



BG

Berufsgenossenschaftliches
Unfallkrankenhaus Hamburg



New Solutions for Rescue in Offshore Windenergy-Fields

... a look beyond the Garden Gate



Markus Stuhr, Dirk Dethleff, Nils Weinrich
Christian Jürgens, Gerhard Kraus

BG Trauma Hospital Hamburg (BUKH)

- founded 1959
- 500 Beds / ~ 2.200 Employees
- ca. 10.000 Pat./year stationary
- ca. 25.000 Pat./year ambulant
- Rescue helicopter (HEMS),
- Fast response car



- Lead Clinician Anaesthesia, Intensive and Prehospital Care
- Emergency Physician, e.g. ADAC Rescue Helicopter „Christoph Hansa“
- Member of two special rescue squads for „Mass Casualty Incidents at sea“ and „landbased“ run by Hamburg Fire Brigade
- Member of the scientific working group „Emergency Medicine“ of the German Society for Anaesthesiology and Intensive Care



The research project „Rescue Chain Offshore Wind“ was initially funded by the German Institution for Statutory Accident Insurance and Prevention for Trade and Merchandise Logistics (BGHW). Further funding by the German Institution for Statutory Accident Insurance and Prevention for Energy, Textiles, Electronics and Media Products (BG ETEM) ensures continuation of the research work.



Offshore wind and the rescue chain

- Increase of work-related accidents, illnesses and injuries
 - Nature of work
 - Hazards and risks
 - Adverse environmental conditions
 - Remoteness (especially from emergency medical services)
-
- To **prevent** injuries and illness
 - ... as much as possible
 - ...by all suitable means



Air Rescue 04/2012

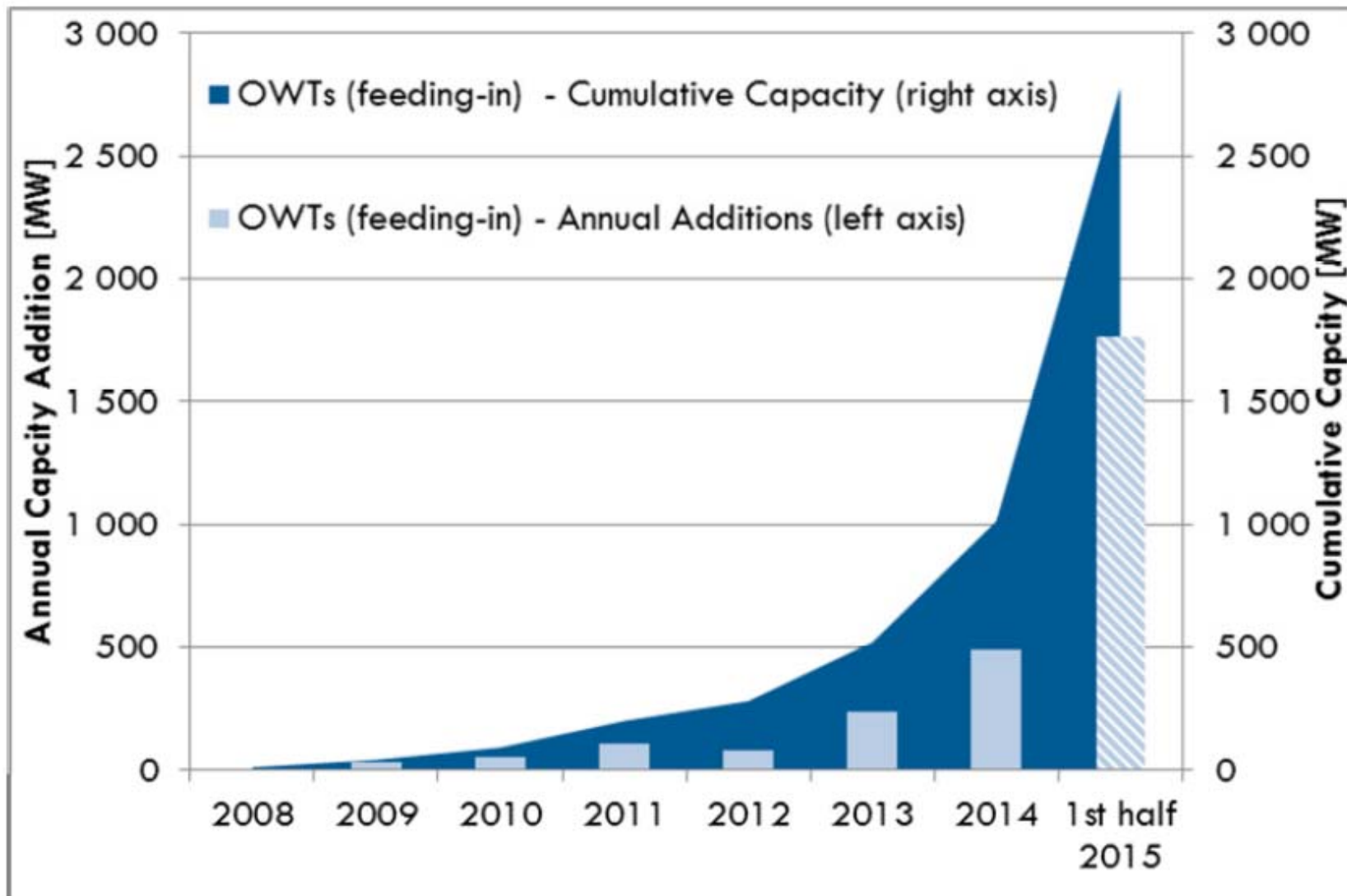
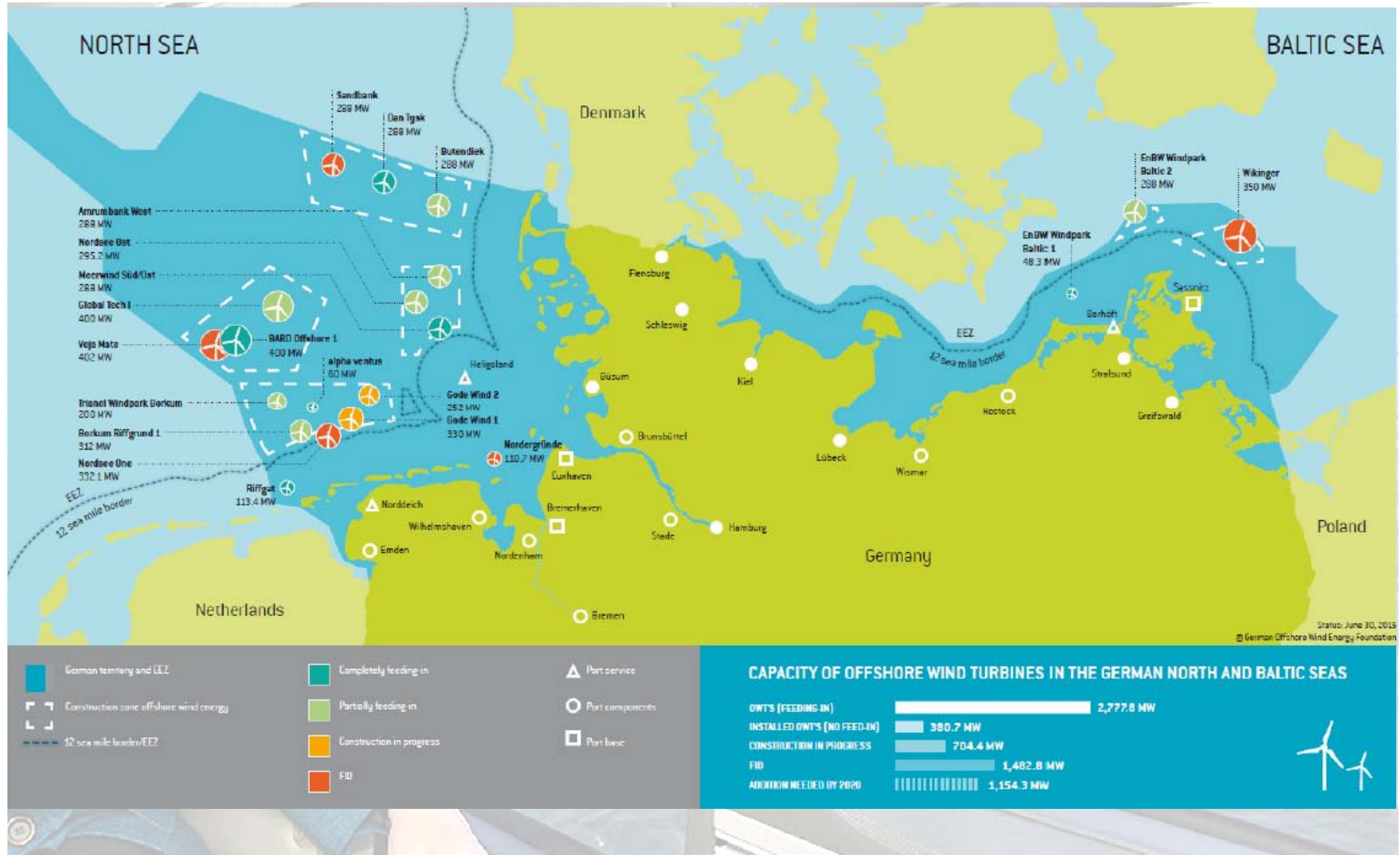
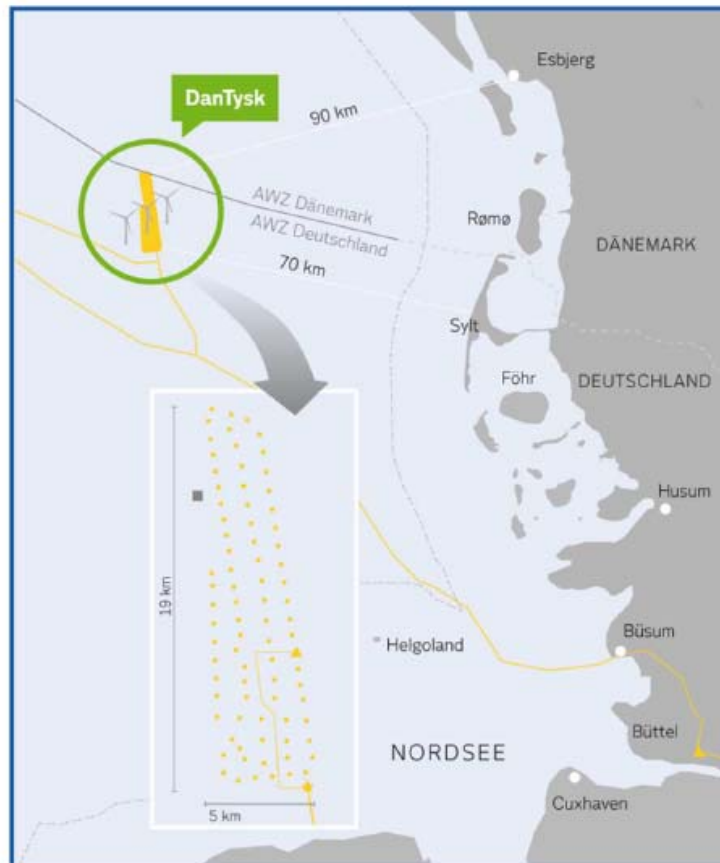


