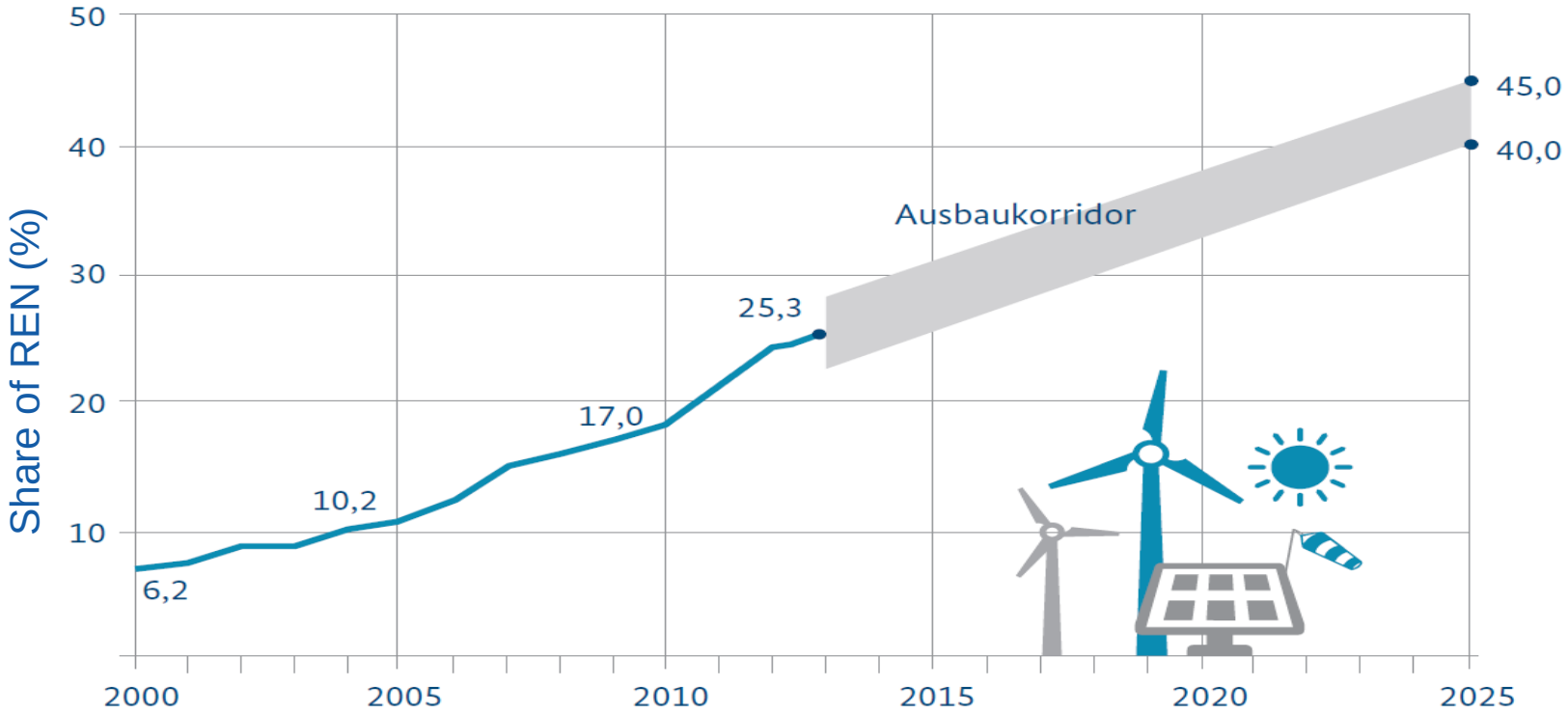
Hydrogen Refuelling Station at Hafencity Hamburg

10th IPHE Education and Outreach Event

Hamburg, April 26, 2017

Oliver Weinmann

Share of renewable Energy Feed-in in the German System



Source: ZSW nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat)

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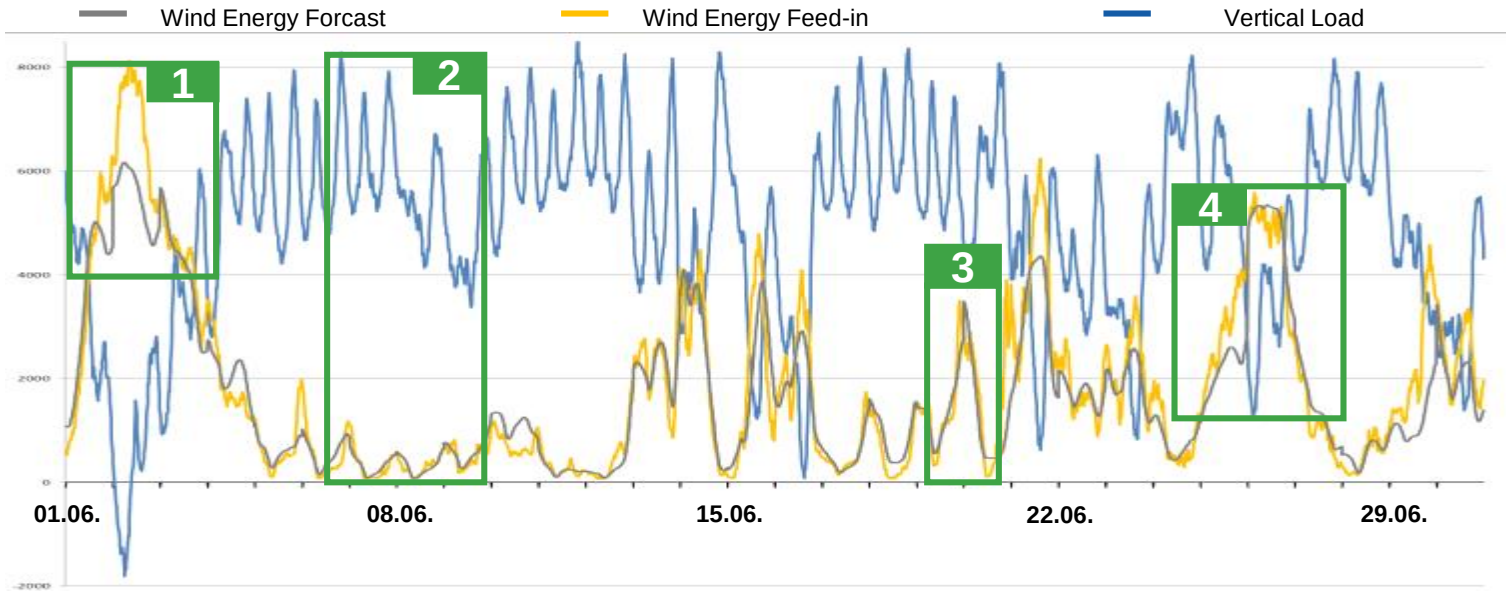
Challenges of REN Feed-in into the System

