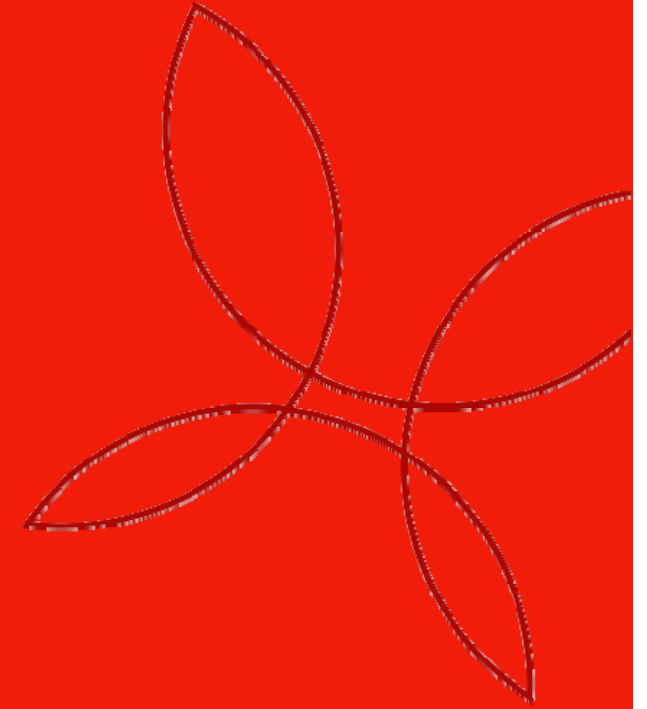




Climate &
Renewables



Round 3 – Zone 6
Proposed Off-Shore Wind Farm
Development

March 2010

E.ON Climate & Renewables

Round 3 – Zone 6

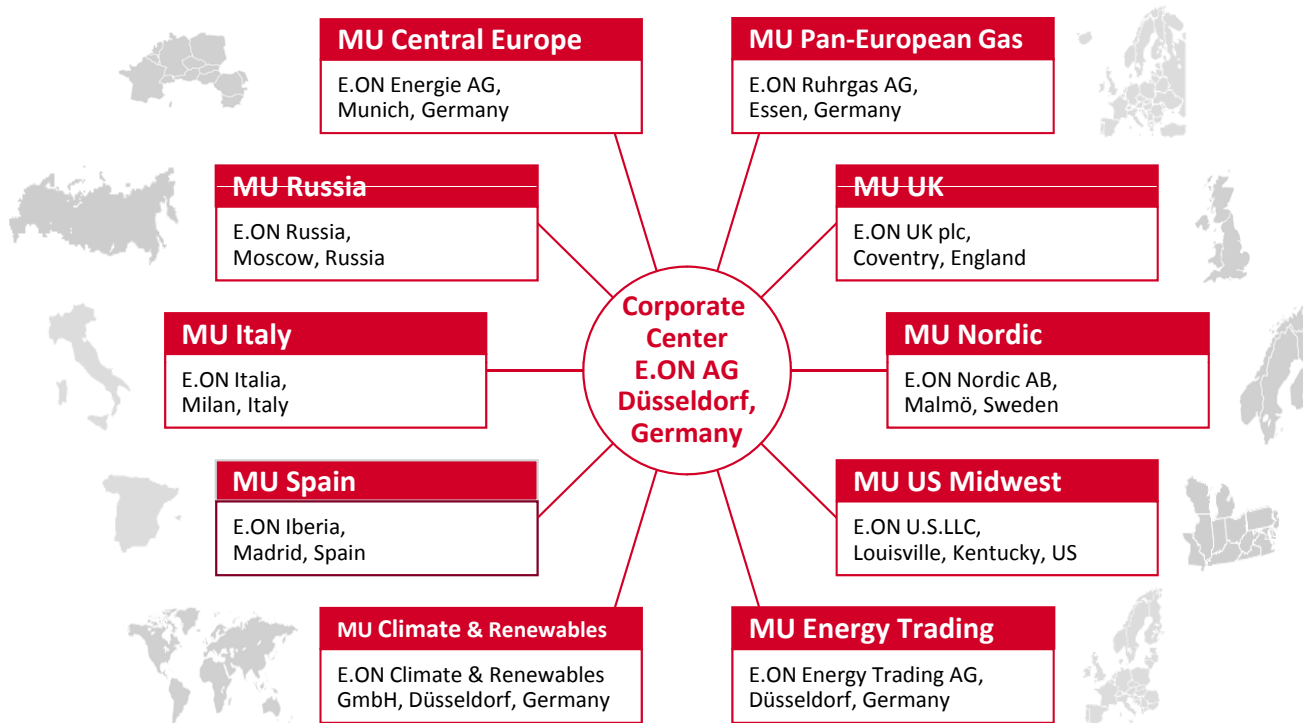
Planned Development Activities 2010-2013