Figure 1: Development of Offshore Wind Energy in Germany (Capacity of OWT feeding-in) as of 30.06.2015



http://www.windguard.de/_Resources/Persistent/08868c237ca99b3648597b4c0a7717fe93090c1b/Factsheet-Status-Offshore-Windenergieausbau-Jahr-2014.pdf

DanTysk Offshore Windpark



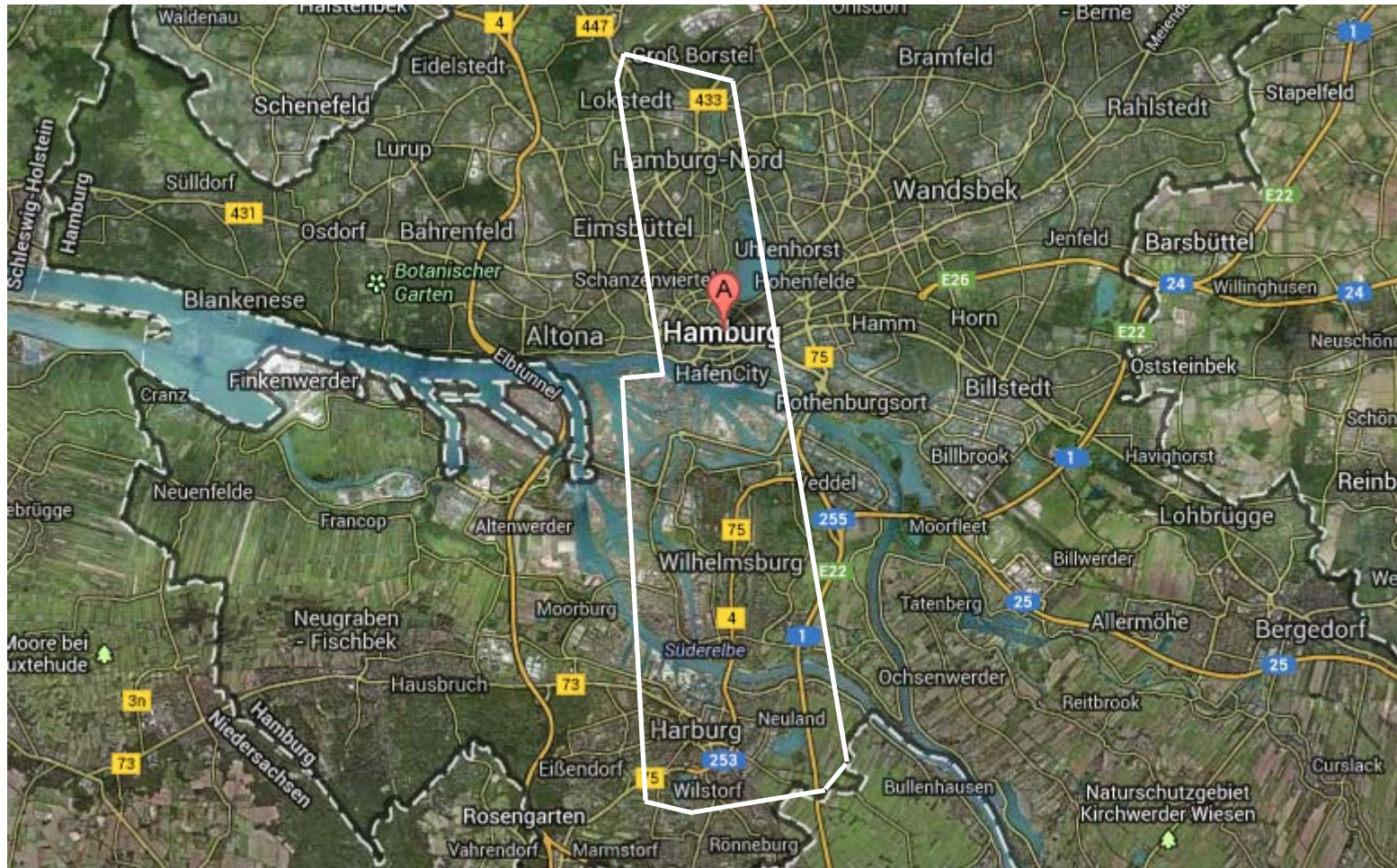
Projekt Details:

- 70 km westlich von Sylt
- Wassertiefen zwischen 21 m und 32 m
- Größe 71 km²

Projekt Aufbau und aktueller Status:

- Joint Venture mit den Stadtwerken München, Projekt Aufnahme 2005
- Bewilligung des Netzanschlusses 2010
- Baubeginn: Anfang 2013
- Geplante Fertigstellung: 2014

