viadonau

Greening Inland Waterway Transport
What Really Makes a Difference

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viadonau – Österreichische Wasserstraßen-GmbH

A3PS

21st International Eco-Mobility Conference 2026

Sustainable Mobility technologies in a Changing World

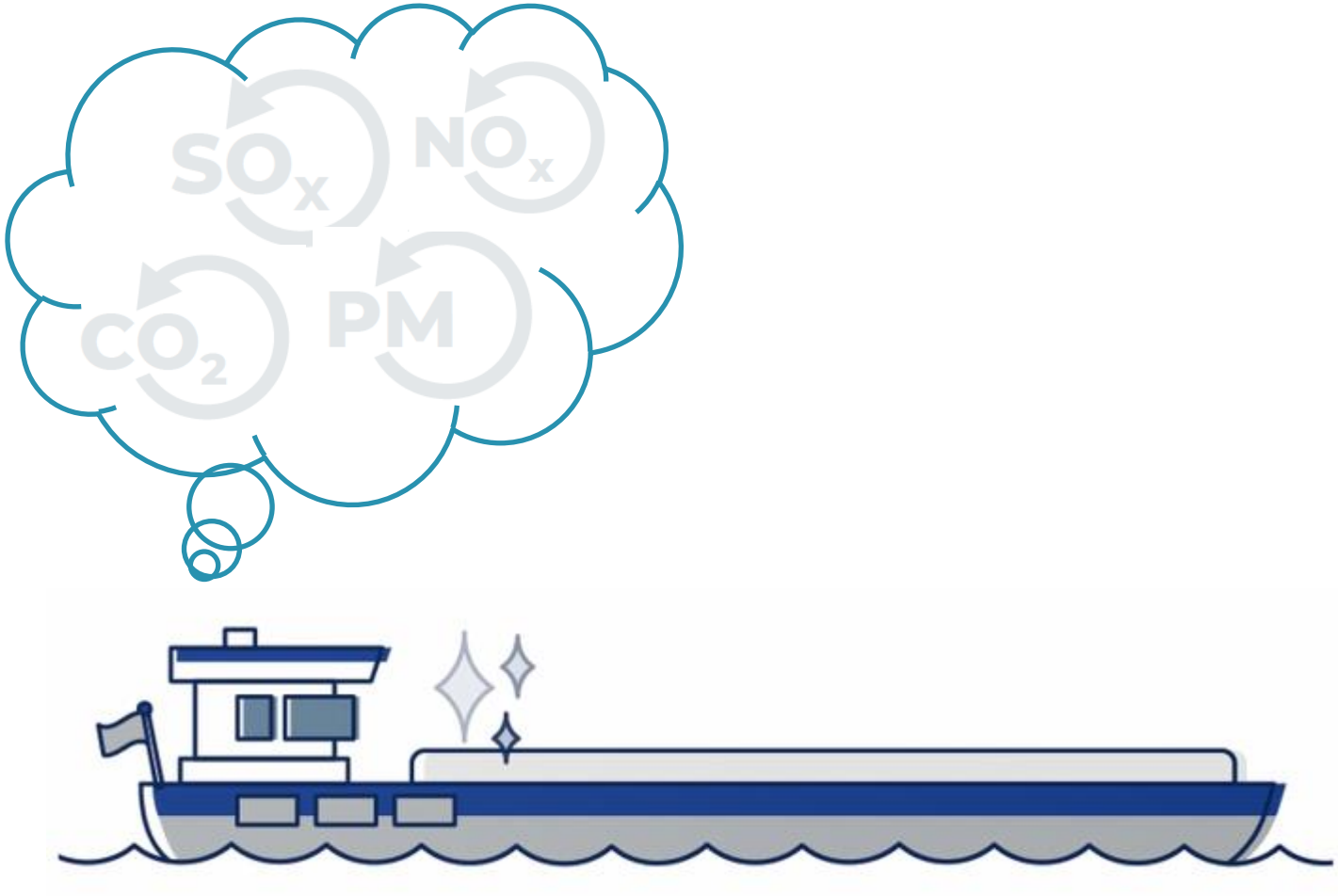
NOV 12 – 13 2026

Vienna

Agenda

- Inland Navigation Emissions
- Technologies and Pathways
- Viadonau HVO100 Pilot Project
- Viadonau Fleet Electrification
- Innovation Action SYNERGETICS
- SYNERGETICS Methanol Demonstrator
- Key Takeaways

