

Technology Roadmaps- The Floating LiDAR Example

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2nd October 2018



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Carbon Trust has been working with government and industry to accelerate offshore wind for >10 years

The Offshore Wind Accelerator (OWA)



€100m+

Total programme spend

60%

Industry funded

9

Developer partners

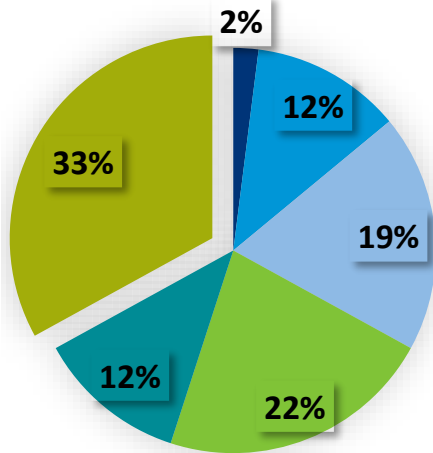
10 yrs

Established 2008

Offshore Wind Accelerator

Six research areas - Focusing on everything but the turbine, representing roughly 70% of offshore wind costs

LCOE Breakdown



Source: Navigant (offshore)

- Development
- Construction Finance
- Installation
- Foundations
- Electrical
- Turbine



Wakes and wind resource working group

Project types

01
Large scale
demonstration &
Innovator support

02
Roadmaps, guidelines,
standard reviews &
recommended practices

03
Model developments
and improvements

Topic specific research

01

02

03



Outputs

Gap analysis

Greater certainty in energy
yield

Lower cost of finance and
lower LCOE

Reduced risk for future
offshore wind projects

Increase understanding of
wind resource

OWA and Technology Innovation

Core to OWA activity is the progression of new technology that can will improve processes and reduce costs through:

- Competitions
- Incubation
- Trials
- Access to end users
- Standardisation

Carbon Trust awards funding to cut offshore wind costs by up to £100m per year

15 July 2014

Contracts awarded to commercialise 66kV offshore wind cables.



Sea trials underway for world's first Surface Effect Ship (SES) Daughter Craft vessel

