Oceanvis AS –Offshore wind

Some experiences since 2001

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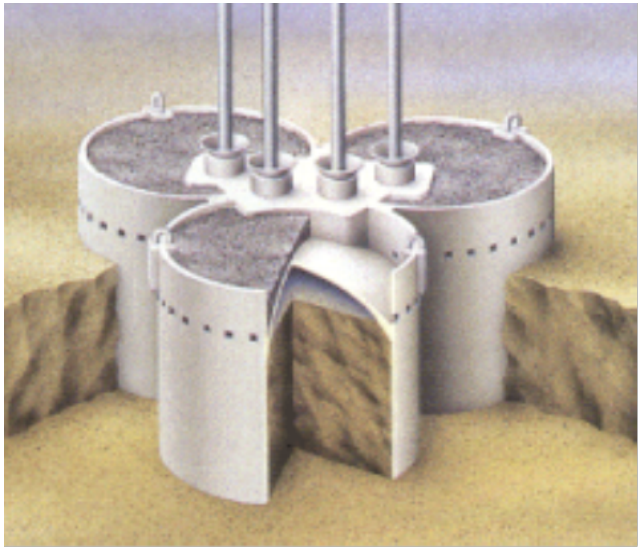
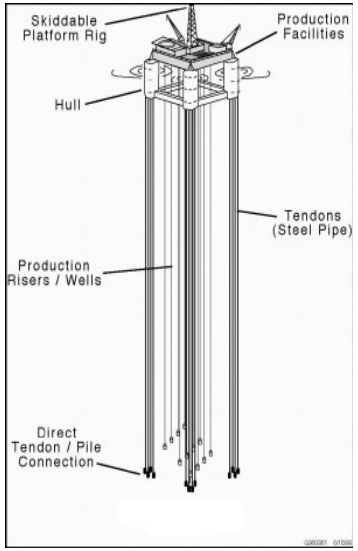
Offshore wind – developing even faster!!!!

Project	FID date (approx[15])	LCoE (2011 pounds)
Robin Rigg	2006	£136/MWhr (weighted average)
Gunfleet Sands	2007	
Thanet	2008	
Walney	2008 & 2010[16]	£131/MWhr (weighted average)
Sheringham Shoal	2008	
Greater Gabbard	2008	
Ormonde	2009	
London Array	2009	
Teeside	2011	
West of Duddon Sands	2011	
Humber Gateway	2012	£121/MWhr (weighted average)
Westermost Rough	2013	
Dudgeon	2014	
East Anglia 1	2016	£106.1/MWhr
Neart na Gaoithe	2016[17]	£101.7/MWhr
OWPB target	2020	£100/MWhr

My backgrund - Oil and gas

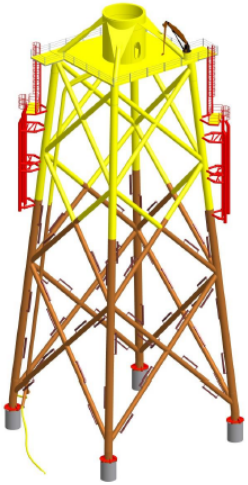
- Background in DnV, Saga Petroleum, Norwegian Contractors
- Certification, inspection, design of offshore structures
- Concrete and steel
- Gravity base, jackets, TLP, Floaters
- Started to develop concepts (installation, foundations) for offshore wind in 2001 together with colleague Gunnar Foss

