

energy solutions – made in Germany

The German Energy Transition
„Energiewende“

Christiane Vaneker, RENAC AG
November 28th, 2022, online



The energy transition triad combines efficiency, direct use of renewables and sector coupling

Efficiency first



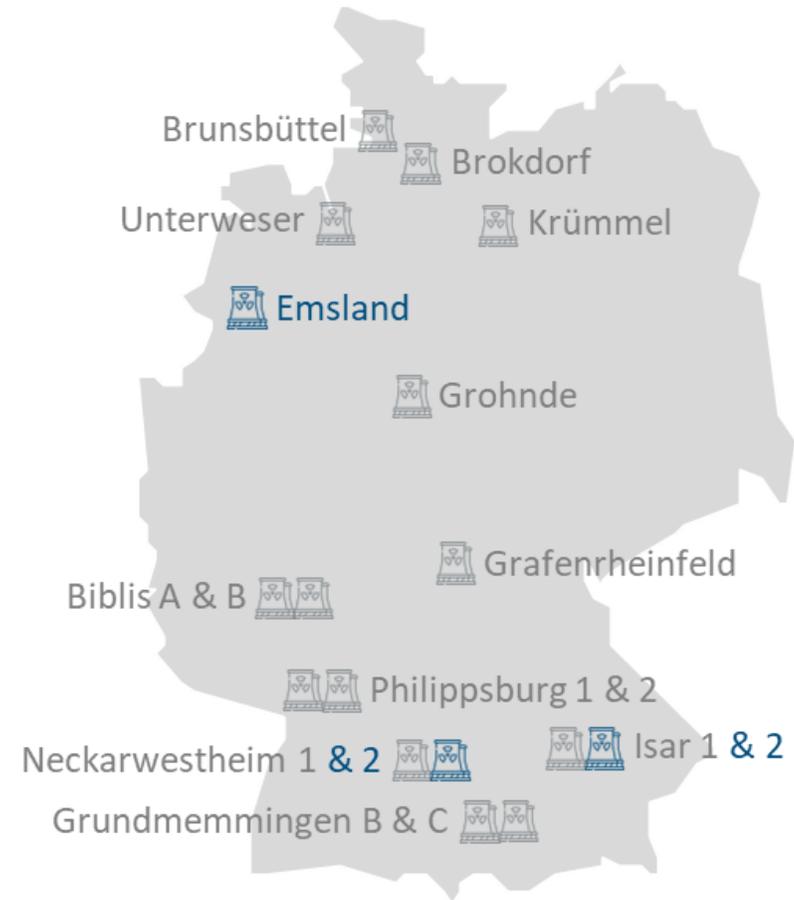
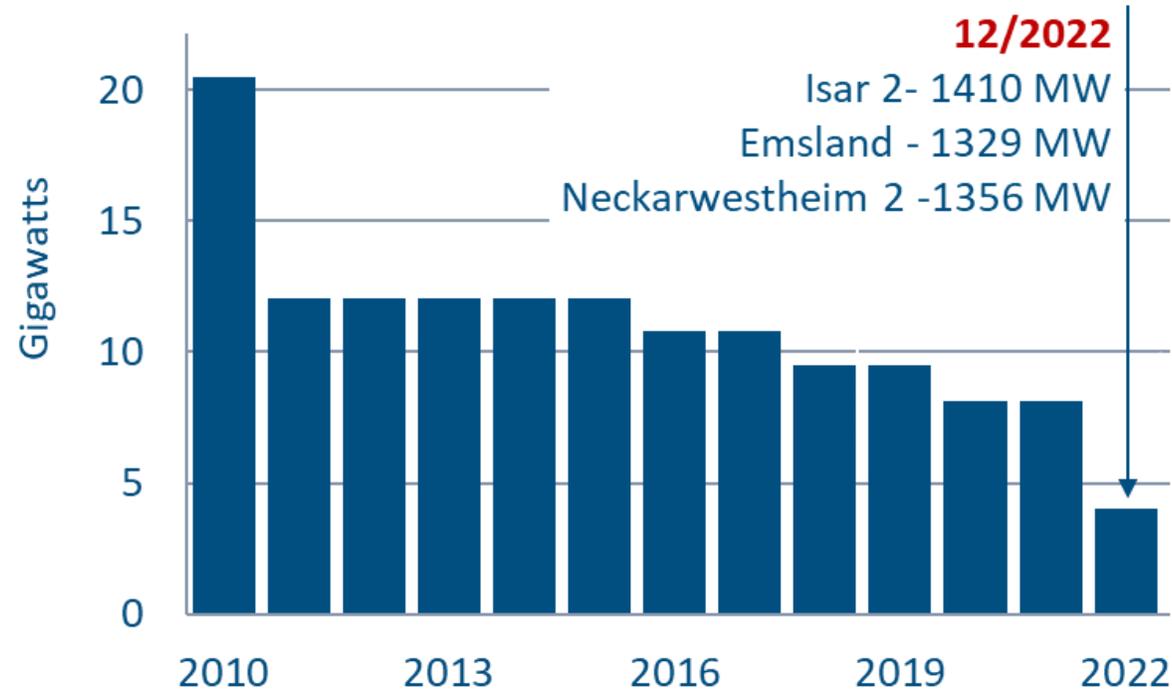
Direct use of renewables



