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Economic and Social Council

Inland Transport Committee

22 August 2023

Working Party on the Transport of Dangerous Goods

Original: English

Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) (ADN Safety Committee)

Forty-second session
Geneva, 21-25 August 2023
Item 3(b) of the provisional agenda
Implementation of the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN): special authorizations, derogations and equivalents

Request for a recommendation on the use of hydrogen fuel cells for the propulsion of the vessel "FPS Waal"

Transmitted by the Government of the Netherlands

FPS Waal
Conversion to 0-emission propulsion system.

ADN presentation

18 August 2023

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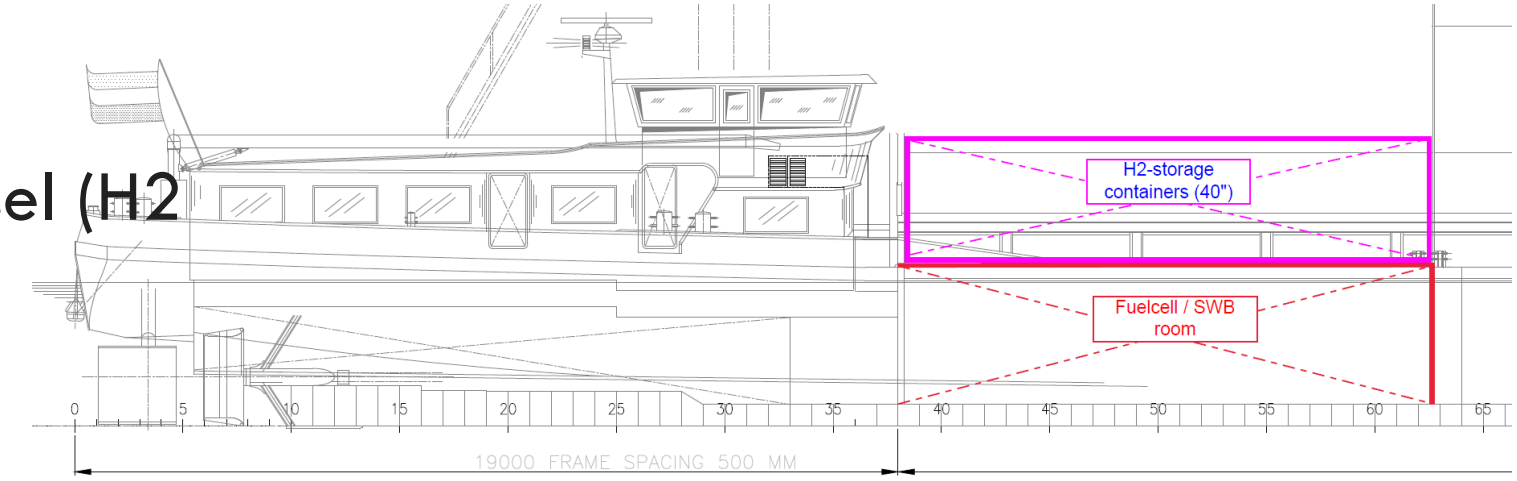
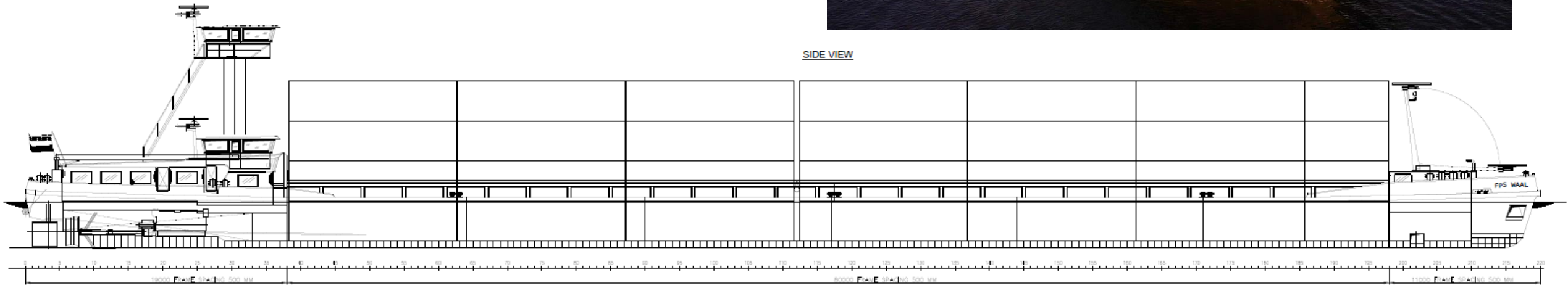


