

## **Towards a Climate-Neutral Germany**

3 Steps for Achieving Climate Neutrality by 2045 and an Intermediate Target of -65% in 2030 as Part of the EU Green Deal

BERLIN, 26. MAI 2021

## Towards a Climate-Neutral Germany 2045 Study on behalf of Agora Energiewende, Agora Verkehrswende and Stiftung Klimaneutralität in Spring 2021





www.agora-energiewende.de/projekte/klimaneutrales-deutschland-2045/

- → Towards a Climate-Neutral Germany 2045 extends the logic of Towards a Climate-Neutral Germany 2050
- Mission: Model an ambitious Climate Neutrality 2045 target for all sectors
- Goal: Present a path towards climate neutrality 2045 taking into account costs and acceptancy
- $\rightarrow$  Published on 26 April 2021
- → German constitutional court published its decision on the Climate Law 2019 on 29 April 2021, stating it unconstitutional with regards to the freedom of future generations

## Climate neutral Germany 2045 is a growth scenario: 1.3% economic growth p.a, industrial structure remains, 75 Mrd. Euros additional investments p.a.



Key indicators of the Climate Neutrality 2045 scenario



Prognos, Öko-Institut, Wuppertal Institut (2021)

## Germany can become climate neutral in 3 steps: (1) reduction of ghg emissions by 65% until 2030, (2) -95% until 2045, and (3) CCS for remaining emissions



Measures in the climate neutrality 2050 scenario (KN2050) (GHG emissions in mio. t CO2-eq.)





# Five central strategies for climate neutrality

#### *The five strategies for climate neutrality:* Strategy 1: Renewables – by 2030, phase out coal & increase renewables to > 70% share; by 2045 increase renewables 4-fold!





Prognos, Öko-Institut, Wuppertal-Institut (2021)

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#### The five strategies for climate neutrality: **Strategy 2: Energy efficiency – primary energy consumption** will be halved by 2045, especially in the heating sector



14,000 13,129 1,802 12,000 9,897 10,000 8,578 2,388 163 8,000 7,328 248 442 6,701 6,458 6,000 4,452

#### Primary energy consumption

Primary energy consumption [PJ] PtX Renewable energy Non-renewable waste 3,778 Fossil gases 4.797 4,000 Petroleum 5,457 2,950 Coal 2,909 2,000 2,108 Nuclear power 851 1,405 829 203 120 J **349** 134 Power 0 =175 2035 2018 2025 2030 2040 2045

#### *The five strategies for climate neutrality:* Strategy 3: Electrification – in transport, heat and industry electric cars, heat pumps, electric boilers replace oil and gas



Gross power consumption



#### The five strategies for climate neutrality Strategy 4: Hydrogen – for safeguarding security of supply in the energy system and to create a climate neutral industry



CO<sub>2</sub> free hydrogen production and consumption in Germany



## The five strategies for climate neutrality Strategy 5: CCS – from 2030 onwards, the ramp-up of a CCS infrastructure (CO2 transport to Norway) will be required







# Conclusion

## Germany can become climate neutral in 3 steps: (1) reduction of ghg emissions by 65% until 2030, (2) -95% until 2045, and (3) CCS for remaining emissions



Measures in the climate neutrality 2050 scenario (KN2050) (GHG emissions in mio. t CO2-eq.)





#### Climate Neutral Germany 2045 and -65% greenhouse gas emissions by 2030 requires a policy mix to be adopted soon



Climate Change Act as framework law
Increase carbon price
Make climate-related risks transparent to financial markets

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# Thank you for your attention!

Questions or Comments? Feel free to contact me:

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## Electricity: Accelerate coal phase-out by 2030 and increase renewable expansion rates to 70% RES share by 2030



Net power generation and net imports



#### Transport: Cars and trucks become electric, due to new mobility concepts the number of cars after 2030 will be reduced



Amount of cars (left) and amount of trucks (right)



#### Buildings: Heat pumps replace oil and gas heating in 1- and 2-family houses, green district heating supplies city centers



Buildings sector: final energy demand for heating by source



Prognos, Öko-Institut, Wuppertal Institut (2021)

#### Industry: Hydrogen, electrification and industrial biomass use replace coal and natural gas – industrial output remains constant





- → Coal: phase-out (CHP by 2030, steel and cement by 2040)
- Natural gas: phase-out after 2030
- → **Hydrogen**: reducing agent and fuel for steam generation
- **Biomass:** use for BECCS in large plants (steel  $\rightarrow$ / chemical)
- **Electricity**: efficient use in electrode boilers,  $\rightarrow$ high-temperature heat pumps, and small and medium-sized industrial furnaces
- **District heating**: long-term use only for temperatures < 100°C