Vertical Load, Wind Energy Forecast and Wind Energy Feed-in in East Germany (1.-30.06.2013, MW)



1 Deviation from forecast

2 Calm

3 Gradient

4 Production > Load

Quelle: 50Hertz Transmission

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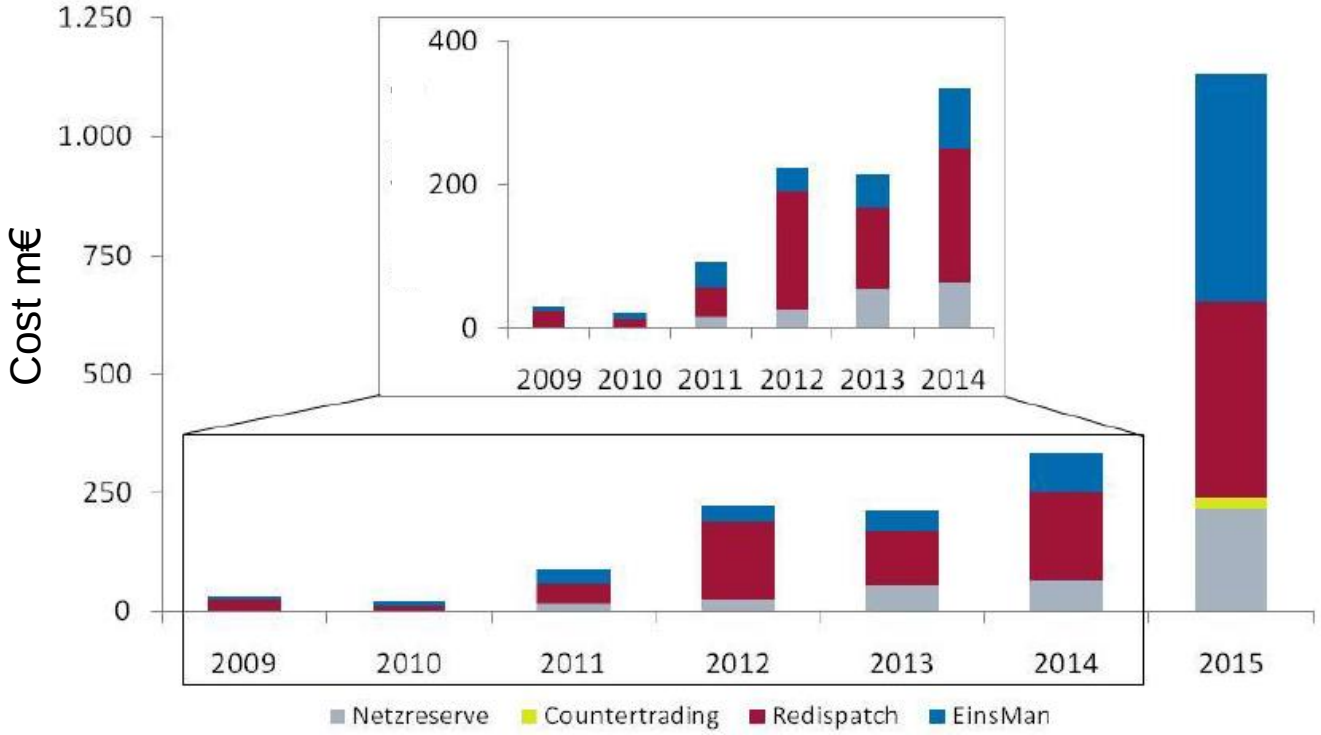
Cost figures Congestion Management (Germany)



