Principle Power

Globalising Floating Wind

FWS´21

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Principle Power | Globalizing floating wind

Company introduction

Principle Power: Globalizing floating wind

Founded in 2007, Principle Power has grown to be a global leader in the floating offshore wind industry

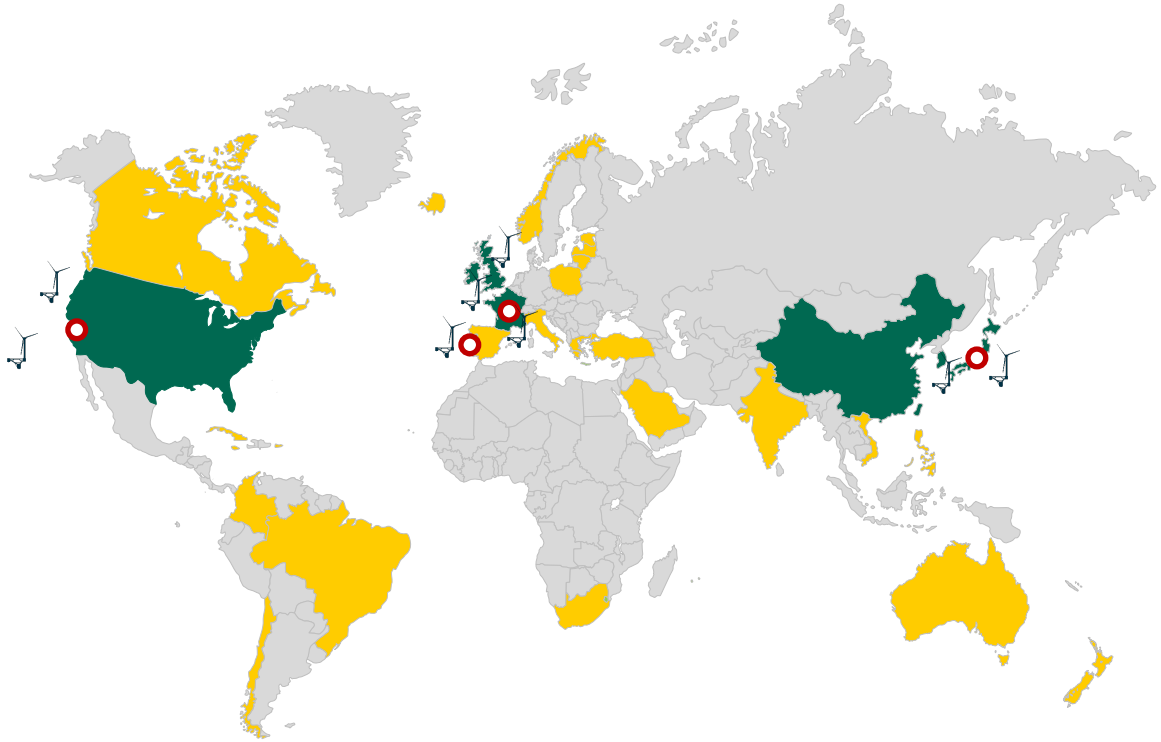
Headquarters in California with offices in Portugal, France, UK, Japan and ~100 employees with 20 different nationalities

Backed by global energy and utility leaders and involved in partnerships with influential industry players

Globally patented and proven floating platform technology that is under deployment in precommercial projects totaling 105 MW

