The NEMOS Power Take-Off System: Status Report And Outlook

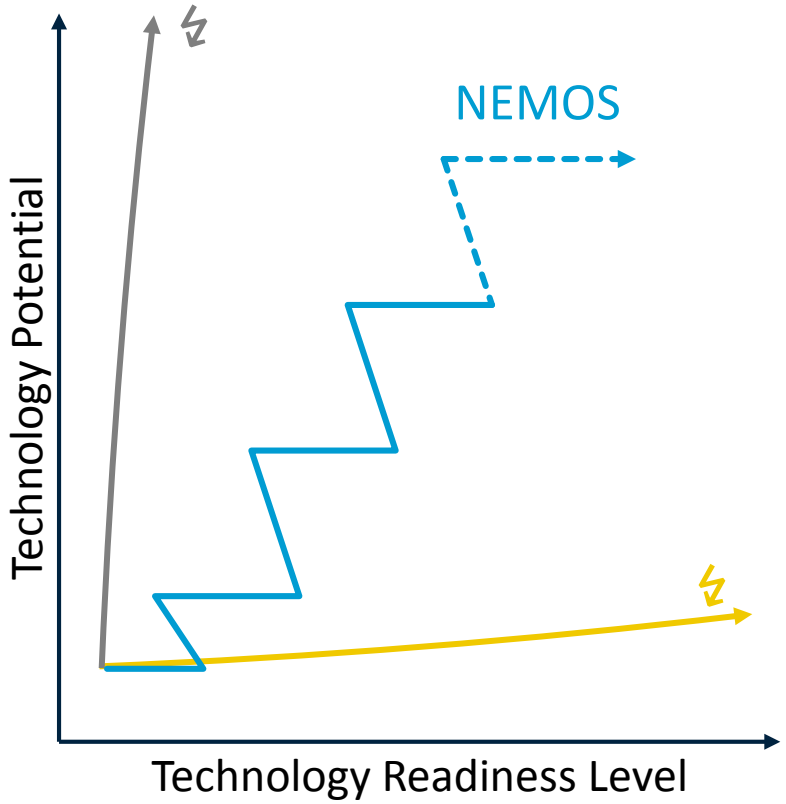
NEMOS

ENGINEERING INNOVATIONS
DRIVEN BY THE CHALLENGE OF WAVES

Wave Power Take-Off: Have We Cracked It?

→ Not Yet!

The NEMOS Development Approach



- Always look for conceptual improvements
- Stepwise improve the TRL to identify new potentials
- Don´t hesitate do take a step back in order to reach a higher performance level

