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UK Offshore Wind Cost Optimisation: Top Head Mass

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All Energy, 10th May 2017

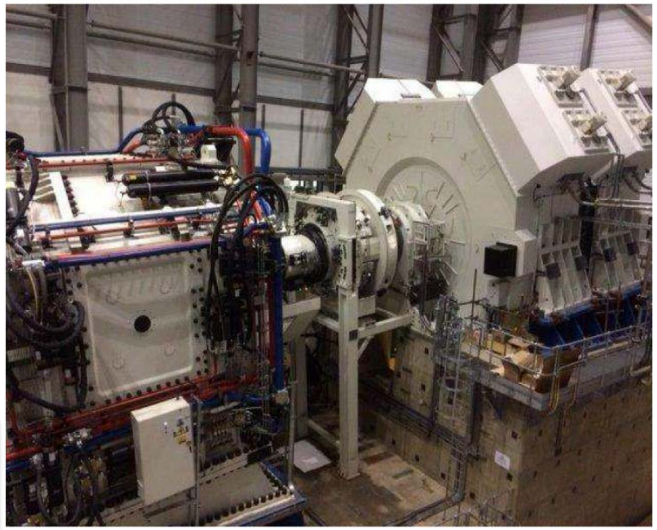
ETI10 TEN YEARS OF INNOVATION 2007 – 2017

ETI Offshore Wind Programme – background

ETI Firsts

Valuable data on floating foundation design & Cost

Purpose-built onshore test facility to reduce risks of mass production and deployment



15% cost reduction on offshore wind through floating platform design

Research Objective: Introduction

Industrial Doctoral Centre for Offshore Renewable Energy

- 4 Year EngD course
- Offshore wind, wave and tidal covered
- Variety of engineering backgrounds
- Currently ~ 50 students

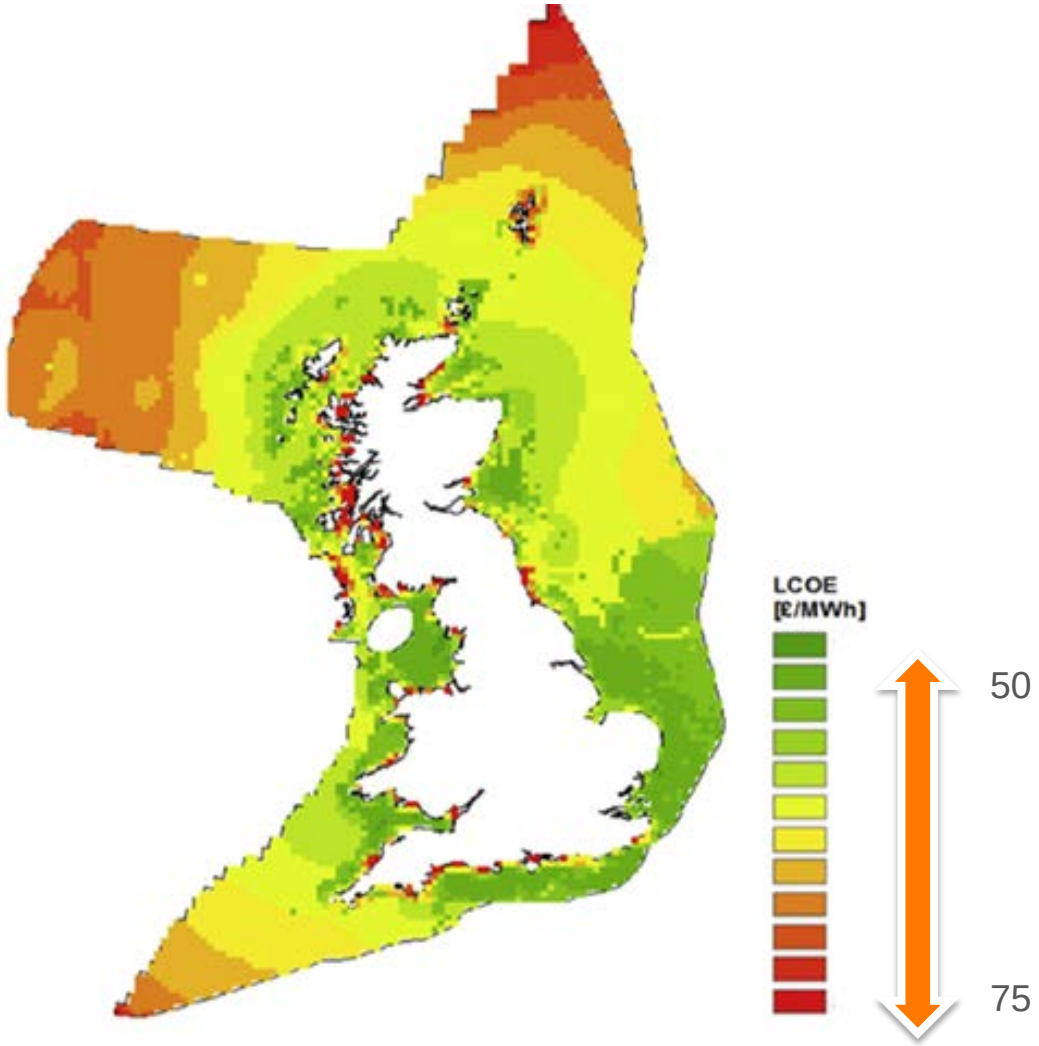
Year 1
- Module based- Edinburgh University

