ELEKTRA

Challenges building the first zero emission inland water push boat ELEKTRA

ELEKTRA-Video

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Workshop der ZKR:
„Alternative Energiequellen für elektrische Antriebe in der Binnenschifffahrt“
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ptj
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ANLEG Advanced Technology

BEHALA

BALLARD

Schiffswerft HERMANN BARTHEL GMBH

EST-Floattech
Intelligent Energy Storage Solutions

HGK SHIPPING

SER

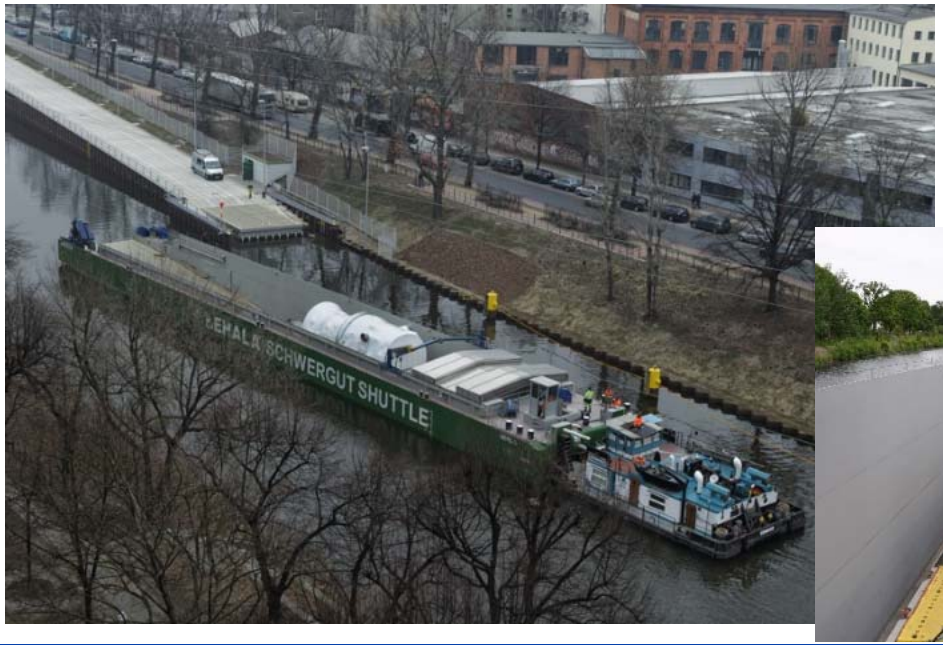
EBMS

Layout - Requirements and constraints – local and global emission-free

Main task „ELEKTRA“ in connection with „URSUS“:

- RoRo – project loads
  regional / supra-regional transport of heavy duty gas turbines from the Siemens AG / Berlin plant

Heavy Cargo RoRo-Barge „URSUS“
length 64.50 m / width 9.50 m
displacement 1,400 t / draught 1.30 m – 3.06 m



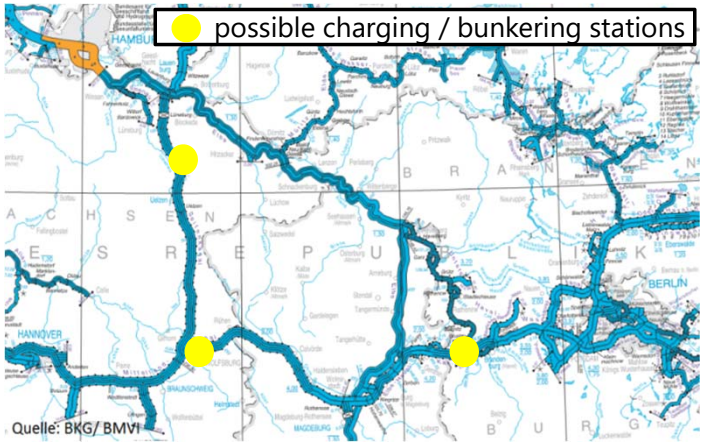
Ramp
length 265 m

Layout - Requirements and constraints – local and global emission-free

Regional operation

- Max. push load of 1.400 t
- Approx. range of 65 km/d
- Area of operation: zone 4
- Operational time of 8 h daily
- Average speed 8 km/h, up to 10 km/h
- Drive: battery

