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Projekt Transitioning to Low Carbon Sea Transport:

Technische Projektumsetzung für Segelfahrzeuge in der Berufsschifffahrt

Siegfried Wagner (M.Sc.)

Sascha Strasser (B.Sc.)

Thomas Peetz (M.Sc.)

Prof. Kapt. Michael Vahs

Structure

- Project overview
- Needs analysis
- R&D studies for new ship
- Vessel design
- Building process
- Next steps & Outlook

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Low Carbon Sea Transport – International Climate Initiative (IKI) Marshall Islands (BMUV/GIZ)

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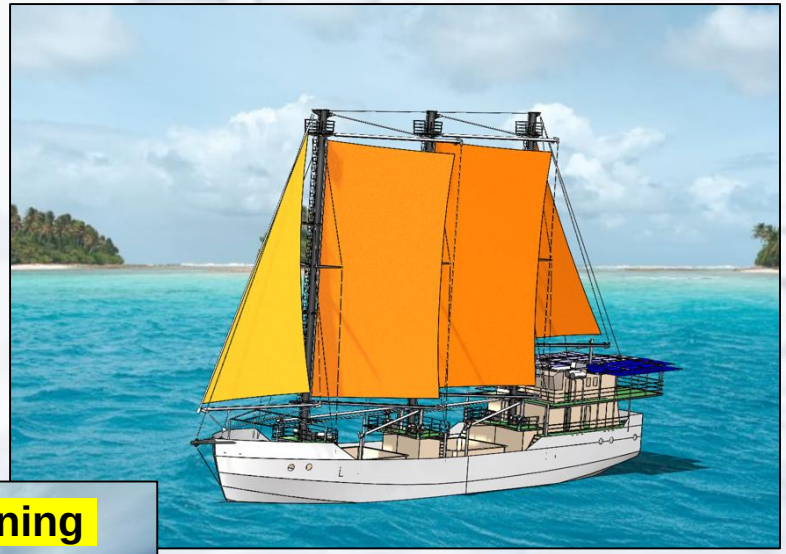
Inside Lagoon Transport

Inter Atoll Transport

Innovative Pacific Island Supply Ship
Innovative Propulsion Concepts: Emission Saving Potential up to 80 % compared to engine driven Vessel + Training Platform



High-Level Policy Support

Strengthen RMI's role within the Pacific as leader in high-level international climate change fora, including the IMO and UNFCCC through capacity development.

Sustainable Shipping Training Center

Maritime Training for College Graduates

Provision of a National Maritime Transport Roadmap in alingment with RMI´s 2050 "Tile Til Eo" Strategy (net zero emissions by 2050)

Structured Approach to Carbon Reduction Goals

HEL responsible for **technical coordination**, technical and operational studies and training

Analysis
- Transport task
- Trading area

Options Catalogue
- Operational measures
- Refit of existing fleet
- Design of new ship

Decision for Newbuild
- Large savings potential
- Manageable risk
- Good project control

Design / Studies / F&E
- Basis: Concept design
- Aero – and hydrodynamic
- Op. concept

Tender process Design
- Applicable rules
- Spec + GA development
- Prel. Stability

Analysis - Trading Area Marshall Islands

- Very remote trading area
- Mostly domestic routes
- International voyages necessary for dry-docking / special charters

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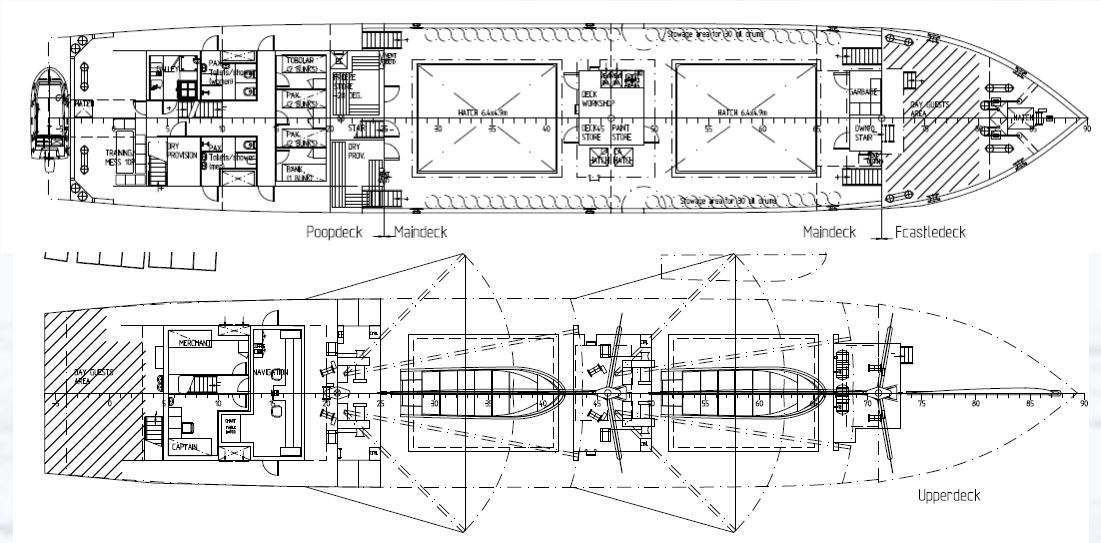
Analysis - RMI Domestic Shipping Operations

