

WORLD'S FIRST AMMONIA-POWERED SHORT-SEA BULK VESSEL

SEPTEMBER 2023

VIRIDIS
BULK CARRIERS



Karl Fredrik Vistad
Deputy Project Manager

152 MNOK ENOVA GRANT 2 x VESSELS



48,2 MNOK ENOVA GRANT TO YARA CLEAN AMMONIA



WHY AMMONIA?



Energy-rich

45-50% higher energy density than liquid hydrogen



Carbon free

Inherently carbon free when produced from renewable energy



Handling

Easier to produce, distribute and store than hydrogen



Well-established

Globally traded commodity with 130+ ports having ammonia import/export infrastructure in place



Abundant

Comprised of Nitrogen and Hydrogen, among the earth's most plentiful resources



Versatile

Demand stretches far beyond shipping fuel (e.g. fertilisers, power generation, hydrogen carrier), incentivising significant investments

9/26/2023

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BACKGROUND



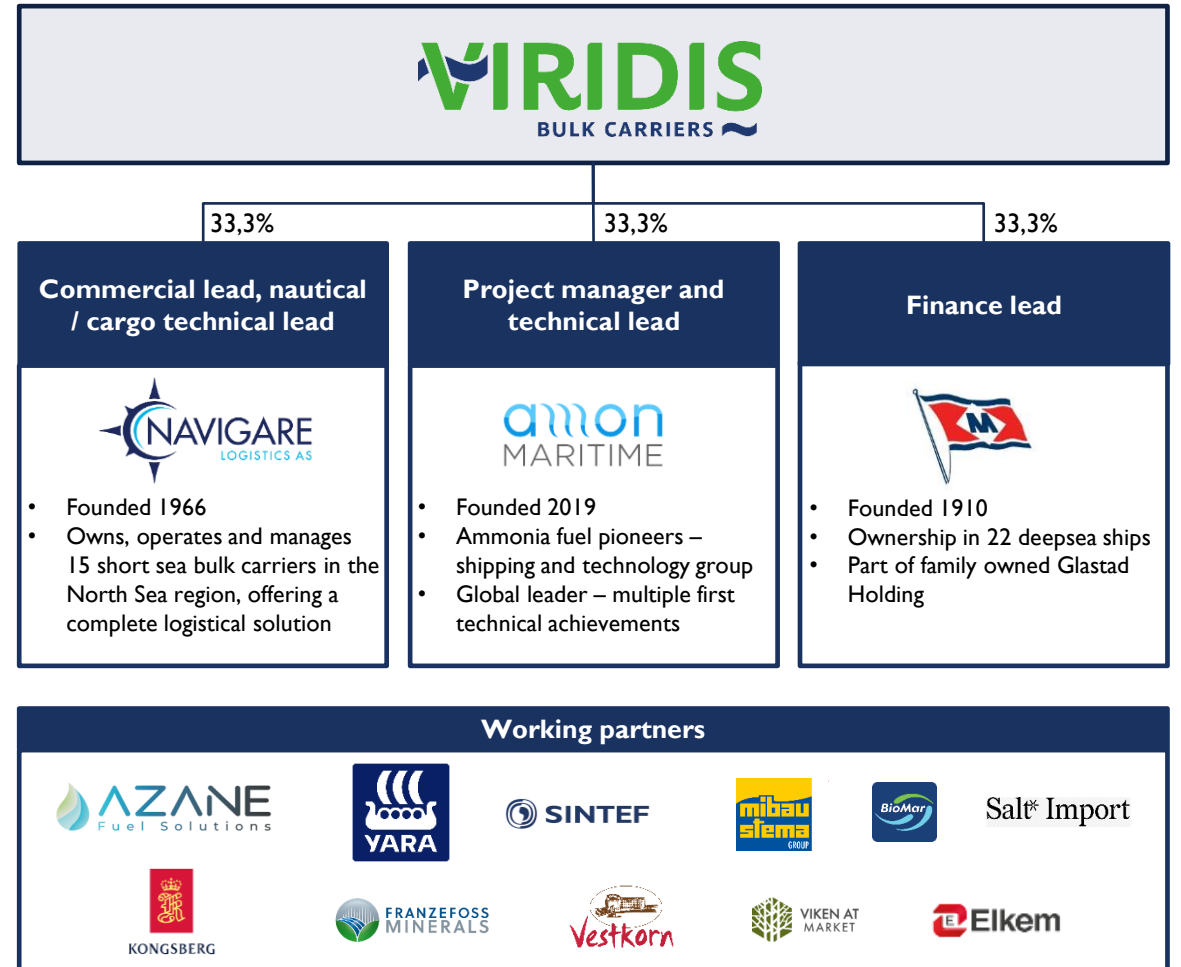
VIRIDIS BULK CARRIERS

Background & Strategy

- Pioneering ammonia as fuel
- Develop, build, own and operate zero carbon bulk carriers without sacrificing operational capabilities like range/endurance
- Optimal joint venture structure from ship concept to operations
- Collaboration with strong industry/technology partners
- Strategy to build the leading bulk operator in Europe through the implementation of ETS in shipping
- Supported by Norwegian Pilot-e grant from development to investment



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DEVELOPMENT SINCE 2020

NEXT GENERATION ZERO CARBON SHORT SEA VESSEL



