

MARKET INSIGHTS GERMANY:

ドイツにおける市場見通し:

The Importance of the hydrogen ecosystem for the
German energy transition: The way ahead

ドイツ エネルギー転換のための水素エコシステムの重要性 :

これからの道筋

MARCH 2023

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Germany Trade & Invest



ドイツ貿易・投資振興機関(GTAI)について

Foreign trade and inward investment agency
of the Federal Republic of Germany

GTAI GERMANY
TRADE & INVEST

(ドイツ貿易・投資振興機関)

Shareholder



Federal Ministry
for Economic Affairs
and Climate Action

(ドイツ連邦経済・気候保護省)

- ドイツ連邦政府が設立し、所有する経済振興機関
- ドイツ連邦経済・気候保護省の所管・後援
- ドイツ市場への事業拡大を計画している外国企業へ、アドバイスやサポートを無料提供
- 海外市場への進出を目指すドイツ国内企業に包括的な海外市場の情報を提供

ドイツ進出へのサポート を無料で提供

主要産業の情報（市場分
析・参入分析）

法規制の情報

税制についての情報

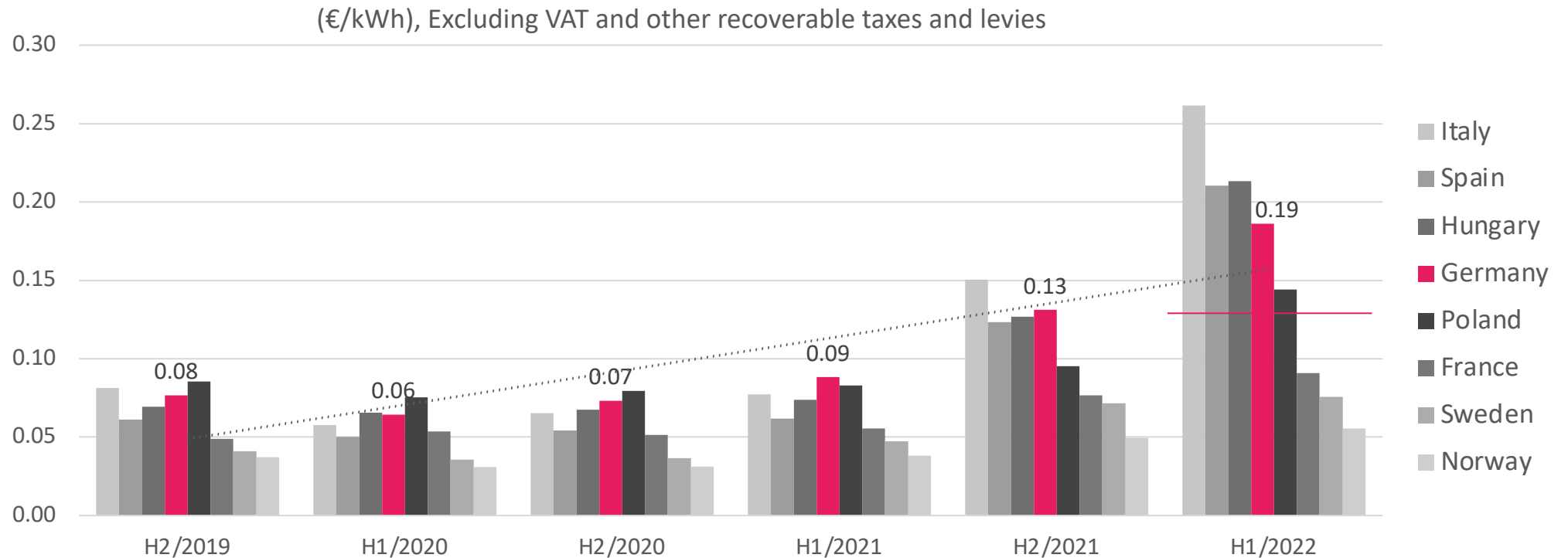
補助金・公的融資について
の情報提供と支援

進出先（立地候補地）
選定の支援

進出先の支援団体紹介

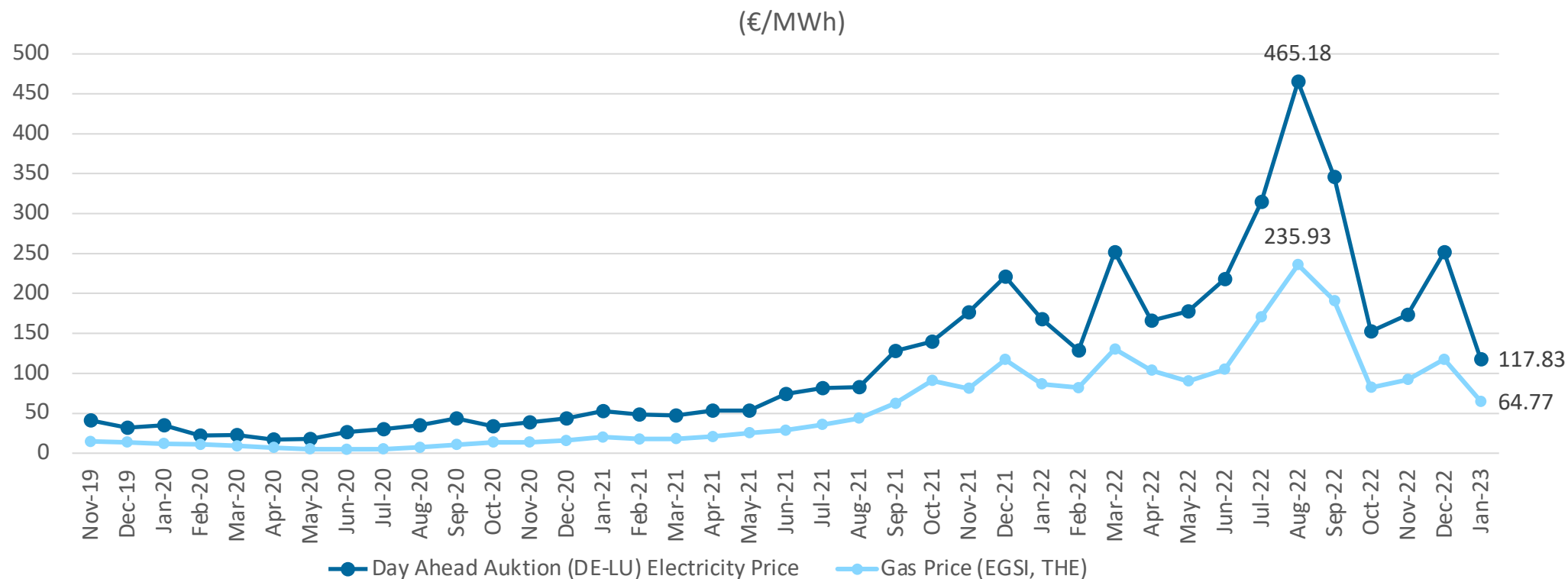


Industrial Electricity Prices



In H1 2022, European industrial clients experienced a strong increase in the average cost of electricity