Year 2
- Begin research project
- SAMS summer school

Year 3
- Continue research
- Exeter summer school

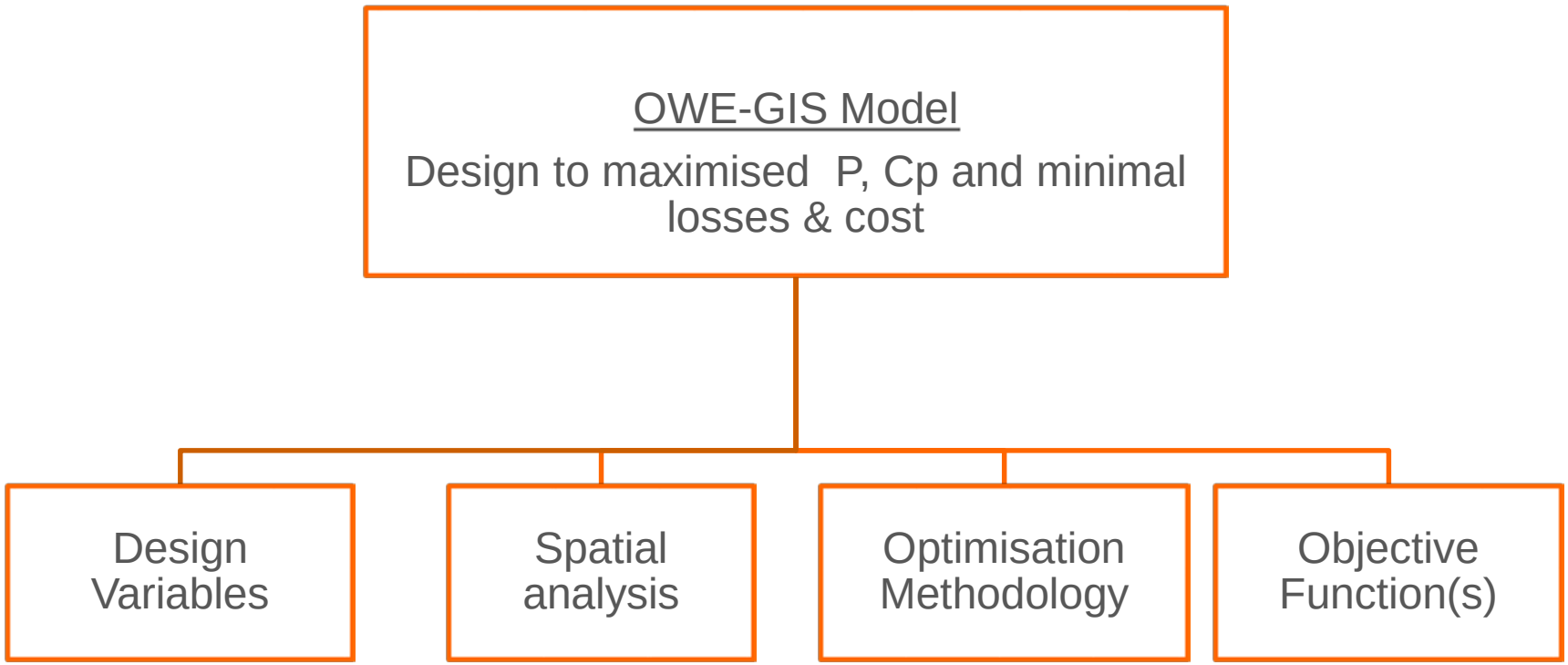
Year 4
- Complete research!

£75/MWh or Lower?