The NEMOS Development Track

Since 2010

Extensive tank tests

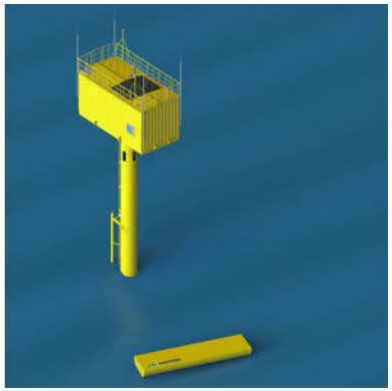
2013-2017

Four years of scaled sea trials

2016-2017

400 kW PTO system tests

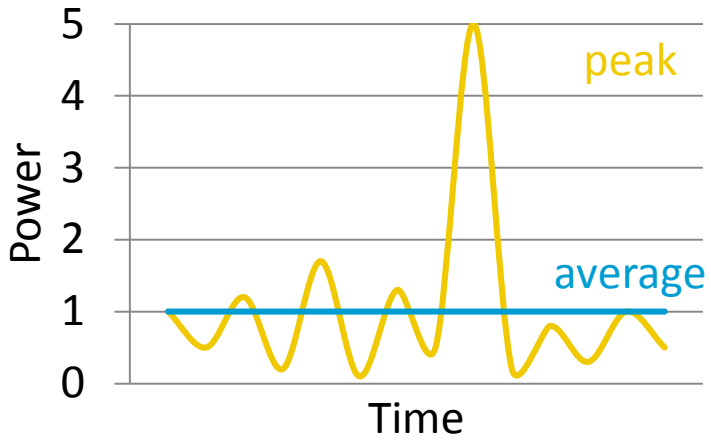
Next steps



North Sea prototype installation

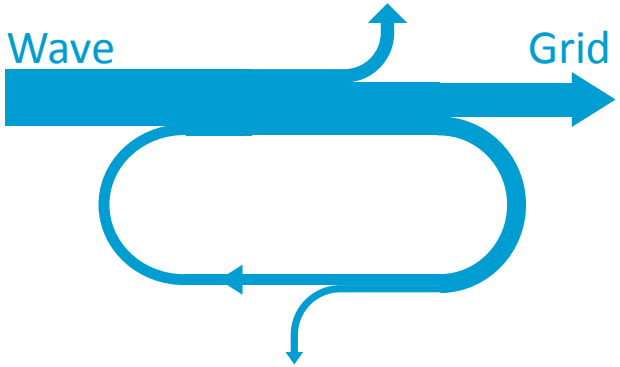
General Challenges

Short term power variations



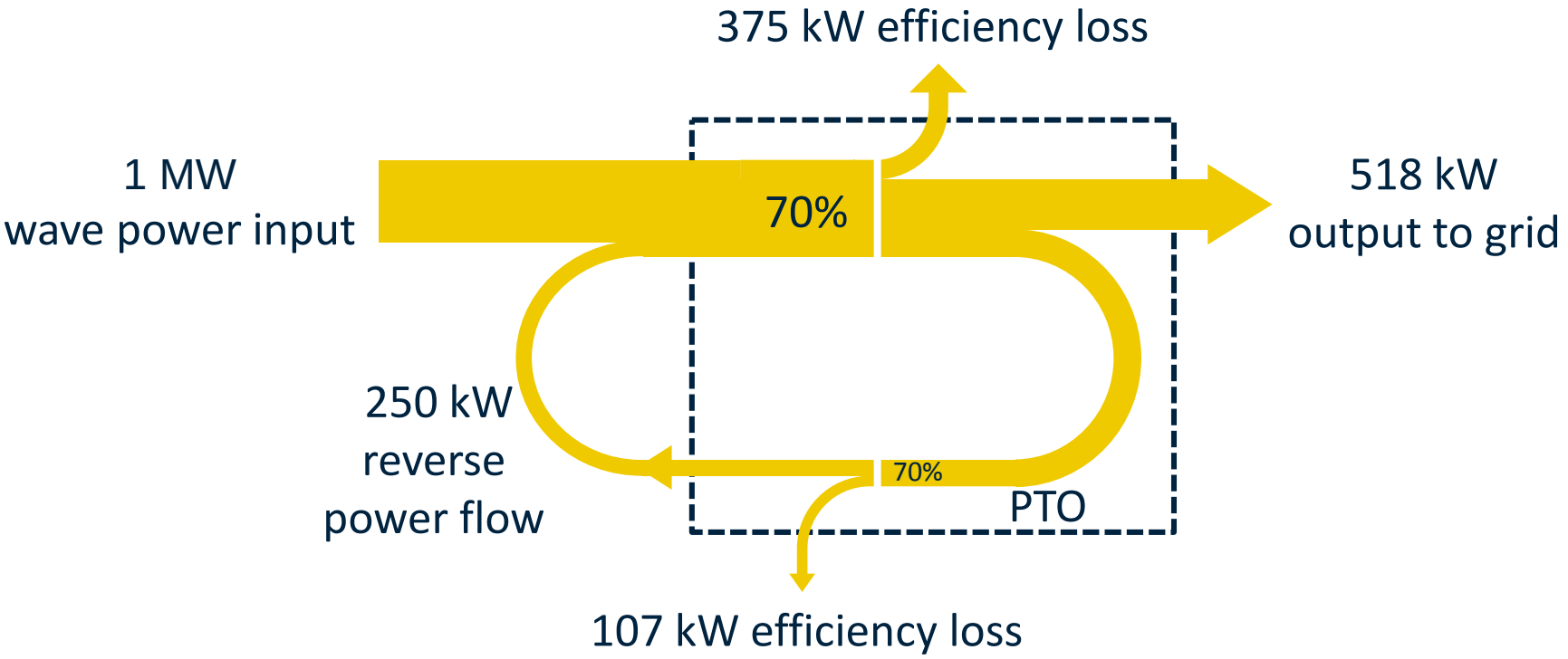
- energy output ≙ average output
- costs ≙ peak power