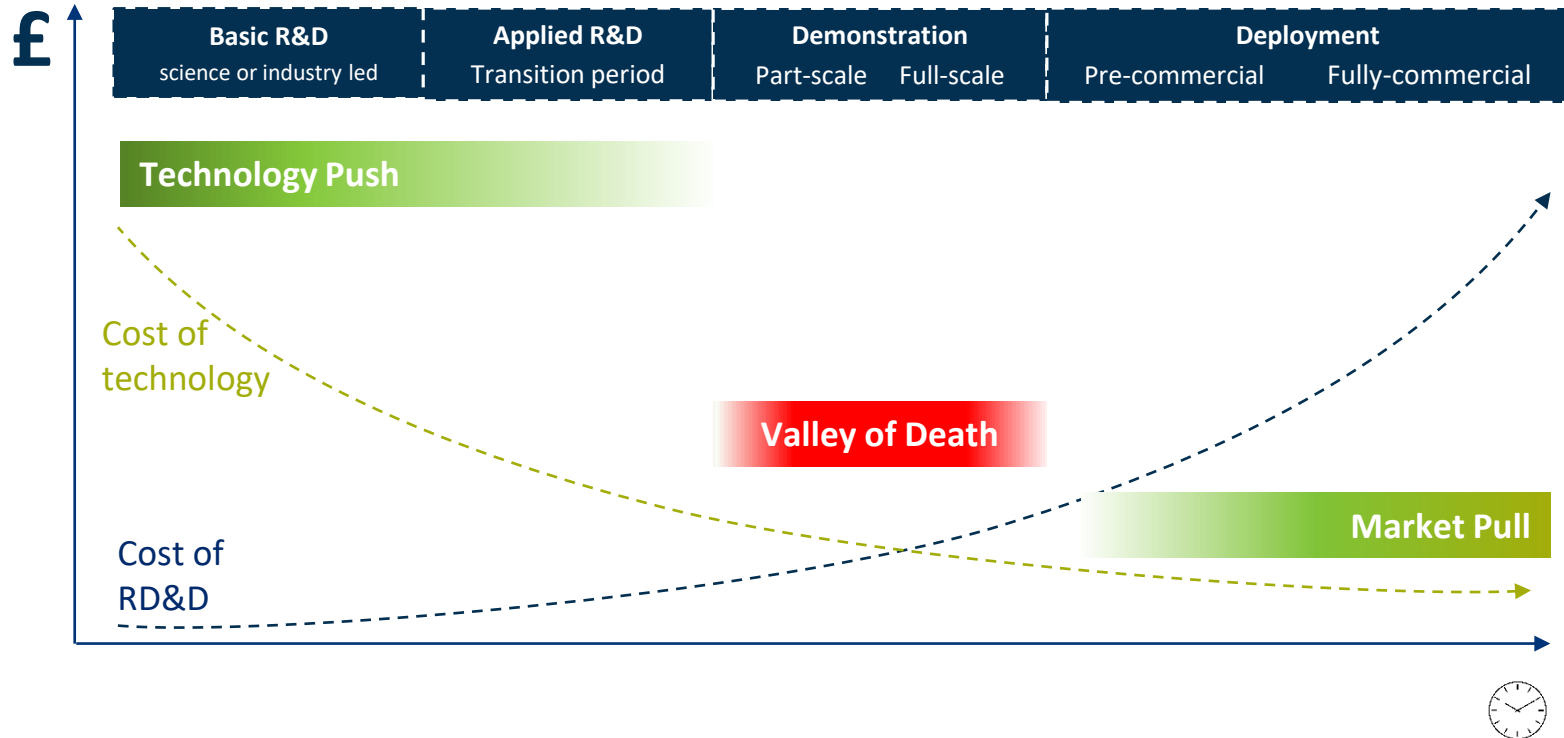
2 August 2018

Carbon Trust's Offshore Wind Accelerator launches subsea inspection competition

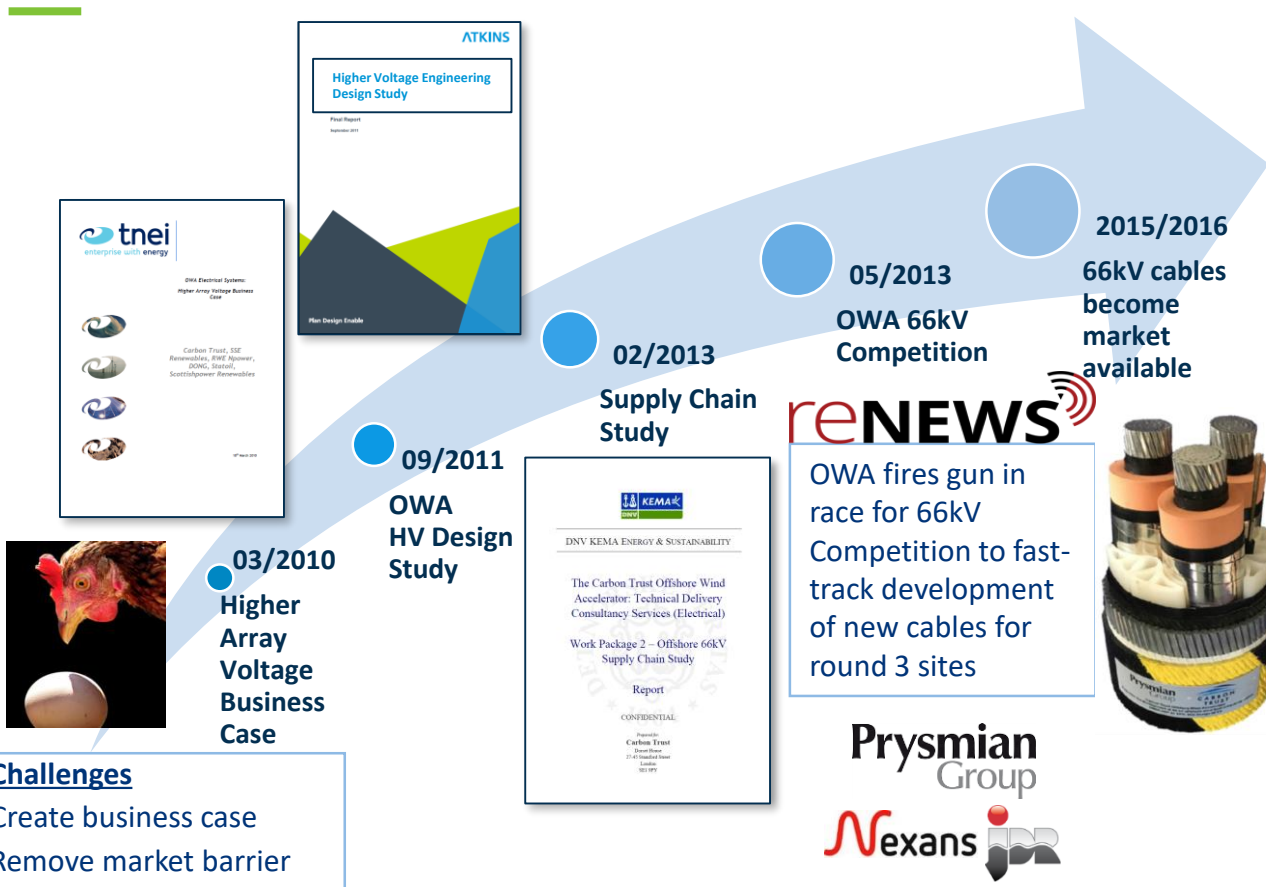
13 July 2017 | [News](#)

