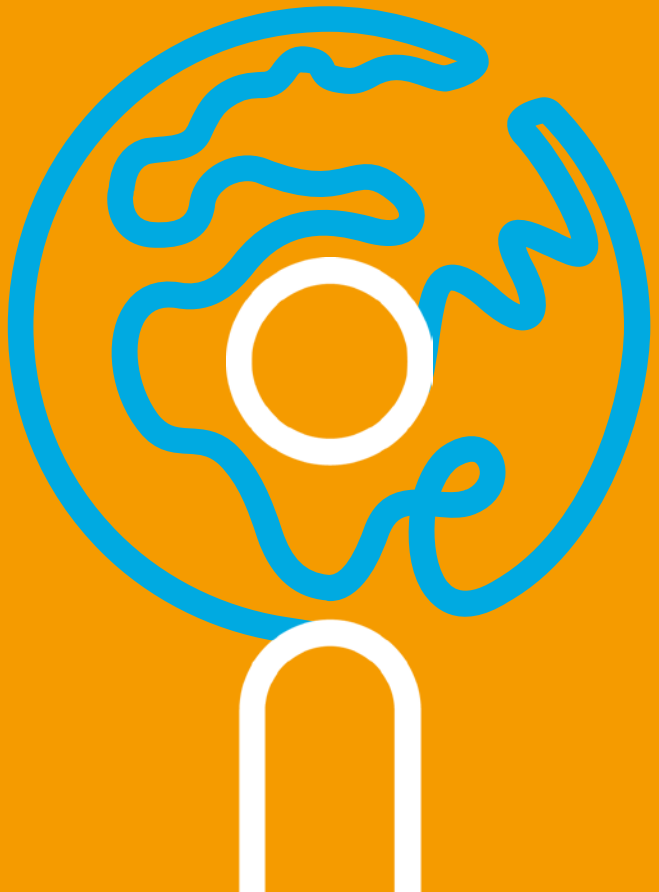

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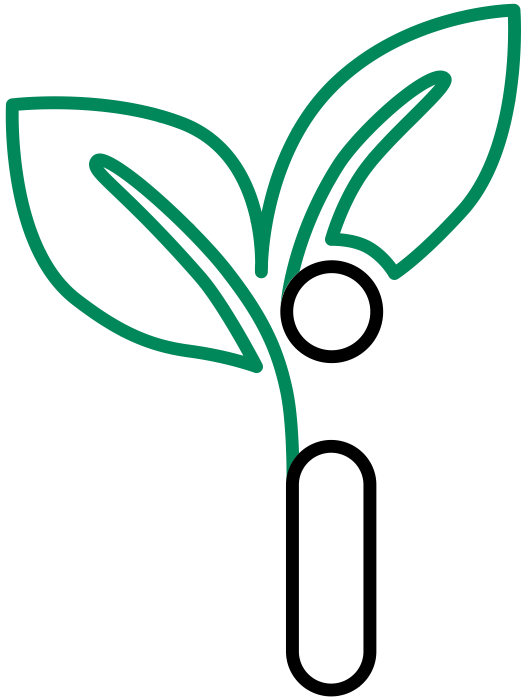
Betriebserfahrungen mit dem Brennstoffzellenschiff auf dem Baldeneysee