1. Main characteristics FPS Waal

Lenght oa	:	**109,80m**
Beam oa	:	11,40m
Depth	:	3,60m
Draft	:	3,30m
TEU capacity	:	204
Main propulsion	:	1.020 kW



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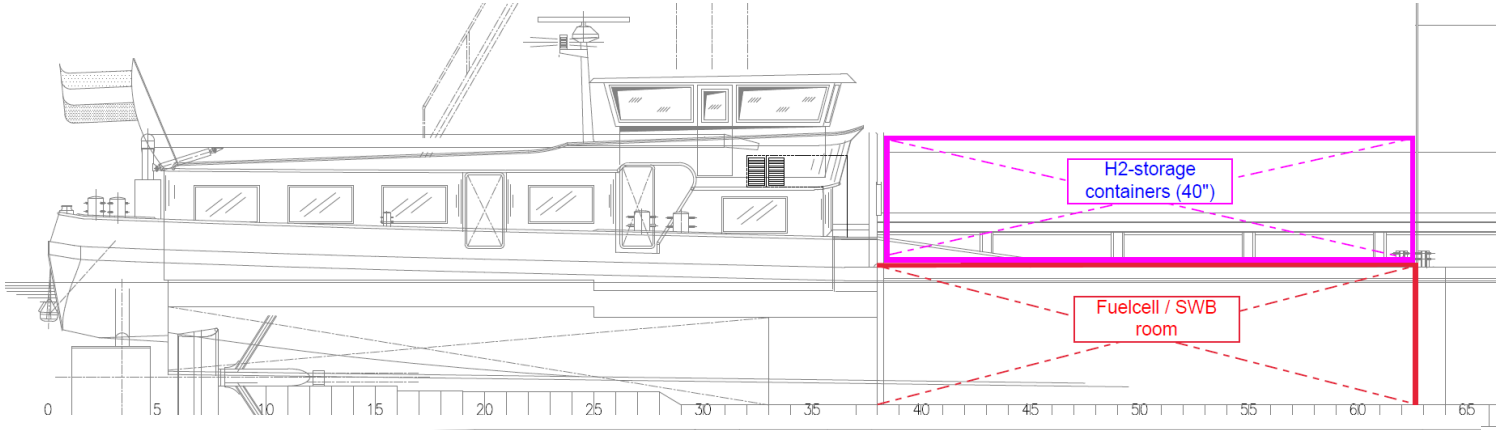
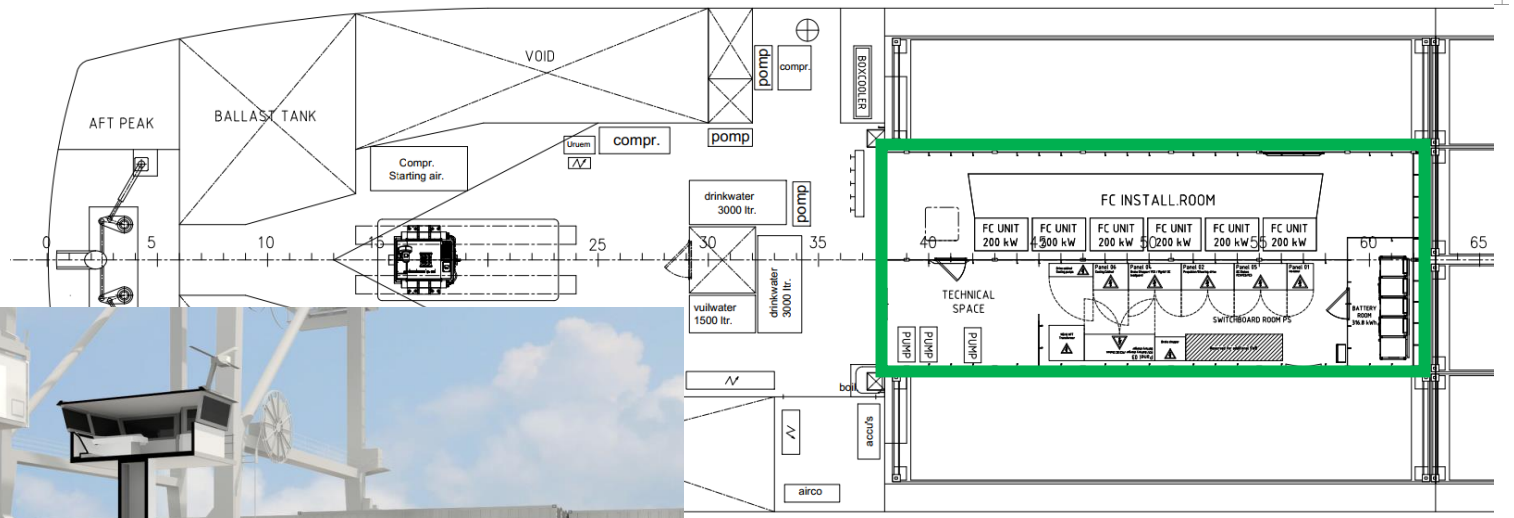
2. Concept design of the new installation