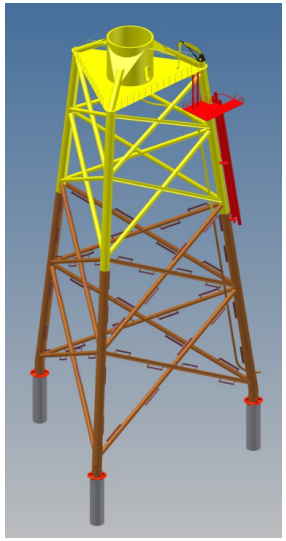




Many concepts to choose from……

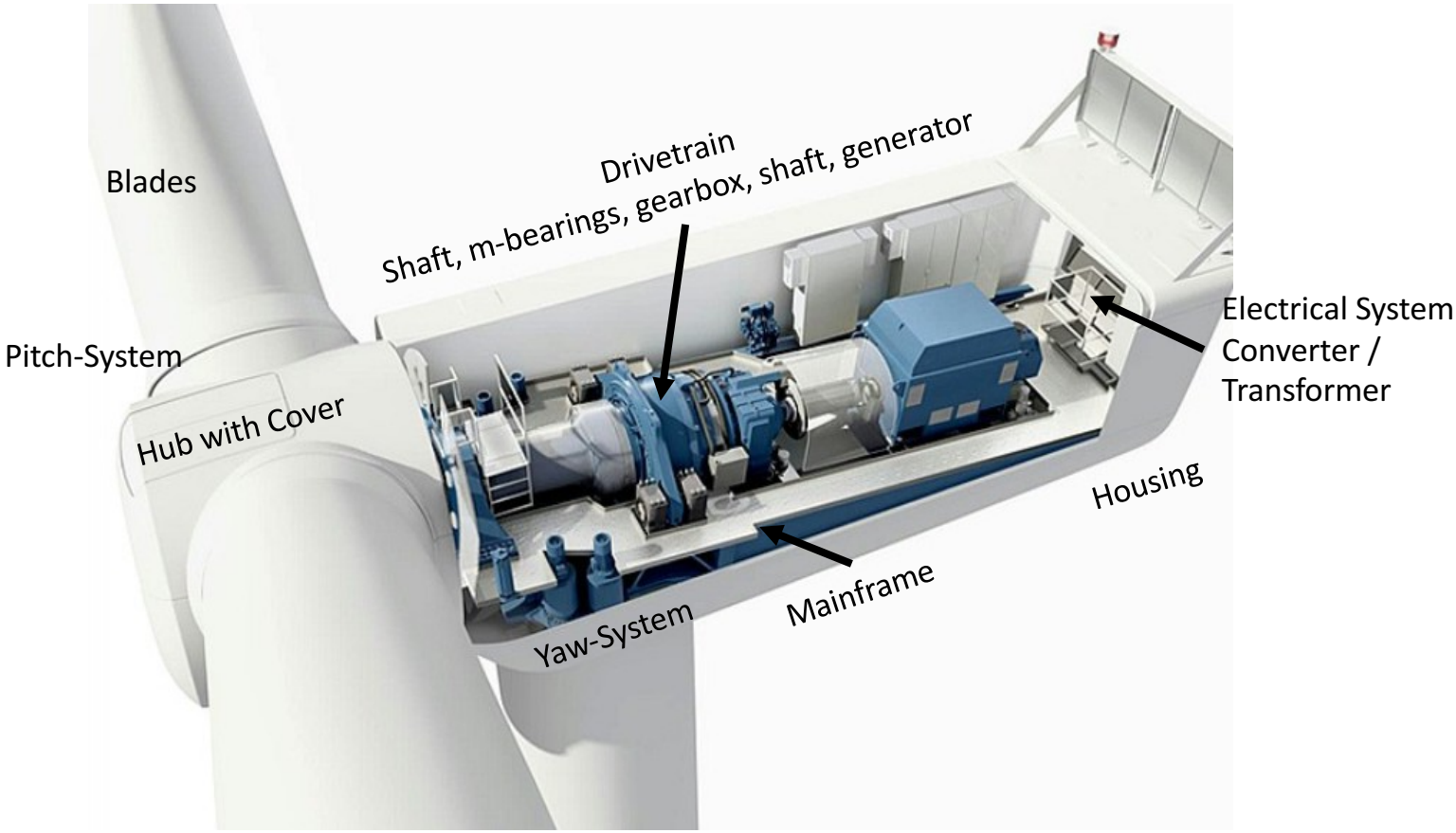
Beatrice/Scotland – a major step for development of offshore wind in Europe (2006)