5. Fachkonferenz Elektromobilität vor Ort

innogy SE · Henning Joswig· 27 February 2018



1 Innogy SE

2 Energiewende und die Rolle erneuerbarer Energieträger

3 MS innogy

RWE has split the company and founded an innovative, decentralised energy-entity

RWE

Trading

Conventional generation

innogy

Grid

Renewables Energies

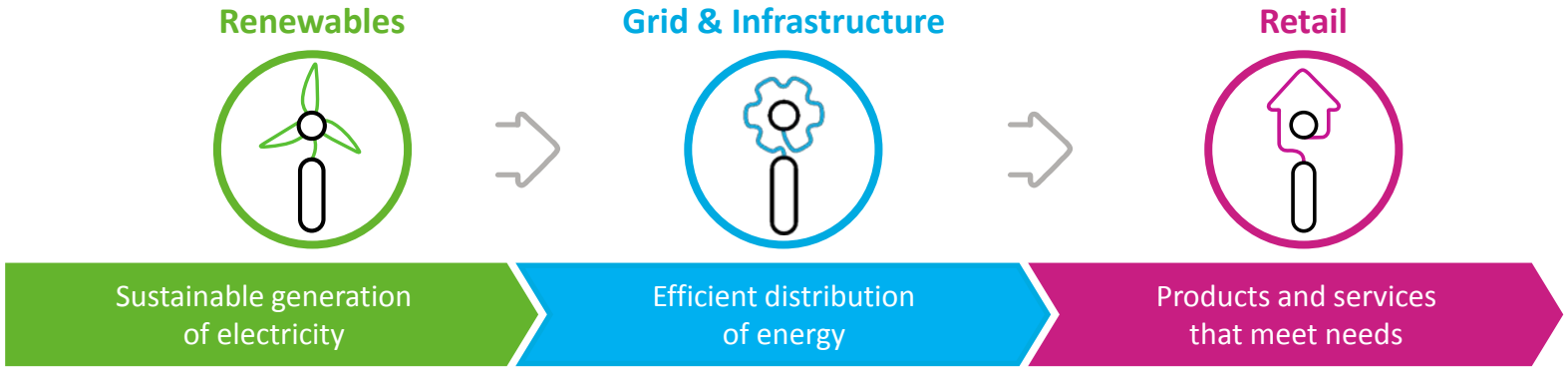
Retail

Innovation

- RWE reamins the main shareholder of innogy.
- innogy has a clear focus on growth

As a leading European utility, we produce, we distribute, we deliver reliably and sustainably

innogy



€44 billion in revenues[2]

€6.5 – 7.0 billion investments planned 2017 – 2019

23 mn. customers across Europe

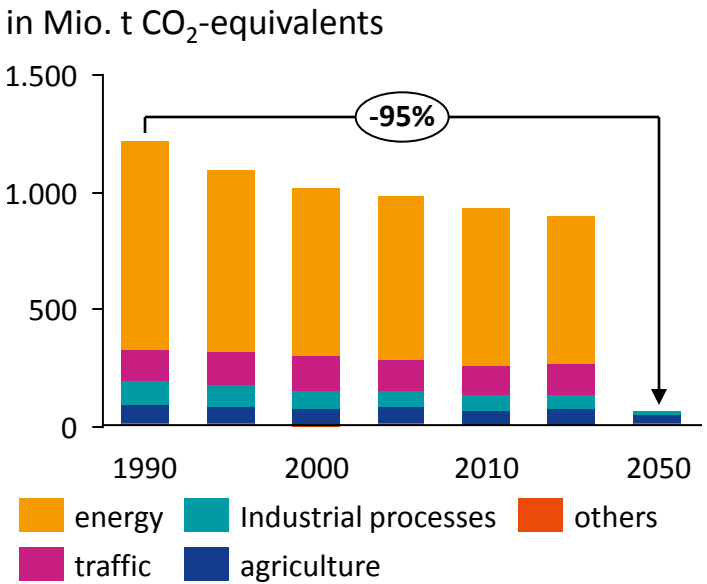
> 40,000 employees[1]

€18 billion market capitalisation[3]

Figures rounded | [1] Converted to full-time positions, as of 31 December 2016 | [2] 2016 | [3] As of 31 December 2016

German CO_2 targets are only achievable with a green energy carrier

Greenhouse gas emissions in Germany



Areas of need for renewable energy carrier

Backup power

Fossil fuels are due to CO2 emission not an option to bridge the “Dunkelflaute”

Long distance travel (air, sea, trucks)