Source: BDEW

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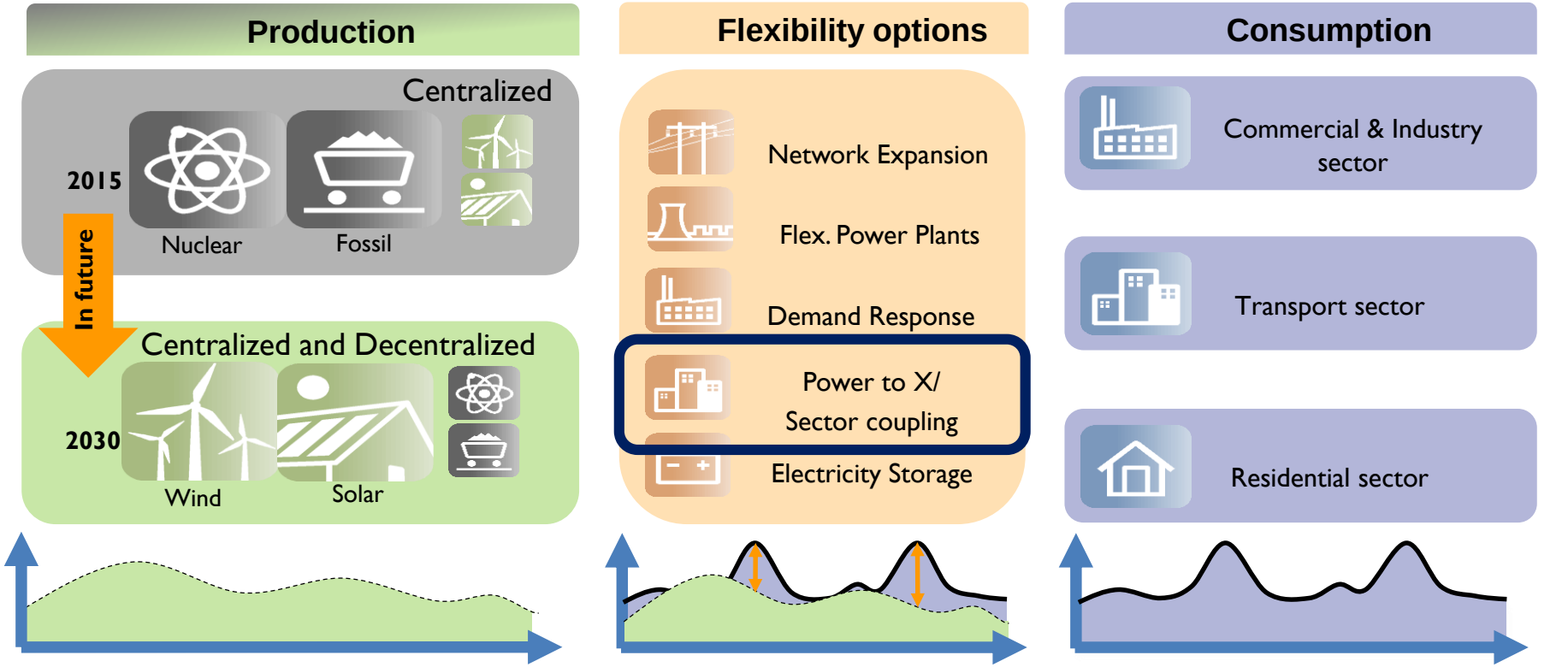
Change from Demand to Supply Driven System



Quelle: Sebastian Gerhard

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Sector Coupling

- Goals:
  - Decarbonisation of mobility and heat
  - Implementation of renewable electricity (incl. surplus production) for house heating, indutrial heat, and transport.

- technologies:
  - Power to Gas (Hydrogen)
  - Power to Heat

- Main applications:
  - Utilization of renewable electricity for heat and transport
  - Supply of ancillary services

Hydrogen as transportation fuel

- Hydrogen (power to gas) production with electrolysis can be used to balance volatile production
- Most attractive business case for H2 is transportation fuel
- Vattenfall operates the largest European H2 filling station since 2011 in Hamburg
- H2Mobility builds up refueling infrastructure for H2 vehicles – 400 filling stations until 2023
- Several European cities are interested in H2 busses for public transportation
- Alstom has developed hydrogen fuel cell train
- Vattenfall currently investigates hydrogen production infrastructure solutions to serve emission transport on a commercial basis

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HYDROGEN REFUELLING STATION HAFENCITY HAMBURG

Experiences & Findings

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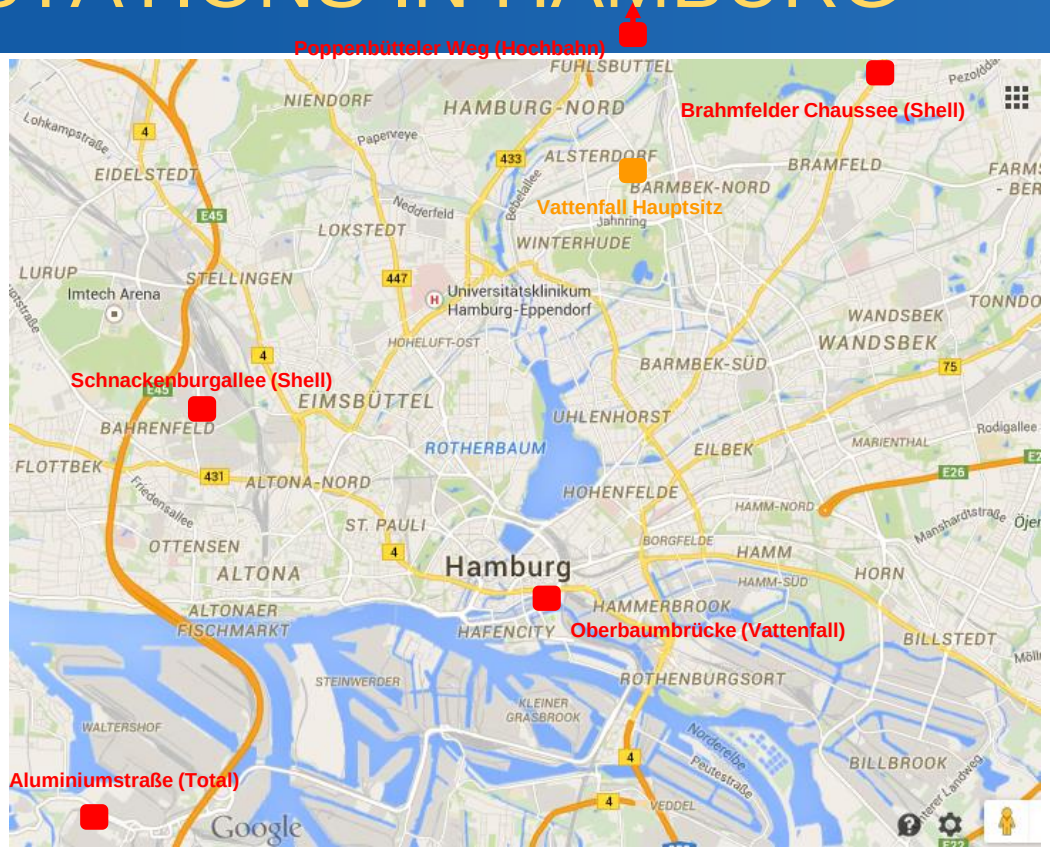
H2-STATIONS IN HAMBURG



