Interreg North-West Europe GenComm
European Regional Development Fund

Ministerium für Wirtschaft, Innovation, Digitales und Energie
SAARLAND

izes gGmbH
Institut für ZukunftsEnergie- und Stoffstromsysteme

Hydrogen Activities at IZES and Bosch Homburg

German Korean Workshop

13th July 2023

Dr Feriel Mustapha; mustapha@izes.de

Dr Bodo Groß; gross@izes.de

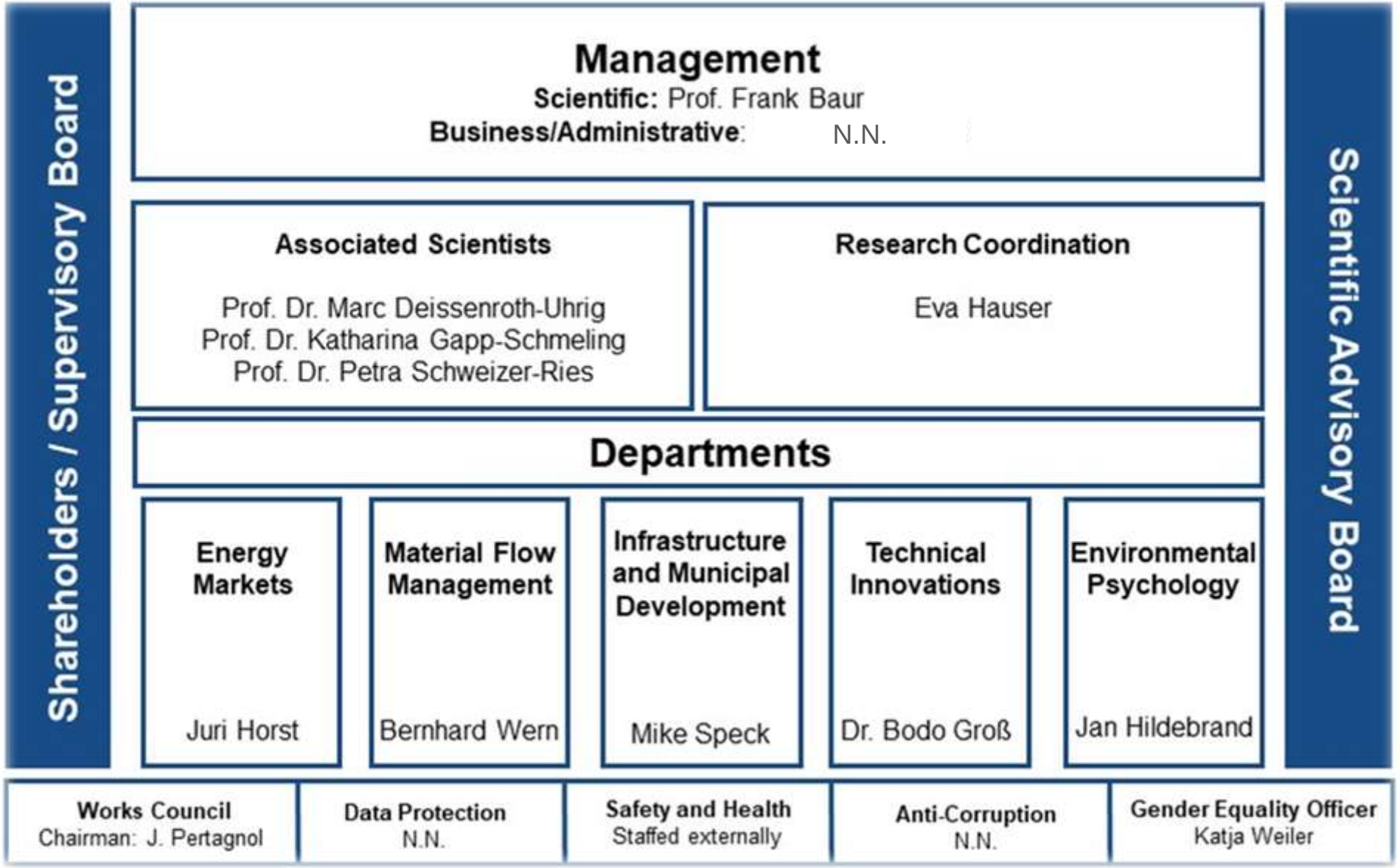
Agenda

- **IZES gGmbH**
- GenComm Work Package I2: Solar Powered Hydrogen Production and Refuelling Station
- Outcomes of GenComm
- KoNSTanZE
- Conclusion