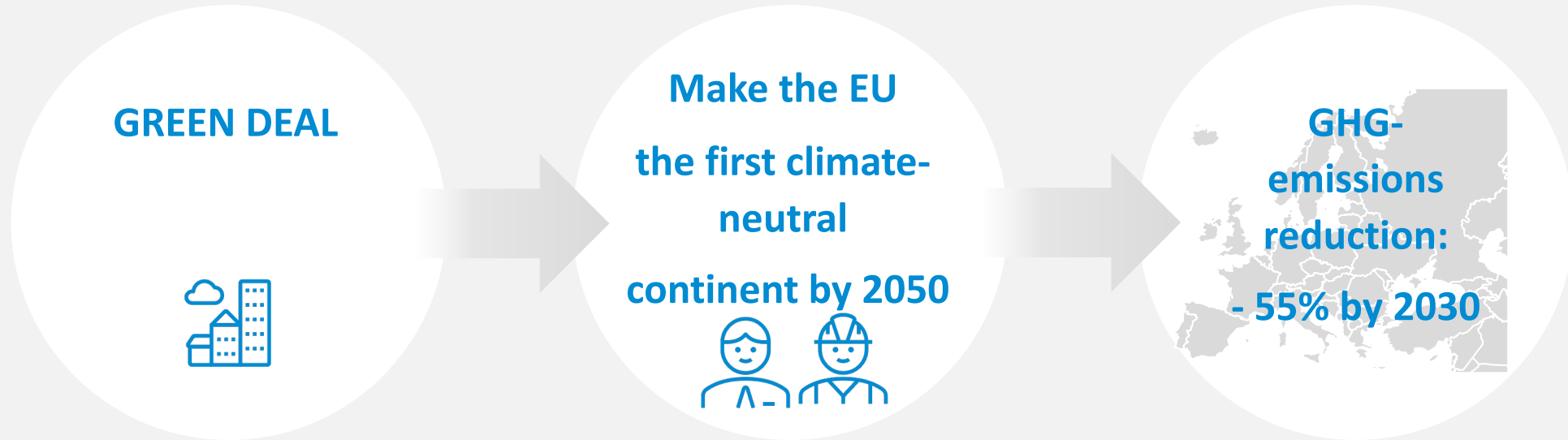
Germany: Energy Exchange Price Development



After initial price peaks in August 2022, German energy exchange prices have shown a downwards trend

European Legal Framework

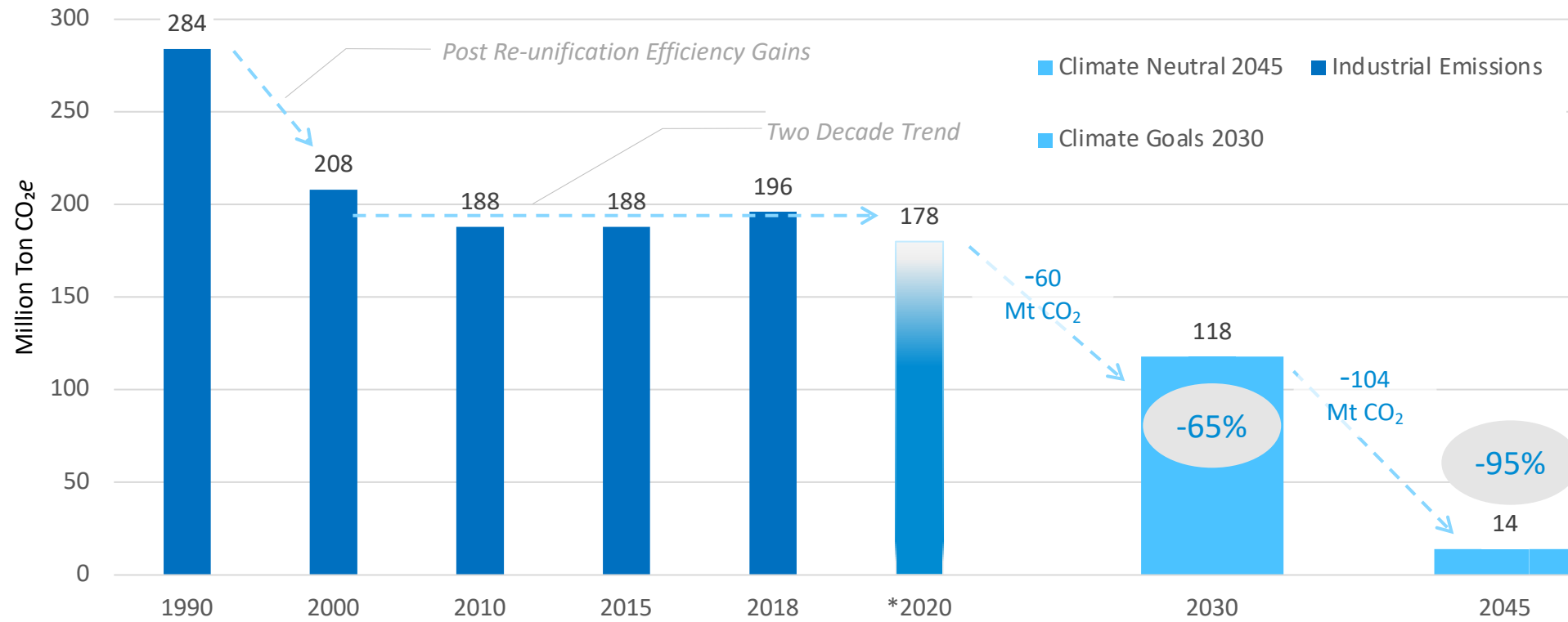
Paving the way for investments in decarbonized production



