

A wide-angle photograph of an offshore wind farm. The sea is dark and choppy, with a line of whitecaps in the distance. The sky is overcast and grey. Several wind turbines are visible, their silhouettes standing against the water. The overall mood is industrial and serene.

NOWITECH FINAL SEMINAR

DONG ENERGY WAY OF WORKING WITH RD&D

Trondheim, 22-23 August 2017

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Technology Partnership Manager

DONG Energy's overview of levers for CoE reduction

Multiple levers to drive down cost in offshore wind power

1 Scale

- Turbines size
- Sites size
- Vessel size



2 Innovation

- Foundation
- Electrical infrastructure



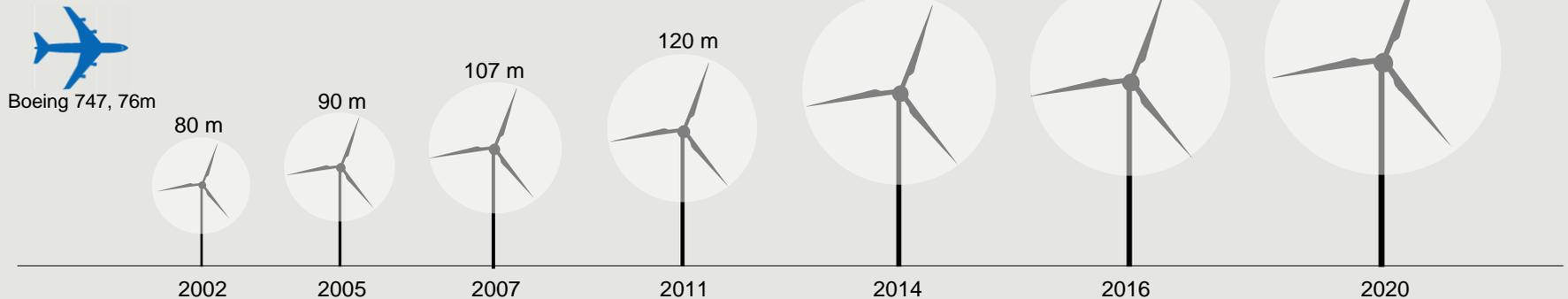
3 Industrialisation

- Transition from single supply to multiple global suppliers

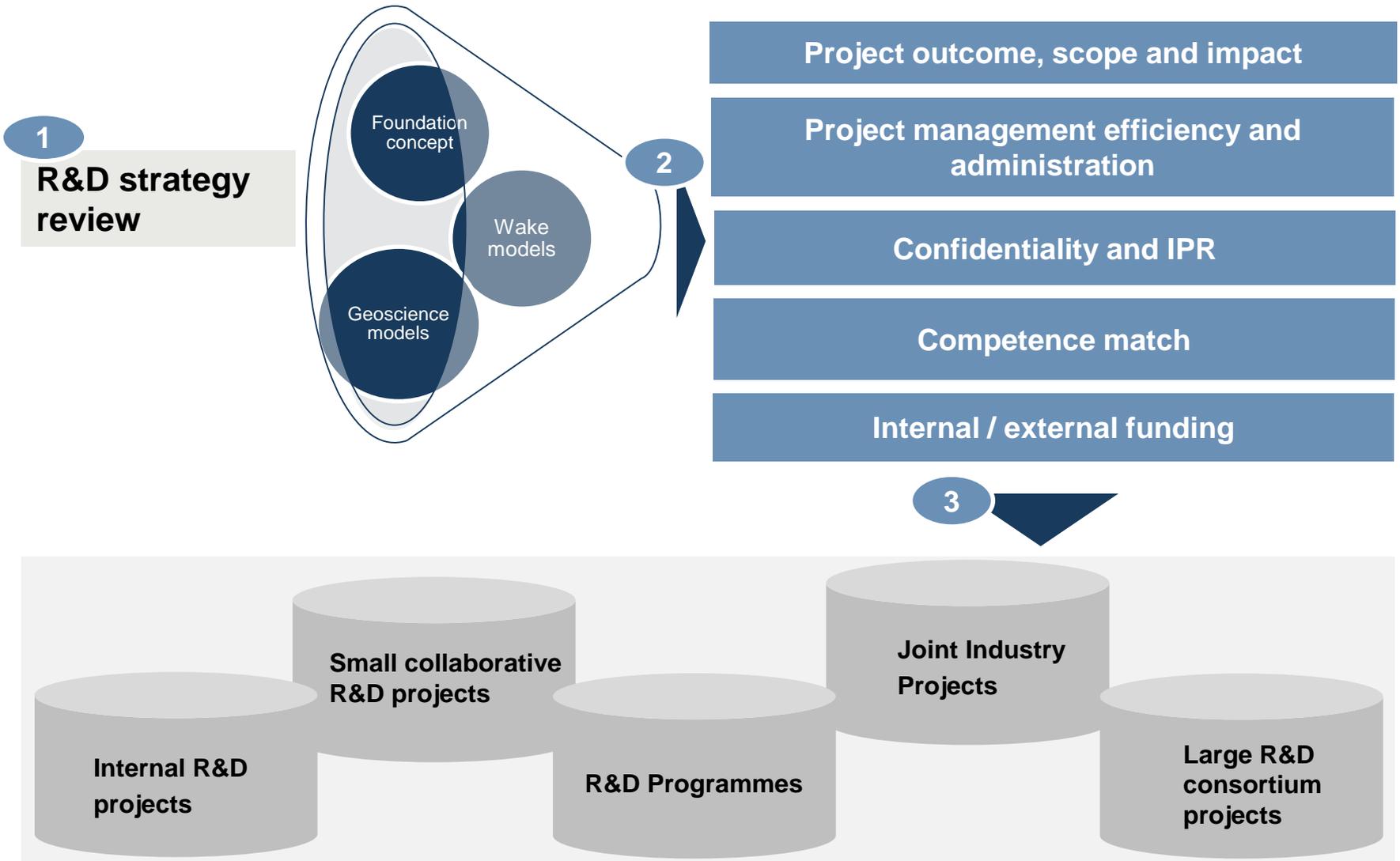


Rapid technological development

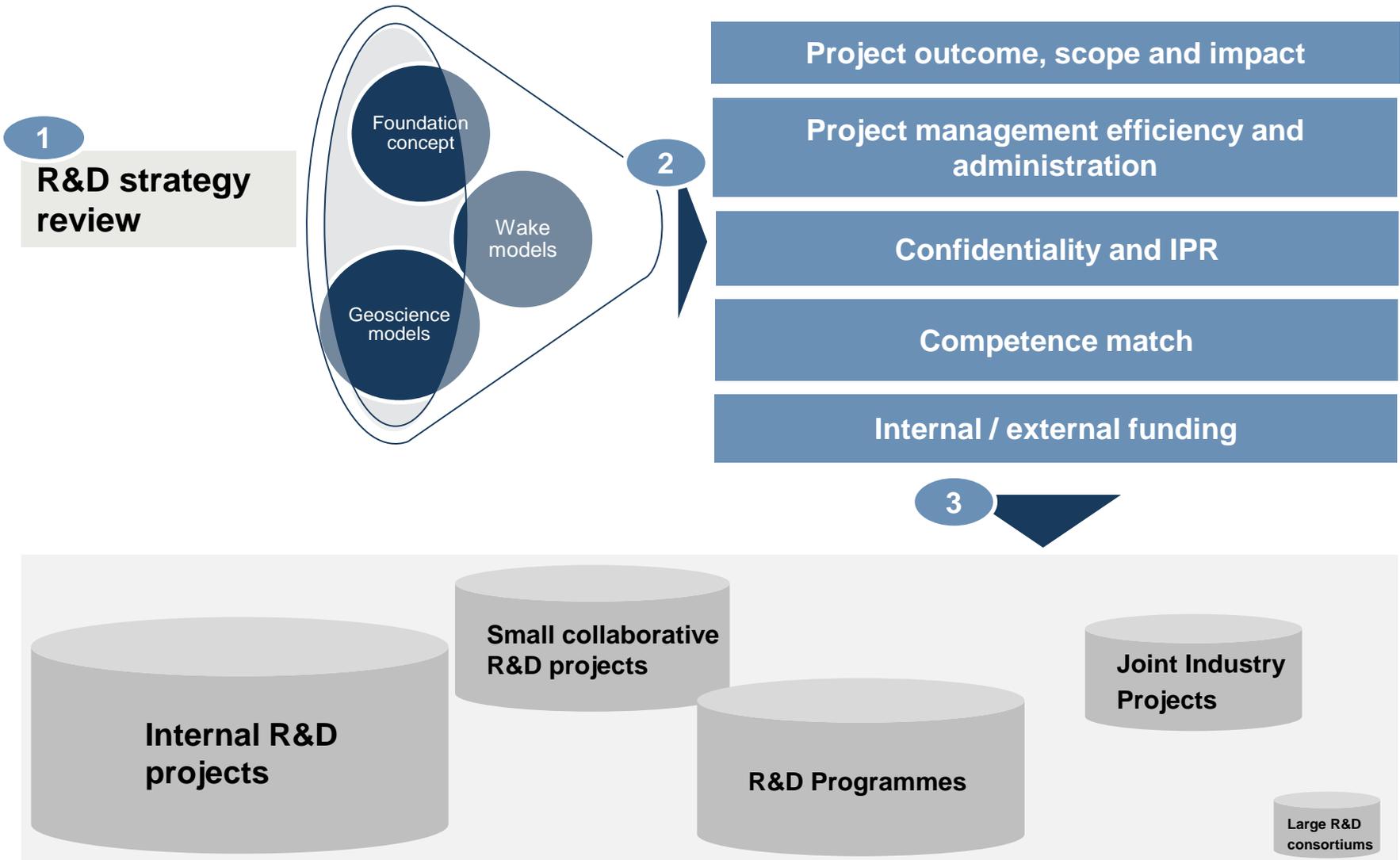
Wind turbine rotor diameter, year of commissioning