Reactive power



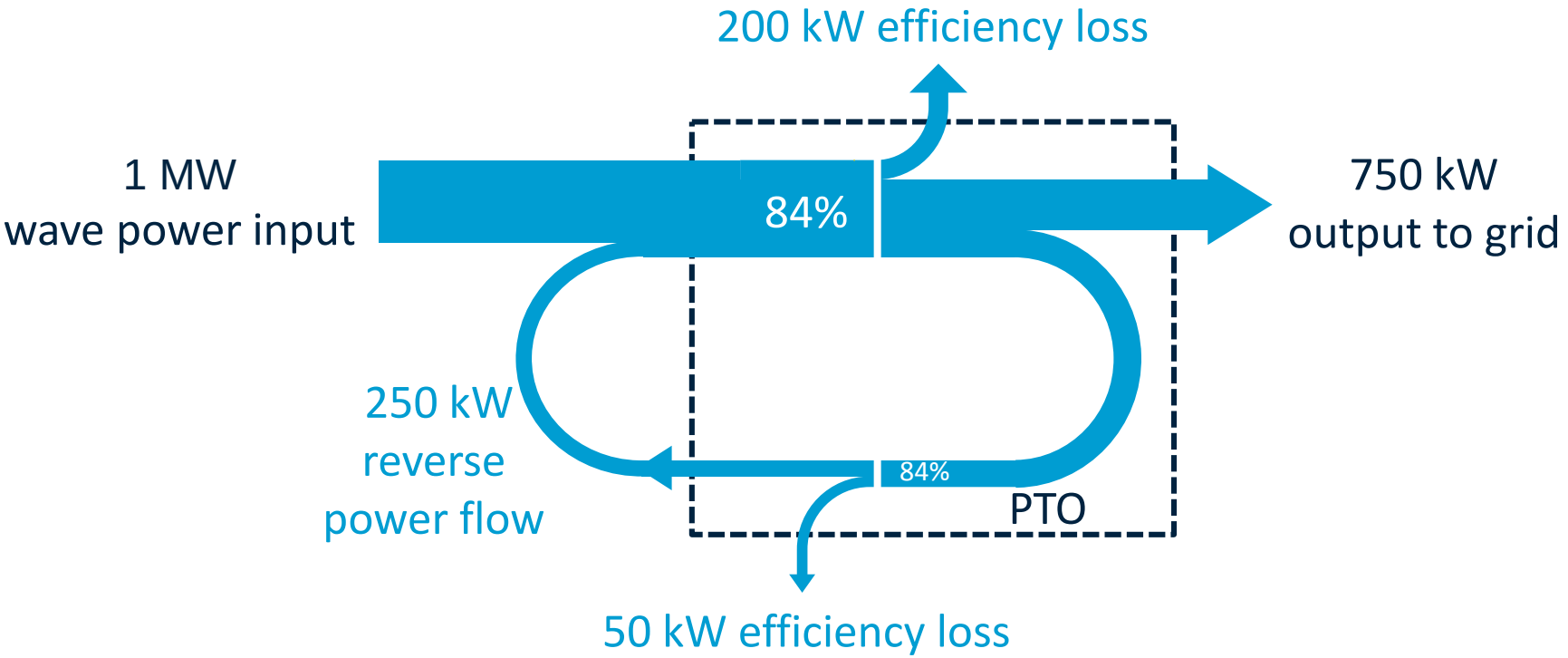
- WECs require reactive power for hydrodynamic efficiency
- Reverse power amplifies efficiency losses