German Industrial Emissions

Trends and Goals 2030-2050 ~~2050~~ 2045

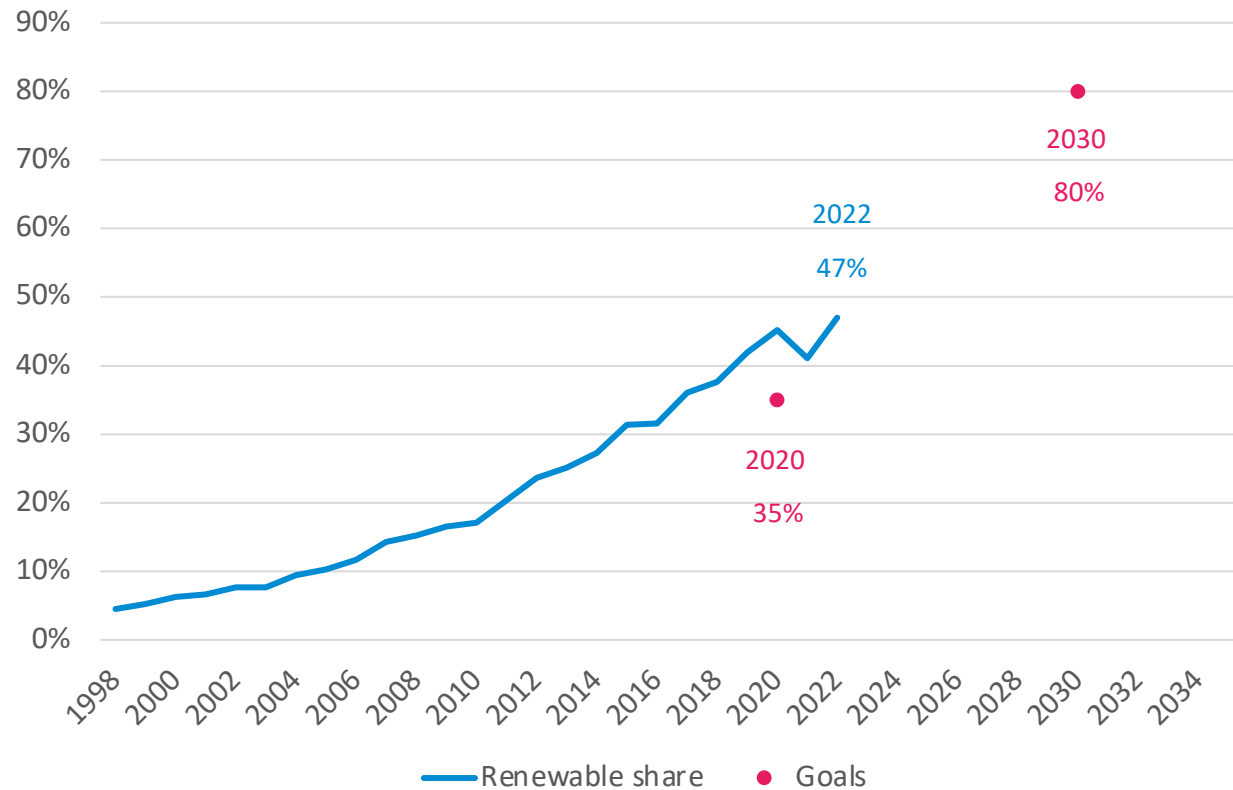
German Industrial Emissions (CO₂e Produced Domestically)



Source: Agora Energiewende und Wuppertal Institut (2019); * Umwelt Bundesamt 2021

Renewable Electricity in Germany

Renewables share of gross electricity consumption growing beyond expectations

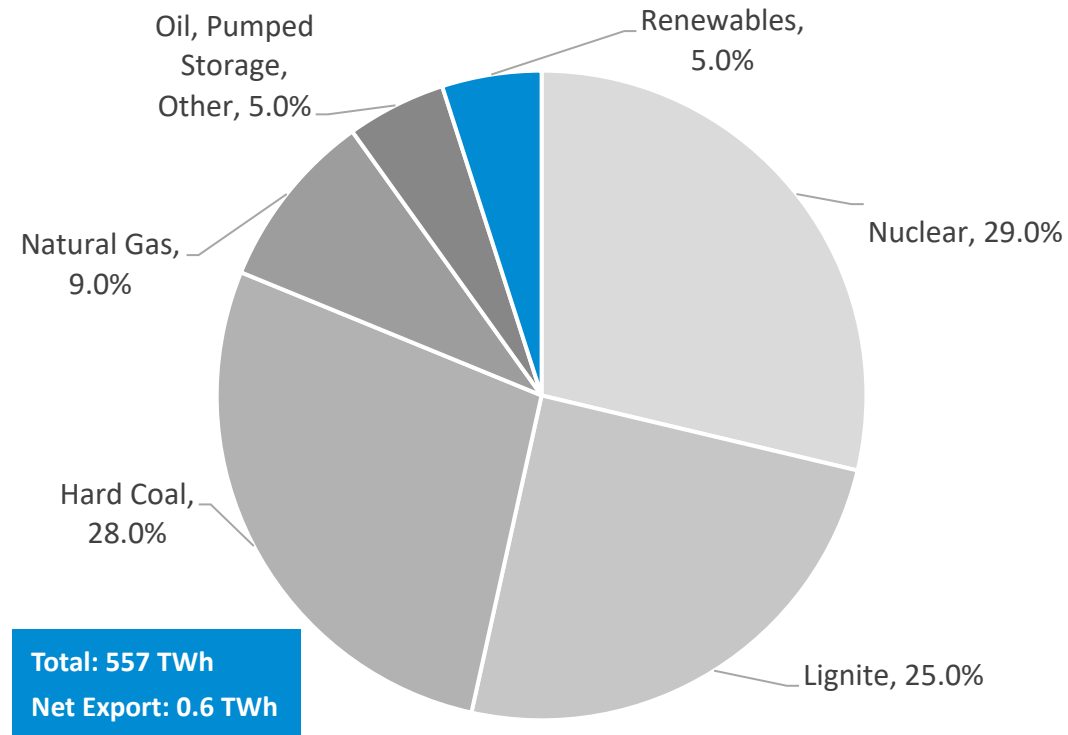


Germany will heavily increase the renewable share of gross electricity consumption by 2030

