

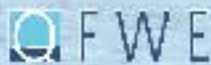
Floating Wind Solutions

Accelerating Deployment of Full-scale Floating Offshore Wind Farm – A Class Society's Perspective

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Director of Technology



Organized by



Quest Offshore

The FWS logo features a stylized blue wind turbine icon to the left of the letters "FWS" in a white, sans-serif font.

FWS

The Marriott Marquis, Houston 1-3 March 2022

ABS Engagement in Floating Offshore Wind Projects



WindFloat 1 Prototype
(one 2.3 MW turbine)



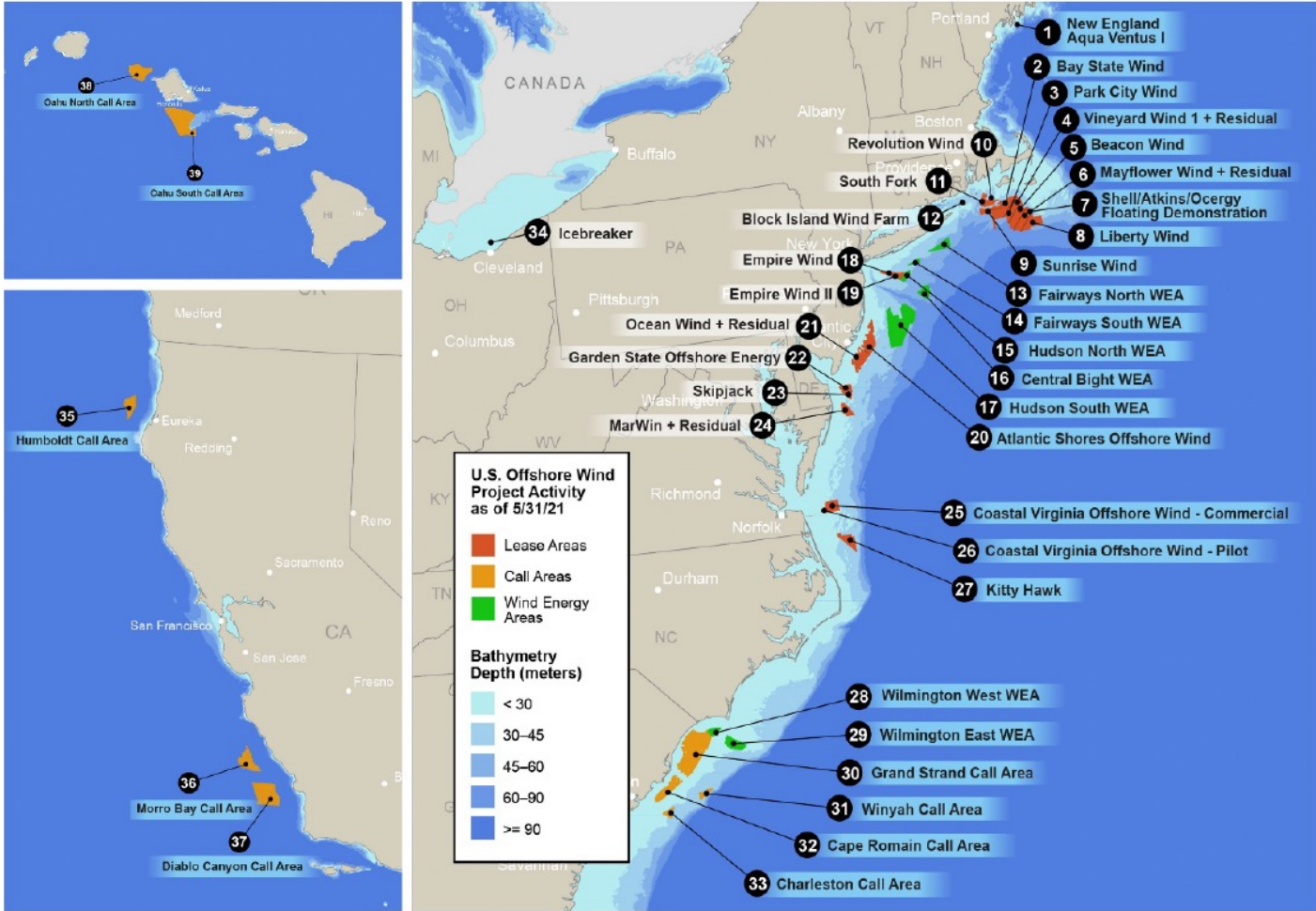
WindFloat Atlantic
(3 x 8.4 MW turbines)



