



Technische
Universität
Braunschweig

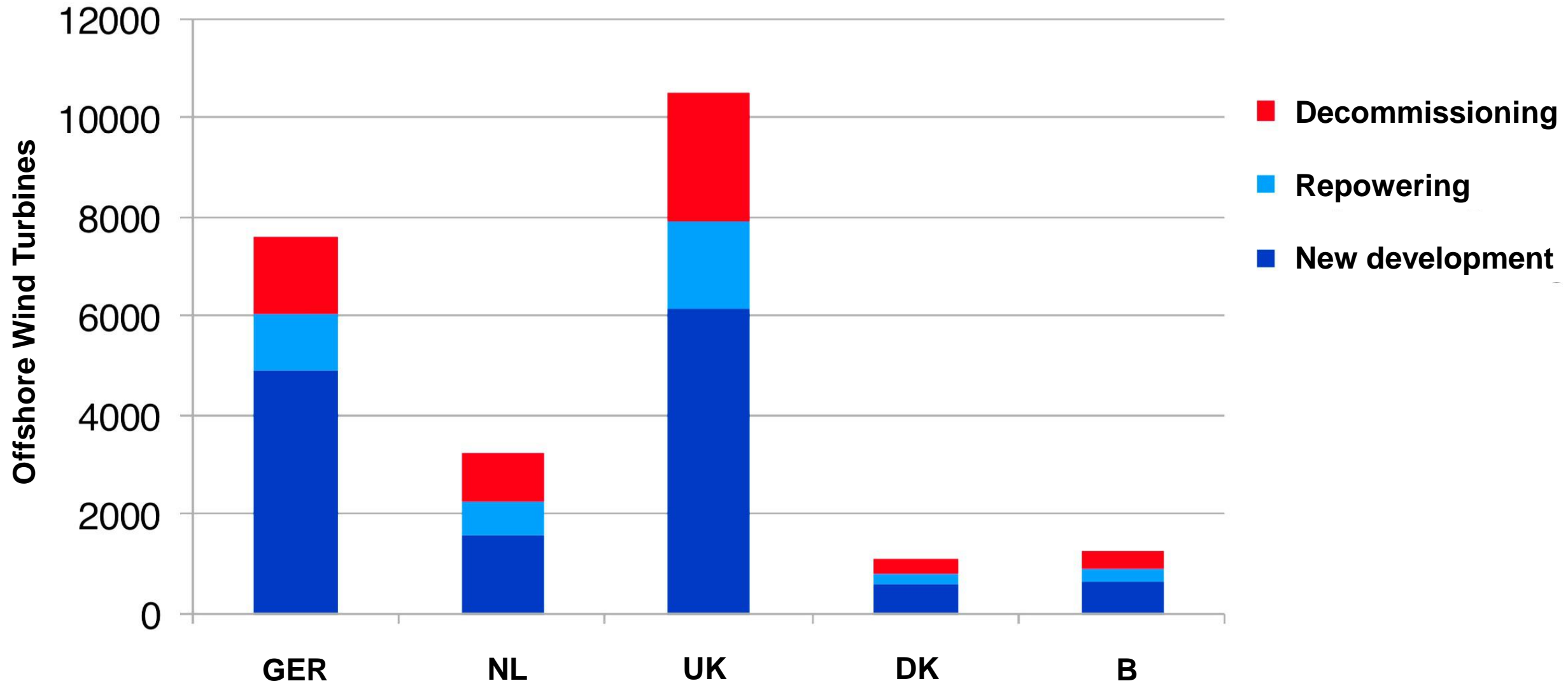


OFFSHORE MONOPILE DECOMMISSIONING ON A SCALED BASIS

Nils Hinzmann, Philipp Stein, Dr. Jörg Gattermann

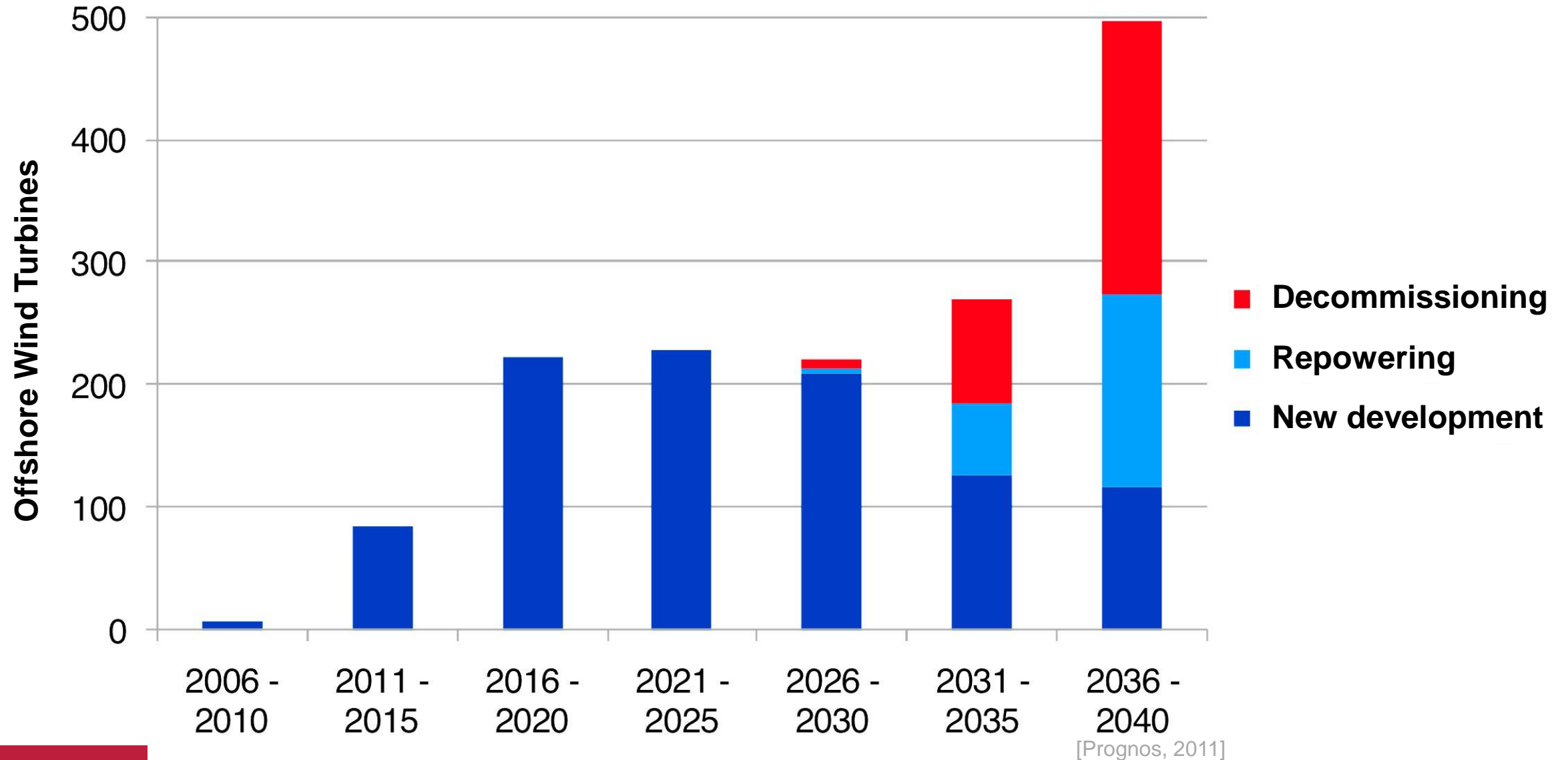
Technische Universität Braunschweig, Institut of Foundation Engineering and Soil Mechanics

