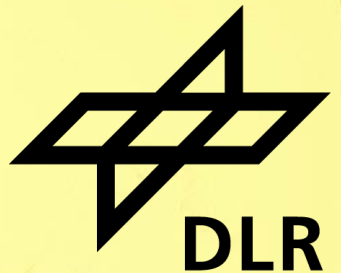


ELECTRIFYING IWT IN GERMANY

WISTAR Final Event

Travis Teske, Annika Fitz, Thorben Schwedt, Lars Baetcke & Sören Ehlers



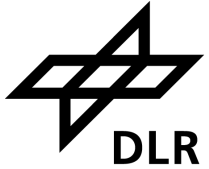
Agenda



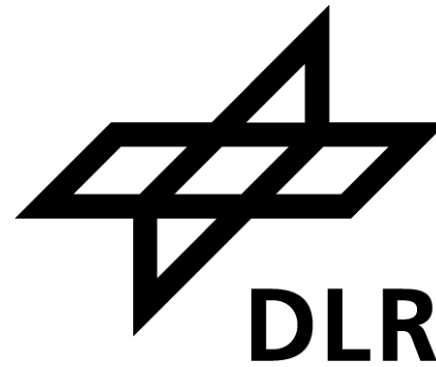
1. The DLR and the Institute of Maritime Energy Systems
2. Motivation
3. Methods
4. Results & Implications
5. Discussion
6. Conclusion & Outlook

Deutsches Zentrum für Luft- und Raumfahrt e.V.

German Aerospace Center

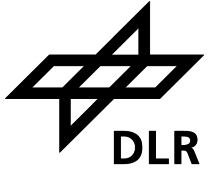


- Research Center of Germany for:
 - Aeronautics
 - Space
 - Energy
 - **Transport**
 - Security
 - Digitalization
- *We explore Earth and space and develop **technologies for a sustainable future.***
- 55 institutes
- 30 locations
- Approx. 10.000 employees
- 1,155 million euros research budget



Research for the maritime Industry

Save investment decisions in new technologies

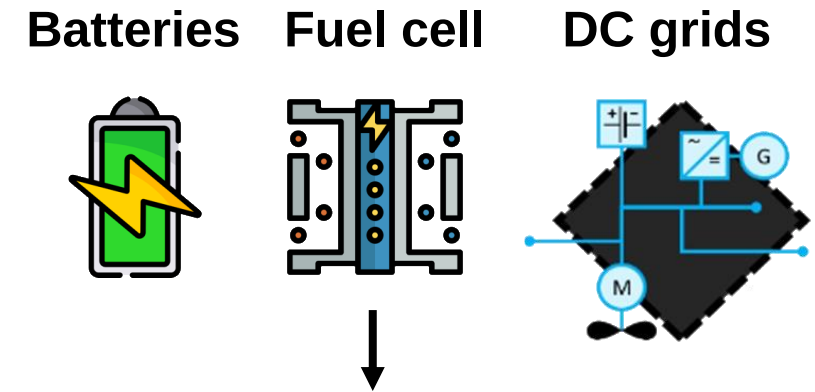


Our mission is to develop **safe** and **economic technological solutions** for **waterborne transportation** to secure the world's economic well-being.

We provide **technological development through integration of demand-oriented energy systems** into new build ships, existing ships and waterborne transport systems.

We integrate **necessary and non-exclusive systems** into ships and overall waterborne transportation concepts to develop safe and economic technological solutions for the maritime customers.

We provide the maritime sector with the **needed support for their investment decisions into new technologies** to accelerate the transformation of waterborne transportation.

