

Installation



Outline

- **Parts to install**
- **Equipment and methods per item**
- **Examples for:**
 - **Egmond aan Zee (OWEZ)**
 - **Beatrice demonstrator project**

Parts to Install



Parts to Install



Parts to Install



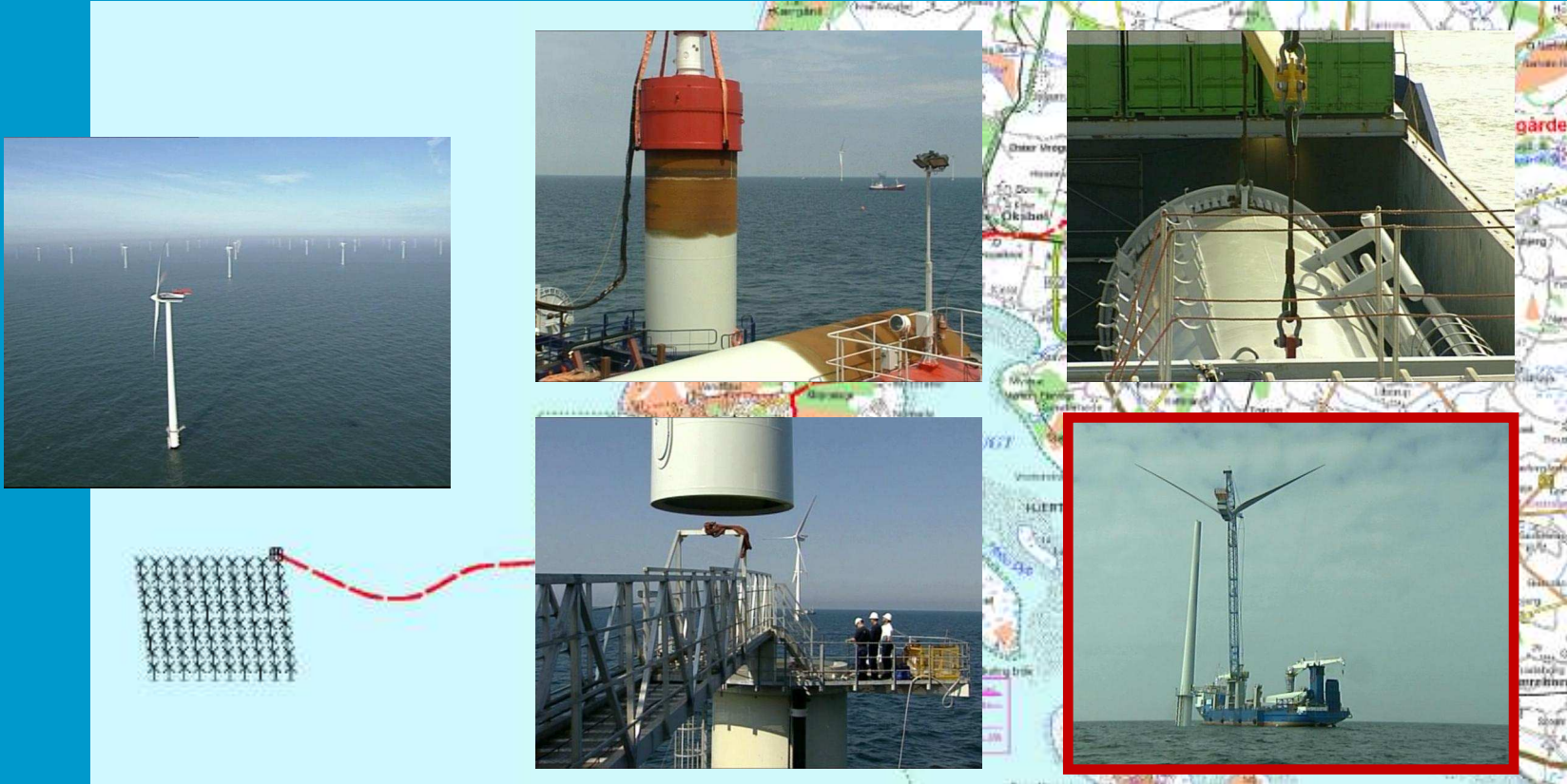
Parts to Install



Parts to Install



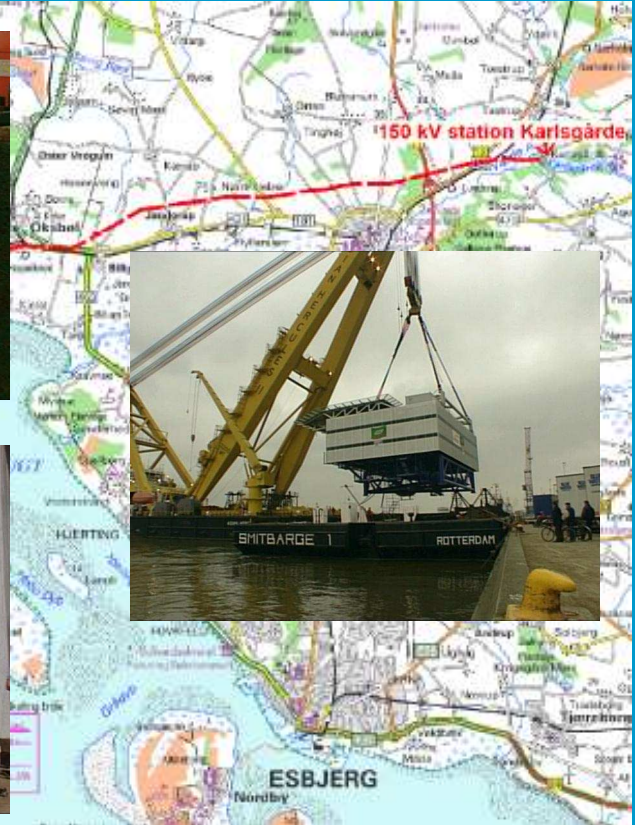
Parts to Install



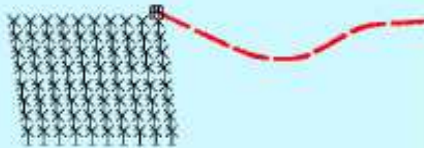
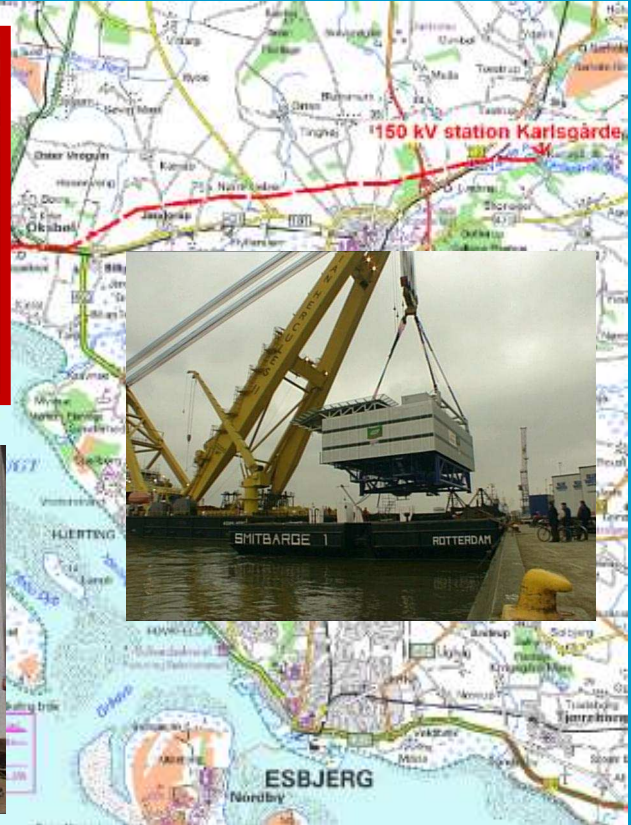
Parts to Install