Supra-regional operation



- Berlin ↔ Hamburg
- Max. push load of 1.400 t
- Approx. range of 100 km/d
- Area of operation: zone 3+4 (exc. Rhine)
- Operation time of 16 h daily
- Average Speed 8.5 km/h, min. 10 km/h
- Drive: hybrid electric (FC/accumulator)

Layout - Push Boat

Main dimensions

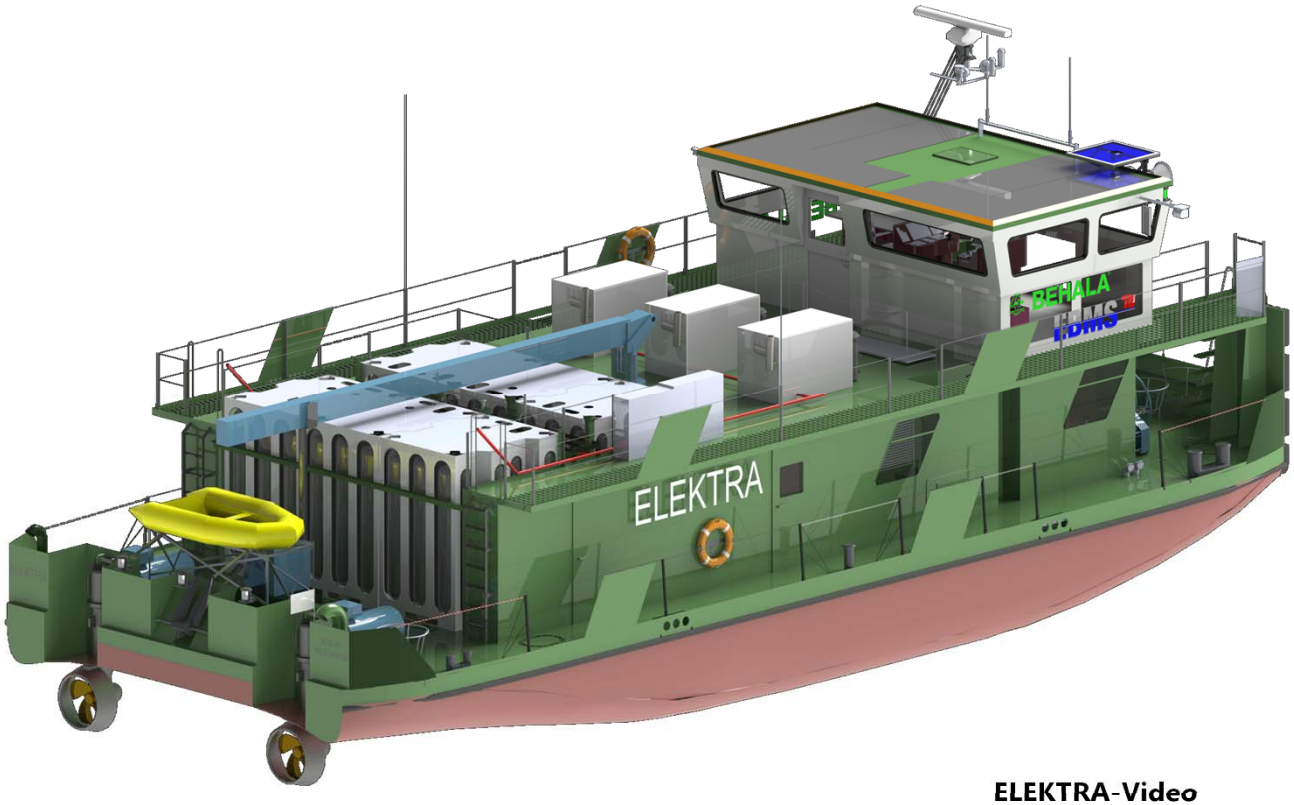
- length 20.00 m
- width 8.25 m
- draught 1.28 m
- displacement appr. 140 t

Operation

- Range total
  at 1.400 t pushload appr. 400 km
- Batterie-electric 8 h / 65 km
- Hybrid-electric 16 h / 100 km