- Full electric propulsion system.
- Energy provided by means of 6x 200kW Ballard fuel cells.
- Two swappable 40ft H2 storage containers providing the H2 for the vessel.
- One battery installation in the foreship used as emergency power supply.
- One battery installation in the aft ship used for:
  - Providing hotel load during loading & unloading; and
  - Peak shaving during sailing operations.





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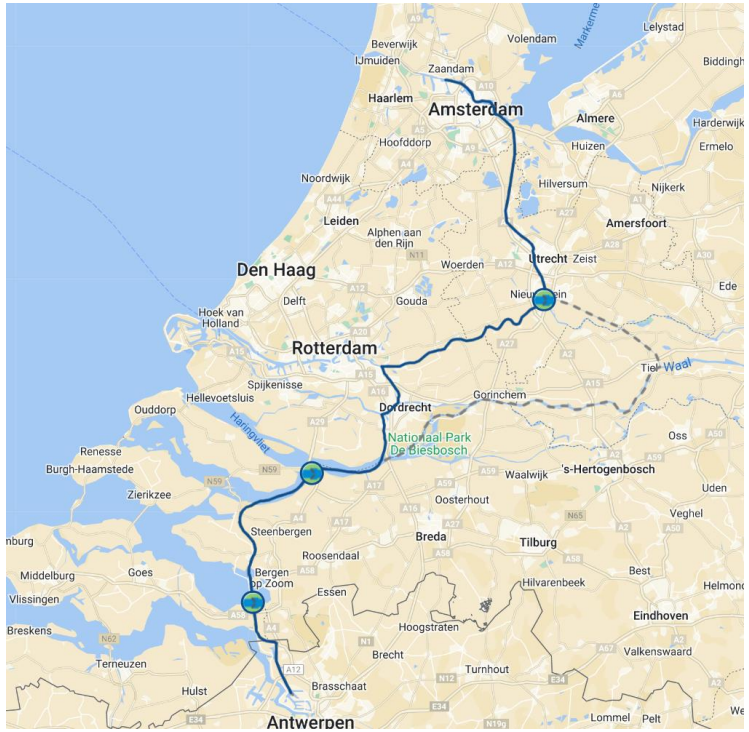
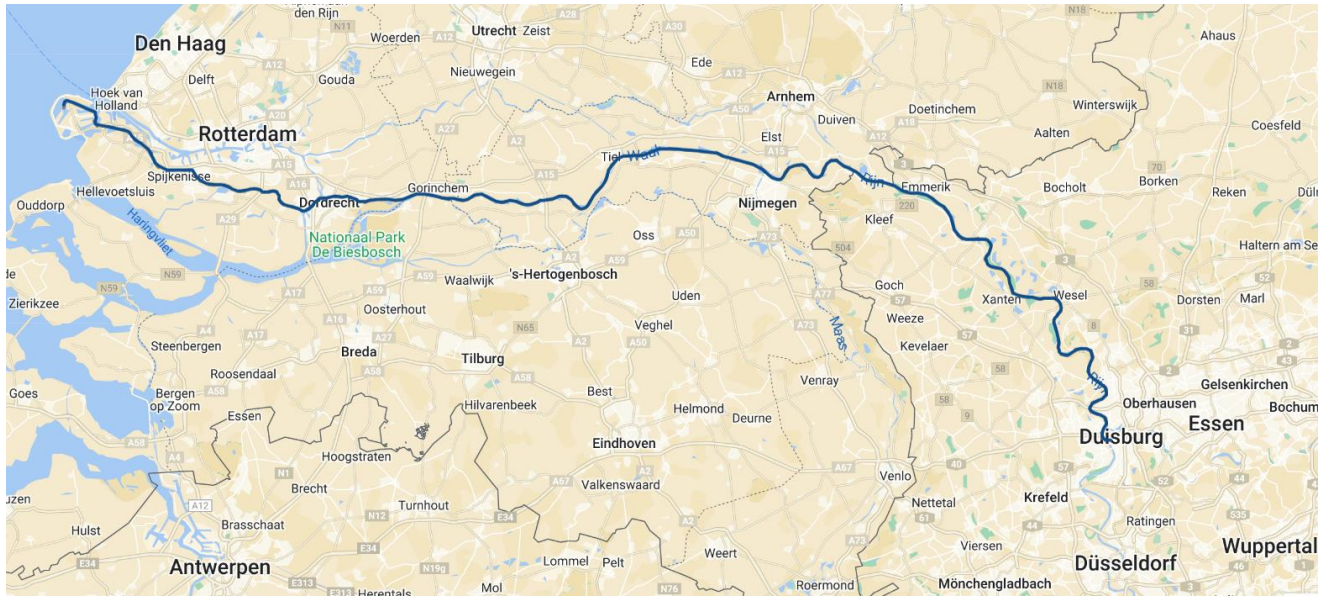
3. Intended operational areas

