



Overview of the international energy transition and lessons learned from Germany

15 December 2021

Implemented by

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



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An international expert consortium to support Viet Nam in navigating the energy transition



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Experts

- Toby D. Couture and Dr. David Jacobs have been working closely with Viet Nam since 2014, including FIT for wind power, the solar PV
- They are now leading a project on the energy transition in Viet Nam, in partnership with several other consortium partners



Topics and agenda

- **1. Aligning Germany's energy sector planning with a long-term decarbonization objectives** (targeting net zero by 2045)
- **2. Building a green economy** – Establishing industry policy for clean energy technologies
- **3. Deploying renewable energy consistently over time** – steady, annual capacity additions to create a “green economy”
- **4. Adjusting the use of fossil fuels to the net zero 2045 plan** (coal phase out, modest additions of LNG/gas)

Key Messages

- **The German energy transition** is an interesting international example, since Germany has started to invest in renewables a couple of decades earlier than other countries, including Vietnam
- However, the situation now is different than 30 years ago because **today many renewable energy sources are the least cost technologies, making it a feasible solution for developing countries!**
- Germany is not far advanced. The scale of change required to **meet net zero targets by 2050** will require **unprecedented measures and policies from all countries.**



Key Messages

- **The requirements for the energy transitions in all countries around the world are more and more similar.**
- **All countries, including Germany and Vietnam, will need to:**
 - **Align targets with net zero economy pathways**
 - **Create a green economy, generating welfare, GDP, jobs with clean energy technologies**
 - **Reduce the use of all fossil fuels sharply and steadily to avoid stranded assets**
 - **Deploy renewable energy sources and other clean energy technologies steadily to assure security of supply**





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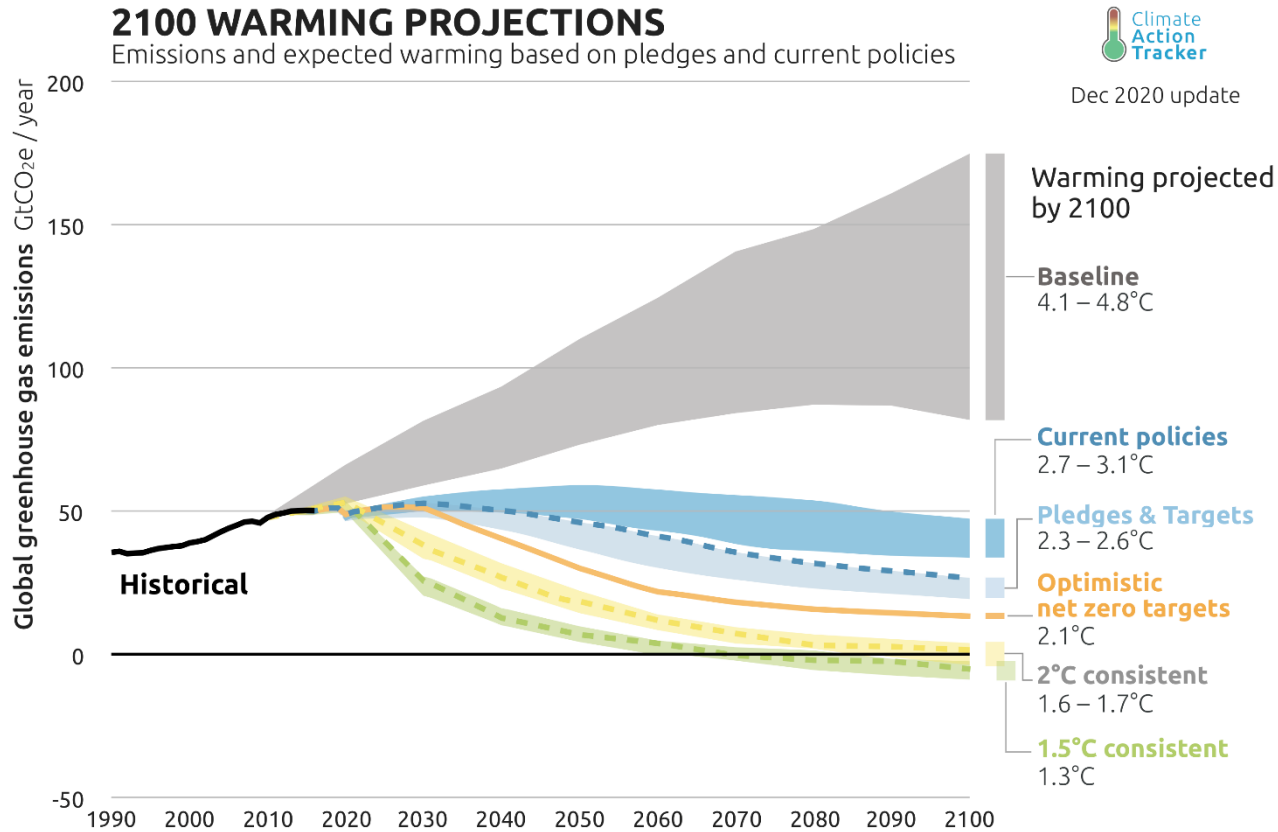
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1. Aligning economic development with net zero carbon emission trajectories (green growth)