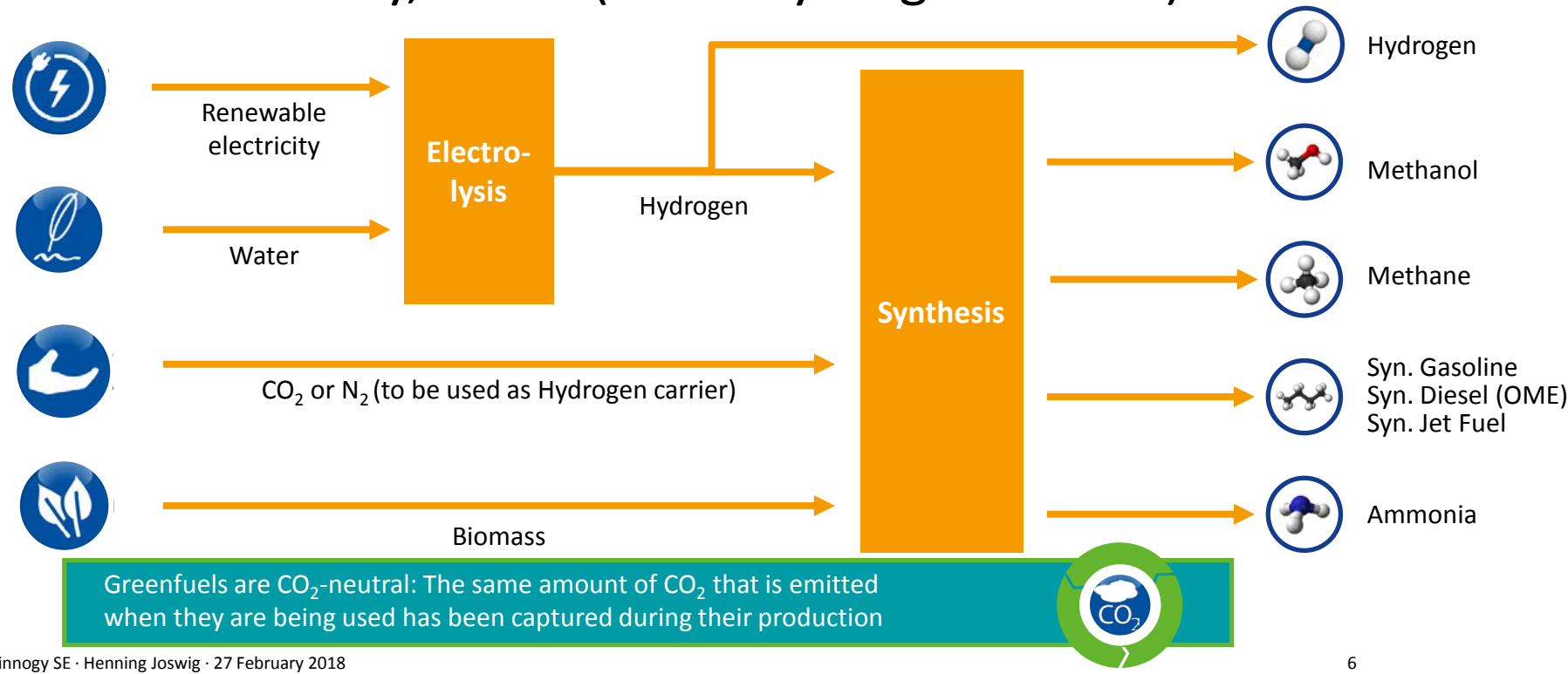
Hardly to decarbonize by means of direct electrification

Chemical industry

Fossil fuels are not an option as raw material

Source: Federal Environment Agency (UBA) „Treibhausneutrales Deutschland in Jahr 2050“(2013), Nationale Trendtabellen für die deutsche Berichterstattung atmosphärischer Emissionen 1990 – 2015, internal analysis

Renewable fuels (greenfuels) are made from biomass or RES electricity, water (and a hydrogen carrier)



Long term CO_2 targets are only achievable if we use green, cheap and globally produced energy carriers