DONG Energy R&D strategy and types of collaboration



DONG Energy R&D strategy and types of collaboration



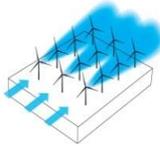


DONG Energy's R&D Programme

R&D Strategy

- organised in 5 Roadmaps

Roadmap 1 Wind & Waves



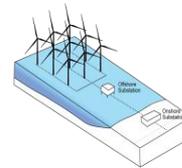
Measurements
Technologies – radar,
lidars and buoys
Wind conditions &
Wakes, Wave
assessment and Power
curves

Roadmap 2 Foundations, Geoscience and Marine



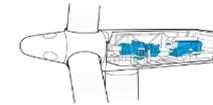
Monopile/jacket design methods
Corrosion protection
Geotechnical survey methods
Soil-structure interaction
Underwater noise damping

Roadmap 3 Electrical Infrastructure



Test and measurement
Ph.Ds on cable
verification and
modelling
Grid simulations and
harmonics

Roadmap 4 WTG O&M



Increase predictability
at component level
Component failure
mitigation
New components/
methods

Roadmap 5 Logistics



Logistics process
development and
tools
Accommodation set-
up development

Objectives

Enable the pipeline, CoE reduction, Risk reduction, HSE performance,
Design standard improvements and competence development

Collaboration with universities and research institutions

- building competences leading to improved R&D



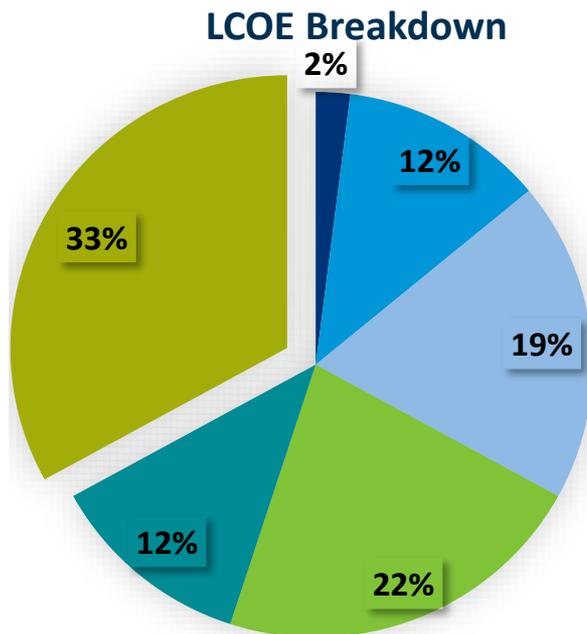
List not exhaustive.