Moorfleet (Total)
-in Planung-

Quelle: google maps

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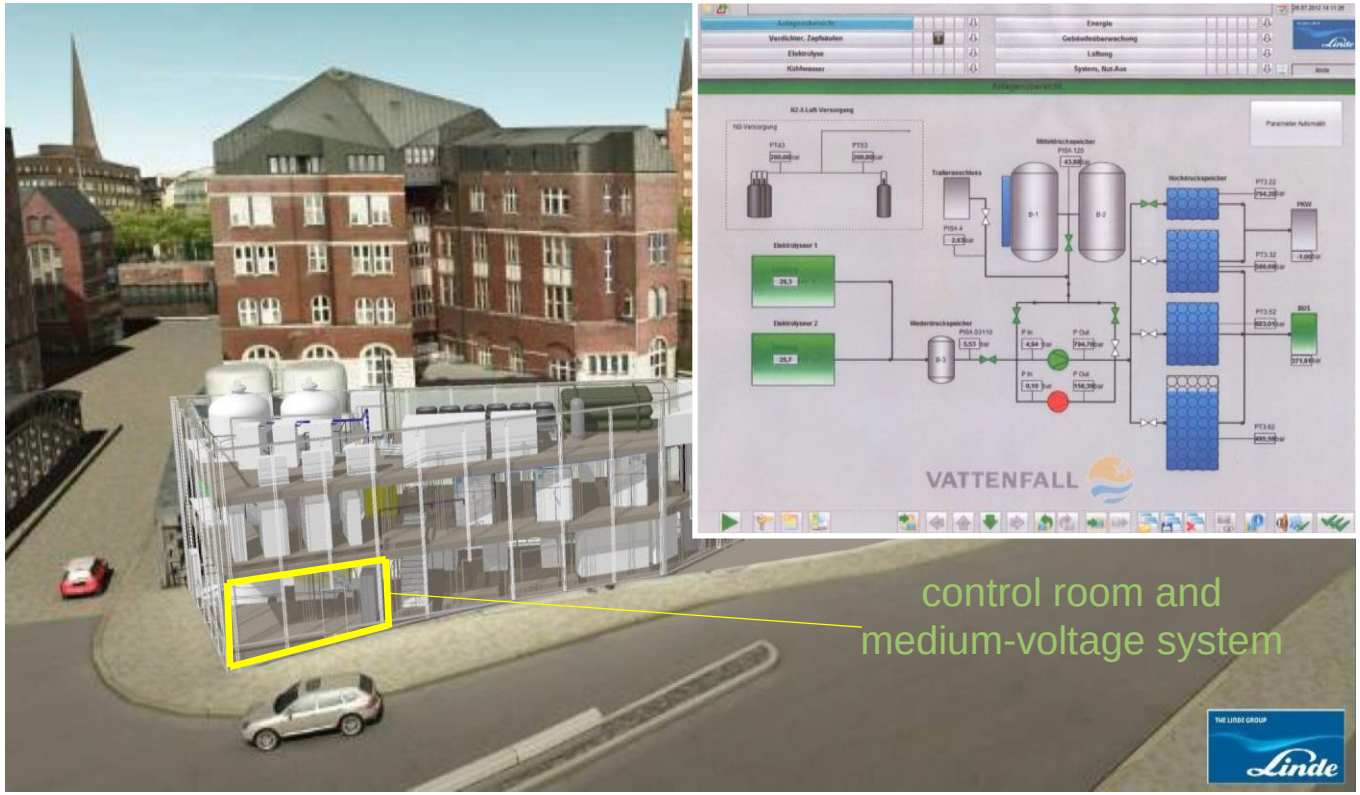
Technical specifications

- Plant engineering: Linde
- 2 Floors + roof area
- 2 Electrolysers (60 Nm^3/h), optional 3
- 2 Ionic compressors (400 Nm^3/h)
- Total storage capacity ~ 700 kg

HYDROGEN STATION STRUCTURE



HYDROGEN STATION STRUCTURE

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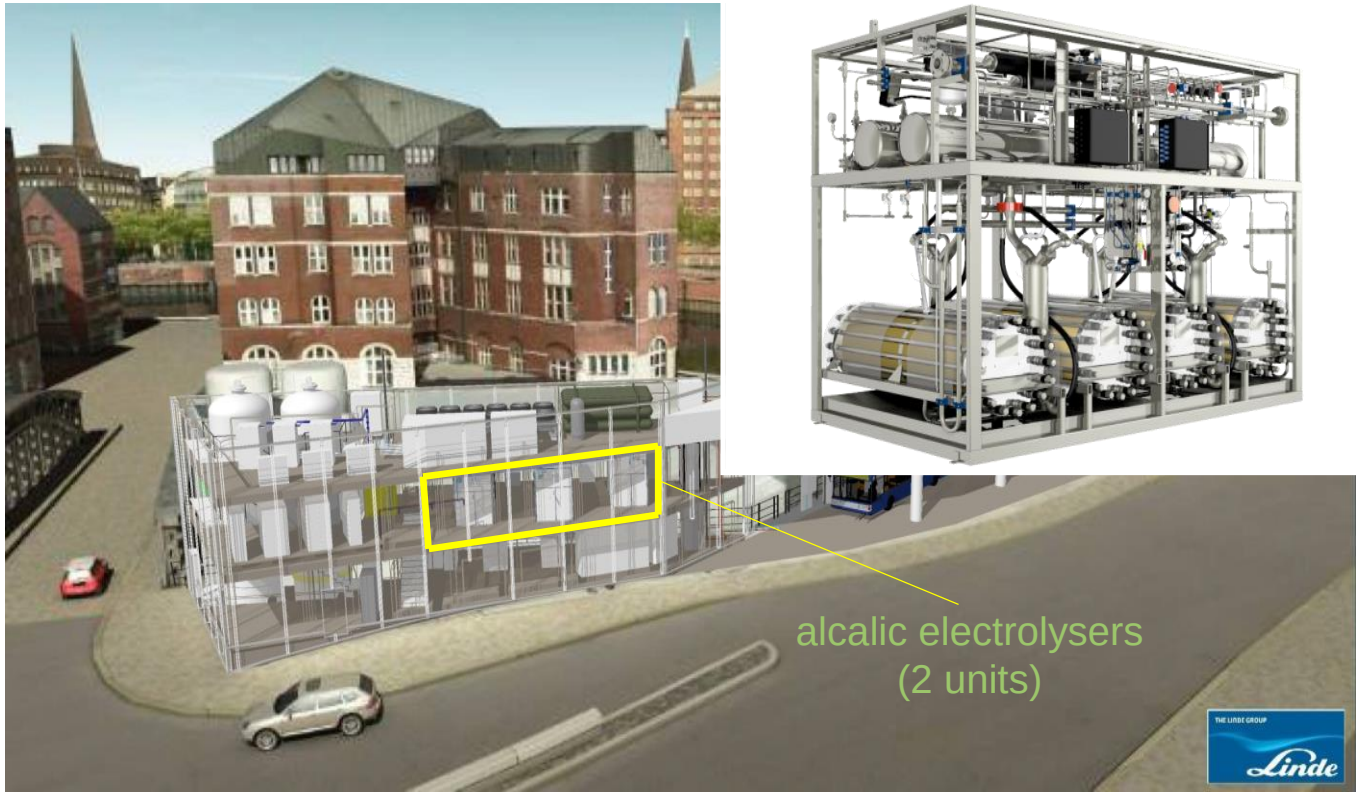
HYDROGEN STATION STRUCTURE