Kincardine Offshore Windfarm
(5 x 9.5 MW turbines)

US Offshore Wind Farm Sites

- US East Coast plays a leading role in offshore wind development using mature fixed offshore wind turbine technologies
- US West Coast and Hawaii call for floating solutions given the water depth limitation



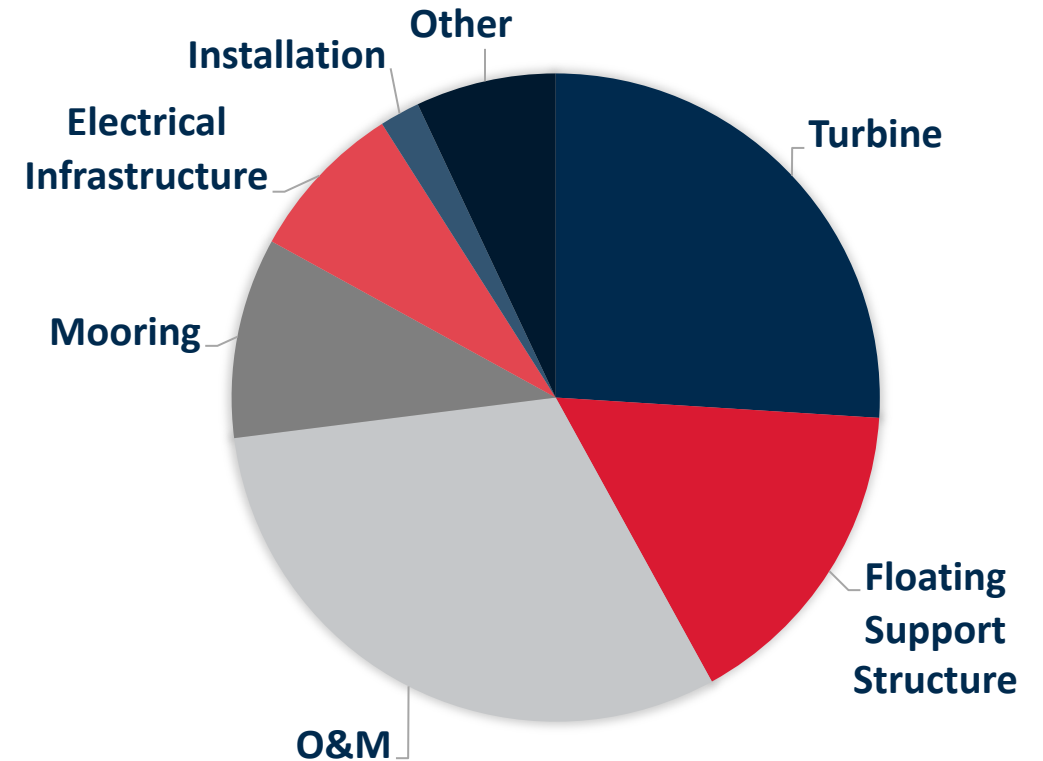
US DOE, Offshore Wind Market Report: 2021 Edition
<https://www.energy.gov/eere/wind/wind-market-reports-2021-edition#offshore>



Floating Wind Farm Market Potential

- Globally, floating offshore wind capacity is expected to grow from 79 MW in operation to 3.7 GW in the next five years and over 26 GW in the longer term
- For certain areas, floating wind turbine is the only viable solution for offshore wind
- Current Levelized Cost of Energy (LCOE) for floating wind turbines is approximately 1.5 ~ 2 times of that for fixed offshore wind turbines

