A solution to globalize offshore wind
Market-leading technology suitable for deep waters

WindFloat technology: Principle Power developed the WindFloat, a pioneering semi-submersible floating platform to support wind turbines in deep waters and/or difficult seabeds

Proven technology: With 6 years of successful operational experience across two sites, including in extreme weather conditions, the WindFloat is technically proven and accepted

Technical leadership: The WindFloat is the most advanced technology of all semi-submersible platforms, significantly ahead of competitors in terms of technology maturity

Industrialization: Building on this successful track record, Principle Power is preparing for industrial scale and to make WindFloat the 1st choice for offshore wind developers globally

Project pipeline: 3 projects (100 MW) under late stage development/construction & a strong commercial pipeline worldwide with potential to capture significant market share
Principle Power history
Successful company history towards industrial scale deployment

WindFloat is now proven as a robust and in-demand technology
WindFloat Atlantic unit loadout in Setúbal, Portugal, September 2019

The route to commercial floating wind:
- Survivability
- Investability
- Industrialisation

WindFloat in Extreme Seas
Storms
LCOE analysis

Cost reductions in offshore wind energy – Identified Factors

- Innovation throughout the supply chain (WTG, fabrication, installation, etc.)
- Government Policy able to support consistent project pipeline that translates into supporting the supply chain sustainable development
- Economies of Scale: reduction in WTG price, marginal increase of export costs and Devex for larger projects.
- Competition collaboration and standardization in the offshore wind industry.
- Technology Maturity increased comfort in mature technology, driving the cost of capital down
The LCOE study assumptions

- Three main LCOE scenarios: Portugal, Scotland and France
- For each location, three stages were defined: pre-commercial/pilot, first commercial, mature commercial
- Wind turbine size reflects next generation of machines, 12MW and 15MW

The LCOE study results

- The LCOE was calculated for each of the three sites (Scotland, Mediterranean, Atlantic) at each stage of the technology development (pre-commercial/pilot, first commercial, mature commercial)
LCOE analysis

Impact of WindFloat on the LCOE from first to mature commercial – PPI study

LCOE reduction from pilot to commercial projects

- **Pilot arrays**
  - **A** Economies of scale
  - **B** AEP, wakes & others
  - **C** WindFloat improvements

- **First commercial**
  - **A** WACC
  - **B** Economies of scale
  - **C** AEP, wakes & others
  - **D** WindFloat improvements

- **Mature commercial 2025 COD**
- **Mature commercial 2030 COD**
The development, demonstration and operation at full scale of the first-ever digital twin technology for a large-scale FOWT represents a good example of LCOE decrease by targeting O&M.

**Concept Summary**

- Create FOWT-specific digital twin computer tool
- Software tool validated using large-scale tank tests, with a turbine emulation technique and adaptive, hybrid testing
- Creation of digital twin of full-scale WindFloat Atlantic project—3x8MW FOWTs—using data from onboard sensors and predictive analytics from onsite measurements
Operations & Maintenance - The role of digital innovation
The Atlantic Testing Platform for Maritime Robotics

Concept Summary

• Industry-oriented Showcases for Offshore Wind Farms
• Adaptation of Robotic Platforms for O&M activities & IT systems for the Platform
• Installation of the ATLANTIS Test Center in Viana do Castelo
• Intelligent Services Supported by Robotics
• Operation and Demonstration of the ATLANTIS Test Center
LCOE projections

Global offshore wind cost reduction trend

Studying LCOE projections shows WindFloat poised to be competitive with offshore wind by 2025, and reaching 30 to 50 €/MWh by 2030.
Portugal offers good potential for floating offshore wind (wind resource @150 m hub height)

Source: Global Wind Atlas 3.0
DTU, World Bank Group
https://globalwindatlas.info/
1. Principle Power is now focusing on industrialization that will drive down LCOE, increase investors confidence and accelerate commercial deployment.

2. Scale and long-term commitment is what has driven fixed foundation OW to record lows, we need the same for floating.

3. Principle Power is committed to support co-development of technology with the academic R&D institutions and industry partners, recognizing the valuable output of such partnerships in the overall O&M cost decrease for FOW.
Thank you!