Cargo Operations

Result of Needs Analysis for new Vessel

- Low carbon operation
  - Large Wind Propulsion System
  - PV-system for aux. power
  - Propeller recuperation
  - Optimized hull



- Simple and robust design, easy to maintain
- Strong focus on safety
- Low cost for upscaling potential

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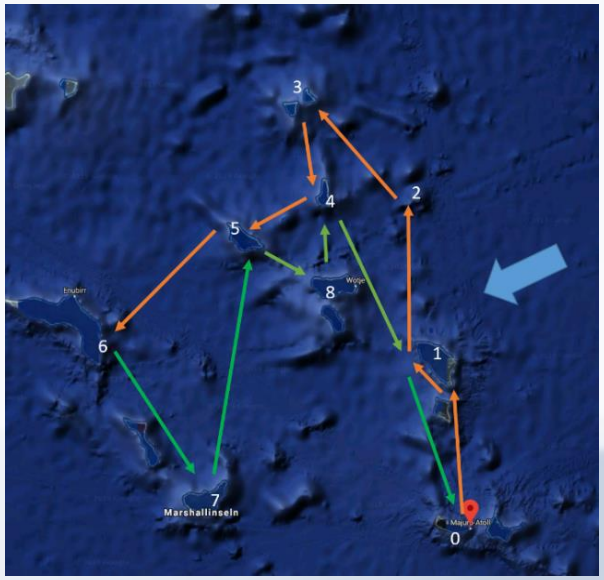
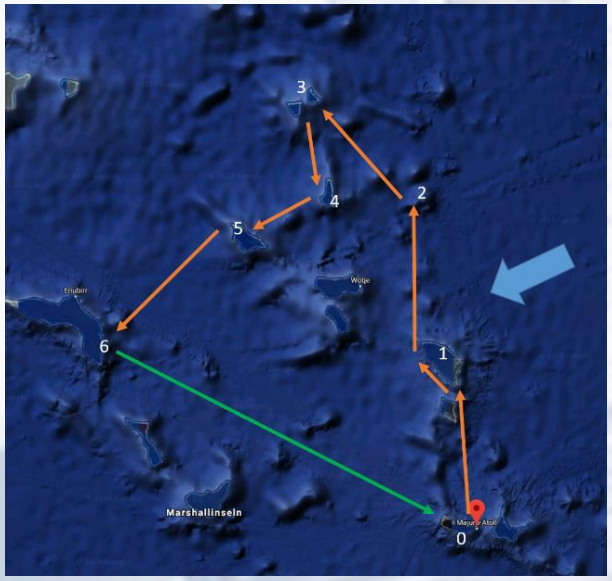
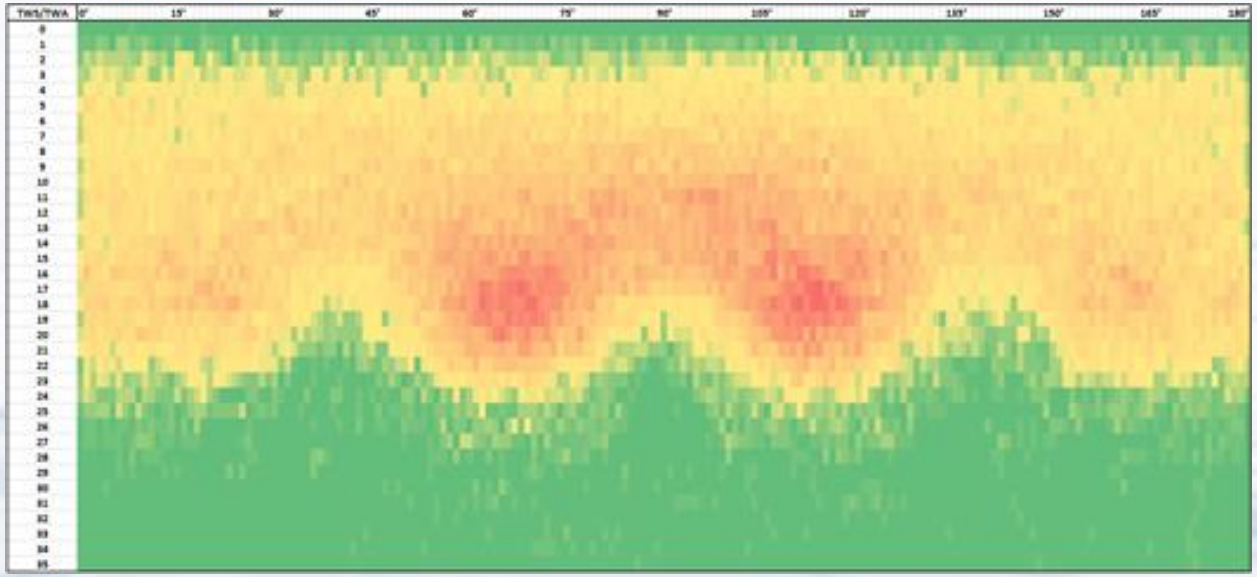
R&D - Low Carbon Ship – Performance

Optimize vessel-design based on the calculation of average fuel consumption, maximize benefit from WPS







Statistical approach:

- Create and compare route-specific wind probability matrices based on historical weather data
- Calculate average fuel consumption for 'specific route' by multiplying with vessel response matrix
- Optimize vessel design based on minimum fuel consumption
- Optimize trading routes to maximize fuel savings