Sector coupling



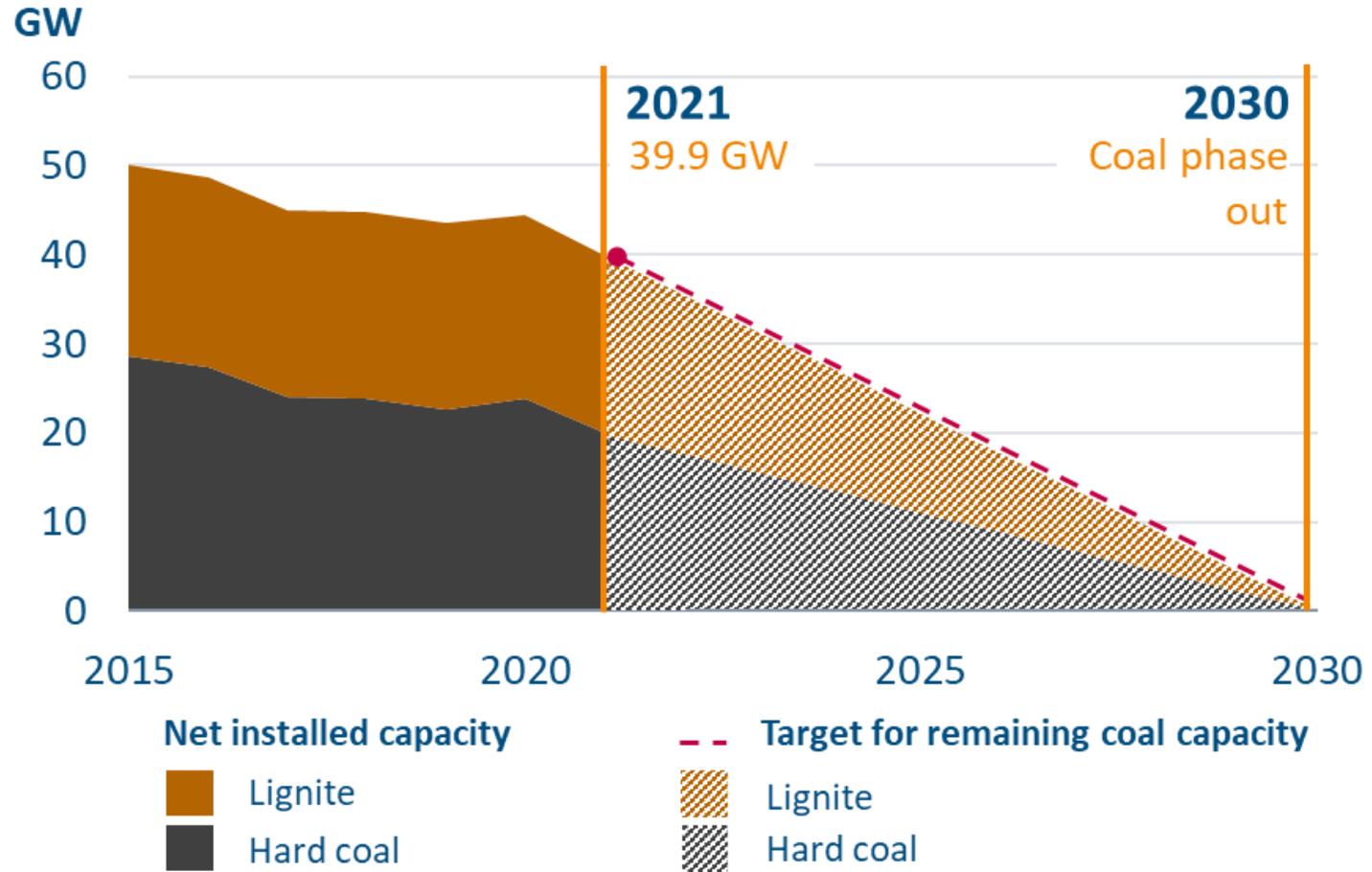
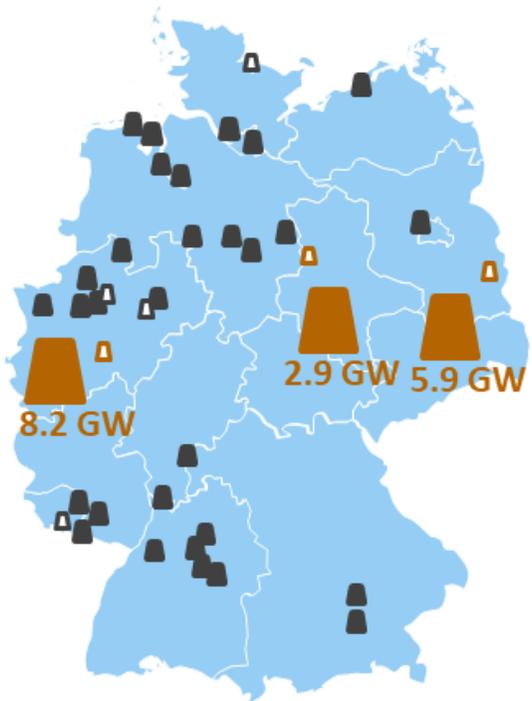
Germany is phasing out nuclear power until the end of 2022