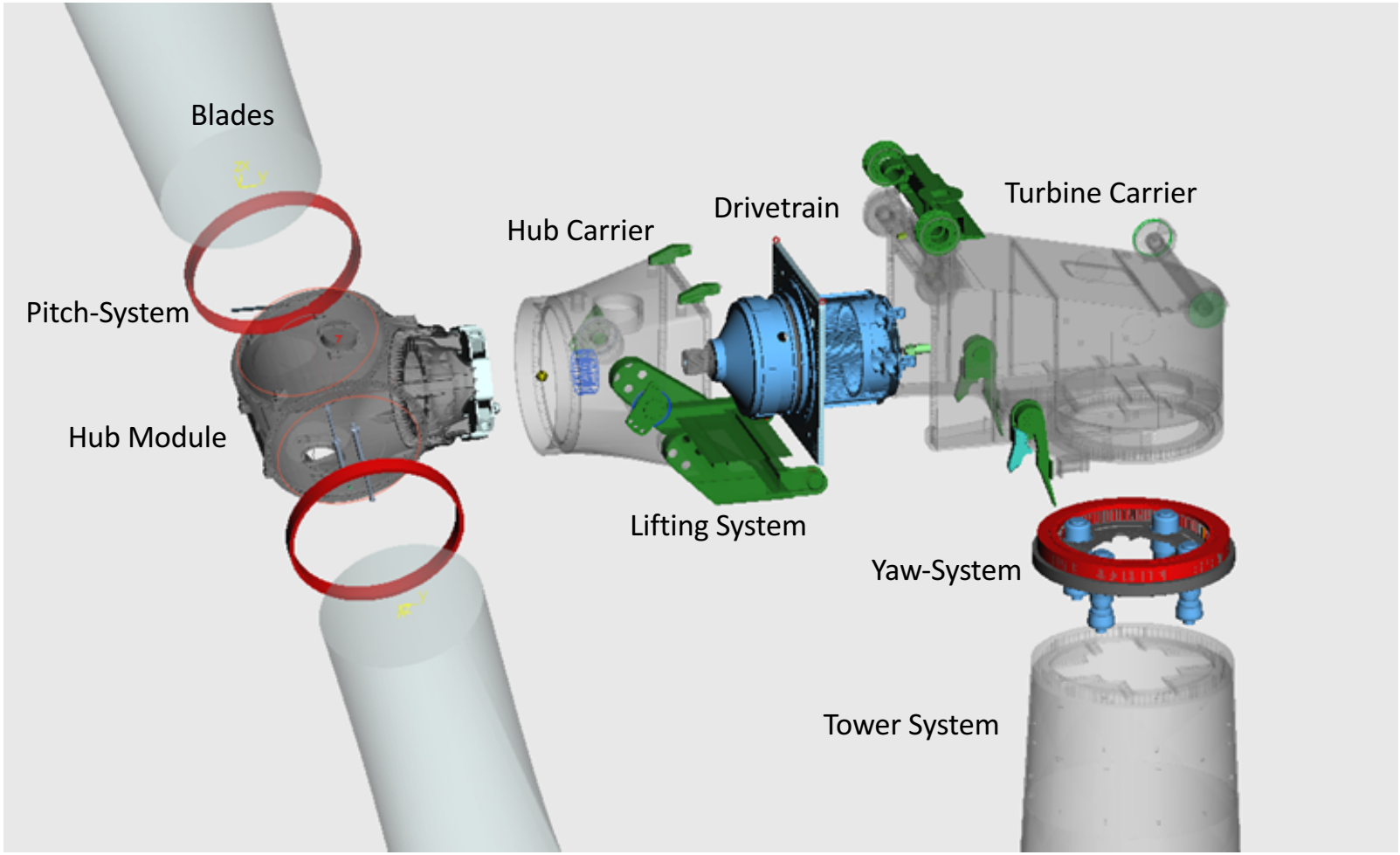


A break through for offshore wind
Ceremony at Burntisland/Scotland

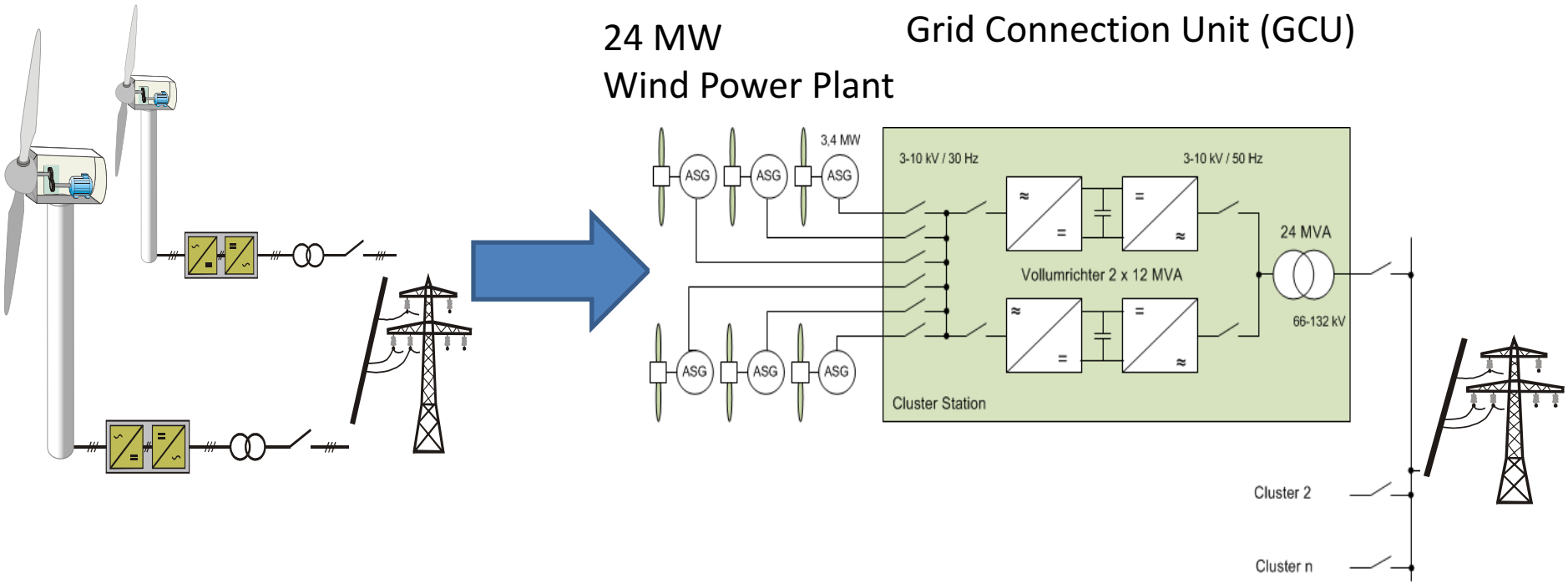
Conventional Wind Turbine



SkyWind turbine
