
synergetics

# Innovation Action **SYNERGETICS**

SYNERGETICS | Synergies for Green Transformation of Inland and Coastal Shipping

Danube Ports Days | 30.10.2024

Funded by the Horizon Europe Programme of the European Union under grant agreement No 101096809
Funded by the Horizon Europe guarantee of the United Kingdom, under project No 10068310
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# General information

| **Project title** | **Synergies for Green Transformation of Inland and Coastal Shipping** |
|---|---|
| Project acronym | SYNERGETICS |
| Call | HORIZON-CL5-2022-D5-01-04 |
| Title | Transformation of the existing fleet towards greener operations through retrofitting (ZEWT Partnership) |
| Type of action | HORIZON-IA |
| Project starting date | January 2023 |
| Project duration | 42 months |

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# ZEWT Call for Proposals HORIZON-CL5-2022-D5-01-04

Transformation of the existing fleet towards greener operations through retrofitting

- *Demonstrated retrofitting solutions for sea-going and inland navigation vessels in operation.
- *Retrofit solutions to reduce GHG emissions that are developed and ready to deploy. The target is to achieve a GHG emissions reduction of at least 35% compared to the original design.
- *Retrofit solutions involving climate neutral fuels making vessels GHG emission free. These solutions are expected to have a significant R&I content going beyond a simple exchange of fuels through minor technical adaptations.
- *Establishment of an up-to-date catalogue of suitable solutions for a wide variety of ship types and operation scenarios.

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# Structure


- The SYNERGETICS consortium gathers 16 partners and 2 associated partners from eight countries which were selected with a purpose to take full advantage of concepts of Synergies.
- The project Coordinator is DST – Development Centre for Ship Technology and Transport Systems from Germany.

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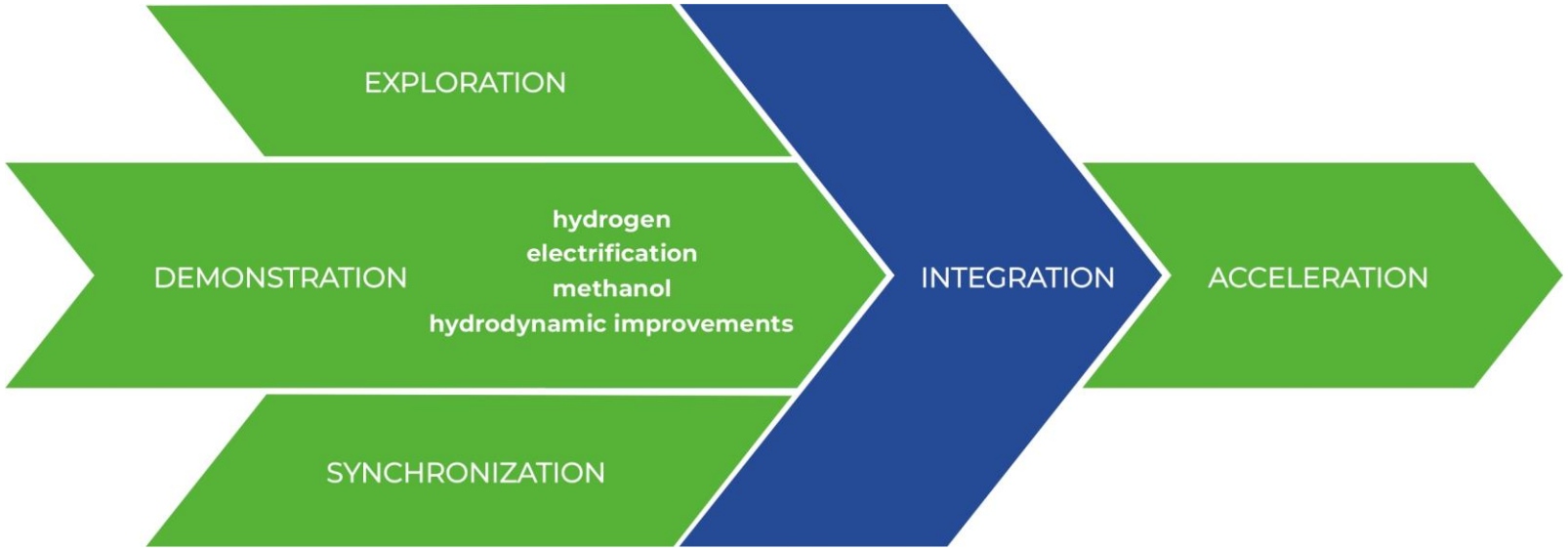
# Synergies