 Scheduled for retirement
 Already retired

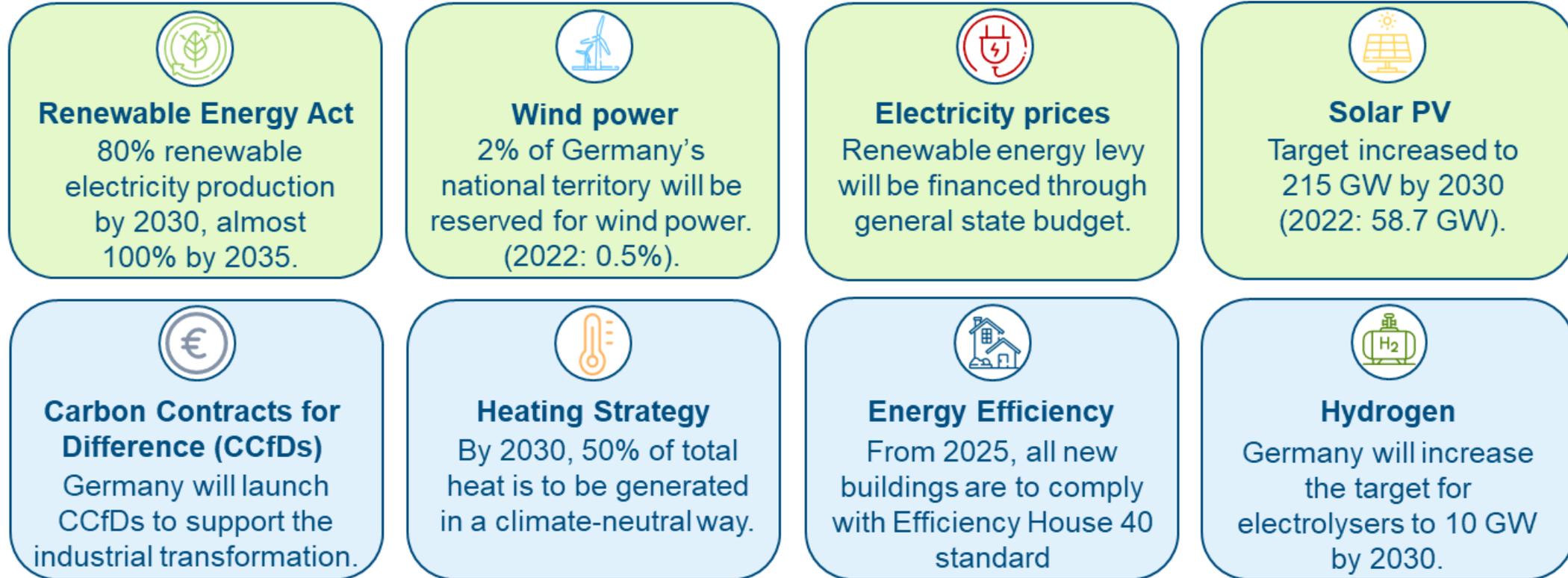
Source: Guidehouse 2022 based on BMU 2021 & BMWK 2021

Germany is phasing out coal ideally by 2030



Source: Guidehouse 2022 based on Agora Energiewende 2022, Bundesnetzagentur 2021 & BMU 2020