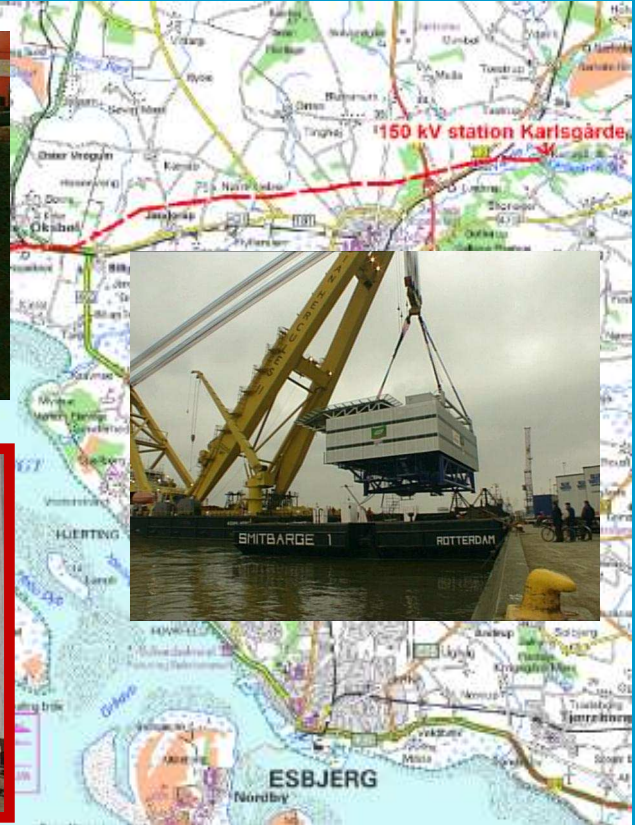
Parts to Install



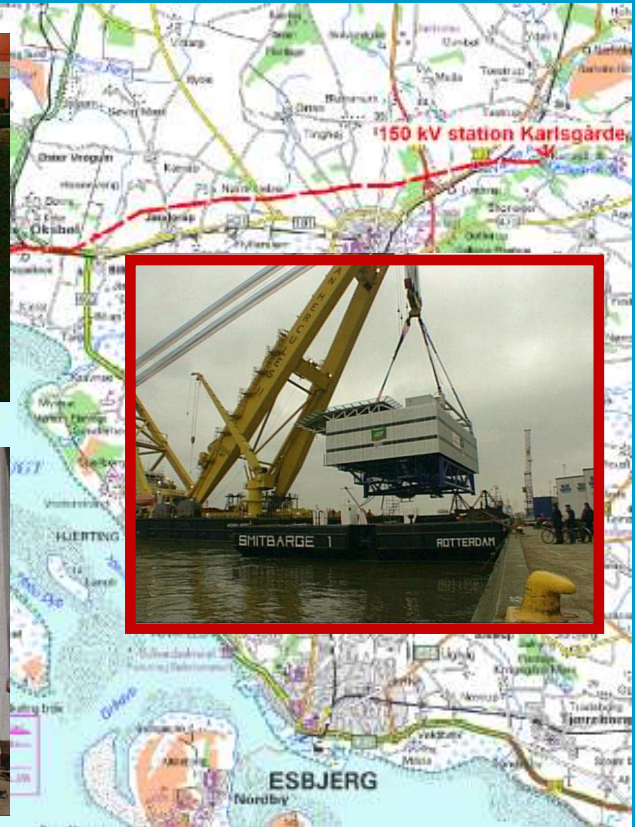
Parts to Install



Parts to Install



Parts to Install



OWT Installation

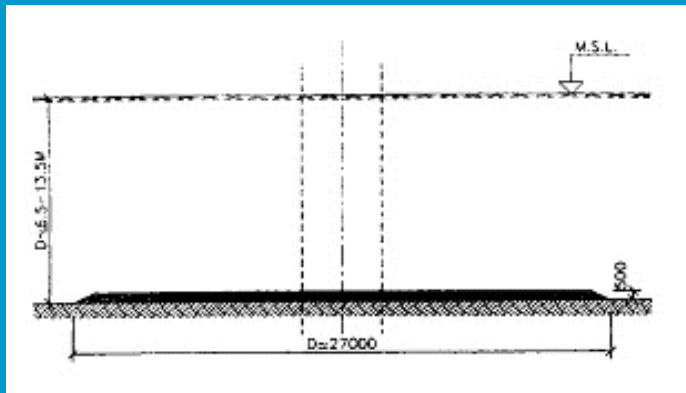
- **Foundation pile**
- **(Transition piece)**
- **Tower**
- **Nacelle**
- **Blades**

OWT Installation: Foundation

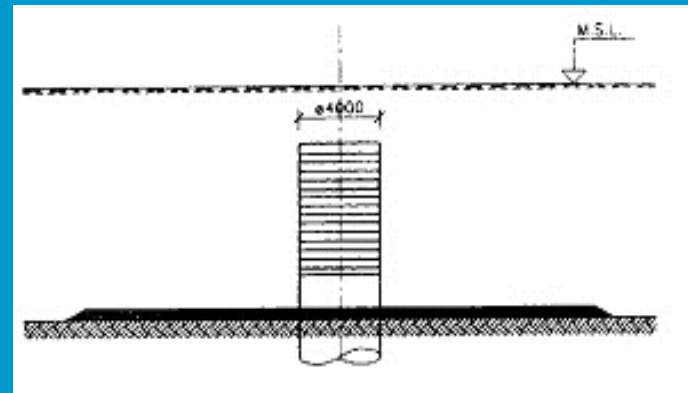
Foundation pile:

- **Driving**
- **Drilling**
- **Suction**

OWT Installation: Foundation



**Scour Protection
Installation**



Pile Driving

OWT Installation: Foundation





OWT Installation: Foundation



Suction Bucket for 3MW turbine in Frederikshavn, Denmark



OWT Installation: Transition piece

Transition Piece:

- **To connect all external details:**
 - **Boat landing**
 - **J-tubes**
 - **Platform**
- **To correct driving misalignment**
- **To offer a flange**

OWT Installation: Transition piece



OWT Installation: Transition piece



At Arklow Banks: misalignment $< 0.1^\circ$

OWT Installation: Transition piece



North Hoyle Aug 2003 © Gunnar Britse



North Hoyle Aug 2003 © Gunnar Britse

OWT Installation: Transition piece?