Powertrain

- power 2 x 210 kW



ELEKTRA-Video

Layout – Overview energy system

BEHALA
- Owner

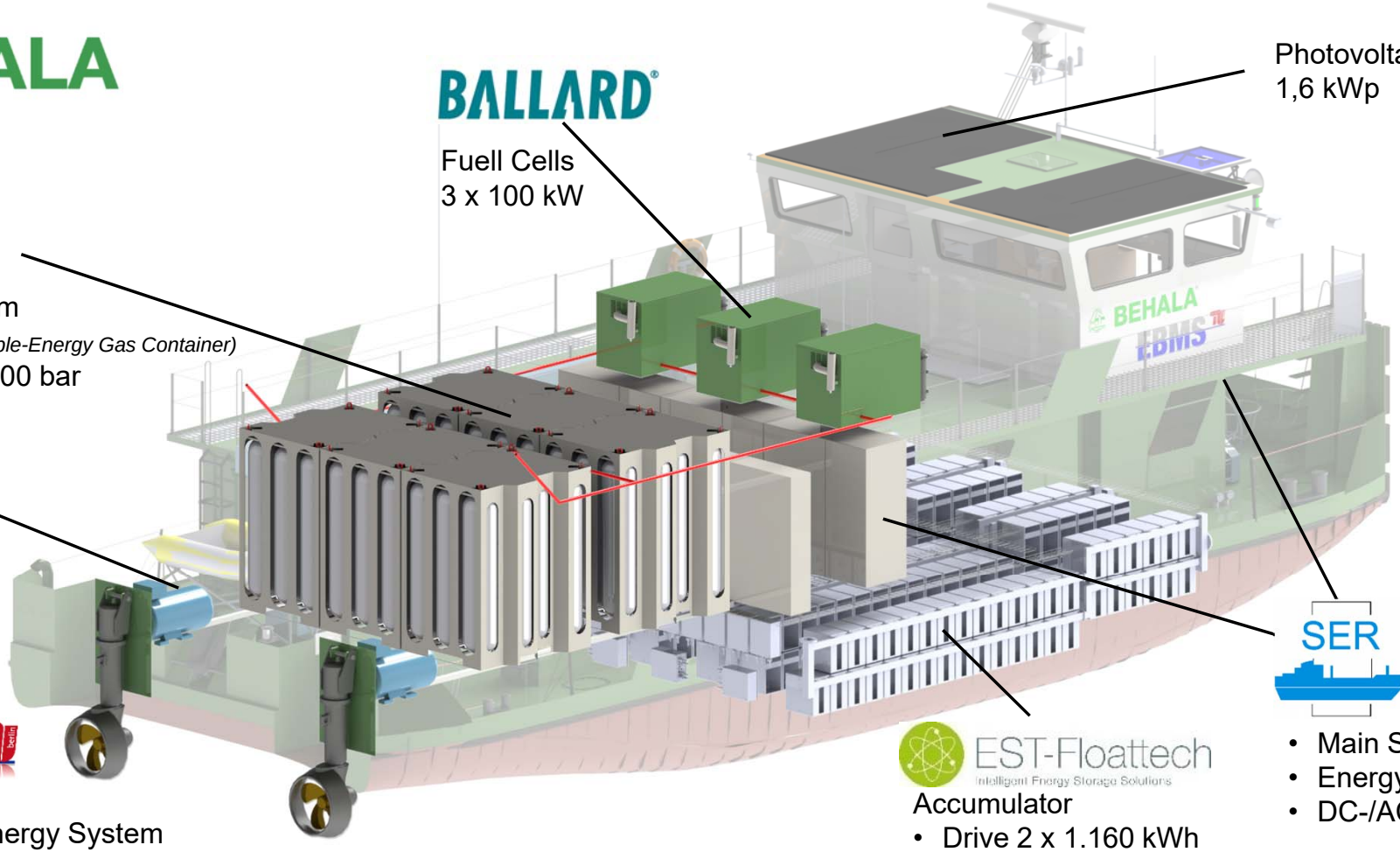
BALLARD

Fuell Cells
3 x 100 kW

Photovoltaics
1,6 kWp

ANLEG
- Hydrogensystem
- H2-MEGC *(Multiple-Energy Gas Container)*
  6 x 125 kg at 500 bar