EU5-Market development till 2040

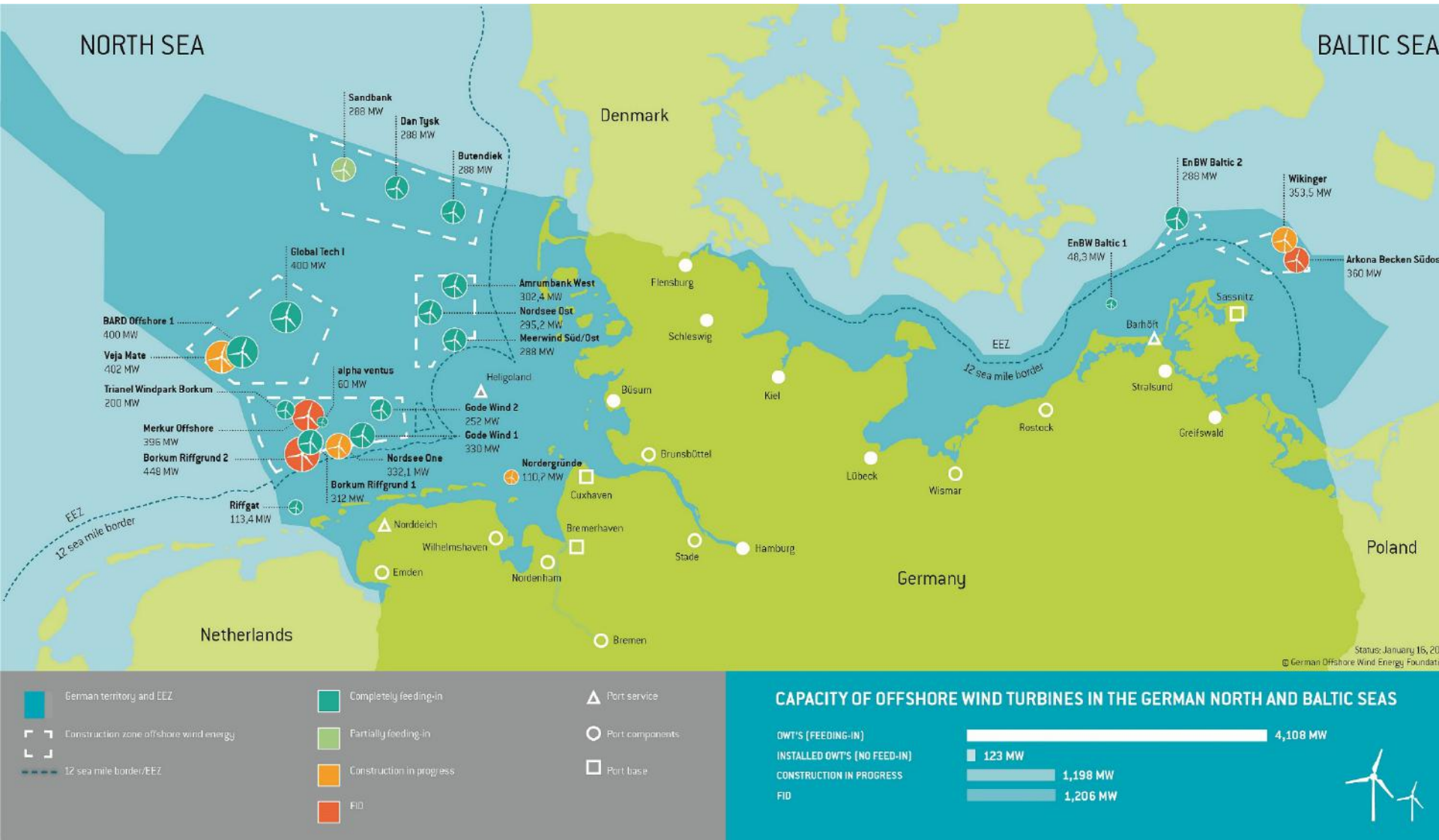


[Prognos, 2011]