The Carbon Trust's Offshore Wind Accelerator (OWA), a collaborative R&D programme funded by nine leading offshore wind developers and the Scottish Government, has today launched a competition targeted at finding new ways to inspect offshore wind substructures and reduce the cost of offshore wind. The competition is open to innovators with inspection technologies that can provide information and data on grout integrity and welds for both monopiles and jackets.

Pushing Forward Innovation



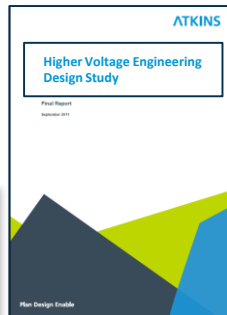
Electricals: 66kV market pull



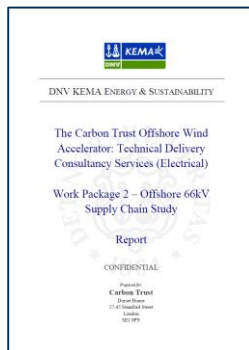
Challenges
 Create business case
 Remove market barrier



03/2010
 Higher Array Voltage Business Case



09/2011
 OWA HV Design Study



02/2013
 Supply Chain Study

reNEWS
 OWA fires gun in race for 66kV Competition to fast-track development of new cables for round 3 sites

05/2013
 OWA 66kV Competition

2015/2016
 66kV cables become market available



OWA – LiDAR – Floating LiDAR Trials

Objective: bring confidence to the market on the ability of the technology to deliver commercial grade wind speed and direction measurements

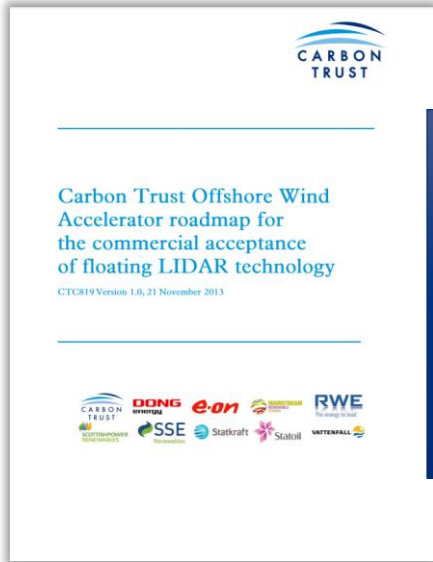
World's largest trial of floating LiDAR systems