Drive engines
2 x 210 kW



- Shipbuilding

SER
- Main Switchbords
- Energy Automation
- DC-/AC-Shoreconection

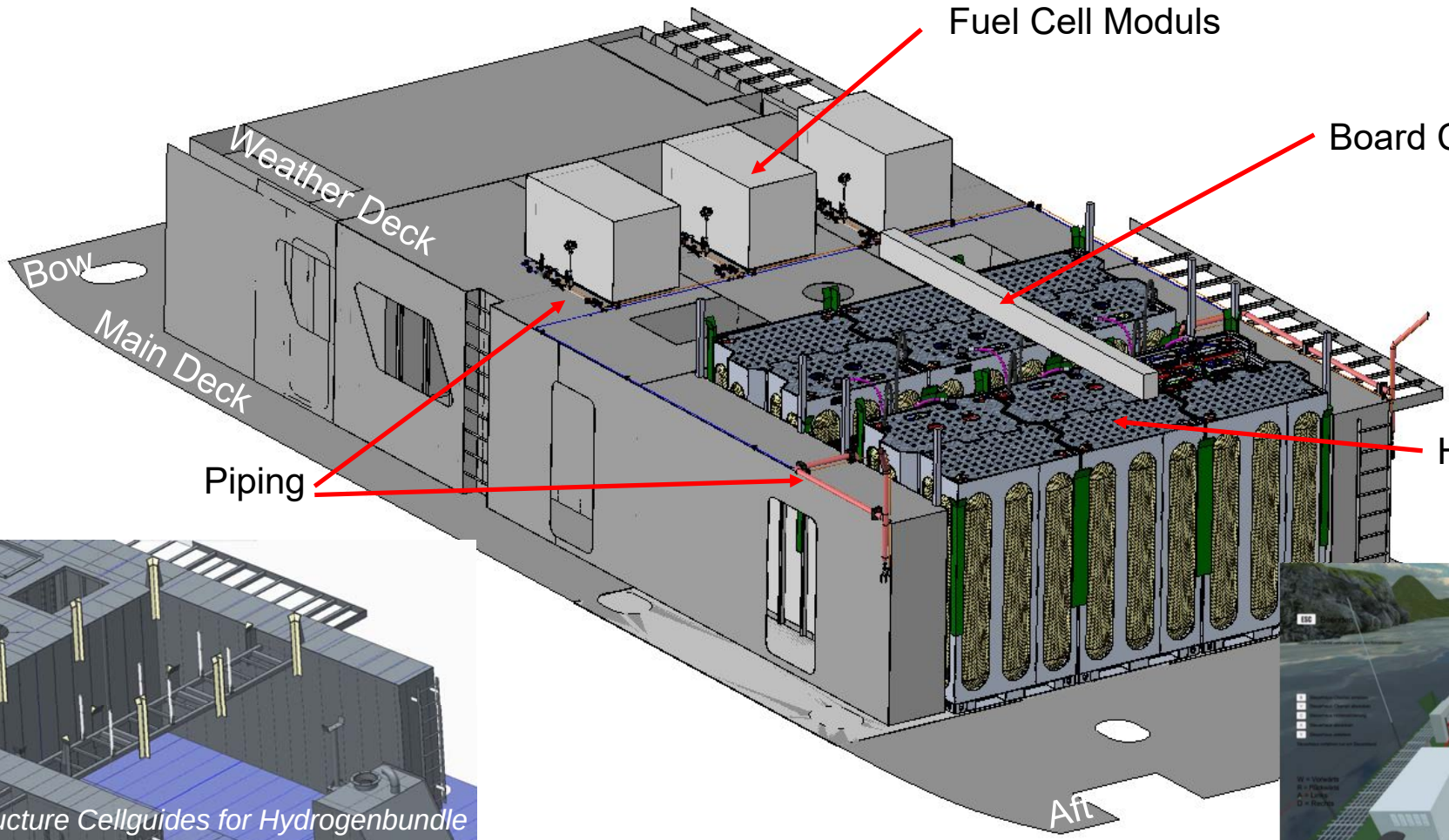
EST-Floattech
Intelligent Energy Storage Solutions