- General operation between the ARA region and Duisburg (or further upstream as required).





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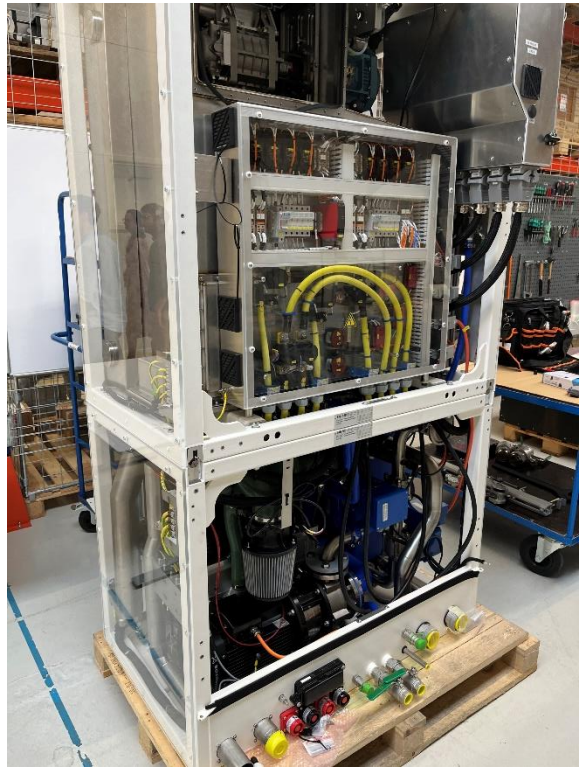
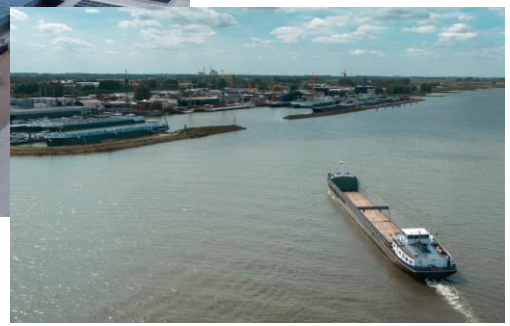
4. Status of the project

- Design & Engineering works completed.
- 2- day HAZID and HAZOP workshop with LR completed.
- Main steel section prepared for installation onboard, including all main equipment.
- Conversion process started (vessel at the shipyard).
- Commissioing to take place end of 2023/beginning 2024
- Trials & Delivery: Jan 2024.





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4. Safety philosophy of the H2 system

- Design is based on the same safety philosophy as applied on sistership H2 Barge 1 (in service since May 2023).
- A comprehensive safety assessment for FPS Waal has performed in the form of a HAZOP and HAZID workshop with all main parties involved in the project, including specialists from Lloyds Register.
- No H2 refueling onboard, refueling by means of swapping empty for full H2 containers at the container terminal.
- Redundant electric propulsion system consisting of:
  - main electric propulsion installation in the aft propulsion room (1.000kW electric propulsion motor driving the main propellor shaft line).
  - emergency propulsion installation in the foreship (500kW electric powered bowthruster).
- LR & DNV type approved Ballard Fuel cells.