German North Sea development till 2040

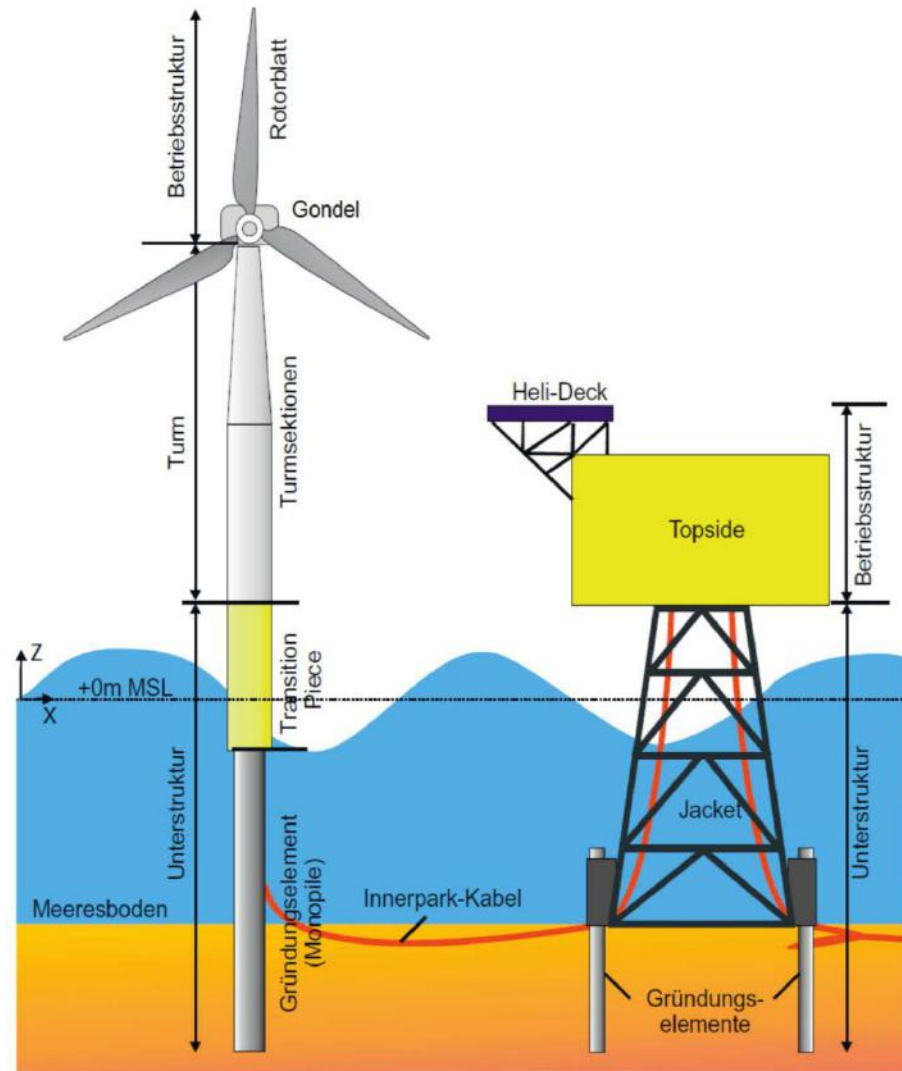


Development of OWF in Europe

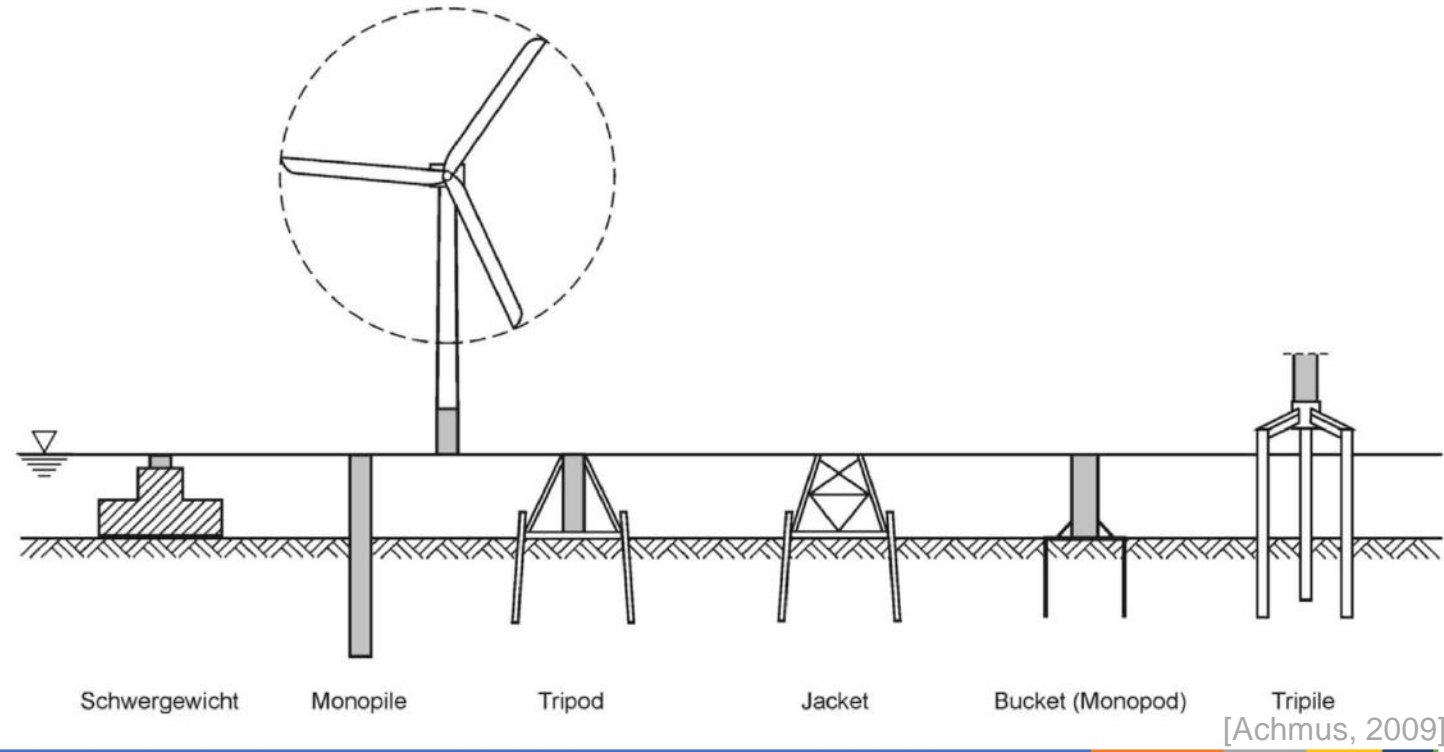


- suitable areas
→ limited resources
- repowering
- decommissioning

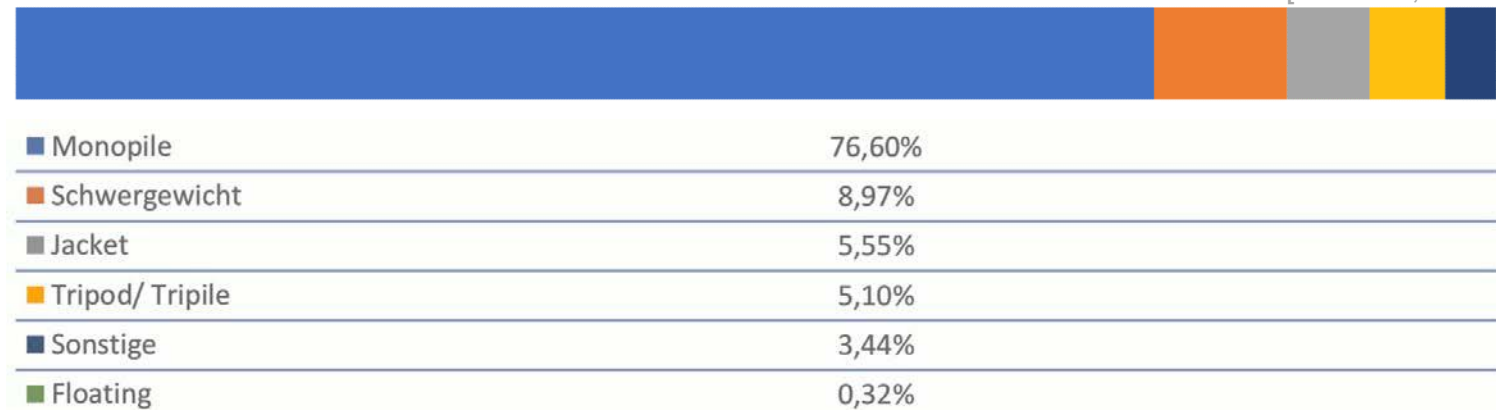
Offshore Wind Substructures



[Schaffarczyk, 2016]