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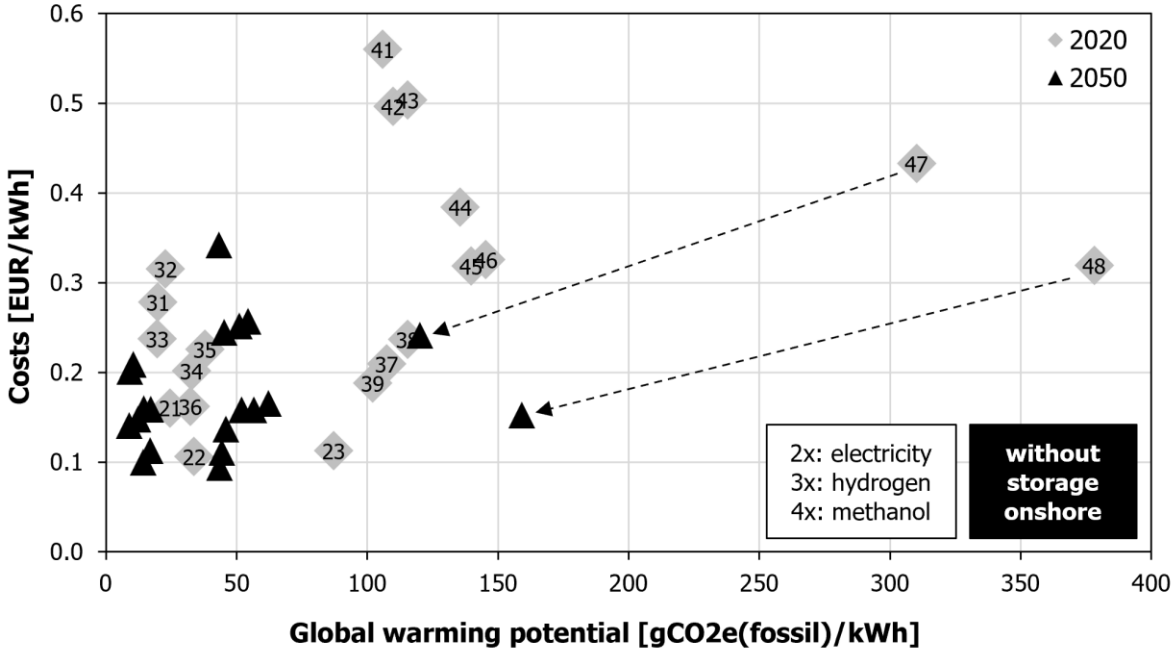
# Well-to-Tank pathways (Exploration by OST)




- electric energy from the grid: lowest emissions and costs
- hydrogen from wind energy: low emissions but higher costs
- green methanol will improve until 2050
- no zero-emission