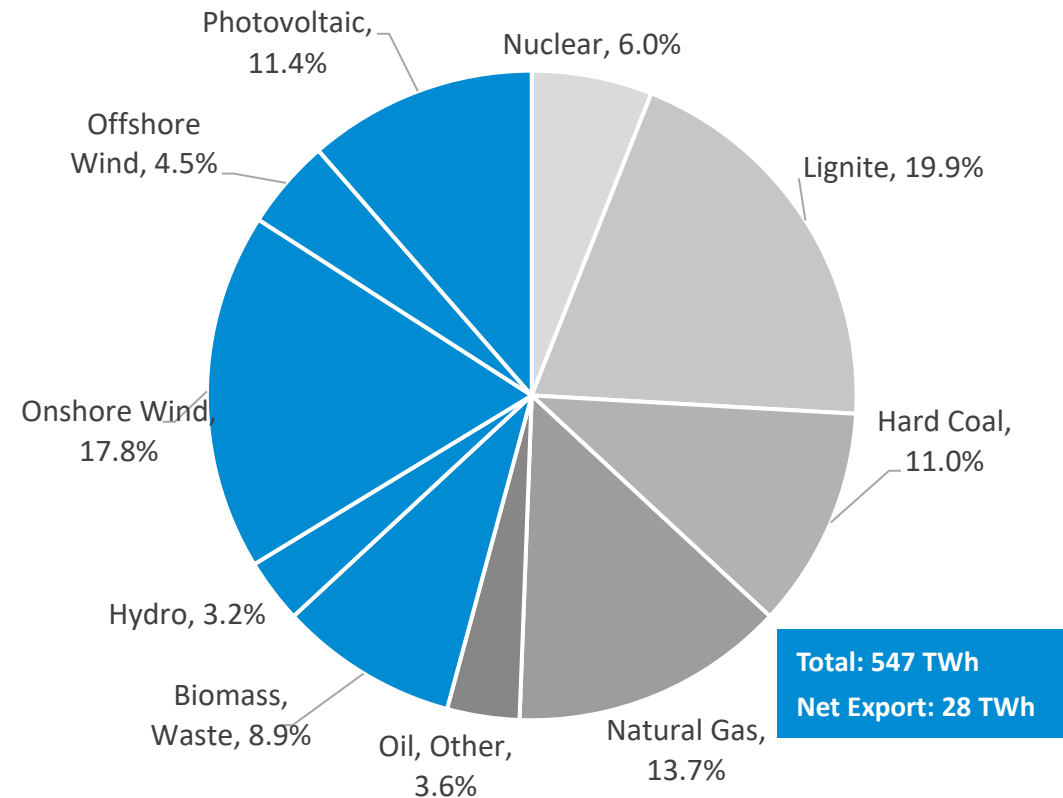
Gross Electricity Generation in Germany

Renewables has increased almost tenfold since 1998

1998



2022

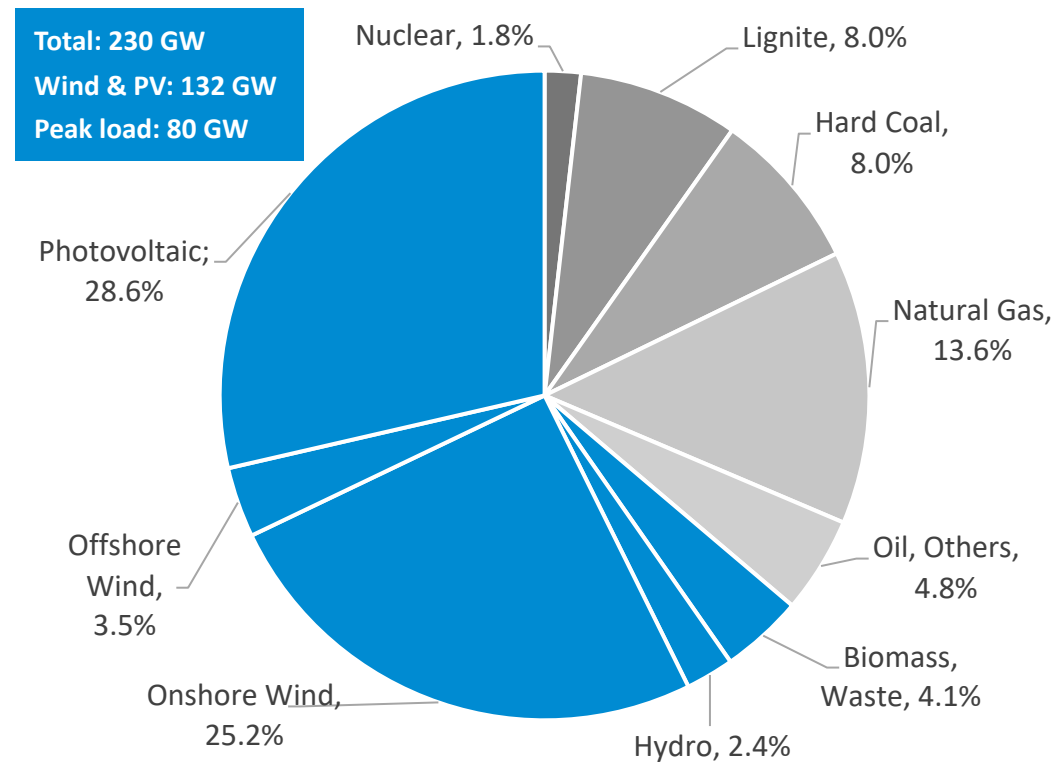


Source: BDEW, 2022

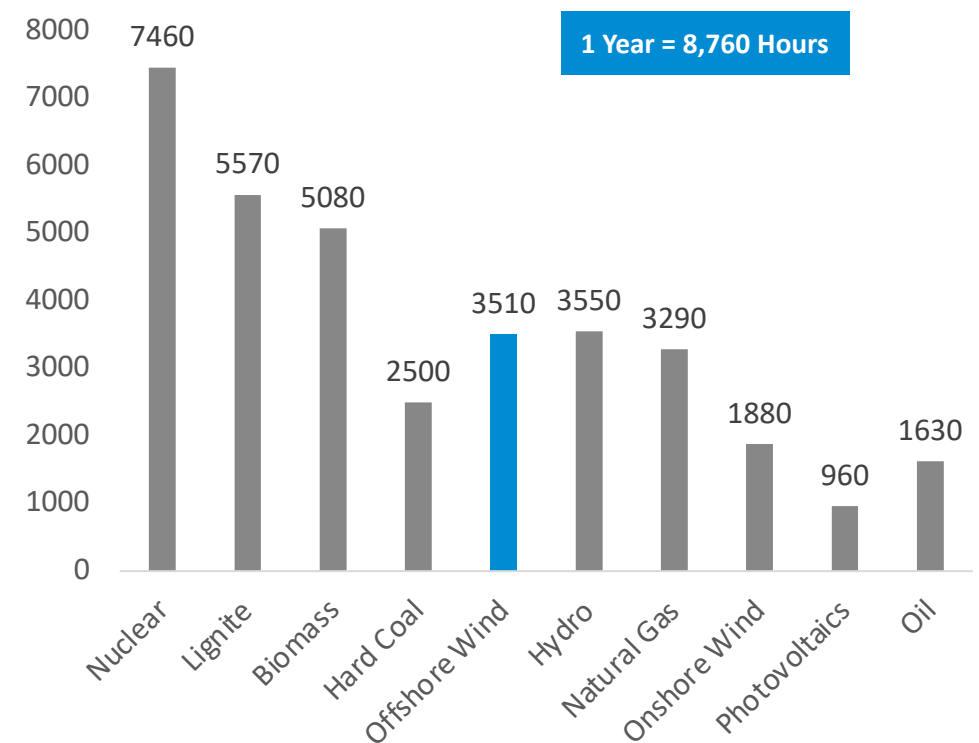
The German Electricity Market

Offshore wind recognized for its high potential

Installed Capacity By Source 2022



Full Load Hours by Plant Type 2020

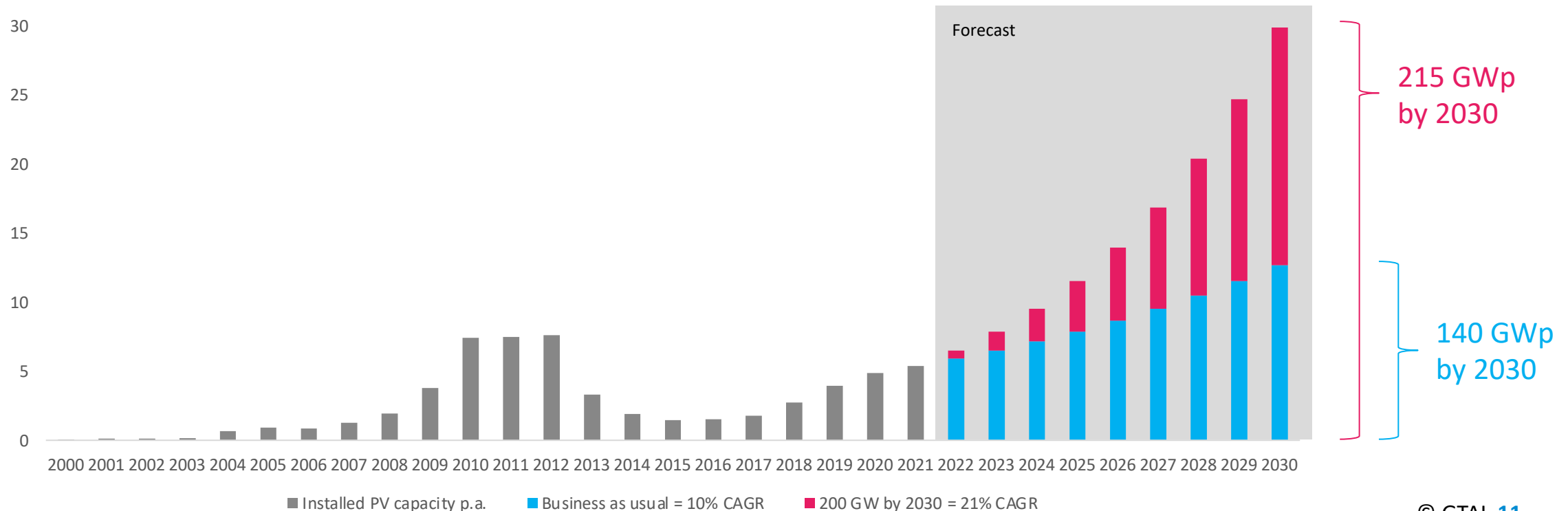


Source: BDEW, 2022

Massive Growth of PV Installations in Germany

>20% CAGR from 2022 to 2030 in annual installations needed in order to meet NEW GOV TARGET of 215 GWp total capacity by 2030

Annually installed PV capacity in Germany
(in GWp p.a.)