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Predicted Global Temperature Increase



Source: <https://climateactiontracker.org/global/temperatures/>

Net Zero by 2050

International Background: The role of energy

- Net zero emissions in the global energy sector by 2050 (launched as we speak...):
 - **Coal** demand will need to **reduce by 90%**
 - **Gas** demand will have to **reduce by 50%**
 - **Oil** demand will have to **reduce by 75%**
- **“No need for NEW oil, gas or coal exploration investments”**

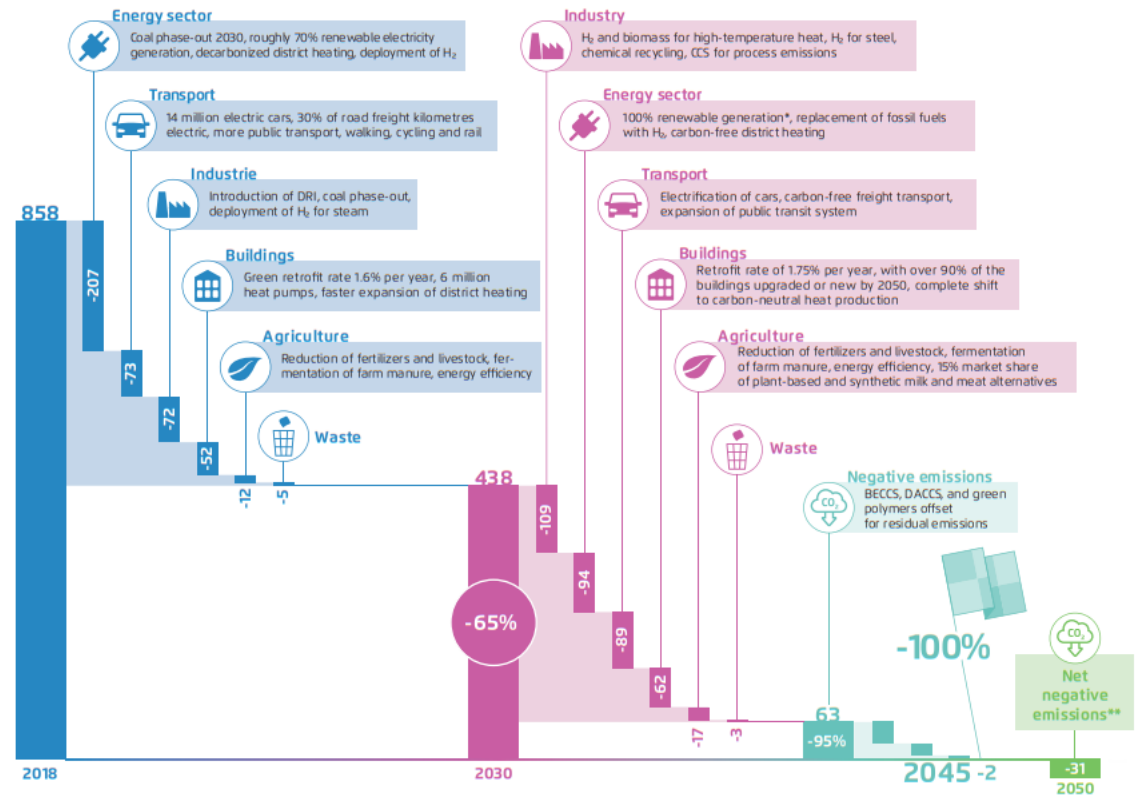
Source: IEA 2021

Net zero by 2045: Implications for the energy sector and others

- 65% of reduction of greenhouse gases until 2030
- 95% of reduction of greenhouse gases until 2045

Measures for the climate-neutral 2045 scenario (CN2045)
(Greenhouse gas emissions in Mt CO₂e)