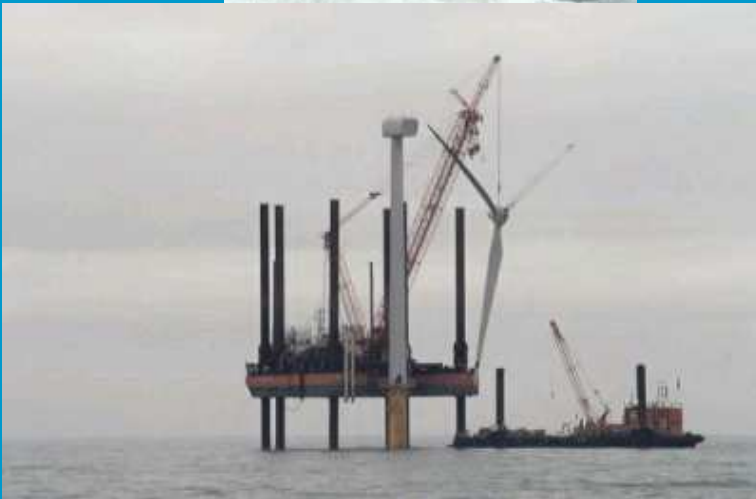


Slip Joint



24

OWT Installation: Turbine



OWT Installation: Turbine

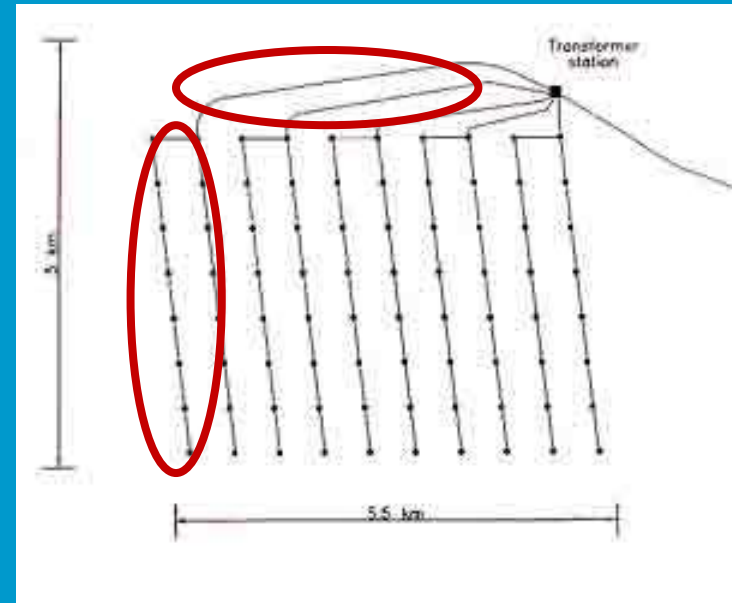


“Bunny Ear Method”

