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<th>19-IEPR-07</th>
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<tr>
<td><strong>Document Title:</strong></td>
<td>Floating Offshore Wind Ready for Commercial Deployment around the World</td>
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<tr>
<td><strong>Description:</strong></td>
<td><em><strong>SUPERSEDES TN  229921</strong></em> Presentation by Kevin Banister. Principle Power</td>
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<tr>
<td><strong>Filer:</strong></td>
<td>Raquel Kravitz</td>
</tr>
<tr>
<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
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<tr>
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<td>Commission Staff</td>
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Floating Offshore Wind: Ready for Commercial Deployment around the World

October 2019
Introduction to Principle Power

- Founded in 2007
- > 70 employees - Offices in California, FR, and PT

Shareholders
- Aker Solutions
- EDP
- REPSOL Ventures
- Portugal Ventures
- Asaamiato

Partners
- EDF
- Shell

- Successful 5-year Full Life-Cycle Demonstration
  - 2MW Vestas, Identical Performance to Fixed Foundation
  - 17GWh, Produced in 12m waves; Survived 17m waves

- 3 Precommercial Projects in Progress (~100MW of installed floating capacity by 2021 in Europe)

Commercial Development in Europe, USA, Asia
The WindFloat, a versatile semi-submersible floating foundation

1. Wind Turbine Agnosticity
2. Inherent Stability at shallow draft and in transit
3. Quay-side Final Assembly and Commissioning / Minimum Offshore Operations
4. Low pre-tension conventional Mooring System for Station-Keeping
5. O&M Revolution with Tow-to-Shore Strategy

Reduction of costs and risks throughout entire lifecycle
WindFloat technology signed off by Key International Certification bodies in different markets, prepared for deployment in China

**WindFloat Atlantic, Portugal**
- Portugal – medium wind, high wave
- 8 MW turbine, MHI Vestas
- AFC stamped Drawings
- DNV certified MHI Vestas turbine (coupled system)

**WindFloat Pacific, US**
- US West Coast – high wind, high wave
- 8MW turbine, Turbine TBD
- Approval in Principle
- Full Document and Project Review with no critical findings

**Golfe du Lion, France**
- France – high wind, medium wave
- 6+ MW turbine, GE/Alstom
- Approval in Principle issued

**WindFloat Japan**
- Japan – medium wind, medium wave
- 5 MW downwind turbine, Hitachi
- Japan Model Testing performed
- Passed all technical committees with Class NK and NEDO
- Approval in Principle issued
3 Floating Wind Farms underway

3 Different Markets and Customers

75 MW currently under Construction and Installation

WindFloat Atlantic – 25 MW
Golfe du Lion – 24MW
WindFloat Kincardine – 50MW

100 MW in Operation by 2021
Next Generation WindFloat has been engineered with all major offshore WTMs

<table>
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<tr>
<th>Project</th>
<th>Turbine OEM</th>
<th>Turbine Model</th>
<th>Power</th>
<th>Diameter</th>
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<tr>
<td>WF1 prototype</td>
<td>MHI VESTAS OFFSHORE WIND</td>
<td>V80</td>
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<td>8.3MW</td>
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<td>MHI VESTAS OFFSHORE WIND</td>
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<td>Haliade</td>
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<td>150m</td>
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Jump-starting the industry in CA with the Redwood Coast Offshore Wind Project...

100-150 MW, Humboldt County, California, Operational 2024
Flagship project for offshore wind industry in CA and the West Coast

- 12+ MW offshore wind turbines
- 25+ miles out; 700-900 m deep; world-class wind resource (9.5+ m/s)
- Deployable by 2024
- Creation of a public-private partnership with RCEA
  - PPI part of Consortium and WindFloat tech selected by RCEA’s RFQ in March 2018
- Strong local community support and control
- Potential to revitalize the Port of Humboldt Bay; could become leading hub on West Coast
- Large potential to drive investments in infrastructure and create local jobs
The WindFloat is on track to compete with conventional power, other renewables, and bottom-fixed offshore wind.
Key Take Aways

1. Floating wind is proven technically, and is now proving its financial and economic viability;

2. The WindFloat addresses the industry’s bottom-fixed foundation challenges, while enabling offshore wind to reach its full potential;

3. Companies like Principle Power are already executing on several pre-commercial projects globally => ~100MW of expected floating wind capacity installed by 2021);

4. Floating Wind expected to be deployed commercially in the marketplace by end of decade;

5. The key for market leadership is to advance to ‘next scale’ projects and to prepare for developing utility-scale commercial projects.
Thank you!