2020 – Viridis Bulk Carriers established / Concept development



- Navigare Logistics, Amon Maritime and Mosvolds Rederi forms **Viridis Bulk Carriers AS** to develop, build, own and operate zero carbon bulk carriers, drawing on the expertise, networks and capabilities of each of the joint venture partners
- Started developing design concept and establishing close collaboration with key technology partners

2021-2022 – Partnerships established / Public funding granted / R&D phase

- Established consortium with 8 charterers and technology partners – **“Flexbulk – NH3 Power”**
- Together developing an efficient zero emission freight network based on Viridis’ ships and cargo volumes from each Client Partner
- Viridis Bulk Carriers and consortium partners awarded NOK 13.75 million in development funding from the Norwegian Pilot-E program to realize a carbon free short sea bulk transportation service comprising cargo, ships- and fuel logistics in the project **“FlexBulk – NH3 Power”**

2023 – Ready for construction

- Main ship design completed ✓
- Approval in principle from BV and DNV class ✓
- Preliminary assessment by the NMA ✓
- Cargo routes map & logistics optimization, corresponding fuel logistics requirements ✓
- Getting ready for ship construction ✓
- Getting ready for fuel terminal construction ✓
- Granted 152 MNOK from ENOVA ✓

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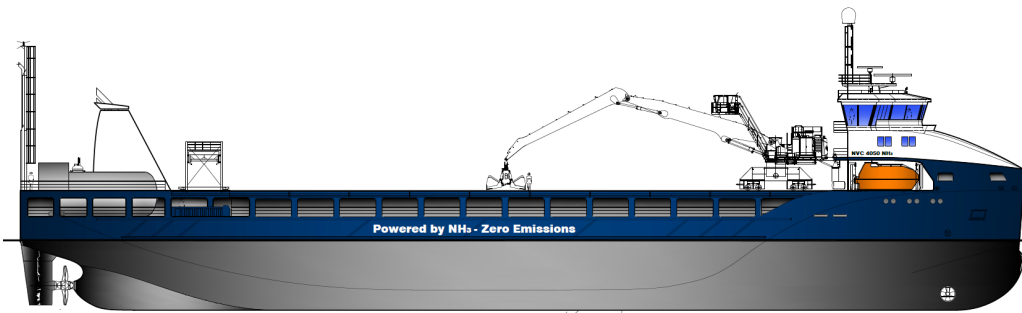
THE VESSEL



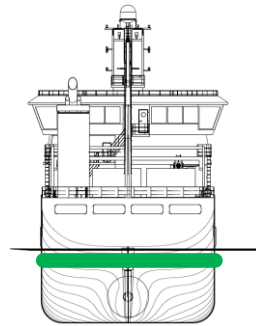
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DESIGN CHALLENGE