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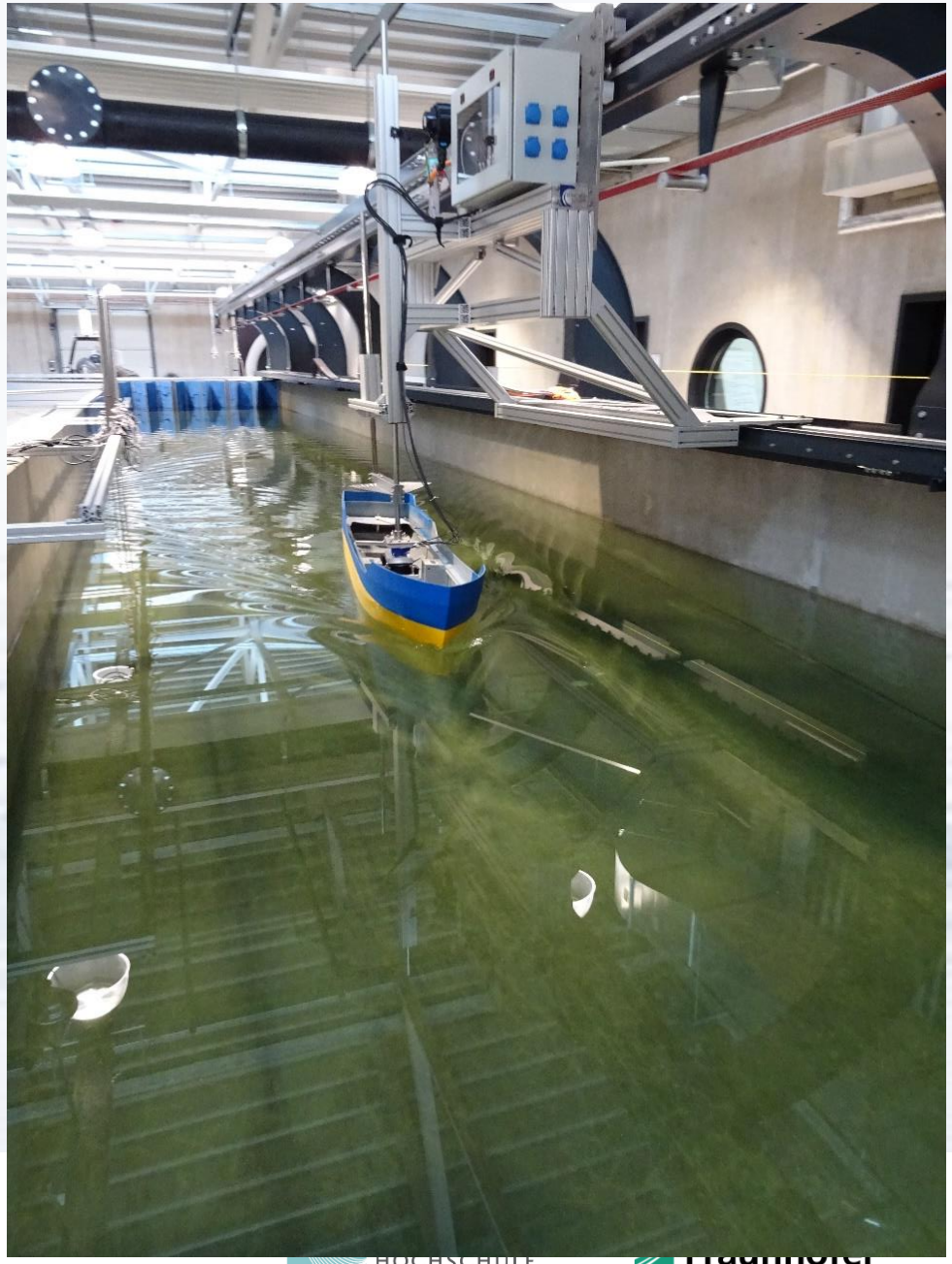
R&D Towing Tank Model Testing

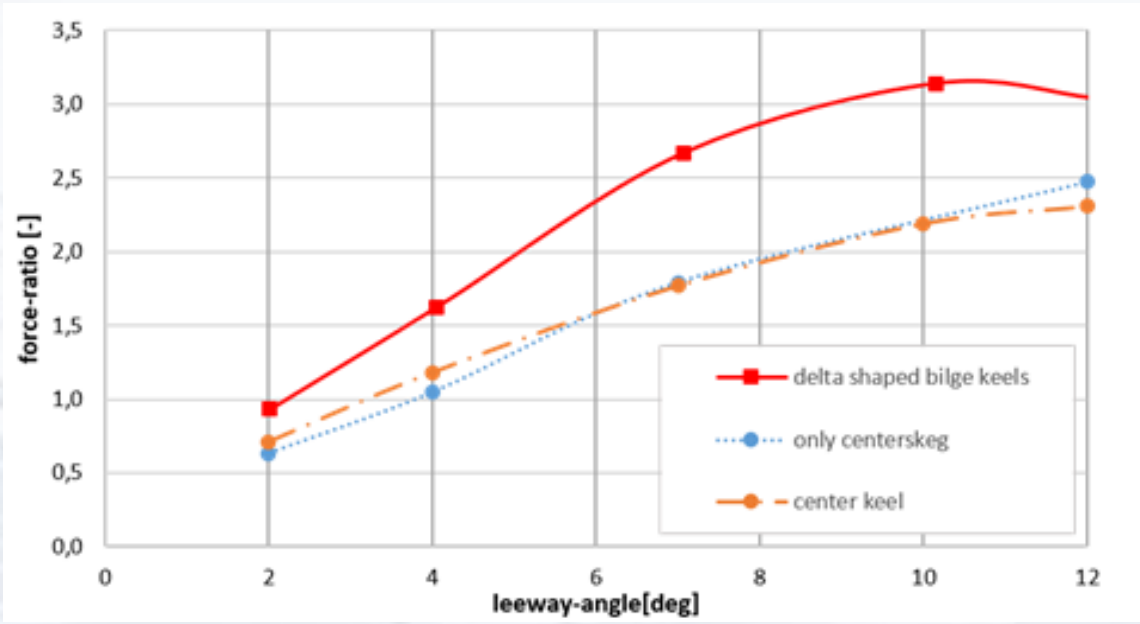
- **Various test series**
  - Investigate towing resistance
  - Testing series with varying leeway- and heel angle
  - Investigate and compare different keel layouts
  - Analyse rudder performance and hydrodynamic center of effort
  - Prepare data for performance prediction program (VPP/PPP) including wind/sea/hybrid-drive/recuperation



