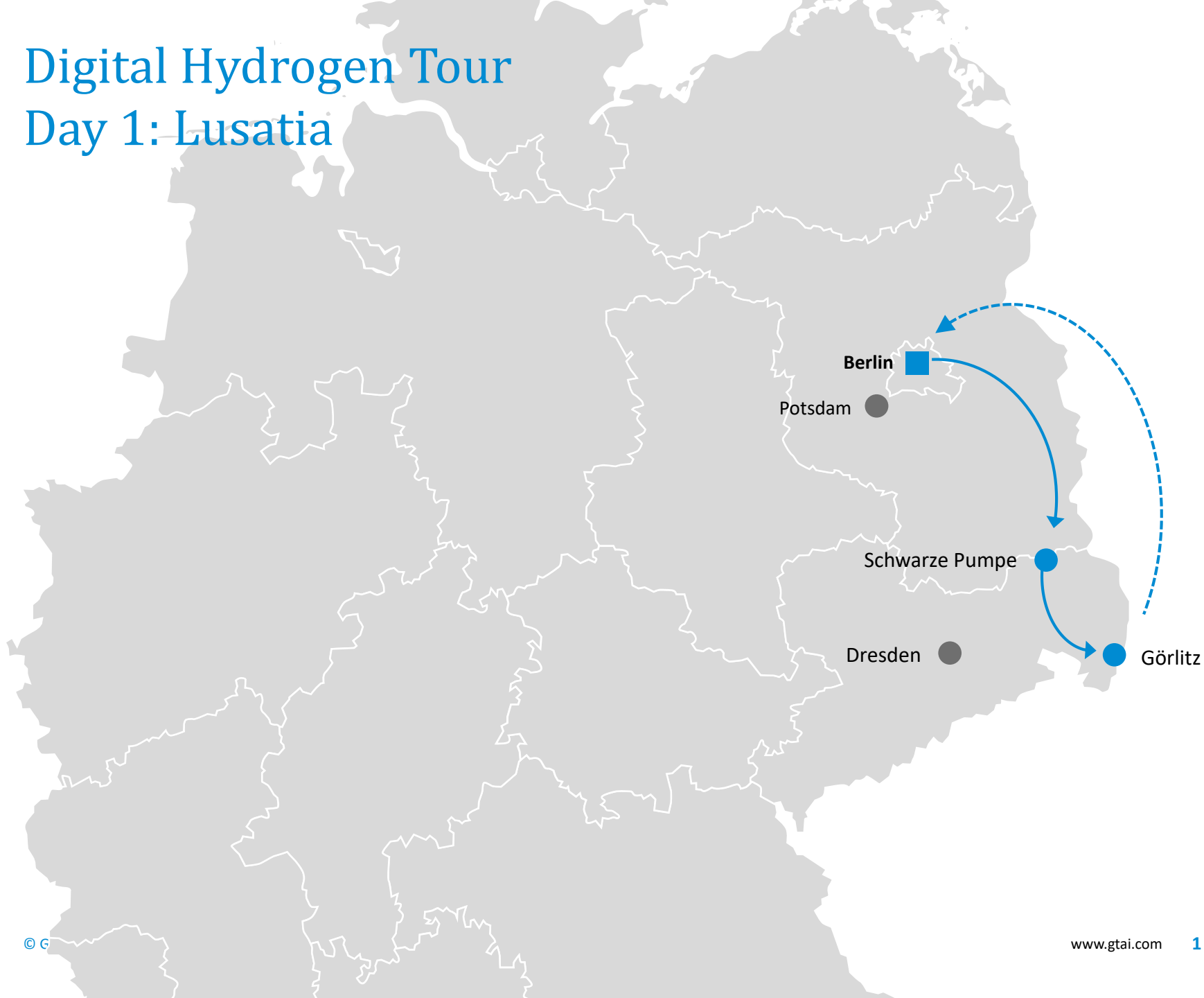


# Digital Hydrogen Tour

## Day 1: Lusatia



# THE GERMAN HYDROGEN MARKET – CURRENT STATUS AND OPPORTUNITIES

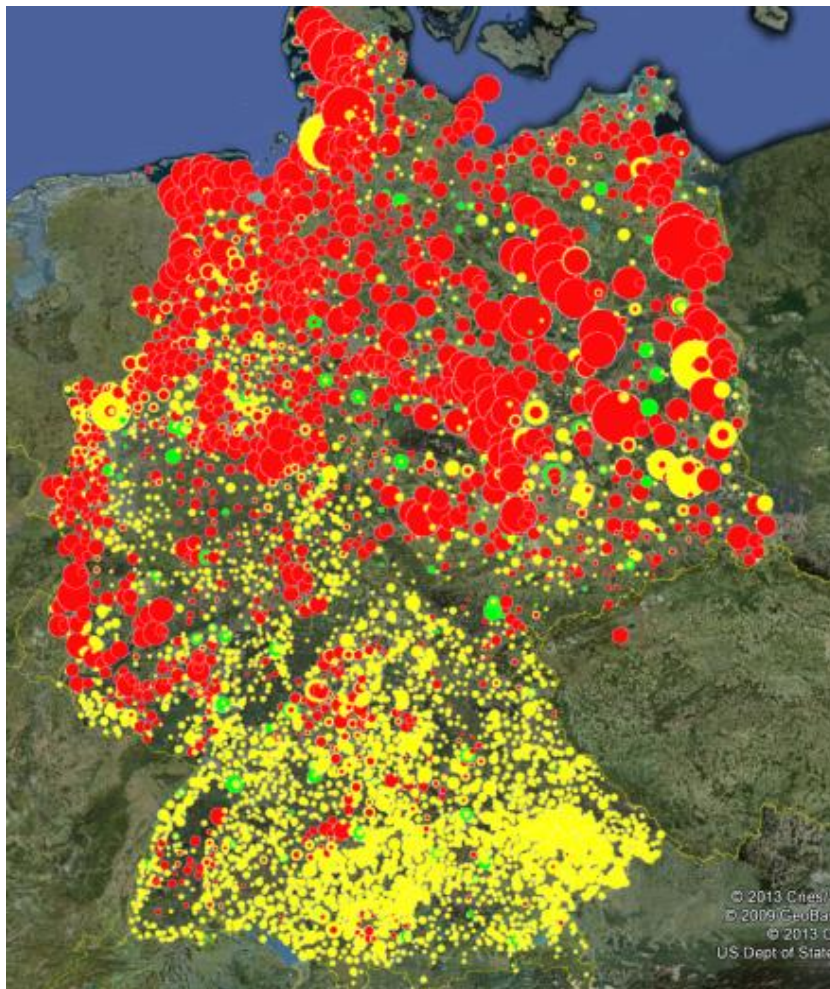
**MARCH 2021**

Heiko Staubitz  
Germany Trade & Invest



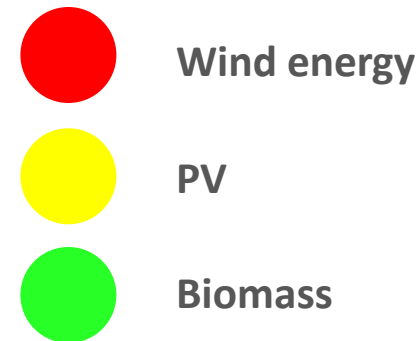
# Development of Renewable Energy Systems

Feed-in-Tariff causes dynamic growth



Total capacity of renewables  
(2020)