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# Full-scale Demonstrators

Image: CMB.TECH

## H2-ICE

Image: Mercurius Shipping

## CH3OH-ICE

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# Full-scale Demonstrators


Image: CFT

## Electrification of the main propulsion plant

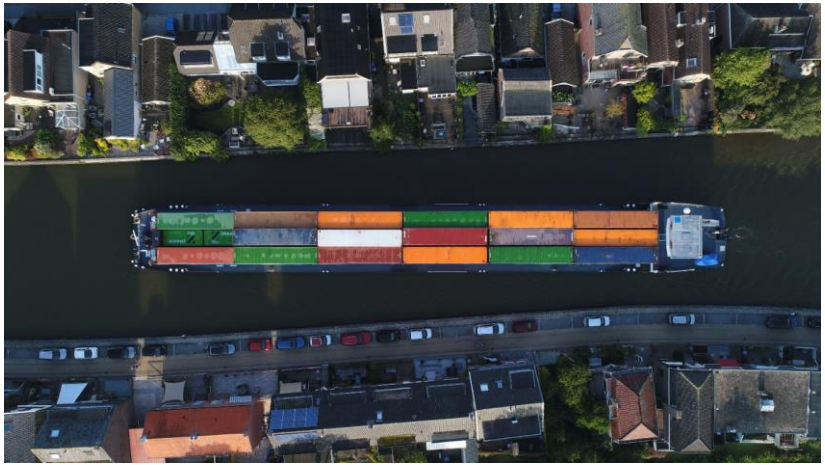

Image: Zero Emission Services

## Battery-electric

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# Model-scale Demonstrators


Image: DST / Benjamin Friedhoff

**Aft-ship replacement**


Image: via donau / Johannes Zinner

**Use of digital tools and virtual assets in finding the optimal greening solution**

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# The Use Case Vessel

## Ernst Kramer - ENI 04029360

| | |
|---|---|
| Length | 105 m |
| Breadth | 9.5 m |
| Depth | 4.83 m |
| Draft | 3.20 m |
| Age | 1974 |
| Fuel Tank | 22 $m^3$ |


**Modifications:**

- ❑ **Length** – 85 m, extended to 105 m in 1985, increasing capacity from 1822 tons to 2293 tons.
- ❑ **Bow Thruster** - Verhaar grid system, 315 kW, added in 1985.
- ❑ **New Main Engine** - Mitsubishi Heavy S16R-MPTA, 1170 kw at 1600 RPM in 2004 .
- ❑ **Other** - Retrofit of side cells (1993), propeller duct (1995), and car crane (2004).

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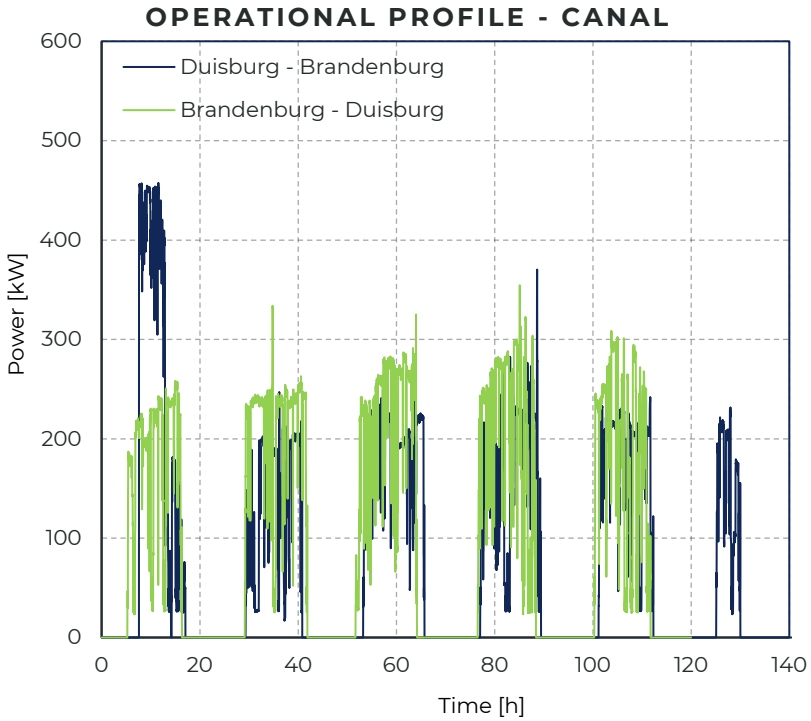
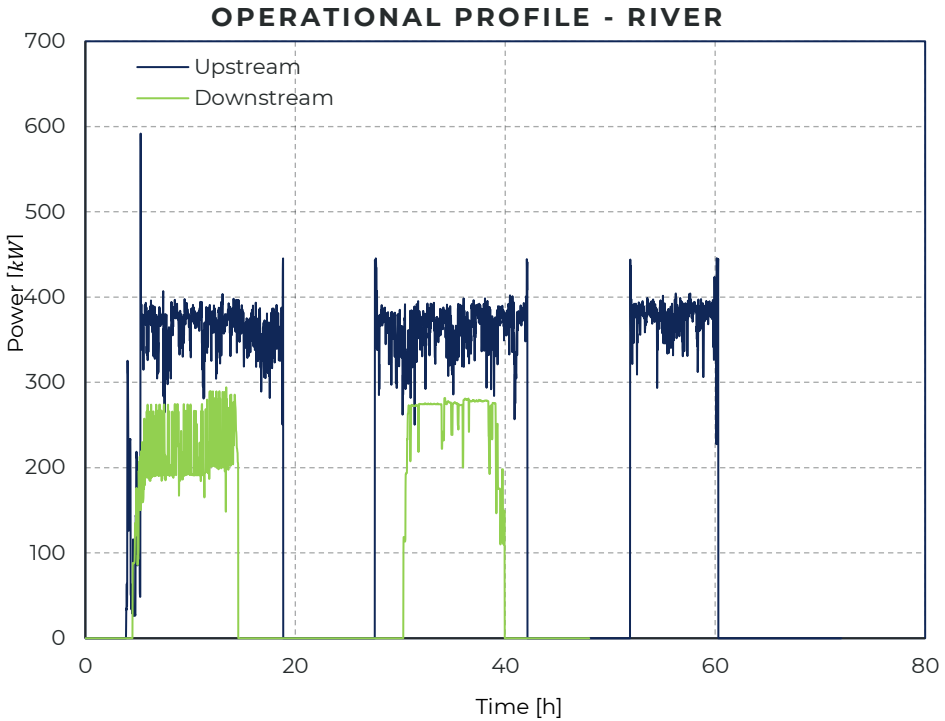
# Operational Profile – Ernst Kramer