Inland Navigation Emissions



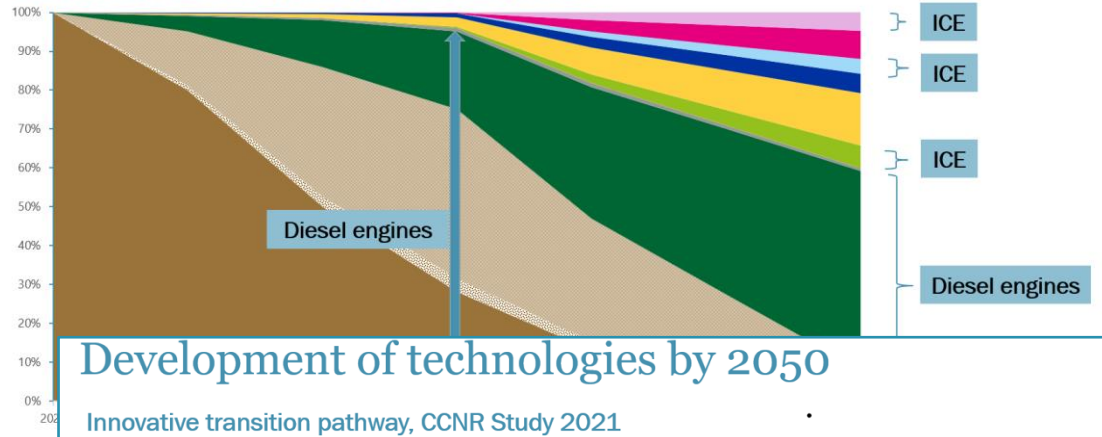
- ✓ 6% of the EU transport sector
- ✓ High tonne-kilometre efficiency
- ✓ 6.2TWh/year of fossil diesel
- ✓ Low carbon footprint transport

- Ø Age and long lifetime
- Ø Long distances
- Ø High propulsion power
- Ø Space and weight limitations

Technologies and Pathways

Development of technologies by 2050

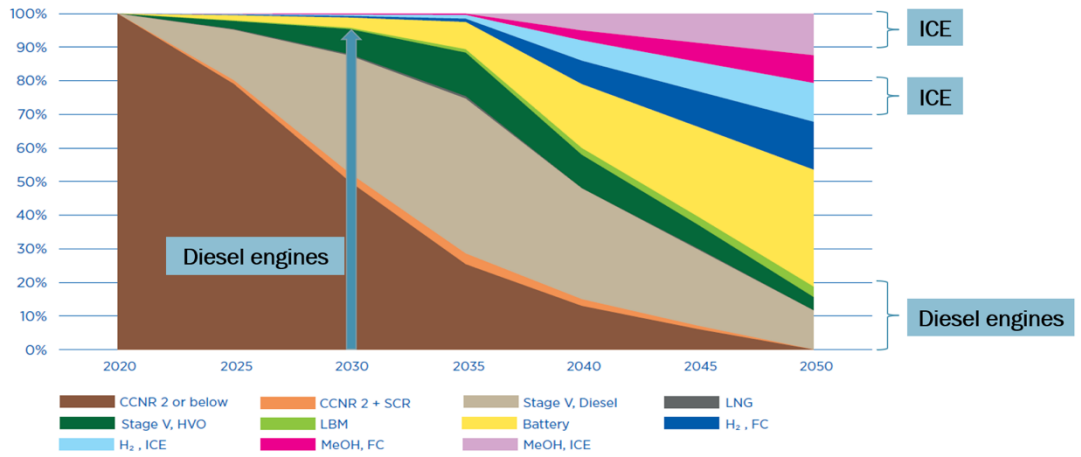
Conservative transition pathway, CCNR Study 2021



Source

Development of technologies by 2050

Innovative transition pathway, CCNR Study 2021



Source: CCNR Roadmap for reducing inland navigation emissions, March 2022

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Technology application – H_2 Hybrid

Elektra

- Pusher - Electric propulsion 400kW
- FC 3x100kW, Batteries 2.500 kWh
- Range 400km: full electric – 65km (8h) / FC 340km
- Charging time 7 Std.
- CAPEX: 13mil EUR vs. 2mil. EUR



H_2

MS Antoine

- Motor cargo vessel, newbuilding 2023
- L,B = 135m x 11,45m
- FC 360kW, Batteries 1.100kWh



Source: Lemten Scheepvaart B.V.

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Technology application - batteries

Kotug E-Pusher 1

- Pusher tug, operational 2023
- L, B, T = 16m x 7,6m x 1,35m
- 2 x 300kWh electric azipods
- „Pay-As-You-Go“ swappable batteries - PwrSwäp
- Range: Amsterdam - Zaandam
- 190t CO_2 yearly



www.kotug.com

ZEETUG Gisas Power

- Harbour tug
- L,B,T = 18,7m x 6,7m x 3,5m
- Electric engines 2 x 925kW
- Batteries 2 x 1.423
- Charging time 1 ho
- Yearly reduction: 9



www.zeetug

viadonau towards „zero emissions“ (1)

- New pushboat (FAIRway works)
- L_{OA} = 22,15 m, B_{OA} = 5,.60 m, T = 1,2 m
- 2 x Scania D09 313A, 257 kW, 2100 rpm
  EU Stage V (SCR and DPF)
- Engine suitable for HVO as fuel
  → CO2 Reduction up to 90 %
- Ducted propeller, consumption measurement,
  Exhaust heat recovery → High efficiency







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viadonau HVO100 Pilot Project

Bad Deutsch-Altenburg

LoA = 22,15m, BoA = 5,60m, T = 1,20m

Built 2023

2 x Scania D09 313A

- ✓ Stage V engines
- ✓ 257kW @ 2100rpm
- ✓ HVO100

High energy efficiency by design

- ✓ Nozzle propellers
- ✓ Consumption measurement
- ✓ Exhaust heat recovery



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High awareness of the crew in regard to fuel consumption.