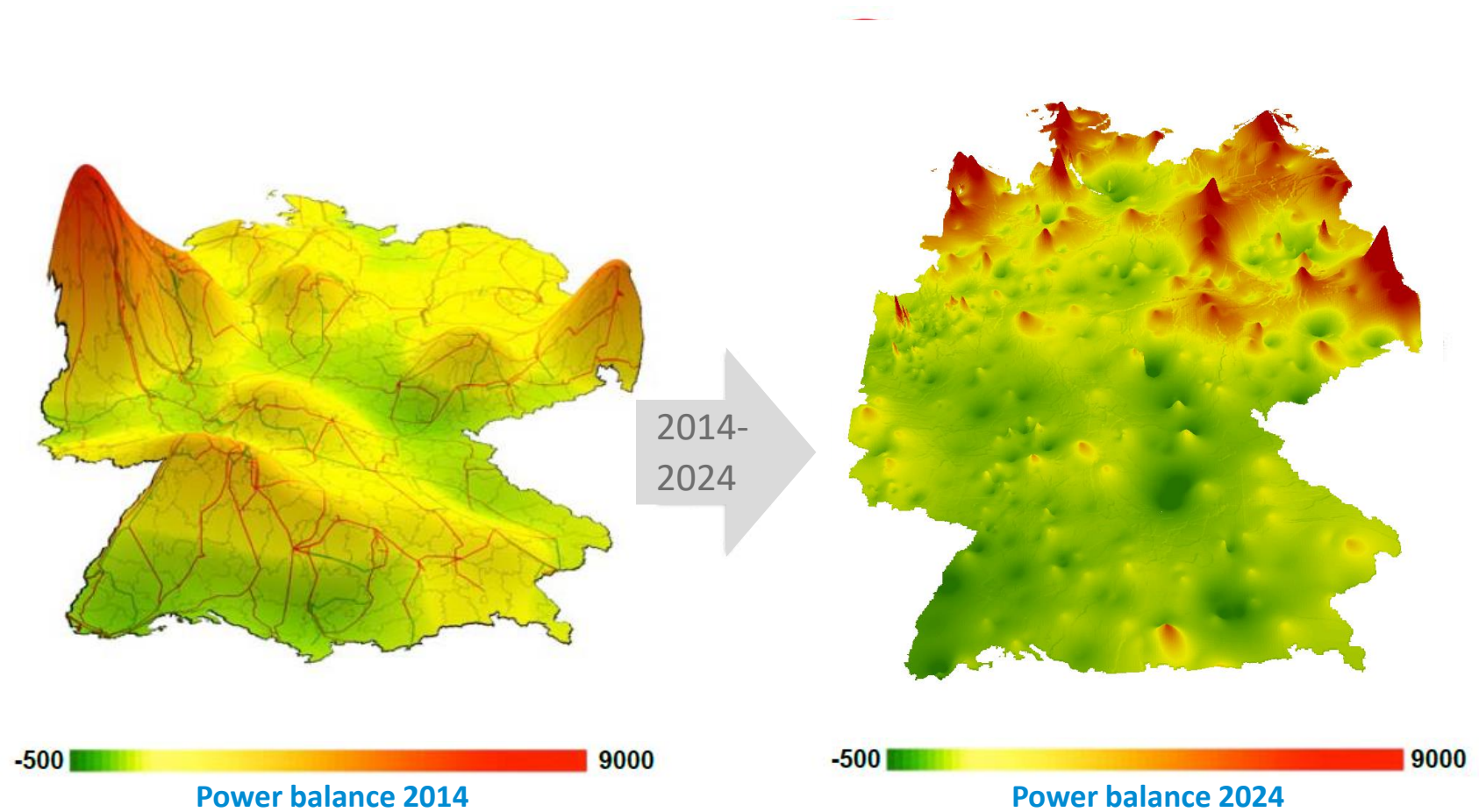
> 1.9 million installations



The circle **diameter** is proportional  
to the electrical capacity

# Changing Power Structure

New generation centers will be far from load centers

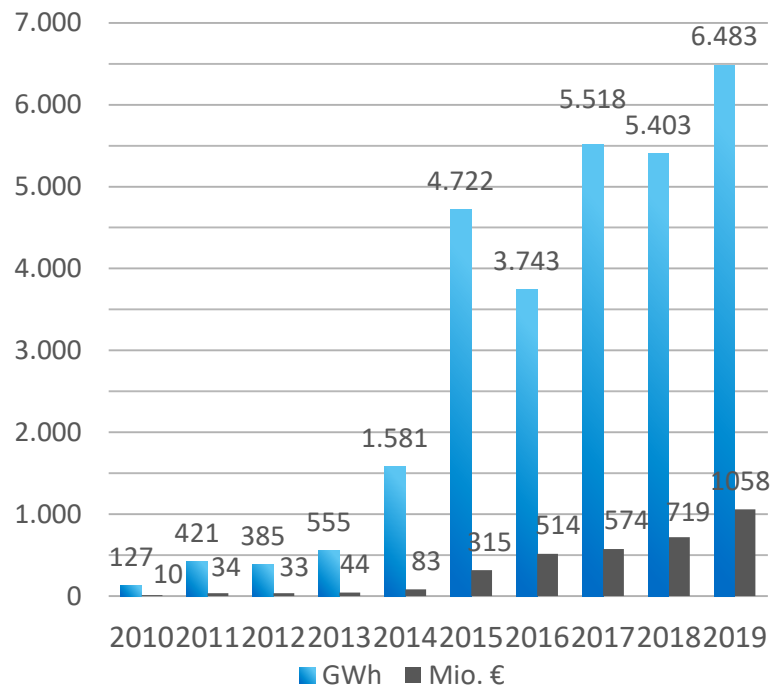


Source: Bundesnetzagentur 2016

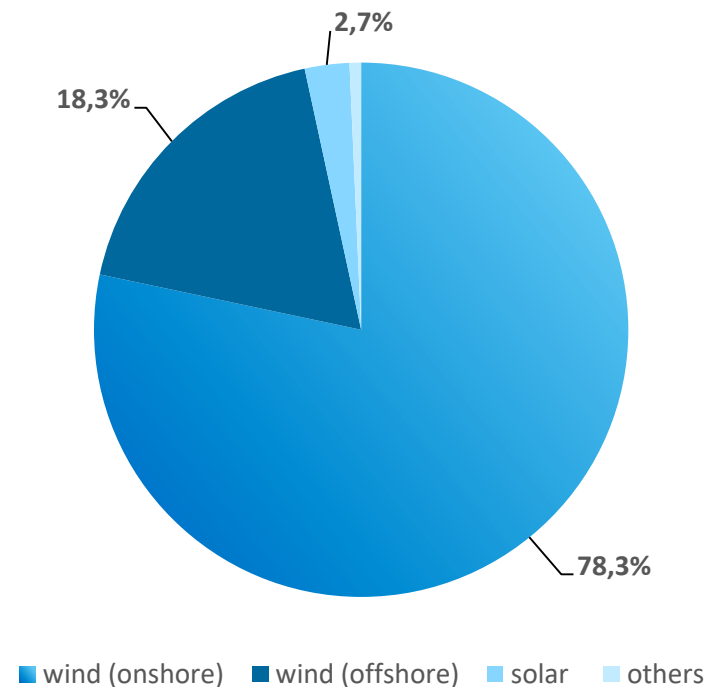
# Development of Renewable Energy Curtailment

Long term energy storage technologies are needed

**Disconnected energy for grid stabilization and compensation**  
(2010-2019)



**Disconnection for grid stabilization by energy source**  
(2019)



# Example: Energiepark Mainz

## Power-to-Gas Plant with PEM Electrolysis

### Key Parameters

- 6.3 MWeI (3 stacks, each 2.1 MW)
- Hydrogen production: 200 tons/a
- Start of construction: October 2012
- Start of operation: December 2016
- Partners: Stadtwerke Mainz, Linde, Siemens, Hochschule RheinMain