Accumulator
- Drive 2 x 1.160 kWh
- Bordpower 2 x 116 kWh

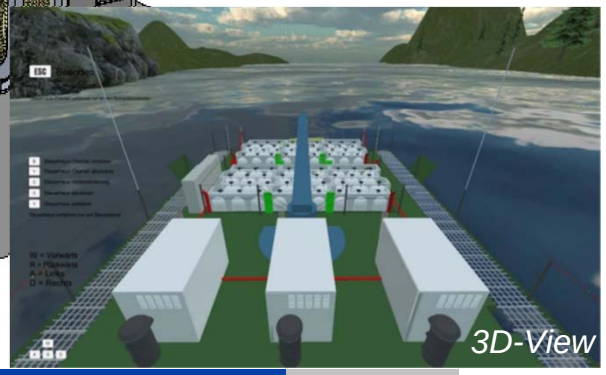
EBMS
- Design of Ship and Energy System
- Project Management

Layout - Impressions of the Newbuilding March 2021

Layout – Hydrogen System - Overview



Steelstructure Cellguides for Hydrogenbundle and passageway without H_2-Tankbundle

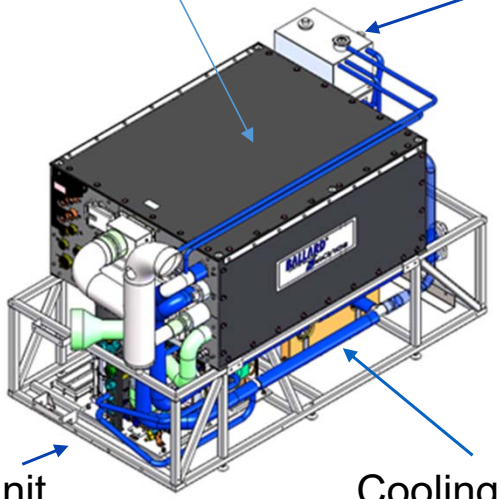


3D-View

Layout – Hydrogen System - Fuel Cells

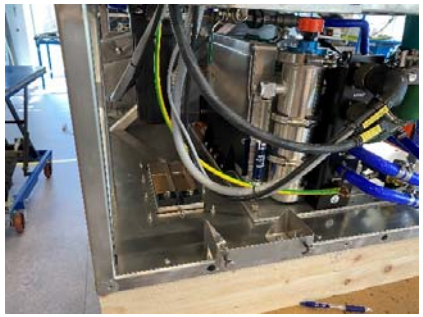
Fuell Cell Units at the weather deck

Fuel Cell Modul



Heatexchanger with pressurevessel

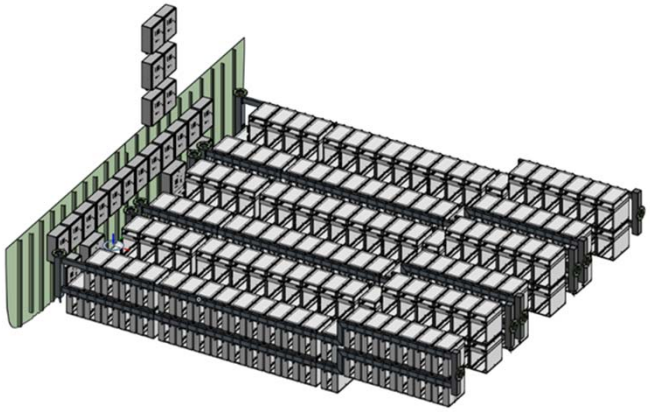
Compressor Unit



Cooling Unit

Layout – Accumumulatorroom / Main-Switchbordroom