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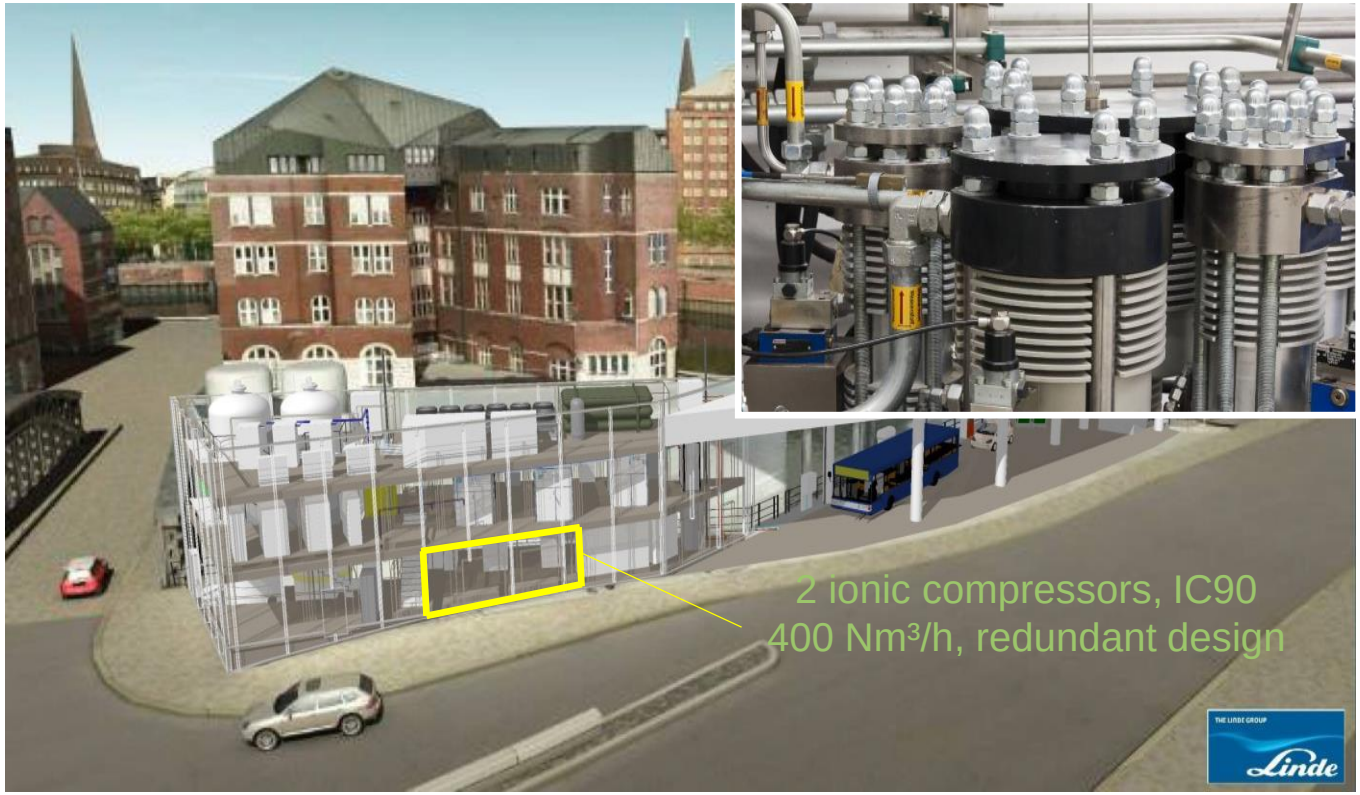