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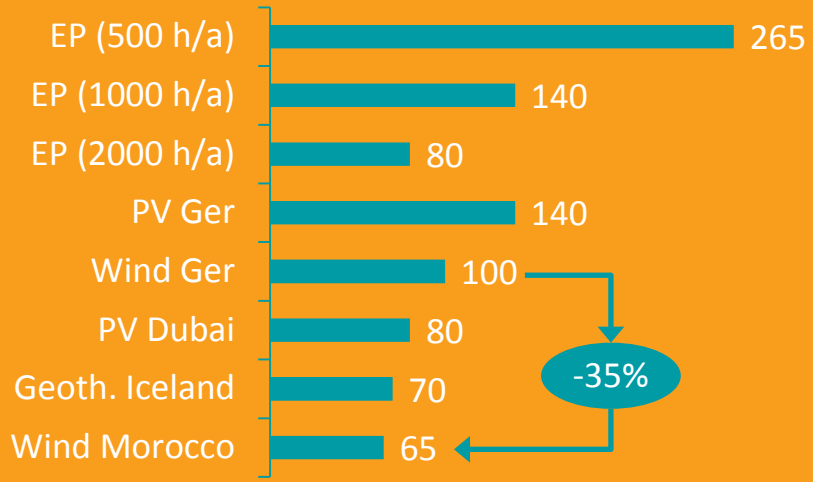
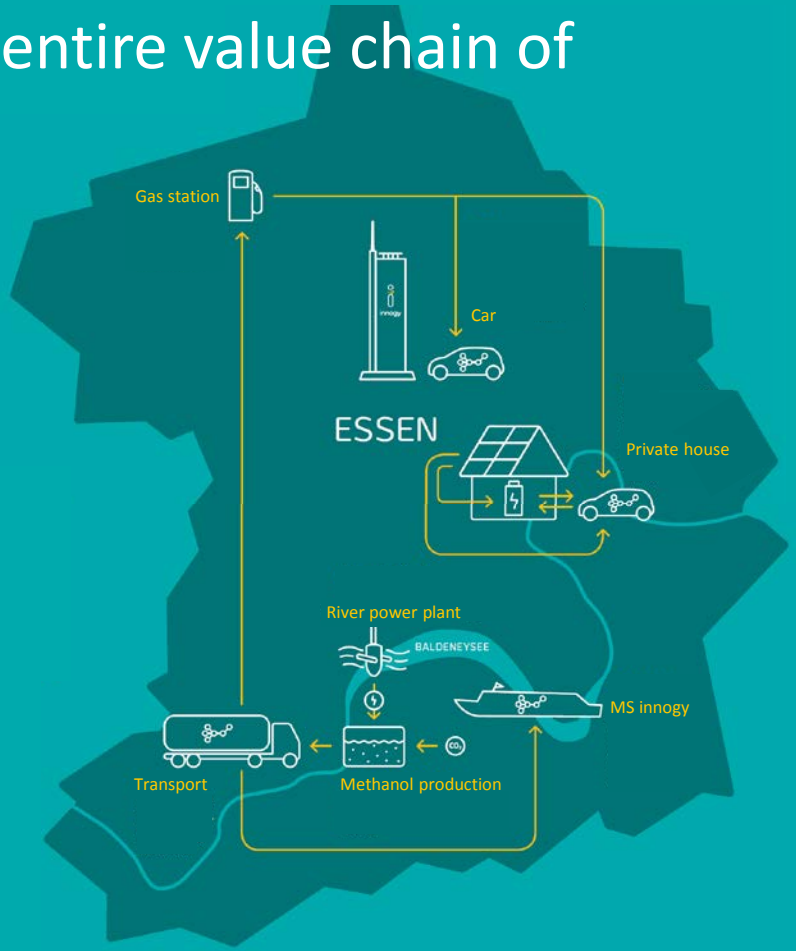
Product costs (Cif ARA) [% of base][1]



[1] Costs comparison for large scale near future technology | Cif ARA: methanol costs at port Rotterdam
[2] EP = Excess Power: assuming power price of 0 €/MWh for the indicated hours per year