6 | Vattenfall Europe Windkraft GmbH | Stefan Kahlen | 2013.02.24 |

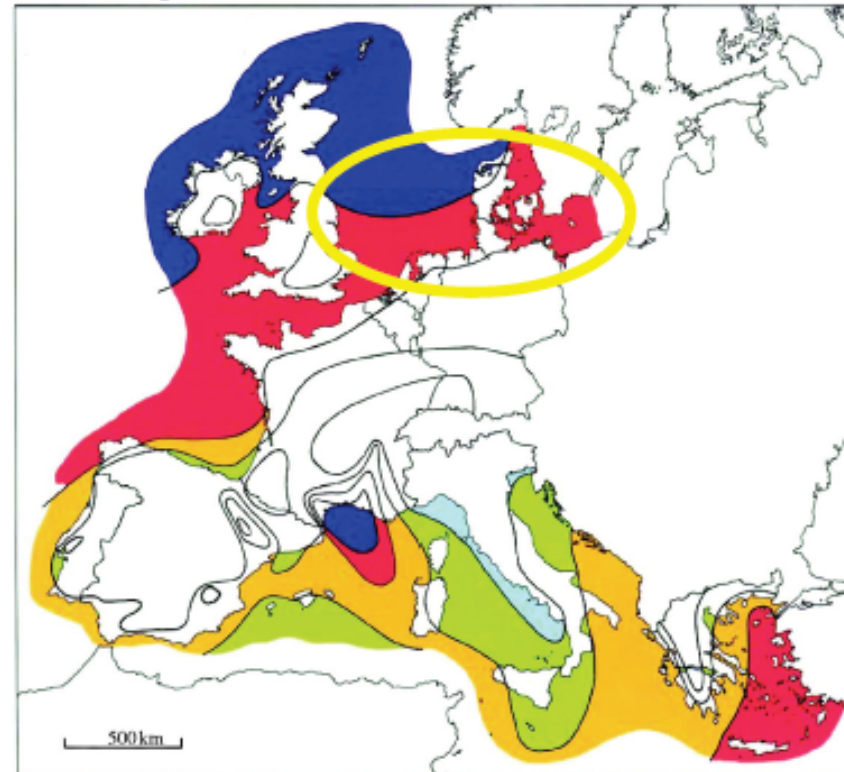


Google Maps - © 2013 Google

| Wind farm | Nation | Production (MV) | Distance (km) |
|----------------------|---------|-----------------|---------------|
| Lillgrund | Sweden | 110 | 9 |
| London Array Phase 1 | UK | 630 | 27 |
| Greater Gabbard | UK | 504 | 33 |
| Horns Rev 2 | Denmark | 209 | 33 |
| Northwind | Belgium | 216 | 37 |
| Nordsee Ost | Germany | 295 | 51 |
| Meerwind Süd/Ost | Germany | 288 | 54 |
| alpha ventus | Germany | 60 | 56 |
| DanTysk | Germany | 288 | 75 |
| Global Tech I | Germany | 400 | 109 |
| BARD Offshore 1 | Germany | 400 | 112 |

Selected international offshore wind farms sorted by distance from mainland to farm center
 (data source: <http://www.4coffshore.com/windfarms/>; status 29.01.2015)

Windforce ...

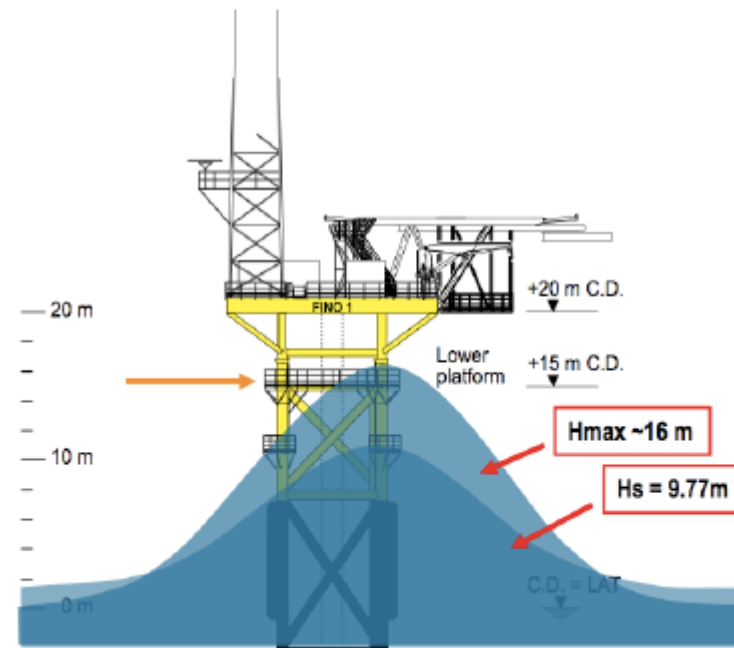


wind resources over open sea (more than 10km offshore) for five standard heights

| | 10m | | 25m | | 50m | | 100m | | 200m | |
|-------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|
| | ms ⁻¹ | W m ⁻² | ms ⁻¹ | W m ⁻² | ms ⁻¹ | W m ⁻² | ms ⁻¹ | W m ⁻² | ms ⁻¹ | W m ⁻² |
| Blue | >8,0 | >600 | >8,5 | >700 | >9,0 | >800 | >10,0 | >1100 | >11,0 | >1500 |
| Red | 7,0 - 8,0 | 350 - 600 | 7,5 - 8,5 | 450 - 700 | 8,0 - 9,0 | 600 - 800 | 8,5 - 10,0 | 650 - 1100 | 9,5 - 11,0 | 900 - 1500 |
| Orange | 6,0 - 7,0 | 250 - 300 | 6,5 - 7,5 | 300 - 450 | 7,0 - 8,0 | 400 - 600 | 7,5 - 8,5 | 450 - 650 | 8,0 - 9,5 | 600 - 900 |
| Yellow | 4,5 - 6,0 | 100 - 250 | 5,0 - 6,5 | 150 - 300 | 5,5 - 7,0 | 200 - 400 | 6,0 - 7,5 | 250 - 450 | 6,5 - 8,0 | 300 - 600 |
| Light Green | <4,5 | <100 | <5,0 | <150 | <5,5 | <200 | <6,0 | <250 | <6,5 | <300 |

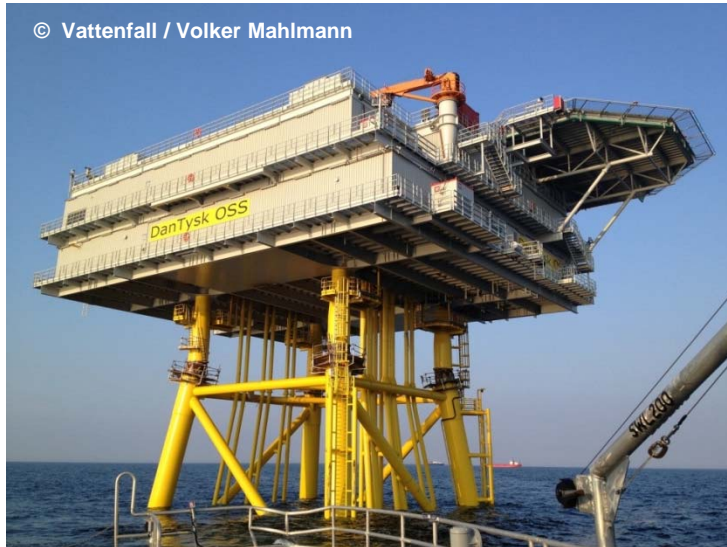
Quelle: Leithead, W., Phil. Trans. R. Soc. A 2007;365:957-970

... and environmental conditions



Quelle: A.Beeken, 3. Windlog (2012)

Various possible accident sites



Limited access

Zum Beispiel nur zwei mögliche Zugänge bzw. Übergabepunkte bei WEAs: Wintchplattform (oben) und Transition Piece (unten)



Foto: © AREVA Wind / Jan Oelker 2010



Foto: © Abeking & Rasmussen

Confined space



Foto: © ROW / Nils Weinrich 2012 (Freigegeben durch Andreas Rauschelbach, OffTEC GmbH)

First Results

- **First Aid at Offshore Wind Farms in German Waters - Consensus Statement from the German Social Accident Insurance (DGUV) (Stuhr M et al. Notarzt 2014; 30: 159-168)**
- **Recording and analysis: injuries and illnesses in Offshore-Windparks (Publications in preparation)**
- **„CeMOR“ (Central medical offshore registry)**
- **Networking (e.g. maritime medicine, tactical medicine, mountain emergency medicine) >> **mine rescue ??****
- **Consensus**
- **Support and contribute in scientific projects on teleconsultation**