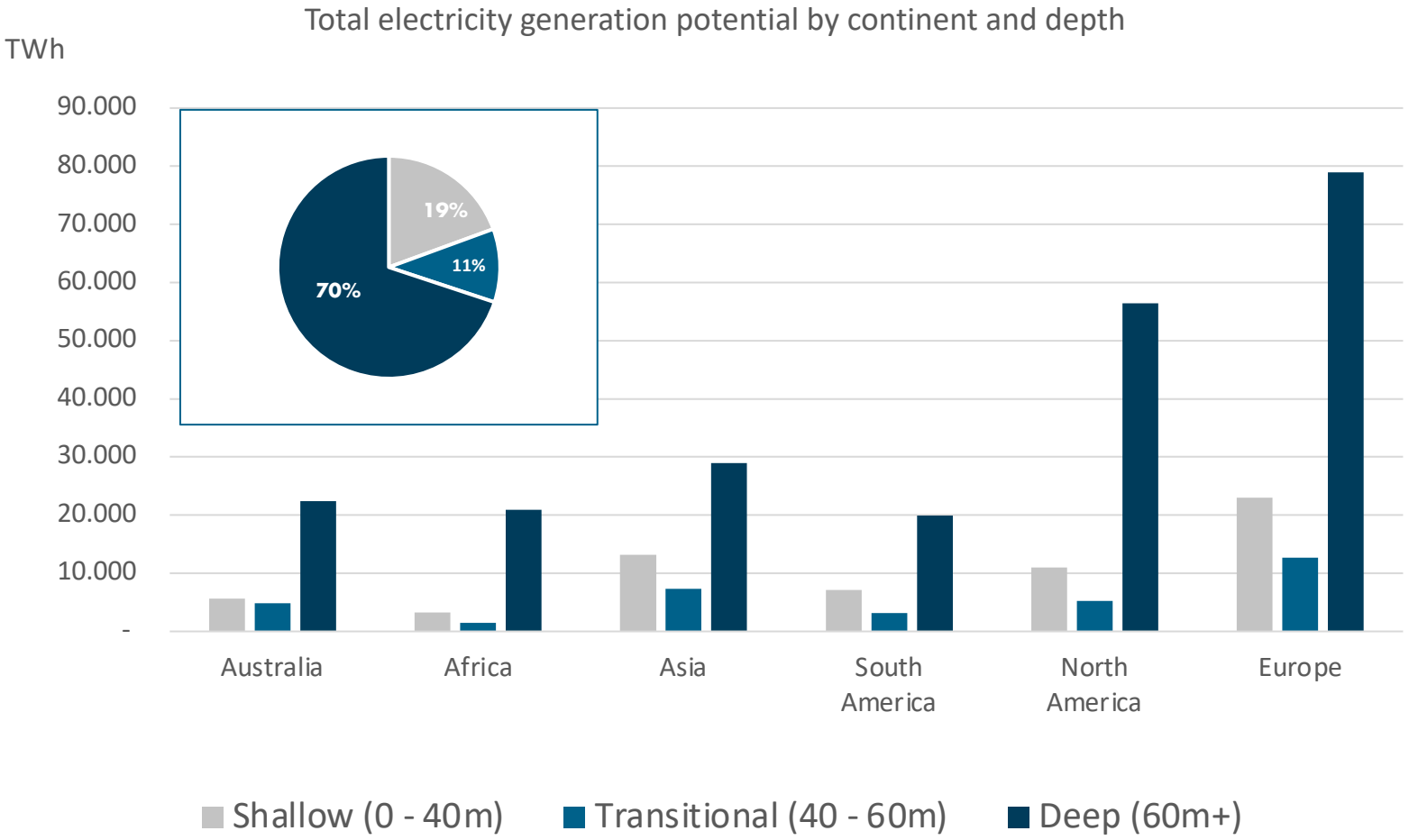
Important global project pipeline secured & serving clients in all key floating offshore wind markets

principlepowerinc.com



Market environment – floating offshore wind potential

We believe floating offshore wind is the key to unlocking the full potential of deep sea



>80% of the offshore wind resource is in waters deeper than 40 m, creating high demand for proven, cost-competitive floating offshore wind solutions

[1] Bosch, J. et al. (2018): Temporally explicit and spatially resolved global offshore wind energy potentials, in: Energy, vol. 163, pp. 766-78, https://www.sciencedirect.com/science/article/pii/S036054421831689X

Our solution – the WindFloat® floating foundation

A WindFloat works with any commercial WTG

Iterative design approach to achieve optimal system

B Heave Plates (Dynamic Stability)