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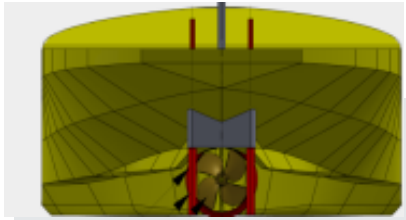
# Model production and baseline tests



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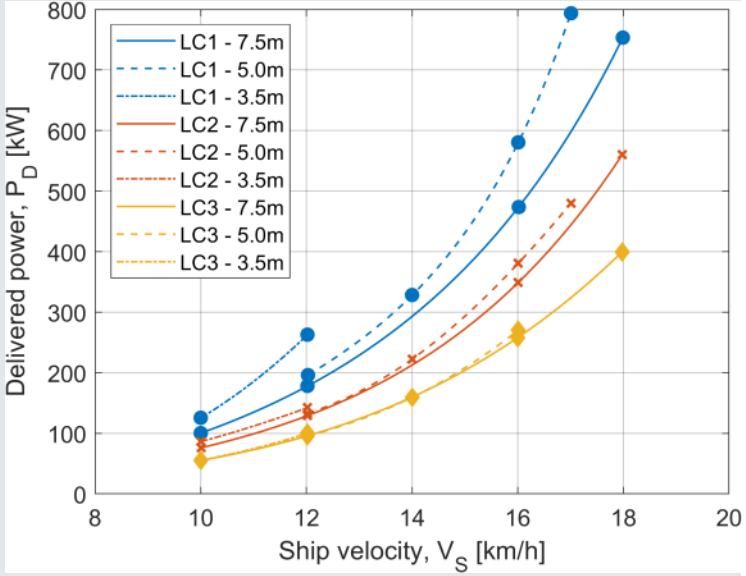
# Test Matrix and Baseline Results

- Resistance and propulsion tests for each water depth and loading condition
- $LC_1$: $T_A = T_F = 2.80$ m
- $LC_2$: $T_A = T_F = 1.90$ m
- $LC_3$: $T_A = 1.30$, $T_F = 0.75$ m

| Water depth/LC | $LC_1$ | $LC_2$ | $LC_3$ |
|---|---|---|---|
| 3.5 [m] | ✓ | ✓ | ✓ |
| 5.0 [m] | ✓ | ✓ | ✓ |
| 7.5 [m] | ✓ | ✓ | ✓ |