### Goals

- Local grid integration by storing fluctuating renewable power
- Provision of ancillary services in the electricity grid (including negative control reserve)
- Intelligent and efficient hydrogen conditioning, storage, smart management structure



Source: Energiepark Mainz

© Germany Trade & Invest

www.gtai.com

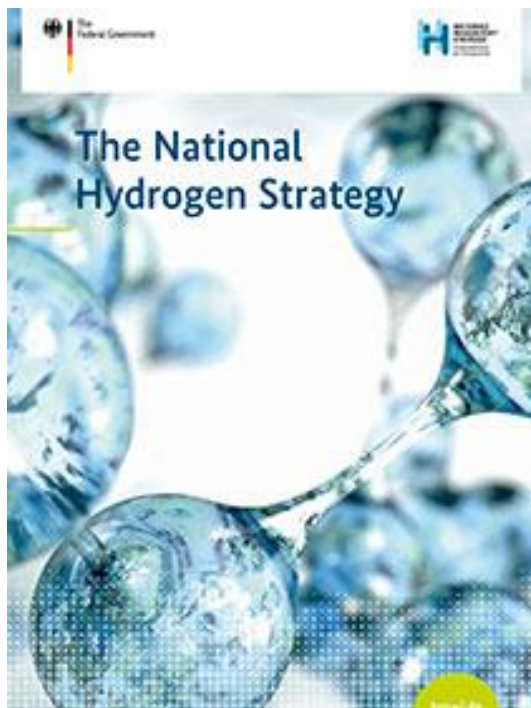
6

# Germany's National Hydrogen Strategy

Hydrogen will become central pillar in achieving Germany's energy transition

## Goals of the National Hydrogen Strategy

---



- Invest EUR 9 billion: EUR 7 billion nationally + EUR 2 billion internationally
- 5 GW of electrolysis generation capacity till 2030
- Another 5 GW of electrolysis generation capacity till 2035 (2040)
- Develop a policy framework that encourages investments
- Determine concrete implementation measures