Figure E5



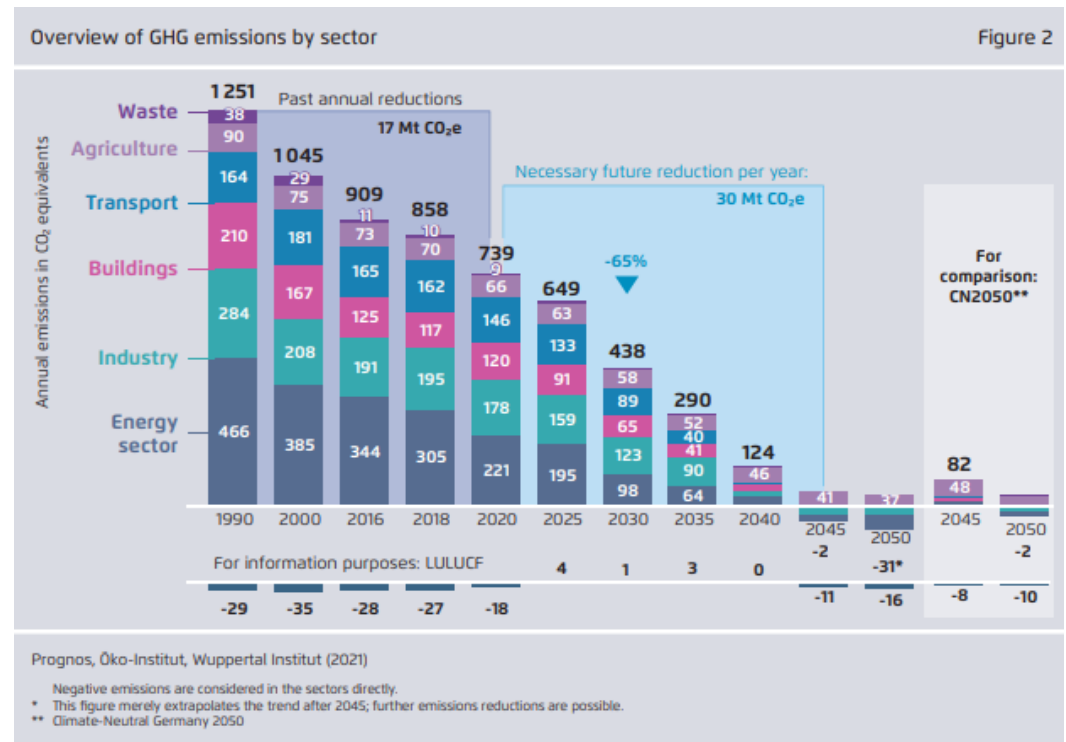
H₂ = Hydrogen
 * This includes electricity generated from renewably generated hydrogen.
 ** This figure merely extrapolates the trend after 2045, further emissions reductions are possible.

Prognos, Öko-Institut, Wuppertal Institut (2021)

Source: Agora Energiewende 2021, https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_04_KNDE45/A-EW_213_KNDE2045_Summary_EN_WEB.pdf

Net zero by 2045: Implications for the energy sector and others

- The energy sector will have to contribute with **NEGATIVE** emission after 2040
- Decarbonisation of agriculture, transport and buildings is even **MORE** challenging



Source: Agora Energiewende 2021, https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_04_KNDE45/A-EW_213_KNDE2045_Summary_EN_WEB.pdf



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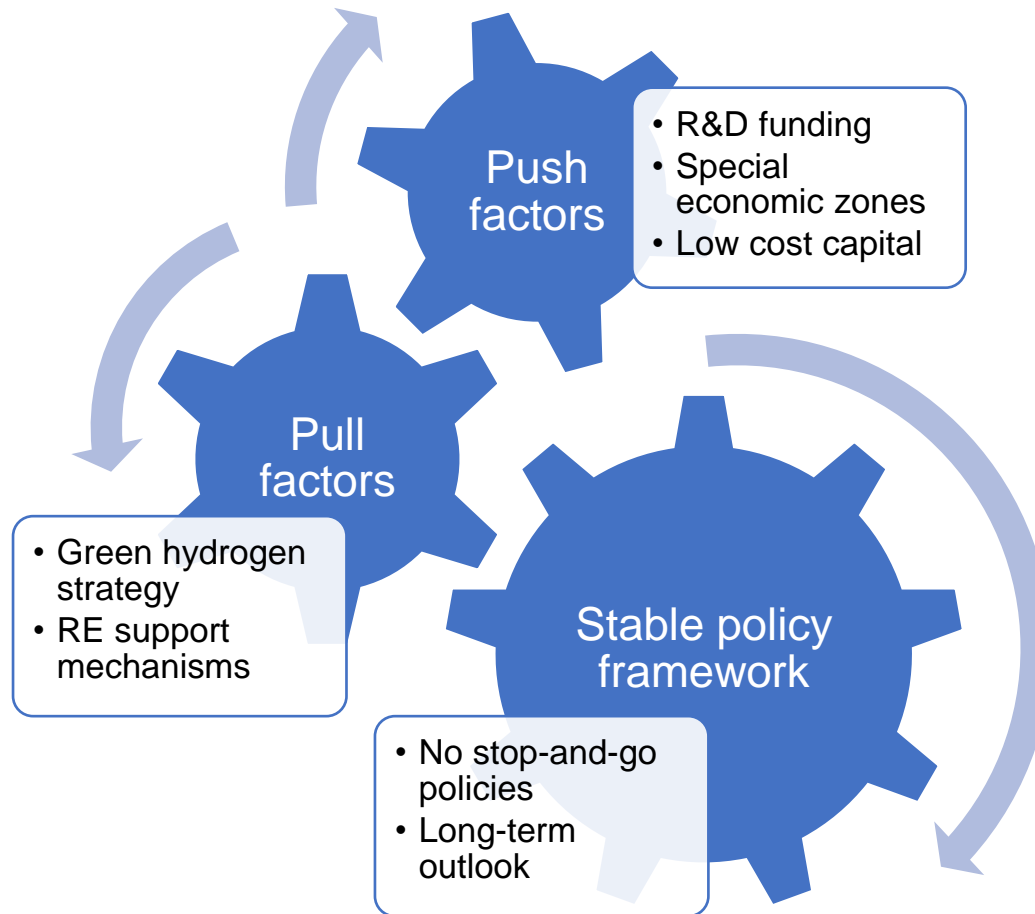
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2. Building a green economy – Industry policy for clean energy technologies