Reactive Power Amplification Effects: Example

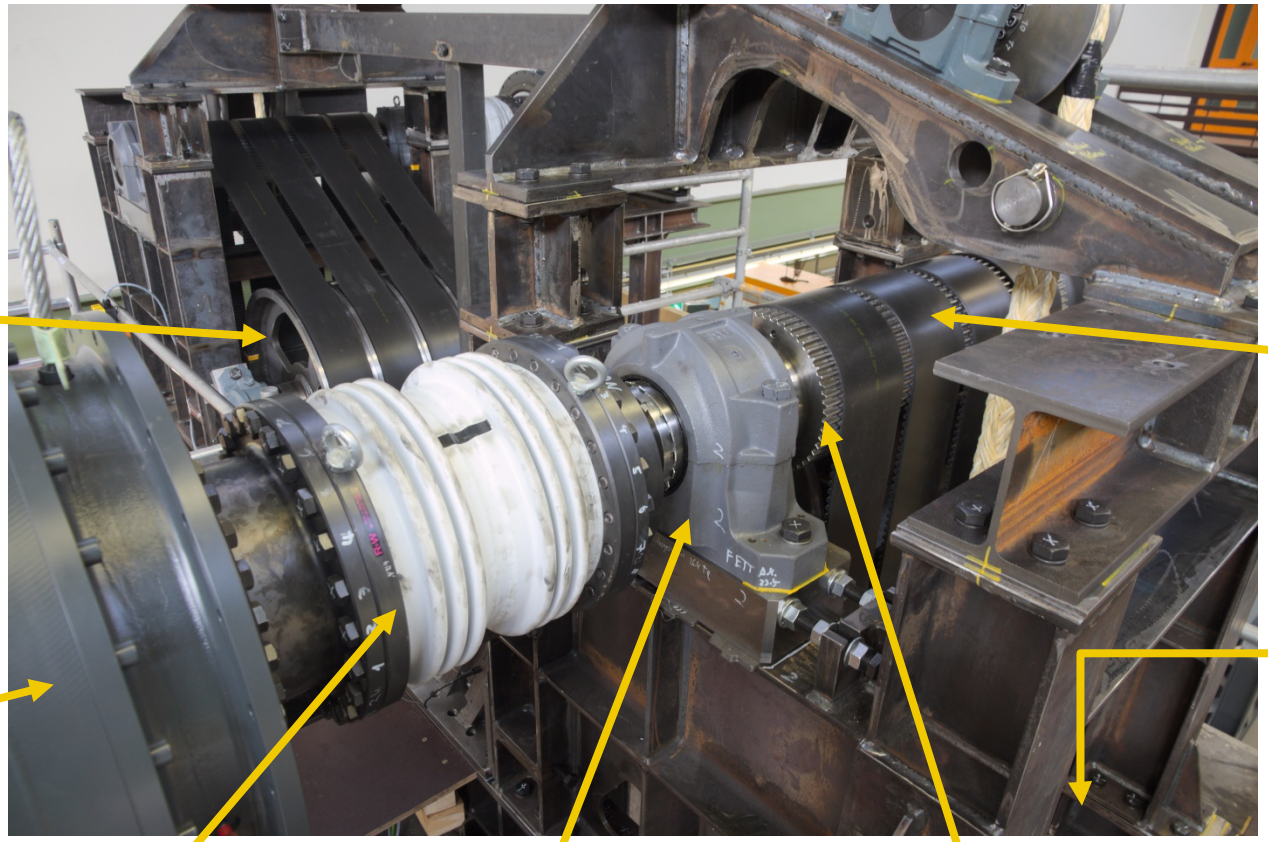


- Efficiency losses count “twice” → High efficiency is required
- Limited efficiencies of available components require innovative solutions