IPC – Statement of Community Consultation



E.ON - Group structure

E.ON – One of The World’s Largest Electricity and Gas Energy Service Providers



MU = Market Unit

...But with deep roots in the

UK:

- PowerGen
- TXU
- East Midlands Electricity
- Midlands Electricity

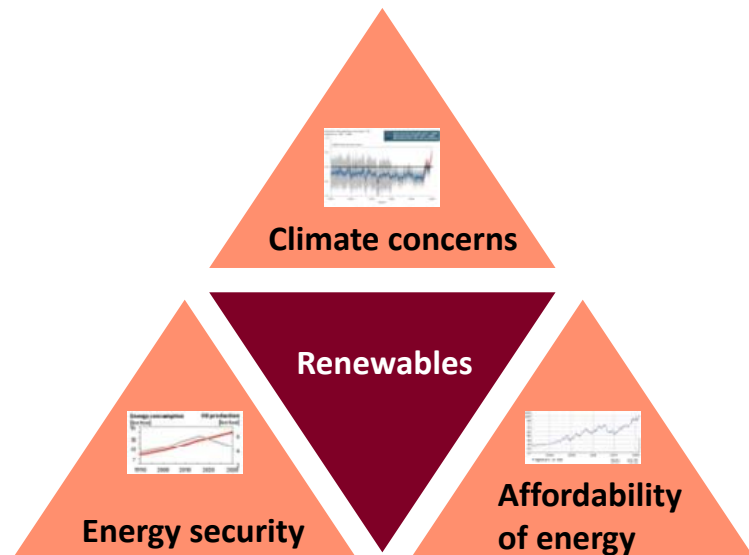
Renewables have a central role in E.ON's strategy

E.ON's Carbon Reduction Strategy

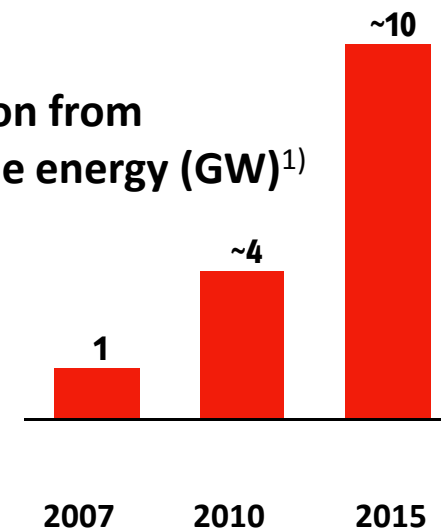
- Reduction of specific CO₂ emissions by 50% by 2030
- Use of renewables and nuclear energy, highly-efficient power plants and innovative energy technologies
- Renewable energies play central role

Setting up E.ON Climate & Renewables (EC&R)

- Bundling of all activities in the fields of renewable energy and carbon sourcing
- Strong expansion of activities supported by major investments: €8 bn. 2007 to 2011
- Expansion of renewable generation from 1 GW in 2007 to c.10 GW in 2015
- Long-term engagement for strong position in the global renewables market



Generation from renewable energy (GW)¹⁾



1) Excluding large hydro (6,019 MW in 2007)

E.ON is active in a range of renewable technologies

Commercial scale applications:

- Offshore wind
- Onshore wind
- Biogas/ biomethane
- Biomass

First commercial plants:

- Solar – photovoltaic (PV) / thin film applications
- Solar – concentrated solar power (CSP)

Proof of concept & technology tracking:

- Wave
- Tidal stream



E.ON has a strong track record in offshore wind in the UK

Operational projects

- 4 MW Blyth – first UK offshore windfarm
- 60 MW Scroby Sands (Great Yarmouth)
- 180 MW Robin Rigg (Solway Firth)
(commissioning)