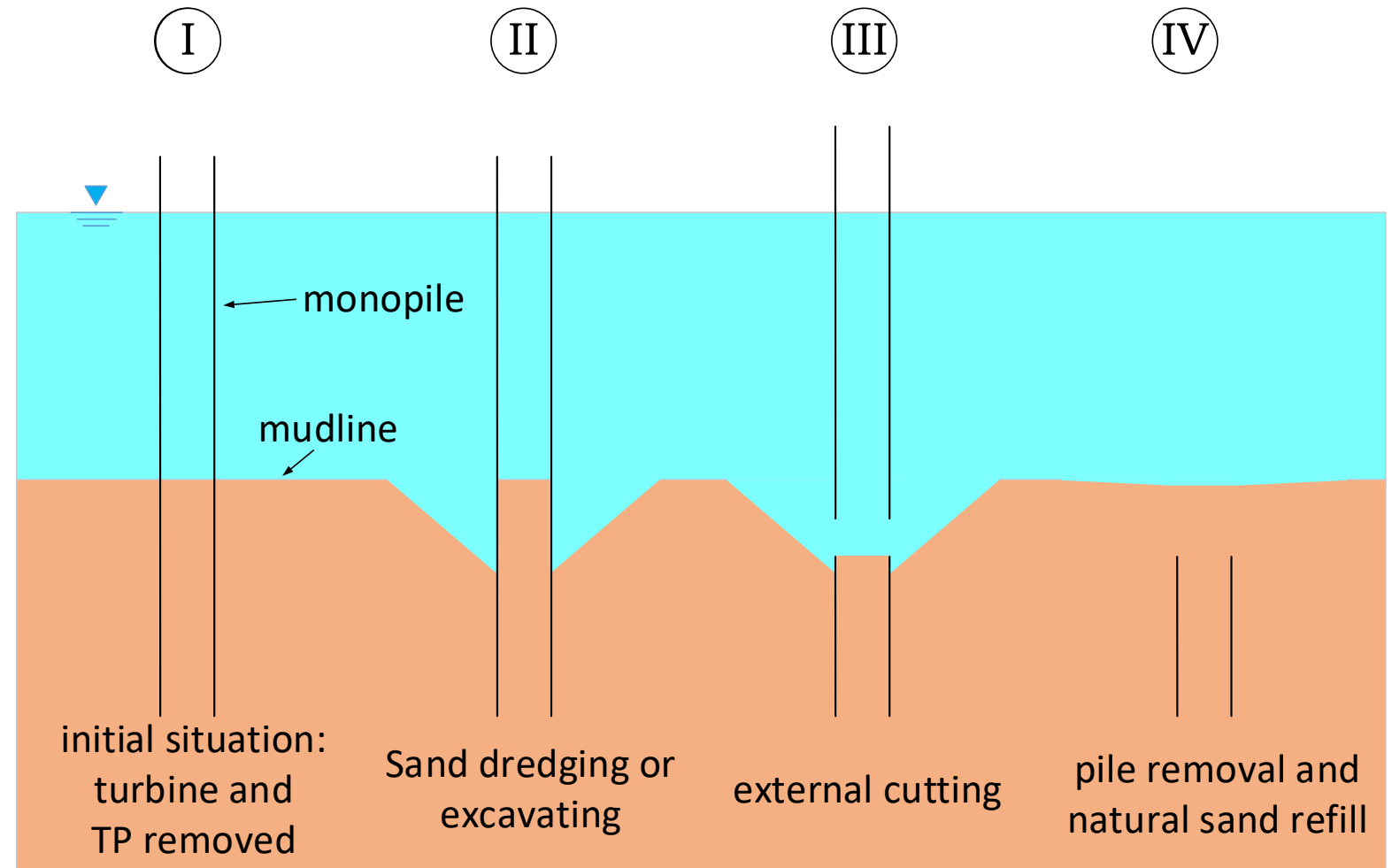


[Achmus, 2009]

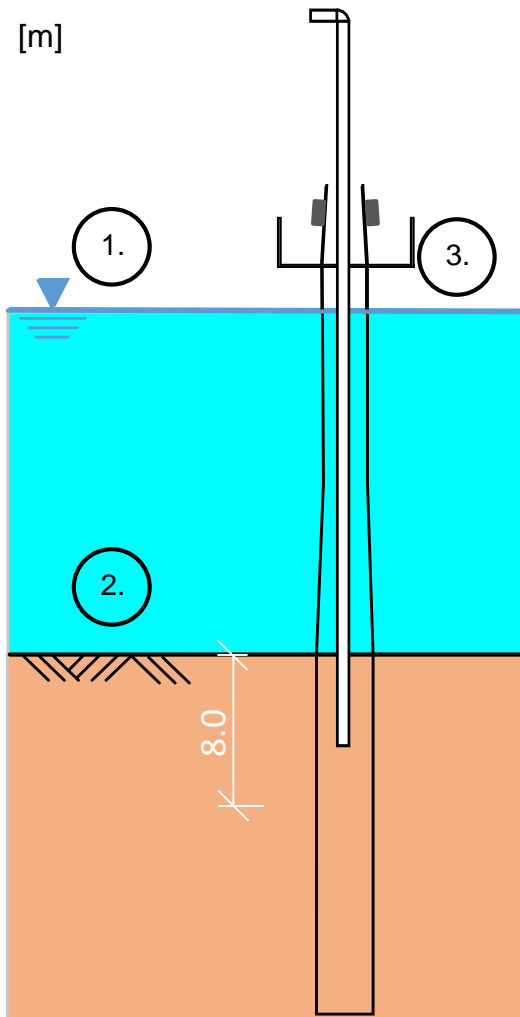


Current decommissioning solution – cutting

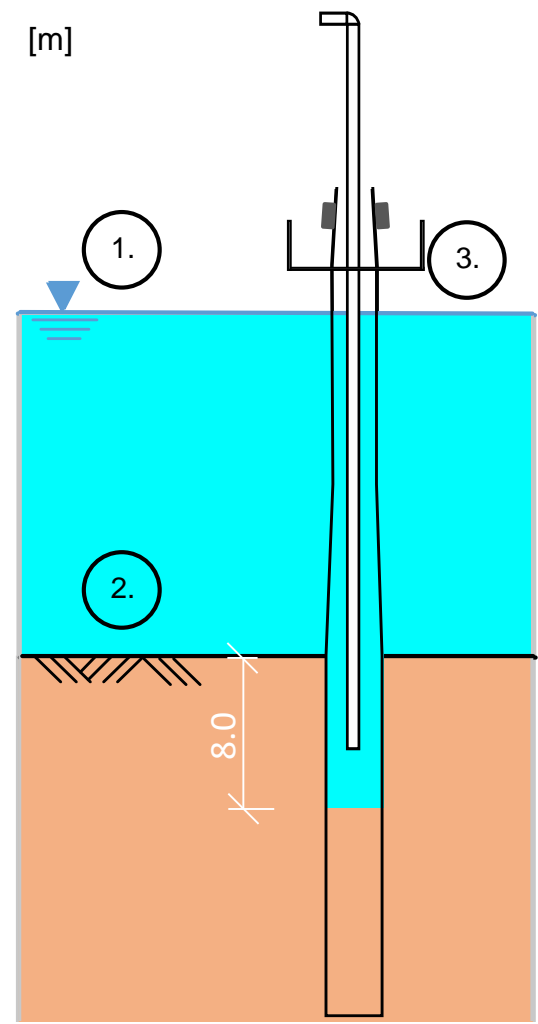
- external jet-cutting
 - dredging or excavating
 - external cutting
 - recovering of the pile