Source: GTAI analysis

Expansion of the Electricity Grid in Germany

An enormous expansion of the high voltage grid system is required by 2035

Grid Expansion	Distance in Km.
AC-New Construction	450
DC-New Construction	2,150
DC-Interconnections	250
AC-Interconnections	50
AC-Grid Reinforcement	3450
Total	6,650

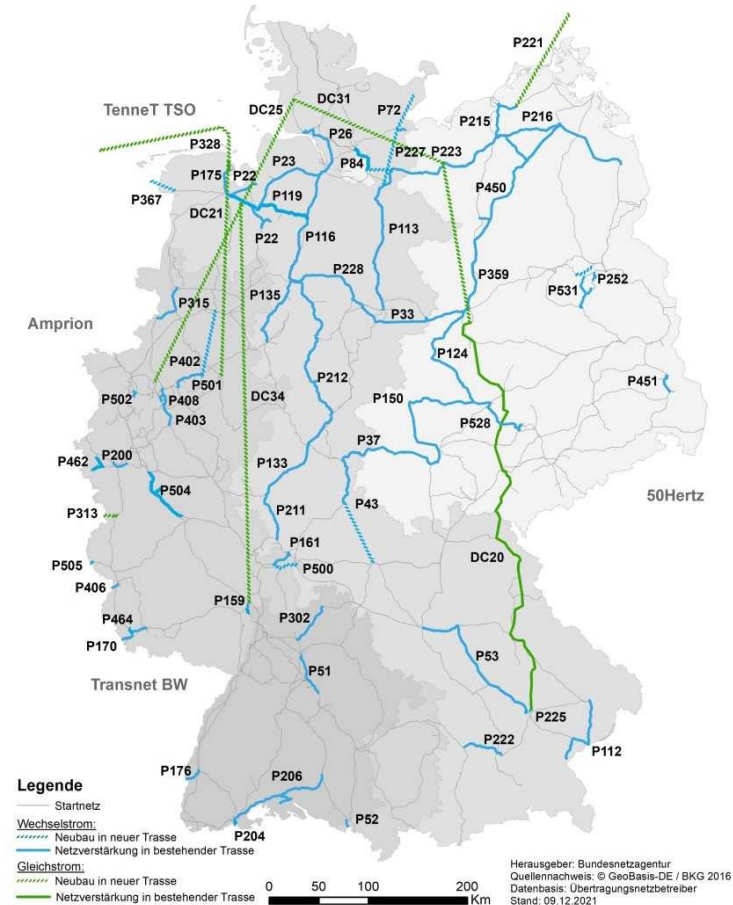
Expansion and Reinforcement

Onshore grid estimated investment:

Total	72,5 bn €
- DC Network Expansion	13.9 bn €
- AC Network Expansion	20 bn €
- Reinforcement (current DC and AC lines)	38.7 bn €

Offshore grid estimated investment:

Total	33 bn €
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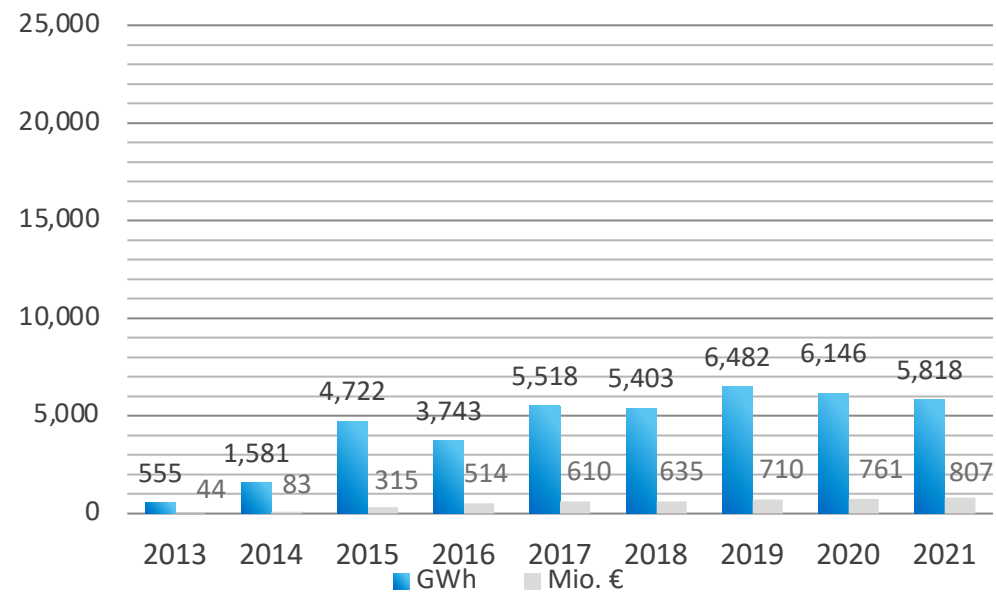