- Floating Offshore Wind Project CAPEX and OPEX



Floating Wind Solutions

Accelerating Deployment of Floating Wind Farm

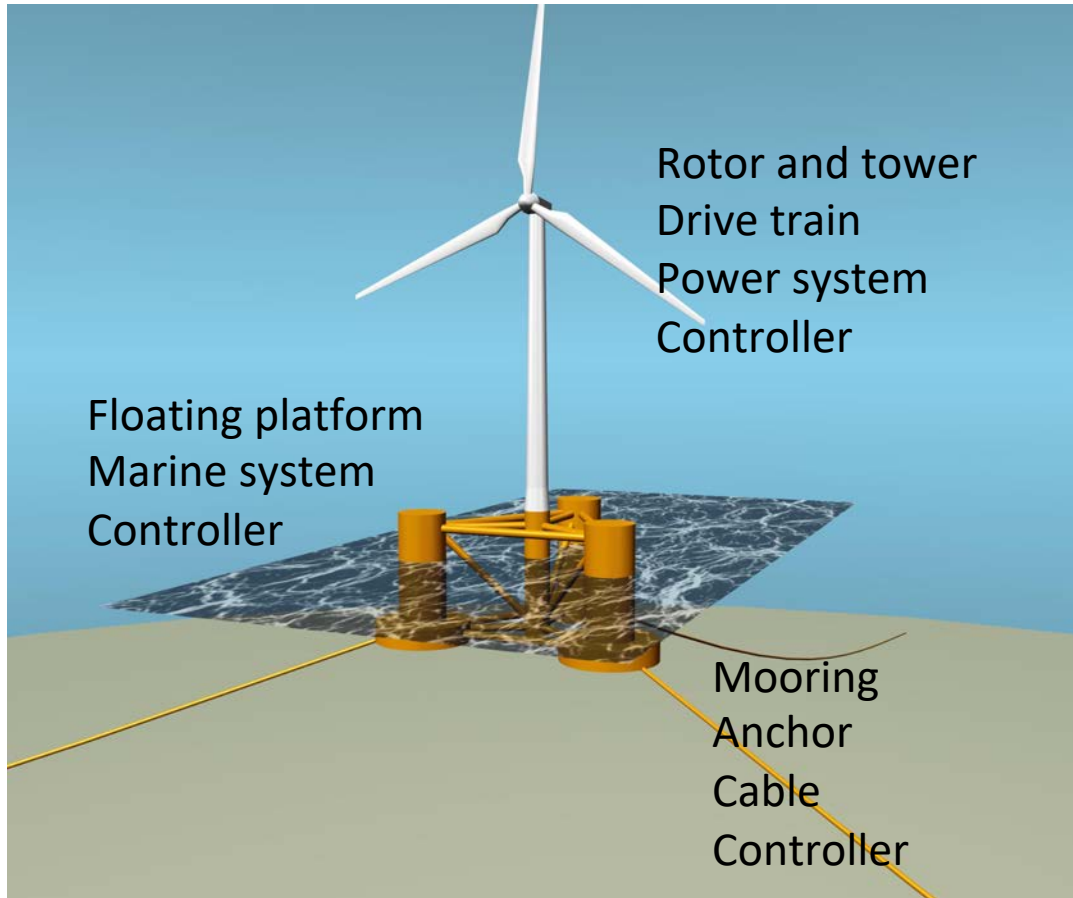
Key enabling technologies

Innovative floating wind turbine technology

Efficient energy transport technology

Standards

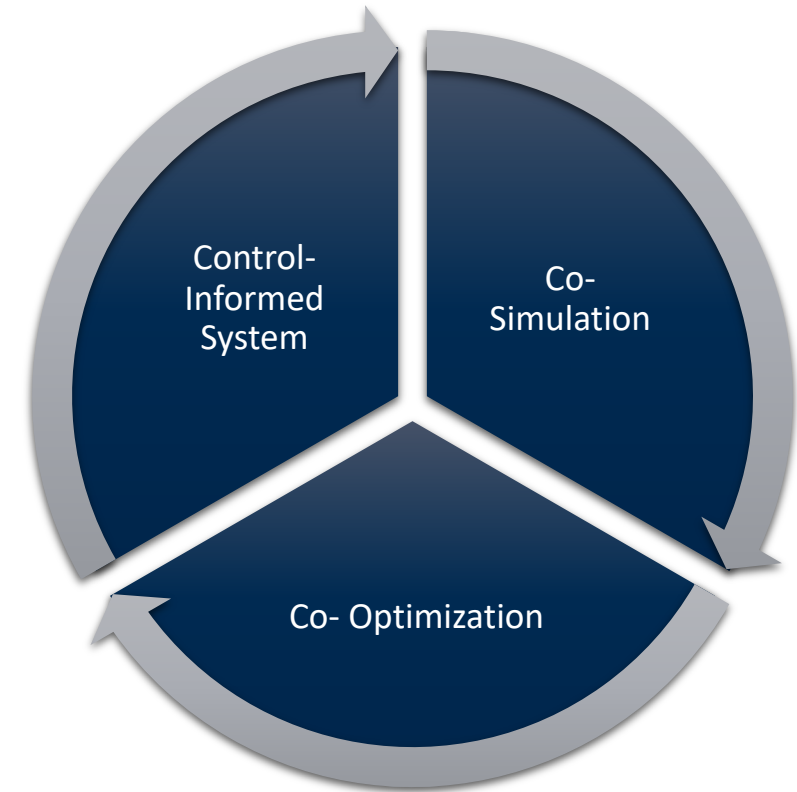
Floating Wind Turbine - System Design



© ABS

Optimal Levelized Cost of Energy (LCOE)