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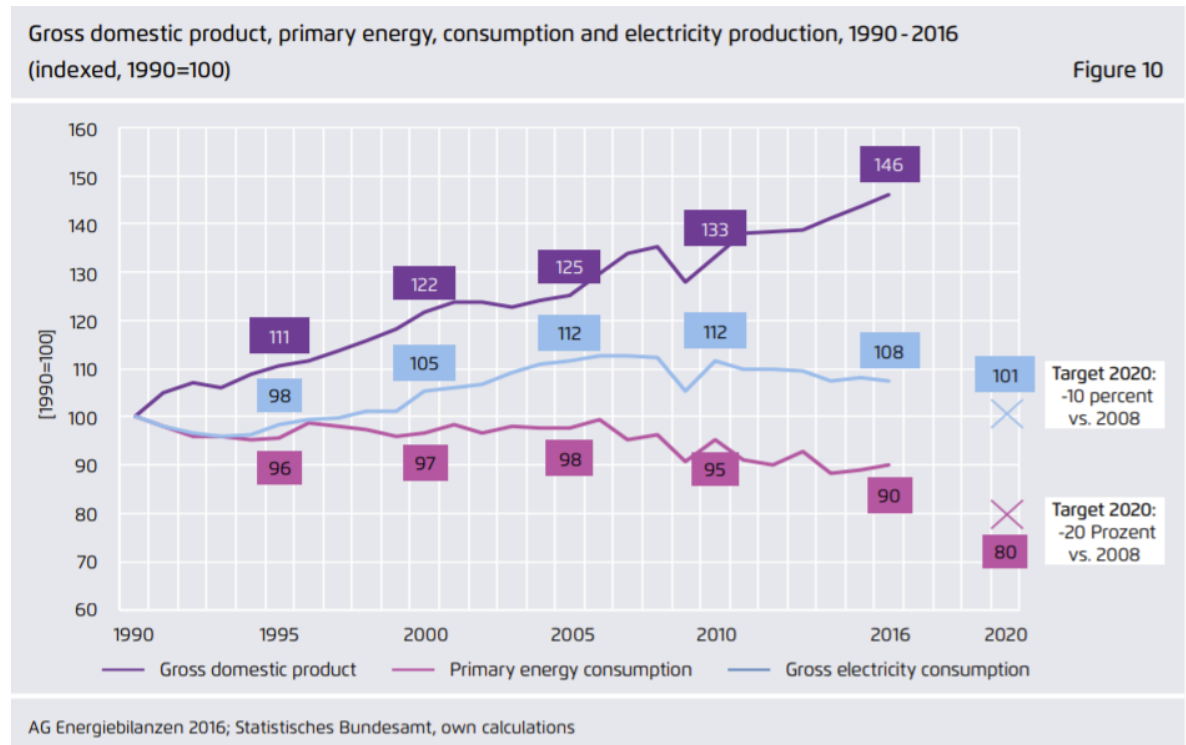
Key elements of successful industry policies for clean energy technologies