Note: Data is based on the German Network Development Plan 2021-2035. Scenario A 2035 Fossil: 61,2 GW Renewable 233,4 GW / Offshore transmission capacity 28 GW. The plan is re-evaluated and updated every two years, next update in 2021. Source: BNetzA April 2022

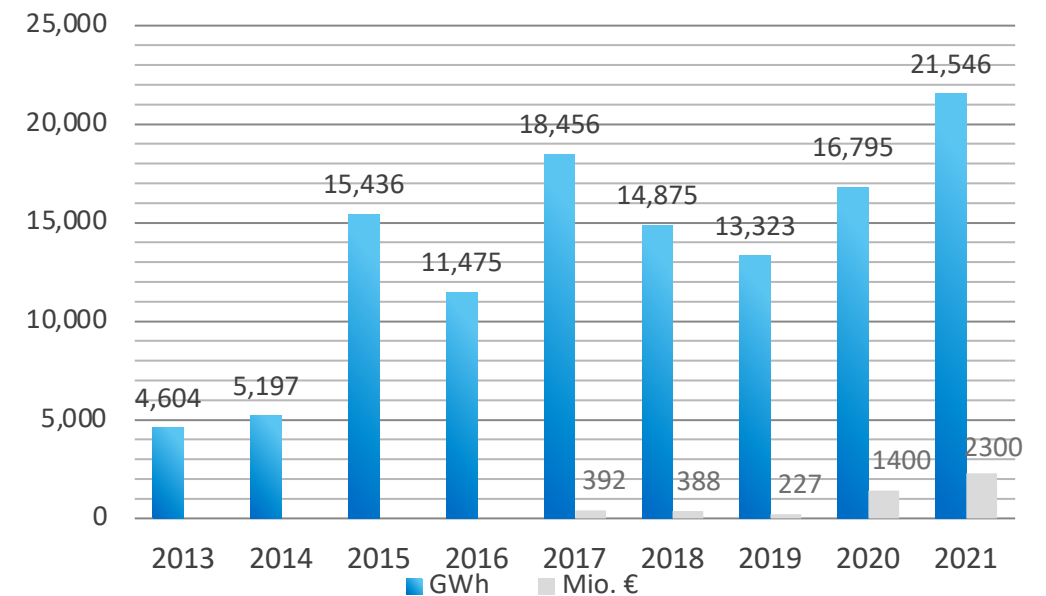
Development of Renewable Energy Curtailment

Long-term energy storage technologies are needed

Disconnected energy for grid stabilization and compensation
2013-2019



Redispatch development and compensation
2013-2021



Hydrogen Technologies in the Energy Transition

Shell refinery hydrogen electrolysis plant in Wesseling



Goals

- Processing and upgrading products at the refinery site
- Testing the PEM technology at the large scale
- Exploring applications in other sectors including: industry, power generation, heating for buildings, and transport

Key Parameters

- Project name: REFHYNE
- Input power: 10 MW
- Hydrogen production: 1,300 ton/year
- Start of operation: July 2021
- Funding: €10 Million from European Commission's Fuel Cells and Hydrogen Joint Undertaking & € 6Million from partners

Partners

- Shell
- ITM Power
- SINTEF
- Thinkstep
- Element Energy

Germany's National Hydrogen Strategy

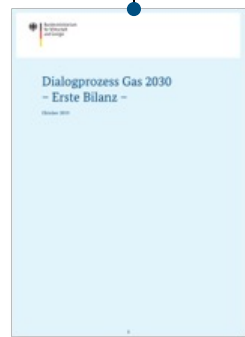
Make hydrogen competitive



2019:
Stakeholder
dialogue on National
Hydrogen Strategy
across ministries



3 June, 2020:
Coalition decision
on stimulus package,
incl. €9 billion
for hydrogen



2019:
Stakeholder dialogue
“Gas 2030” run by Federal
Ministry for Economic
Affairs and Energy



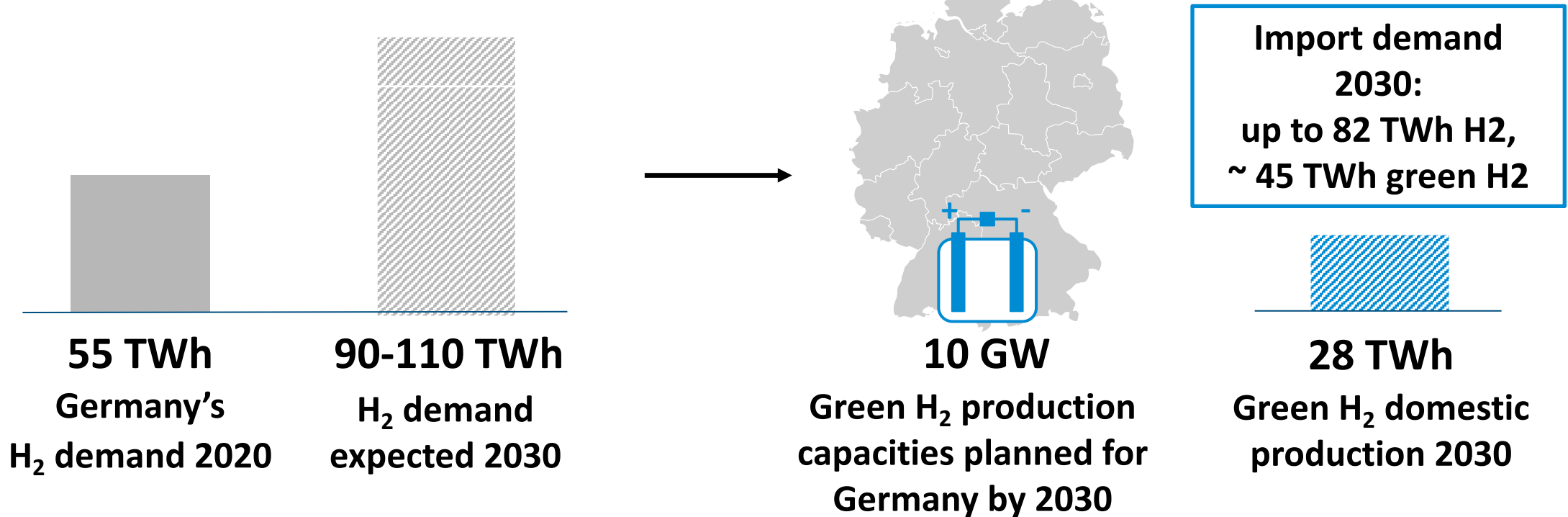
10 June, 2020:
Cabinet adopts
National
Hydrogen
Strategy