5. Main safety features

H2 supply system:

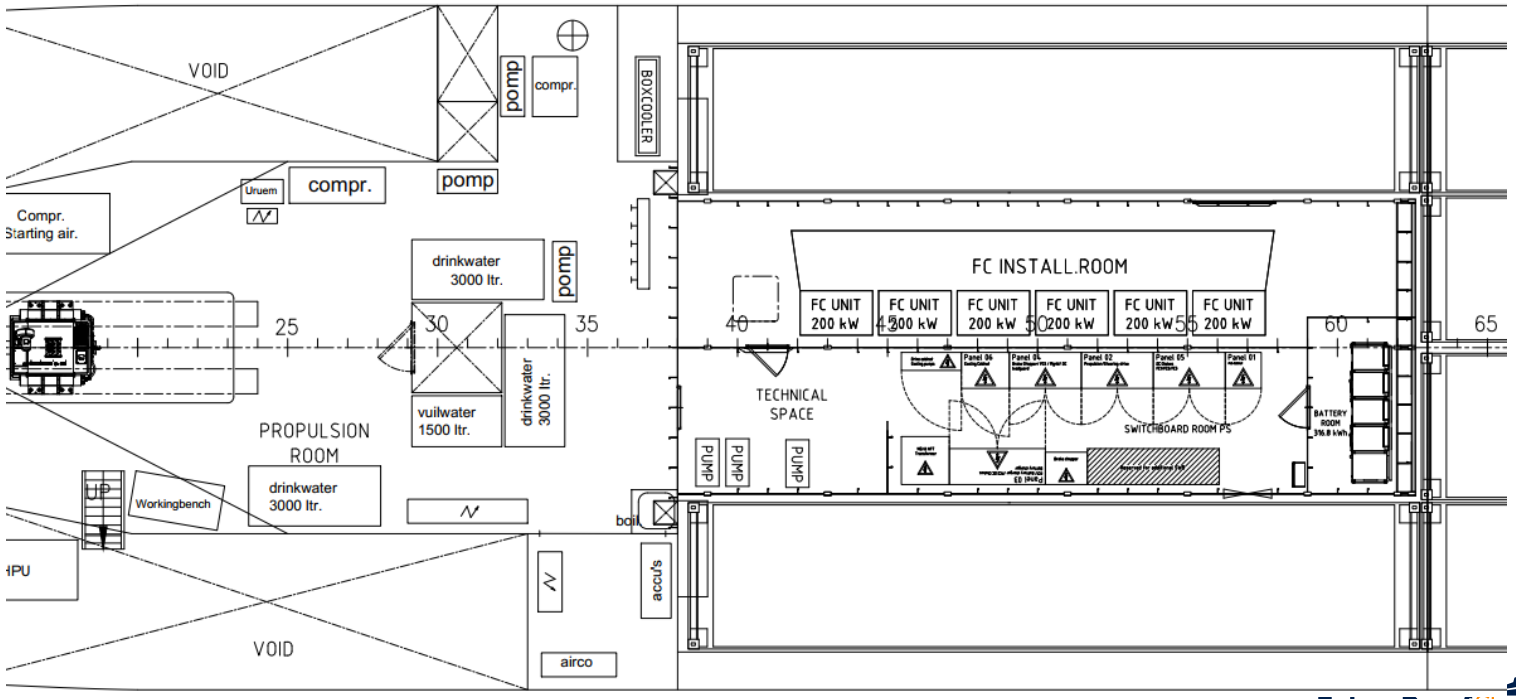
- Pressure reduction from max 300 bar to 10 bar located inside the H2 storage container
- Main manifold and pressure regulation (10 bar to 4,5 bar) located on open deck.
- Each pair of fuel cell provided with an air activated emergency shutdown of the H2 supply.
- Double wall H2 piping system inside the fuel cell installation room with leak detection system.

Ventilation system:

- Redundant EX type ventilation in FC installation room.
- Separated process air and enclosure ventilation system for the fuel cells.
- Air in and outlets well separated and away from the cargo hold.

Electrical system:

- Redundant electrical distribution system with split main bus-bar (separate switchboard fore and aftship).
- Independent emergency power supply from forward battery system located in foreship (permanent on-line).



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6. Other safety features

Secondary safety systems:

- H2 gas detection system.
- Fire detection system.
- Gas based fire suppression system in FC installation room
- Additional fire fighting monitors driven by dedicated fire-fighting pomp located in front of the wheelhouse.