DC-Main Switchbord



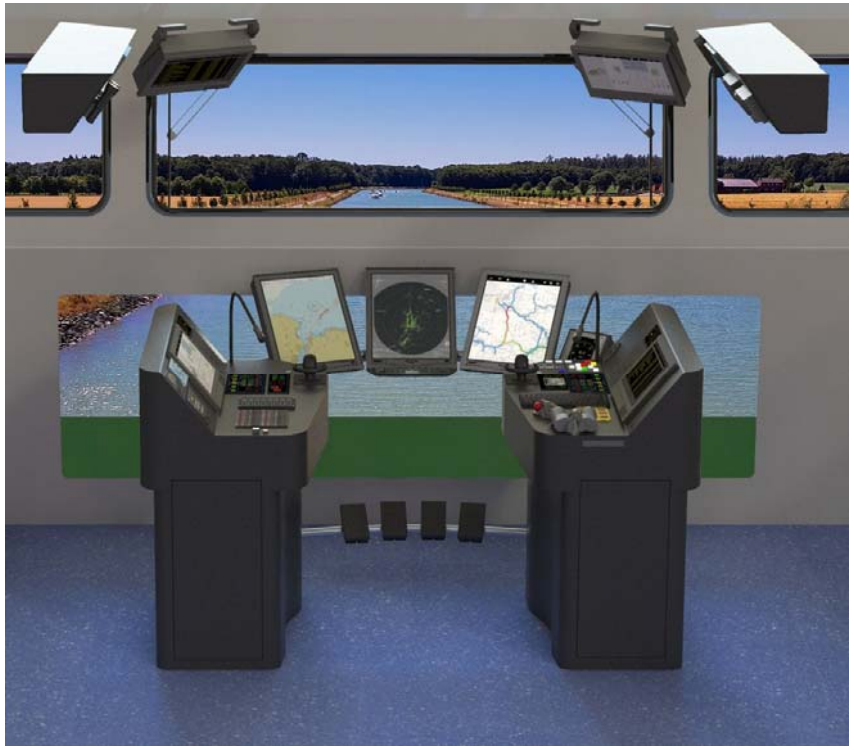
Accu Arrangement

Accu Unit

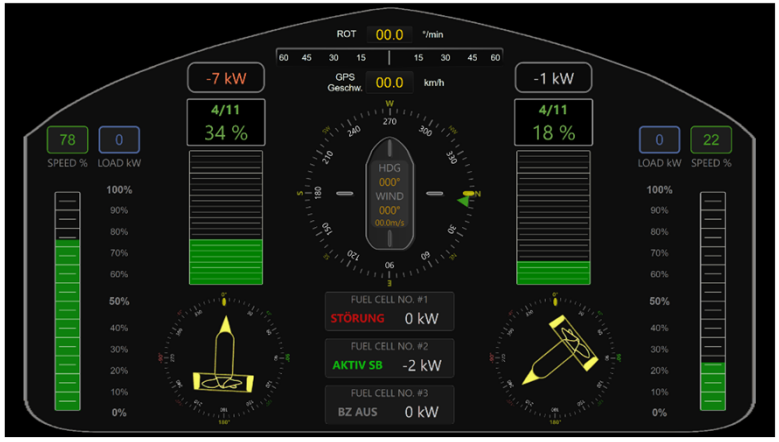
Battery Control Units *(part)*

View to the Accu room *(part)*

Layout – Overview Wheelhouseconcept



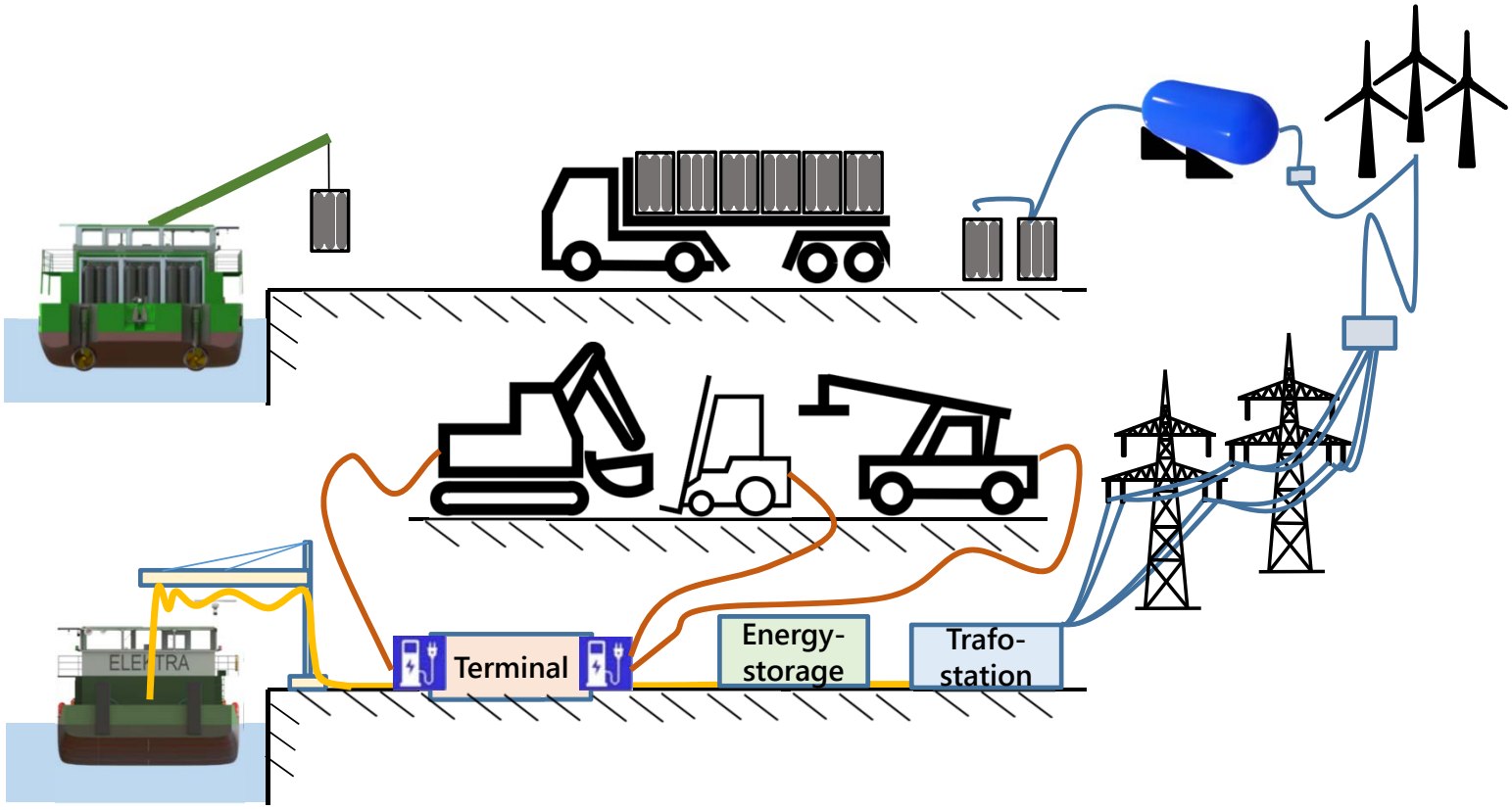
3D-Mockup



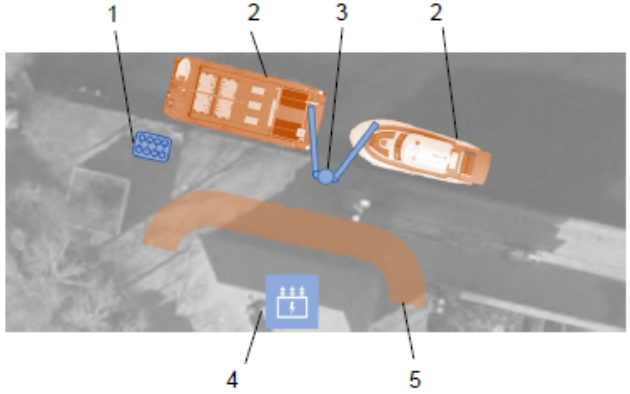
Main Energy-Display

Mockup during Validation

Supply of Hydrogen and Electric Energy



Westhafen Berlin



Hafen Lüneburg

1. Hydrogen Store
3. * Powerlock 400 V_{AC}, 660 A
   * DC 2x Marechal 640 V_{DC} up to 360 A
   * CEE 400 V_{AC} 125/63/(32/16) A

Summary

1. **Local zero-emission transport in metropolitan areas and longdistance transport is today possible**
2. **Building of an inland waterway vessel only powered by fuel cells and batteries is possible**
3. **Further work has to be done regarding the implemenation of low energy heating as the standard construction in ships**
4. **ship concepts have to take into account the space that is needed to install amount of batteries and or hydrogen tanks**
5. **Rules and regulations for reliable investments are necessary**
6. **ELEKTRA is a blueprint for Inland Water and Coastal Shipping**

The ELEKTRA with the heavy cargo barge URSUS in front of the Berlin Westhafen port in 2021

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