Construction

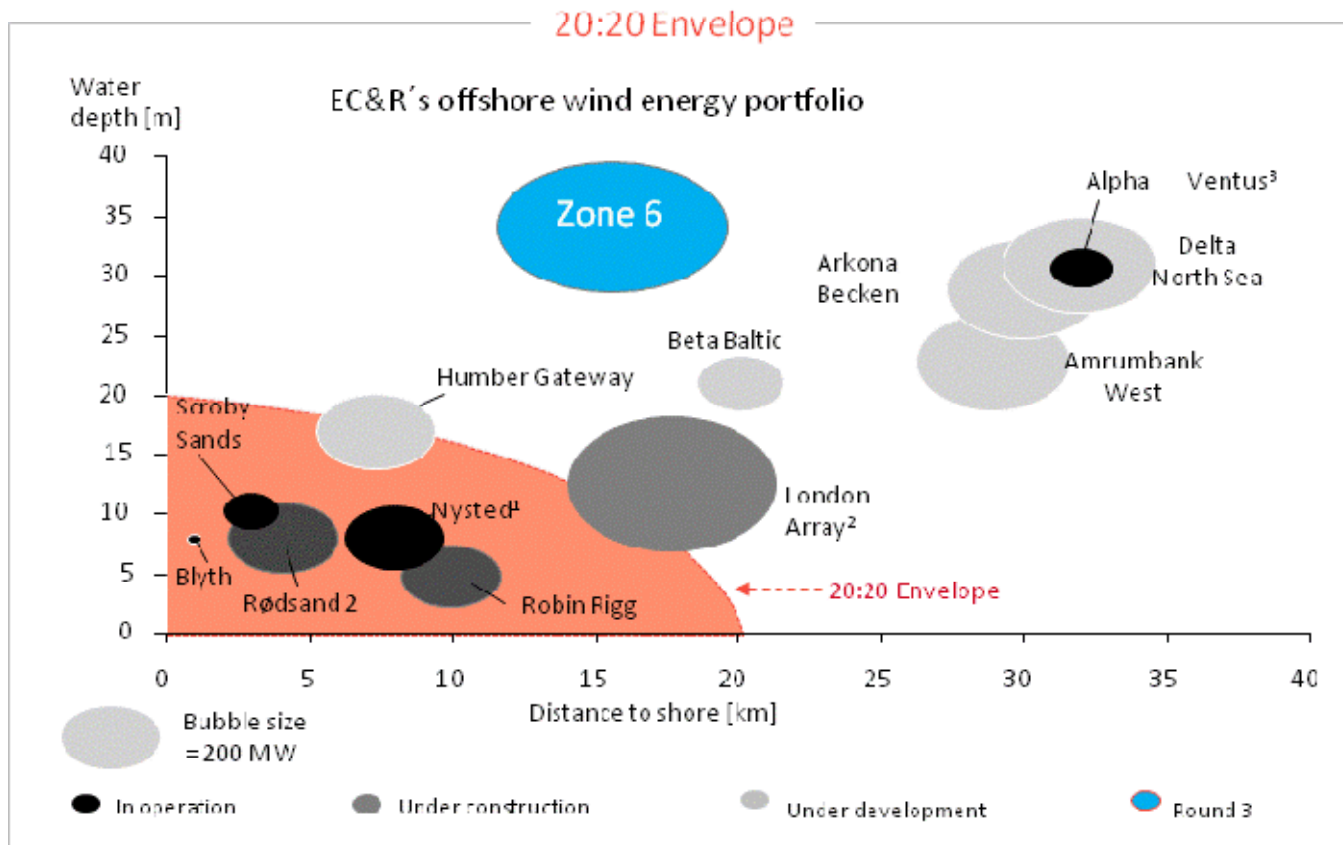
- 630 MW London Array Phase 1 (Thames Estuary)
(JV with our partners Dong & Masdar)

Development

- 300 MW Humber Gateway – awaiting consent
- 350 MW Solway Firth – early development
- **650 MW planned in Zone 6 – Round 3**



E.ON offshore pipeline allows evolutionary learning



Challenges

- Soil conditions/ foundations
- O&M access
- Availability of critical equipment, vessels, logistics, staff

Opportunities

- Load factors (up to 50%)
- Nearly constant energy production
- Efficient size of projects