Source: Guidehouse 2020 based on BMWK 2020

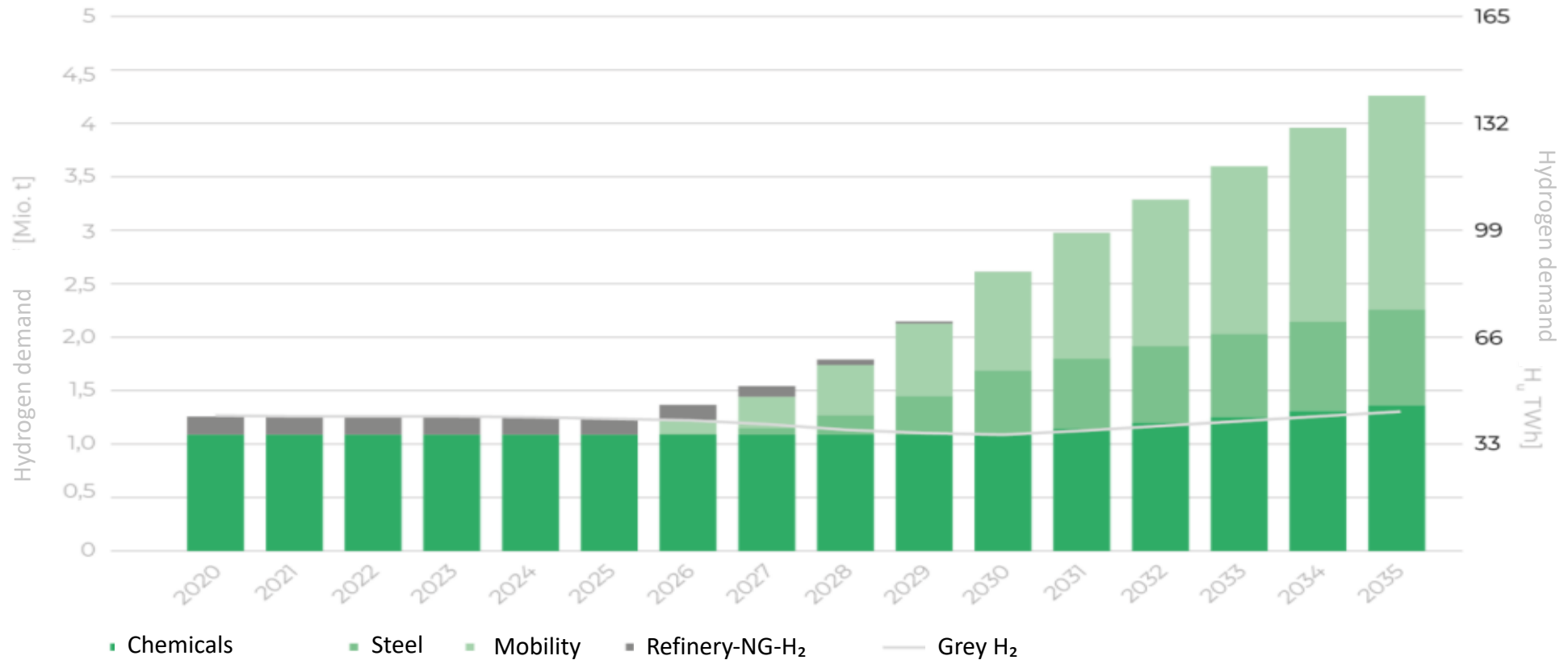
Pictures: BMWK/BILDKRAFTWERK & BMWK/Andreas Mertens

Domestic Hydrogen Market and Import Demand

Hydrogen (H₂) volumes foreseen for 2030

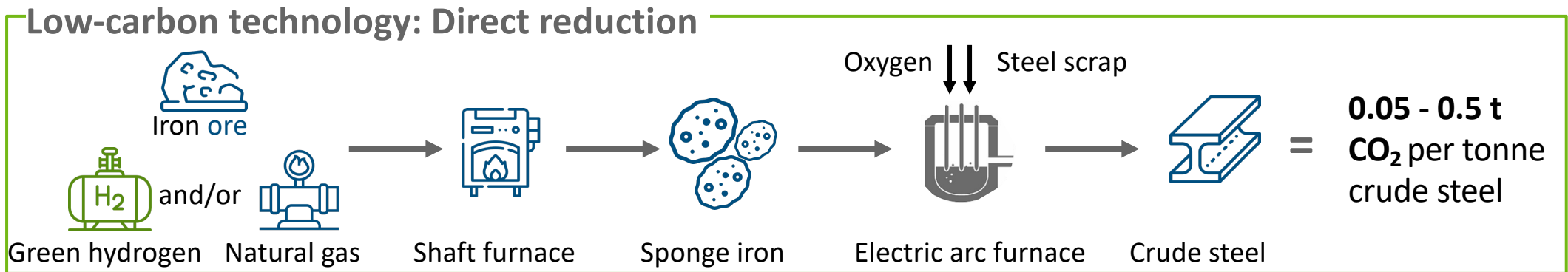
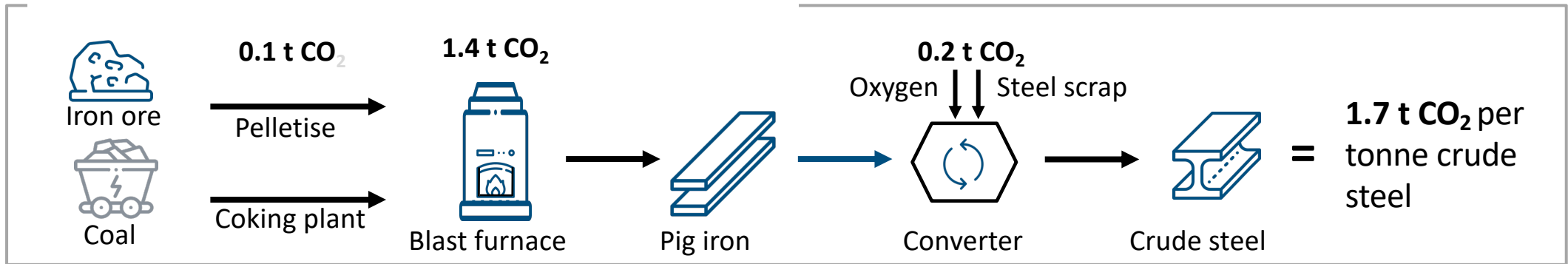