IZES gGmbH

- Founded in 1999 as non-profite research organisation
- Shareholders: Federal State Saarland (~70%), several regional utilities, the University of Saarland and the University of Applied Science Saarbrücken
- Interdisciplinary team with educational background in engineering, law, economics, forestry, social and natural sciences
- 80 employees, including the administrative department as well as bachelor, master and PhD students

Organisation Chart of the IZES gGmbH



Department Technical Innovations

Main Working Fields of the Department

- Hydrogen technologies
- Development of electrostatic particle precipitators
- Specific development of electronic components and sensor technology
- Innovative energetic building refurbishment and building energy supply
- Infrastructure for alternative propulsion chains and mobility concepts

The working fields of the department are closely linked to the planning and realisation of individual measurement and monitoring concepts.

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General Objectives

- Implementation of three pilot plants with different renewable sources in three different sizes for the production and usage of green hydrogen
  - Solar Power (25 kW), Bioenergy (150 kW) and Wind Power (1 MW)
- Usage in the main areas of energetic demand
  - Transportation, Heat and Power
- Development of the so-called “Enabling Support Tool” (EST), see http://communityh2.eu/enabling-support-tool-intro-page/
  - Calculates the costs with regard to the decarbonisation of individual bus fleets
  - Calculates the individual total Cost of Ownership as well as the Total Carbon Abatement

Work Package I2

- IZES was responsible for the construction of a solar powered hydrogen production and refuelling station

Why a Hydrogen Refuelling Station at IZES?

- In 2014 IZES build a quasi-autarkic solar powered charging station for Battery Electric Vehicles.
- Fuel Cell Electric Vehicles could be seen as the next evolution step of Electric Vehicles.

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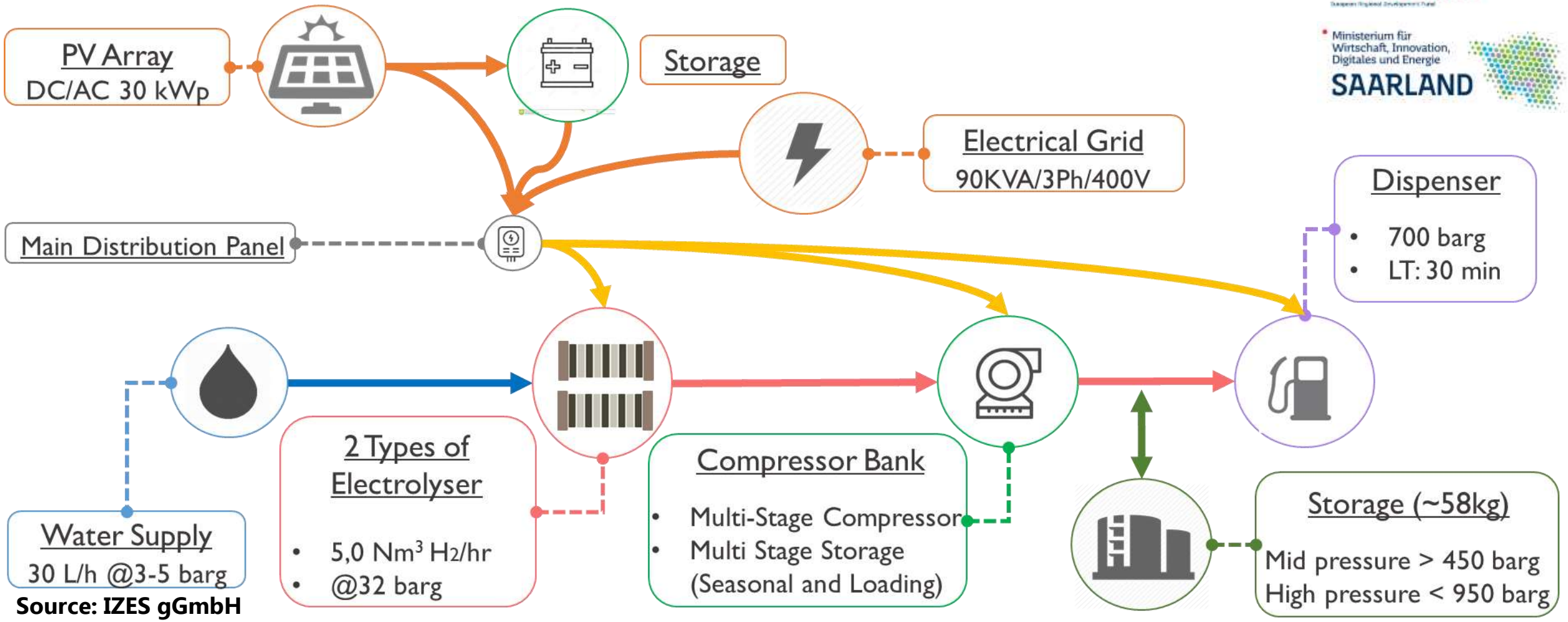
Planned Design of the Solar Powered Hydrogen Refuelling Station