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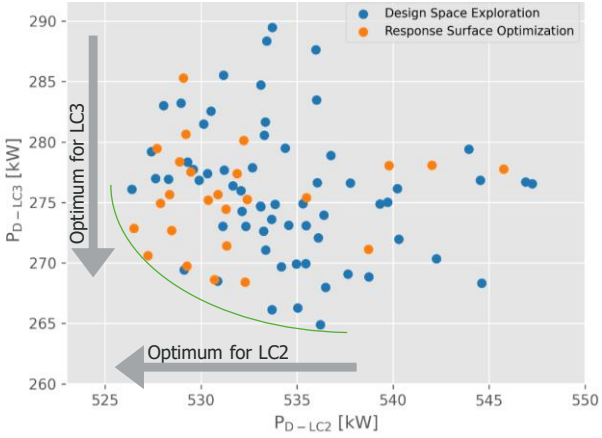
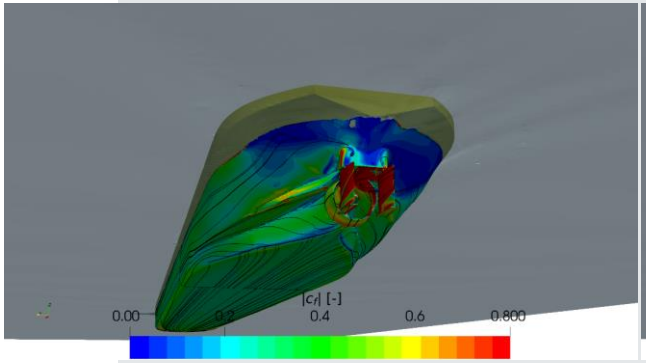
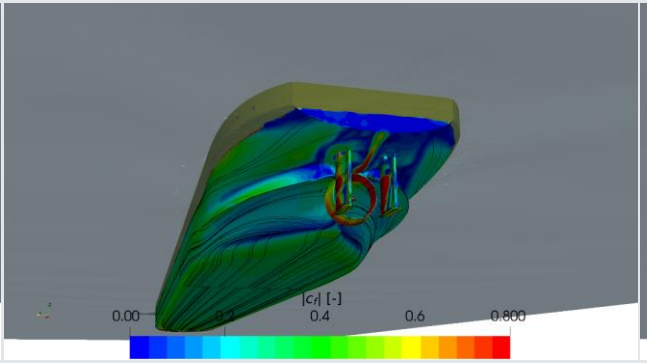
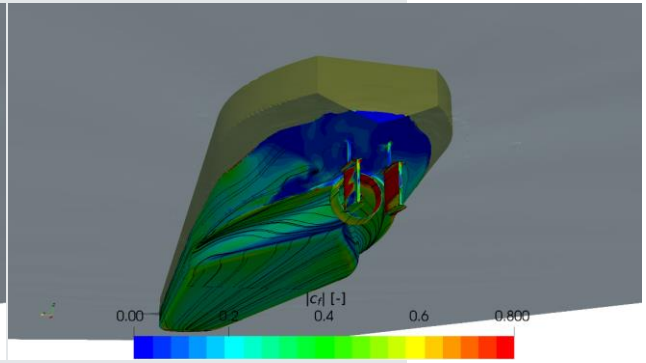
# CFD optimisation

- Comparison of different designs
- Multi-objective parametric optimisation
- Almost constant displacement
- ≥15% reduction in power demand

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# System Demonstrators


Image: ScandiNAOS

**Comparison of a dual fuel methanol engine with a compression ignited methanol engine**


Image: Future Proof Shipping

**Development of power and energy management system for fuel cells and hydrogen powered ships**

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# SYNERGETICS Tools

Catalogue
of Greening Retrofit Solutions

Decision Support Tool
for Vessel Owners

Updated Transition Pathways
& Landscape of Synergies

Handbook for Implementation
of Greening Retrofit Solutions

Scenarios for Policy Makers


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