- **Safety**
- **Manufacturability**
- **Installability**
- **Operability**
- **Maintainability**



Floating Wind Solutions

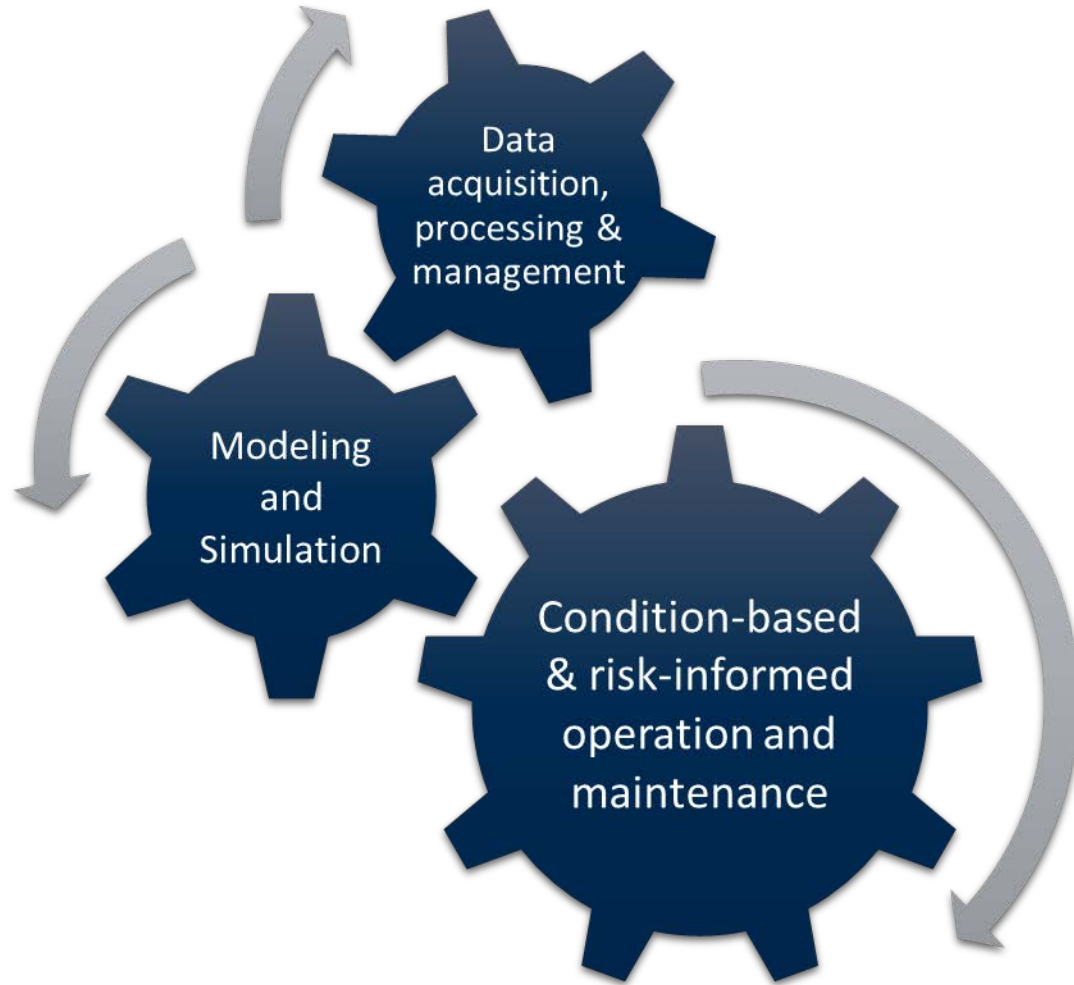
Floating Wind Turbine - Mooring and Anchor