Rescue Chain

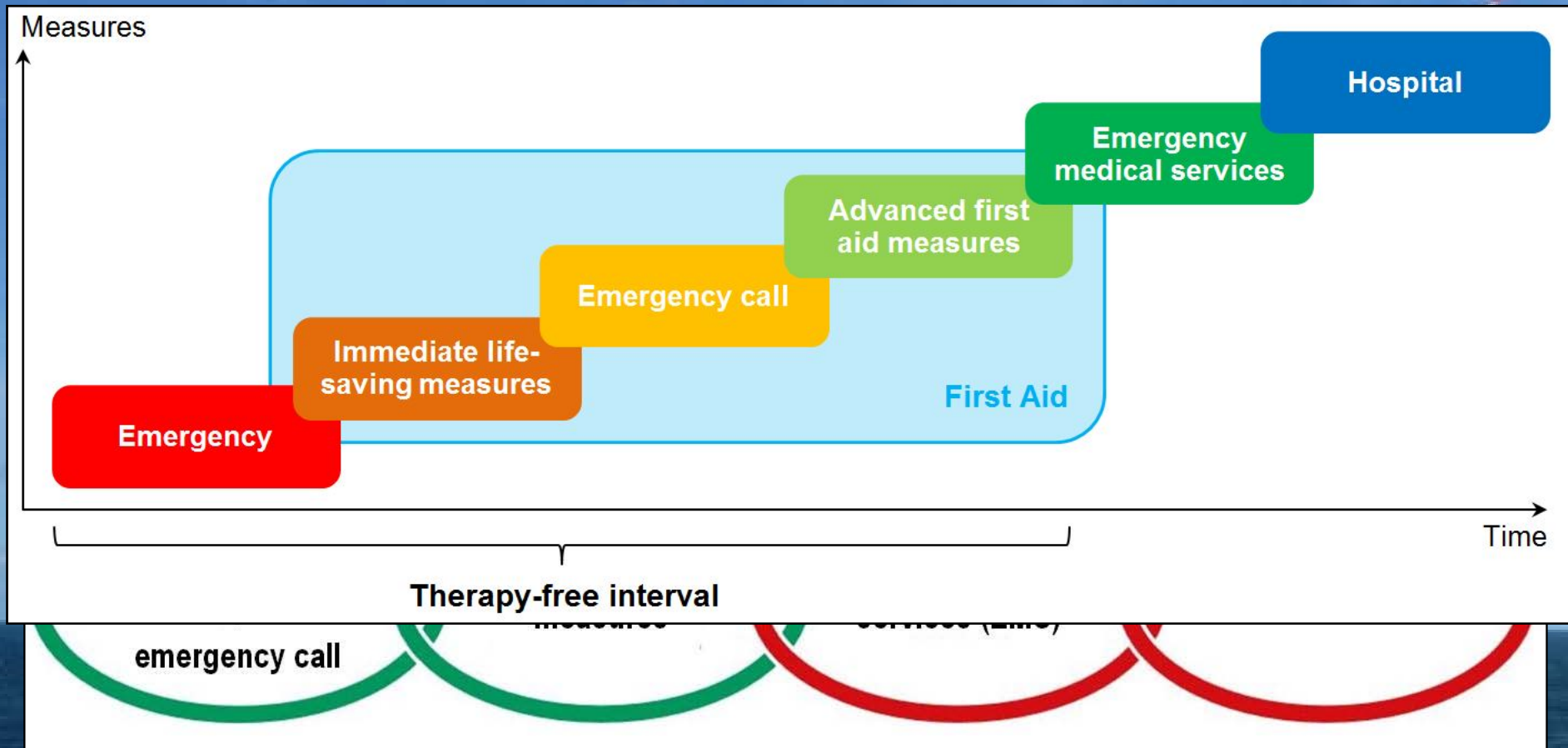


photo courtesy: Deutsche Offshore-Testfeld- und Infrastruktur-GmbH & Co. KG

New Qualification: „Offshore First Aider“

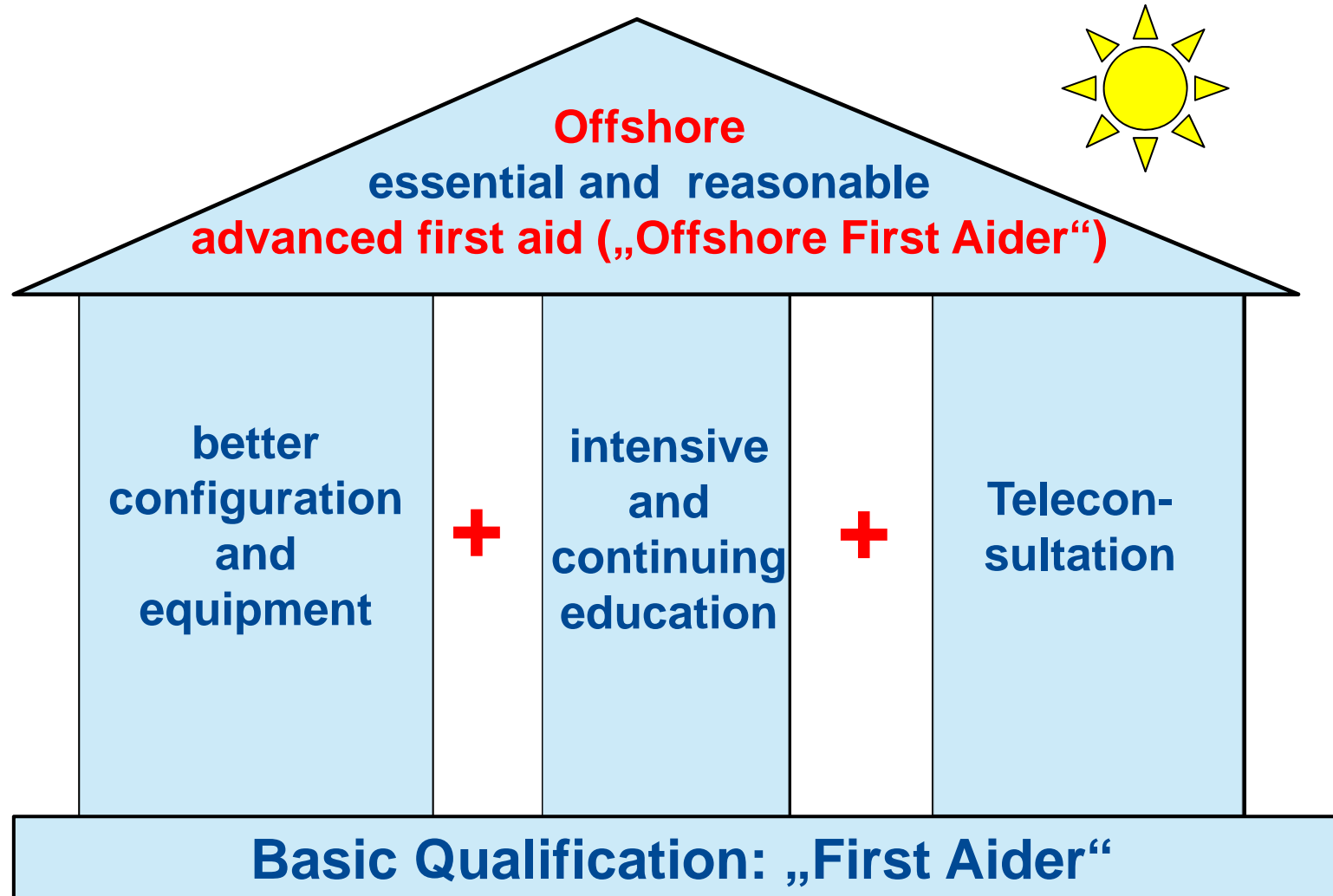


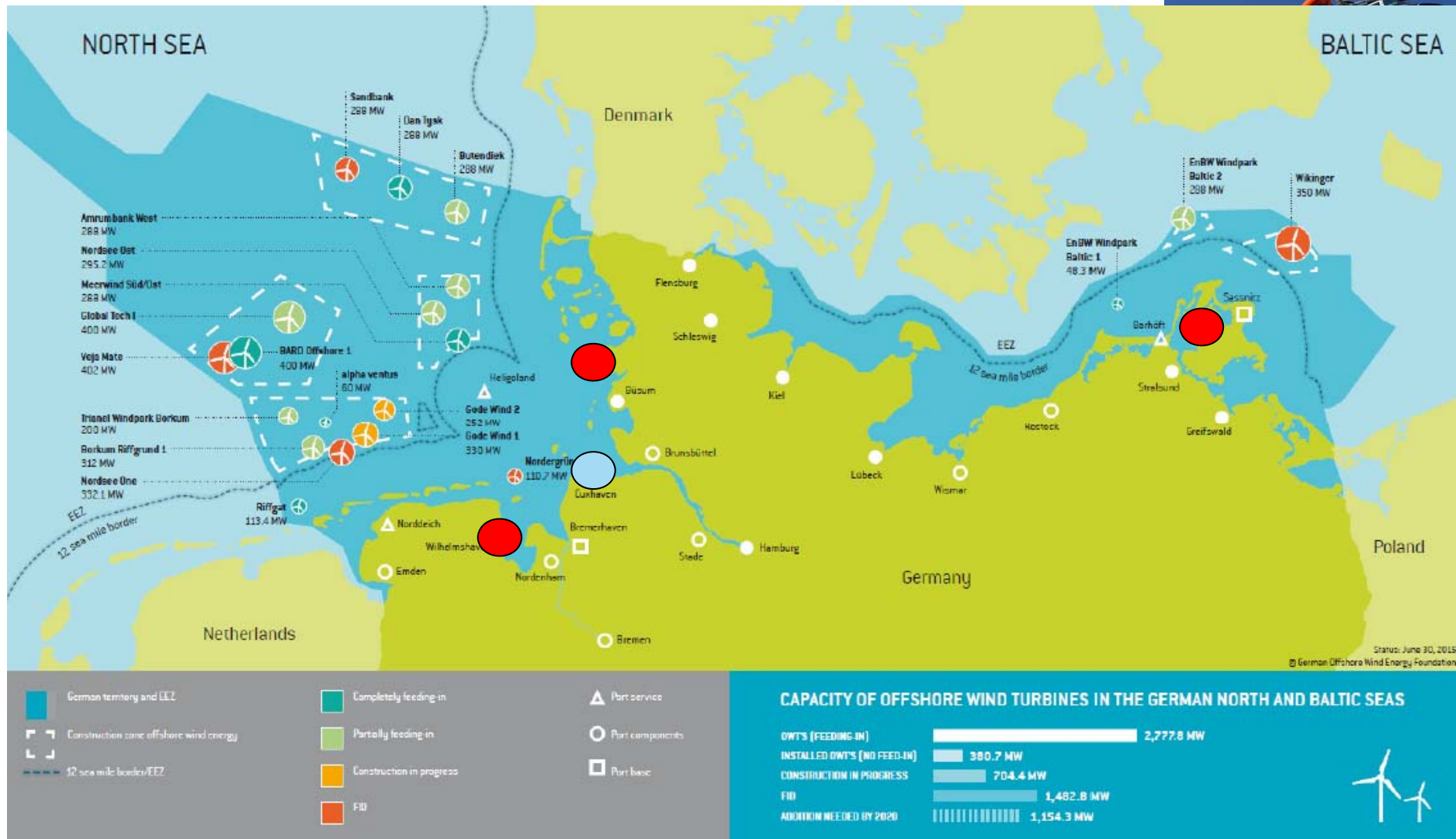
Figure by courtesy: G. Kraus BG ETEM

First-Aid at Offshore Wind Farms

This recommendation for ensuring correct provisions for first-aid at offshore wind farms is intended to serve as an aid to the employer in the required planning and implementation of measures under the specific conditions in offshore deployments.

The concept plan presented here describes offshore first-aid as the first element in the rescue chain, in particular the function of the offshore first-aider.

- **Consensus Statement from the German Social Accident Insurance (DGUV) (Stuhr M et al. Notarzt 2014; 30: 159-168)**
- **Interdisciplinary working group**
- **Strong Network between Occupational and Emergency Medicine**
- **Scientific based recommendations**
- **Consensus Conference with all relevant institutions, societies and experts**