Source: IZES gGmbH

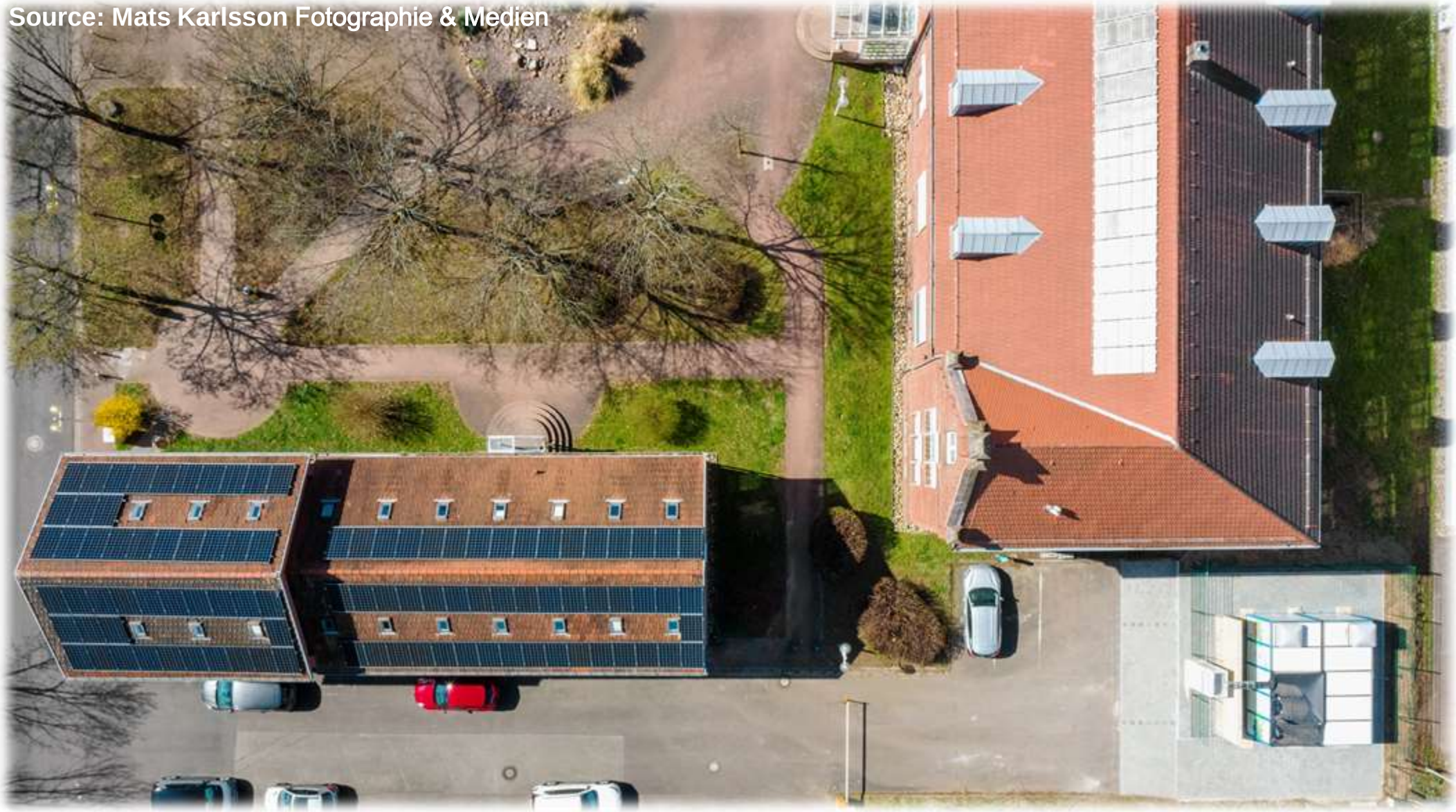
Facts and Data of the Solar Operated Hydrogen Refuelling Station