R&D - Low Carbon Ship - Recuperation

Technology research towards hull and keel system:

Towing-Tank – testing of different keel solutions at maritime lab at University of Applied Sciences Emden-Leer



Towing-Tank – compare results of different keel configurations

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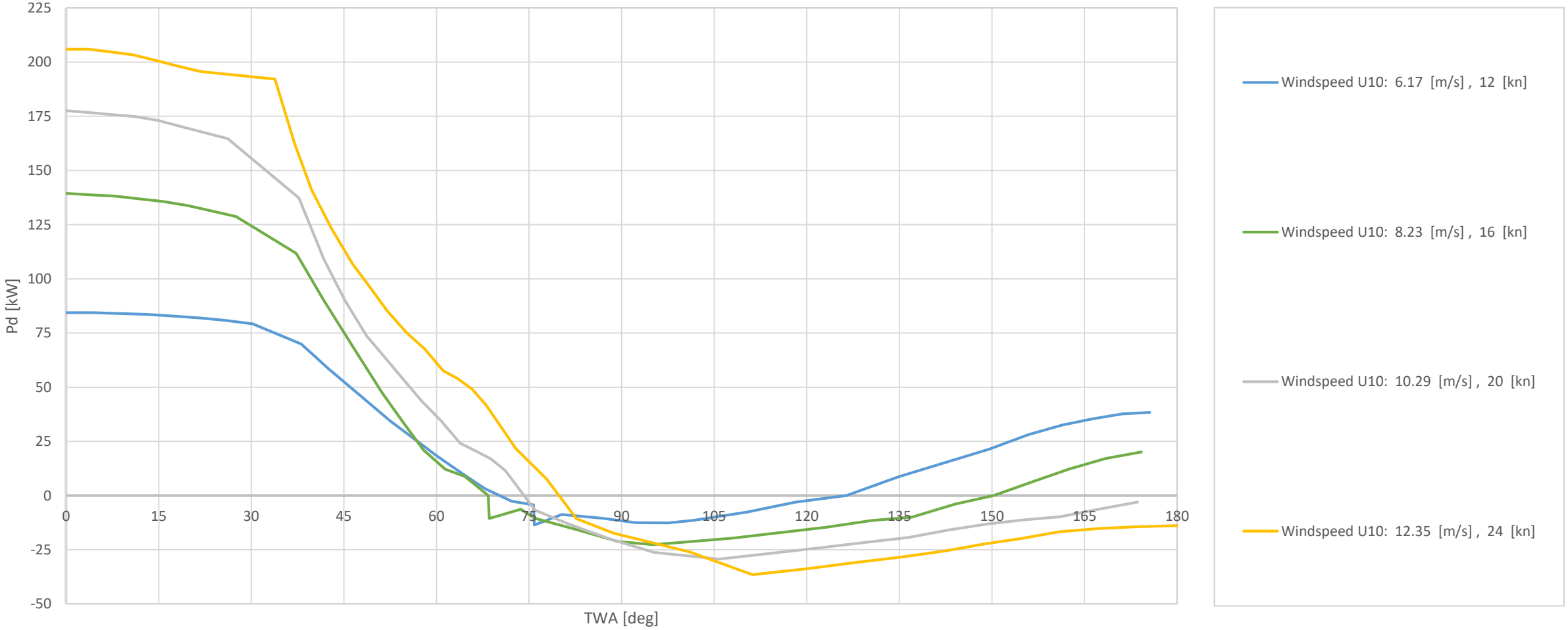
R&D – Recuperation Potential VPP/PPP