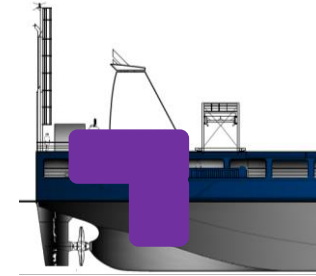
SHIP PARTICULARS COMPROMISE



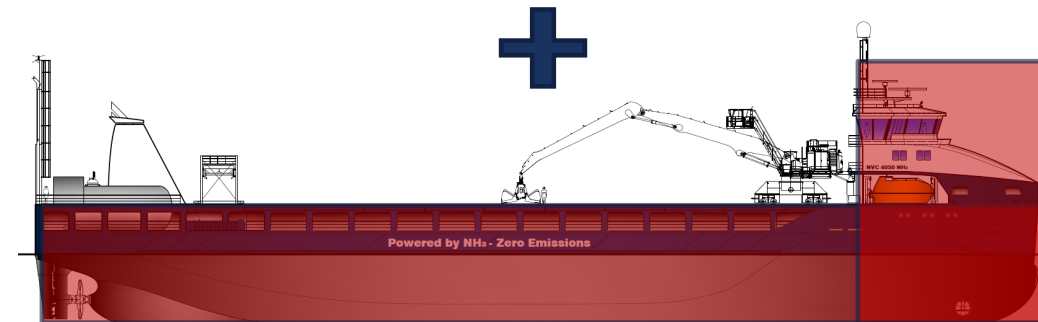
L_{pp} = < 85m



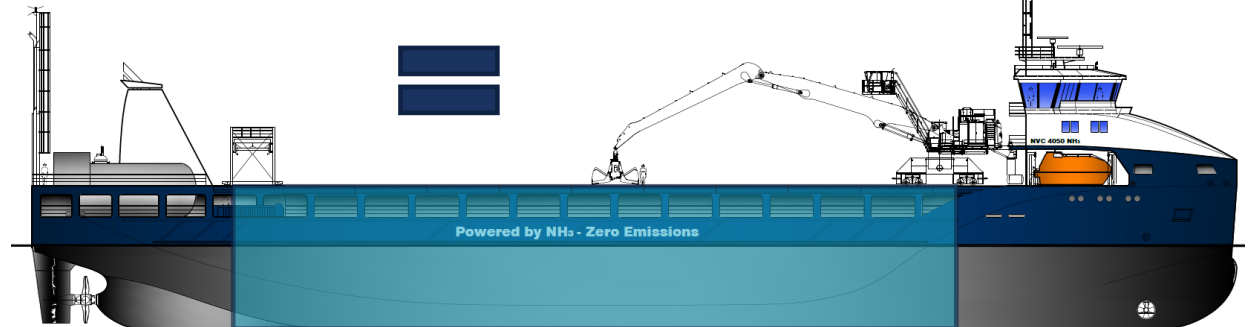
B = < 15.9m



NH₃ FGSS



GT = < 3000



DWTCC = ~4500 tonnes

VBC 4800 – NH₃ powered, self-discharging, short sea dry bulk carrier



Operational capacities

Eco service speed	10 kn
Operational range (NH ₃ mode)	3000 nm

Main dimensions

Length	<90,00 m
Deadweight	4800
Gross tonnage	Approx. 3000







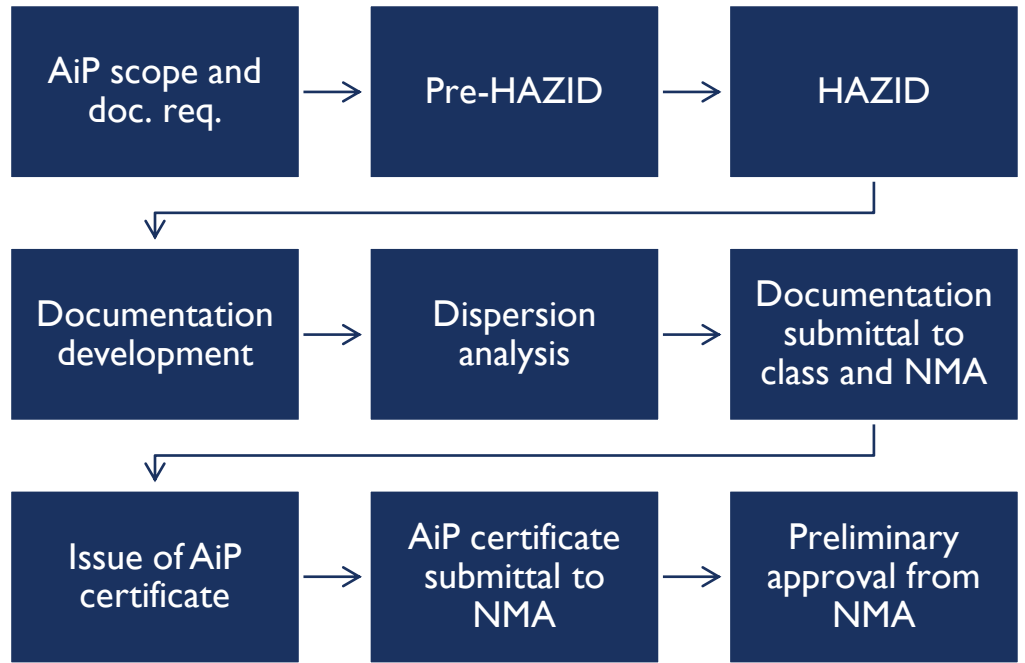
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SAFETY