- Location: Innovation Campus Saar, 66115 Saarbrücken, Altenkesseler Straße 17A1, Headquarter IZES gGmbH
- Energy supply: PV-Array with 30 kW peak power
- Containerised solution: two 20 feet container with a separated dispenser
- Hydrogen production: two different electrolyser (AEM and PEM) with a maximum H_2 production of 5 Nm^3/h
- Hydrogen storage capacity: 58 kg at two different pressure levels 450/950 bar
- Gas quality: 5.0 or 99,999% or at least according to the fuel standard
- Suitable for 700 bar vehicles
- Maximum refuelling time is less than 30 min
- Operation as a non-public research station

GenComm WP I2: PV Array with approx. 30 kWp

Source: IZES gGmbH

GenComm WP I2: Hydrogen Production and Refuelling Station



GenComm WP I2: Hydrogen Production and Refuelling Station

GenComm WP I2: Meeting #23; December 2022, St. Ingbert

Source: IZES gGmbH

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SAARLAND

Welcome and Introduction by State Secretary Elena Yorgova-Ramanauskas from Saarland's Ministry for Economics, Innovation, Digital and Energy

Agenda

- IZES gGmbH
- GenComm Work Package I2: Solar Powered Hydrogen Production and Refuelling Station
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- Conclusion

Outcomes

- GenComm was the first hydrogen project at IZES after the initial hype at the beginning of the new millennium
- After the launch of GenComm in 2017, more than ten hydrogen related projects were started at IZES and several more are currently in the application phase
  - HALLIE
  - SH2AMROCK
  - **KoNSTanZE**

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KoNSTanZE

Gefördert durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

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- Starts on 2021

Hydrogen H2

Source: nicepng

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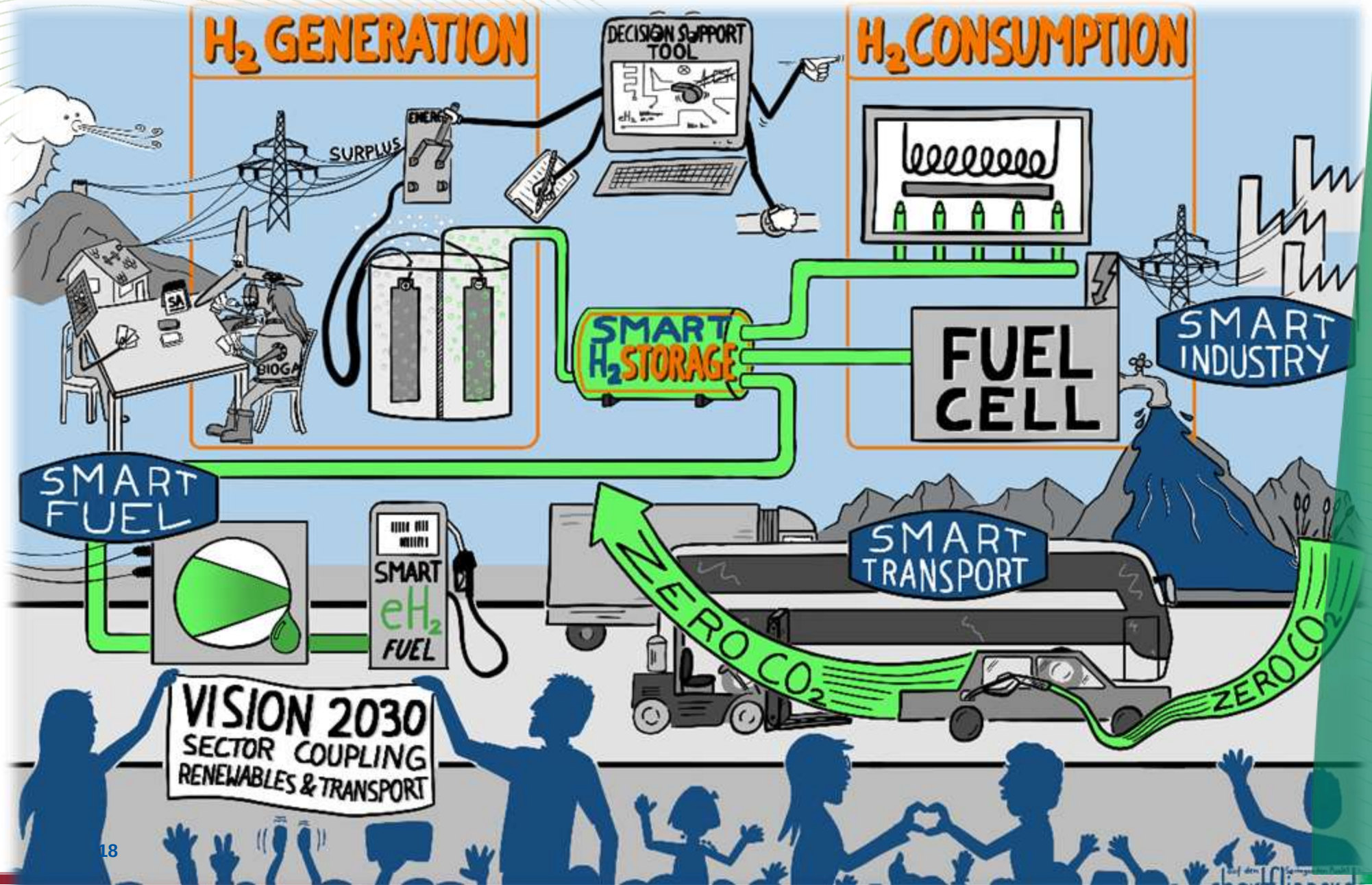
BOSCH