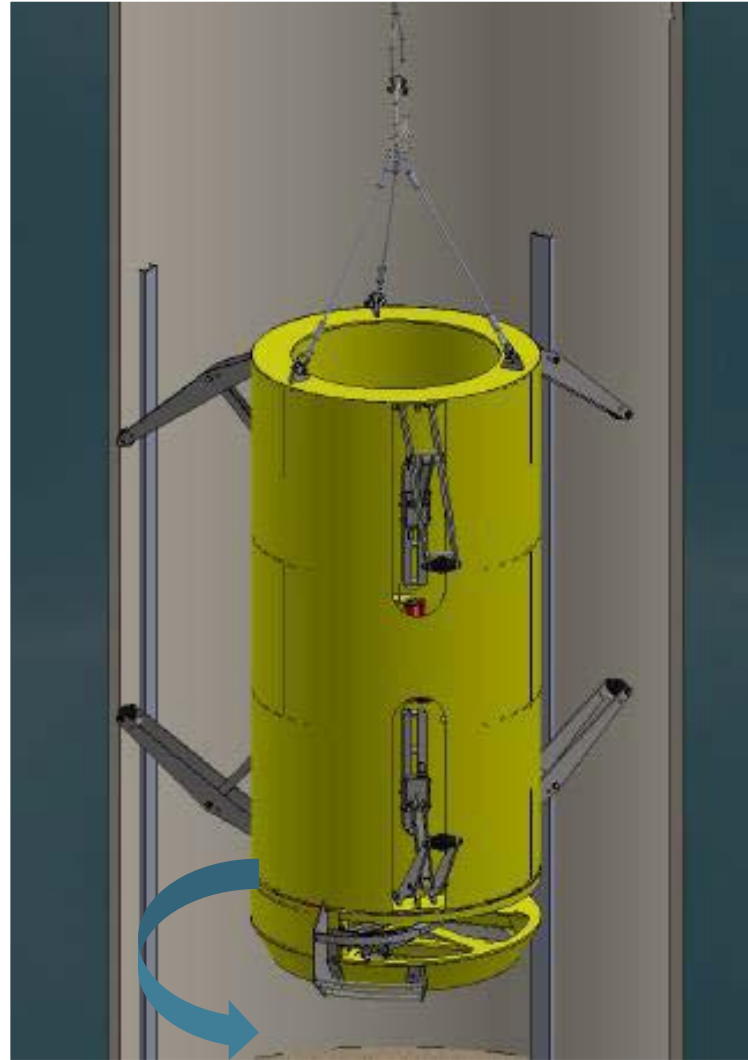
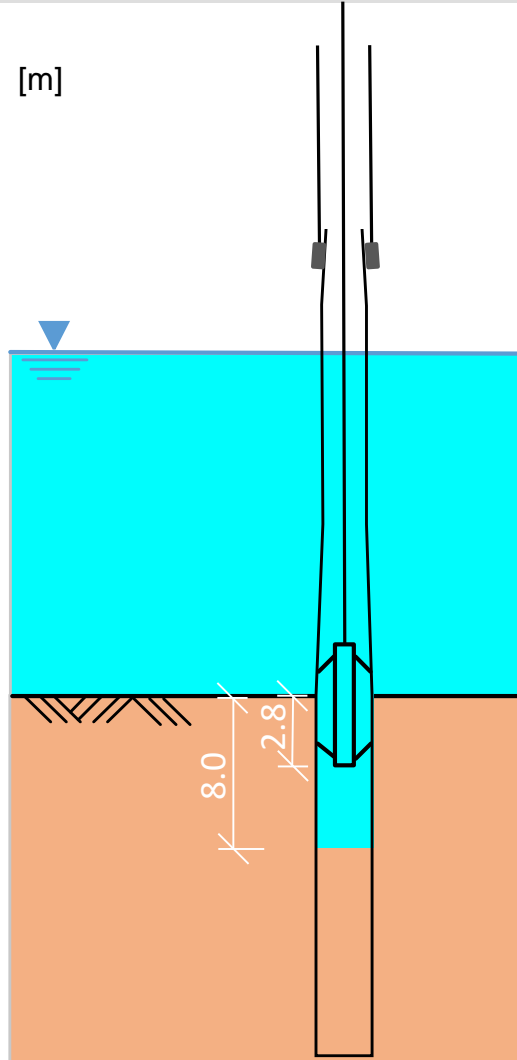
monopile decommissioning preparation