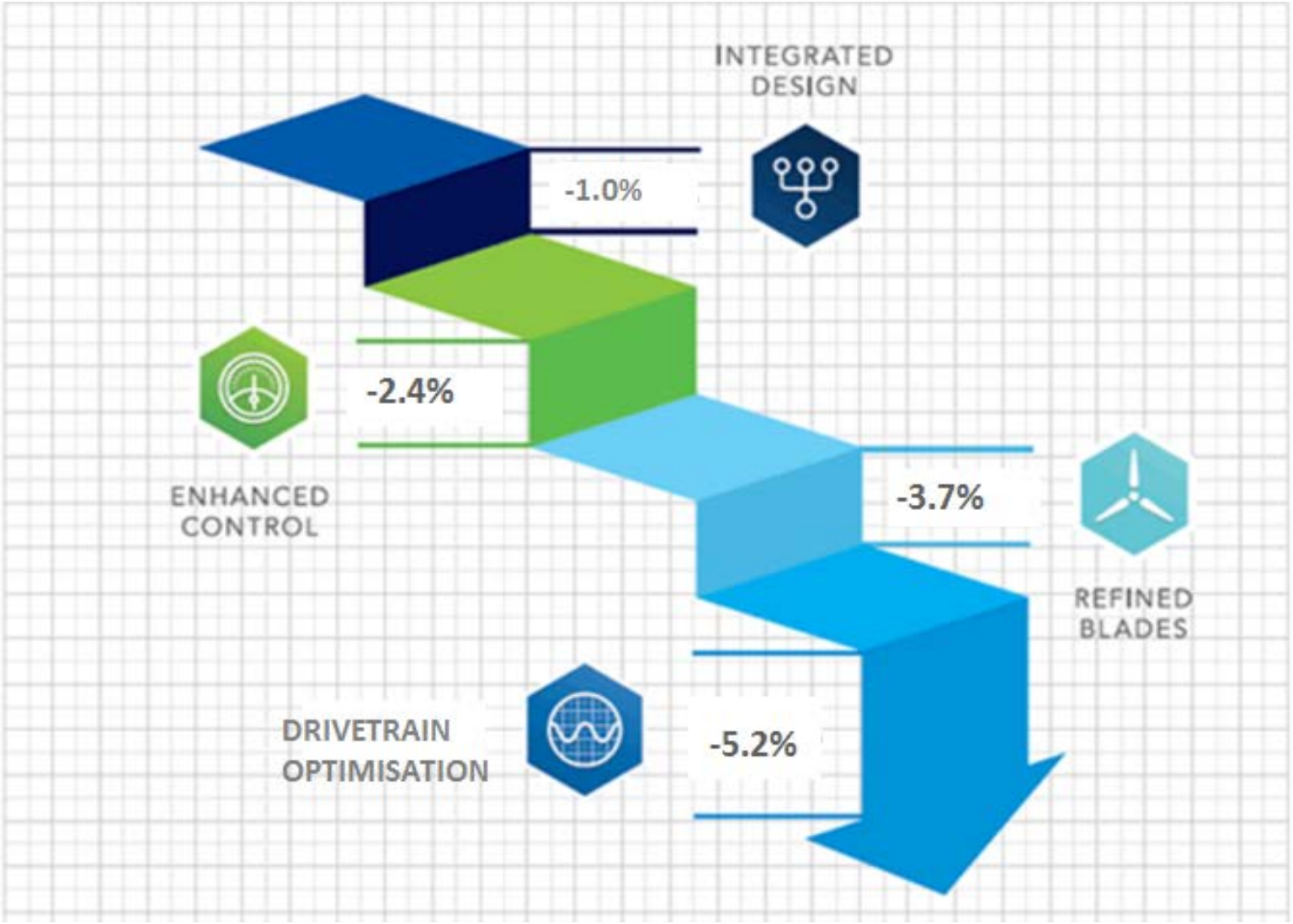


Cavazzi, S (2015)

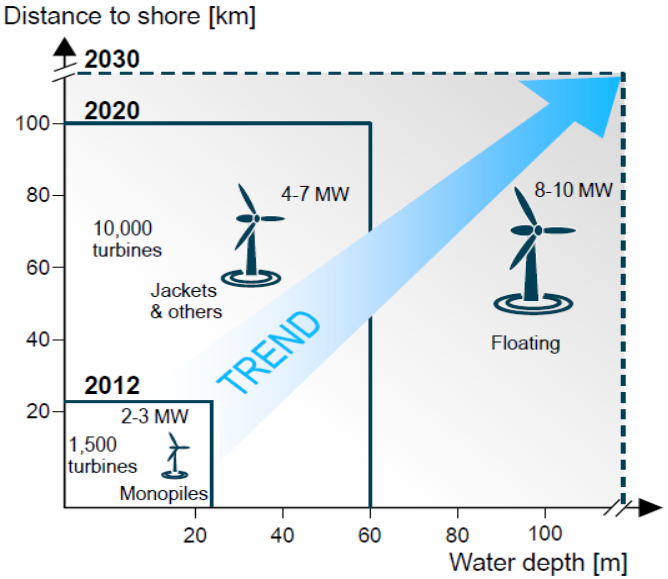
Research Objective (2)