Our strategy

Measured steps to expand our activities

- Near-term focus on 20:20 envelope
- Mid-term objective to extend outside 20:20 envelope (Alpha Ventus pilot)

E.ON Climate & Renewables

Round 3 – Zone 6

Planned Development Activities 2010-2013

IPC – Statement of Community Engagement

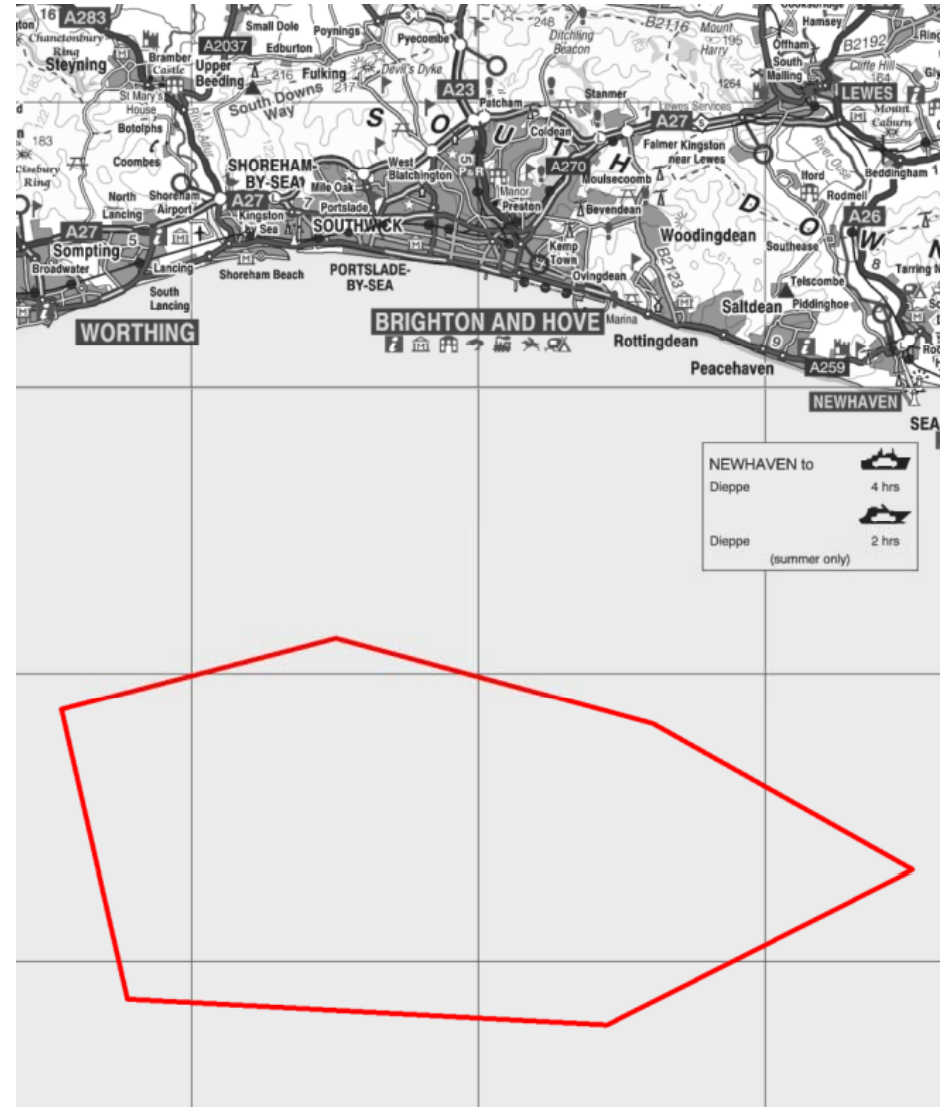


Zone 6

Key Statistics

- Location: 13 km – 26 km off the Sussex coast
- Site area: 270.2 km²
- Water depth: 19 m – 62 m
- Target zone capacity: around 650 MW
- Ownership:
 - Development partnership with the Crown Estate to the point of consent
 - Construction and Operation 100% owned by E.ON Climate and Renewables

..... ***new name required!***



Zone 6 – A great project for E.ON and the UK

- Grid connection without reinforcement
 - Size & distance like London Array but deeper water
 - Good fit with our offshore strategy
-
- **Potential for early delivery**
 - **Flagship Round 3 project**