26

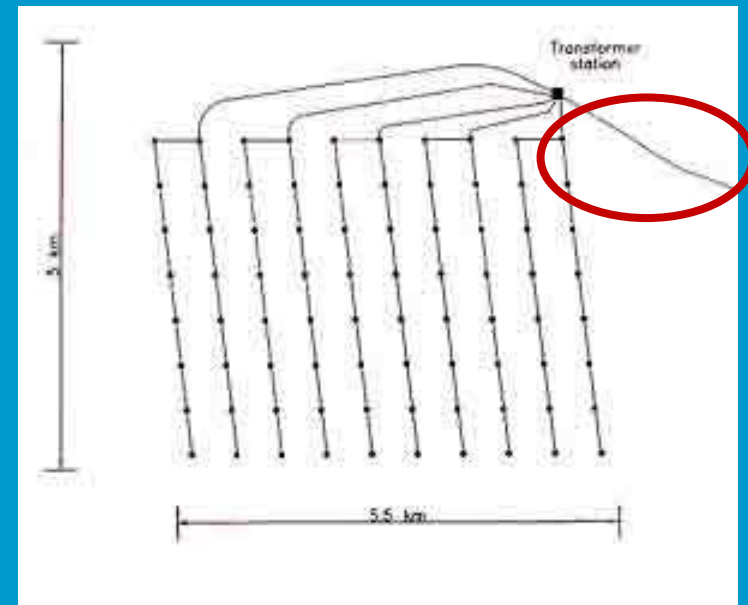
Cable Installation

- **In-field cables**



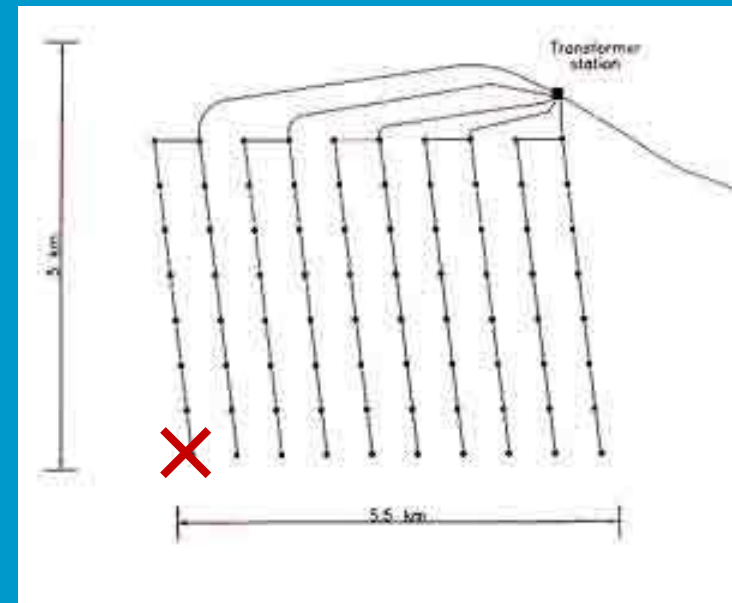
Cable Installation

- **In-field cables**
- **Shore connection**



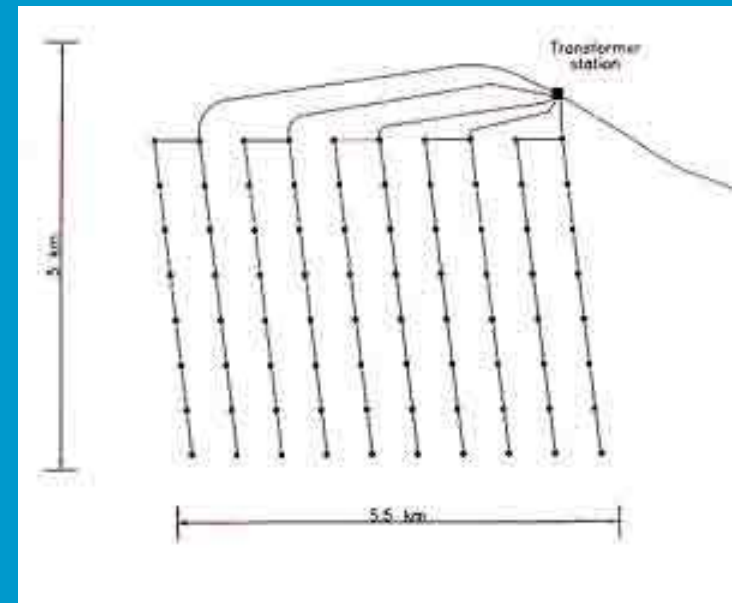
Cable Installation

- **In-field cables**
- **Shore connection**
- **Connection to turbine**



Cable Installation

- **In-field cables**
- **Shore connection**
- **Connection to turbine**
- **Landfall**



Cable Installation



Cable Installation



Cable Installation



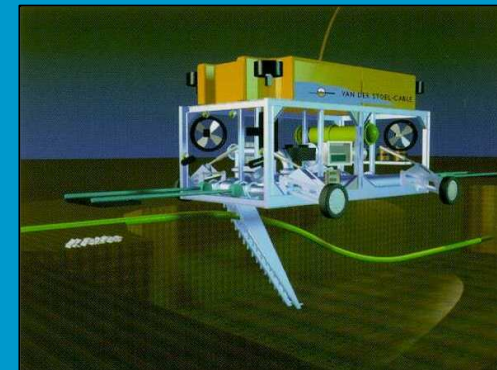
Cable Installation

Trenching against:

- **Fishing gear**
- **Anchors**
- **Dropped objects**
- **....**

Or rock-dump

Cable Installation



Shore Connection



Shore Connection

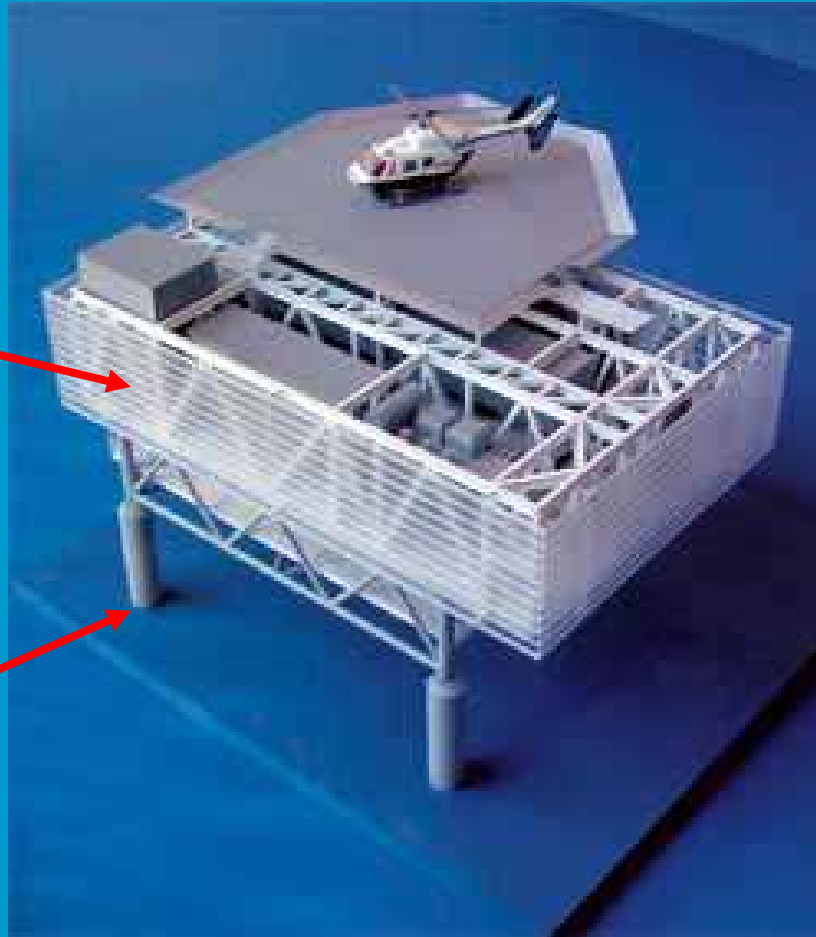


Shore Connection

Directional Drilling



Transformation Platform



39

Transformation Platform



Number of Vessels

- **Foundation pile**
- **Transition piece**
- **Tower + turbine**
- **Rock dumping**
- **Cable laying**
- **Trenching**
- **Diver support**
- **Heavy lifting**
- **Shore connection**
- **Tugs**
- **Personnel transport**