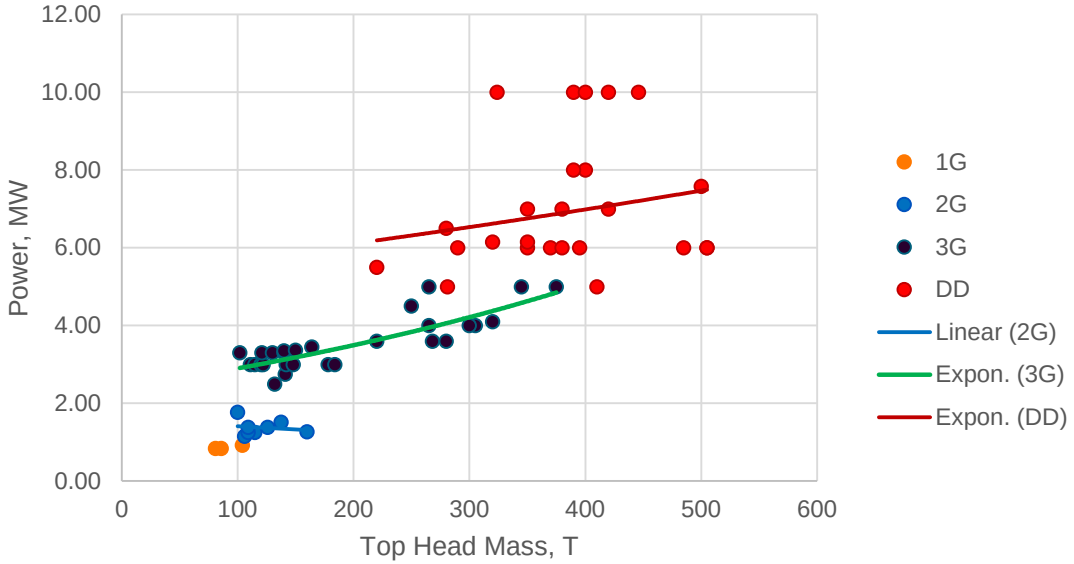
How do we get the cost down?