- Four year trial Floating LiDARs deployed alongside existing offshore met-masts
- Five systems were tested at six different sites across Europe



OWA Floating LiDAR 'desk based' support

Desk based



2013



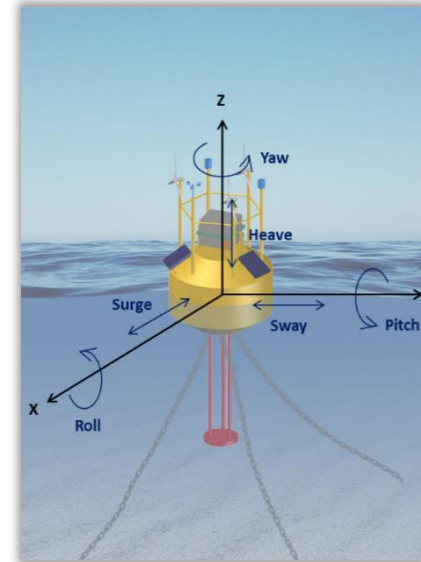
To date we have only produced one technology roadmap

WHY?

2016 & 2017



2018



The Roadmap Sweet Spot

When a technology Roadmap will have the most impact

- **Proven ability of the technology:** the technology must be fully developed
- **Clear need for the technology:** Need a distinct ‘pull’/use case to bring everyone together to ensure the required collaboration and buy-in
- **Barriers to commercialisation are non-technical:** Roadmaps are designed to overcome soft barriers
 - *being a ‘New technology’ is a soft barrier*
 - *Lack of acceptance is a soft barrier*
- **Agreed uncertainty or lack of drive for the ‘next steps’:** If there is a clear pathway, a roadmap won’t provide ‘additionality’

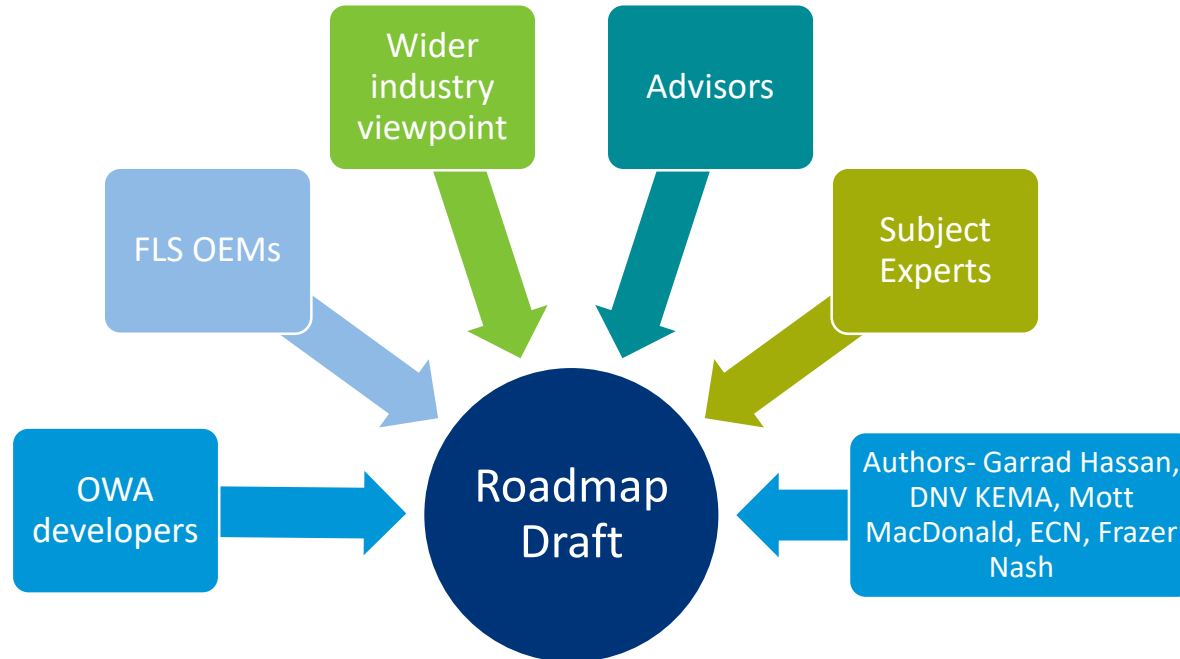
The Roadmap Sweet Spot

Floating LiDARs in 2012, the key drivers:

- At that time there was a big squeeze in the UK- Renewables Obligation was ending and CFD was coming and no one knew how much money was available with CFD
- Nervous time in the industry, and minimising upfront cost was a key focus
- Carbon Trust Floating LiDAR Trials were underway
- OWA developers saw a clear value proposition in the trial progress
- OWA Engaged with the value engineers/technical advisors to understand what was needed as proof of concept- they said 'we need more data' [OWA pushing the definition of 'bankable']
- The advisors wrote the roadmap, they defined the evidence requirements and there was no **direct** academic or OEM input as the roadmap was being drafted

Creating the FLS roadmap- 2013

A Collaborative Effort

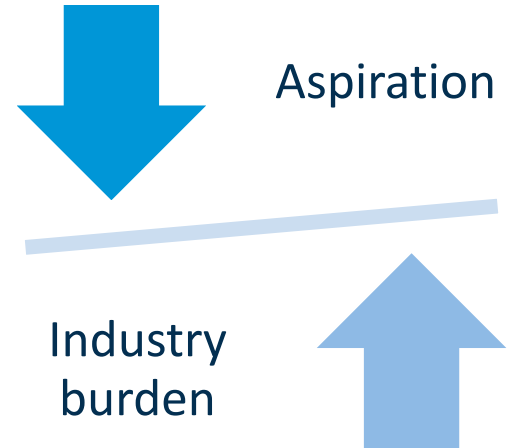


Creating the FLS roadmap- 2013

Getting the correct balance

Defining the content of a roadmap:

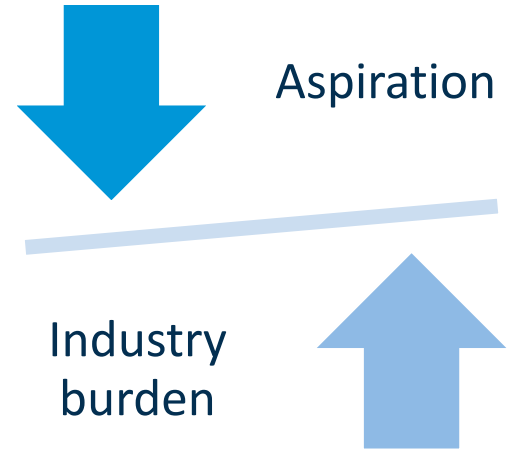
- Make the roadmap ambitious enough to demonstrate ability
- Avoid unnecessary burdens on innovators
- Avoid extra cost to the wind developers



Creating the FLS roadmap- 2013

What the Roadmap achieved:

- Adoption!
- A good balance, for that stage in the development of the technology
- Acceptance of floating LiDAR data.



Creating the FLS roadmap- 2013

Using maturity stages



A useful tool for the FL roadmap which was employed following feedback from industry

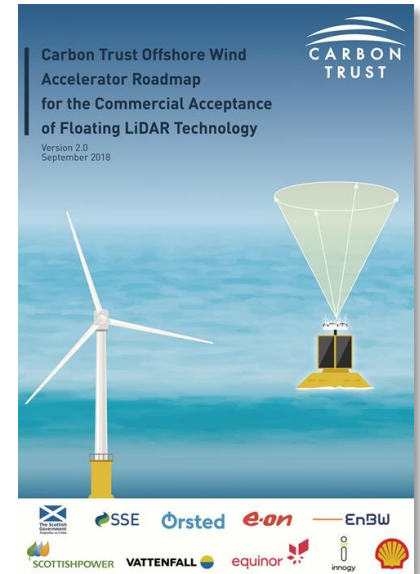
- **Freedom to define what progress and success looks like-** Key performance indicators were set to define progress, accuracy and availability, depending on the use case
- **Opportunity to expand or reduce the scope-** flexibility according to what is found in stakeholder engagement
- **Risk of over defining, or bringing in a development ‘ceiling’**