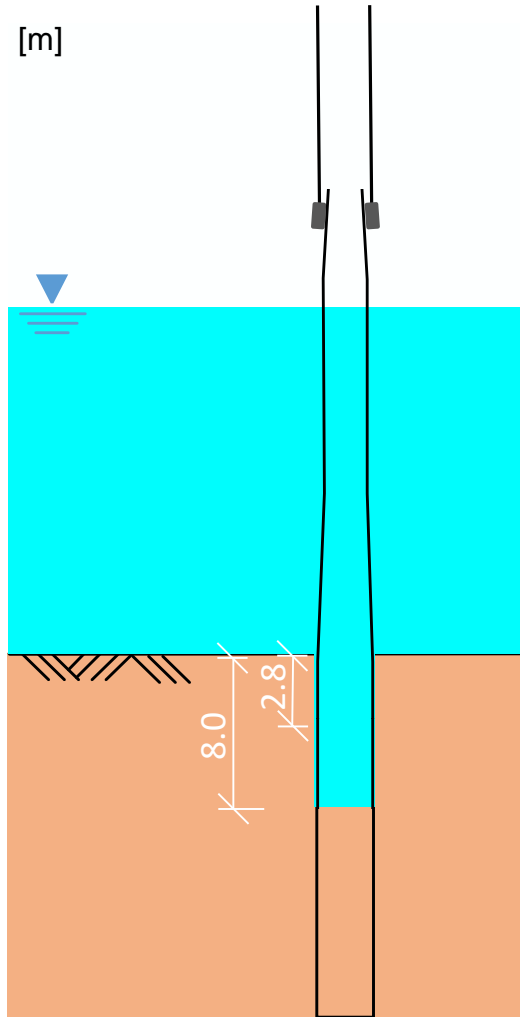
monopile decommissioning preparation



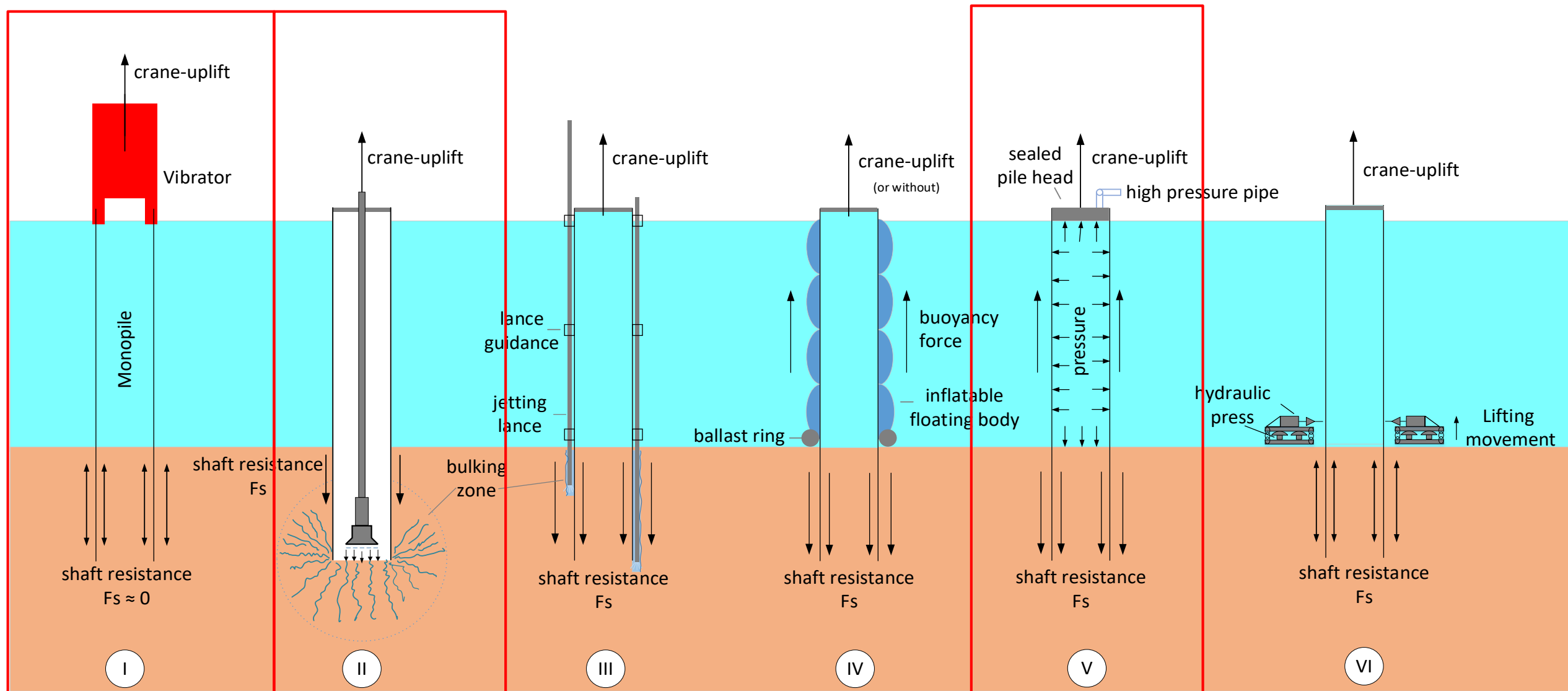
jet cutting



monopile recovery



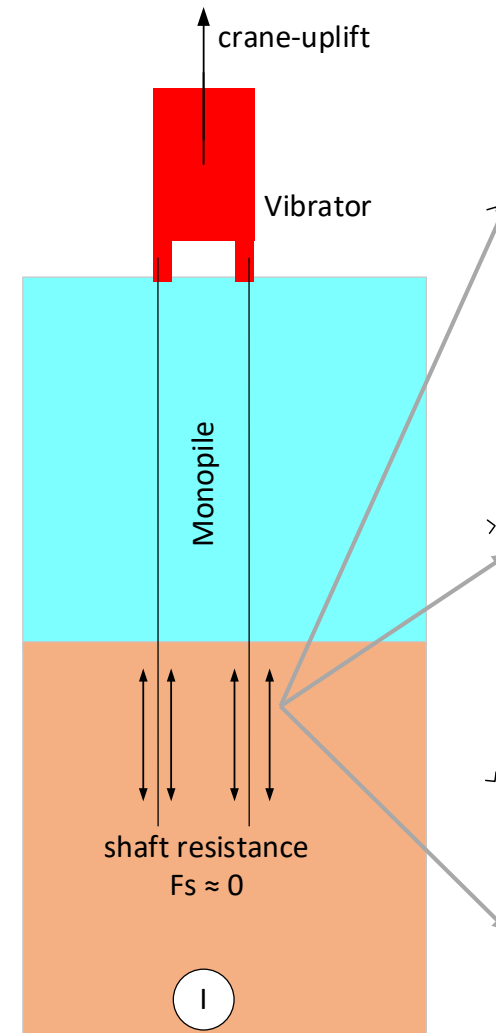
Alternative decommissioning methods



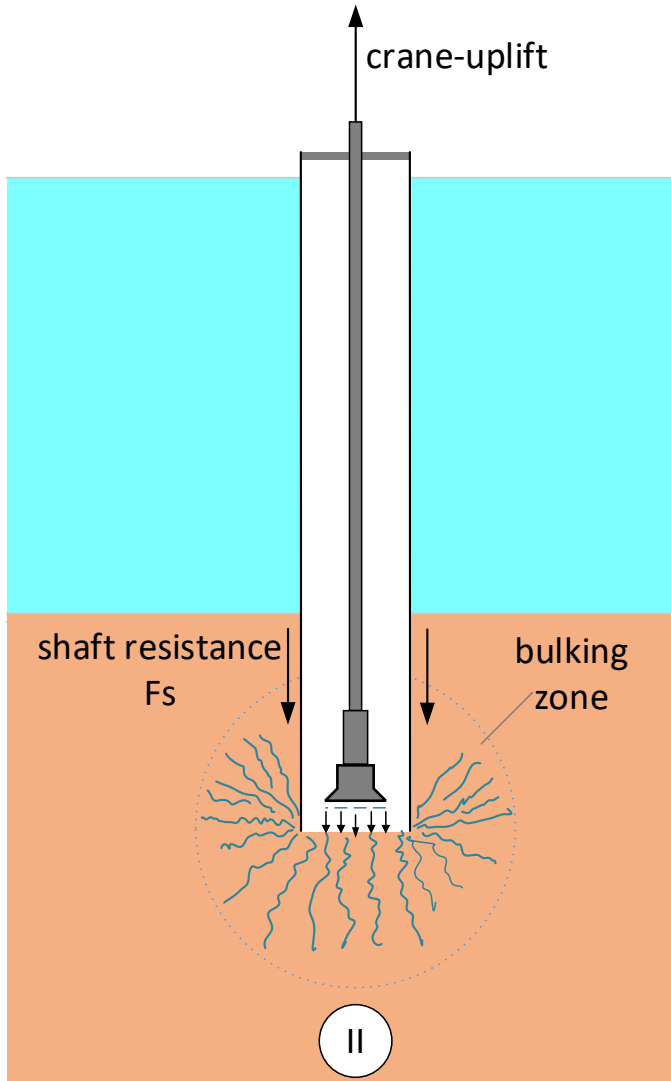


Vibratory Extraktion

- excitation of surrounding soil
- "free fall" of soil particles $\rightarrow \gamma \approx 0$
- skin friction drastically reduced
- extraction by lifting (pile + vibro)