First full demonstration of entire value chain of Methanol in Essen

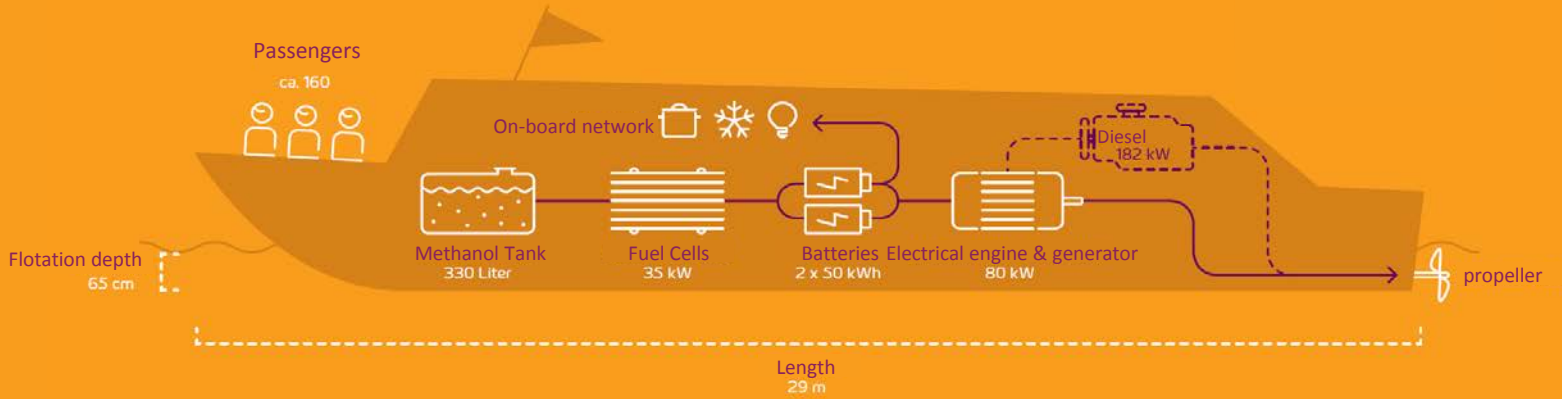
- The demonstration of the entire value chain of a liquid renewable energy carriers is the first one worldwide
- Project „greenfuel“ is part of the “European Green Capital – Essen 2017”
- All parts are realized in the city area of Essen



ESSEN 2017 GRÜNE HAUPTSTADT EUROPAS
HAUPTSPONSOR

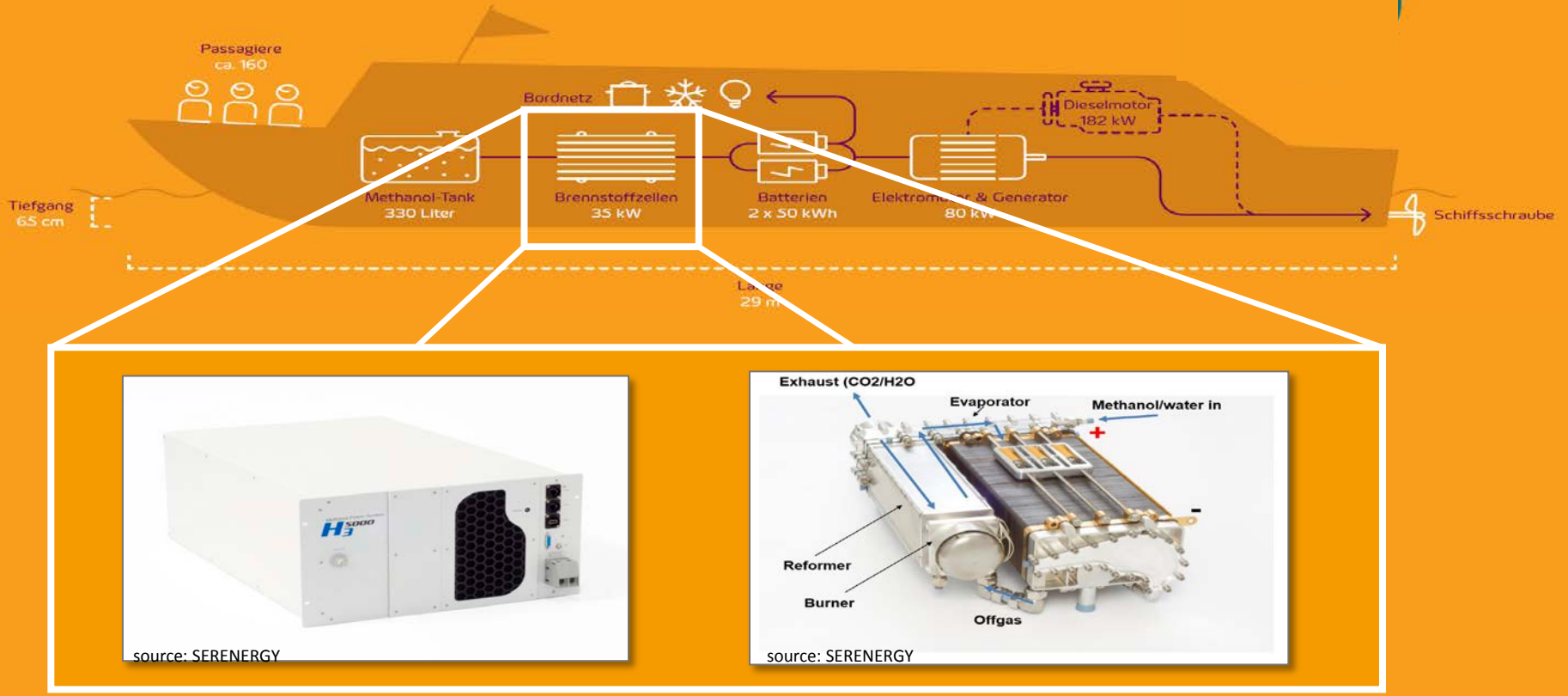
MS innogy
Ship naming ceremony on August 25th, 2017 in Essen