Delivered Power and Recuperation power in different wind conditions



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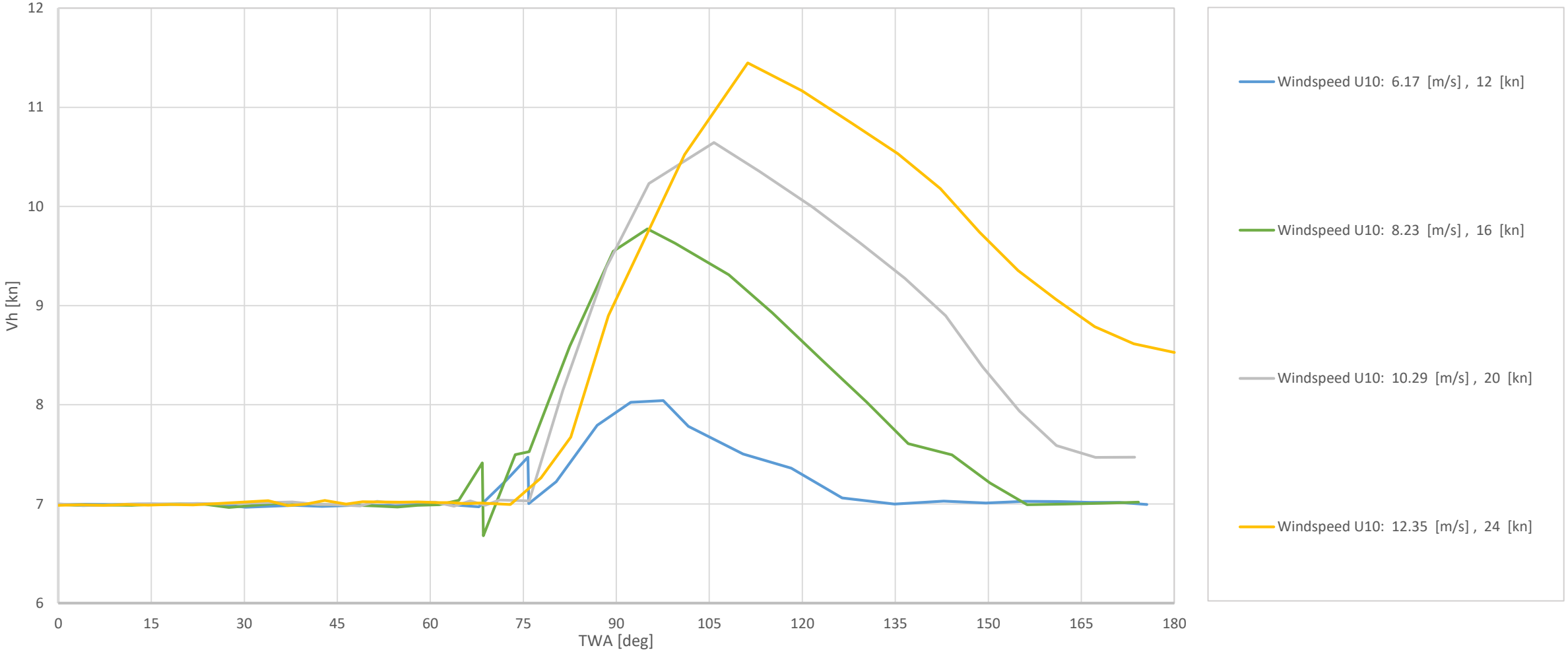
R&D – Performance Prediction VPP

Vessel speed in different wind conditions and angles sailed towards the wind (0° to 180°)



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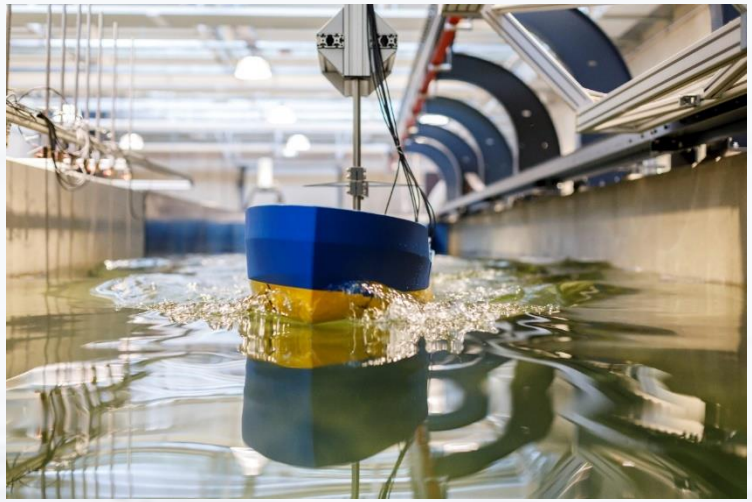
R&D – Performance Prediction VPP/PPP



Conclusions:

- Max vessel speed - engine plus sail: ~13kn
- Max vessel speed - sail system only: ~11kn
- Max recuperation power at sailing speed of ~11kn: ~37 kW
- Larger propeller diameter will increase recuperation potential
- Expected savings of up to 80 % average

R&D - Development of Ship Design

Main Particulars	
Length over all	approx. 48.00 m
Beam moulded	approx. 8.70 m
Draught	approx. 2.70 m
Gross Tonnage	approx. 455 GT
Deadweight	approx. 285 tdw