Germany adopts ambitious climate measures to achieve climate neutrality by 2045

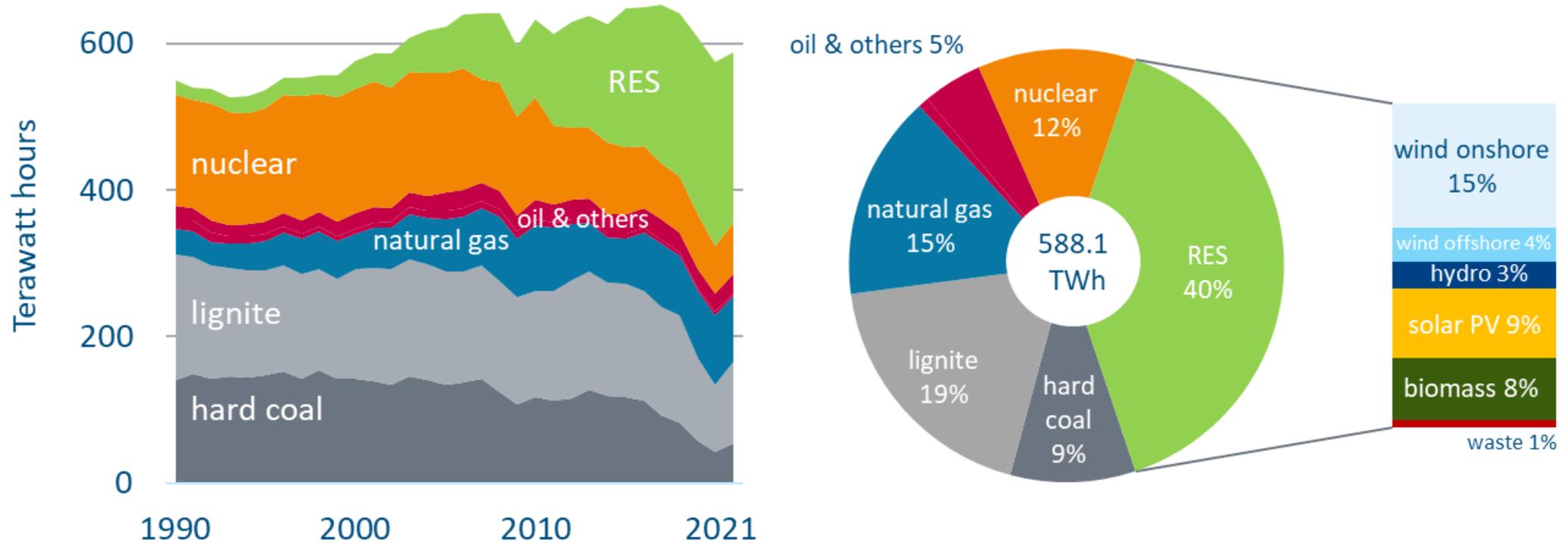


Adopted measures
Announced measures

Source: Guidehouse 2022 based on BMWK 2022
Icons from Flaticon.com

Renewables have become Germany's No. 1 source of electricity

Development and status quo of gross electricity generation by sources in Germany



Source: Guidehouse 2022 based on BDEW 2021 & AGEB 2020

The digital transformation of the Energiewende is about more than just the technology

Regulation and innovation

Challenge for governments to balance between stable framework conditions (e.g. data collection, smart data processing) without stifling innovation

New business models based on e.g.:

Digital “pooling” of generation, time-shiftable loads and storage system to form a network
“Blockchain” technology to reduce transaction costs in power exchanges

Data market

Data collected through communication between energy producers and consumers also has implications for data privacy and security of supply (e.g. risk of cyberattacks and blackouts)

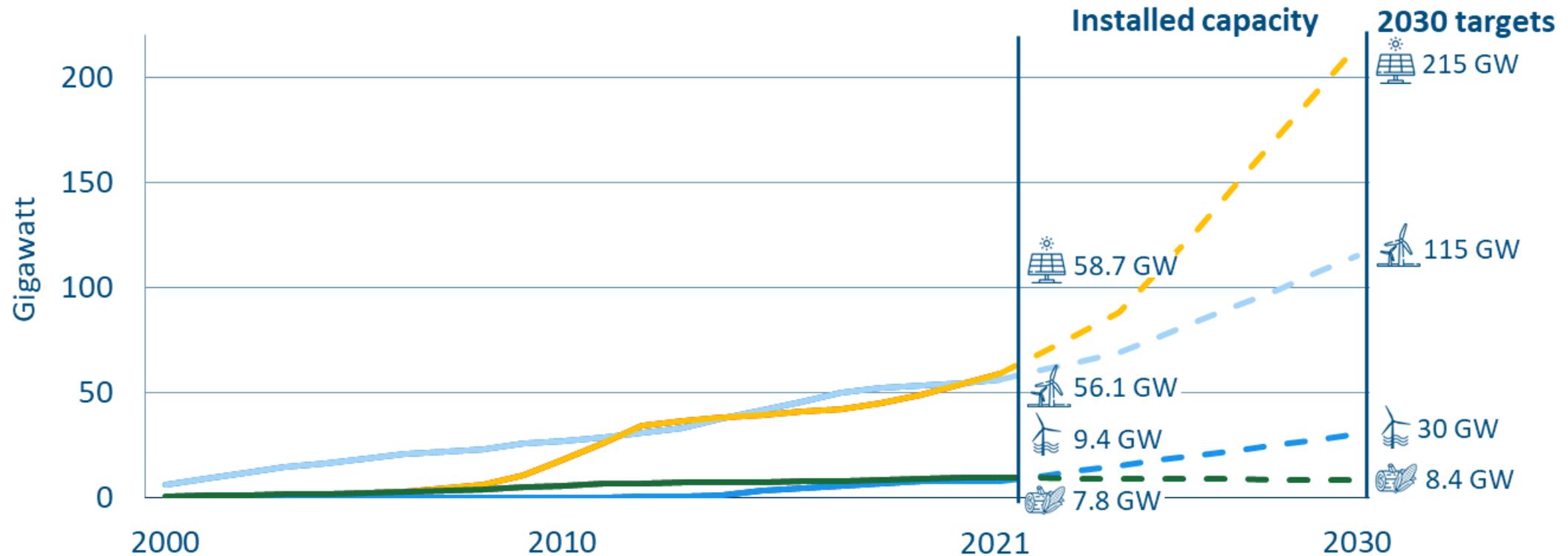
Smart markets and grids

Key issues in the discussion include:
How to market flexibility services?
How to send required price signals (fixed and variable components of electricity)?

