Future trends in offshore renewable energy

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Agenda

1. Why wind energy?
2. Key parameters of energy demand
3. Investment process
4. Supply chain elements
5. Challenge – Solution Examples
6. Innovation trends
7. Vision of the future
1. Why Wind Energy?
2. Key parameters of energy demand

LCOE

- Safe
- Effective
- Stable
- Environment Friendly
2. Key parameters of energy demand
2. Key parameters of energy demand
3. Investment process

**Development Phase**
- Managed by wind farm developer
  - Feasibility studies, Licensing, Planning, Radar
  - Environmental surveys
    - Benthic, pelagic, ornithological, seamounts, etc.
    - Environmental surveys
  - Coastal processes
  - Meteorological surveys
  - Geophysical
  - Geotechnical
  - Front-end engineering and design
  - Human impact studies

**Construction Phase**
- Wind turbine
  - Nacelle
  - Rotor
  - Tower
- Balance of plant
  - Cables
  - Turbine foundation
  - Offshore substation
  - Onshore substation
- Installation and Commissioning
  - Export cable-laying
  - Foundation installation
  - Array cable-laying
  - Construction port
  - Offshore substation installation
  - Sea-bed support
  - Turbine installation
  - Commissioning

**Operation Phase**
- Operations and Maintenance
  - O&M Port
  - Technician and equipment transfer
  - Offshore accommodation
  - Large component refurbishment, replacement and repair

**Deconstruction Phase**
- Deconstruction
  - Removal
  - Recycling

Barbara Weig
4. Supply Chain Elements
5. Challenge – Solution examples

- Reliable Foundation of Wind Turbine Generator - Monopile
- "Strong" Enough
- "Durable" Enough
- Collision Proof
- Water Proof
- Monopile Painting

Solution

- Painting Cost & Quality
  - Painting Facilities
- Anode Cage Construction

Limitations

Innovation

Characteristic
5. Challenge – Solution examples
5. Challenge - Solution - WTG

- 7.7m 50kW
- 23.5m 48.2m 1500kW
- 34.0m 70m 5MW
- 61.5m 126m 5-6MW
- 73.5m 150m 8MW
- 88.4m
- 107m 220m 12MW
5. Challenge - Solution - WTG

Materials:

Logistics:

LM Wind Power

Siemens
5. Challenge - Solution - O&M
5. Challenge - Solution – BoP

Transformer Stations:

Cabling:

Siemens JDR Cables
5. Challenge - Solution - Foundation

Orsted

Carbon Trust

Equinor

Jan De Nul
6. Innovation Trends

LCOE

- Effective
- Stable
- Safe
- Environment Friendly
6. Innovation Trends - Safety

Esteyco
6. Innovation Trends - Effectiveness

SeaTwirl

Hywind Tampen floating wind farm

Gullfaks

Snorre

Equinor
6. Innovation Trends - Stable
6. Innovation Trends – Environment Friendly
7. Vision of the Future - Hubs
7. Vision of the Future – Multiuse & Integration
Thank You for your attention!

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