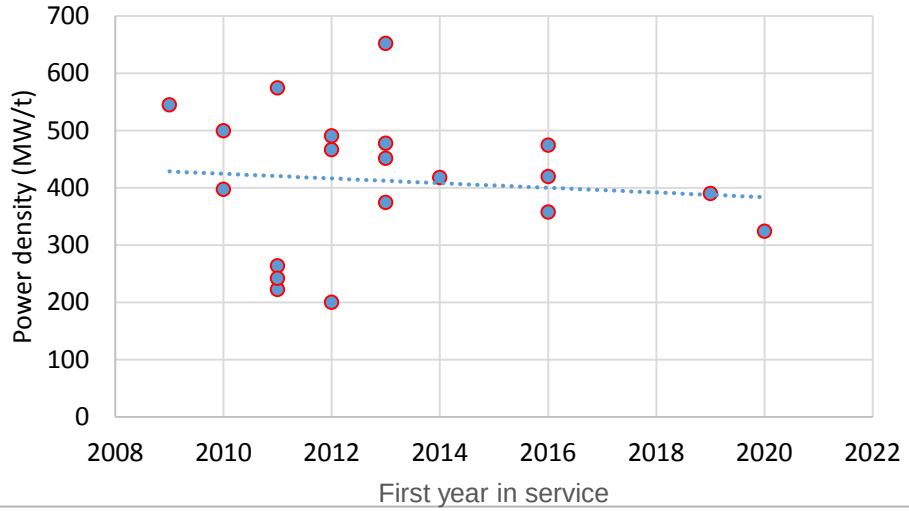


Technology Trends

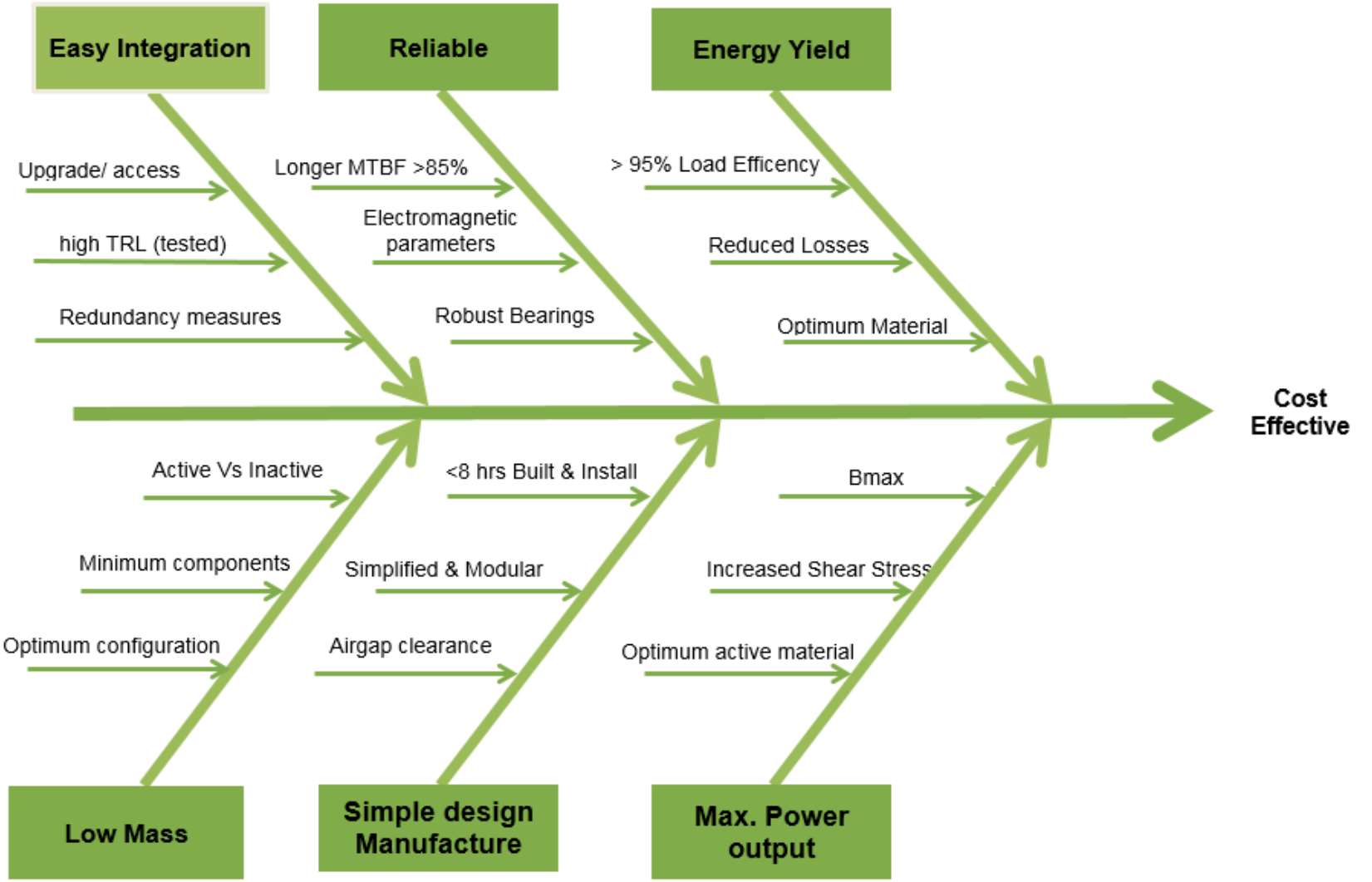


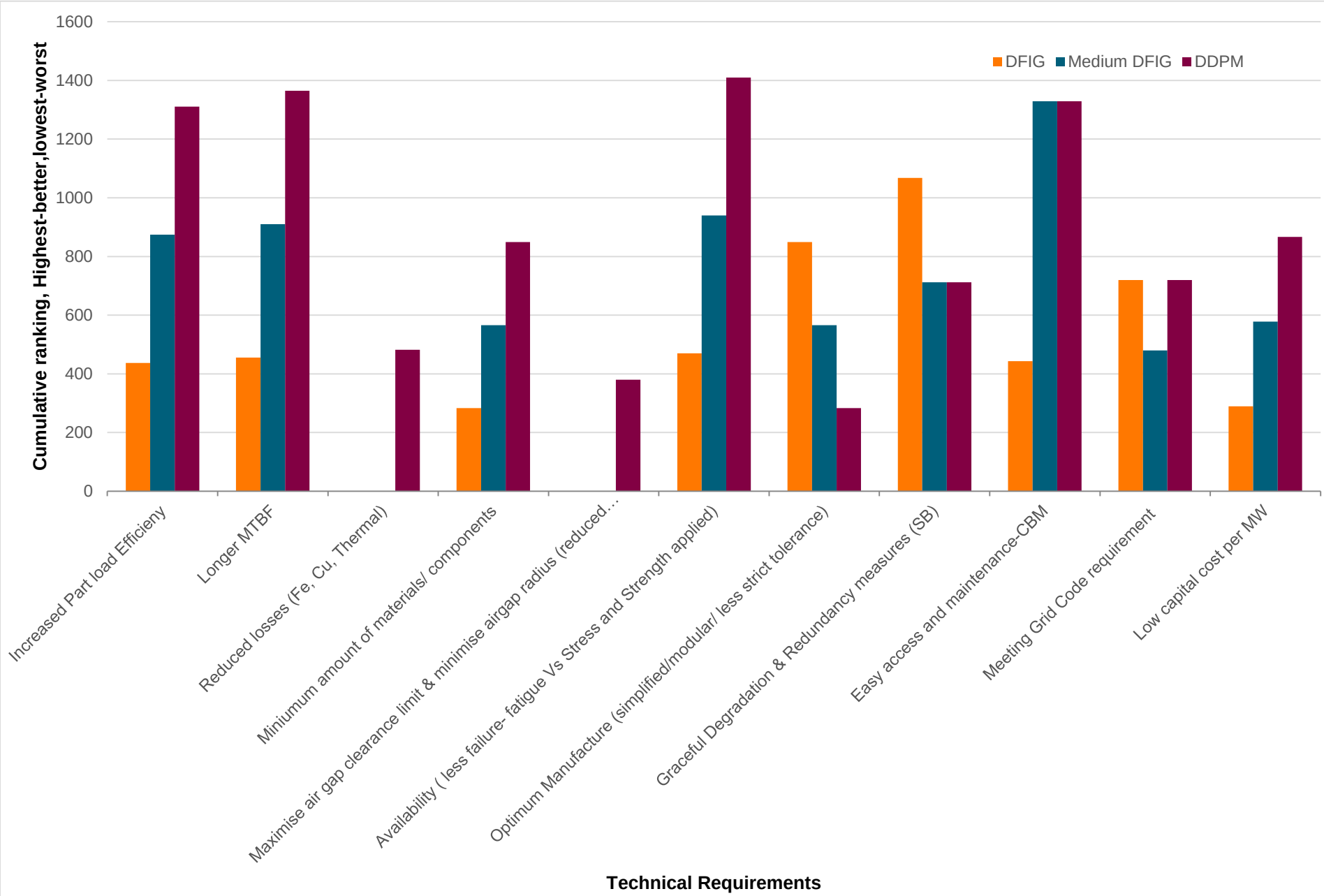
Roland Berger, 2013





How do we achieve this?



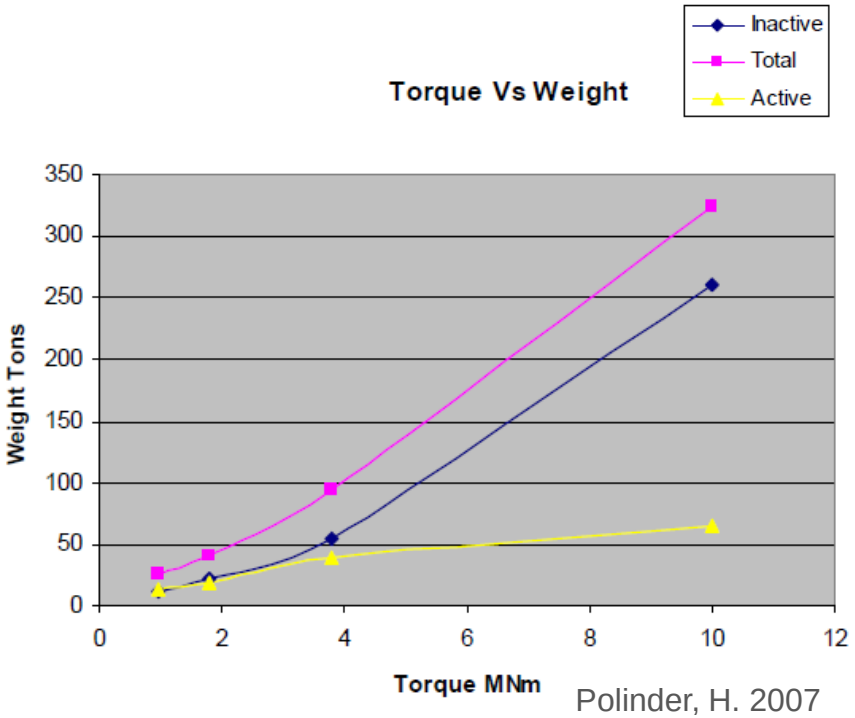


Discussion

- **Availability :** Reliability, Redundancy measures

- **Optimum material and component designs**:
  - Advanced Permanent magnets ($\mathbf{R_2Fe_{14}B}$…)
  - Efficient bearing configuration
  - Decrease of structural mass (upto 80% of total mass [2])
  - Embedded Power electronics

