associated with either finance or technology are included in those sections above.

The following topics are additional cross cutting themes:

### **Supporting regulation**

- Stable support / regulatory framework
- Streamline consents and planning for commercial scale arrays (commercialisation)
- Emergence, support and consent of projects on infrastructure (Sub-sea cables, grid connection)

### **Performance -> Environmental**

- Performance assessment vs environmental footprint

### **Information sharing**

- Cross - cutting
  - How do we share information / experience (set up portal)
- Knowledge sharing and dividing technologies into R+D and pre commercial
- Knowledge sharing: technology, finance, consenting, EIA
- Standardization and best practices for the 3 work streams

### **Implementation**

- Who will do what?

### **Delivering benefits**

- Socio economics
- Employment
- Industrial benefits (to European industry)
- Supply chain

## Annex 1 Agenda

# Ocean Energy Forum Conference 1 July 2015, Bilbao Exhibition Centre, Bilbao Agenda

During the day, people will alternate between working in **breakout groups (G)** so everyone has the chance to contribute, and working in **plenary (P)** for briefing or to reconnect and hear progress.

8:30	Registration	
9:00	<b>Welcome</b>	
	Welcome	Stijn Billiet, DG Mare <b>P</b>
	Facilitator's introduction	Diana Pound, Director, Dialogue Matters <b>P</b>
	<b>Review of the Draft Sections of the Strategic Roadmap</b>	
9:20	<b>Work Stream updates</b>	Work Stream Chairs <b>P</b>
9:40	<b>Breakout discussions</b> (Environment & Consenting, Technology, Financing)	<b>G</b>
	<b>The messaging (3 page document)</b>	
	What do you like about the messaging overall?	
	<ul style="list-style-type: none"><li>▪ Is anything substantive missing? If so what, and why is it important?</li><li>▪ What suggestions do you have for improving the messaging overall?</li><li>▪ What suggestions do you have for improving the detail?</li></ul>	
10:45	Short comfort break (groups stay in rooms, coffee served in rooms)	
10:55	<b>Ensuring the messaging is backed by sound evidence</b>	
	<ul style="list-style-type: none"><li>▪ What comments do you have on the evidence?</li><li>▪ What are the remaining gaps in evidence?</li><li>▪ How can they be filled (eg, more examples, more literature)?</li><li>▪ What can you do to help fill them?</li><li>▪</li><li>▪ From your Work Stream discussion, what specific point do you most want to feed back to the wider group?</li><li>▪ If the improvements discussed this morning were made, to what extent would you support this document?</li><li>▪ What would need to happen for you to increase your support?</li></ul>	
11:50	<b>Feedback from Work Streams</b>	<b>P</b>
12:30	Lunch	
13:30	<del>Cross-cutting Issues</del> —This was cancelled because the chairs felt they needed more time on the messaging/route map sections	
	<b>Continue work stream discussions</b>	<b>G</b>
14:40	Break	
15:00	<b>Feedback session on cross-cutting issues</b>	<b>P</b>
15:35	<b>Wrap up, thanks and next steps</b>	Stijn Billiet, DG MARE <b>P</b>
16:00	FINISH	

## Annex 2 Technology Work Stream - Questionnaire

If you have said 'no' to one of the questions below, please put in the reference number of the point and what you think should be done instead.

### A) General

#### General

Is the over-arching objective of reaching industrial roll-out correct? Yes  No

Is an average levelised cost of energy of €c10/kWh the right indicator for this? Yes  No

Are the timelines and capacity volumes indicated for each technology the right ones? Yes  No

#### In relation to TRL

a) Should it be used in the objectives section? Yes  No

Is the concept too linear for this road map? Yes  No

Is the level of detail best reserved for a more complete technical document such as the TP Ocean Strategic Research Agenda (SRA)? Yes  No

### B) Individual technologies.

The wave and tidal stream objectives came from the discussions during the meeting of the Ocean Energy Forum in Brussels on 16 April 2015. At the meeting, less detail was offered for Salinity Gradient, OTEC and Tidal Range....

a) Is the outline for the latter three technologies correct? Yes  No

What evidence is there to validate the outline and complete the sections?