PRE-CONSTRUCTION APPROVAL PROCESS



HAZID REPORT
Viridius - MHC Project

NH3 Bunkering Procedure
Viridius Bulk Carriers

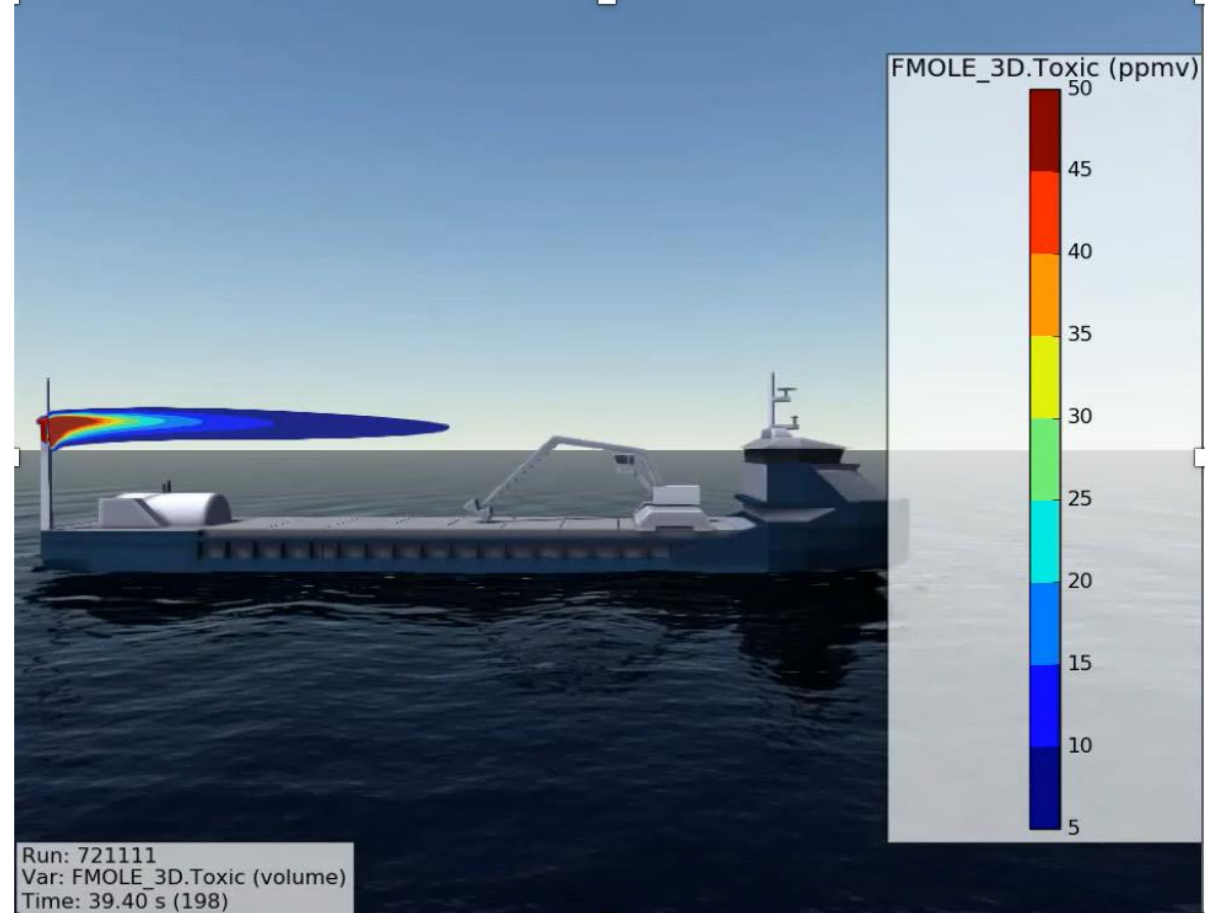
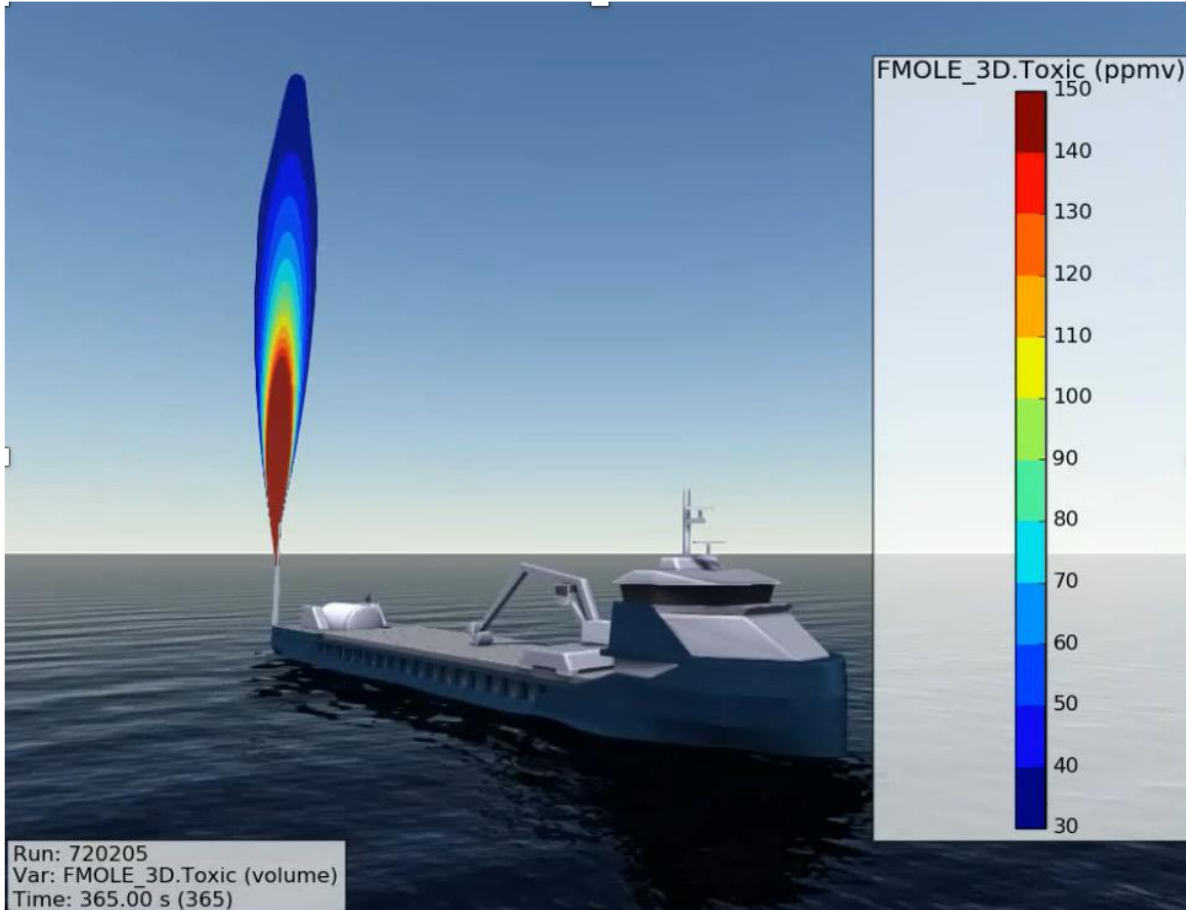
AMON MARITIME