Source: BMWi, 2020

© Germany Trade & Invest

www.gtai.com

7

# Potential Market for Green Hydrogen

## Current Market

Application	Requirement	H <sub>2</sub> Price
Refinery	177,000 ton/y -> 3.7 GW Electrolysis Power	1.65 €/kg H <sub>2</sub>
Chemical Industry	284,000 ton/y -> 6 GW Electrolysis Power	1-2 €/kg H <sub>2</sub>
Glass Industry	0.75 ton/y -> 0.16 GW Electrolysis Power	6.50 €/kg H <sub>2</sub>
Steel Industry	350 MW Electrolysis pro 1 Mio t Crude Steel -> 15.75 GW Electrolysis Power (for 42 Mio. t Crude Steel/y)	-

- Current electrolysis potential to meet H<sub>2</sub> demand: 26.6 GW
- Substitution of the gray H<sub>2</sub> by green H<sub>2</sub> offers great potential in the short term
- Today's markets need to be tapped for a rapid ramp-up of Electrolysis

## Future Market

Application	Requirement	H <sub>2</sub> Price
Rail Transport	40% of lines are not electrified	-
Trucks (PtG), Air (PtL) and Shipping (LNG)	Share of Fuel Cell Electric Vehicles / Commercial Vehicles	-
Car (H <sub>2</sub> )	2030: 5-50% depending on the type	4.67 – 9.33 €/kg
Heating Market (2-10% Feed into Gas Network)	88,000 ton/y – 440,000 ton/y -> 1.22-6.1 GW Electrolysis Power	1.67 – 2.97 €/kg H <sub>2</sub>

- Decarbonisation of the heat sector, by feeding H<sub>2</sub> into the gas network
- Prices in the other sectors make the transport sector most accessible

Source: NPM



# Regulatory Sandboxes for the Energy Transition

This program enables real life tests of innovative technology and processes

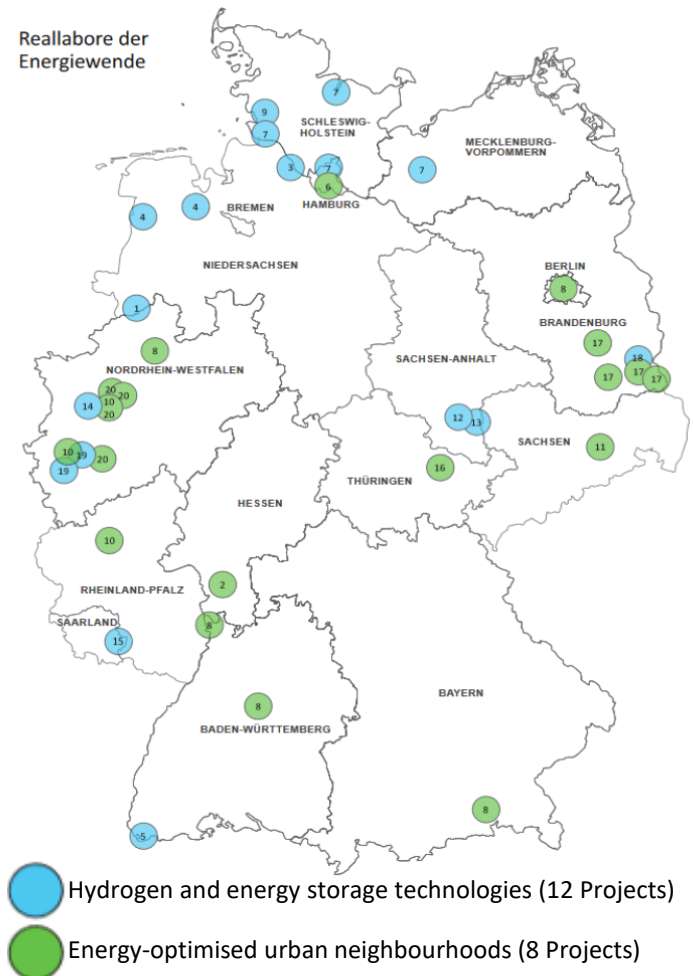
## Regulatory Sandboxes “Reallabor”