COMMENT	Docket Ref number
OES report (2015) is good	1
Not an expert	3
Unable to say	5
NER 300 approved wave project -> business case MEYGEN project	6
In the case of tidal range, the past experience	7
Results of the projects carried out and the ones going on	11
Tidal range seems ok	13

#### Wave

a) Is the approach to consolidate concepts in 2 phases correct? Yes  No

b) Should the desalination potential be highlighted in the Roadmap? Yes  No

#### Salinity Gradient

a) Should the energy storage potential of salinity gradient be highlighted in the Roadmap? Yes  No

#### OTEC (Ocean Thermal Energy Conversion)

- a) Are there specificities of the synergies between OTEC and the oil and gas sector that require a specific action or recommendation in this Roadmap? Yes  No

### C) Overarching Research Priorities Section

The research priorities set out in this roadmap are taken from prioritisation of topics carried out by TP Ocean.

- a) Do the headings in this Roadmap cover the main priorities of the TP Ocean SRA to be published in early 2016? Yes  No
- b) Should this roadmap include more technical recommendations or are the headings with a reference to TPOcean's SRA sufficient? Yes  No

### D) Recommendations Section

The Roadmap should be limited to a few high-level recommendations where both industry, EU and national authorities can play a role.

- a) Is 5 recommendations the right number? Yes  No
- b) Are the 5 chosen headings the right ones? Yes  No

If not, what should they be and why?

COMMENT	Docket Ref number
Ocean energy technologies cost reduction predictions are very small and require a large deployment effort. To reduce this breakthrough innovations on components, operations, materials and devices should be a research recommendation. The same applies to theories that allow to reduce the cost for technology development	5
#4 Not only "resource" atlas: wave energy, comments, soil conditions ... See EMODNet (European Marine Observation and Data Network	6
All are appropriate, through the scope of the resource atlas is unclear. This needs to focus on more than the energy resource and include mapping of grid, environmental constraints, supply chain etc...	9
Resource maps. There have been several projects covering this particular issue. Therefore seems to be not a crucial point. Technology exchange. Probably technology exchange between similar sectors (oil charges, off shore wind,...) should be promoted in order to reduce time to market	15

### E) Additional comments

If you have said 'no' to one of the questions above, please put in the reference number and what you think should be done instead. If you have more than one comment please separate each comment with a line.

Q Ref	COMMENT	Docket Ref number
1		
1a	Yes it is correct but could be strengthened see feedback from Bilbao session. In particular we need to articulate the macro level business case for ocean energy. This is not currently present in the document. Something along lines of "ocean energy technologies can greatly assist Europe in meeting longer term renewable energy	2