SDC
SHIP DESIGN & CONSULT

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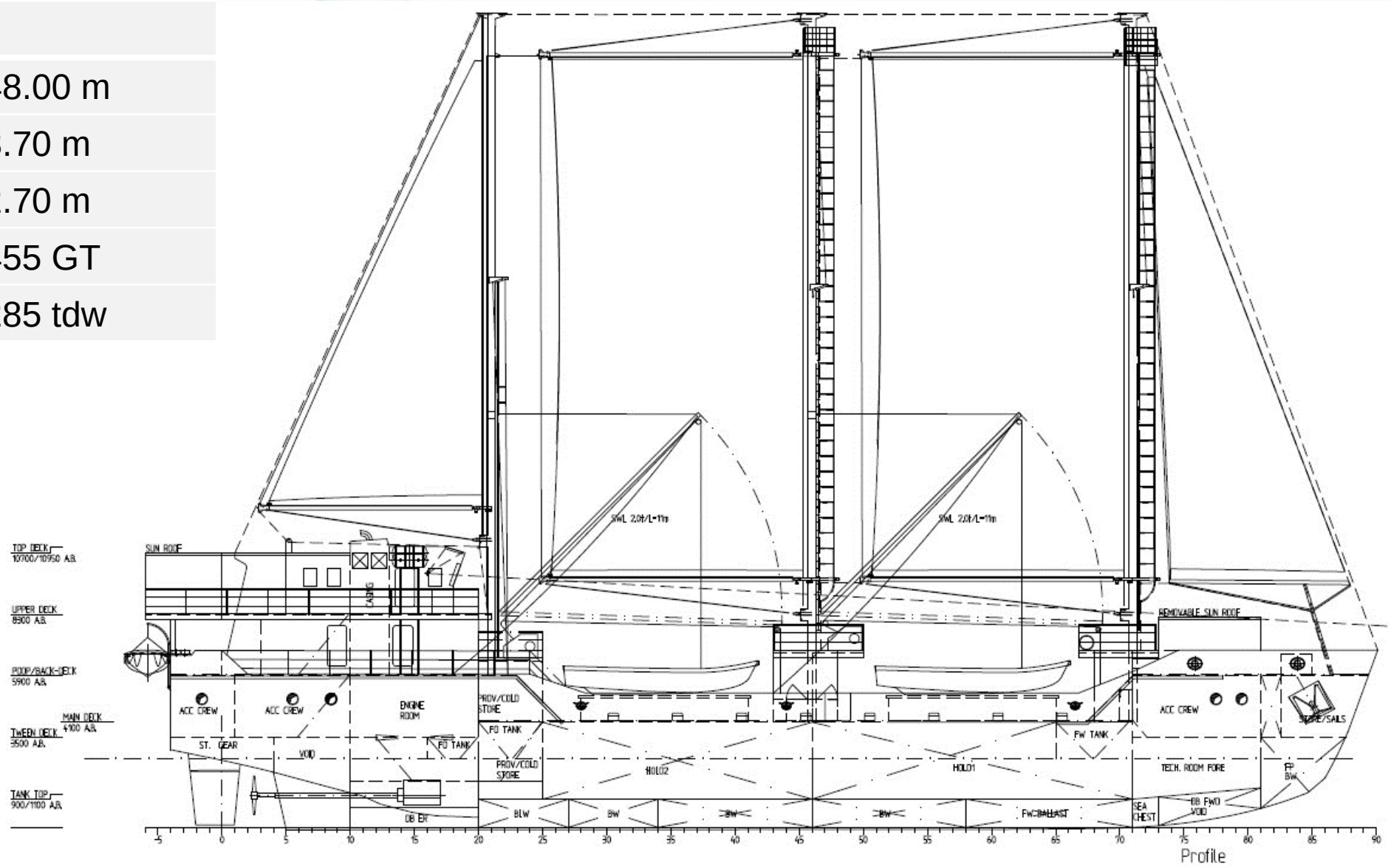
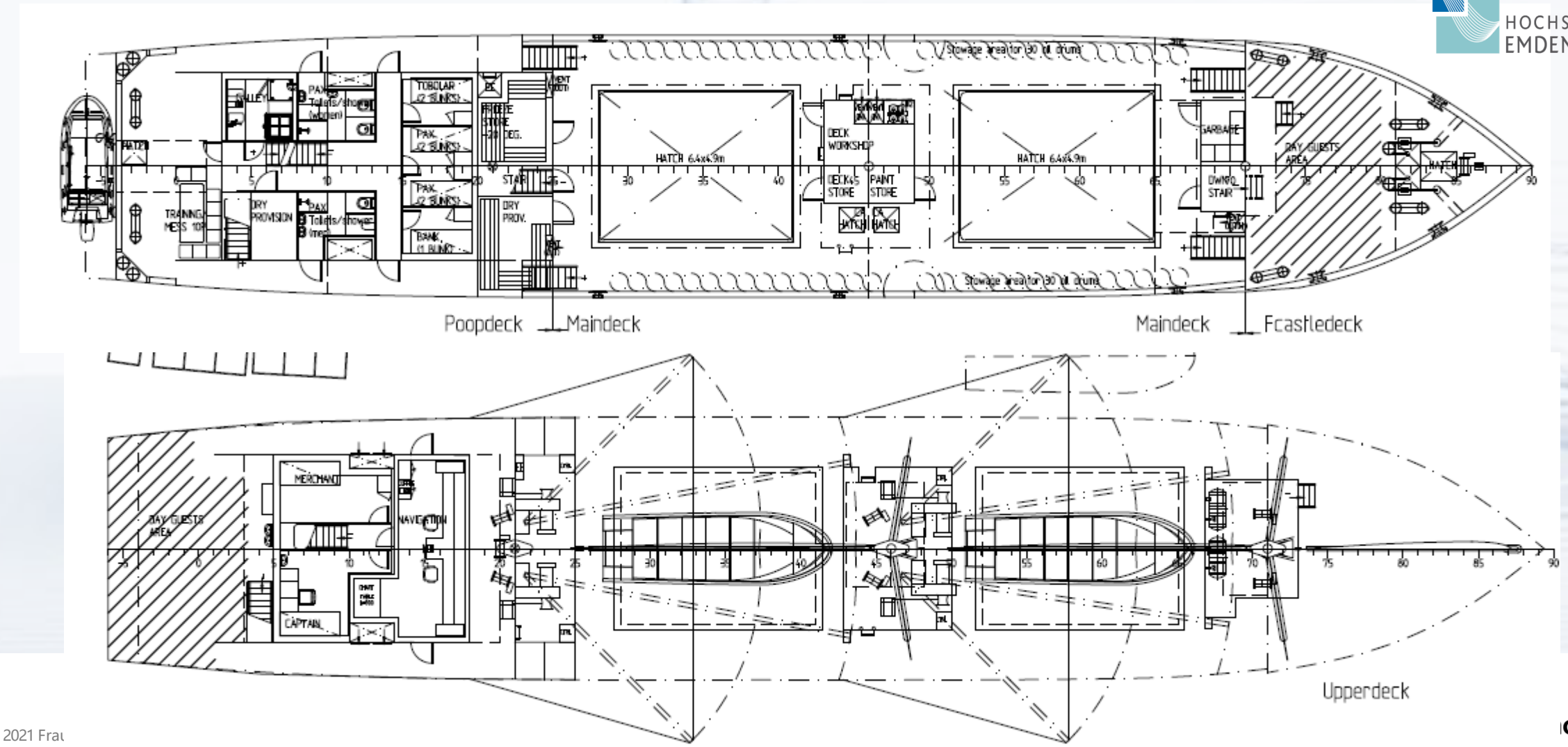