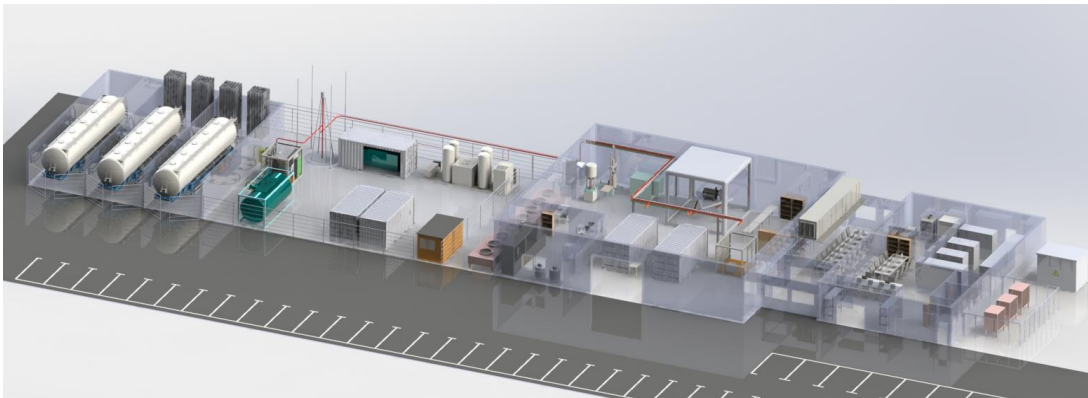


Integration of energy system components

Research Infrastructure

Shore-based research facilities Kiel *Laboratory for Maritime Energy Systems*

Planning: 2022
Construction: 2025
In operation: 2026
Location: Kiel



Floating demonstrator *Realistic test platform for maritime energy systems*

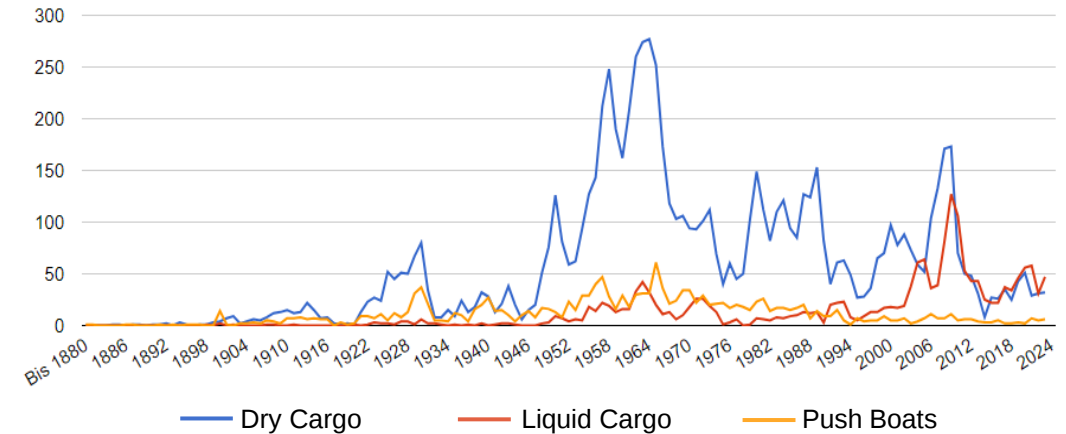
Planning: 2022
Construction: 2025 commissioning of Lloyd Werft
In Operation: 2027
Location: Kiel



ELECTRIFYING IWW TRANSPORT

Motivation

- IWW among the most sustainable forms of transport
 - 1 vessel replaces up to 500 trucks
- Average vessel is >60 years old
- 95 % use diesel engines