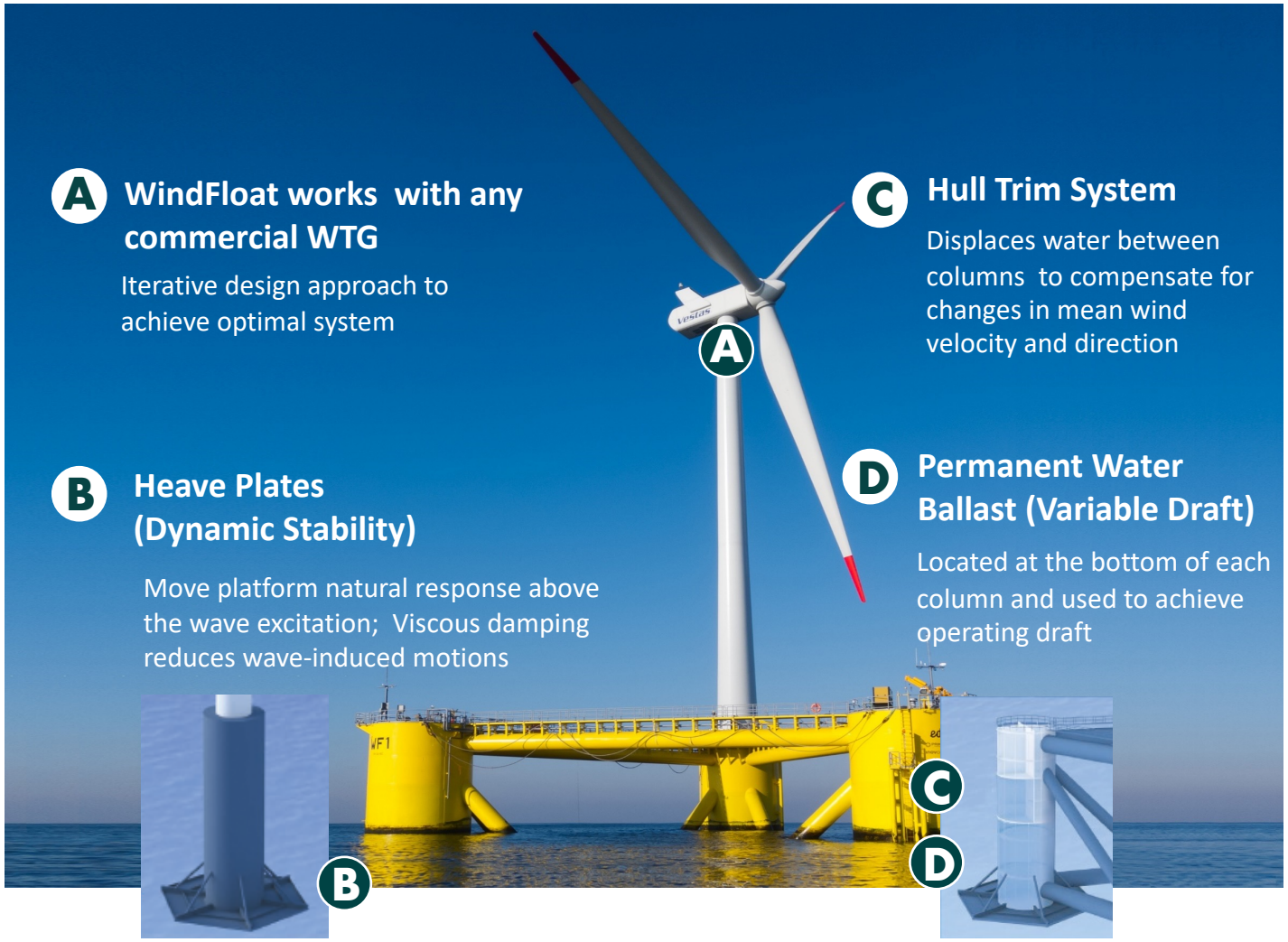
Move platform natural response above the wave excitation; Viscous damping reduces wave-induced motions