Built in separate modules



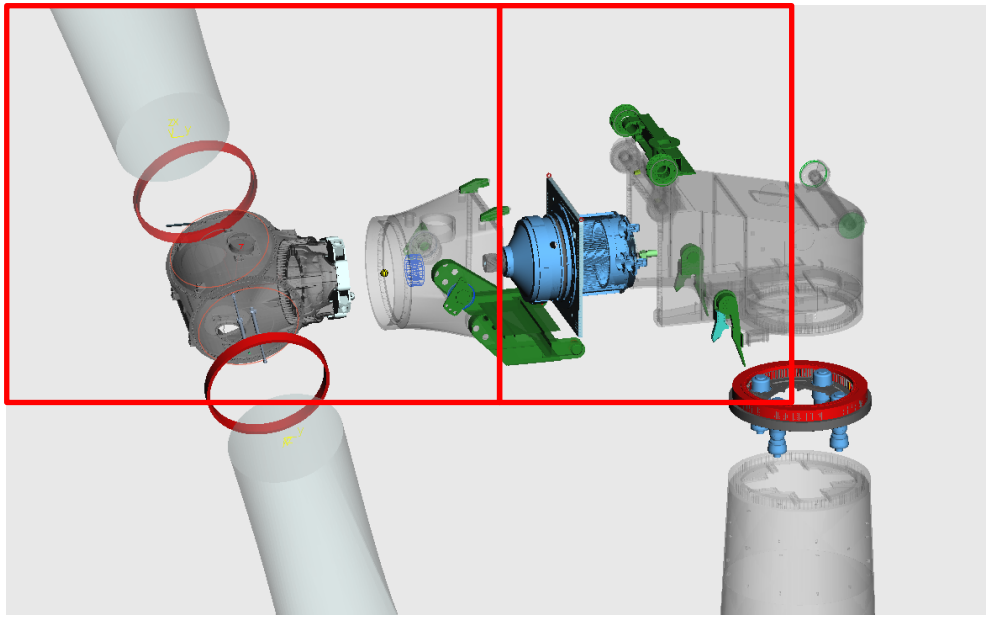
Wind Power Plant



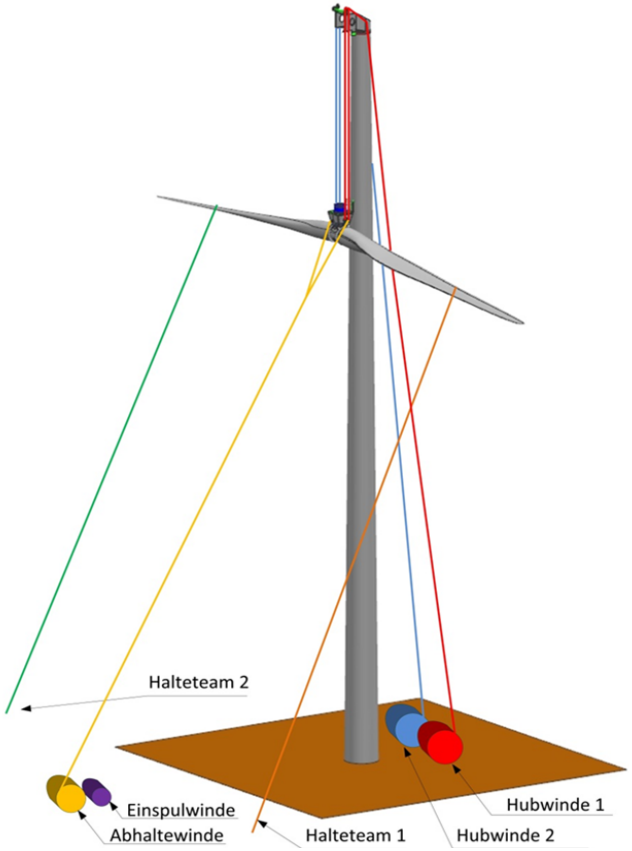
Installation without crane

„Turbine“

Turbine Carrier
with lifting support