viadonau HVO100 Pilot Project

Fairway marking – Bojenleger

- LoA = 19,74m, BoA = 6,05m, T = 0,80m
- Marking barge
- Buoy handling crane
- Genset 69kW
- Bow thruster 50kW
- Deckload 10t / 20 buoys

Waterway maintenance – Noriker

- LoA = 25,12m, BoA = 8,37m, T = 1,50m
- Multi-purpose pontoon
- Fully-electrified
- Pump jet bow thruster
- Deckload – excavator + tree trunks
- 3 anchor piles





viadonau HVO100 Pilot project

- September 2023 – December 2024
- Main propulsion on HVO100
- Approx. 400 running hours

- Emissions Well-to-Wake
- Total CO2 reduction 87,8%

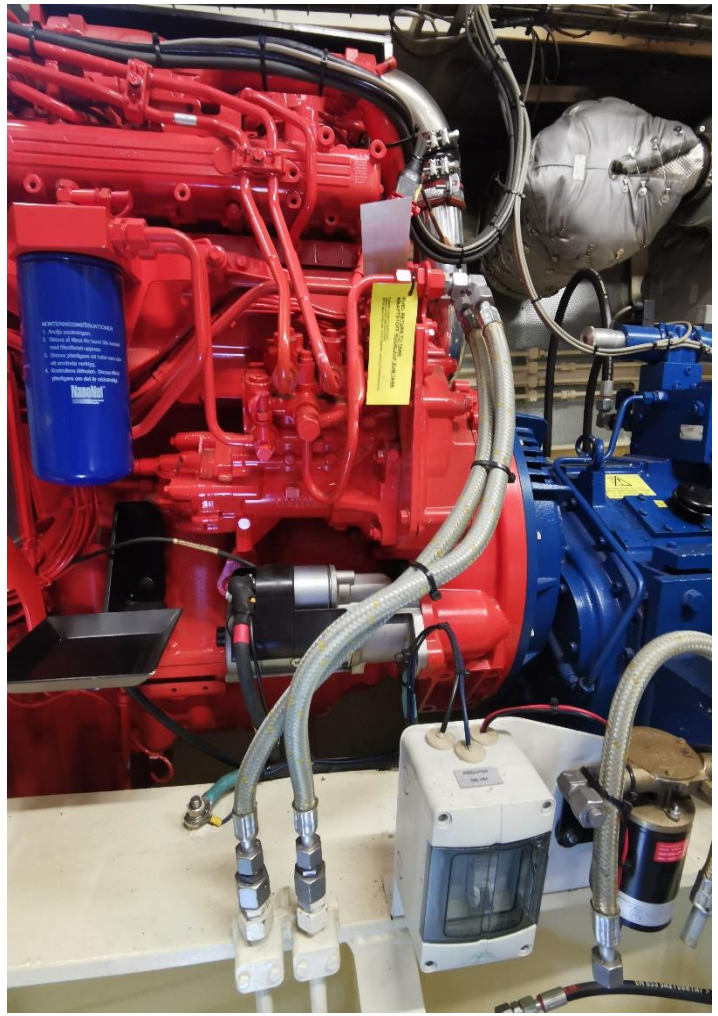
Bunkered quantity	Emissions Diesel (EF*)	Emissions HVO (EF*)	Emissions reduction (EF)	Emissions reduction (EF)	Emissions HVO (Certificate)	Emissions reduction (C)	Emissions reduction (C)
[Litre]	[Kg CO_2-eq]	[Kg CO_2-eq]	[Kg CO_2-eq]	[%]	[Kg CO_2-eq]	[Kg CO_2-eq]	[%]
3 262	11 293,0	1 438,5	9 854,5	87,3%	694,8	10 598,2	93,9%
3 637	12 591,3	1 603,9	10 987,4	87,3%	774,7	11 816,6	93,9%
3 907	13 526,0	1 723,0	11 803,1	87,3%	2 014,5	11 511,6	85,1%
2 826	9 783,6	1 246,3	8 537,4	87,3%	1 678,1	8 105,5	82,9%
3 522	12 193,2	1 553,2	10 640,0	87,3%	2 091,4	10 101,8	82,9%

viadonau HVO100 Pilot project

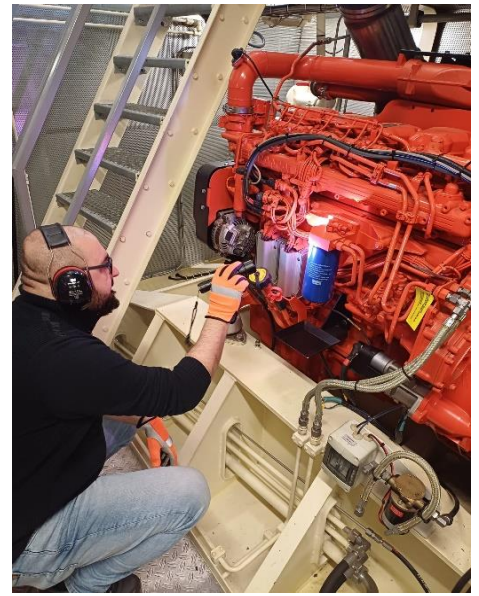
Visual inspection during operation.
Interviews with the crew.