Ship ahoy! – Demonstration of use case “shipping” with modified passenger liner

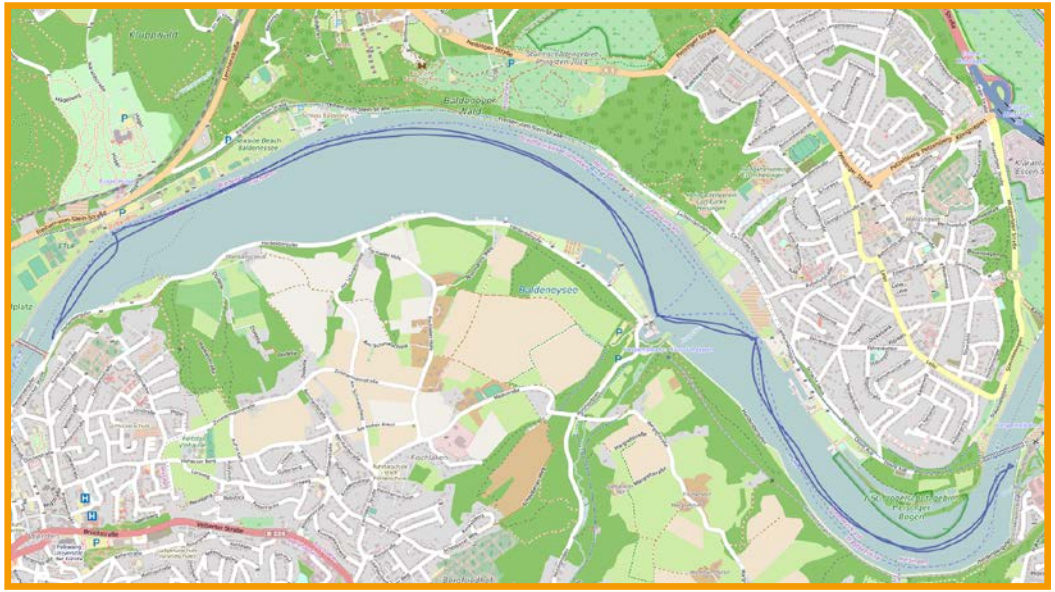


- Acquisition of „MS Inselstadt Ratzeburg“ and modification with methanol power unit
- Operation by „Weiße Flotte Baldeney“
- Full electrical operation mode