11 topics

> 20 vessels

Players: A2Sea



Players: Mammoet van Oord



Players: Seacore

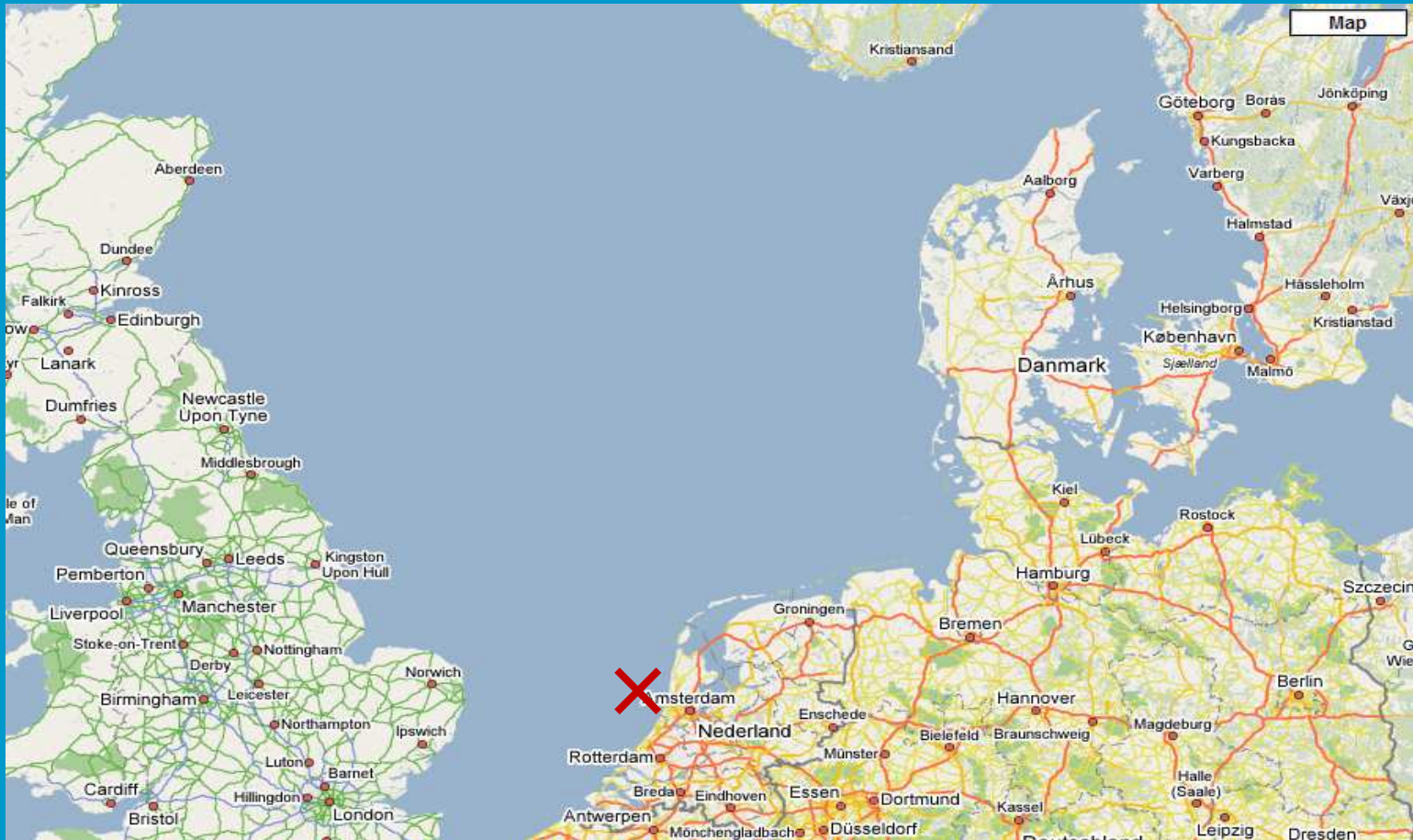


North Hoyle Aug 2003 © Gunnar Britse

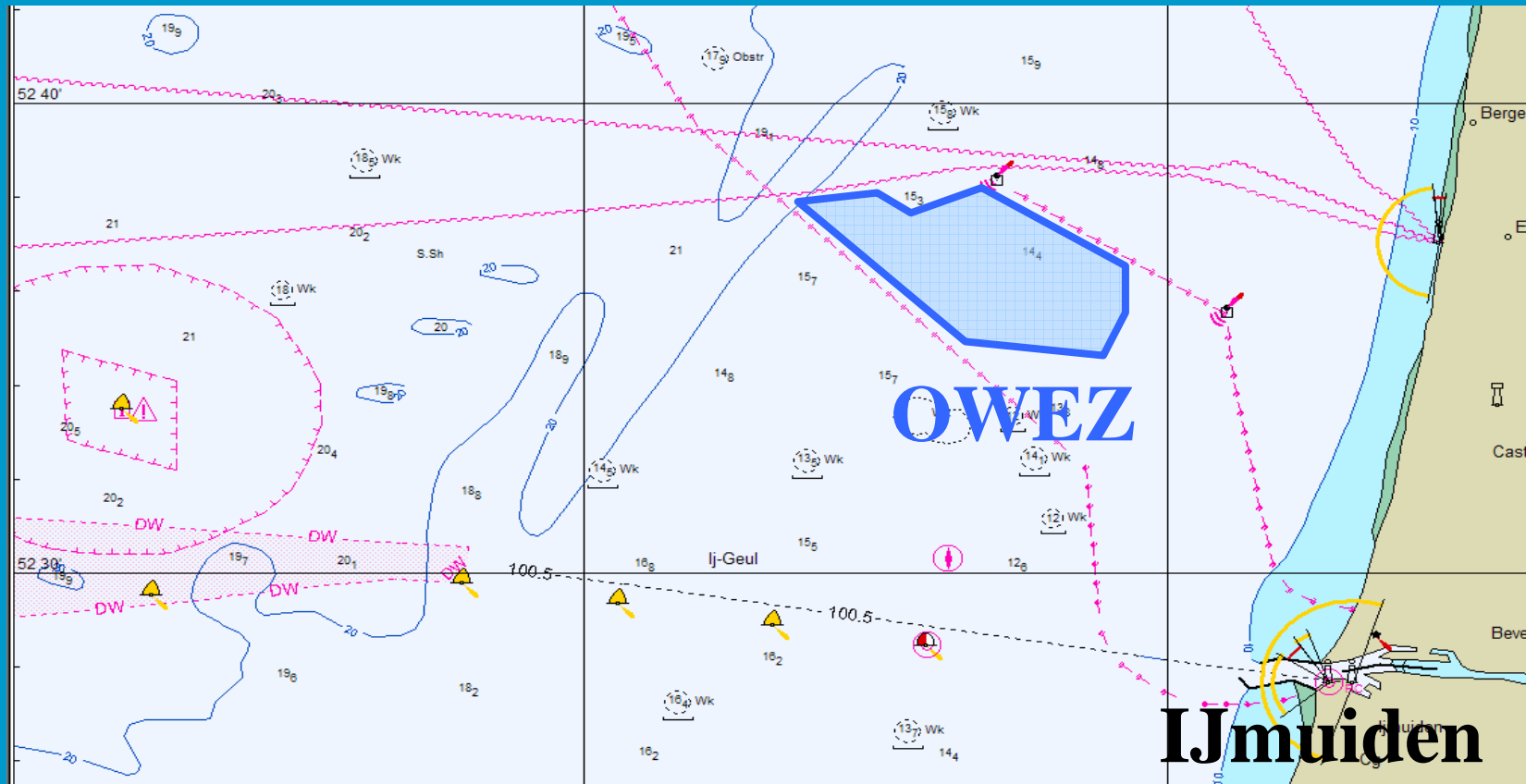
Players: Mayflower Resolution



Example: OWEZ



Example: OWEZ



Example: OWEZ

Key facts:

- 36 Offshore wind turbines
- Vestas V90 3.0 MW turbine
- ± 20 m water depth
- 10 to 18 km offshore