500 running hours maintenance
- fuel filters and prefilter exchange
- assessment of gasket condition

→ The fuel system is in outstanding condition.
→ No differences by fuel bunkering.
→ No differences in performance.













viadonau Fleet Electrification

Noriker

LoA = 25,12m, BoA = 8,37m, T = 1,50m

Built 2026

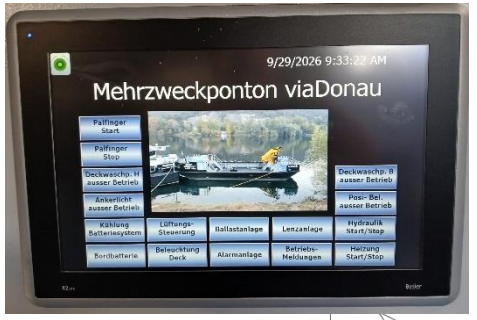
Multi-purpose pontoon

- ✓ Excavator (up to 25 tonnes)
- ✓ Crane – 880kg
- ✓ Space for a 20ft container

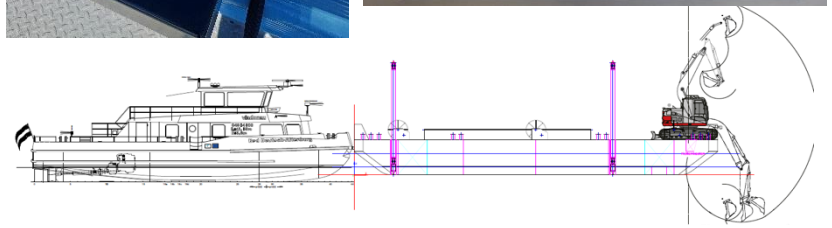
Propulsion

- ✓ 360° De Groot pump jet thruster 88kW
- ✓ 110kWh Lehmann Marine LFP Cubes
- ✓ Water cooled batteries
- ✓ BMS on each battery cell
- ✓ Baumüller PMS







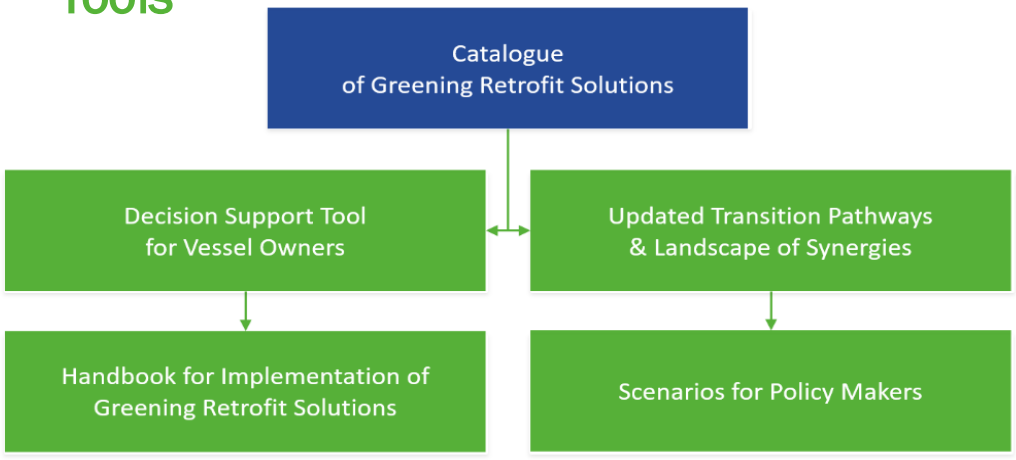






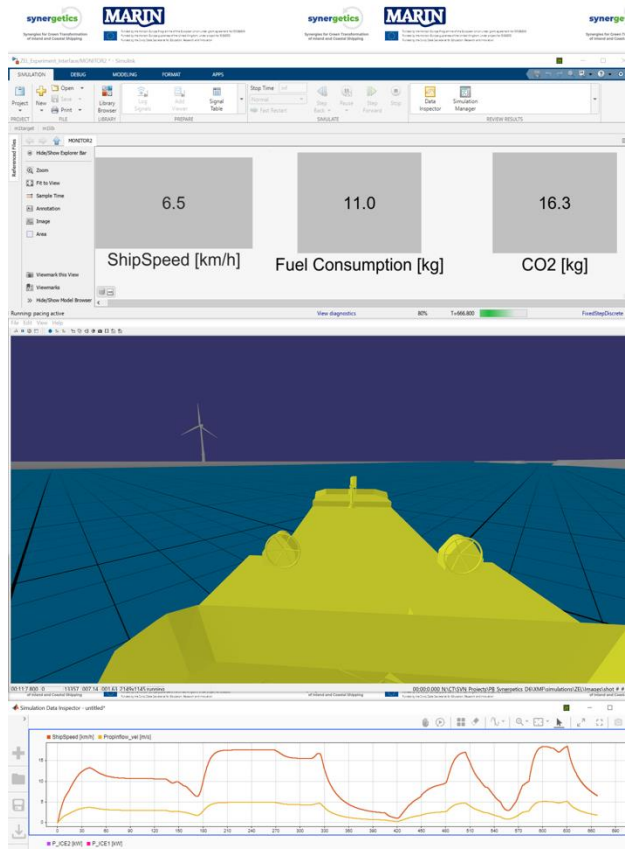
Innovation Action SYNERGETICS

- **Demonstrators**
  - Full-scale – H_2 & battery packs
  - Model scale – CH_3OH & hydrodynamics
  - System – CH_3OH & Energy management
- **viadonau & MARIN**
  - Digital twin – Bad Deutsch-Altenburg
  - Power Propulsion and Energy Systems model
  - Evaluation of alternative fuels in the virtual Zero Emission Lab
- **Tools**