Central Command for Maritime Emergencies, DGzRS

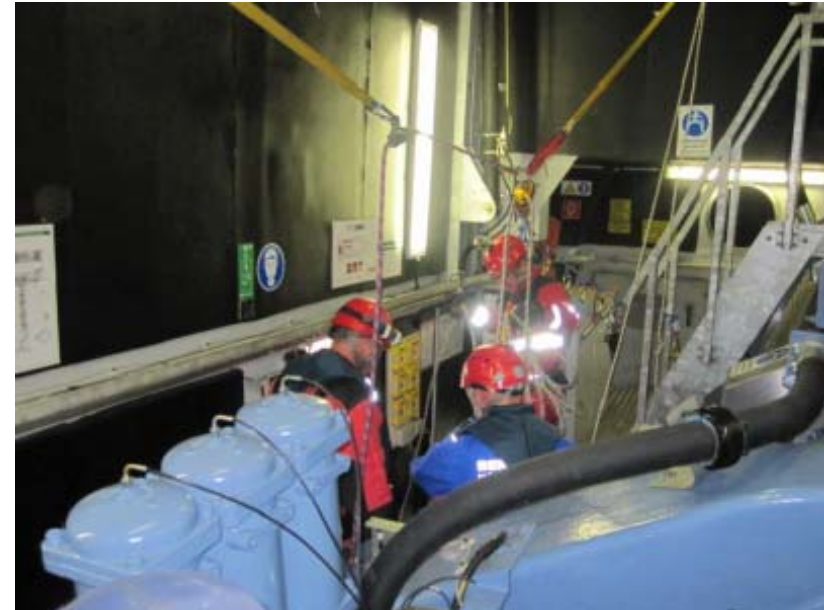


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© Pictures: Havariekommando



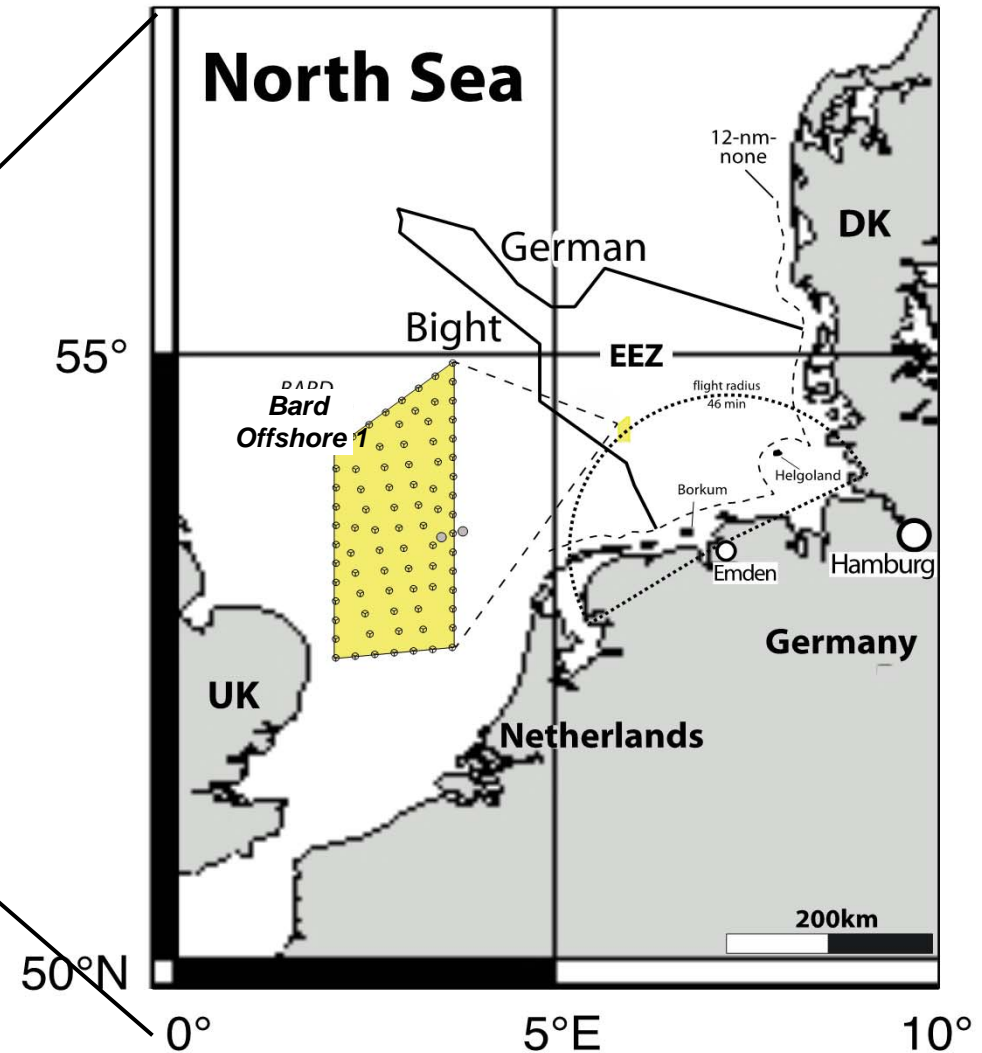
© Pictures: Havariekommando

Site map of wind farm Bard Offshore 1



Source: <http://www.worldatlas.com>

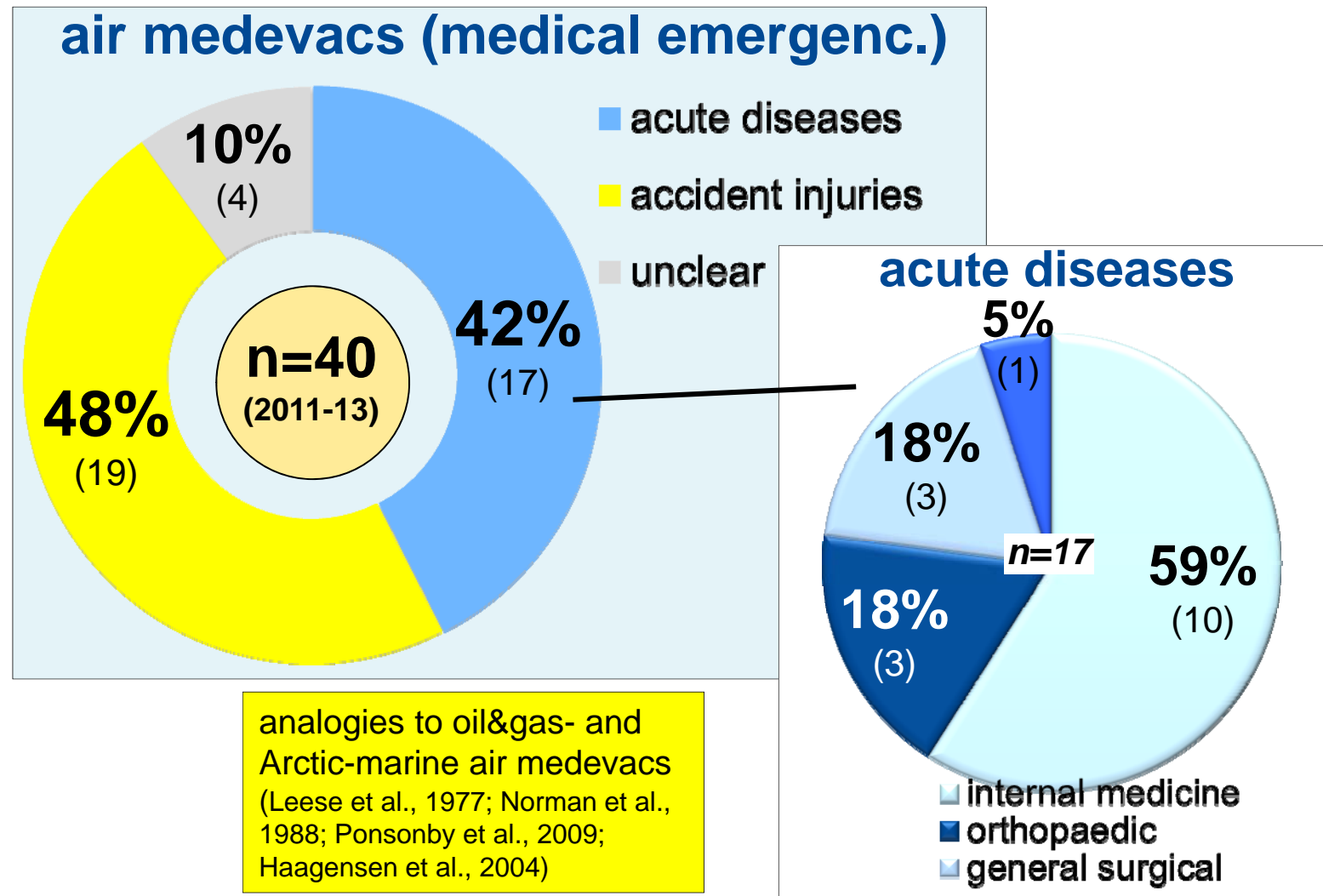
- ~70nm offshore, EEZ
- area of 60km²
- 80 wind turbines
- nacelle height: 90m
- 5 MW each



Medical offshore emergencies 2011-2013

- n=40 operational air medical evacuations ('air medevacs')
Emden/wind farm BO 1
- *implies*: n=40 evaluated medical emergencies
- light to medium traumata and acute diseases
- life threatening acute diseases based only on suspicion
- no severe or multiple traumata

Medical offshore emergencies 2011-2013



Medical Offshore emergencies (*n=40*)

- 48% injuries, 42% acute diseases, 10% unclear