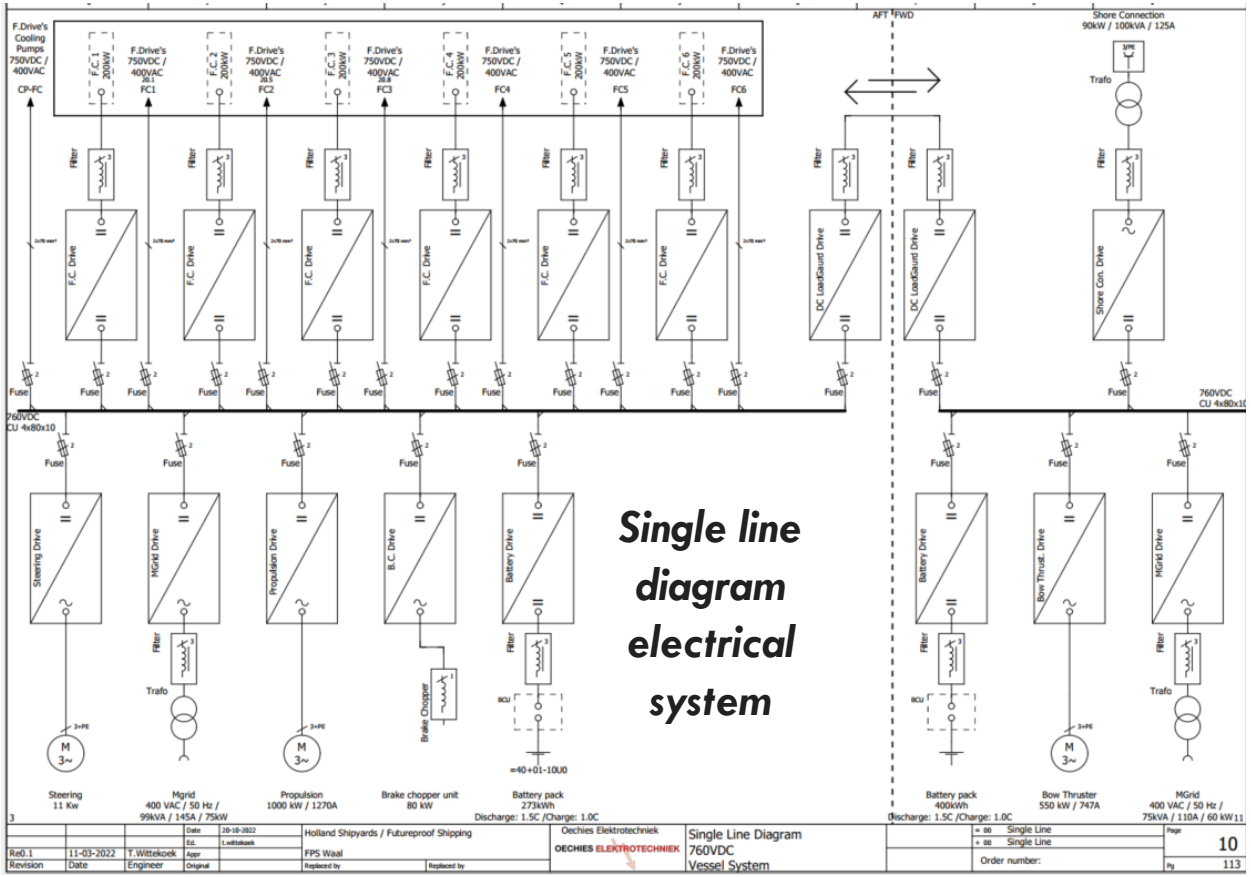
Fire-fighting monitor

Redundant main power supply system consisting of:

- Six type approved fuel cells.
- Fuel cells running in pairs (three separate / independent systems)

Redundant emergency power supply system consisting of:

- Aft battery system (always online) for normal operations.
- Forward battery system (always online) for emergency operation.



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7. Main differences with H2 Barge 1 (ex-Maas)

FCwave™
200kW Marine Fuel Cell

Description	MSC Maas	FPS Waal
Fuel cell supplier	Nedstack / Koedood	Ballard (**DNV & LR type approved**)
Number & power of FC's	3 x 275kW (total installed power 825kW)	6x 200kW (total installed power 1.200kW)
Cooling system FC's	Intercool system via boxcoolers.	Intercool system using river water as cooling medium.

DNV

TYPE APPROVAL CERTIFICATE

Certificate No:
TAE00004GG
Revision No:
1

This is to certify:
That the Fuel Cell

with type designation(s)
FCwave

Issued to
Ballard Power Systems Europe A/S
Hobro, Nordjylland, Denmark

is found to comply with
DNV rules for classification – Ships

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Let’s define shipping’s new normal together!

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