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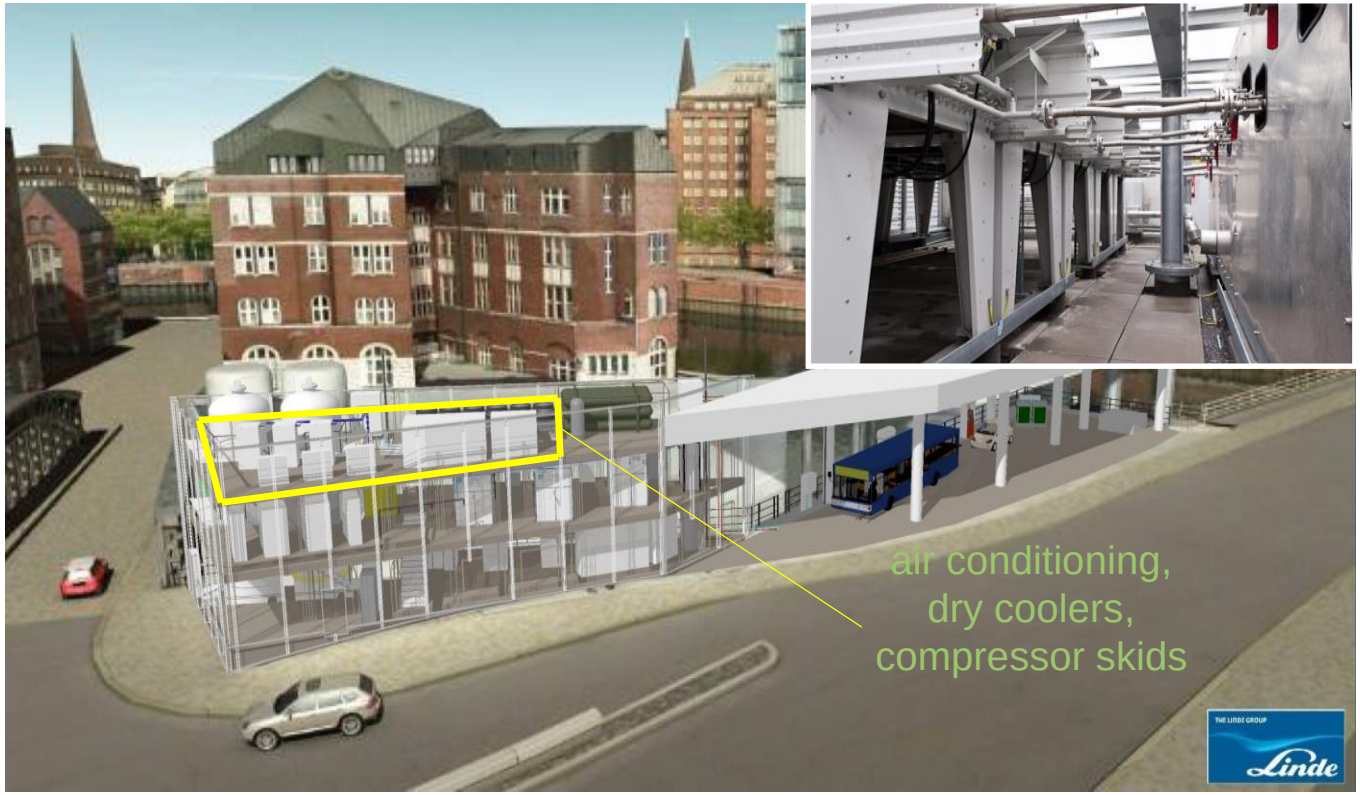

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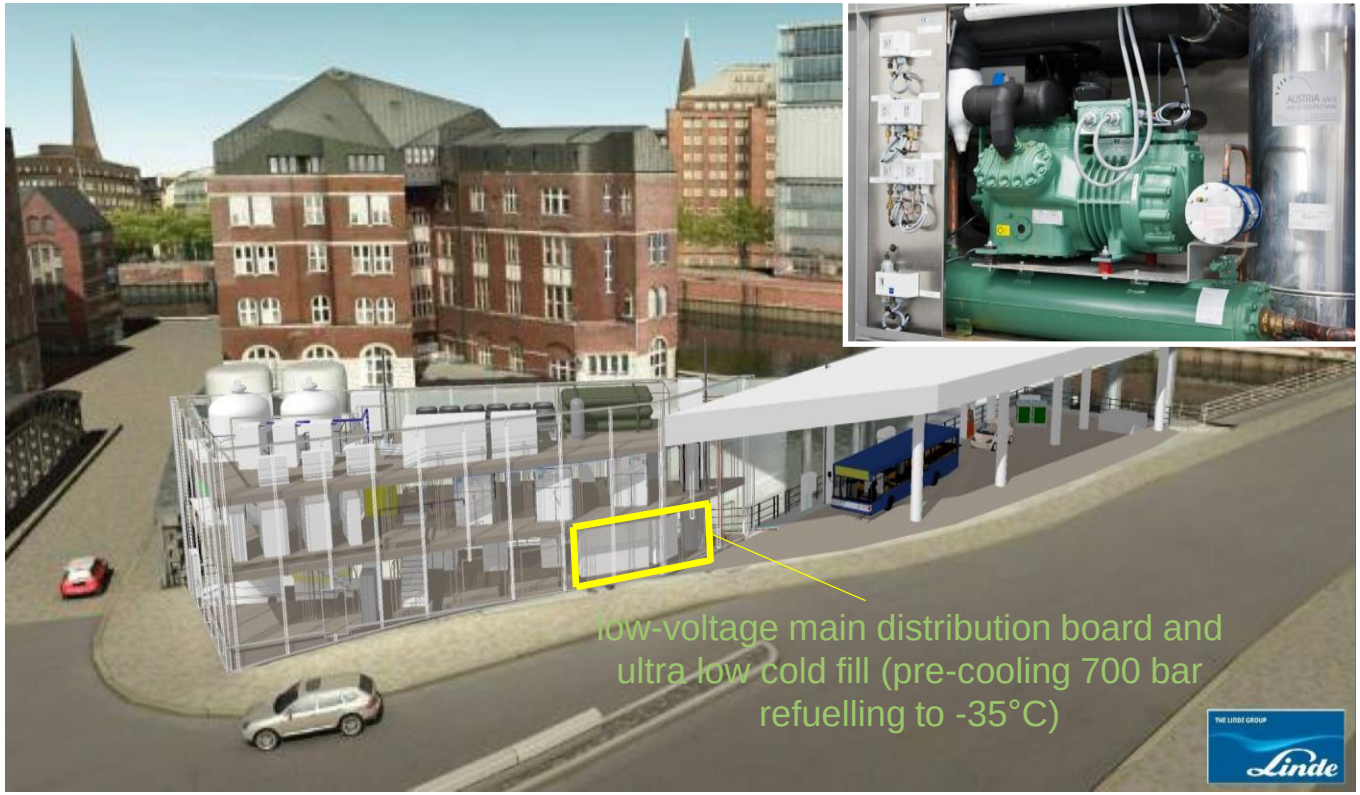