Development work underway - seeking to establish:

- ✓ Whether permissions and consents can be granted
- ✓ Technical and engineering feasibility
- ✓ Transmission connection to National Grid and route to market
- ✓ Economic viability



E.ON Climate & Renewables

Round 3 – Zone 6

Planned Development Activities 2010-2013

IPC – Statement of Community Engagement



Zone 6 – Development & delivery programme

Challenging timetable (indicative):

2010 - 2013

- EIA Scoping
- Baseline Surveys
- Initial Ground Investigations
- Met mast installation
- Pre-application consultations
- Application submission

2014 - 2016

- Financial Close
- Tender
- Procurement
- Construction/Delivery



Supply chain will need to be active throughout the whole development programme to deliver cost competitive contracts.

Opportunities - construction and operations

Construction:

- Wind turbines (incl. towers, associated ancillary equipment)
- Foundations
- Substations (marine & onshore)
- Export cables – onshore and offshore
- Array cables
- Vessels – construction & logistics
- Port facilities

Operations & Maintenance:

- Port facilities
- O&M facilities
- O&M services
- Vessels
- etc



E.ON Climate & Renewables

Round 3 – Zone 6

Planned Development Activities 2010-2013

IPC – Statement of Community Engagement



Stakeholder Engagement

- A fundamental and integral part of our development process and a key element under the new IPC requirements
- Development of the Statement of Community Consultation
 - Sets out the consultation we intend to undertake
 - Identification and analysis of stakeholders
 - Strategy and plan with numerous methods of engagement
 - Discuss, formulate and agreement with local authorities
 - Notify the IPC and publicise the proposed application
- Inform, engage and consult throughout the process to build awareness, educate, listen and capture views of stakeholders to help shape the development
- Build strong relationships and forge strong community ties from an early stage
- Immediate engagement – presentations, launch, competition, project information sheet