Scientific follow up of the project and data analysis of the given informations

Realisation of the project KoNSTanZE with the **eH_2 Cycle**

KoNSTanZE



Connected eH_2-Cycle

BOSCH

KoNSTanZE

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Challenges

- Rising **costs**
- New **mobility concepts**
- High **volatility**

Strategy

- **Efficient** and **flexible** use
- **Connection** through the Energy Platform
- **Optimized generation** in regard to consumption
- **Storage** and **sector coupling,** e.g. through **H_2-Cycle**

Reduced consumption through efficiency

Connected eH_2-Cycle

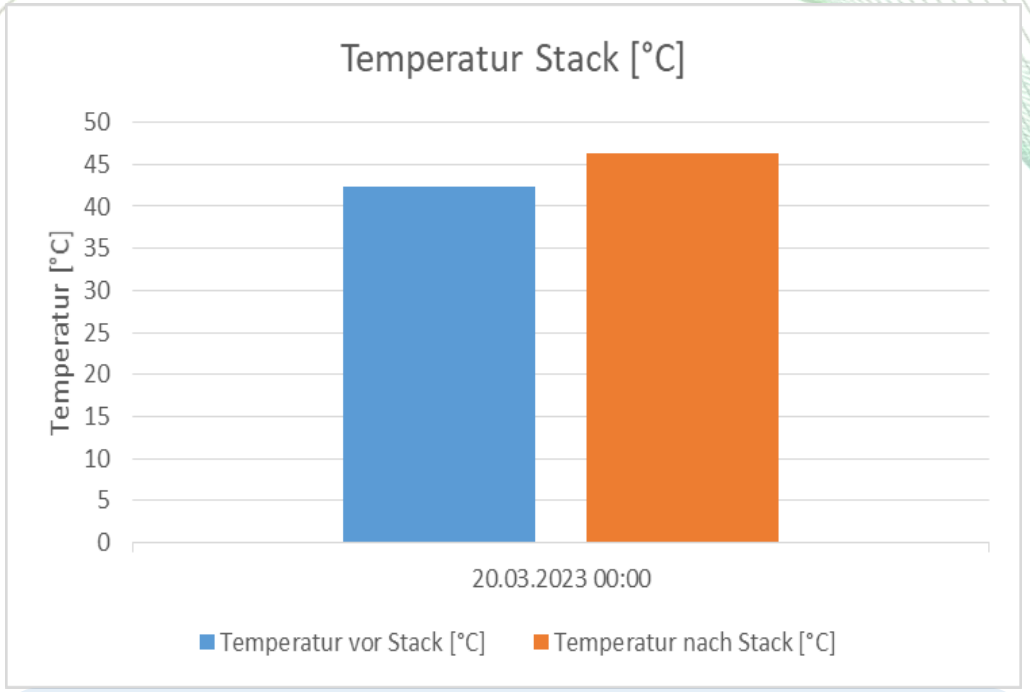
Energy Platform

Self-generated energy

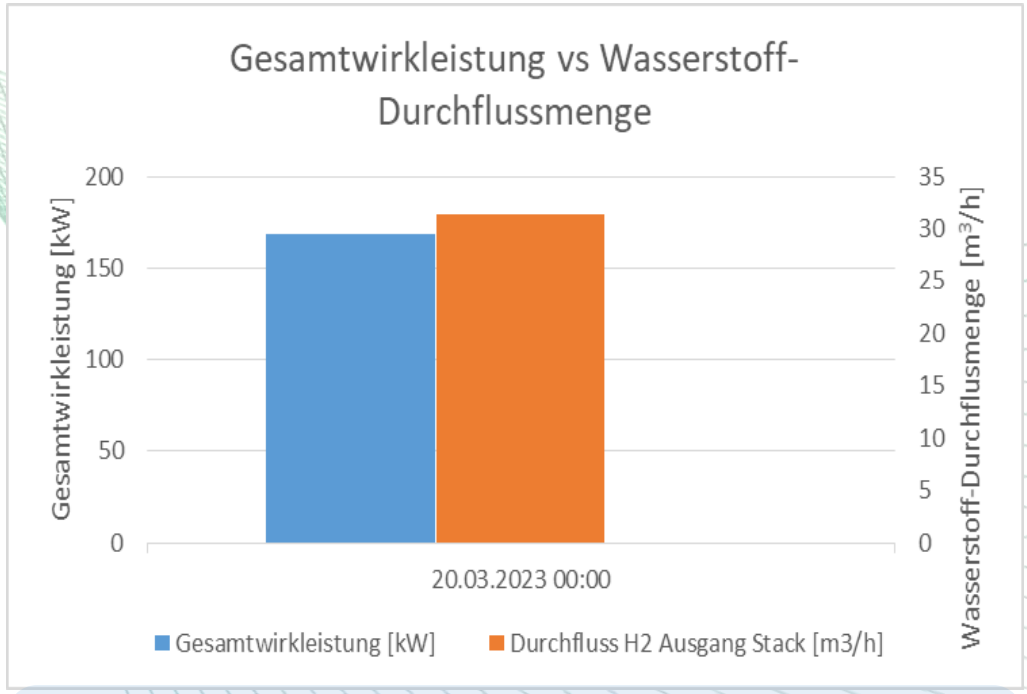
Cost reduction through flexibility

KoNSTanZE

Data provided by BOSCH Energy Platform during one day

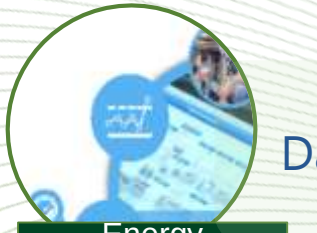


Average of inlet and outlet temperature of the PEM electrolyser



Average of active power of the PEM electrolyser

KoNSTanZE