Source: IET

Socio-economic benefits related to the energy transition

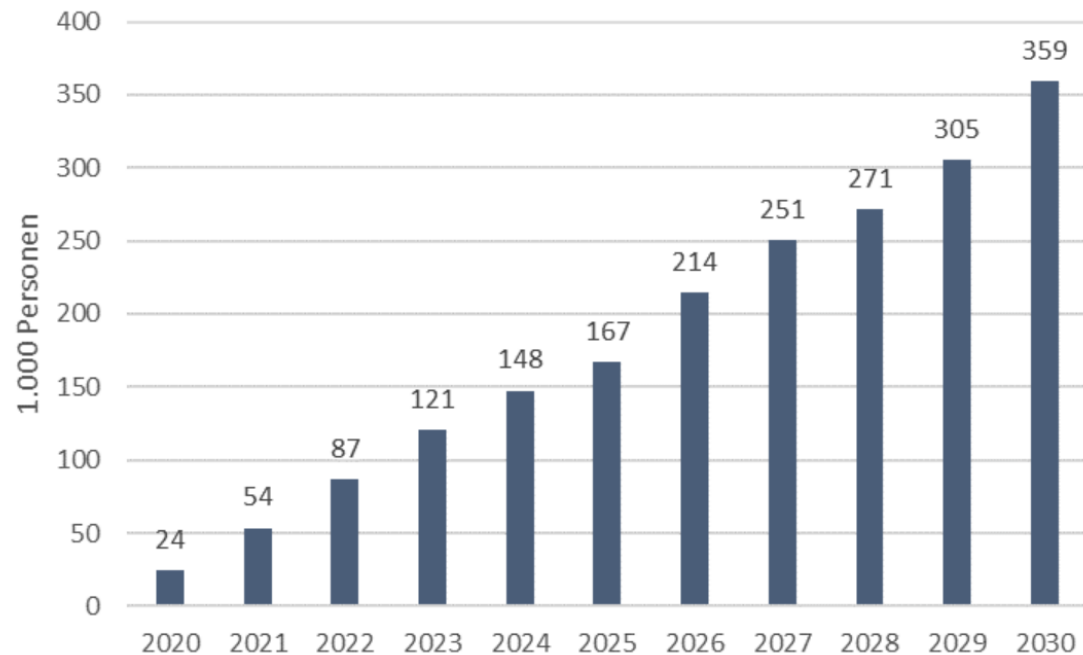
- **Decoupling economic growth** from energy and carbon intensity
- Green economy: Green technology accounts for **15 percent of German economic output** (BMU 2018)



Source: Agora Energiewende (2017): The Energiewende in a nutshell

Socio-economic benefits related to the energy transition

- Creating green jobs: **additional 360,000 green jobs (net)** until 2030 (GWS 2021)
- **Higher GDP growth:** additional € 74 billion until 2030 (GWS 2021)
- **Reduced costs for energy imports:** High costs for gas and fuel imports (70% of import dependency)
- **Stablizing prices for industry:** volatile price for gas



Source: GWS 2021



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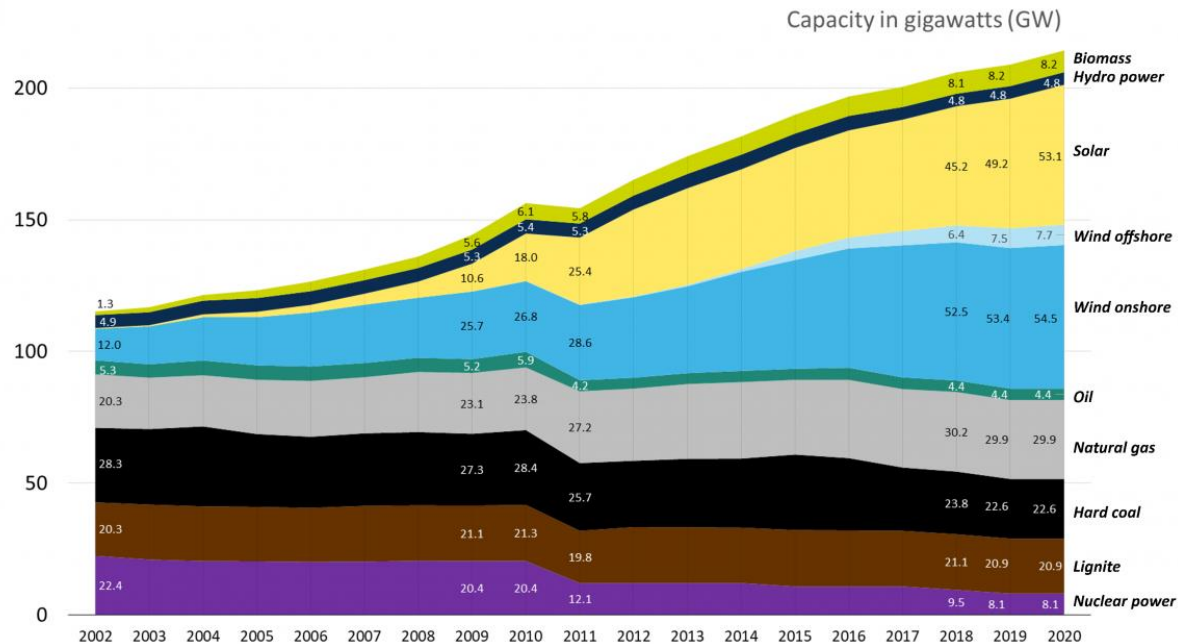
3. Deploying renewable energy consistently over time – steady, annual capacity additions to build a strong national industry

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Historic trends in the German Energiewende

- Continuous deployment of renewables (but not fast enough)
- Slow phase out of fossil fuel technologies (but not fast enough)
- = **Not compatible with the net zero target for 2045**



Source: Clean Energy Wire <https://www.cleanenergywire.org/factsheets/germanys-energy-consumption-and-power-mix-charts>

Increasingly ambitious renewable energy targets

- Existing renewable energy targets are ambitious but not yet in line with net zero 2045 targets