Thank You

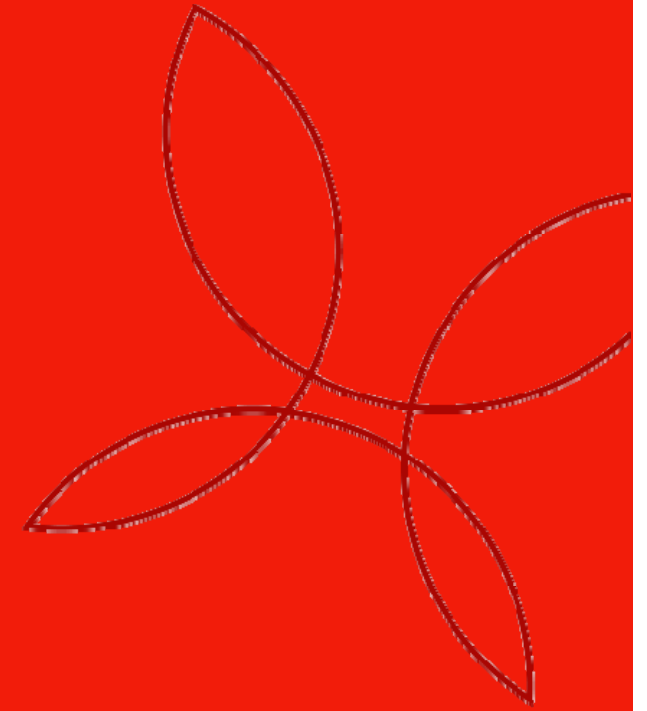
Opportunity for Questions

E-Mail Contact

Zone6@eon.com

e.on

Climate &
Renewables



Backup

E.ON Climate & Renewables

Round 3 – Zone 6

Supply chain opportunities

Constructing an offshore wind farm - video

Next Steps

Backups



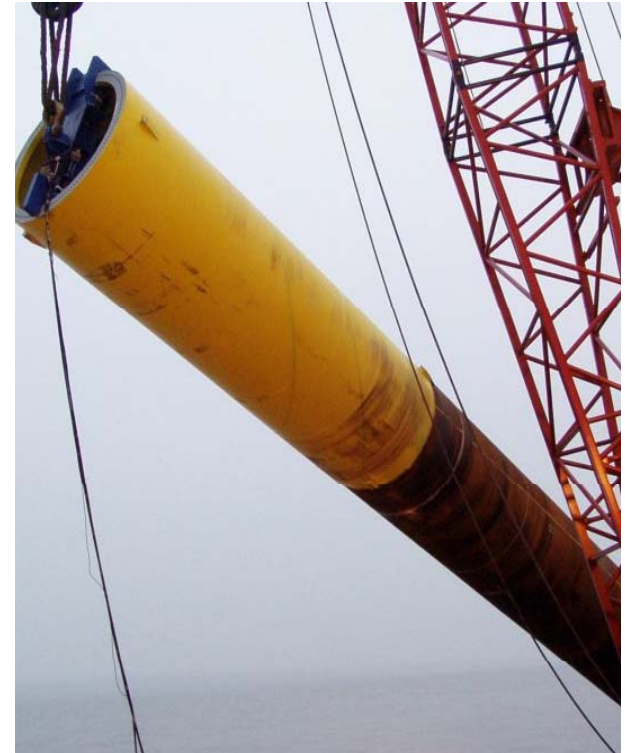
Monopile Foundation - Delivery



Monopile delivered to harbor



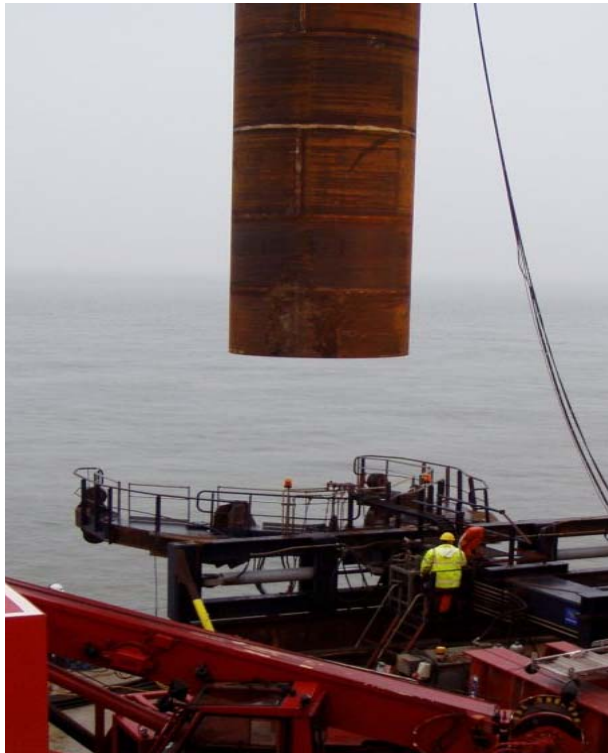
Monopiles loaded out on jack-up barge



Monopile being up-ended for installation

- Monopile foundations can be used in waters with a maximum depth of 25 meters
- Made of steel, one monopile foundation weighs up to 300 tons
- About 30 meters of the monopile is driven into the seabed

Monopile Foundation - Installation



Pile gripper for exact pile positioning



Pile hammer (300t of force) driving monopile



Installation completed

- From arrival at site the complete cycle of installation of a foundation takes less than 24 hours
- E.ON has gained experience with monopile foundations in its UK projects Blyth, Scroby Sands, Robin Rigg
- To date E.ON has successfully installed more than 90 monopile foundations

Gravity Foundation - Manufacturing



Construction of the steel formwork



Foundations are cast in concrete



Completed gravity foundation

- Gravity base foundations (GBF) usable in waters with a maximum depth of 30 meters
- Require firm ground conditions and good seabed preparation
- Made of reinforced concrete, one gravity foundation can weigh up to 1,400 tons
- To increase weight & stability gravity foundations are often filled with gravel & stones
- From arrival at site the complete cycle of installation of a foundation takes <24 hours
- E.ON has gained experience with GBF in its Danish projects Nysted and Rødsand 2
- To date, E.ON has successfully installed more than 80 gravity foundations