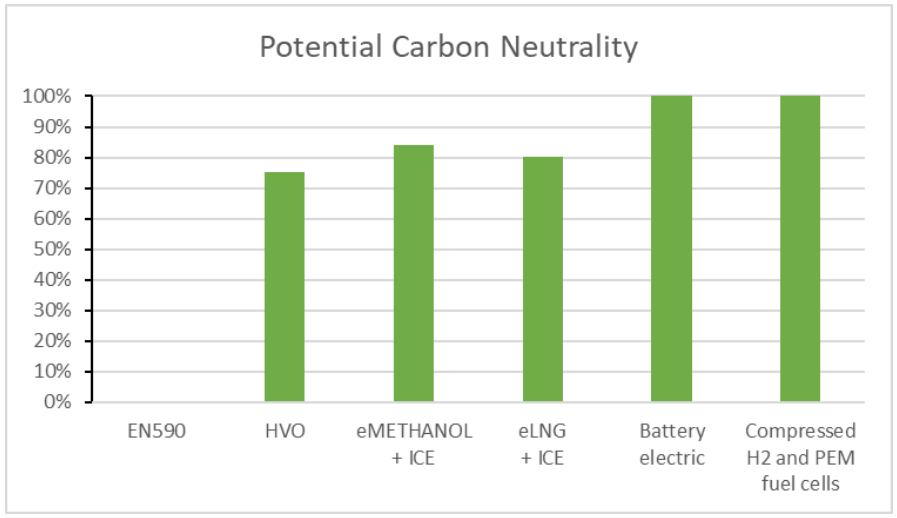


www.synergetics-project.eu

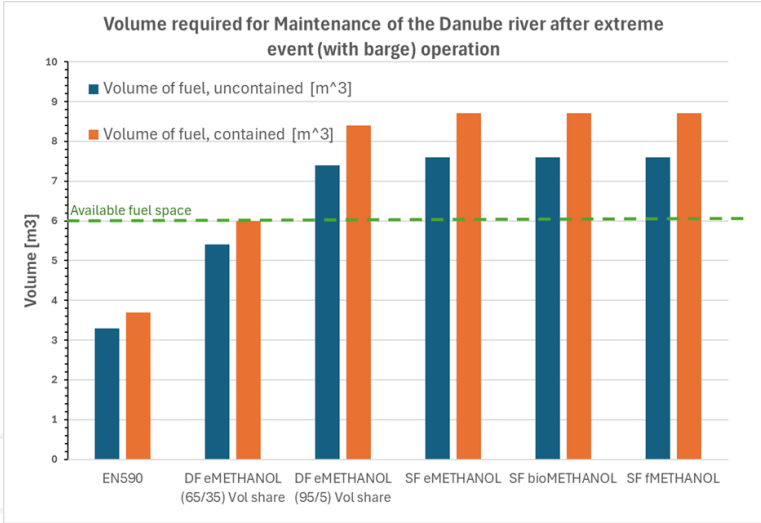
SYNERGETICS BDA Methanol Demo

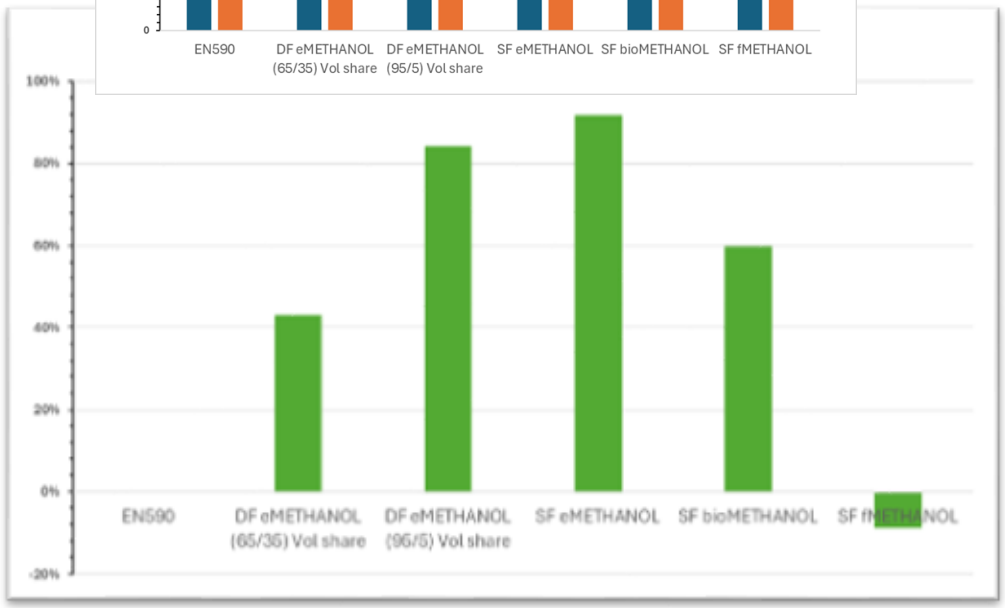
Initial assessment to evaluate 51 combinations of power and energy systems, based on requirements and operational profile on criteria such as:

- ✓ Weight
- ✓ Volume
- ✓ Fuel consumption
- ✓ Potential carbon neutrality

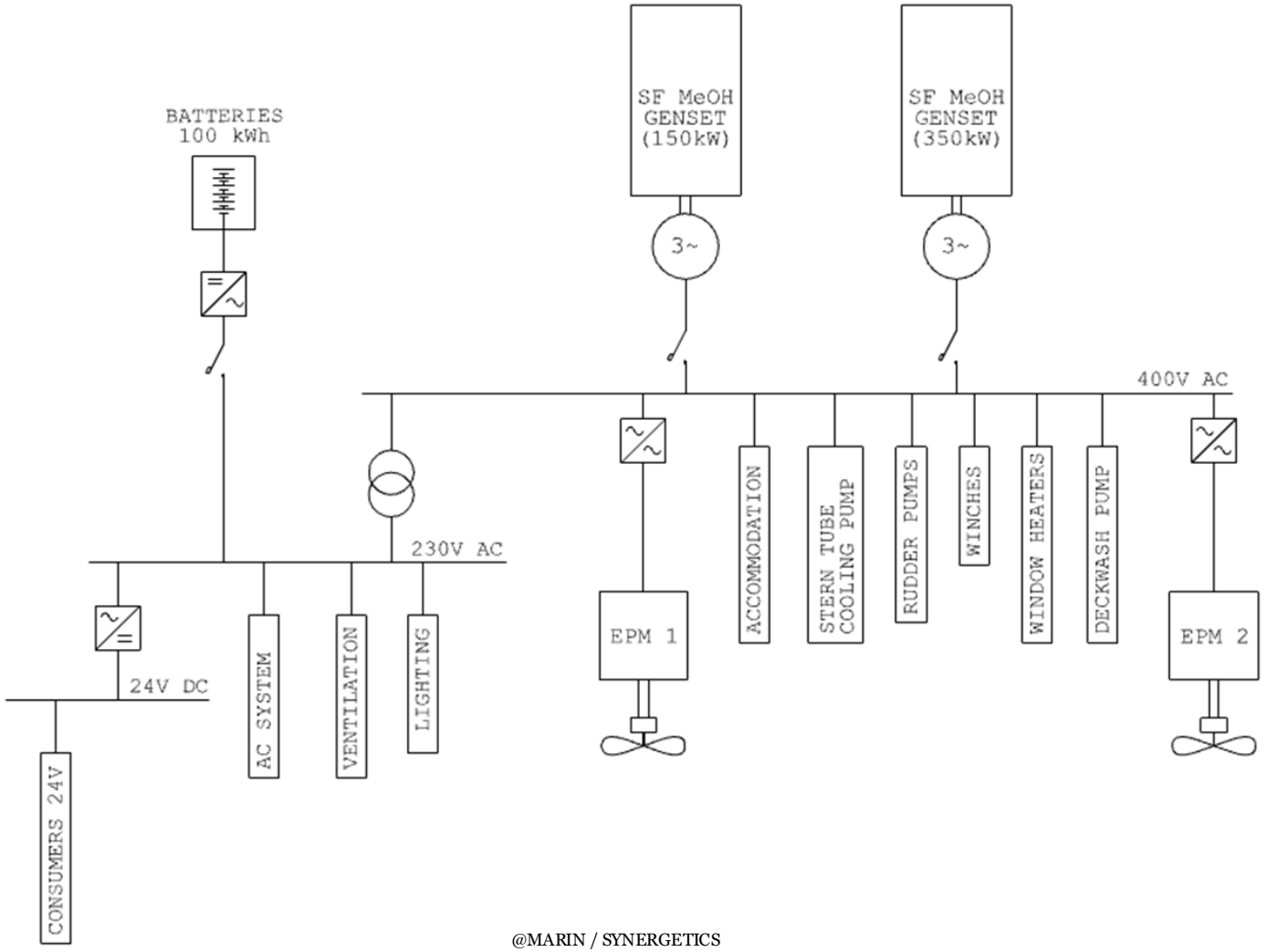


viadonau indicated methanol as the preferred solution





SYNERGETICS BDA Methanol Demo



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SF Methanol-electric configuration

Fuel (methanol) system

2x 6 m3 inerted tanks -> capacity based on most energy demanding operation + 30% margin

Propulsion system

2x 250 kW propulsion motors -> size based on data from manufacturers

Electric system

2x Methanol SF gensets (150 kW and 350 kW)-> based on volumetric density of MeOH SF engines and diesel gensets of similar size