Source: Guidehouse 2018 based on dena, BDEW & Clean Energy Wire

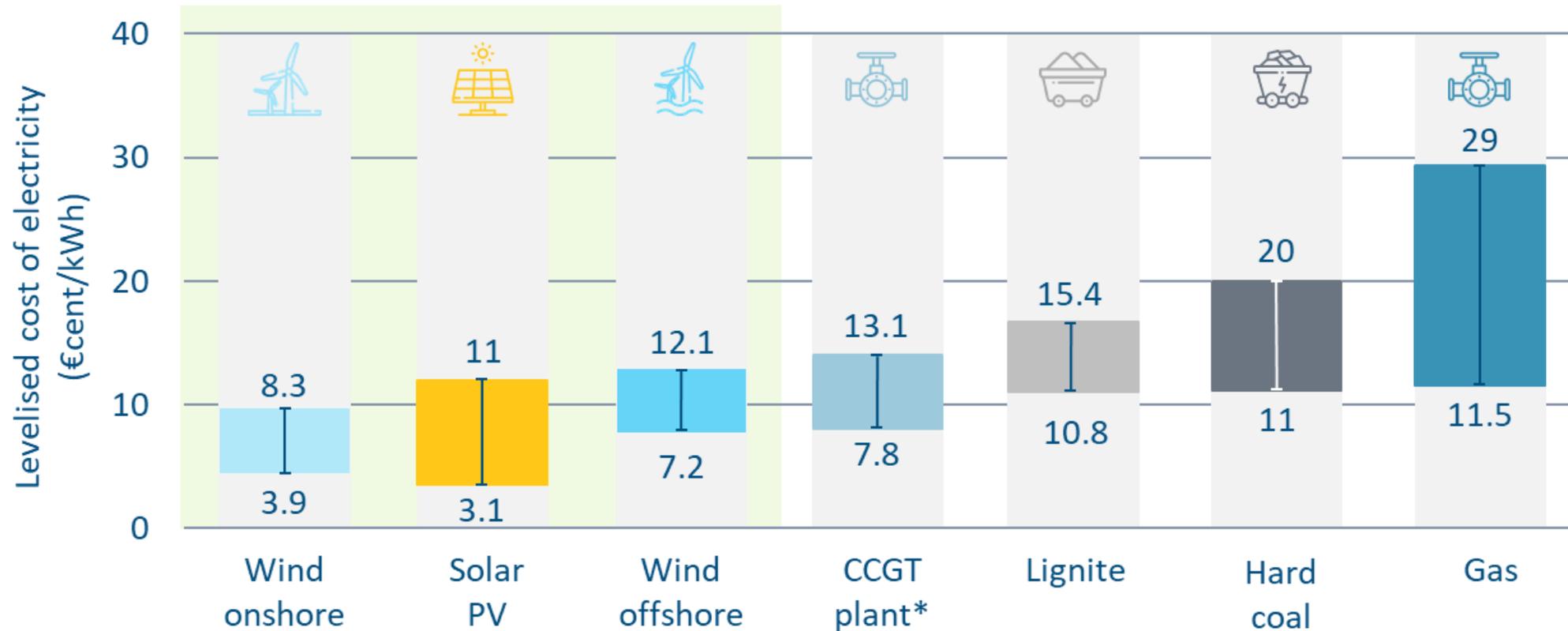
Technology-specific capacity expansion targets make deployment of renewables plannable

Renewable energy installed capacity 2000-2021 and capacity targets for 2030 per technology