	Status		Targets			
	2019	2020	2020	2030	2040	2050
Share of renewable energies						
Share in gross final energy consumption	17.7 %	19.6 %	18 %	30 %	45 %	60 %
Share in gross power consumption	42.0 %	45.4 %	min 35 %	65 %*		**
Share in heat consumption	15 %	15.2 %	14 %			
Share in transport sector	5.6 %	7.3 %	10 % (EU goal)			

*Target from Climate Action Programme 2030, EEG 2021

**The EEG 2021 stipulates that before 2050 all electricity generated or consumed in Germany is generated in a greenhouse gas-neutral manner

Source: Clean Energy Wire <https://www.cleanenergywire.org/factsheets/germanys-greenhouse-gas-emissions-and-climate-targets>

Increasingly ambitious renewable energy targets

- Existing renewable energy targets are ambitious but not yet in line with net zero 2045 targets
- The new coalition will raise the RE target in the electricity sector from 65% to 80% in 2030**

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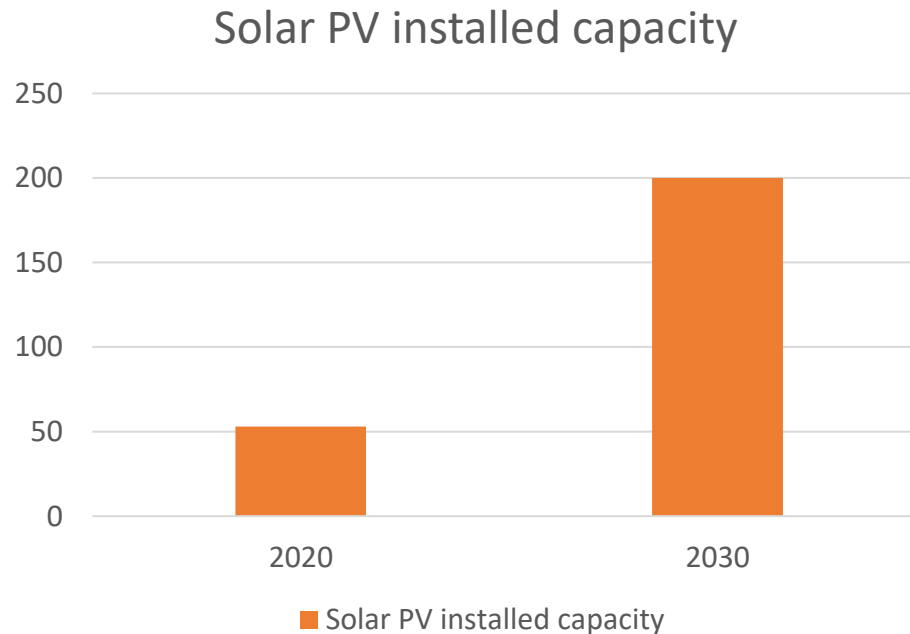
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Increasingly ambitious renewable energy targets

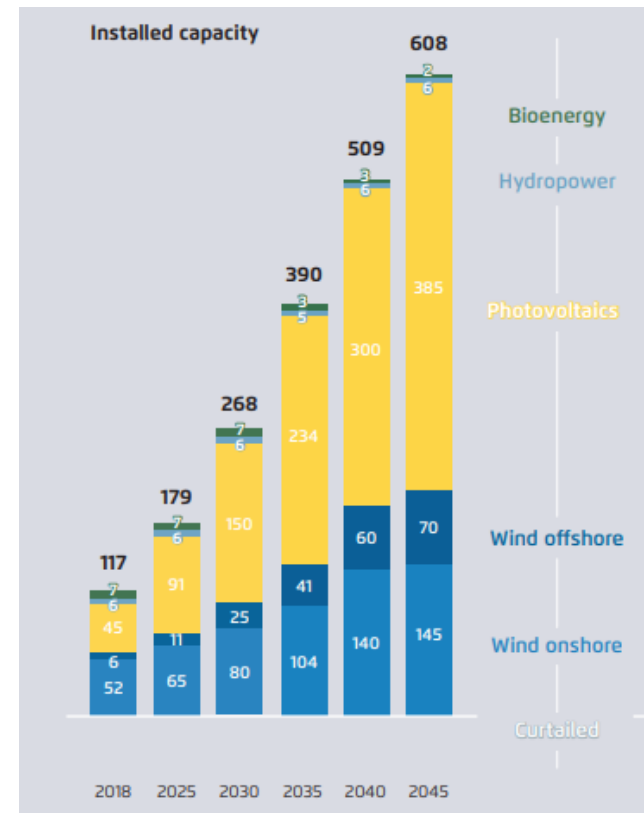
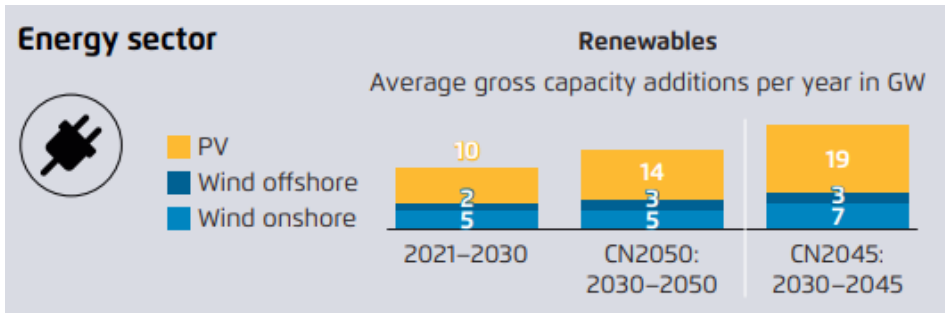
- New Coalition Agreement 2021: Sharply increased target for solar PV: 200 GW by 2030!
- From 53 GW in 2020, translating to **14.7 GW new solar PV capacity every year!**