Brennstoffzellentyp



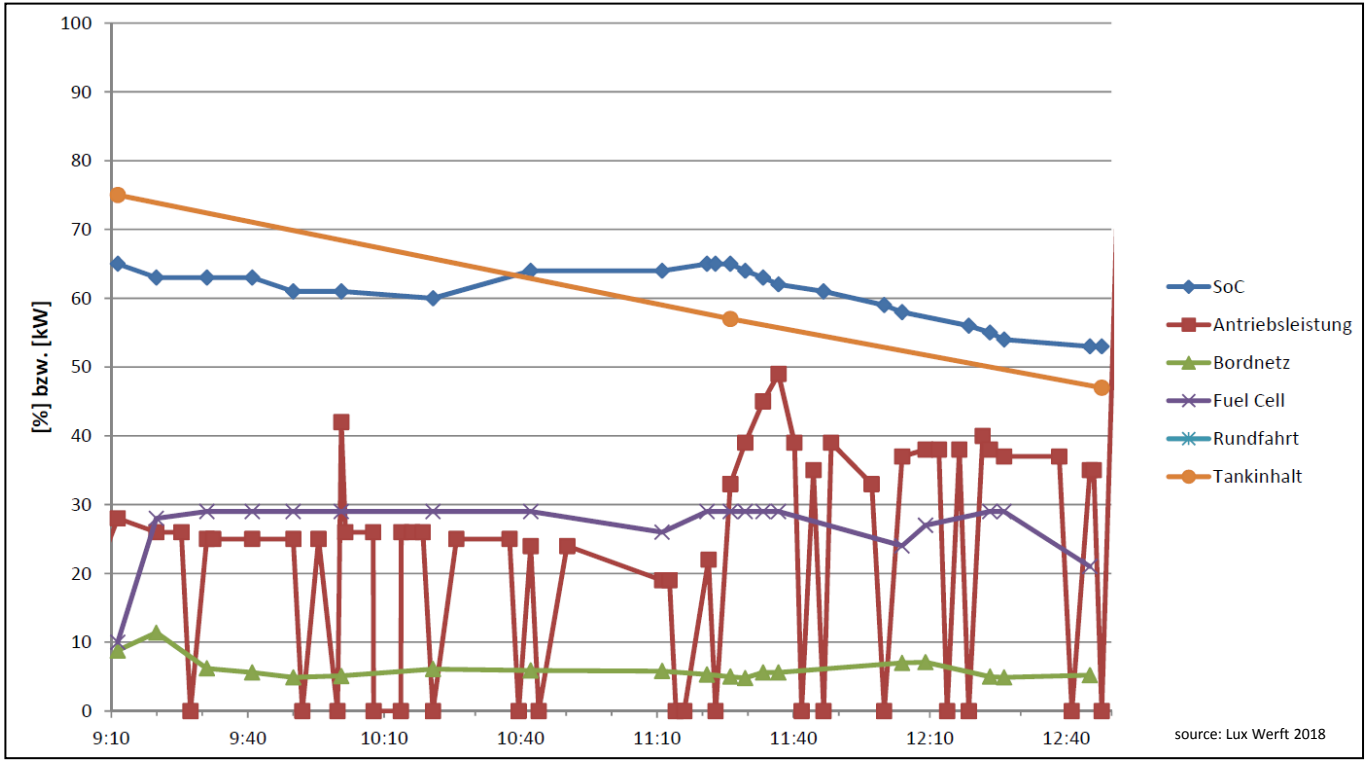
Successful system acceptance test shows more than 4h electric operation time



- 29kW FC system
- 65% SOC battery system
- 10 (1) & 12 (2) km/h speed
- Base load 42 kW

source: Lux Werft 2018

Successful system acceptance test shows more than 4h electric operation time



- Green fuels are required to reach global and national GHG targets

- Greenfuels enable stronger sector coupling

- Methanol is a very promising green fuels due to its chemical advantages

- Methanol might become an interesting alternative for the shipping either in fuel cells or in combustion engines

Thank you very much for your attention!

Contacts

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