Source: Guidehouse 2022 based on BMWK 2022

Renewable electricity is cheaper than conventional

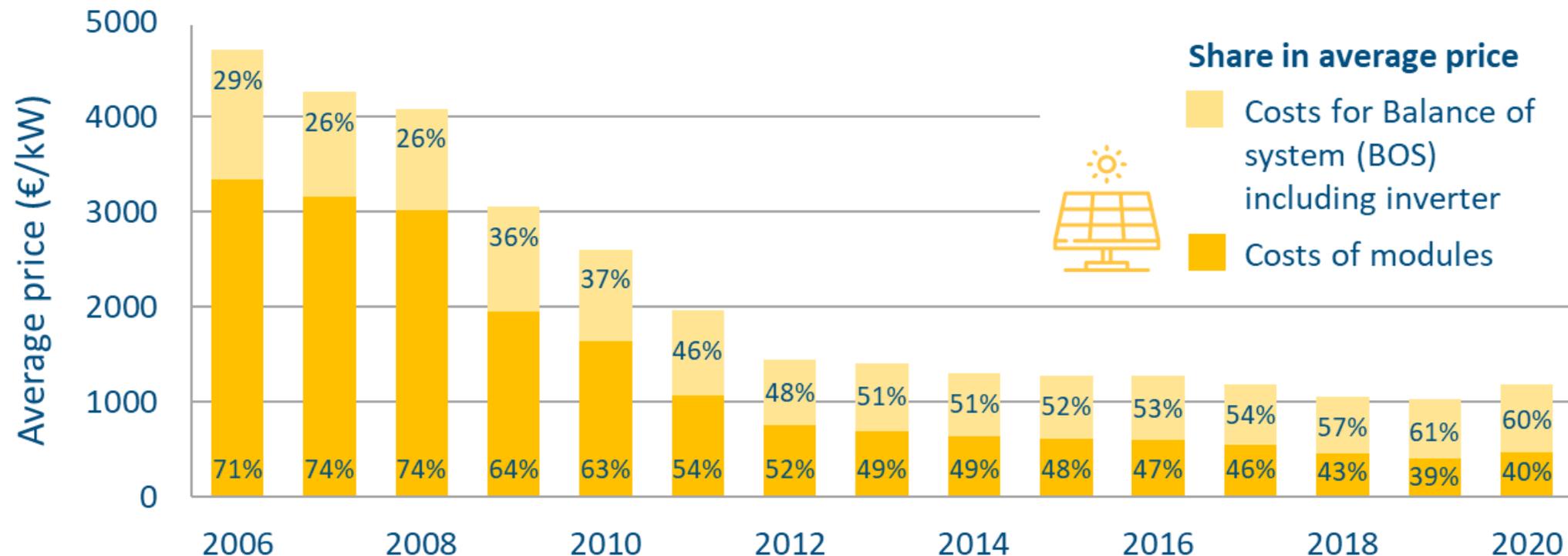


* Combined cycle gas turbine plant

Source: Guidehouse 2022 based on Fraunhofer ISE 2021
Icons designed by Freepik and srip from Flaticon

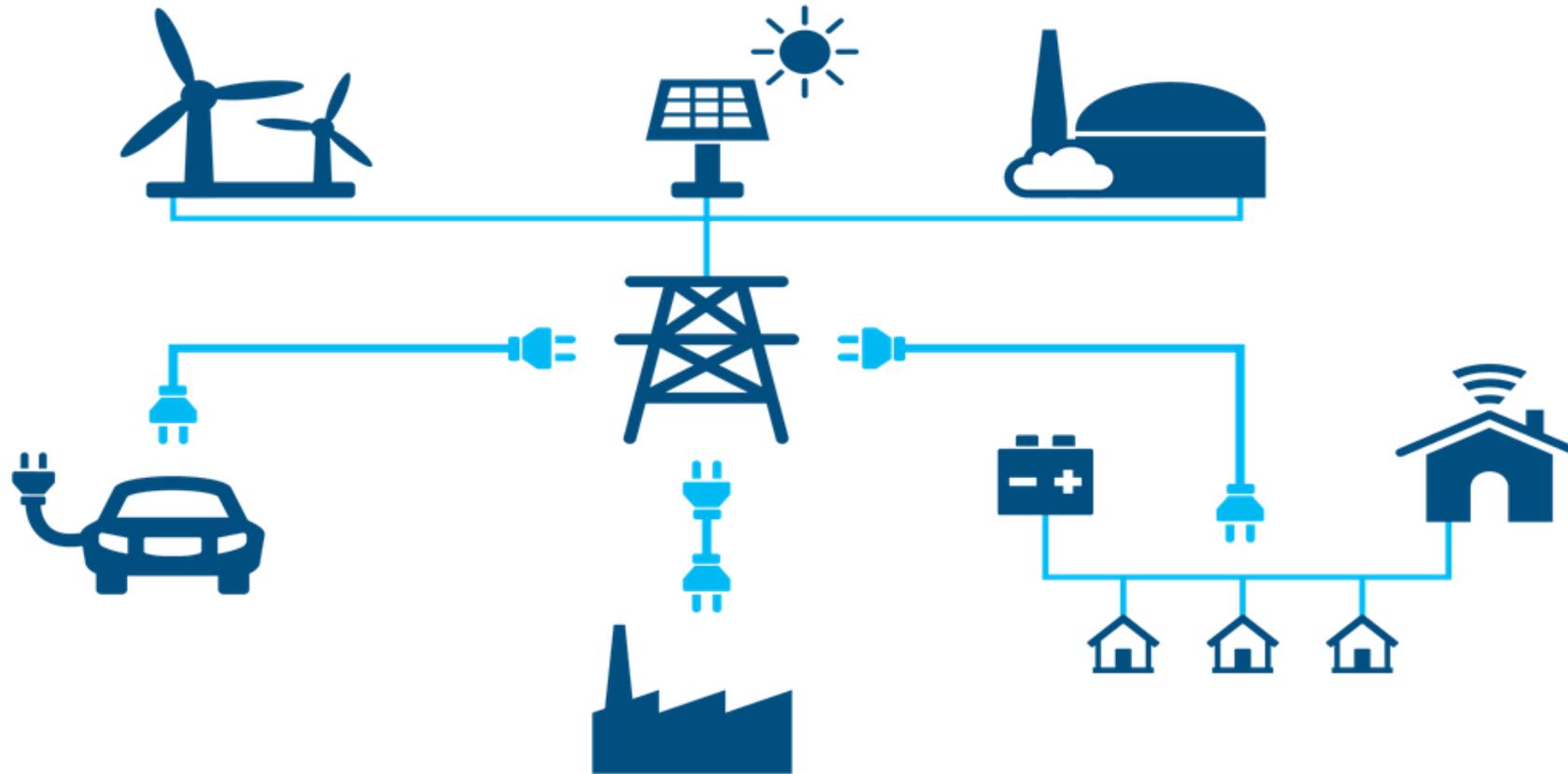
Declining module costs have driven down the price of solar PV systems in Germany