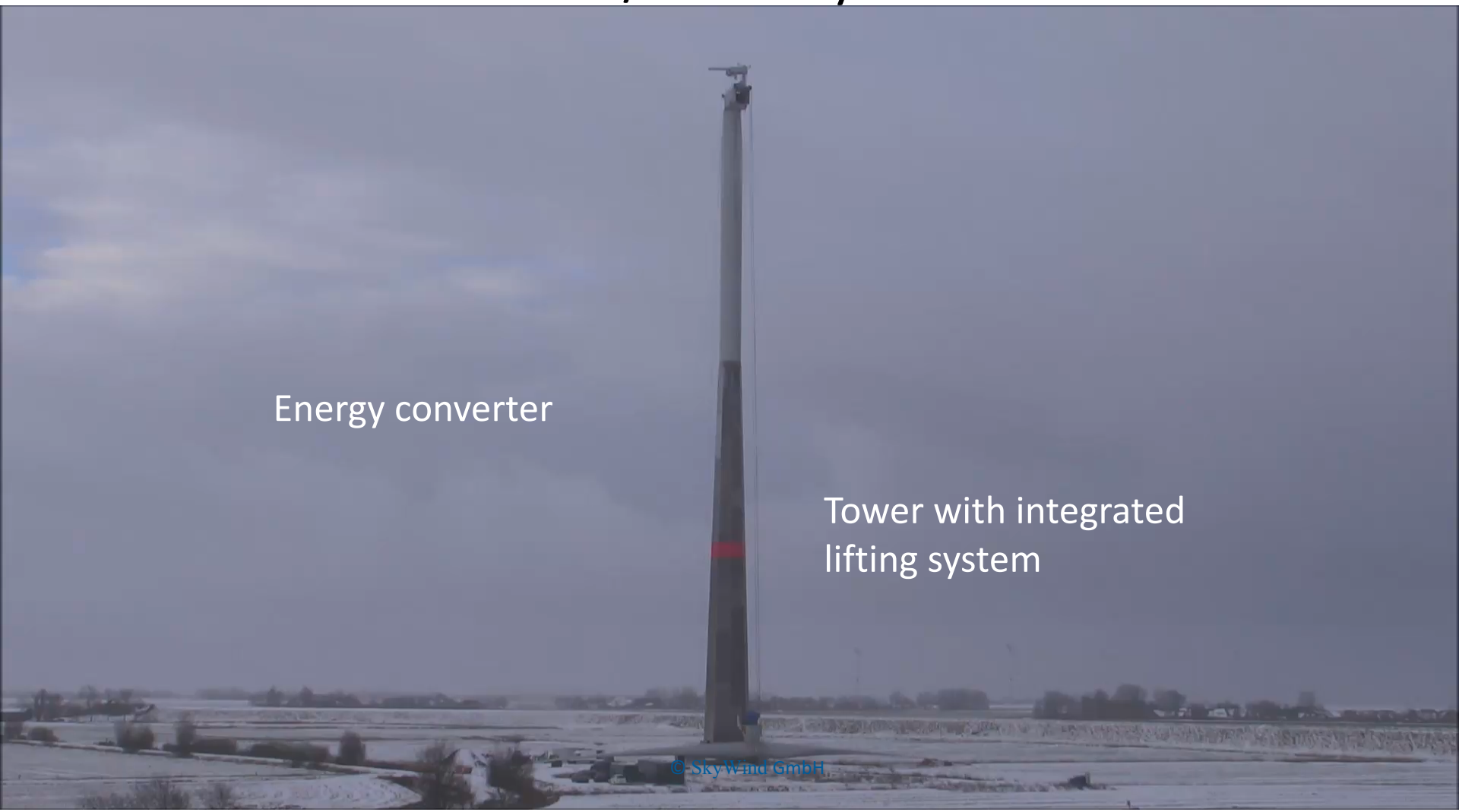


„Craneless“ Lifting

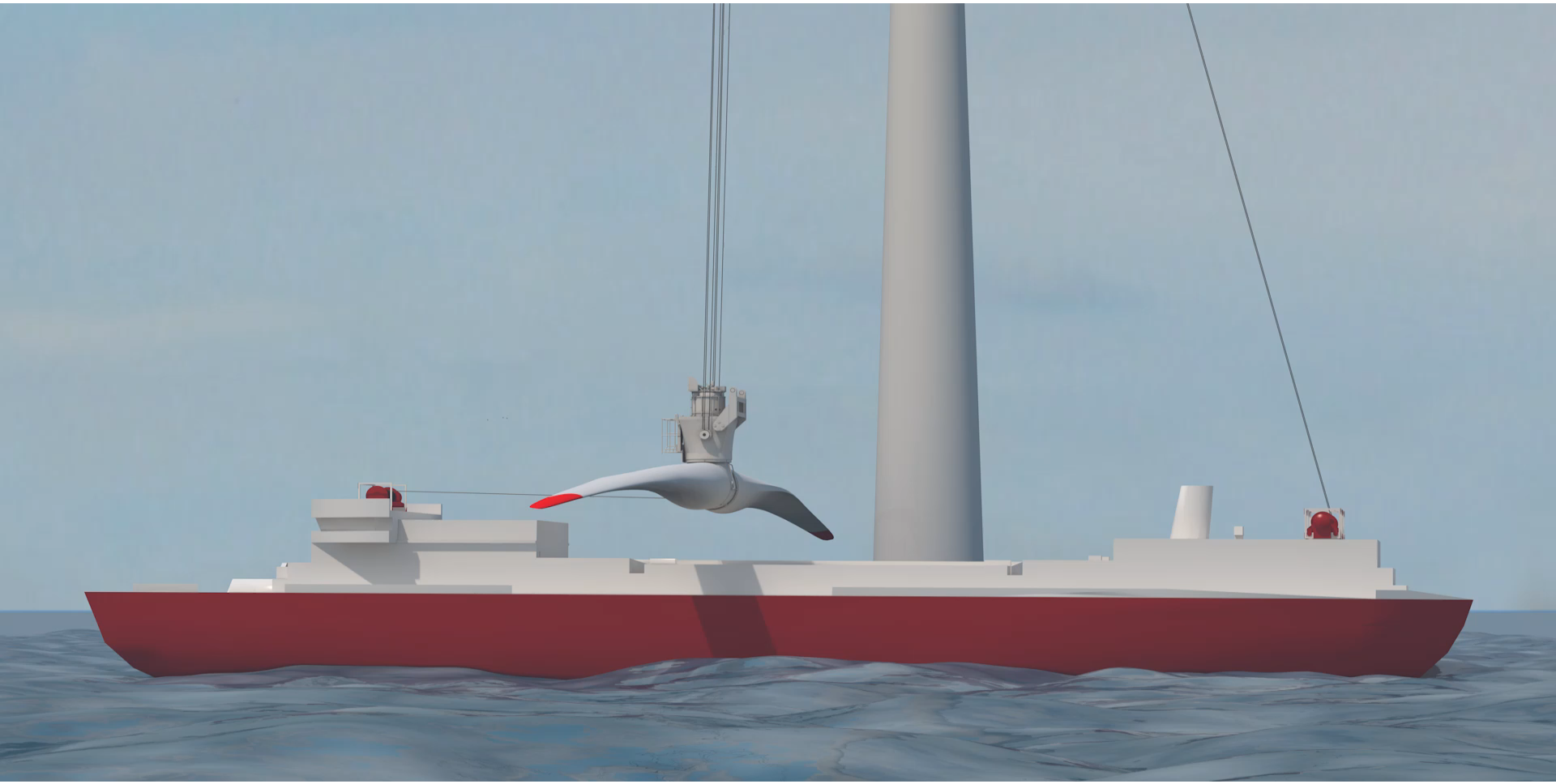


Demonstration plant

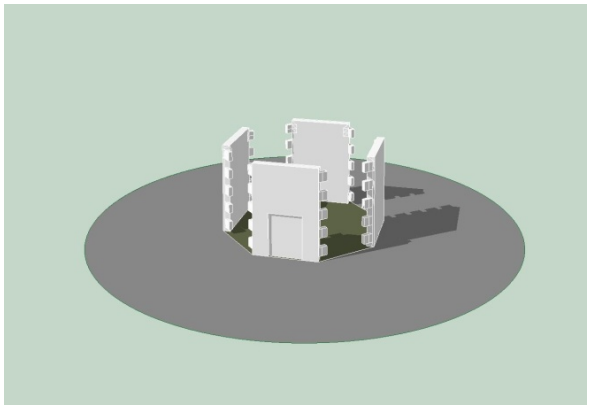
Husum/Germany 2015

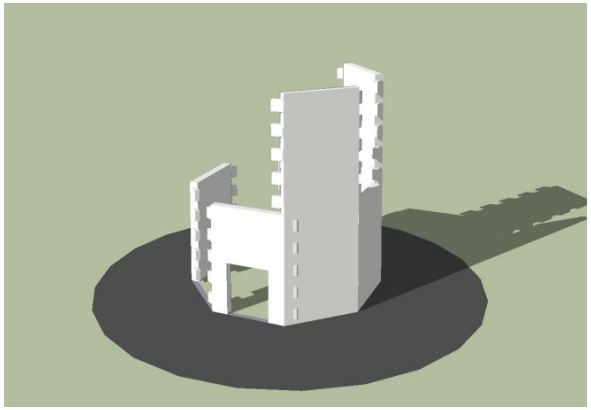