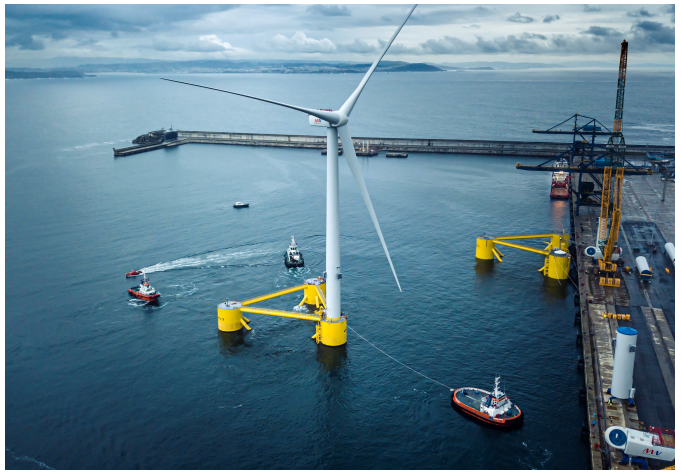
C Hull Trim System

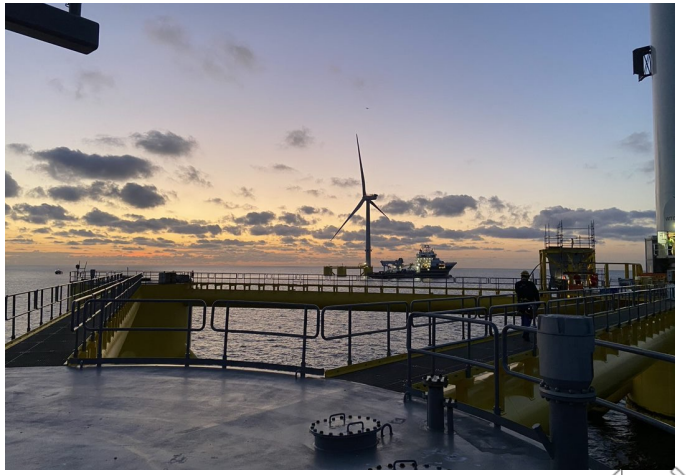
Displaces water between columns to compensate for changes in mean wind velocity and direction

D Permanent Water Ballast (Variable Draft)

Located at the bottom of each column and used to achieve operating draft







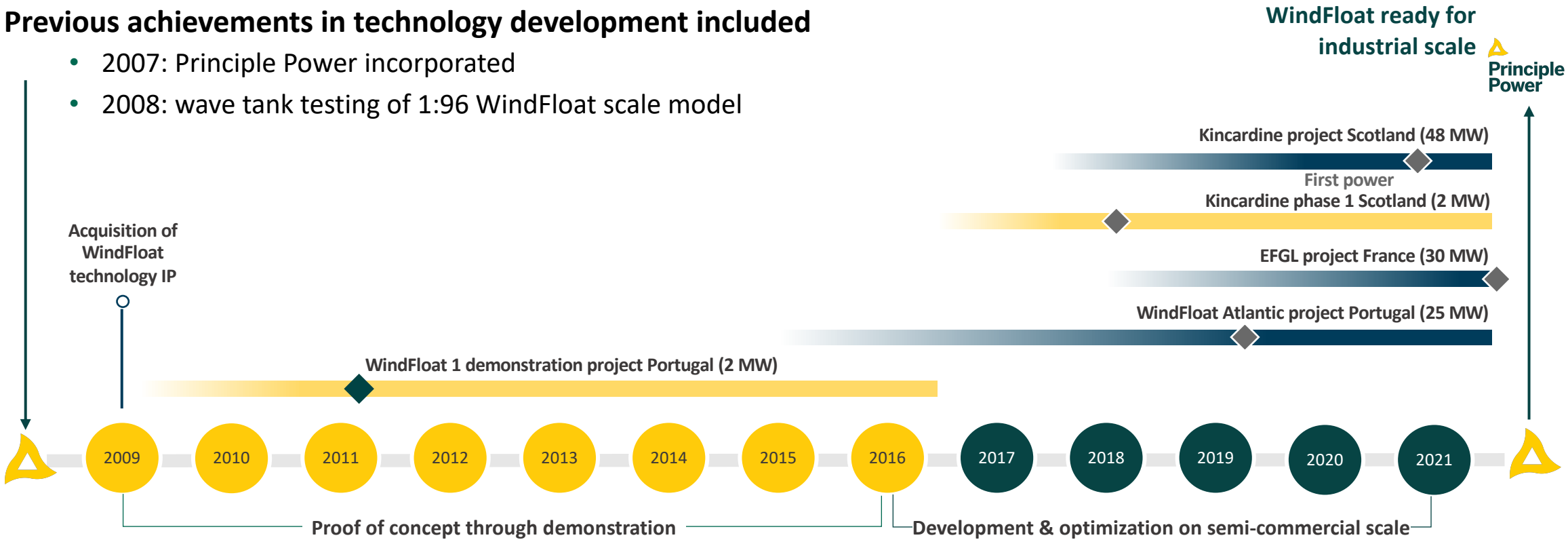
Major companies are actively positioning themselves for commercial-scale floating wind projects