Reactive Power Amplification Effects: NEMOS PTO

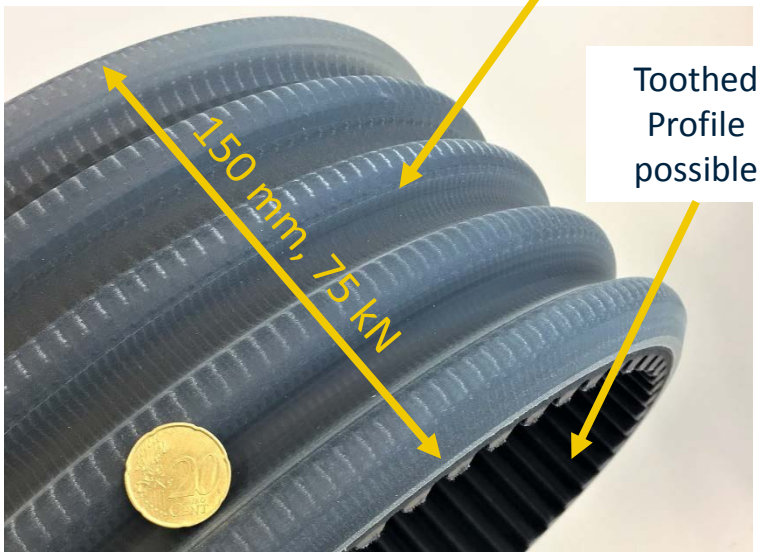


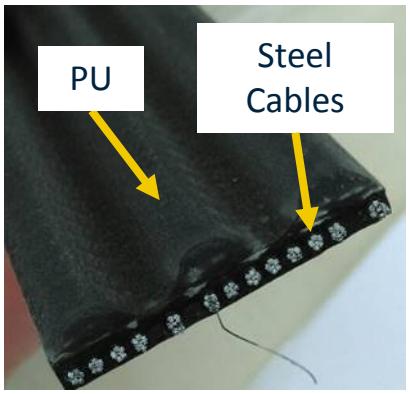
Innovative PTO Components
For High Efficiency And Durability

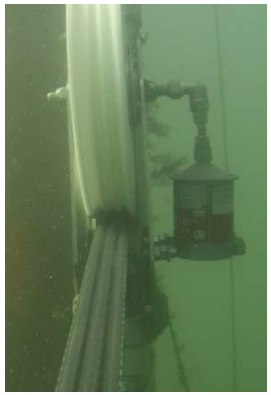


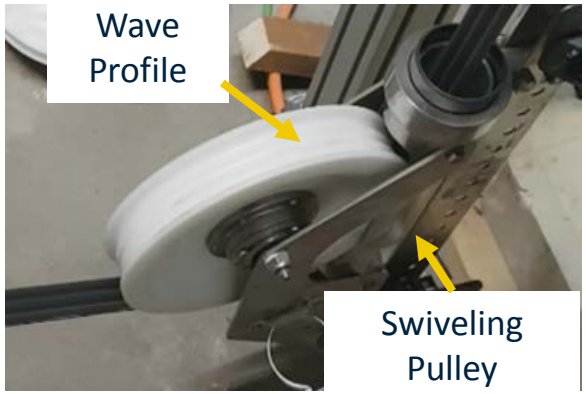
The NEMOS Wave Belt

- Efficient and durable power transmission
- Reliable positioning due to patented profile
- small bending radii possible
  → gear ratio reduces generator torque
- Proven in long term tests