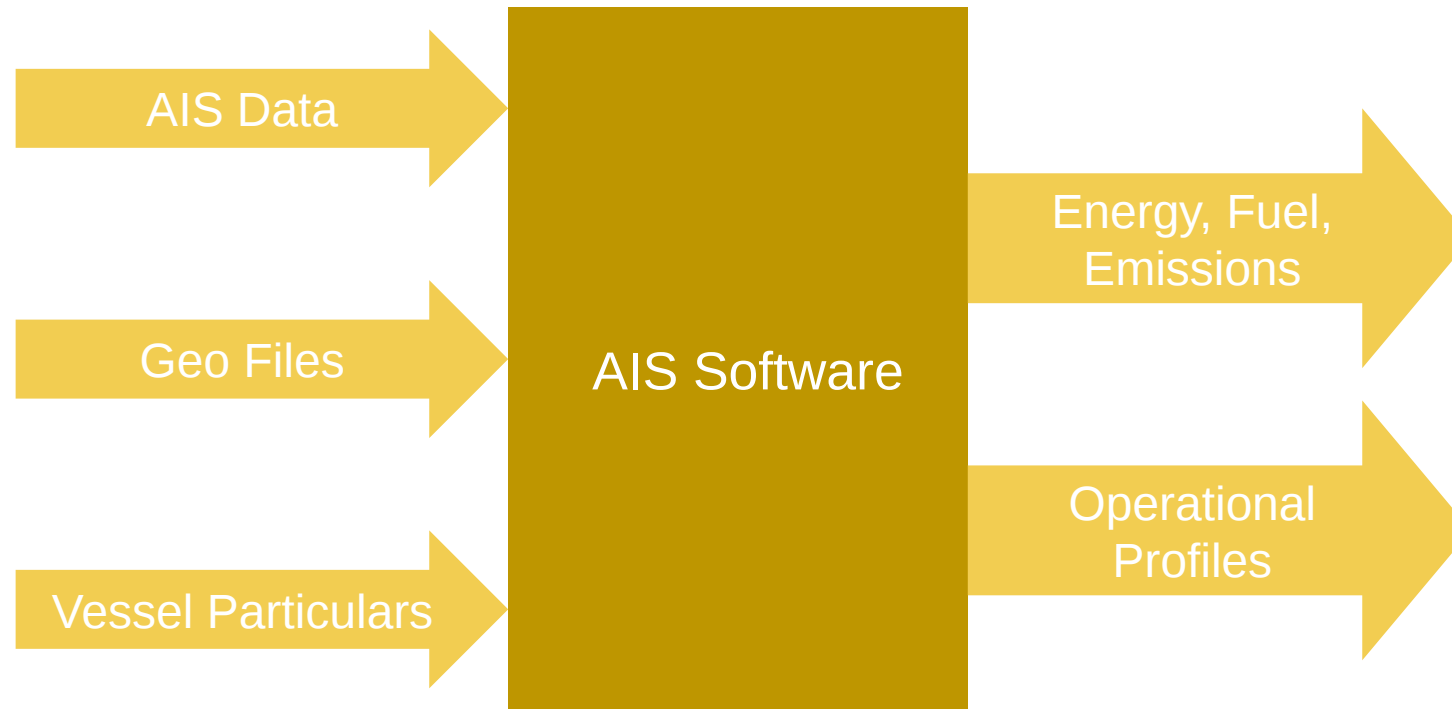
Source: ZKR 2024

- Batteries may be suitable due to short trips and frequent charging opportunities
- IWW transport struggles to compete in terms of level of service & flexibility