Hydrogen Demand in Various Sectors



Green Steel Production

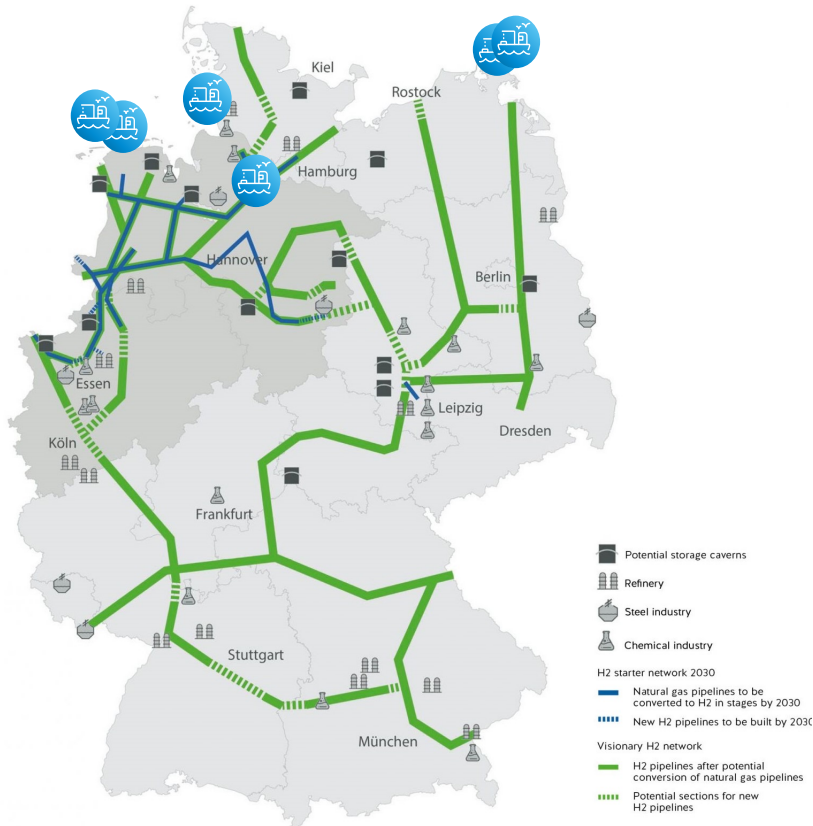
Green hydrogen can reduce CO₂ emissions by 97%



New Hydrogen Infrastructure

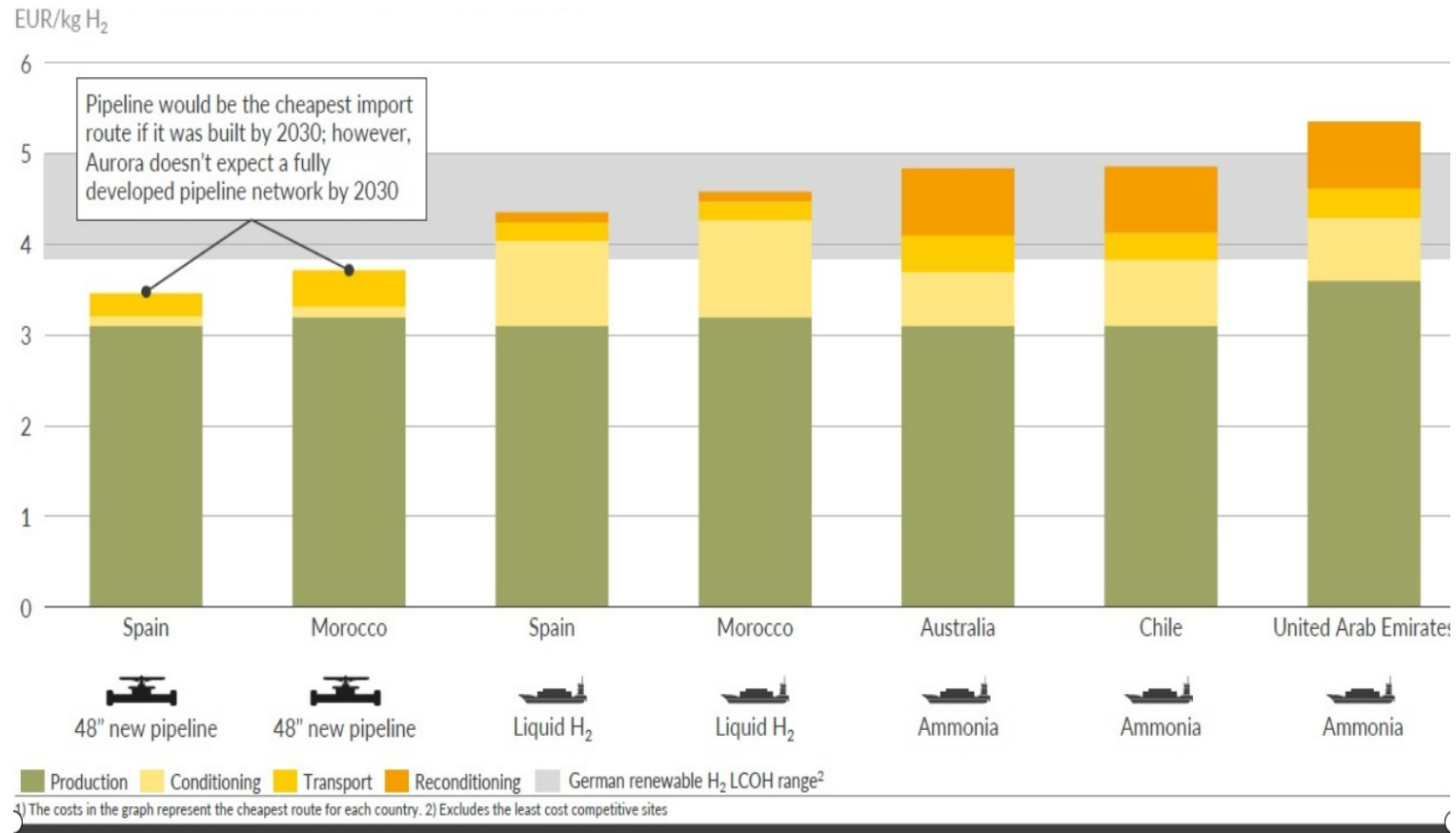
A pipeline network to supply the German industry

H₂ starter network 2030



- The NG infrastructure will be repurposed for hydrogen transport in connection with the European hydrogen backbone
- Storage capacity and 2 H₂ pipeline networks already exist and will be further developed
- H₂-ready LNG terminals are being built to import gas and H₂ from overseas

Levelised cost of hydrogen imports to Wilhelmshaven by 2030



Despite conditioning and transport costs, imports can be cheaper than domestically produced renewable H₂ in Germany by 2030

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