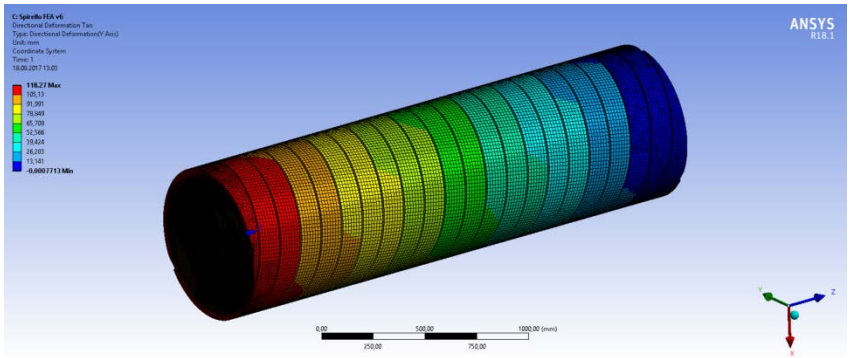




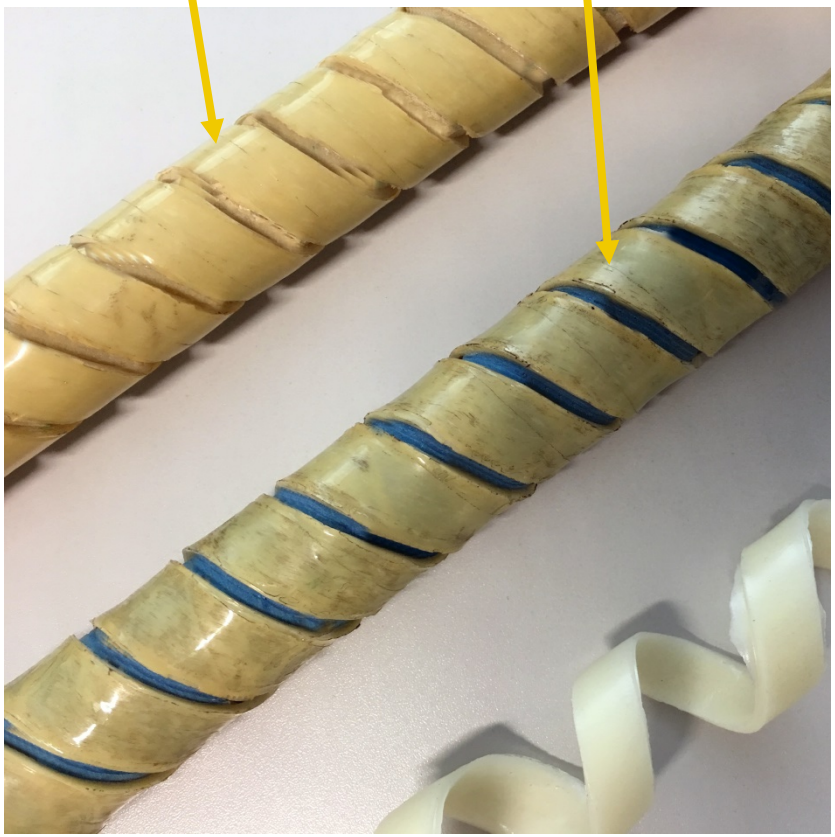
Development of a Novel Floater to Power Take-Off Connection for Wave Energy Converters Based on a Belt-Pulley System. *International Conference on Offshore Mechanics and Arctic Engineering, Volume 10: Ocean Renewable Energy* ***doi:10.1115/OMAE2017-62589***

Mechanical Spring

- Balancing system with 99% efficiency
- Lightweight due to composite technology
- Highly adaptive since geometry and material properties are adjustable
- Low cost level



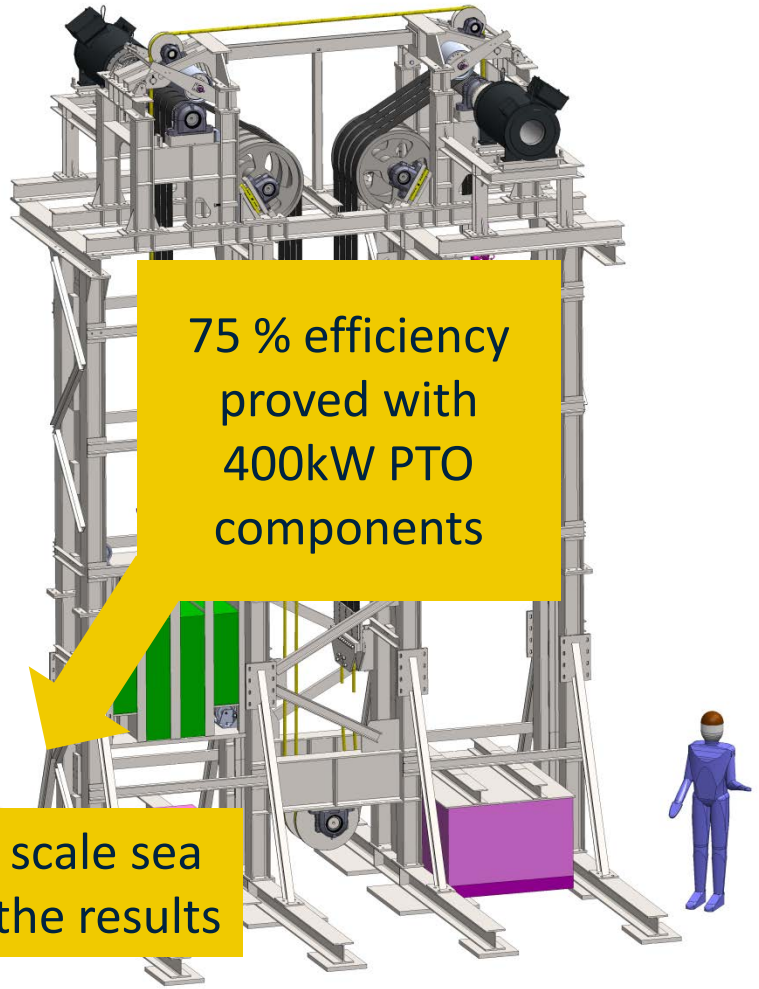
FEA geometry and material optimization



Design test specimen

PTO System Optimization: Off- and Onshore Test Benches

6 months fully automated operation with remote monitoring



75 % efficiency proved with 400kW PTO components

Next Step: large scale sea trial to combine the results

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