- *injuries*: 95% traumalogical; *diseases*: ~80% internal medicine
- 70% distorsion/contusion as well as snag/laceration/abrasion
- 60% limb injuries, 32% head- and eye injuries
- 24% cardiovascular, 24% gastrointestinal, 17% orthopaed., 17% gen.surgical
- preclinical measures: in 55% of cases; **45% none**
- type of emergency: 55% diseases, 45% accident injuries
- type of measures: monitoring, stop of bleeding, intravenous access, medication, bandage

Outlook

- data acquired rather inhomogeneous/heterogeneous
- Central Medical Offshore Register (CeMOR); on-site questionnaire
- implementation to the German TraumaRegister of the DGU

Real Scenario - Onshore

Male patient, 37 years old

- Fall from height (12m) inside a wind turbine, first aid by colleague
- Transport by Ambulance/Emergency Physician to the next hospital
- Operation of lumbar spine
- Next day: Transfer to BUKH for further surgery

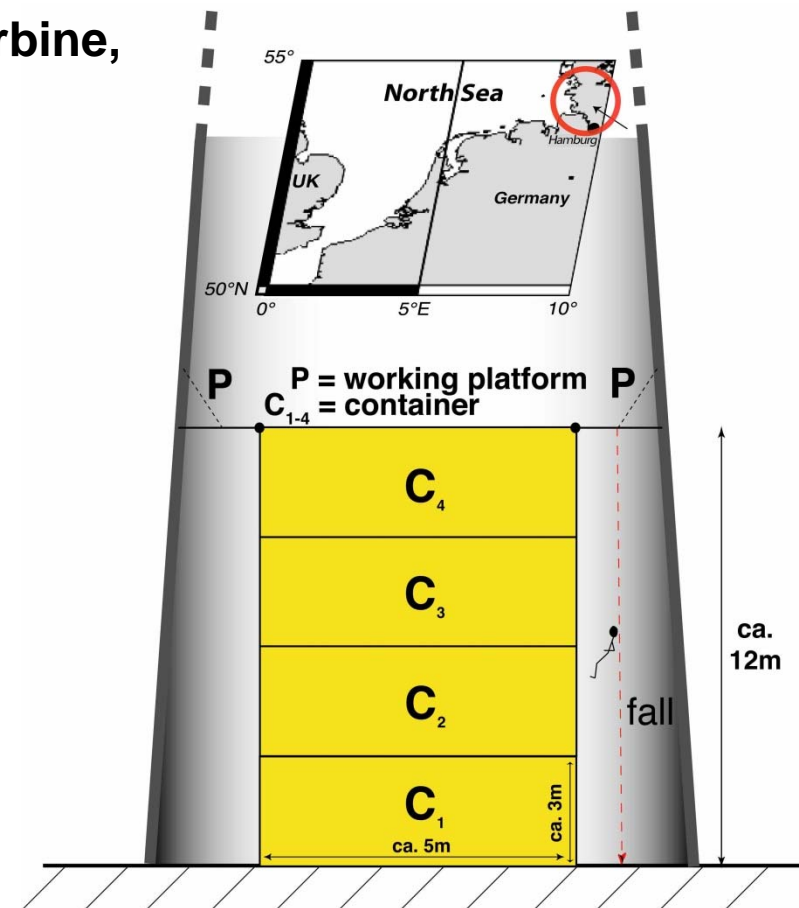
Timeline:

04:01 p.m.: Alarm

04:18 p.m.: Ambulance at scene

16:35 p.m.: Transport to hospital

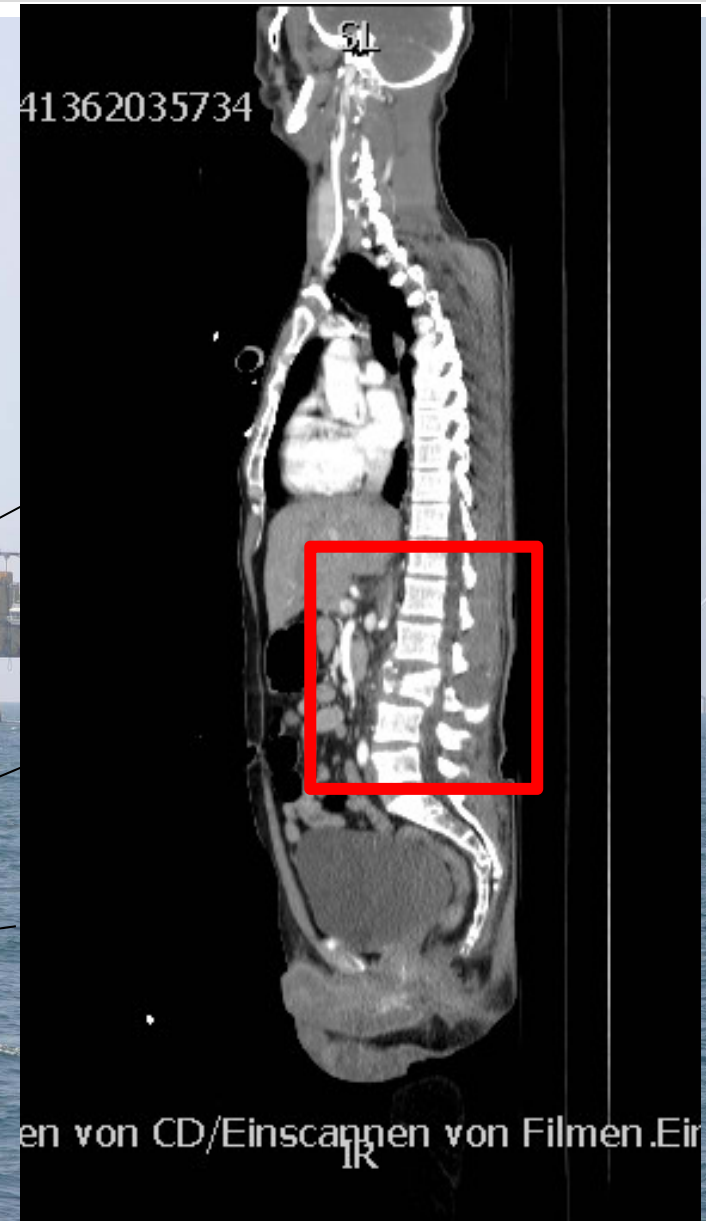
17:05 p.m.: Arrival at hospital



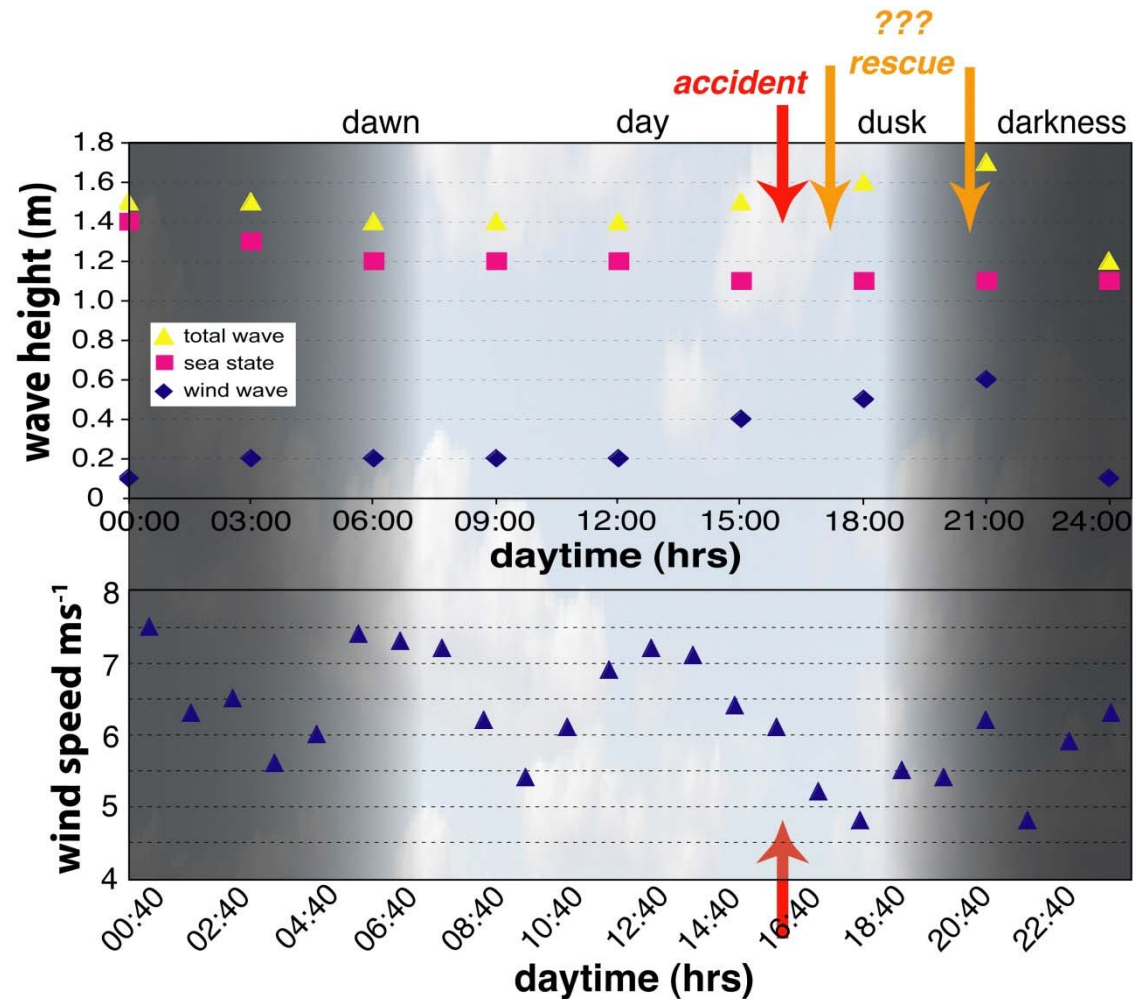
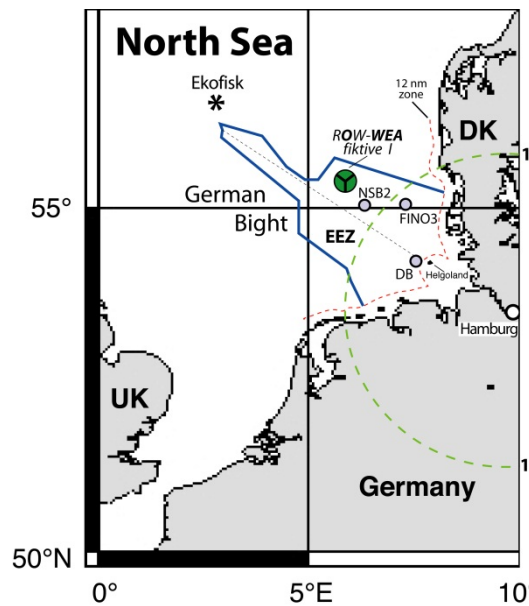
Injury pattern and potential scenario offshore