Updating the roadmap- 2018

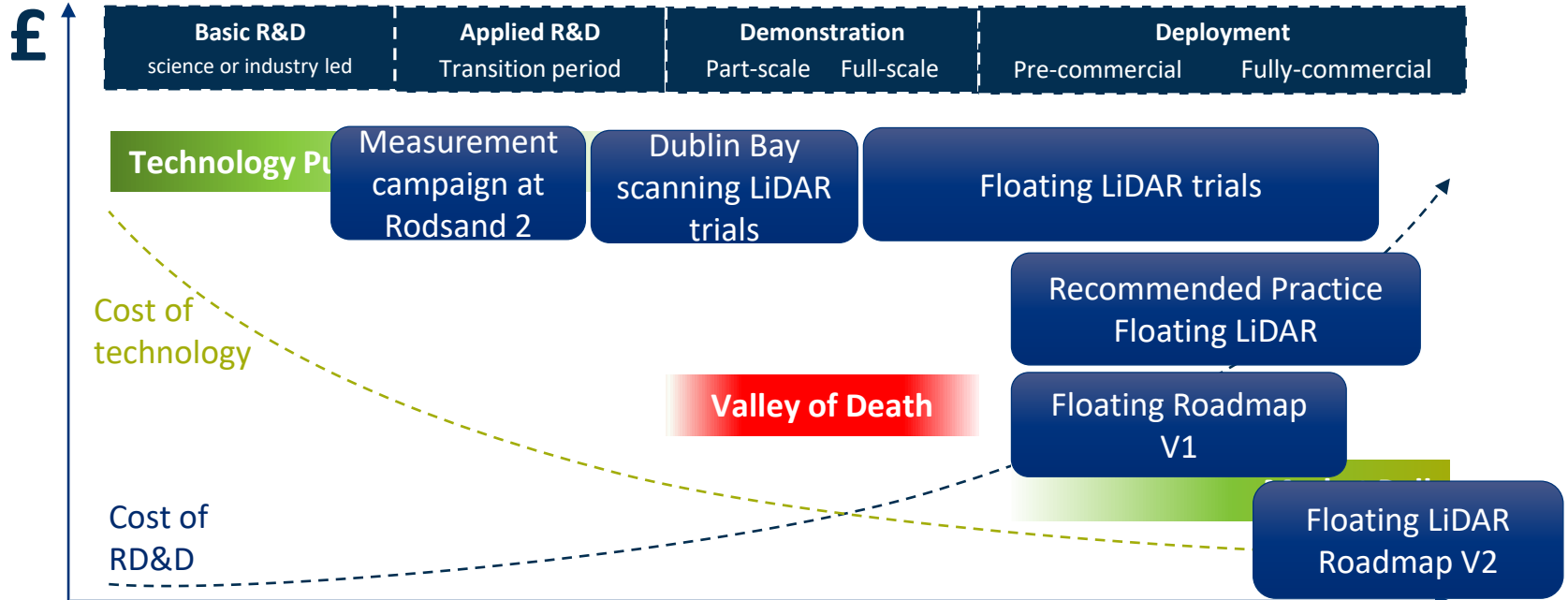
A fresh challenge!

New version of the roadmap to be launched this week

- Keeping up with industry changes
- Re-analysis of the aims and objectives of the roadmap
- Balance between and roadmap and standard
- Balance between the roadmap and the recommended practice
- Ensuring the right people understand and adopt the new version
- Encouraging continued innovation
- Communication and engagement with the OEMS



Pushing Forward Innovation



Conclusion



- **If the circumstances are right** roadmaps are very useful
- **There are other methods** which can ‘pull’ new technology forwards to being fully commercial
- **Collaboration is crucial** and the right buy-in and process is incredibly important.
- **Scanning LiDAR**
 - Exploration of activities i.e. recommended practices
 - Exploration and confirmation of end users needs- advisors and developers
 - Demonstration of cost reduction



Thank you

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