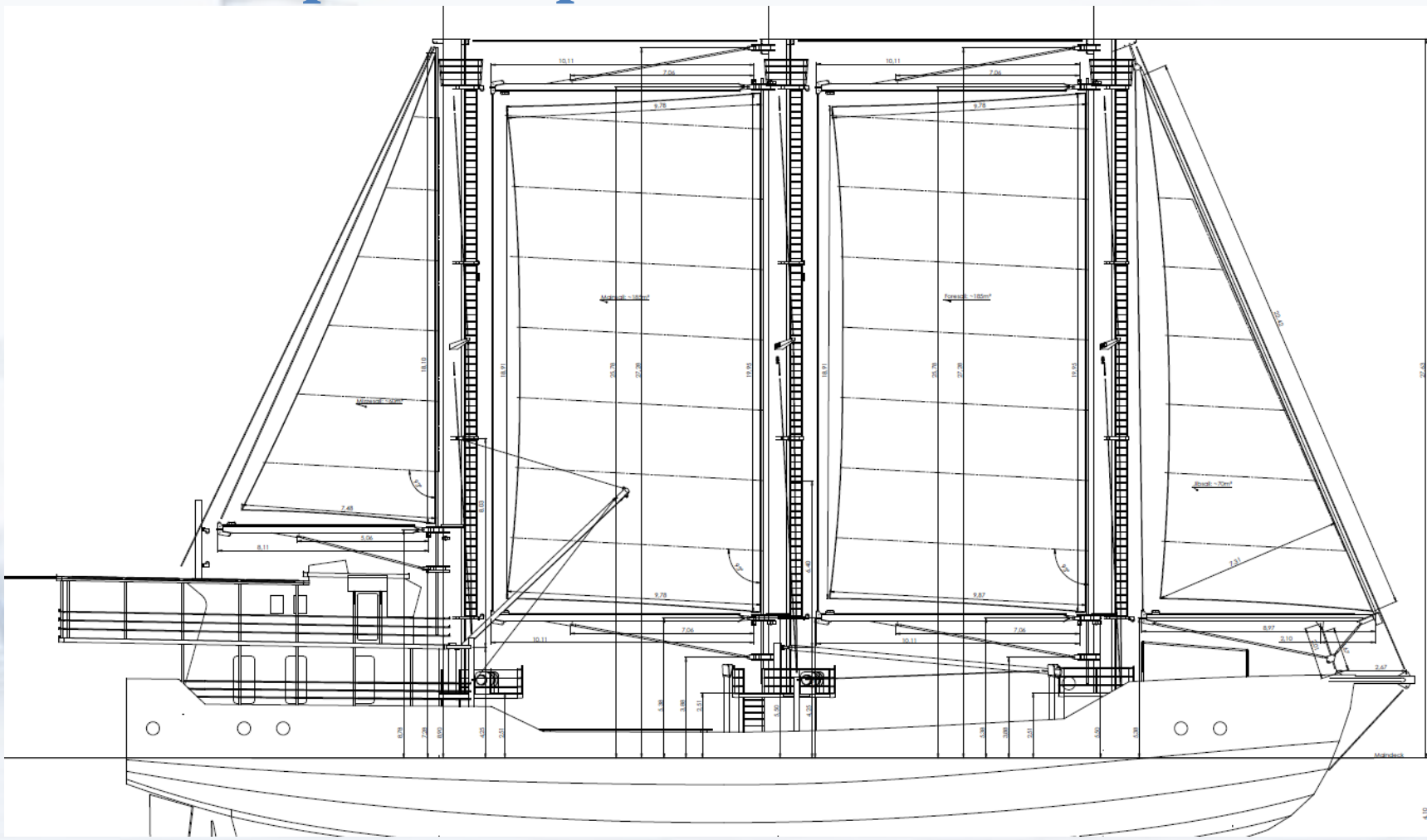
R&D - General Arrangement



R&D - Low Carbon Ship - Sailplan

Indosail – System

- Simple, robust
- Easy Maintenance
- Low sheeting forces
- Emergency ops manual
- Automation possible