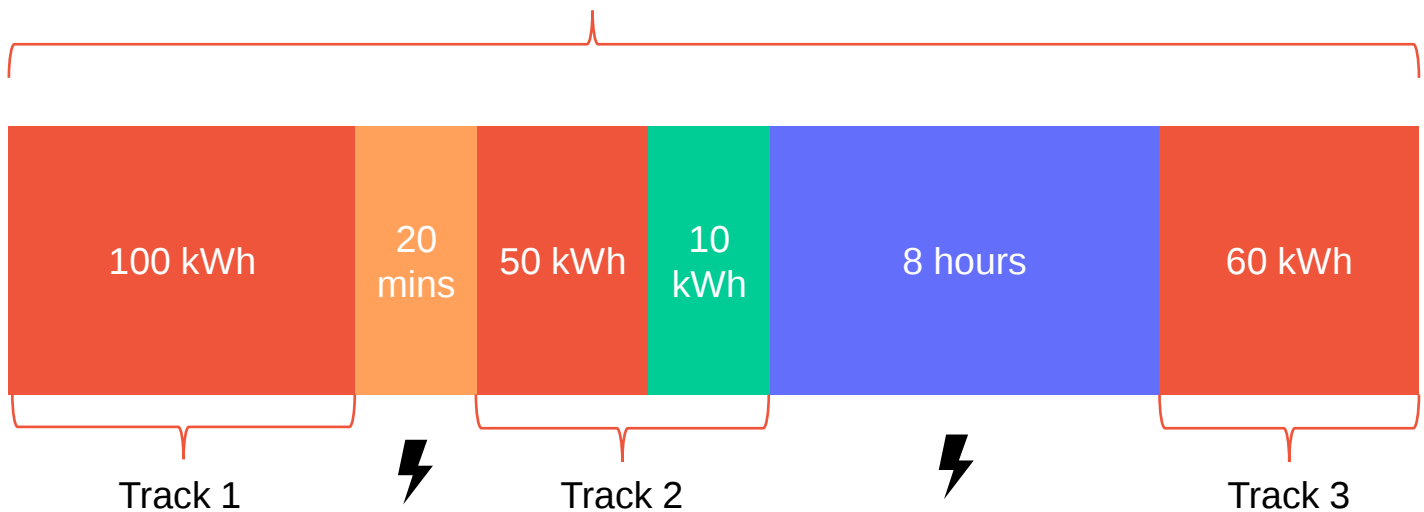
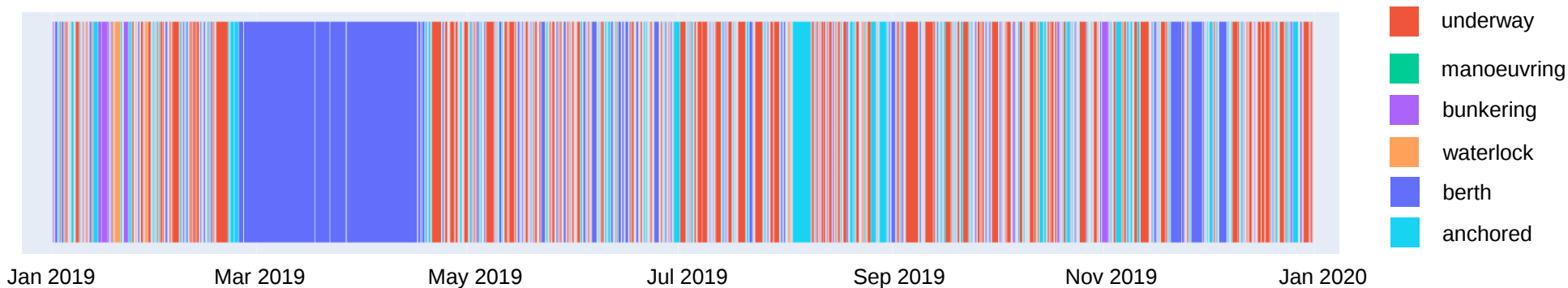