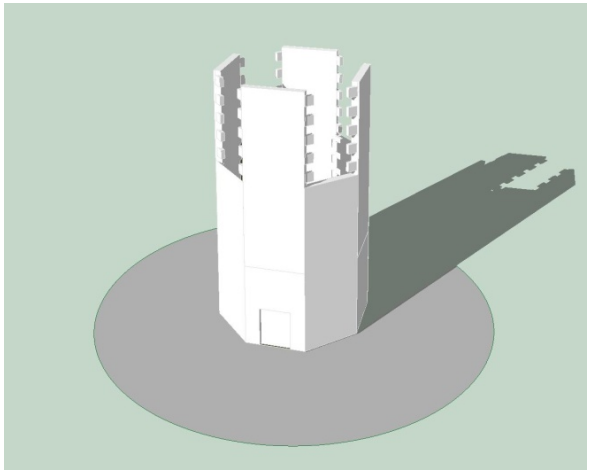
Next step: Offshore installation

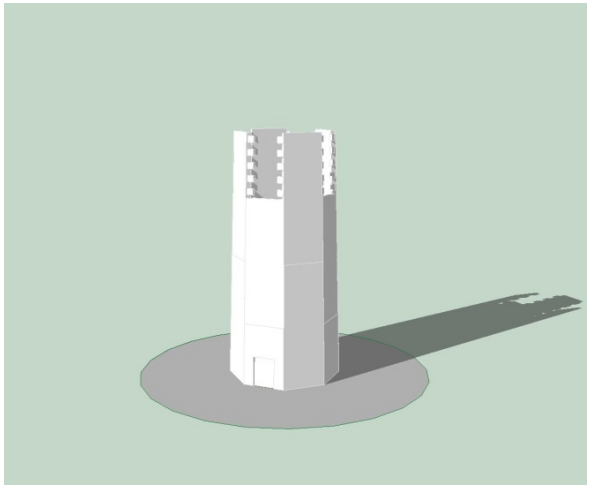


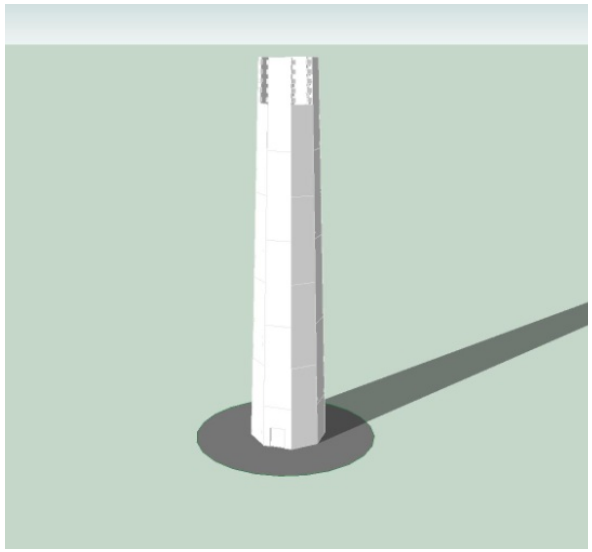
Onshore tower- also without major crane?