Diagnoses

- Traumatic Brain Injury, Orbital fracture
- Rib fracture 6-10 right / 8-9 left, lung contusion
- Fracture of the 3rd lumbar vertebrae with narrowing of spinal canal
- Fracture of sacral bone
- Fracture of left tibia and fibula, compartment syndrome
- Fracture of right and left calcaneus



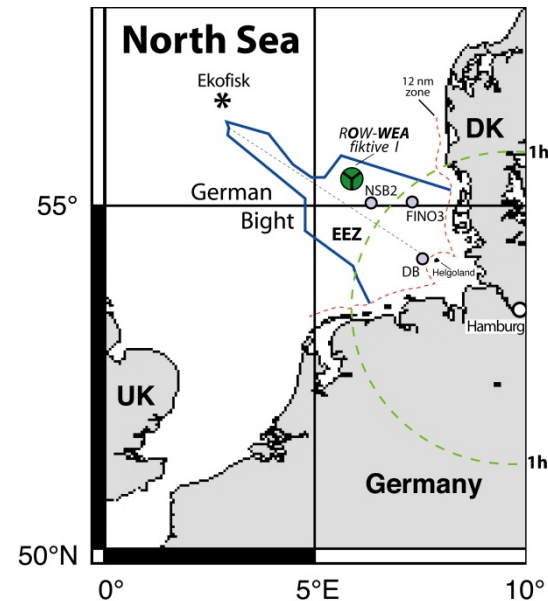
What would (should) have happened OFFSHORE?



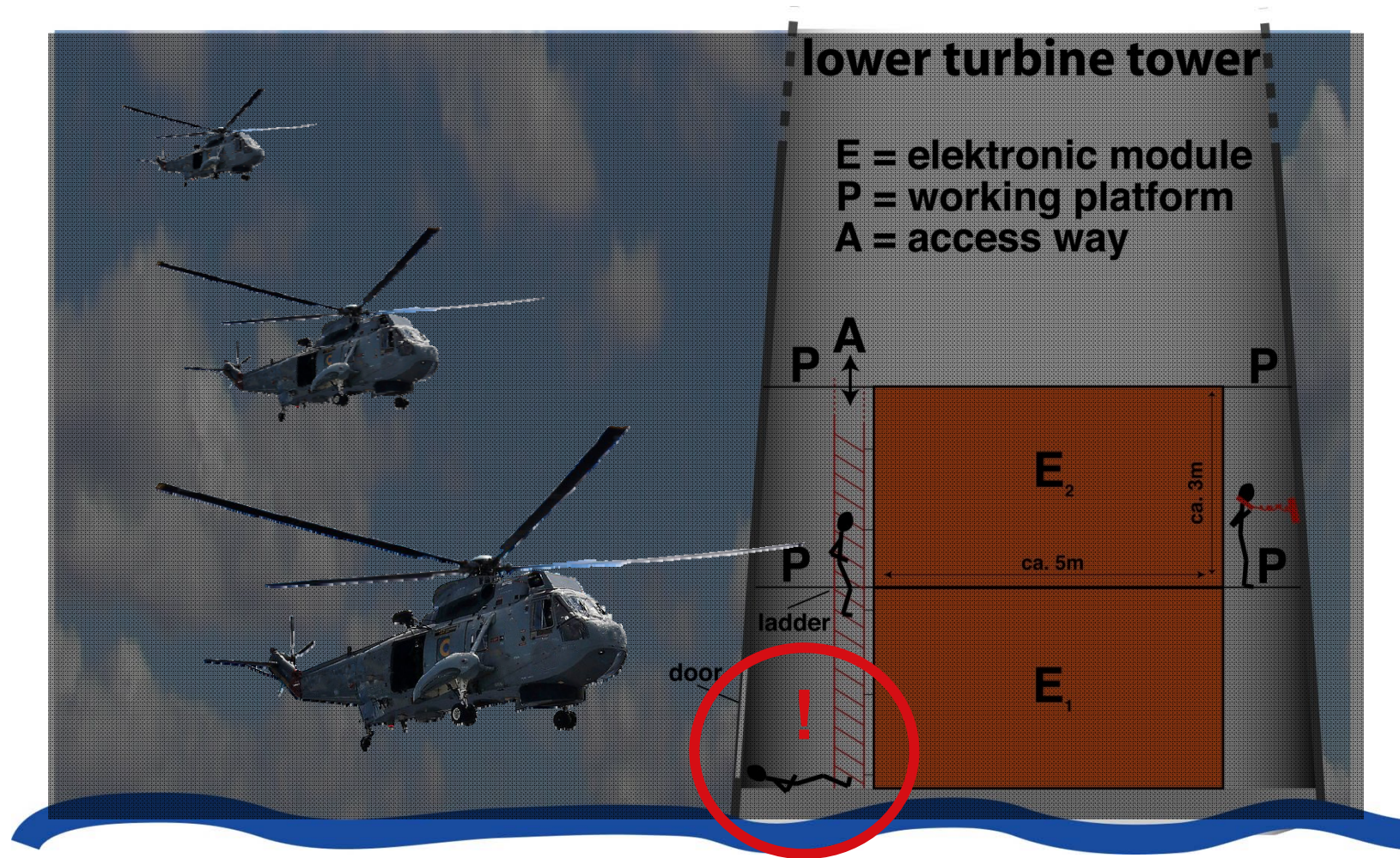
First Aid and Rescue

To do Onshore/Offshore:

- First Aid
- Immobilisation
- Analgesia/Sedation
- **Anesthesia**
- Rescue
- **how?**
- Evacuation
- **by Sea? by Air?**



Rescue by Helicopter?



Conclusion

- Adapt all parts of the rescue chain to the workplaces offshore
- Systematic registry: medical casualties and illnesses offshore
„CeMOR (Central medical offshore registry)
- Sustainable research for validation and evidence
 - health and safety measures
 - parts of the rescue chain
- International Networking across faculties (e.g. maritime medicine, tactical medicine, mountain emergency medicine)
>> **mine rescue ??**
- **Remoteness of workplace, importance of first aid, rescue “from the bottom to the top”**

*Thank you for attention and let us share our challenges
and experience!*
m.stuhr@buk-hamburg.de

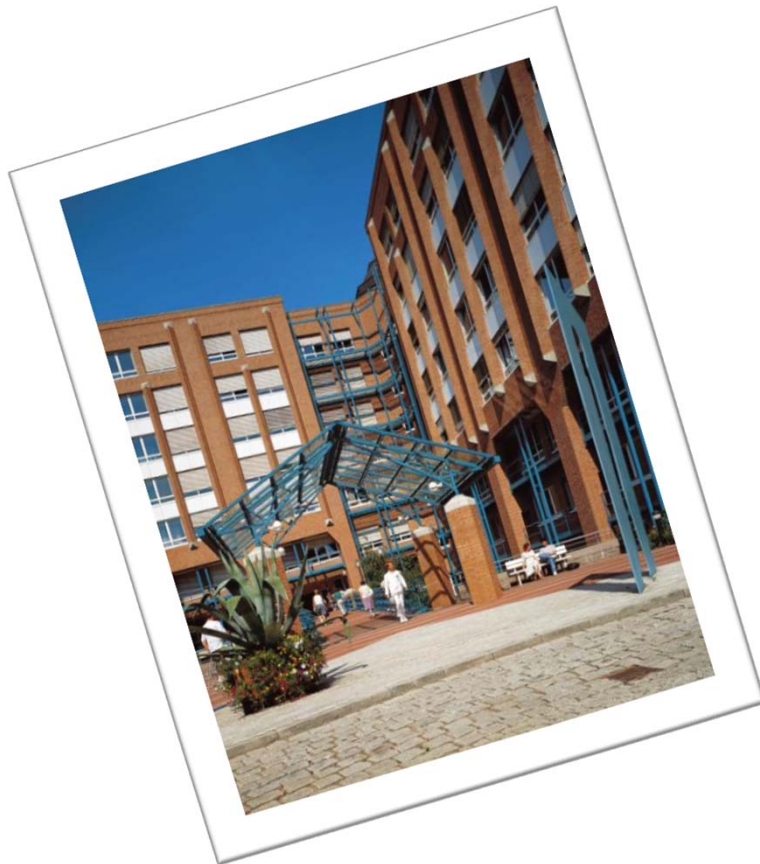


Photo courtesy: © Nils Weinrich