- **Optimum Torque Vs Active material**



Polinder, H. 2007

Reflection

- Dependency on Rare Earth elements (Dy, Nd, Pr) for Permanent magnets
- Load and Cost impact on the drivetrain and overall turbine

- Impact on Implication on site selection (fixed Vs Floating platform)

- Can more saving be made by using HTS machines?

Thank you for your attention

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References

[1] ETI Offshore Wind Programme

[2] J.Carroll- Structural Mass

[3] Reliability…

[4] Direct Drive Wind Turbine Generator with Magnetic Bearing
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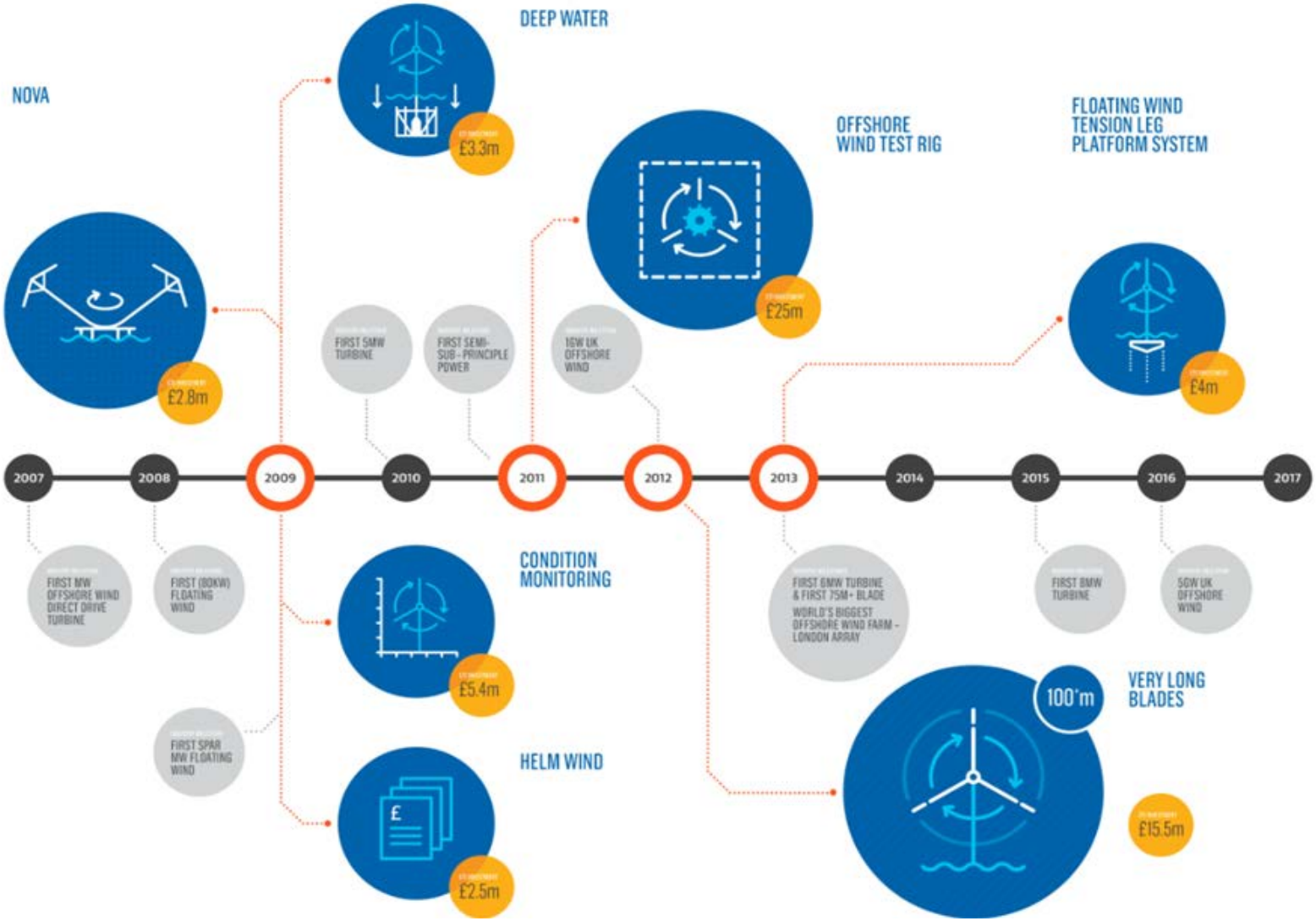
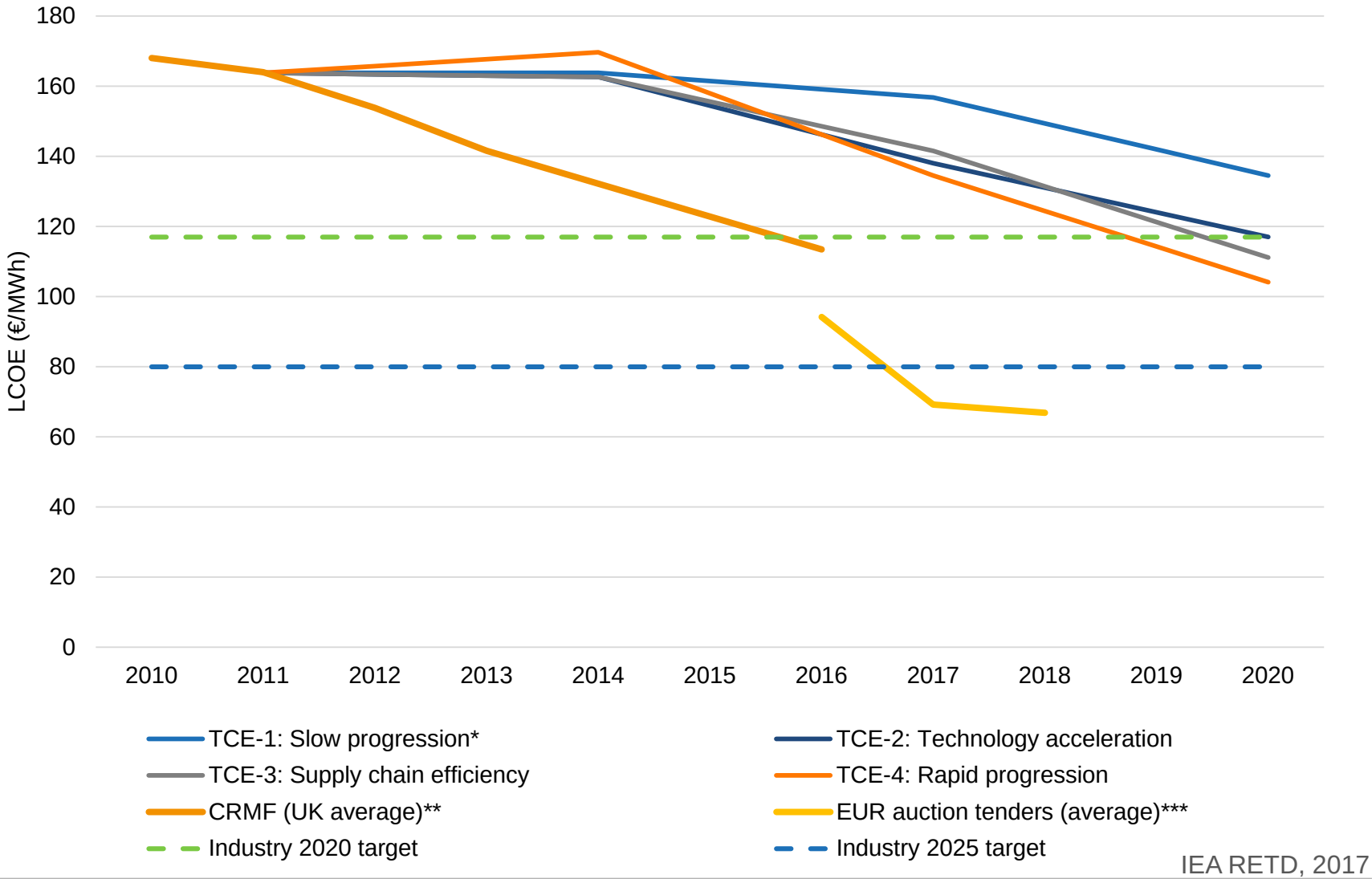
[5] Effective policies for Booming Offshore Wind Sector- IEA RETD Report, 2017



Cost Trend



IEA RETD, 2017