Battery back up pack (100 kWh) -> based on data from manufacturers

Other systems

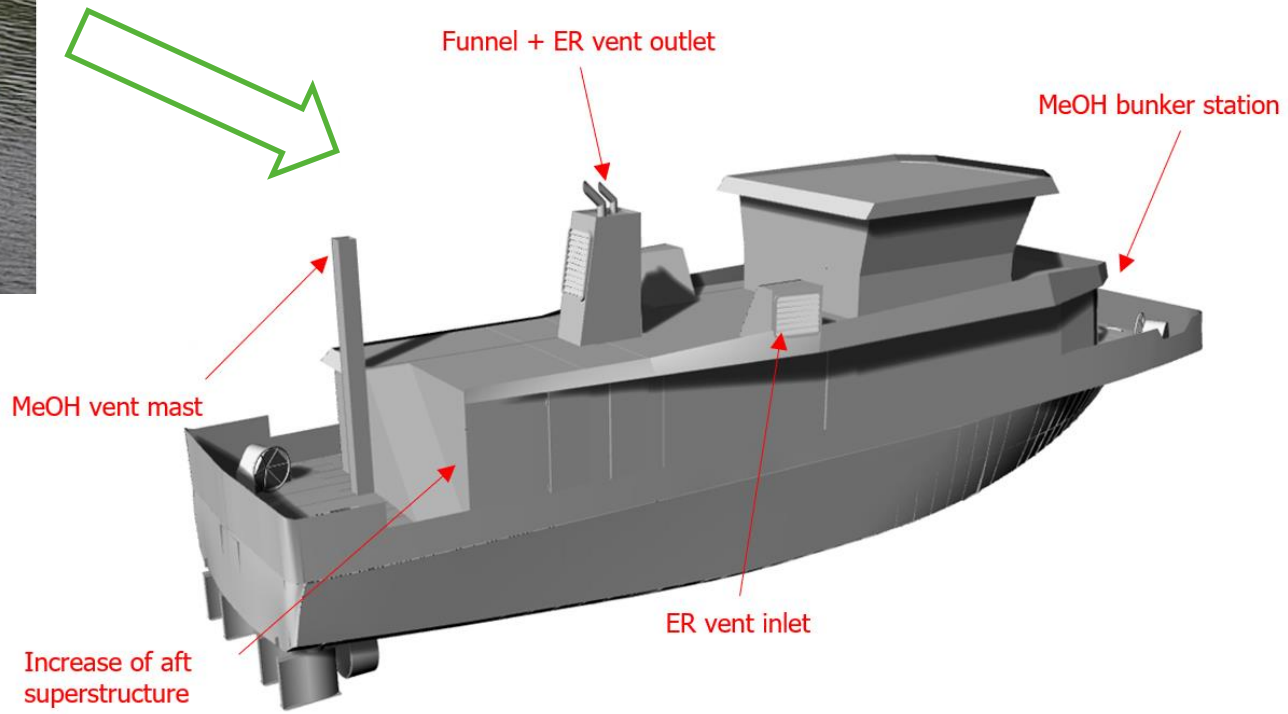
Bilge -> additional bilge/holding tank for methanol

Inert gas system -> based on data from manufacturers

SYNERGETICS BDA Methanol Demo



- **Feasible** design – subject to full safety assessment
- Additional **space** required for the fuel system
- **Negative** influence on the draft
- **Succesfully** tested in MARIN virtual Zero Emission Lab



@MARIN / SYNERGETICS

SYNERGETICS BDA Methanol Demo

Parameter	Unit	Diesel (EN590)		Diesel (HVO100) (61)		e-CH_3OH (M1/41)	
Fuel consumed	t	33.67	100%	33.67	100%	78.63	234%
	m3	39.15	100%	39.15	100%	99.29	254%
CO_2eq emissions (T2W)	tCO_2eq	106.22	100%	0.00	0%	0.00	0%
CO_2eq emissions (W2T)	tCO_2eq	33.54	100%	5.09	15%	46.07	137%
Total CO_2eq emissions (WTW)	**tCO_2eq**	**139.76**	**100%**	**5.09**	**4%**	**46.07**	**33%**
NOx emissions (TTW)	tNOx	1.57	100%	0.62	39%	0.67	43%
NOx emissions (WTT)	tNOx	0.04	100%	0.01	33%	0.06	145%
Total NOx emissions (WTW)	**tNOx**	**1.61**	**100%**	**0.63**	**39%**	**0.74**	**46%**
PM10 emissions (TTW)	kgPM10	31.63	100%	15.81	50%	17.21	54%
PM10 emissions (WTT)	kgPM10	1.44	100%	115.00	8000%	0.30	21%
Total PM10 emissions (WTW)	**kgPM10**	**33.06**	**100%**	**130.82**	**396%**	**17.51**	**53%**