- Material
- Configuration
- Shared anchor
- Shared mooring line
- Redundancy
- Disconnectable solutions
- Monitoring



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Digitalization for Operation and Maintenance

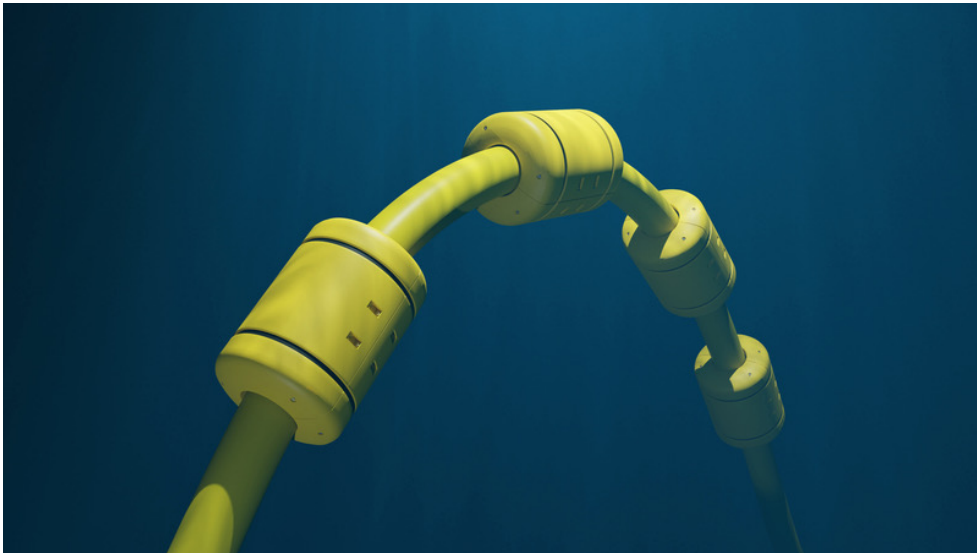


© Principle Power Inc.

Energy Transport Technology

- Electric Power

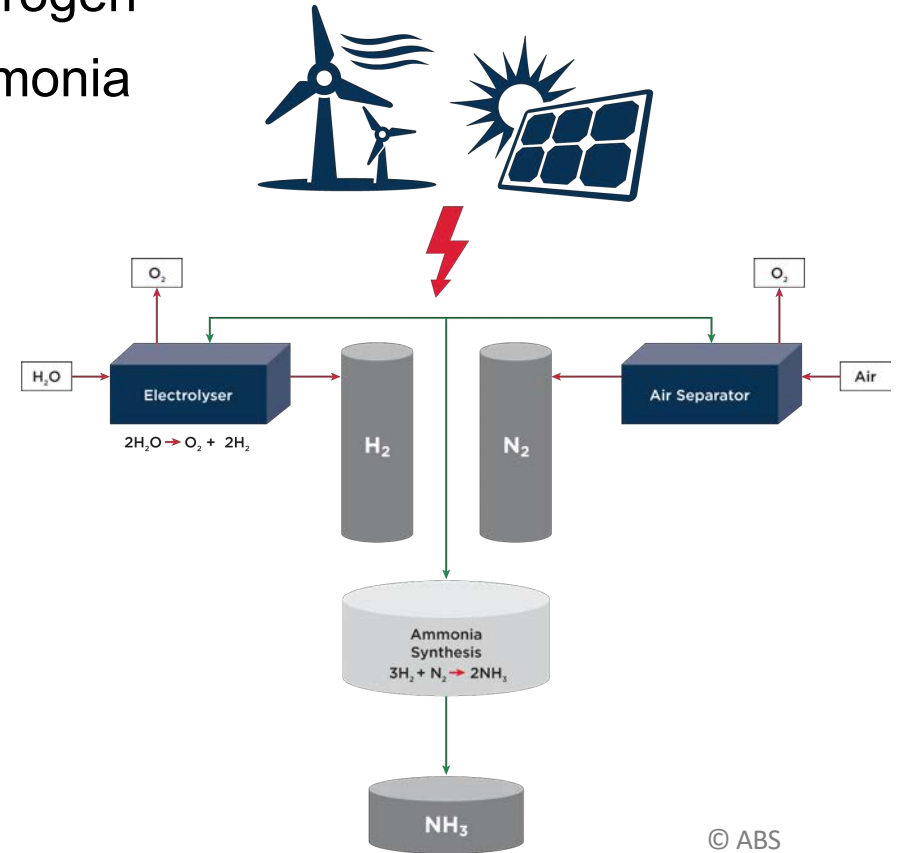
- Floating substations
- High voltage dynamic cables