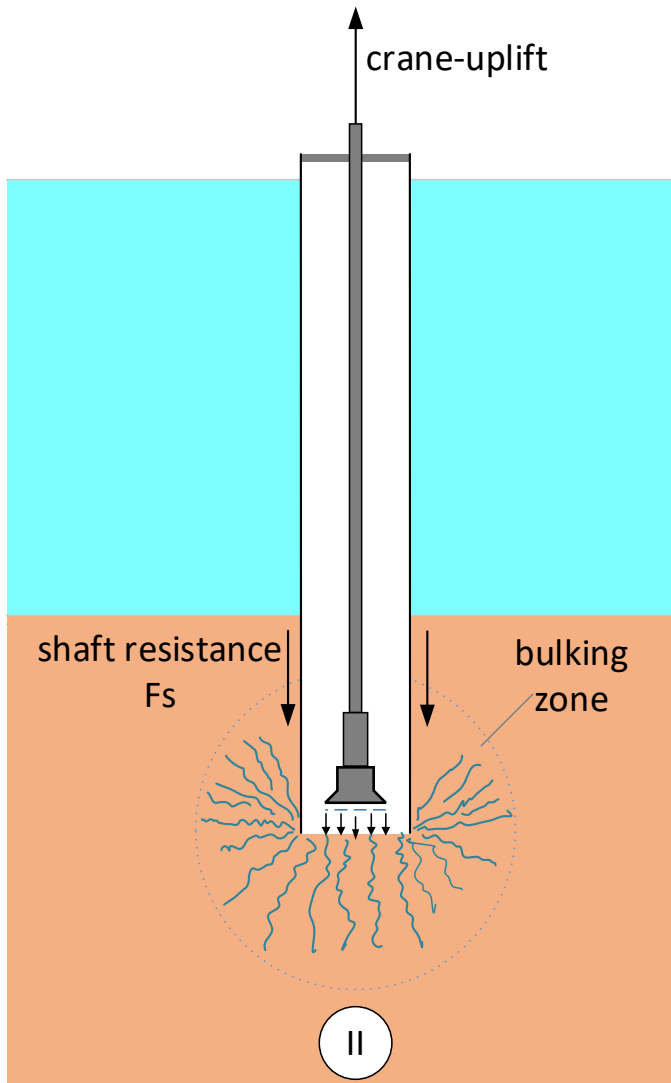
Internal Dredging



- reducing the inner shaft resistance
- loose pile toe area
- bulking zone – hydraulic heave
- reducing outer shaft resistance



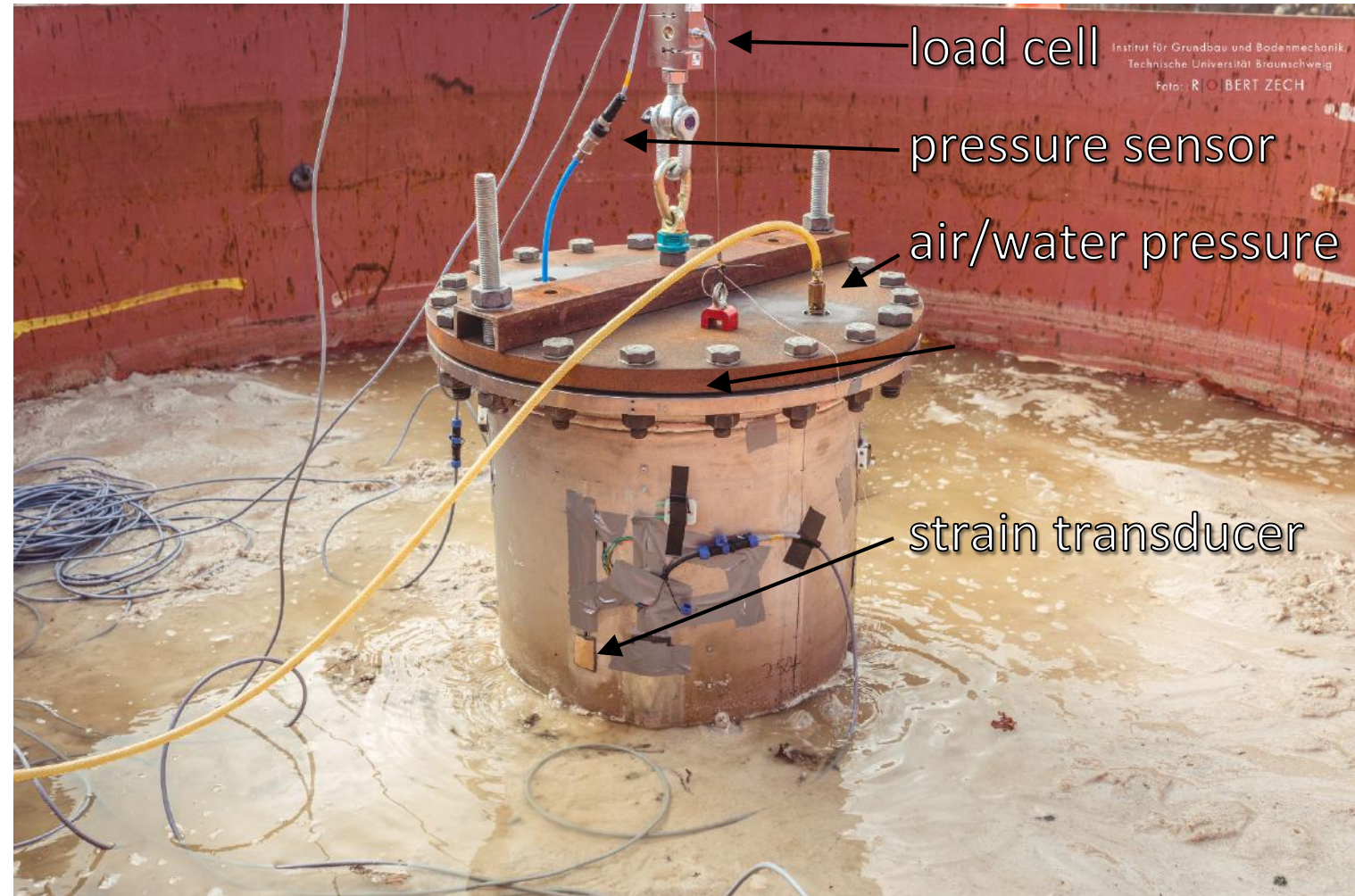
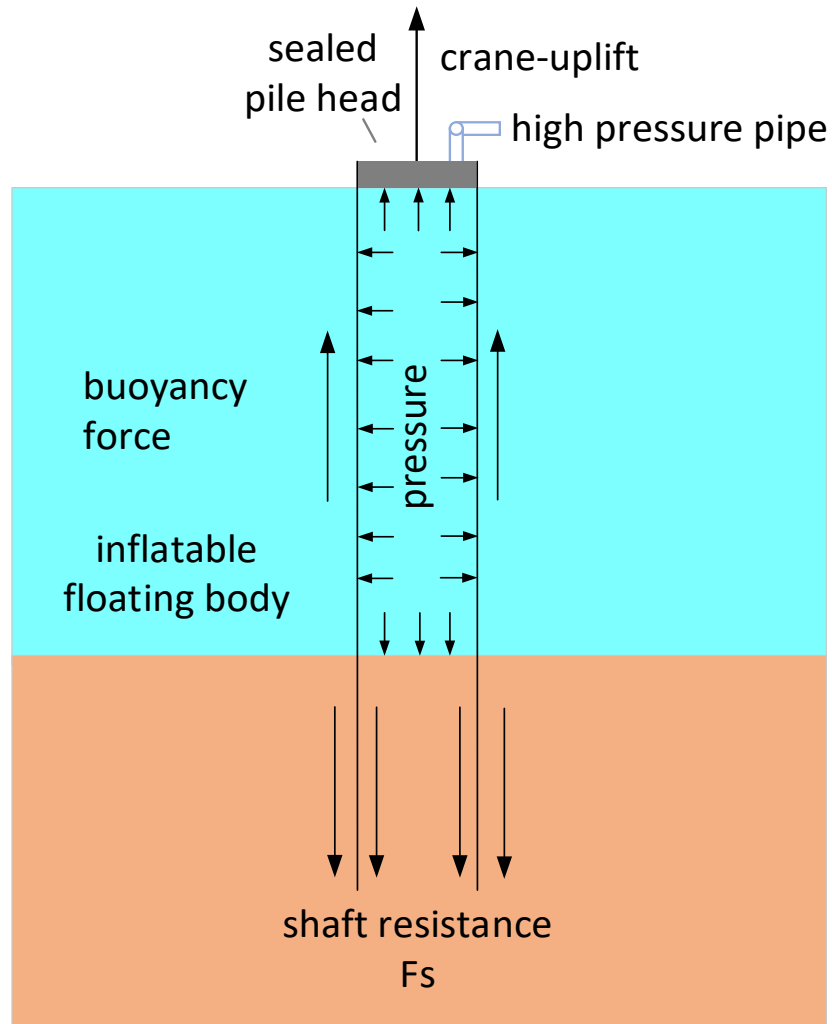
Internal Dredging