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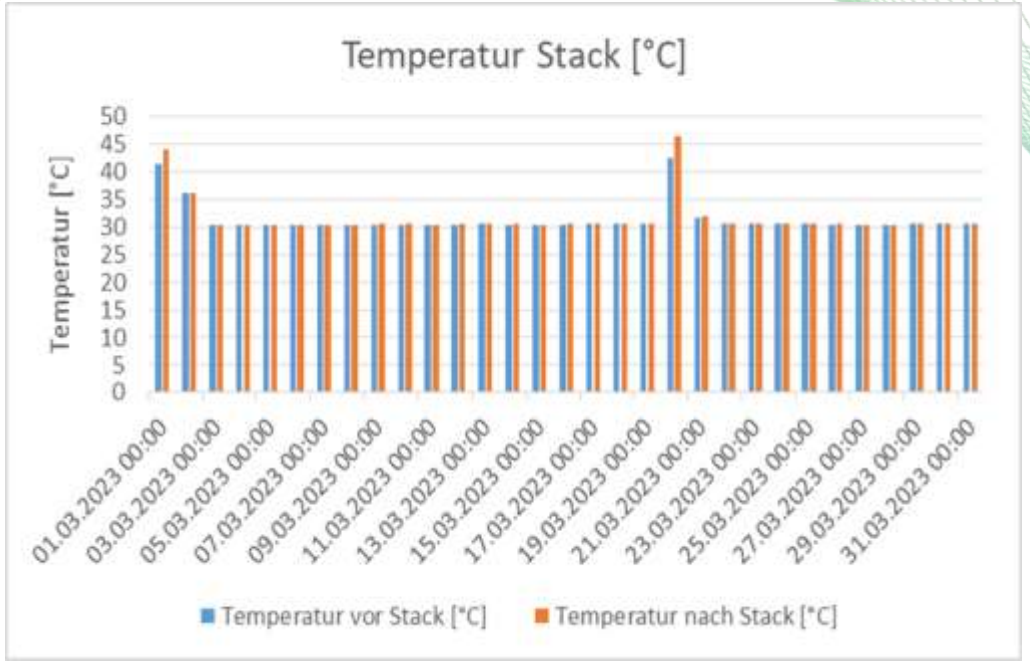
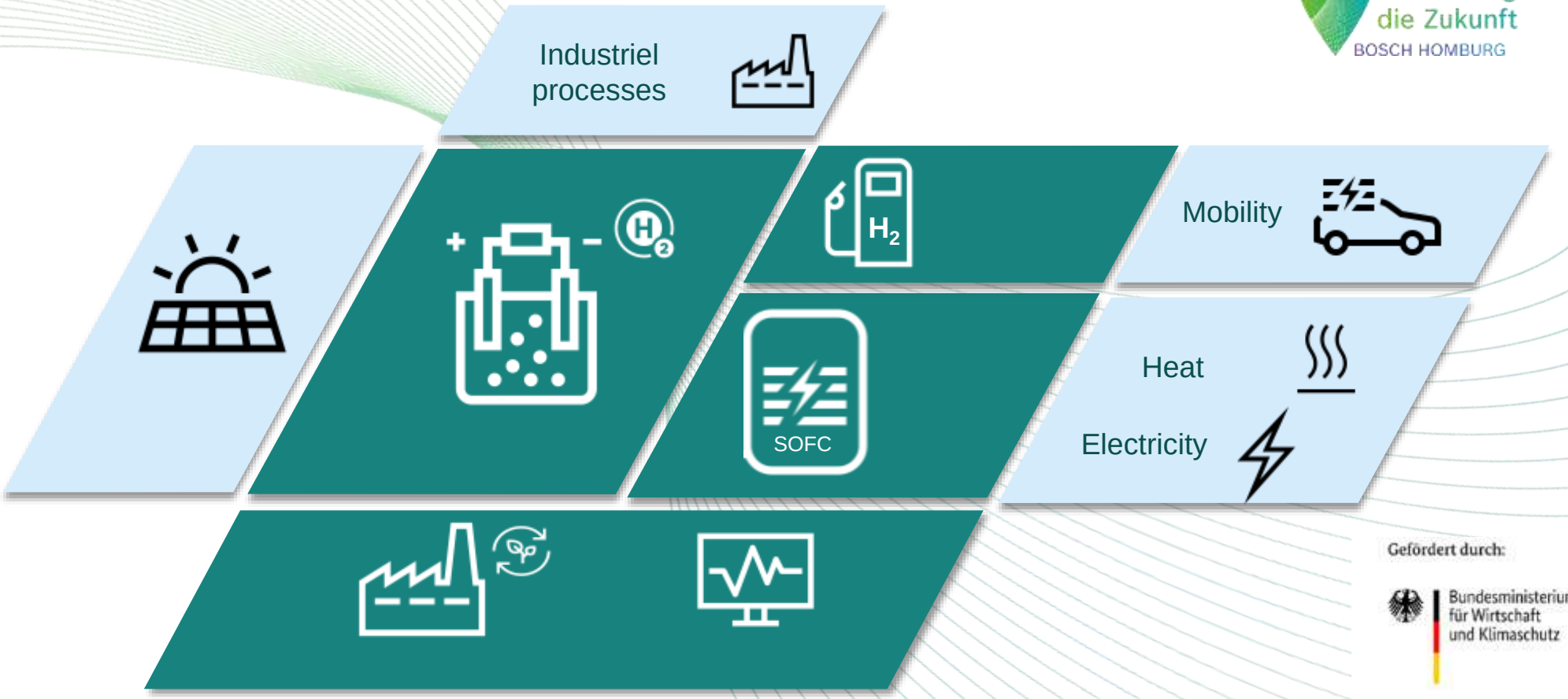


Average of inlet and outlet temperature of the PEM electrolyser

Average volume of the purification plant and H_2 and O_2 volume in the tanks

KoNSTanZE

eH_2 Cycle



Wir bewegen die Zukunft
BOSCH HOMBURG

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Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

BOSCH

KoNSTanZE

PV power plant 3.8 MW_p

(2023: >8 MW_p)