The current pipeline of floating wind projects under development exceeds 50 GW

Successful company history taking a step-by-step approach to commercialization and industrial readiness

Previous achievements in technology development included

- 2007: Principle Power incorporated
- 2008: wave tank testing of 1:96 WindFloat scale model



Floating structures have complex dynamics and require early engagement and robust management of interfaces between WTG supplier and platform designer

External certification agencies provide independent validation of coupled design to satisfy sponsor and lenders

Engineering

MHI VESTAS OFFSHORE WIND

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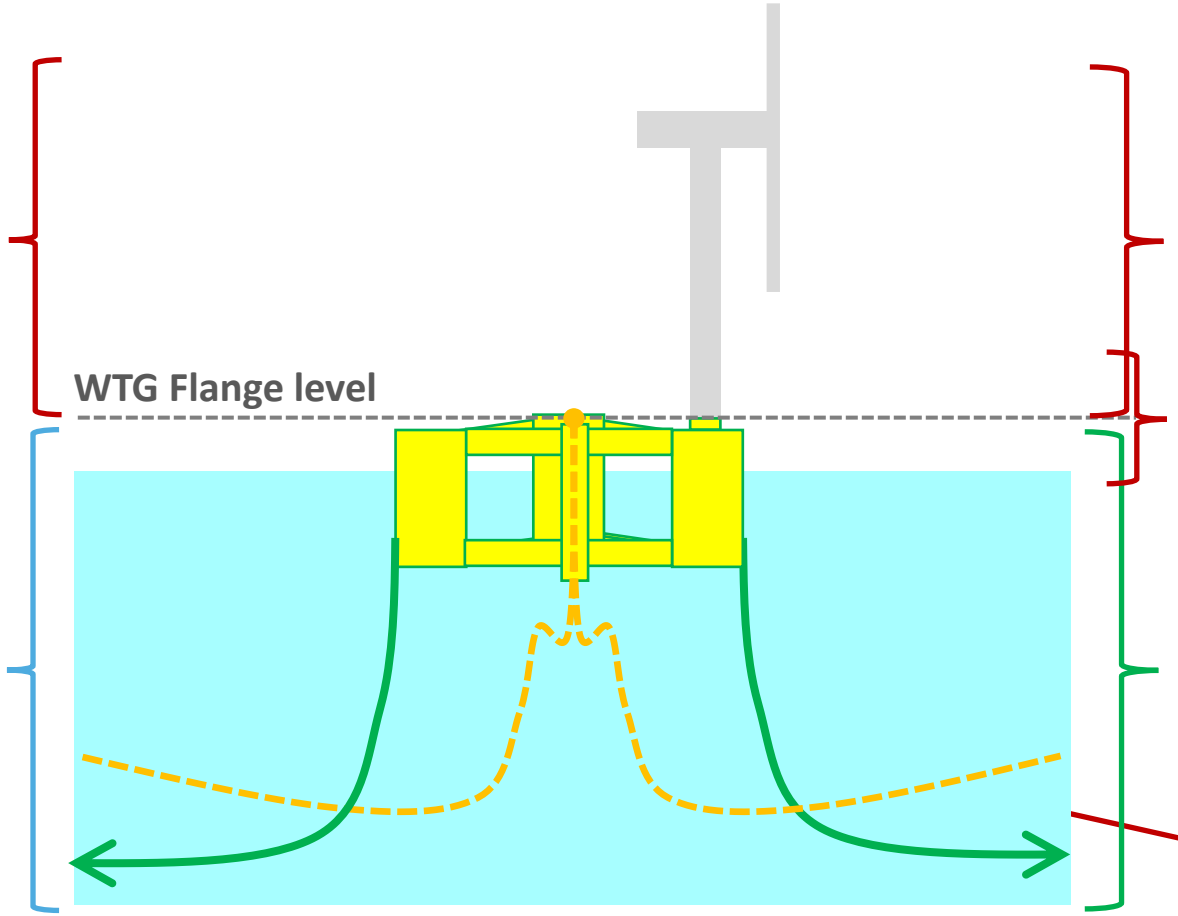