METHODS

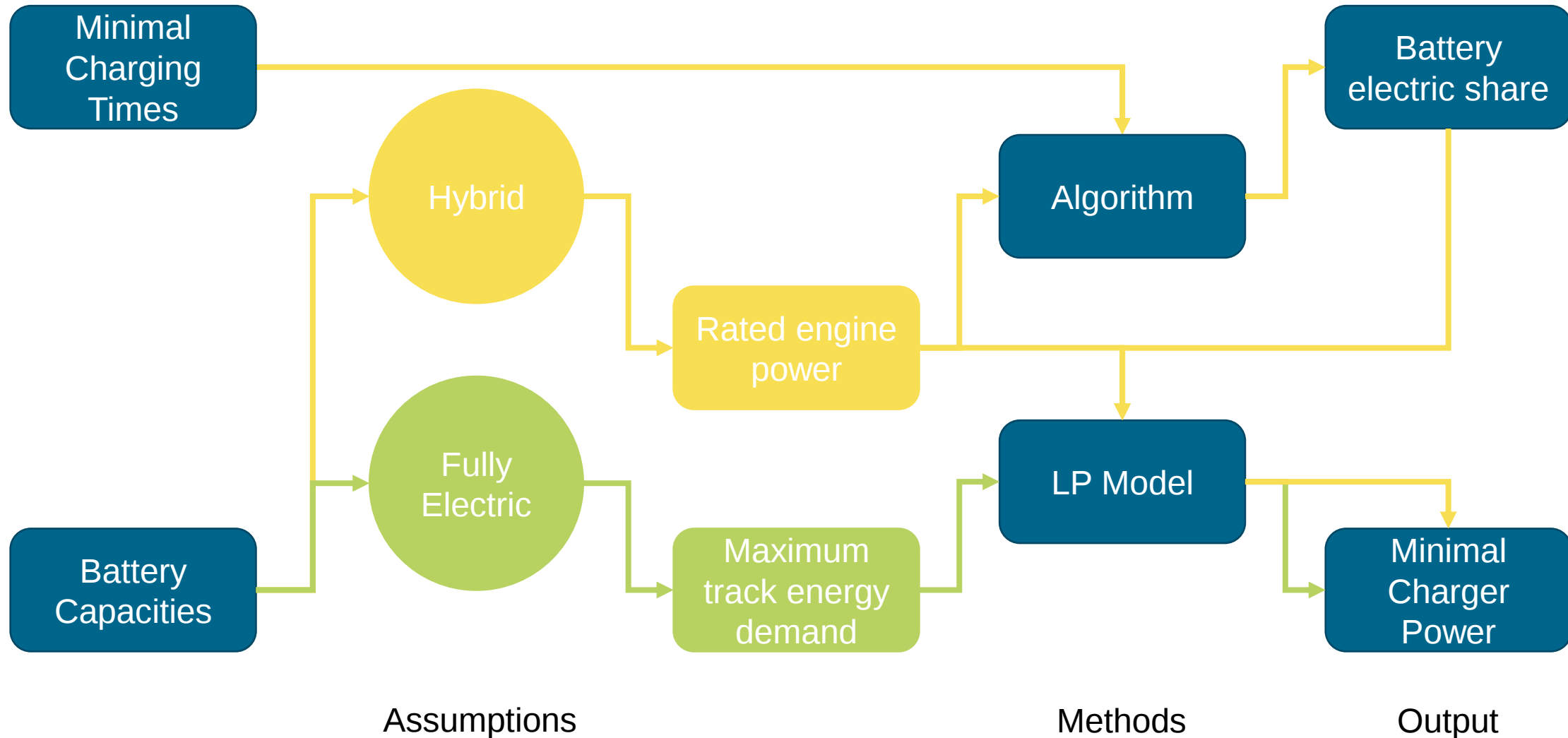
Methods – AIS Data



Methods – AIS Data – Operational Profiles



Methods – Deriving electrification potentials



Assumptions

Methods

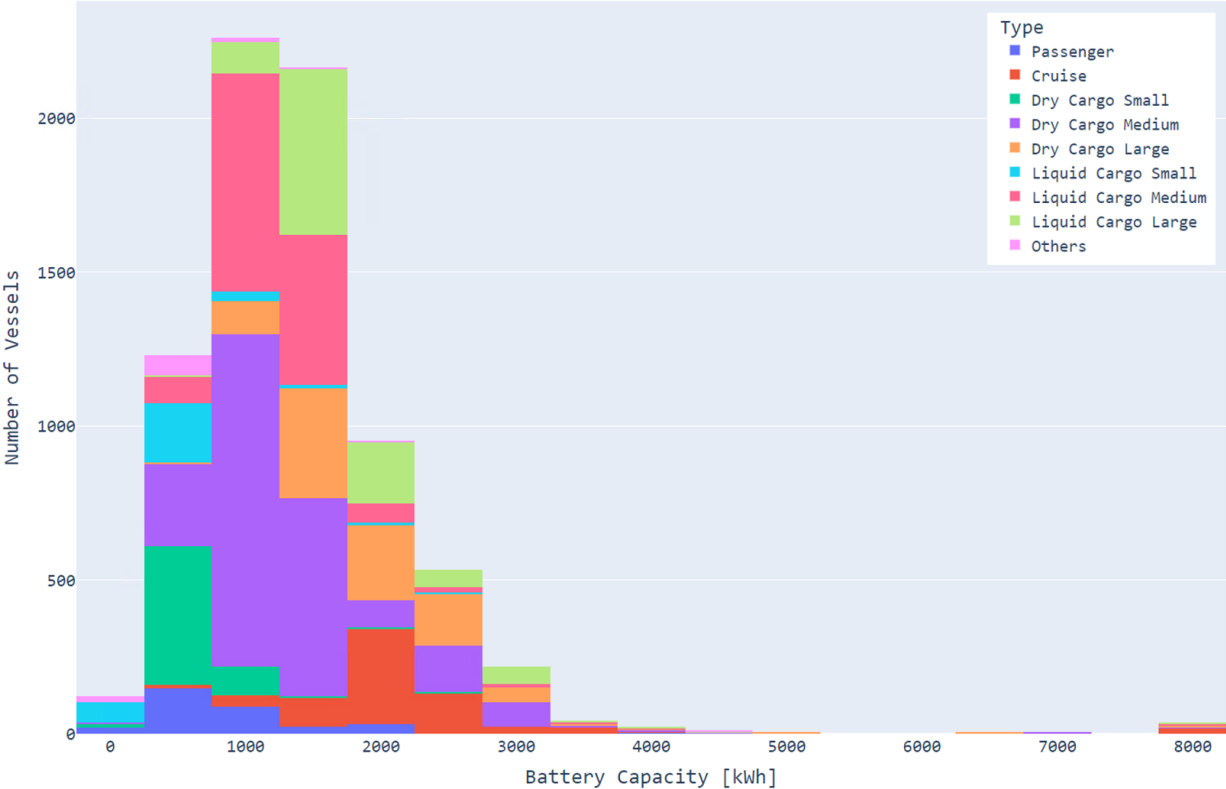
Output



Results – Hybrid Propulsion Assumptions



	Case 1	Case 2	Case 3
Battery Capacity (Max Operating time at rated power)	1 hour	2 hours	1 hour
Min Charger Time	10 mins	10 mins	60 mins



RESULTS

Results – Hybrid Propulsion

- Median El. shares between 35 – 70%
- Passenger Vessels & small tankers exhibit the best potentials
- Sharp decrease in **case 3** due to water locks