Example: OWEZ



Example: OWEZ



Example: OWEZ



Example: OWEZ



52

Example: OWEZ



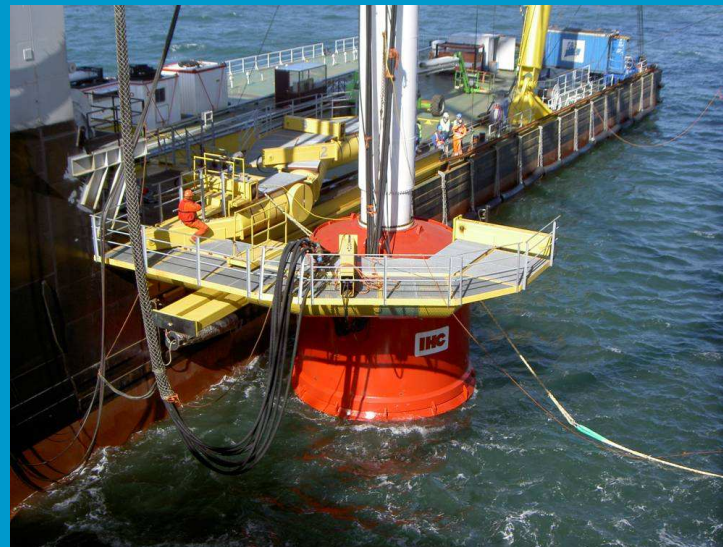
Example: OWEZ



Example: OWEZ



Example: OWEZ



Example: OWEZ



Example: OWEZ



58

Example: OWEZ



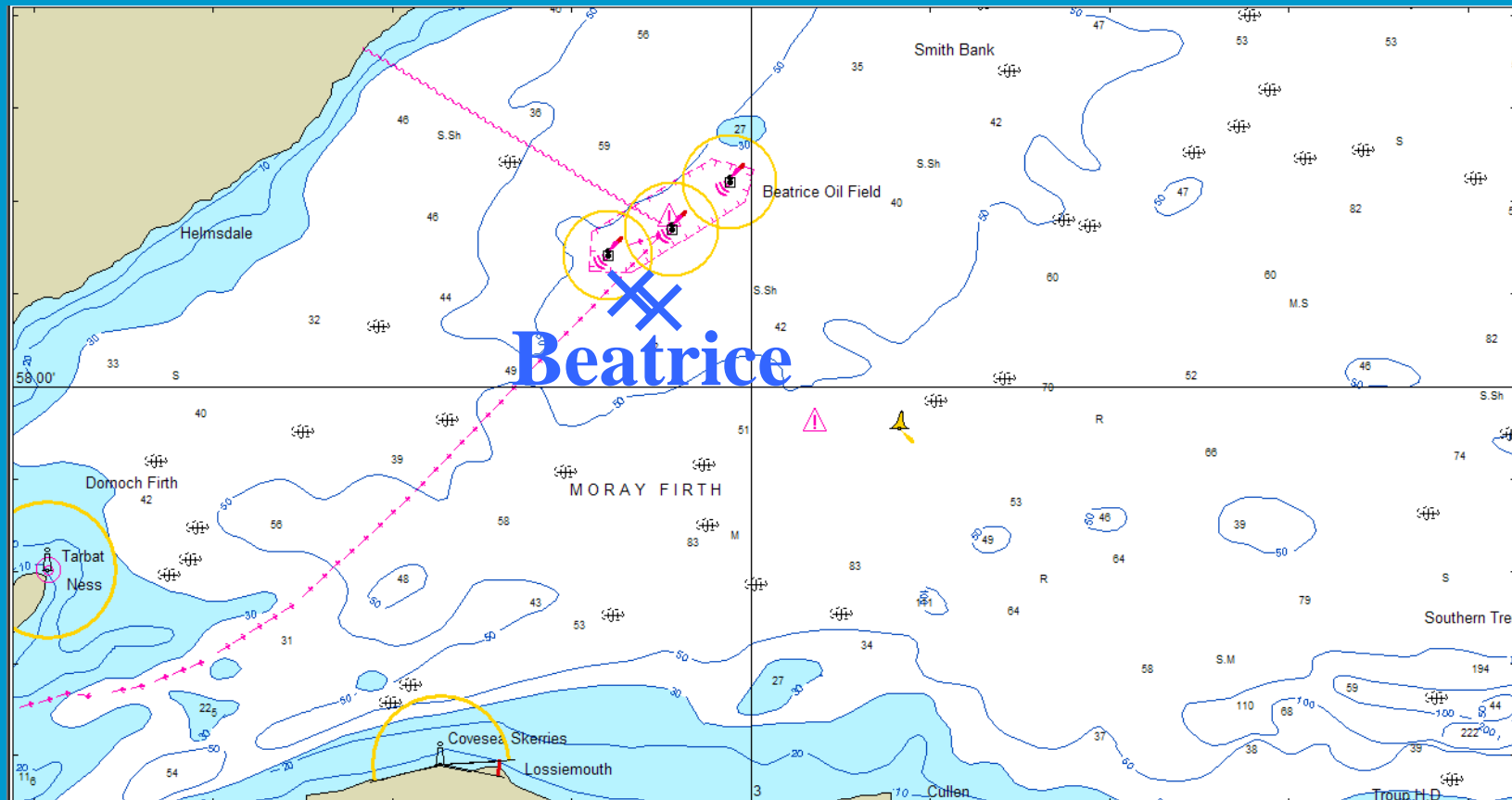
Example: OWEZ



Example: Beatrice



Example: Beatrice



Example: Beatrice

Key facts:

- 2 Offshore wind turbines
- REpower 5.0 MW turbine
- ± 45 m water depth
- 22 km offshore

Example: Beatrice



Example: Beatrice



Example: Beatrice



Example: Beatrice



Example: Beatrice



Example: Beatrice



69

Example: Beatrice