Average retail price for rooftop systems with an installed capacity of 10-100 kW



Source: Guidehouse 2021 based on Fraunhofer ISE 2021

Decarbonising our energy systems leads to an increased electrification of all sectors



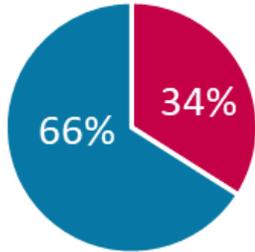
Source: Guidehouse 2019 based on BMWi

Germany restructures its energy imports in response to the Russian invasion of Ukraine

Energy imports before the war (2020)

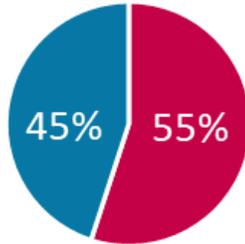
Oil Imports

98% of German oil demand



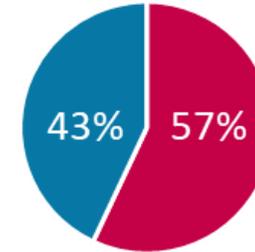
Natural Gas Imports

89% of German gas demand

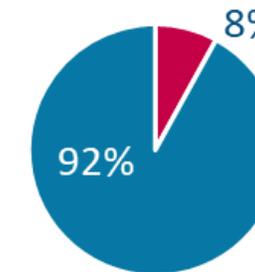
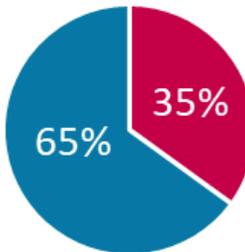
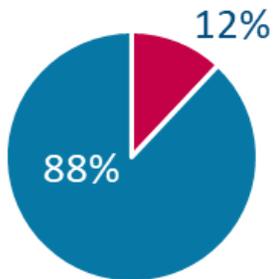


Hard Coal Imports

93% of German coal demand



Current energy imports (May 2022)

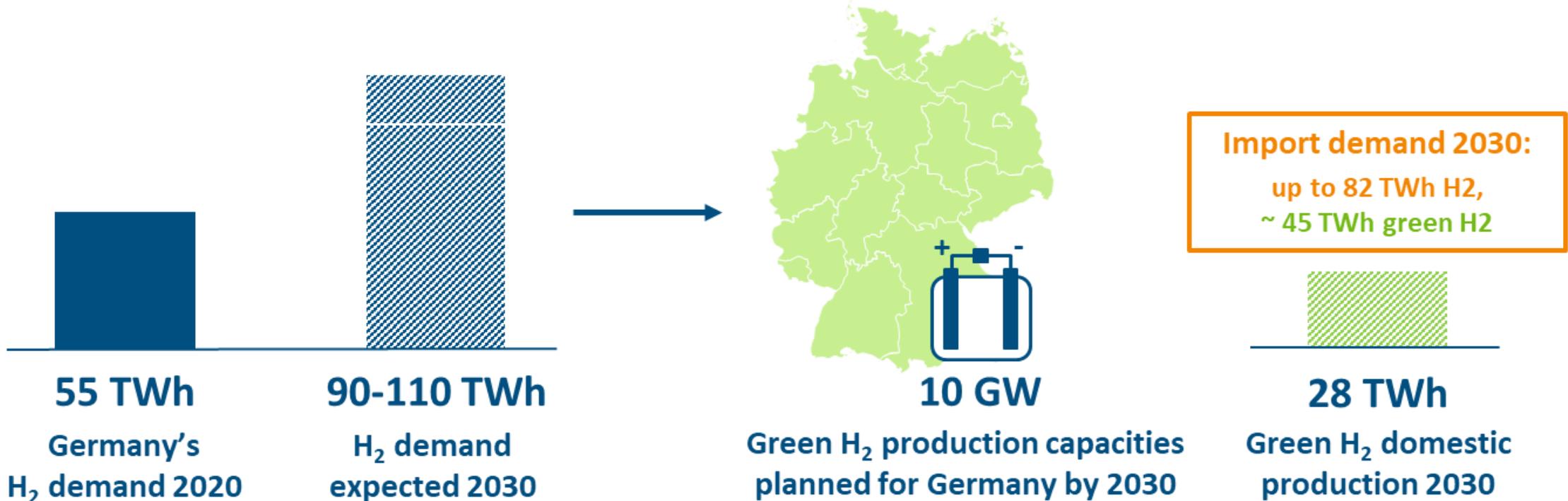


■ Russia
■ Rest of the world

Source: Guidehouse 2022 based on BAFA 2022a, BAFA 2022b, BMWK 2022b, Icons designed by Freepik and strip from Flaticon