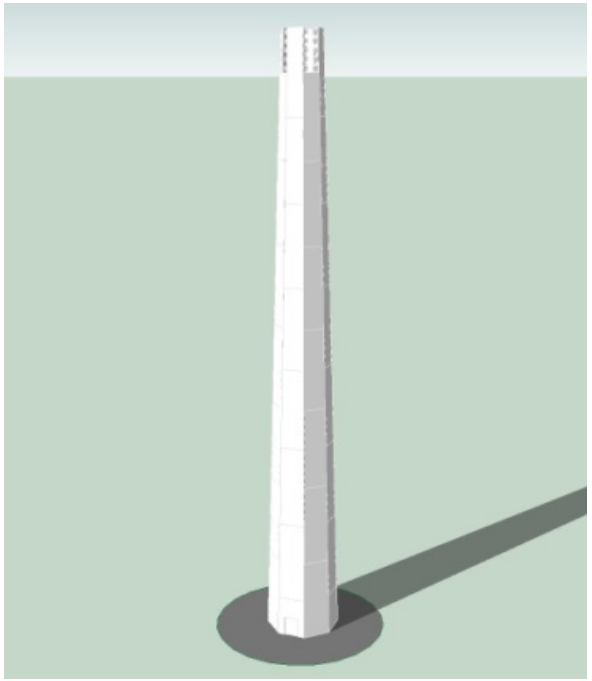






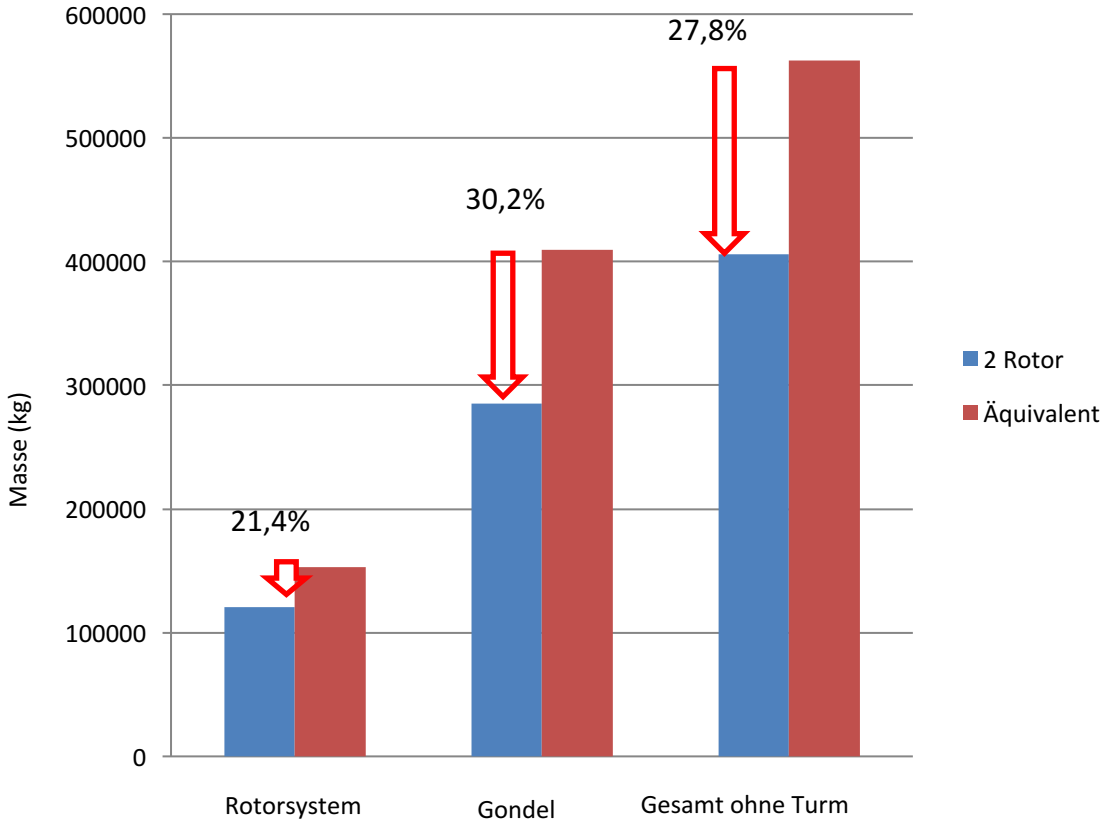






Mass- and Cost Potential

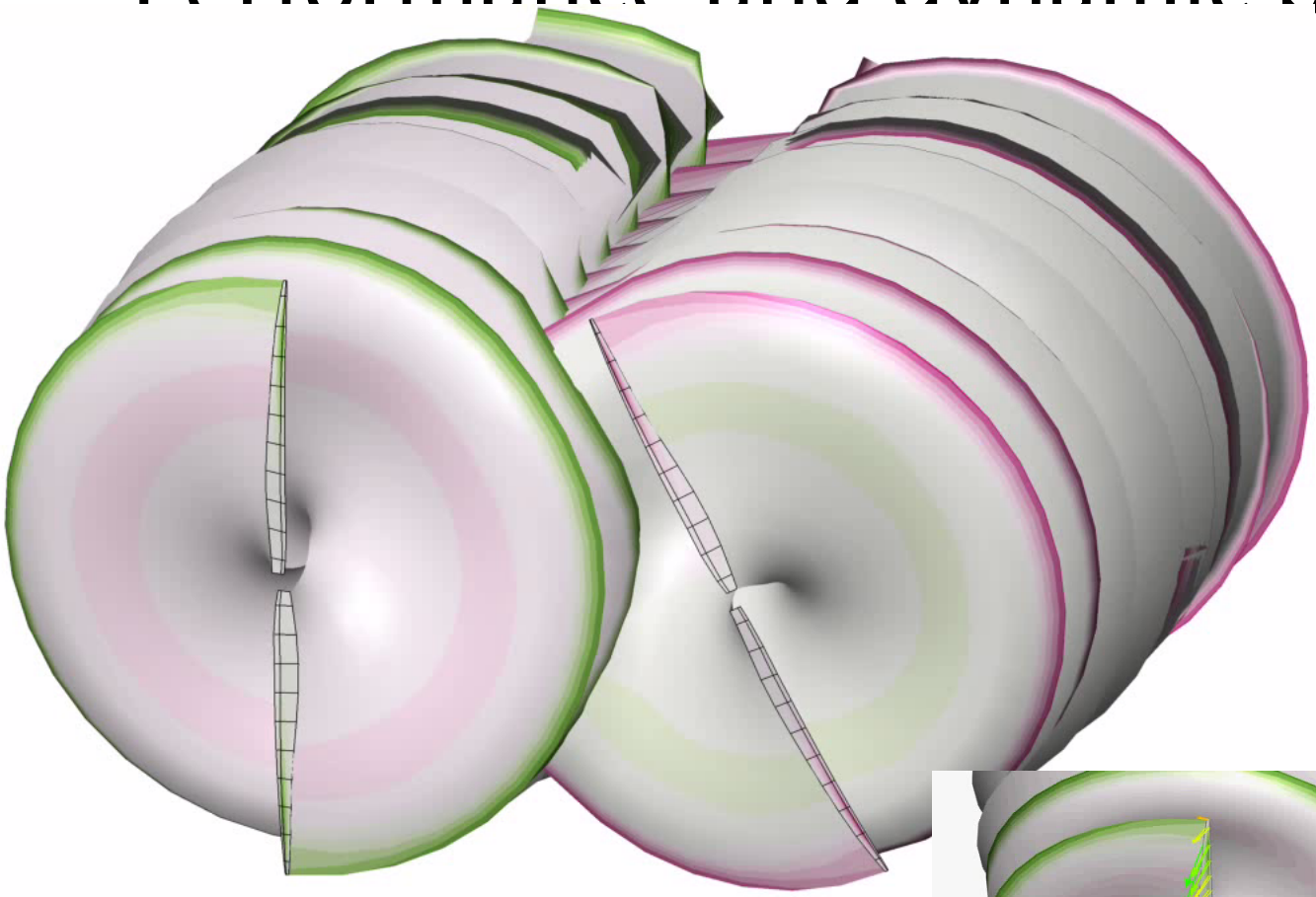
According to WindPACT und Jamieson

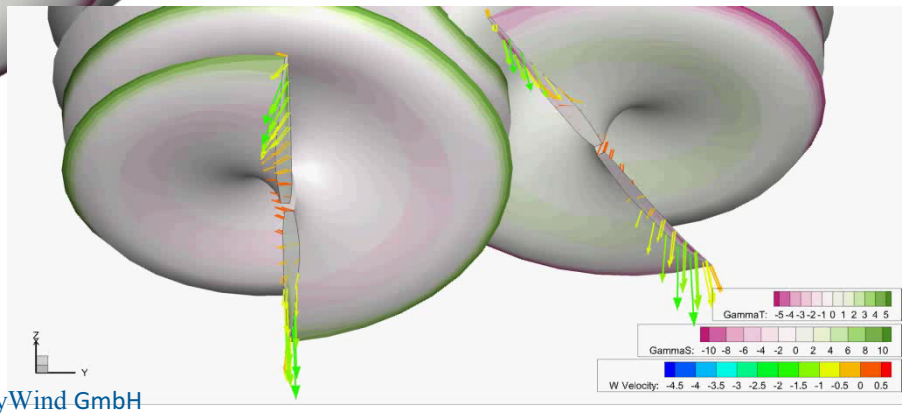



SkyWind
SkyWind

MW TwinRotor

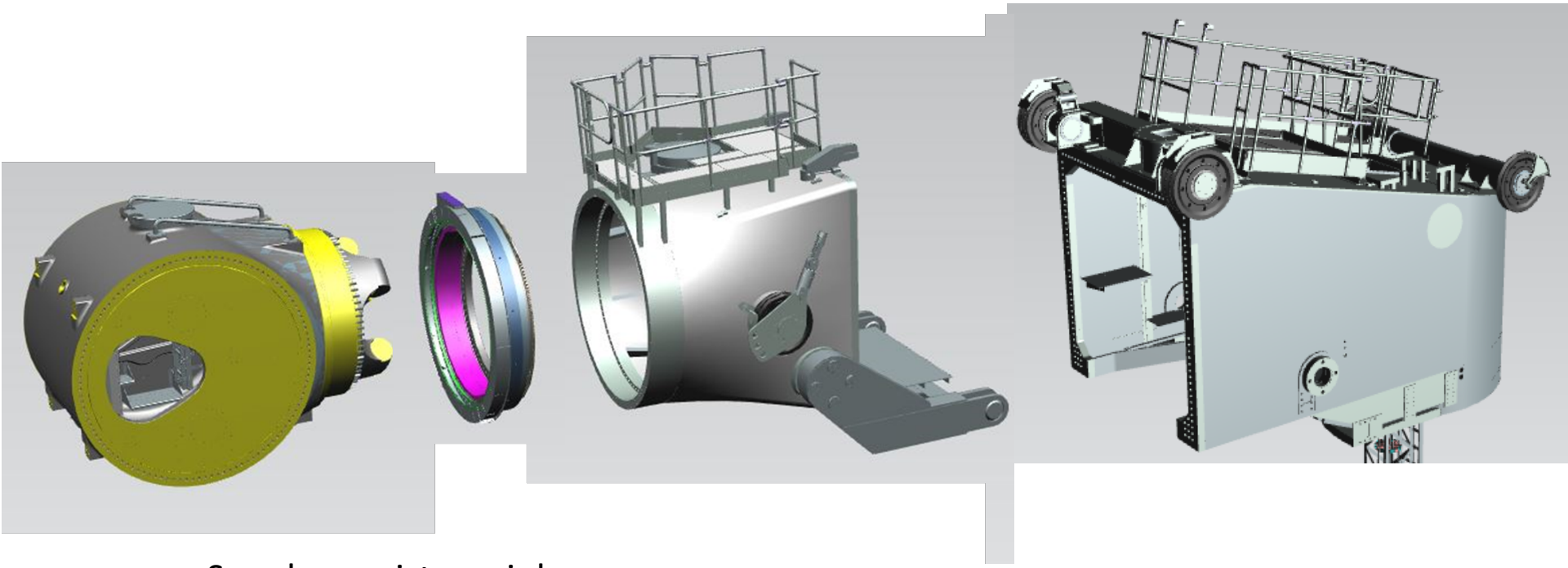
Performance and dynamic behaviour





DLR

Modules fabricated in Norway?

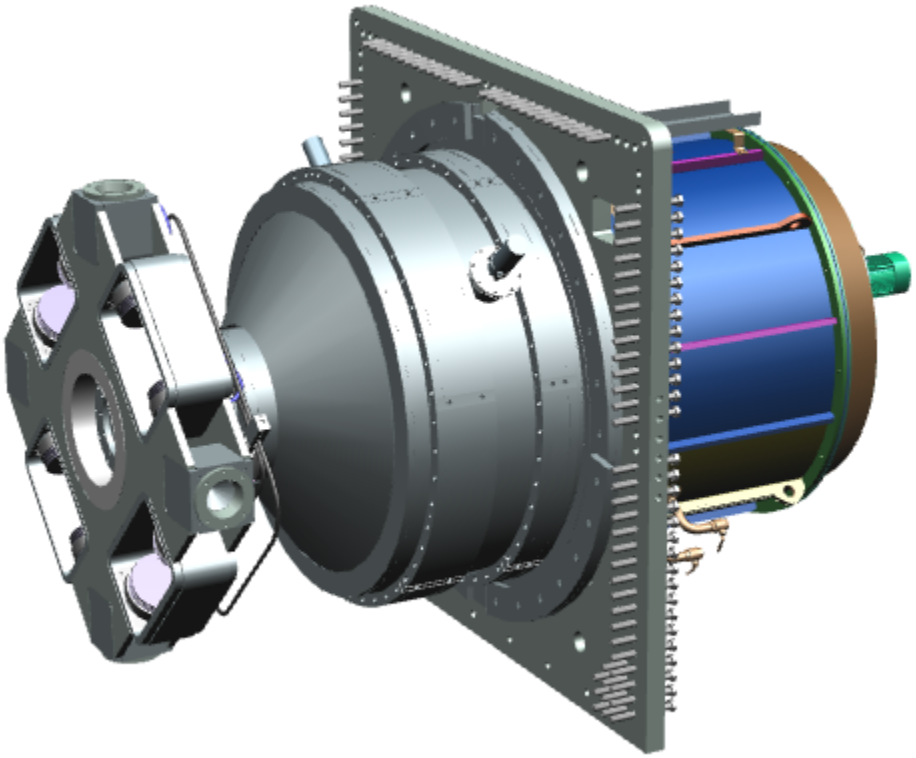


Supply consists mainly:

- (Cast iron) Hub
- Rotorbearing
- Hub Carrier (welded steel construction)
- Turbine Carrier (welded steel construction)
- Lifting system (welded steel construction)
- Handrail / deck
- Board crane (not shown)

Rotorblade

Drive Train



Supply consists mainly:

- Gearbox

2-stage planetary gearbox, ratio 1/30.8, 525 max rpm, 3 MN max torque, dry sump lubrication

- Generator

Squirrel cage induction generator, 3.5 MW nominal power, medium voltage (3.3 kV) ,8 pole, 0- 530 rpm, freq. 0 - 35 Hz,watercooled, IP 54/55

- LSS

4 to, Welded steel structure, transfers the rotor torque to the gearbox shaft

- AST

8 to, steel plate

Thank you