© Vismar UK/Shutterstock

- Gas or Liquified Products

- Hydrogen
- Ammonia

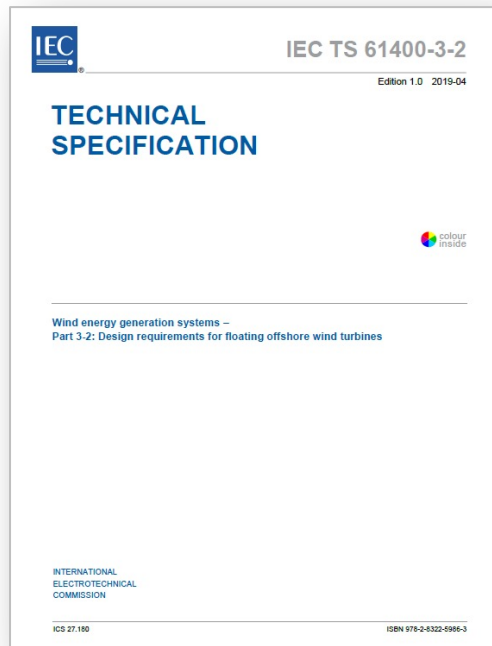


Floating Wind Solutions

Standards – Evolving with the Industry

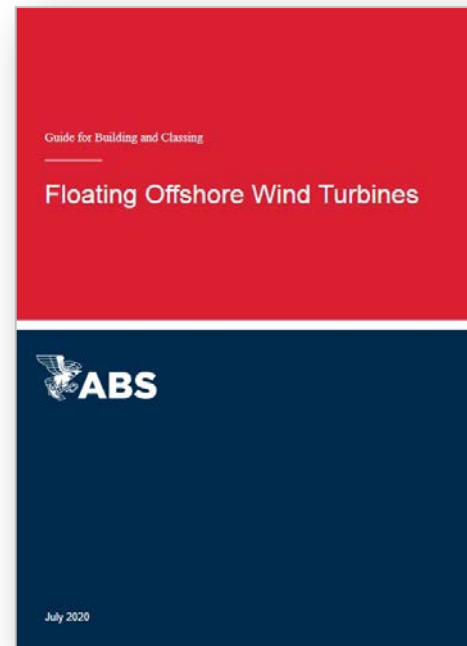
As floating wind advancing toward large-scale deployment, standards and classification/certification processes must evolve along with the industry.

- IEC and National Standards

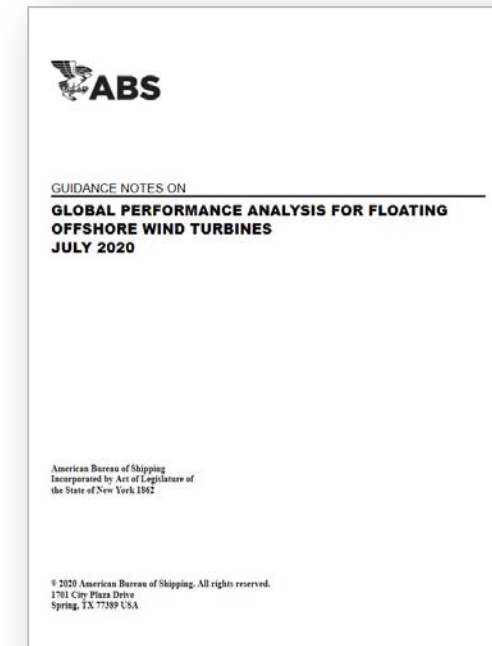


<https://webstore.iec.ch/publication/29244>

- Classification/Certification Guidelines



<http://ww2.eagle.org/en/rules-and-resources/rules-and-guides.html>



Floating Wind Solutions

Concluding Remarks

- Offshore wind continues evolving toward a competitive renewable energy source
- Floating offshore wind market is expecting a significant expansion
- ABS has been supporting floating offshore wind development since its nascent days by leveraging ABS's 160 years of marine and offshore experience

OFFSHORE LEADERSHIP

- Experience from Classing close to 80 MW of Floating Offshore Wind

INDUSTRY COLLABORATION

- Convener roles in committees to develop global and US standards

Thank You

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