Source: IET based on Coalition Agreement 2021

Increasingly ambitious renewable energy targets

- Required deployment targets to meet net zero 2045 targets:
 - PV: 10-19 GW annually
 - Wind: 7-10 GW annually



Source: Agora Energiewende 2021 scenarios, https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_04_KNDE45/A-EW_213_KNDE2045_Summary_EN_WEB.pdf



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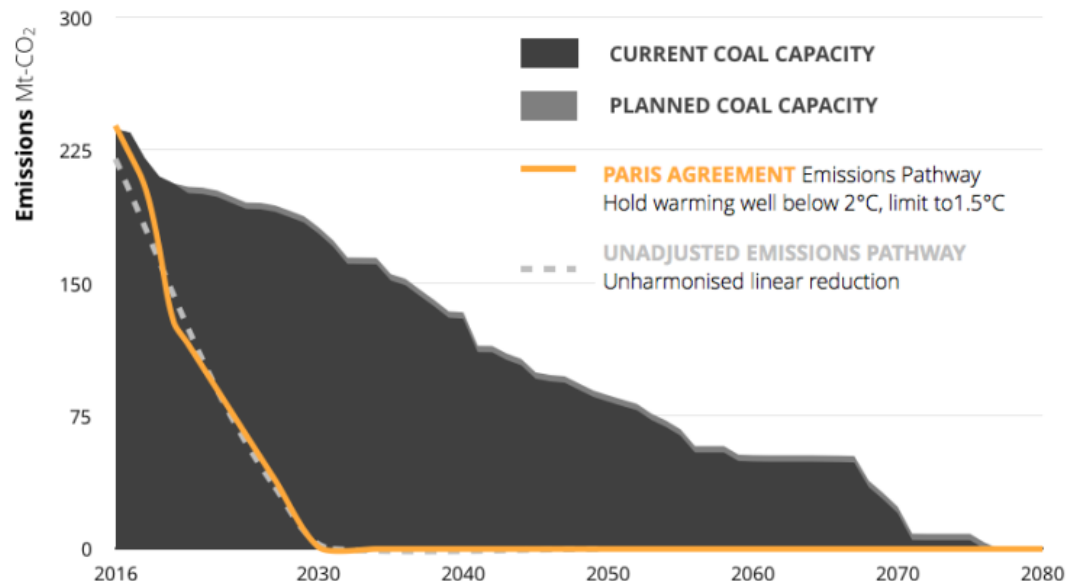
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The coal phase out: Drastic changes within the last 5 years

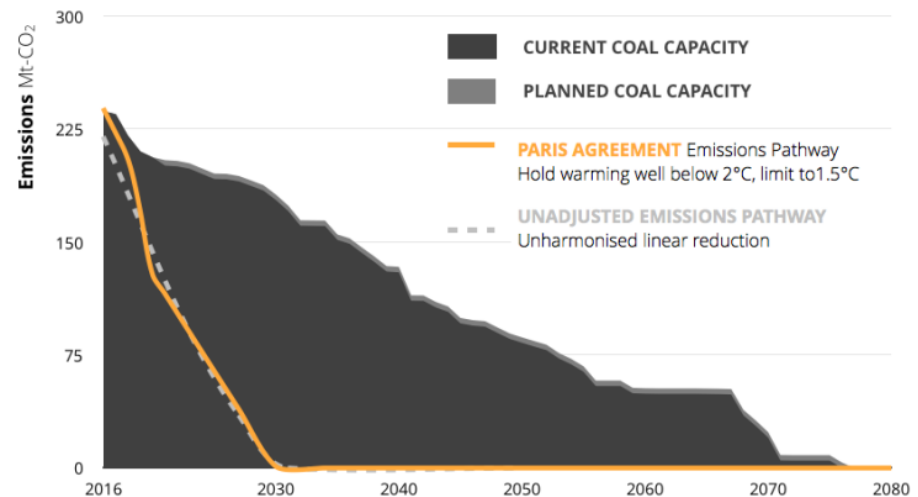
- In 2016, the coal phase out was termed as „impossible“ by the Minister for Economic Affairs and Energy
- Coal was the backbone of the German energy system for more than 70 years



Source: Climate Analytics <https://climateanalytics.org/briefings/coal-phase-out-germany/>

The coal phase out: Drastic changes within the last 5 years

- 2018: Industry said that **2045 of 2050 might be feasible**
- 2019: Decision to **phase out** all coal fired power plants **by 2038**
- 2021 (new coalition agreement): **Phase out until 2030**
- This also includes the newest coal fired power station, connected in 2019 (and **only running for 11 years**).