Certification

DNV-GL DK — WTG design 3rd party validation finalised

DNV-GL DK — Spot checks review of 4 load iterations carried out by PPI and MVOW

ABS — Certification of the platform successfully completed

DNV-GL DK — 3rd party review of dynamic cable design

"WindFloat Atlantic is the first floating wind project with project-financing, and an important step towards the bankability of floating wind"

- Prajeev Rasiah, Executive Vice President, EMEA, DNV GL

WindFloat Atlantic serves as a springboard for the industry

Precommercial projects provide indispensable lessons for future commercial projects

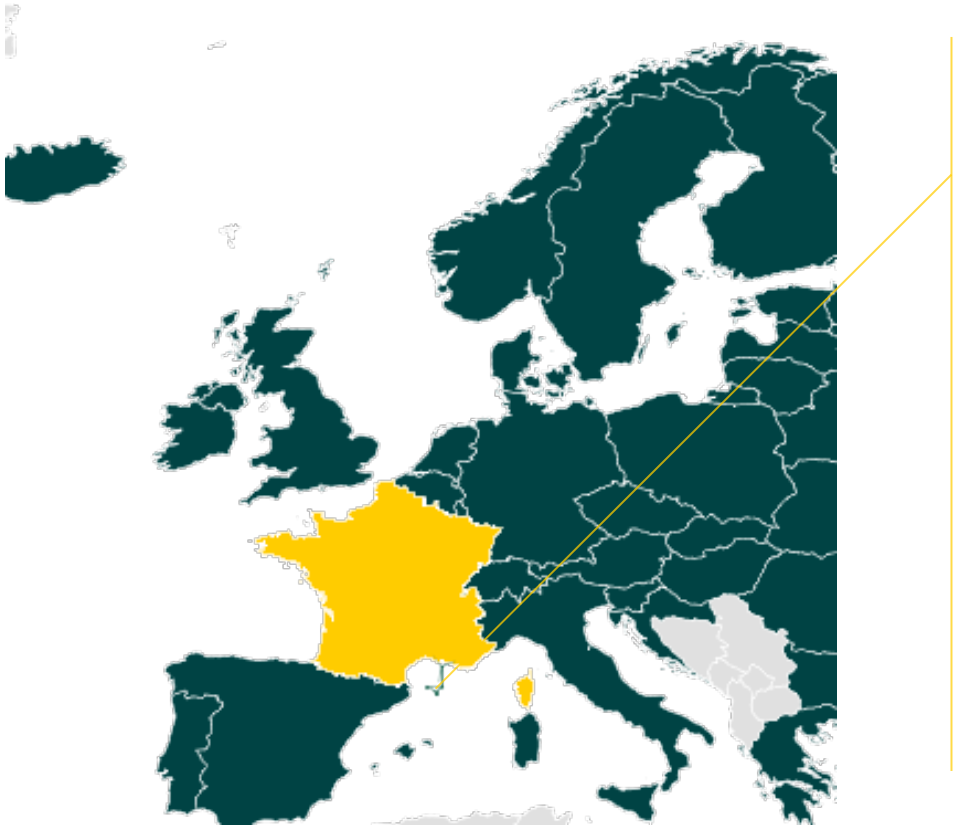
Lessons Learned

1. Empirical data increase design confidence and bankability
2. Interface between floating foundation designer and WTG is highly important;
3. Refinements gained through experience:
   - Design choices and fabrication methods
   - Logistics processes and specification of enabling equipment
   - Engineering workflow
   - Contract structure & risk management