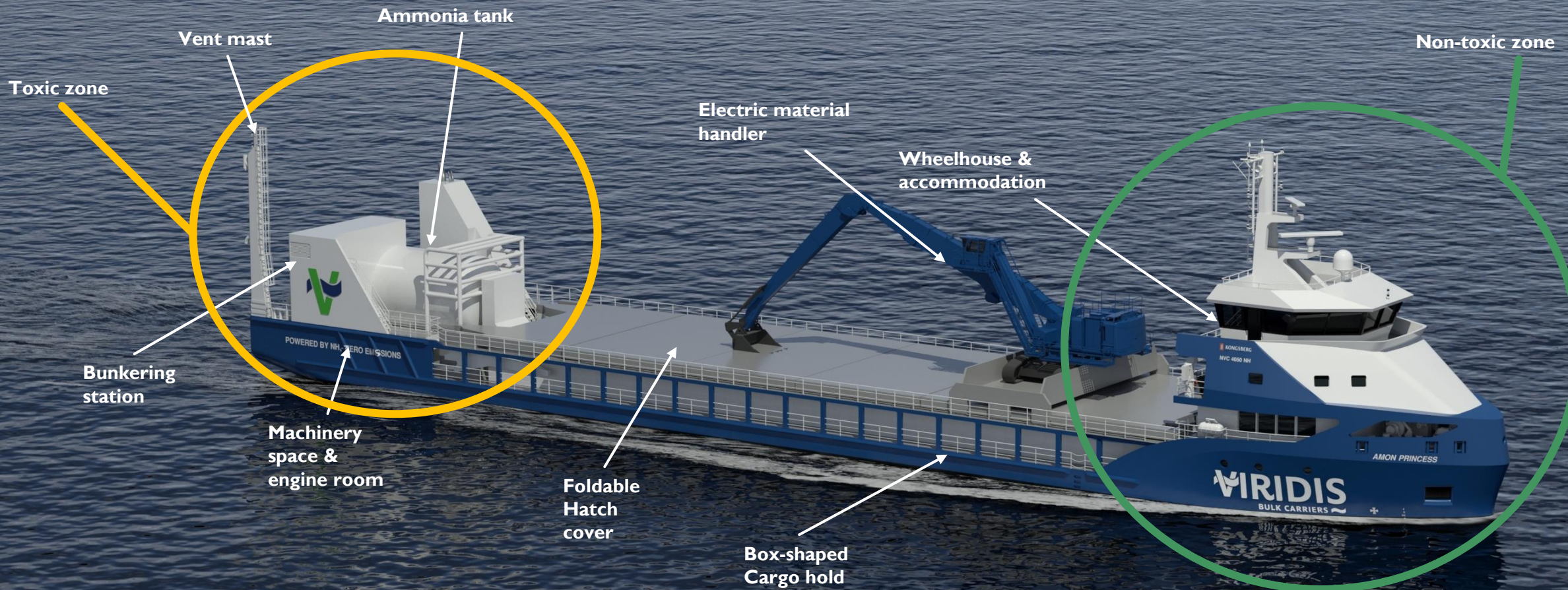
Run: 301102
Var: FMOLE_3D.Toxic (volume)
Time: 42.00 s (211)