	<p>targets through diversification of the current portfolio of generation. This will result in a number of system benefits including:</p> <ul style="list-style-type: none"> <li>- Reduction of net variability of power output renewables</li> <li>- Improved system security</li> <li>- Lower system balancing lost, ultimately leading to lower cost for consumers</li> </ul> <p>Also need to ref, job creation, revenue potential</p>	
1b	15 €/kwh is already a good objective (2020) 10 €/kwh for 2030	1
1b	It should be more specific for each technology	4
1b	The LCOE indicator should be defined for each technology and not as a general one	14
1c	Timelines maybe right but the long timeframes can deliver the political messages that the science is not a priority	3
1c	It needs more evidence	4
1c	There is no clear evidence for the timeline, volume and estimated LCOE and this is extremely relevant for this exercise. It is unclear how these were obtained and what assumption were used in supporting them. It may destroy the opportunity for ocean energy if we say that we need 1GW of deployment to get to 200 €/Kwh and so we need to be sure that this figure is correct and that no other development path allows to achieve a bigger reduction in energy cost.	5
1c	Too optimistic in volumes. Probably we will not reach such capacity in the next decades	7
1c	LCOE €c20 – €c25 /Kwh through deployment of 1Gw of capacity by 2025 (or mid 20s) NOT early 20's for tidal stream	13
1c	Capacity factor is not a target because is dependent on other factors (test site, size...)	14
1c	I think that OTEC and salinity have been treated so optimistically	15
2		
2b	Assuming that the use of TRL is measurable it is reasonable to use it	5
2b	Include some reference to the MRL (Manufacturing Readiness Level)	6
2b	There is a need to insure performance and commercial readiness or technologies are considered. These can be independent of TRL or should be included in a new TRL definition	9
2b	Provided that it is clear that there is a "hurdle" for a technology whereby it does not come out of the nursery (TRL 4/5) until it can be demonstrated to have achieved or be able to achieve the necessary LCOE at a commercial scale. E.g. WES panel of experts to assess technology before moving to fund more expensive higher TRL projects. Funds are limited and need to provide value for money and progress towards commercialisation	13
2b	TRI is not linear since each step involved different levels of complexity / funding	15
2c	This document requires a certain level of technical detail	5
2c	The detail is best reserved for the TP Ocean SRA but the importance of performance and reliability beyond TRL should also be reflected	9
2c	Can use the TRL levels as an indicator on the roadmap (as the EC understand TRLs)	13
4		
4	Wave headline, I believe send out the wrong message. We do not expect the technologies to 'converge'. Suggest a new title. "Wave- first mover technologies proven by mid 2020s." Wave paragraph 1. Last line, mentions consolidation of concepts. I feel this needs to be "consolidation of common technology systems e.g. power take off systems, etc.	2
4a	<p>Technology development framework required.</p> <p>First current phase is too big a jump (farms by 2020). A number of key/leading technologies will still be at single device stage. Also, larger devices are more likely to deploy single devices Vs. smaller devices in arrays.</p> <p>I would suggest an earlier (3<sup>rd</sup>) phase is still required before we move to deployment in farms. Suggest and new phase 1. "Deployment and demonstrate (survivability, performance, availability and affordability of a range of devices (typically 8) Prior to Phase 2 – small arrays"</p> <p>Then existing phase 1 becomes phase 2 and phase 2 becomes phase 3</p>	2
4a	Check the timings are consistent with the second graph it seems that there are more challenges beyond 2030, which will mean adding another phase	3
4a	There is still a need to encourage novel technologies (early stages) that can deliver a step change in LCOE, rather than pushing the current generation of devices towards deployment	9
4b	Online max	2
4b	Along with other niche markets	3

4b	It is desirable to take advantage for different purposes, but maybe not convenient at this stage since even the wave energy concepts and technology are not clean. Desalination will fit with wave in a future	4
4b	We should focus on pushing the development on the wave energy sector; it is not necessary to put in bold the different application wave energy converters have	7
5		
5a	Or yes, but a completely different scale	1
5a	Salinity gradient is at a complete different scale of development and goals to feed back to commission are different	1
5a	I think that SG is less mature than the others and at a basic research stage for to be even considered as a future commercial option	15
7		
7a	The renewable technologies for the balance of plan should be highlighted within the priorities	3
7a	I miss some mention to the measurement of oceanographic variables (waves, currents) in the "modelling" research priority	6
7b	Include more theoretical recommendations. Link to set-plan IR -> key performance indicators and impacts	3
7b	Some technical recommendations would be desired. At least wave energy, there exist some mock technologies that could be reworked as done for other energies (eg. Tidal range)	4
7b	Technical recommendations should be better explained, at least as "Policy Recommendations"	6
8		
8a	In fact there are 6 recommendations: #6 is "Power remote location and islands..." which I like	6
8a	Changed the 5 to a 6	7
8b	Leverage on previous results and resources at EU level knowledge sharing should include both best and bad practices -> disseminate cases for failure and lessons learnt so that this id divided in the future. Before creating more testing sites, first maximise the value of existing facilities and facilities across national access Standards and certification to focus on their aspects beyond performance - certifying designs -> survivability - certifying operation -> performance and reliability	3
8b	Changed the 5 to a 6	7
8b	Provided that item 1 is expanded to include key SRA priorities that support: Cost Reduction Reliability growth                                 } Which all drive LCOE Yield growth =>Key barrier identified by Finance group. Item 3 – Not sure what "small demonstration" projects mean. This could/should include early commercial arrays up to (say) 30MW with shared grid, ///, port infrastructure where multiple project developers and OEMs can in a full array. Grid can be a key barrier for a stand-alone 30MW array, killing the project finance.	13
GEN	Create a synthesized timeline with – years, LCOE for each technology ... in place of detailed data for each technology	1