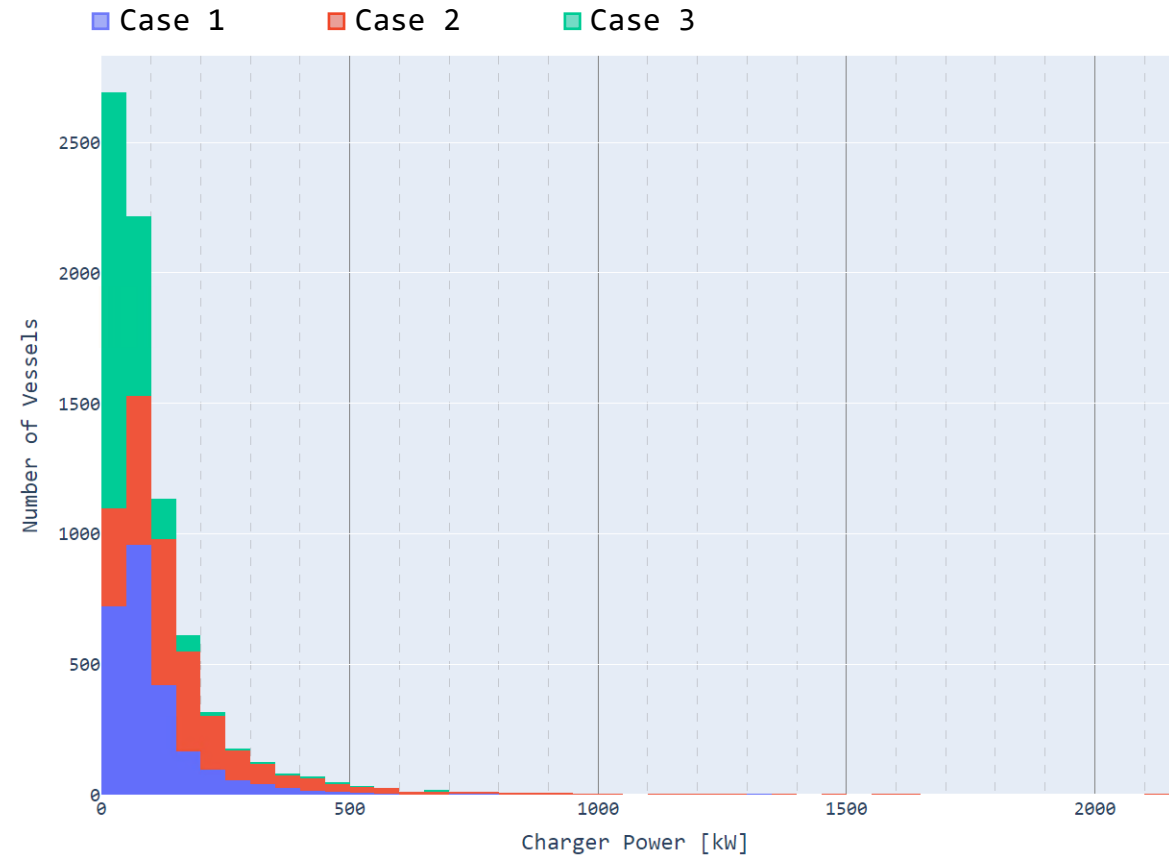


→ Hybrid Propulsion Systems could reduce tank-to-wake CO₂ emissions by 26 – 52%



Results – Hybrid Propulsion

- Electric shares of total energy demand achievable with 100 – 200 kW for most vessels
- Similar power range to road vehicles



→ Intermodal charging stations (e.g. for trucks and IWW vessels) to mitigate economic risk may be feasible



Results – Fully Electric Propulsion

- Median Vessel: Battery Capacity 9.66 MWh
Charger Power 454 kW
- Small Tankers and Passenger Vessels exhibit biggest potentials



- Fully Electric Propulsion may be an option for parts of the fleet
- Other Ships may need additional stops to charge



Discussion

- Gaps in AIS data should be addressed
→ 30% had to be discarded
- More investigation into retrofitting options
- Possibilities for intermodal charging stations
- Investment decision into charging/bunkering infrastructure must be well informed

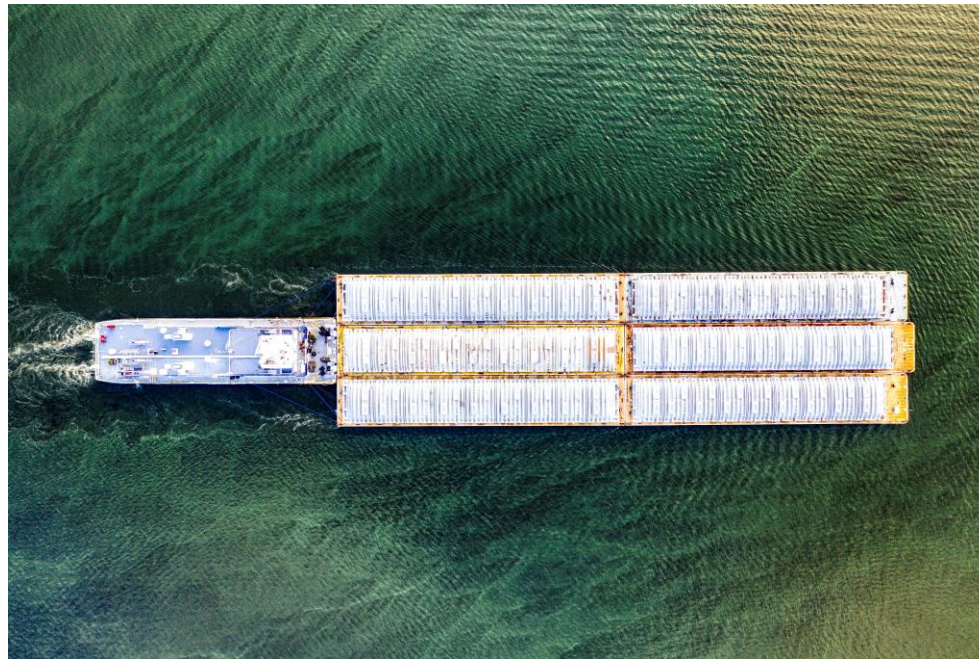


● AIS Signal ● Gaps



Conclusion

- Significant potentials for electrification in IWW fleet
- Charging powers in similar range as road vehicles → Intermodal stations?
- Some vessels may require additional stops → Opportunity to make IWW transport more efficient ecological and economical



Source: Pexels <https://www.pexels.com/de-de/foto/sonnenuntergang-segeln-transport-schiff-9508989/>



Topic: **Electrifying IWT in Germany**
WISTAR Final Event Duisburg

Date: 2025-09-30

Author: Travis Teske (travis.teske@dlr.de)

Institute: Maritime Energy Systems

Bildcredits: Alle Bilder „DLR (CC BY-NC-ND 3.0)“,
sofern nicht anders angegeben