Purging in 2 m/s wind

FMOLE_3D.Toxic (ppmv)

Time	Var	Project	Checked	Approved	Approval	Description





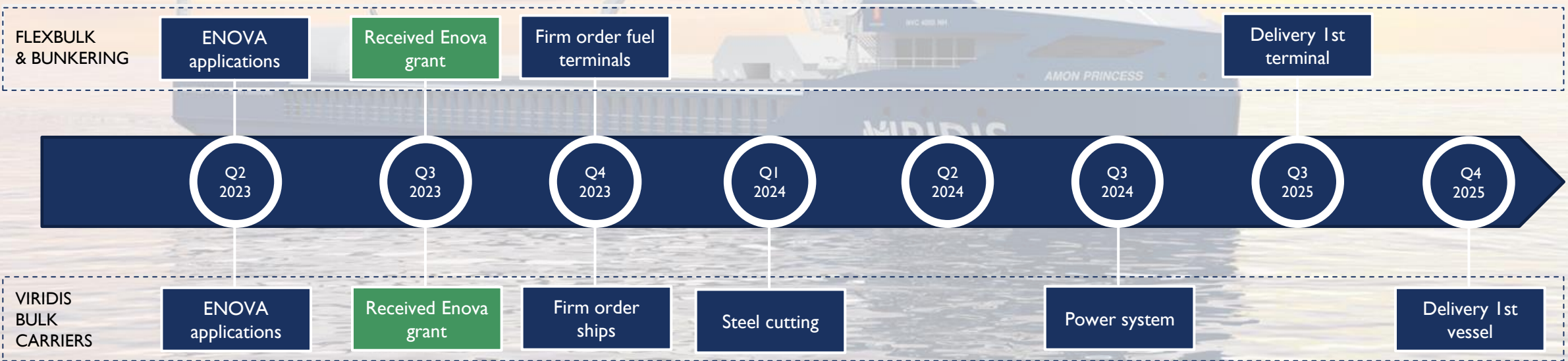
VIRIDIS BULK CARRIERS

PARTNER STRUCTURE SOLVING THE “CHICKEN & EGG” DILEMMA

Vessel Capacity and Operations

Ammonia fuel supply and Bunkering

Cargo – FLEXBULK project



VIRIDIS
BULK CARRIERS



AMON PRINCESS