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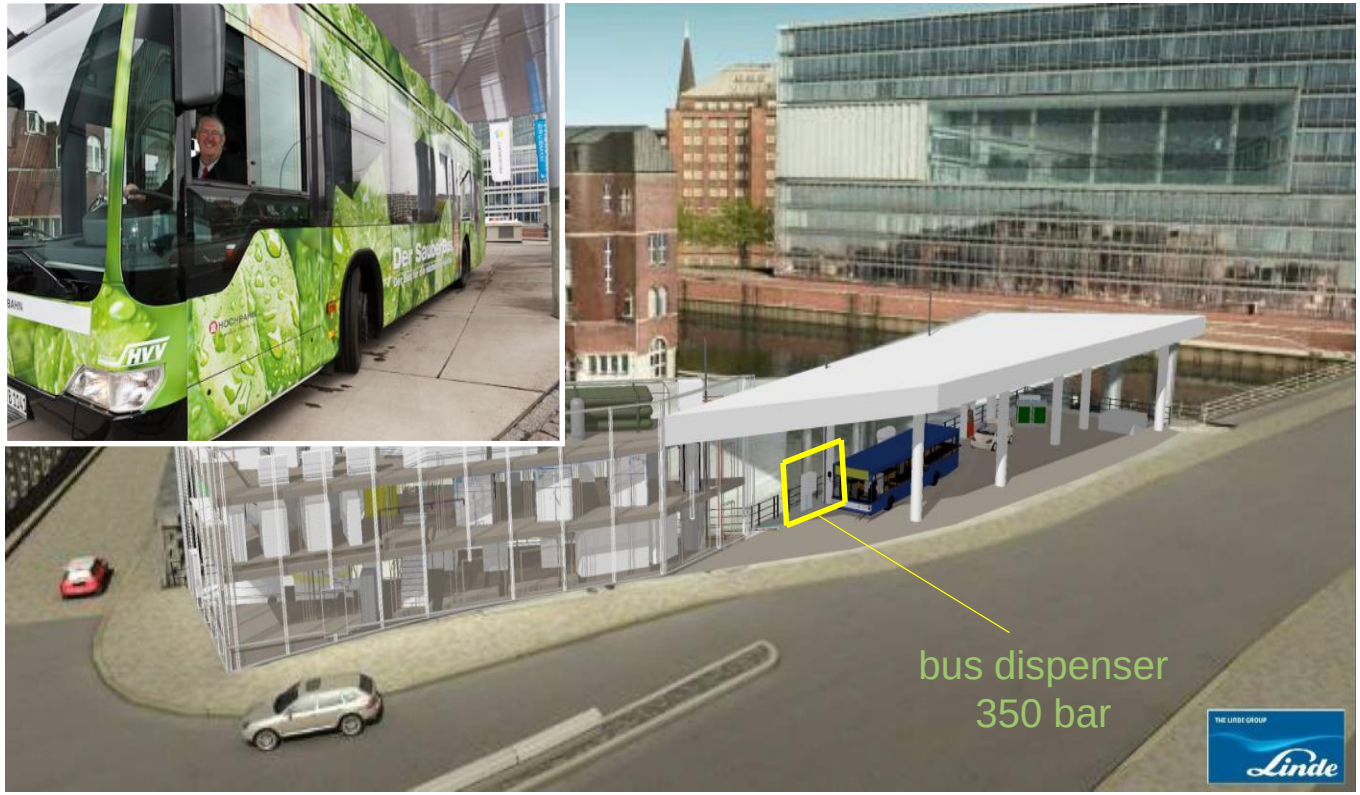

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HYDROGEN STATION STRUCTURE

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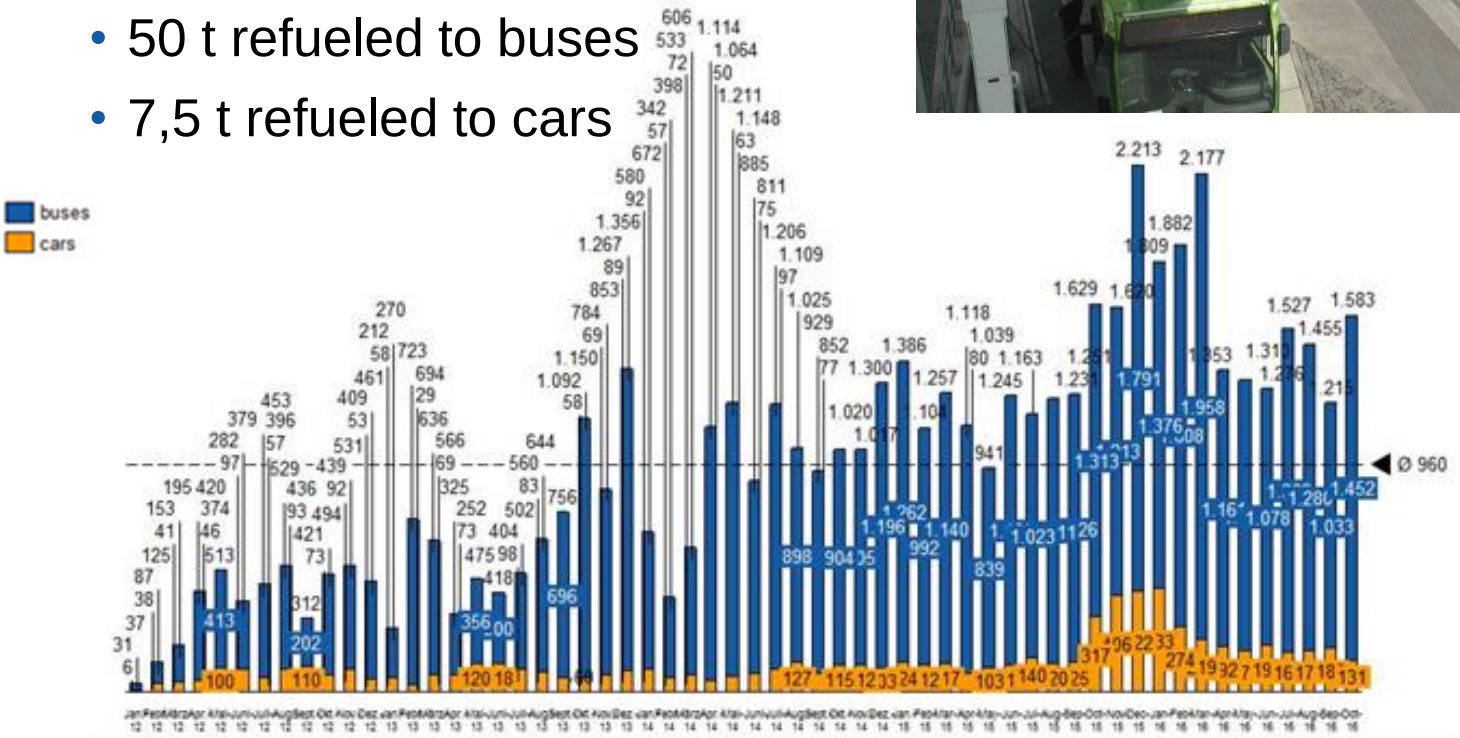
Sales volume [kg H_2]