Example on joint demonstration and commercialisation

- Carbon Trust OWA



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



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



Source: Navigant



IEA report

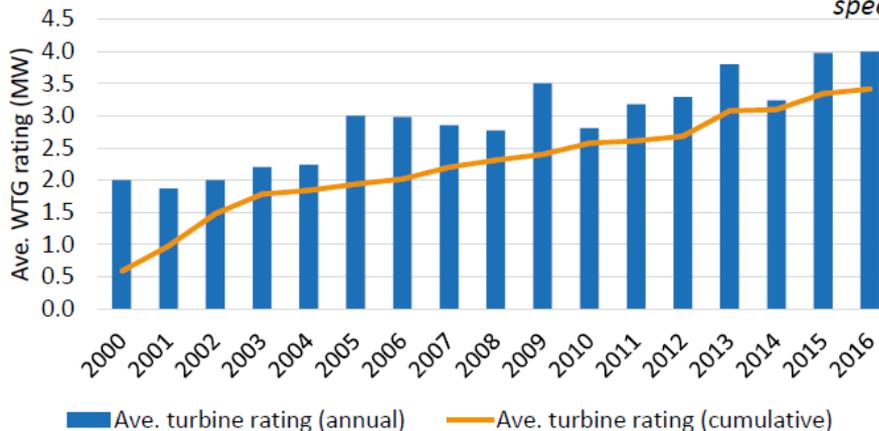
- technology innovation as a main driver for CoE reductions

State of the Industry



Cost reduction has been driven by several factors, but underpinned by supportive policy frameworks

- Scale effects
 - *Project size; cumulative capacity*
- Technology innovation
 - *Larger turbines; foundations; electrical systems*
- Competition
 - *Auctions; supply chain*
- Learning-by-doing
 - *Experience; maturity*
- Financing
 - *Bankable asset class; lower cost of capital*
- Market economics
 - *Low oil & steel prices; low cost finance*
- Site de-risking
 - *Site data, consent, permits*
- Site conditions
 - *Shallow water depth, near to shore, wind speeds*



Latest market trends:

Largest turbine:

- **9 MW** (MHI-Vestas)

Largest project:

- **1,200 MW** (Hornsea, UK)

From basic research to commercial deployment

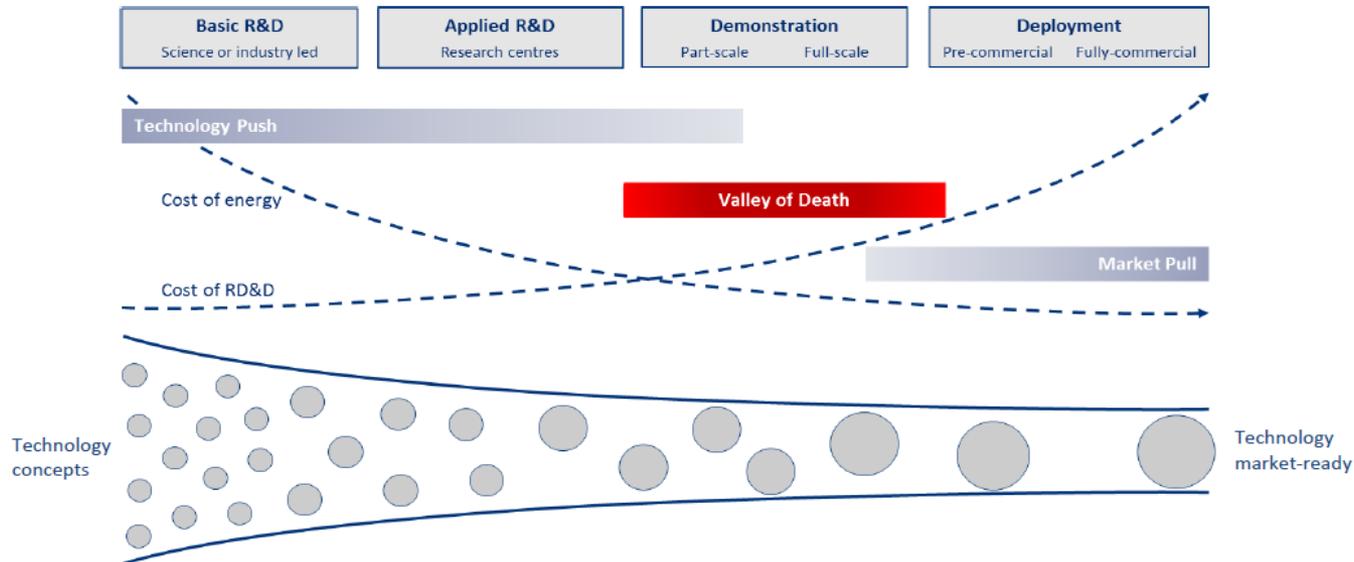
- how, who, what...

6: Innovation

IEA-RETD 

Innovation is critical to delivering cost reduction and building supply chain capability

- Balance of support required across technology readiness levels (TRL)
- Forging links between industry and academia can maximise market penetration of new technologies
- Greater information and data sharing can accelerate technology innovation



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energy



Thank you for your attention