### Main Goals:

- Taking and expanding technology leadership
- From isolated individual projects to a systemic approach
- Industrial standards
- Available business models
- Implement cross-sectoral CO<sub>2</sub> savings
- Regulatory learning, this means reviewing the energy industry framework

### Selected Projects for Funding:

- 20 winning projects:
  - 12 focused on Hydrogen and Energy Storage
- Funding: 100 million € per year (2019-2022)



Source: BMWi

# Germany's National Hydrogen Strategy

Hydrogen will become central pillar in achieving Germany's energy transition

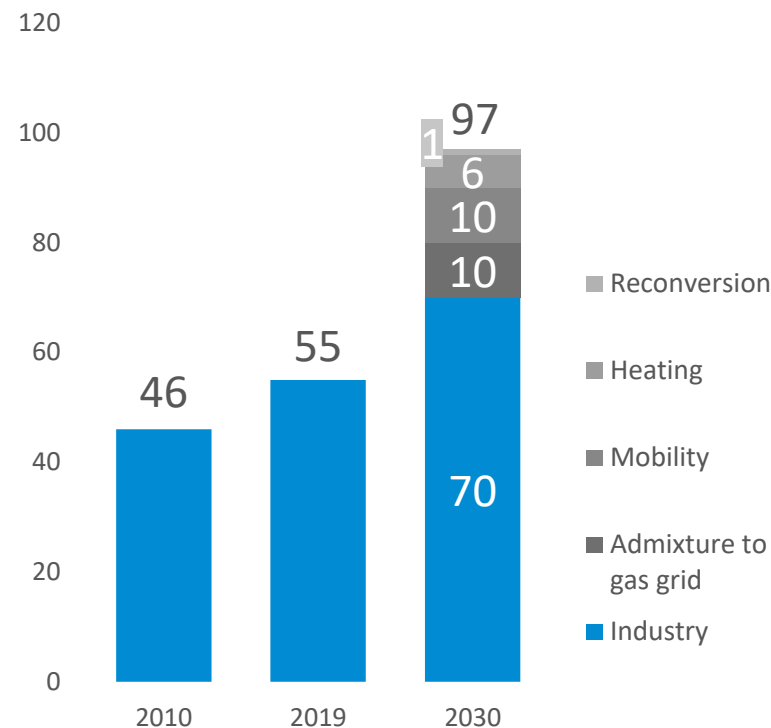
## Goals of the National Hydrogen Strategy

- The Federal Government expects that around 90 to 110 TWh of hydrogen will be needed in Germany by 2030
- Green hydrogen will be especially important in decarbonizing industries such as steel and chemical
- Germany as an energy importing country will also need to import hydrogen in the future

Source: BMWi, 2020

© Germany Trade & Invest

## Hydrogen utilization in Germany (in TWh)



Source: BMWi, 2020; e.venture, 2020

# Contact Us

## Energy Storage – Smart Grid

**Heiko Staubitz**

**Senior Manager**

**T +49 (0)30 200 099-226**

heiko.staubitz@gtai.com

Friedrichstr. 60

10117 Berlin

Germany Trade & Invest is the economic development agency of the Federal Republic of Germany. The company helps create and secure extra employment opportunities, strengthening Germany as a business location. With more than 50 offices in Germany and abroad and its network of partners throughout the world, Germany Trade & Invest supports German companies setting up in foreign markets, promotes Germany as a business location and assists foreign companies setting up in Germany.

Supported by the Federal Ministry for Economic Affairs and Energy on the basis of a decision by the German Bundestag.

© Germany Trade & Invest

All market data provided is based on the most current market information available at the time of publication.

Germany Trade & Invest accepts no liability for the actuality, accuracy, or completeness of the information provided.