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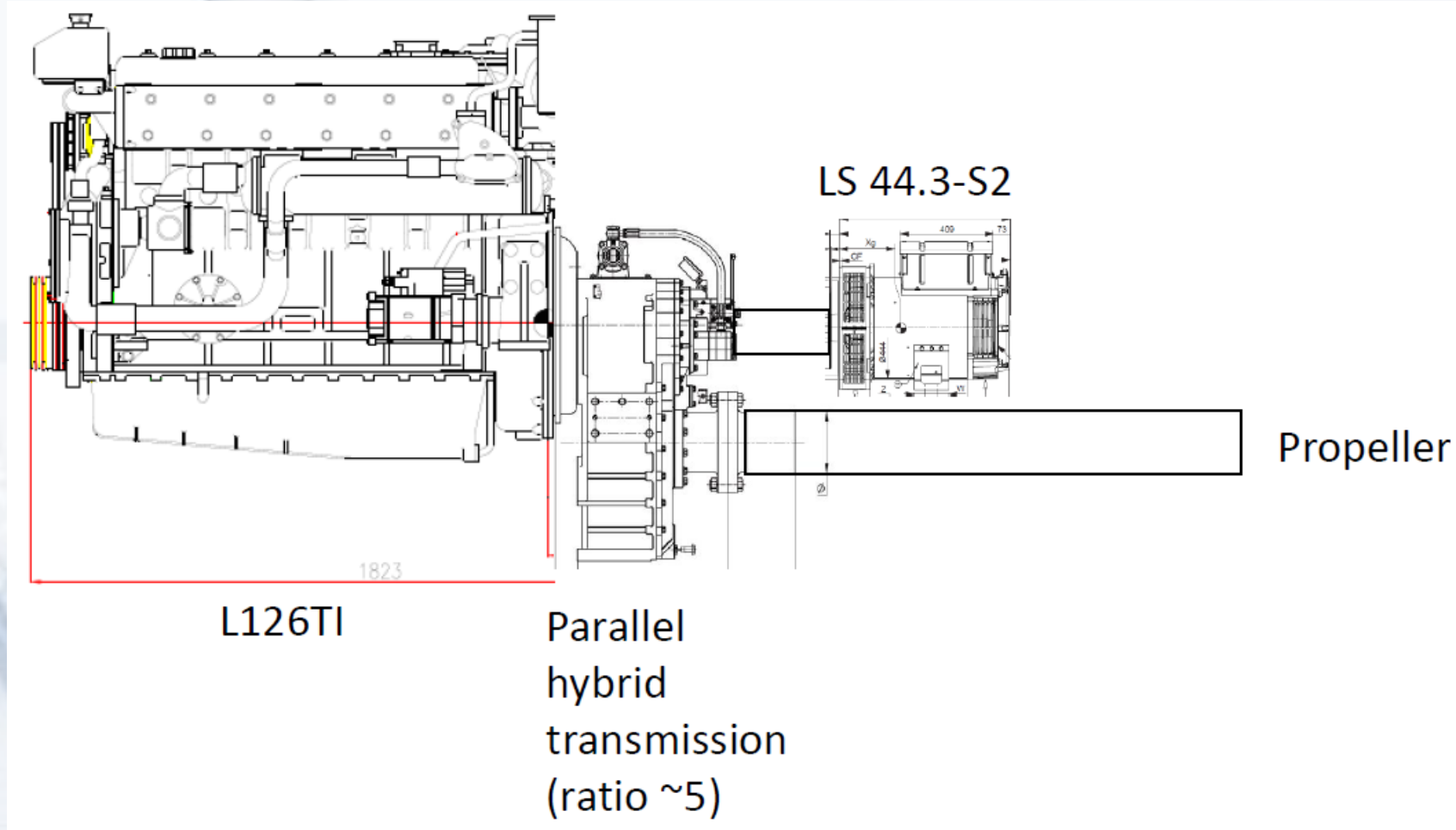
R&D - Low Carbon Ship - Main Drive

Operation Modes

1. ME + PTO
2. PTO only (redundant Aux)
3. Recuperation from windmilling propeller
4. PTI booster mode
5. Electric propulsion from battery or auxiliary generators



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Structured Approach to Carbon Reduction Goals

HEL responsible for **technical coordination**, technical and operational studies and training

Tender process Shipbuilding
- Market research
- Internat. tender
- Contract negotiations

Building supervision
- Detailed design
- Plan approval
- Supervision on site
- Sea trials

Hand-Over and training
- Transport to RMI
- Train the trainer
- Focus on efficiency and safety

Evaluation
- Technology
- Operation
- Performance
- Safety

Shipbuilding

Wind assisted Island Supply Ship for MI:

Contract was awarded to Korean Consortium (August 2022):

- Ship design office: KOSTEC
- Shipyard: Asia-Shipbuilding

Support with specific 'unconventional' technologies:

- Wind propulsion System
- PTO/PTI, PV, etc.
- Propeller Power Recuperation

Plan Approval & Building Supervision:

- HEL
- BRIESE RESEARCH

Delivery of new Vessel expected
for Jan./Feb. 2024

Next Steps & Outlook

- **Building process: efficient, high quality**
- **Involvement of future owners and operators (MISC)**
- **Training concept: train the trainer**
- **Testing, evaluation of concept, design, project etc.**
- **Upscaling: climate action now!**

Question / Discussion

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