Germany develops a domestic market for hydrogen and paves the way for imports

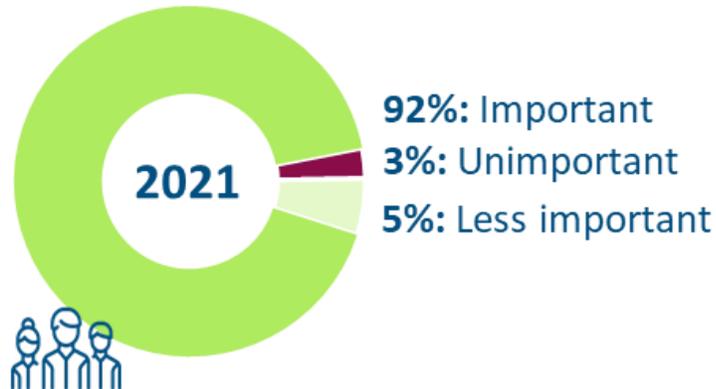
Hydrogen (H₂) volumes foreseen for 2030



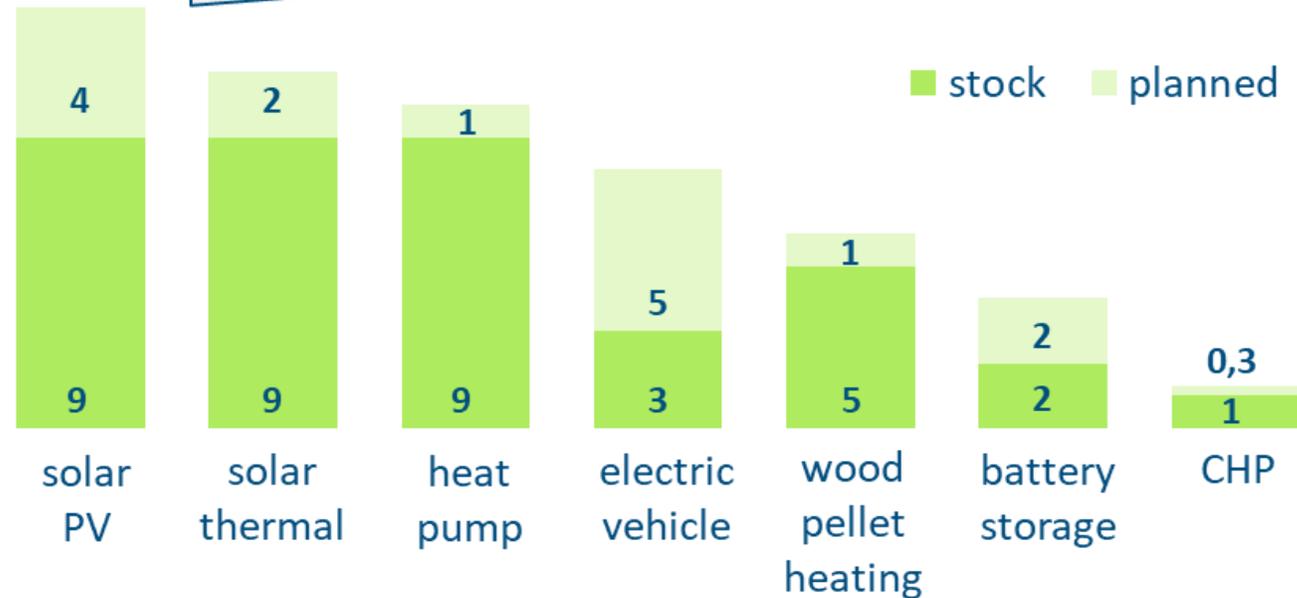
Source: Guidehouse 2022 based on BMWK 2022 & BMWK 2020

The Energiewende enjoys wide support within the German population

Support of the Energiewende (in %, 2021)



Participation of German households in technologies contributing to the Energiewende (in %, 2021).



Source: Guidehouse 2022 based on Ariadne 2022 & KfW 2021
Icons designed by Freepik from Flaticon

Contact us

Coordination Office of the German Energy Solutions Initiative

office@german-energy-solutions.de
www.german-energy-solutions.de/en
twitter: @export_EE

Facilitator: Renewables Academy (RENAC) AG

Christiane Vaneker
vaneker@renac.de
www.renac.de