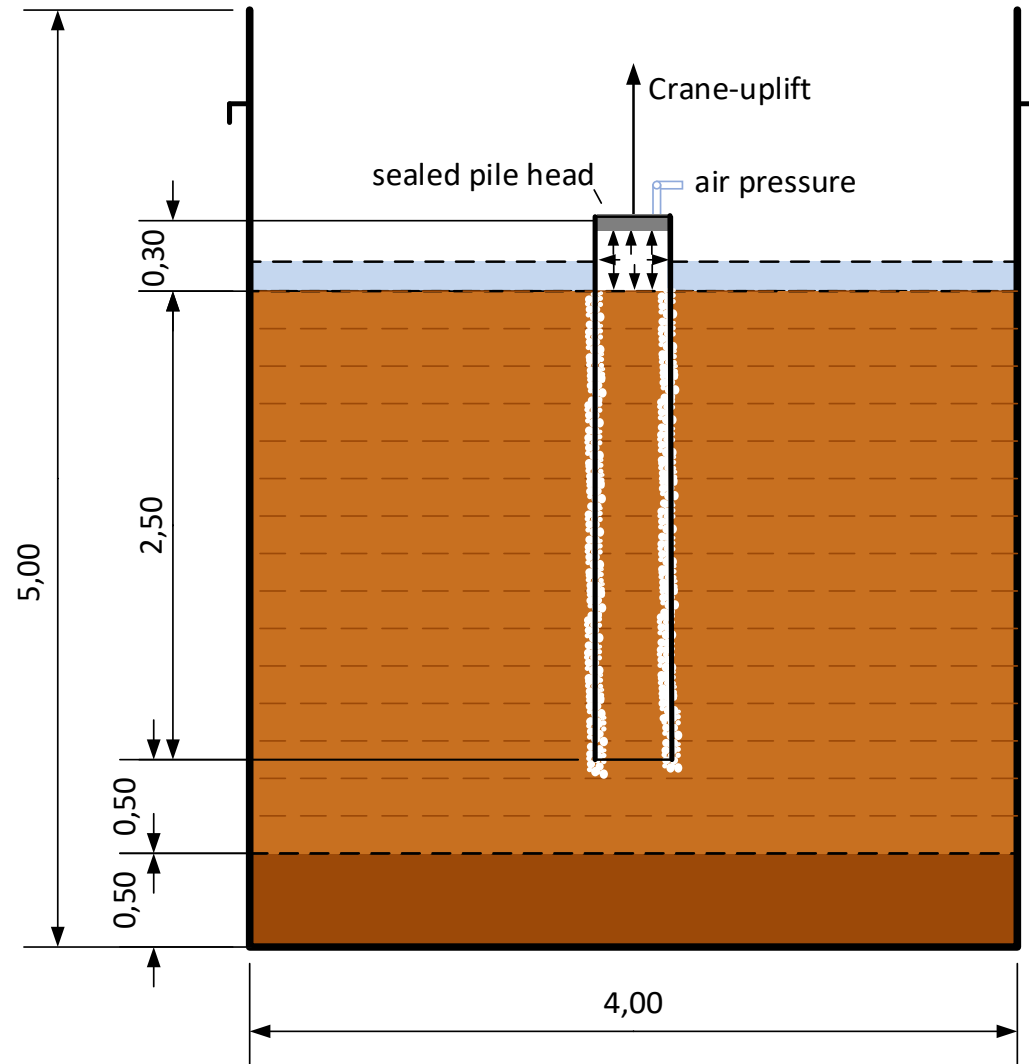
- reducing the inner shaft resistance
- loose pile toe area
- bulking zone – hydraulic heave
- reducing outer shaft resistance



Air-Pressure / over-pressure



Air-Pressure / over-pressure





Conclusion and Outlook

- steady increase of OWF worldwide
- decommissioning of the turbine and tower → construction steps in reverse order
- jet-cutting is an approved method for offshore decommissioning:
 - low risk → remote operating
- the need for sufficient decommissioning methods
- alternative methods need to be researched, developed and approved

Acknowledgements

research project 'DeCoMP'

large-scale model investigations for decommissioning of Monopiles

01.12.2018 – 30.11.2021

funding code: 0324316

pile driving equipment

vibro hammers provided by CAPE Holland BV



hydraulic/jetting lance equipment

Keller Grundbau GmbH



Supported by:



Federal Ministry
for Economic Affairs
and Energy

on the basis of a decision
by the German Bundestag



Thank you for your attention!