Gravity Foundation - Installation



Foundations being shipped to site



Heavy lift vessel on site



1,300 ton foundation being positioned



Foundation being lowered to seabed



Level checks being taken



Installation completed

Tripod - Manufacturing and Delivery



Tripods being welded in Norway



Tripod up-ended for shipping



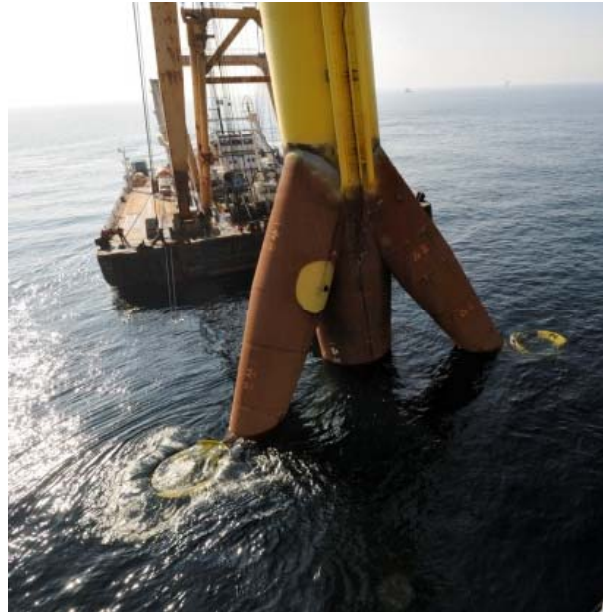
Tripods arriving at Wilhelmshaven port

- Tripod foundations can be used in deep waters with a maximum depth of 35 meters
- Made of steel, one tripod foundation weighs up to 700 tons with a total height of up to 50 meters
- The installation of a tripod foundation requires three securing steel piles, each 30 meters long and with 100 tons of weight
- The manufacturing of the tripods is a complicated process due to extensive welding works

Tripod - Installation



Heavy-lift crane ship on site



Tripod foundation being lowered to seabed



Installation completed

- E.ON has gained experience with the successful installation of six tripod foundations in the German offshore wind project Alpha Ventus
- From arrival at site the complete installation cycle of a foundation takes 2-3 days
- The installation of tripod foundations will benefit from larger capacity jack-up crane vessels
- So far only little experience has been gained with the installation of tripod foundations

Wind Turbines - Pre-Assembly and Installation



Pre-assembled turbine parts in the harbour



Offshore installation of turbine tower



Turbine nacelle being lifted

- Wind turbine components need to be pre-assembled onshore to allow quick installation offshore
- Most important pre-assembly works include mounting blades on nacelle and stacking tower segments
- Greater wind resources mean much higher workloads for offshore wind turbines compared to onshore
- As offshore wind turbines cannot be accessed all the time due to weather and wave conditions they need to be highly robust and reliable to avoid costly standstills

Wind Turbines - Installation



Turbine nacelle being positioned on tower



Installation of the third turbine blade



Installation completed

- Wind turbines must be larger further offshore to reward increased costs of far-shore
- From arrival at site the installation of a wind turbine takes a minimum of 24 hours
- Offshore wind turbines require special protection against aggressive marine conditions
- To date E.ON is operating and installing more than 250 offshore wind turbines in 3 different countries

Offshore Vessels - Requirements



Jack-up crane vessel during foundation installation



Heavy-lift crane ship during foundation installation

- In order to meet offshore wind construction requirements vessels need:
 - sufficient storage capacity
 - sufficient height and lifting power
 - the ability to quickly anchor and jack-up on-site
 - year-round operating ability in a range of water depths, wave heights & currents
- Purpose-built vessels are key to successful offshore construction

Offshore Vessels - Characteristics

Heavy-lift crane ship



Jack-up barge



Jack-up crane vessel



- Very limited storage capacity
 - Strong lifting power, low height
 - Slow, hauler needed
 - Susceptible to waves
- Limited storage capacity
 - Sufficient lifting power and height
 - Slow, hauler needed
 - Less susceptible to waves
- Large storage capacity
 - Sufficient lifting power and height
 - Fast, flexible and independent
 - Less susceptible to waves
- Jack-up crane vessels the ideal solution, but do not yet exist for turbines <3.6 MW
 - Global market for offshore installation vessels scarce. Only a few ships available worldwide
- 3 vessels for turbines up to 3 MW → 1 vessel for 3.6 MW turbines → 3 crane-ships/barges for 5 MW turbines (no vessels)