WindFloat Atlantic during Storm Dora December 2020

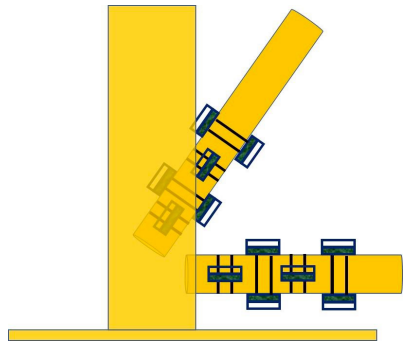
WindFloat ® Technology Development Path

France: Les Eoliennes Flottantes Du Golfe Du Lion (EFGL)



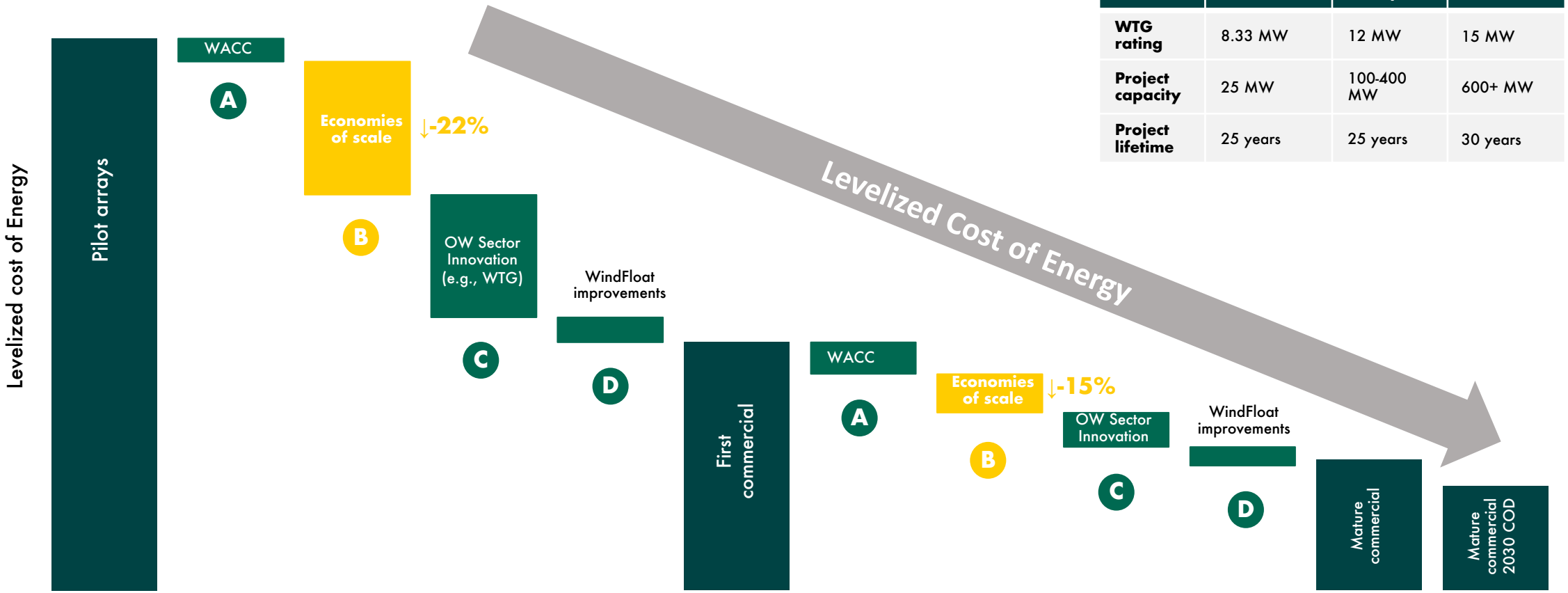
30MW, France, Operational 2022

- 3 × 10 MW
- 18 km out; 70-100 m deep
- Certified by BV
- Feed-In Tariff (through competitive process)
- Important innovations in modularisation and manufacturability to further increase deliverability and competitiveness
- Deploying fish nursery habitats (Biohuts) on WindFloat



Clear pathway towards cost competitiveness, however, achieving project (and sector) scale is a prerequisite