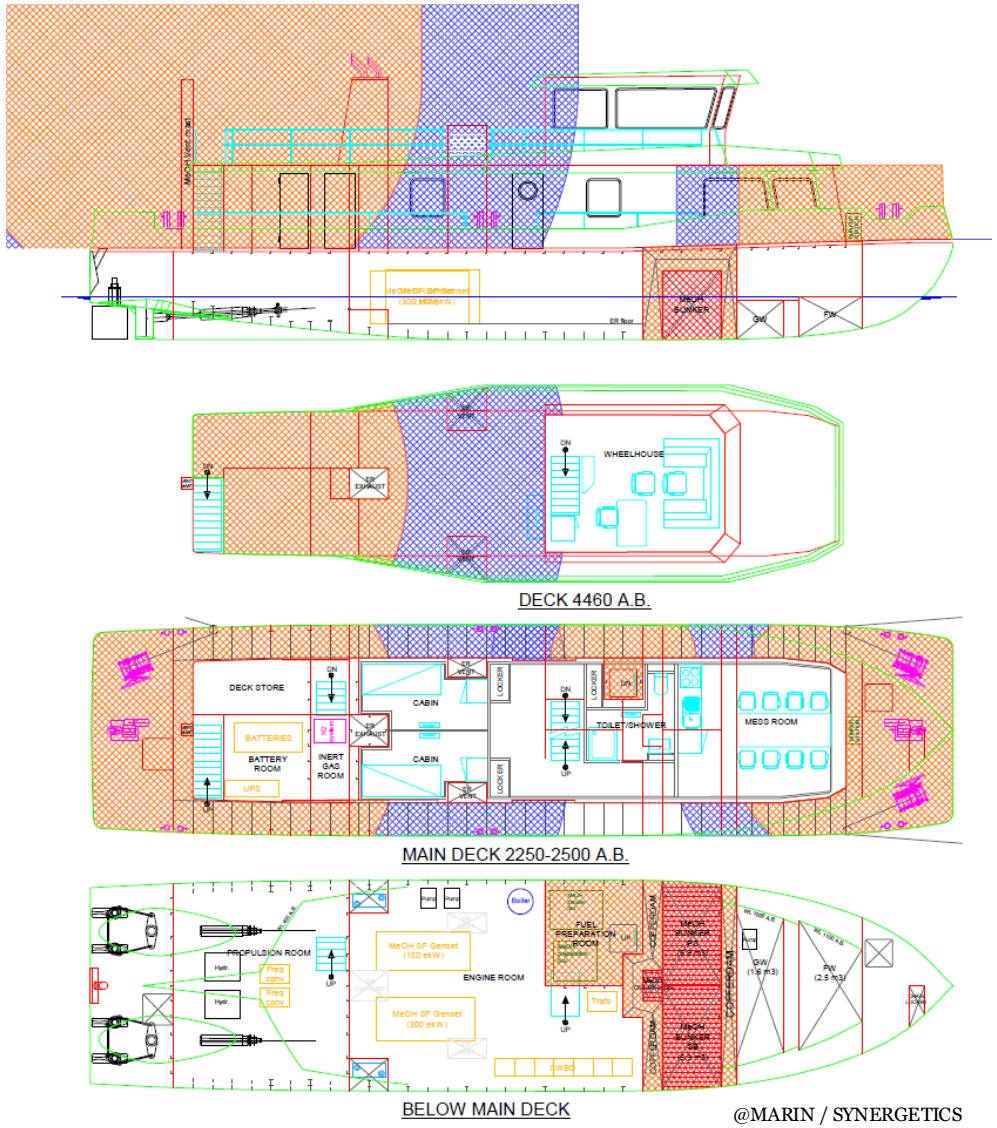
Annual emissions between the reference diesel direct concept [Diesel (EN590)], the diesel direct concept running with HVO100 [Diesel (HVO100) (61)] and the methanol electric concept with single fuel methanol engines [e-CH_3OH (M1/41)].

Figures are the average values for the 15 years voyage simulations.

SYNERGETICS BDA Methanol Demo

Integration challanges

- ICE - approval within the scope of Regulation (EU) 2016/1628 (**NRMM Stage V**).
- Methanol is not a reference fuel → **no** suitable **engines available**
- Definition of hazardous areas in **ESTRIN not clear**, reference to EN 60079-10-1:2020 which are regulations made/applicable for chemical plants!
- Rules for seagoing ships were followed
  - Methanol vent mast → sphere and cylinder of hazardous zone 1 with 6 m radius, with 4 m additional radius for zone 2
  - Ventilation inlet/outlet of the engine room and other spaces within the hazardous areas
  - **Design impractical**
  - Risk assessment, **HAZID**, **HAZOP** required.



@MARIN / SYNERGETICS

Key Takeaways

- Inland Waterway Transportation is subject to c**onstraints and challenges.**
- Policy framework requires **climate neutrality** by 2050; IWT must align and contribute.
- Alternative technologies are ready for deployment, but currently they do not represent a viable **business case** for IWT.
- The choice of technology depends heavily on the type of vessel and its **operational profile.**
- IWT energy transition is not a **technology-development** problem, it is a **policy-design** and **execution** problem.
- The focus must shift from individual projects to **system design**.

Key Takeaways

- **Infrastructure** deployment must be accelerated.
- **Regulatory** fitness must be prioritised; comprehensive revision of the NRMM and alignment to ES-TRIN and safety regulation is essential.
- Solutions with **immediate implementation** such as engine replacements, aftertreatment installation, the use of drop-in fuels, digitalisation, and energy efficiency improvements are available and must be supported.
- Carbon pricing, taxation and revenue recycling should be tailored to the sector in order to preserve **competitiveness**.

The greenest kWh is the saved one!

Thank you for your attention!



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