Cabling



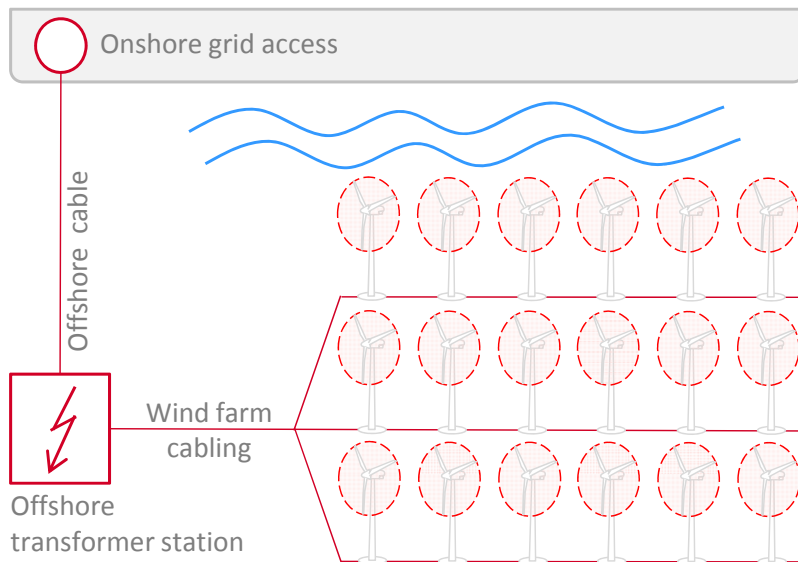
Cable plowing on shore



Cable pulling to foundation



Installation completed



- Offshore cables are installed on seabed and need to be designed to withstand offshore conditions
- Cables used for offshore wind farms consist of three phases and one communication line
- For safe operations, offshore cables need to be buried 1 – 3 meters deep into the seabed

Offshore transformer stations



700 ton jacket foundation being transported



Transformer topside installation



Installation completed

- Offshore wind farms need a transformer station to connect to the local power grid – often installed offshore with a sub-sea export cable linking it to the onshore grid
- Transformer substations need to be completely fitted out onshore and installed as a single unit offshore
- Heavy lift crane ships required for installation of foundation and transformer station
- At Alpha Ventus, the transformer station has a height of 30 meters above sea level, standing on a jacket foundation of 700 tons weight

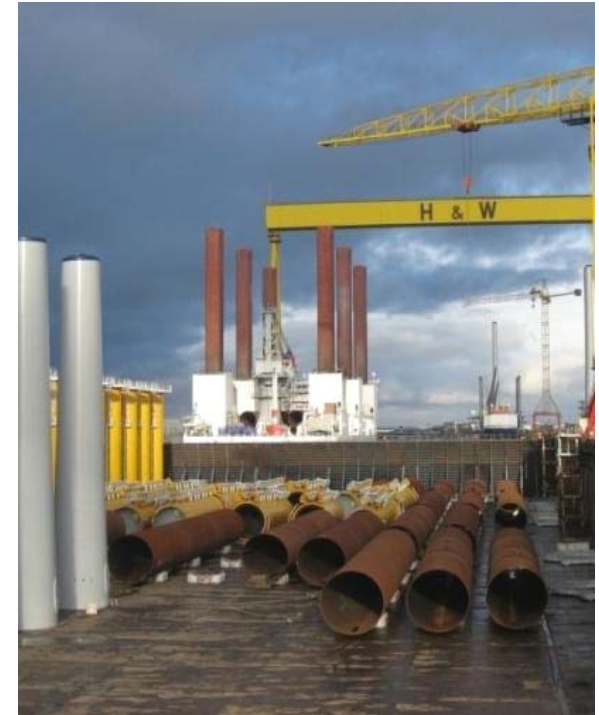
Port Infrastructure



Port storage for towers & nacelles



Port storage for monopiles



Components awaiting shipment

- Offshore success comes from doing as much as possible onshore - saves time and money during offshore installation
- Port facilities need space for storage and pre-assembly of foundations & wind turbine parts
- Development of the offshore business requires major investment in port infrastructure

Operations and Maintenance (O&M)



O&M vessel arriving on site



Preparing boat landing at site



Accessing offshore wind turbine

- Quick O&M site access is crucial to avoid costly stand-stills
- Offshore access is constrained by weather & waves and can be impossible in winter or during storms
- Travel time is a big issue: small boat access current offshore wind farms can take 6 hours
- New O&M concepts for far-shore projects including manned platforms and daily helicopter or speed boat transfer need to be developed