	Small Arrays	First commercial	Mature commercial
WTG rating	8.33 MW	12 MW	15 MW
Project capacity	25 MW	100-400 MW	600+ MW
Project lifetime	25 years	25 years	30 years



Timing depends on political and regulatory conditions enabling such projects (e.g., site control, permitting, and offtake support)

Preparing for Industrialization: understanding the challenge

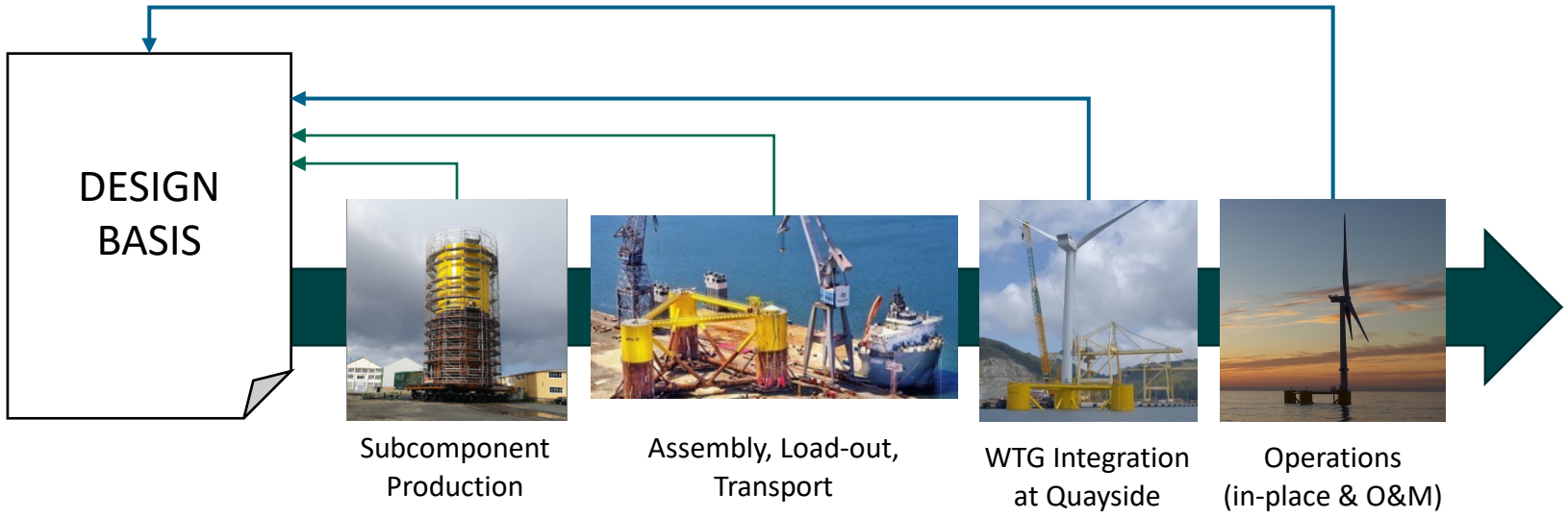
Commercial scale project requirements are very different than precommercial projects

Project Execution Plan Requirements:

- >100k tons of fabricated steel
- >100 mooring legs
- Installed in 1-2 years

Selection of Design Basis Constraints:

- Site Conditions
- WTG Technology
- Class Requirements
- Fabrication Yard Capabilities & Limits
- Local Content Requirements
- Temp. Limitations (e.g., quayside draft)



Conclusions

- Pre-commercial projects provide indispensable experience and track-record to mature and de-risk floating technology for use in commercial scale projects.
- The 50 GW of floating projects under development globally provides the market pull for sector industrialization
- Debt capital is available for good projects: lenders expected to establish “Bankability” and debt terms based on:
  1. Operational Track record of both the WTG and the Floating technology (experience and class approvals)
  2. Credibility of the Project Execution Plan (contract structure, risk allocation, counterparty, & interfaces)
  3. Project permitting, offtake, and regulatory environment
- Floating offshore wind unlocks a new source of GW-scale renewable energ globally, with high potential to contribute to Public and private sector net- especially for densely populated coastal areas

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