- 87% bus share
- 50 t refueled to buses
- 7,5 t refueled to cars



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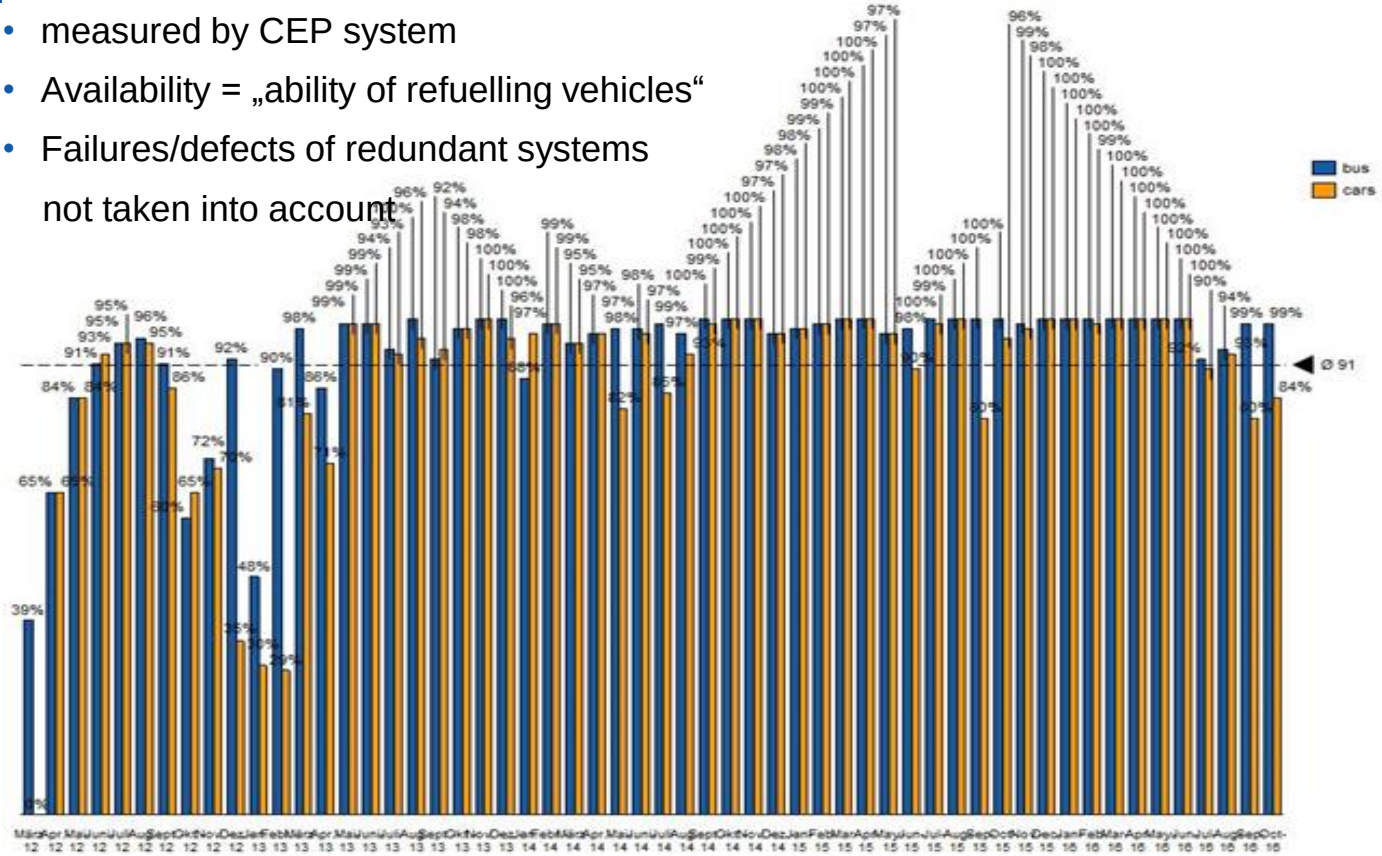
availability

- measured by CEP system
- Availability = „ability of refuelling vehicles“
- Failures/defects of redundant systems not taken into account



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Conclusions

- Share of renewables will further increase
- Volatile sources like wind and solar will be the dominating electricity energy source in the future
- Besides electricity the energy sectors heat and transport need to be decarbonized as well to fulfill the goals of the Paris COP agreement
- Main source for decarbonization of heat and transport will be renewable electricity.
- sector coupling will play a more important role in the future
- Today business cases for these systems are only possible in niche applications
- For large scale roll out attractive business are required:
  - The regulatory and legal framework needs to be adapted to develop economical viable business cases.
  - Cost of sector coupling systems need to decrease

THANK YOU

Dr. Oliver Weinmann, Vattenfall Europe Innovation GmbH

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