BOSCH

KoNSTanZE

Connected eH_2 Cycle

Electrolyser

KoNSTanZE

Industrial process

Compressor

Compressors from Maximator Hydrogen

KoNSTanZE

The mobile refuelling station

KoNSTanZE

H_2 Forklifts

H_2 Cars

H_2 Van

BOSCH

KoNSTanZE

H_2 low pressure storage

SOFC

BOSCH

KoNSTanZE in the future …

BOSCH

BOSCH

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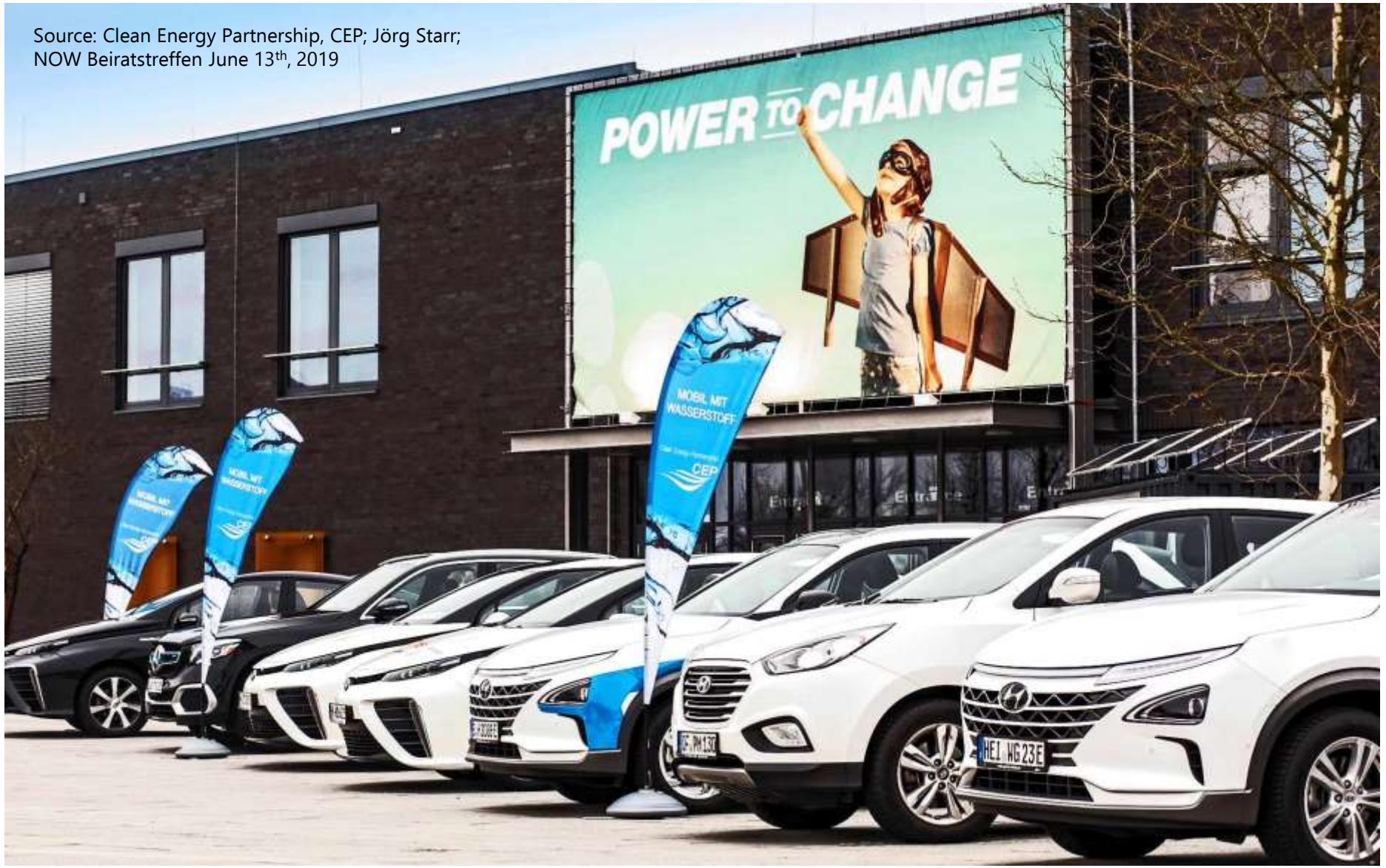
Conclusion



Source: Clean Energy Partnership, CEP; Jörg Starr;
NOW Beiratstreffen June 13th, 2019

Hydrogen may not be **the** only No. 1 but in any case an important pillar on our way to decarbonise the European energy economy in a sustainable way!

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Thank you for listening!

Dr Feriel Mustapha
Dr Bodo Groß

IZES gGmbH
Altenkessler Str. 17, Geb. A1
D-66115 Saarbrücken

gross@izes.de; +49 681 844972 51