Source: Climate Analytics <https://climateanalytics.org/briefings/coal-phase-out-germany/>

International Background: Gas as a bridging technology

- As a “**bridging technology**”, in the electricity sector natural gas/LNG can help countries to move from a coal-dominated system towards a 100% renewable energy based system.
- However, the **window for using natural gas** in the electricity sector is relatively short, since by **2040 or 2050** the power system already needs to be **fully decarbonized**.
- Therefore, the **risk of stranded investments is high**.



Reducing the use of natural gas and LNG considerably

- Attention recently focused mostly on the coal phase out
- Now the “gas phase out” is going to move into focus
- To comply with the Paris Agreement objective, the use of natural gas in Germany will need to be:
 - Reduced by up to 50% until 2030
 - Reduced by 80-100% by 2050
- Implications:
 - Avoid new investment in new gas infrastructure for buildings (no more gas for residential heating)
 - Shift to green gases (biomethane strategy since 2008, green gases)

Source:



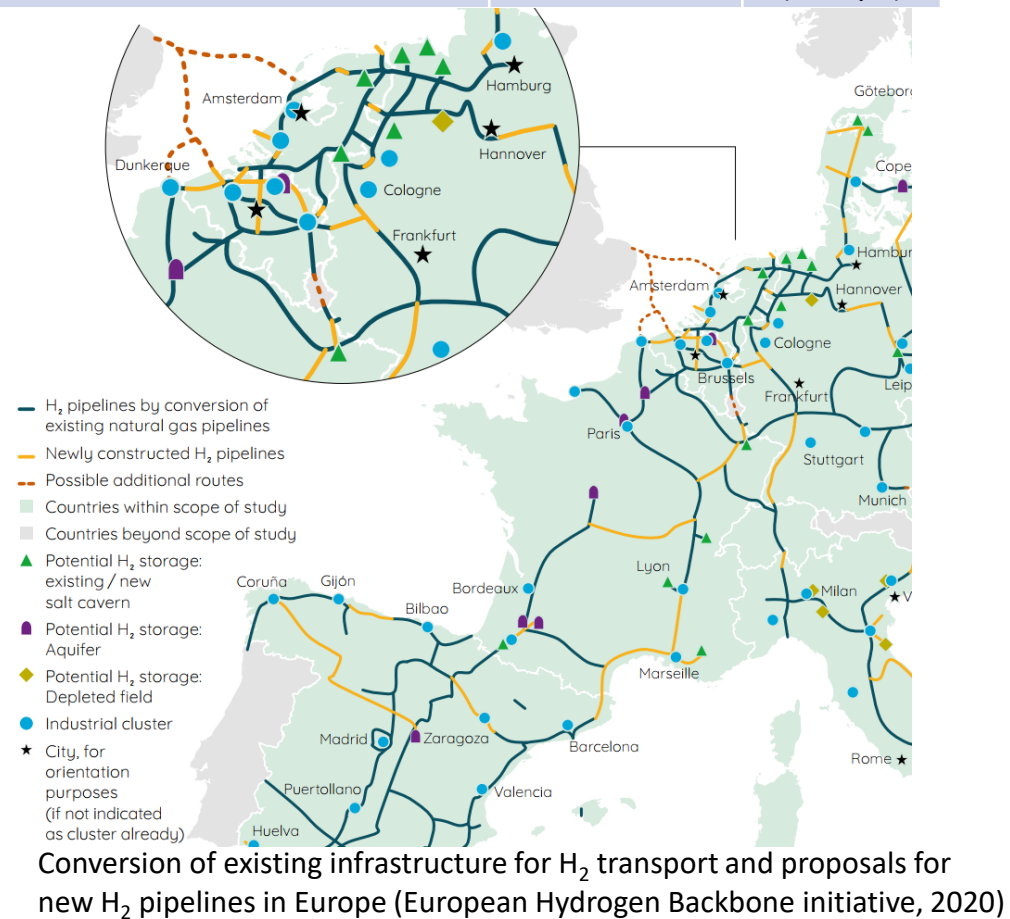
The role of LNG Infrastructure

Ensure that all LNG related infrastructure is capable of being re-purposed to mitigate the risk of stranded assets.

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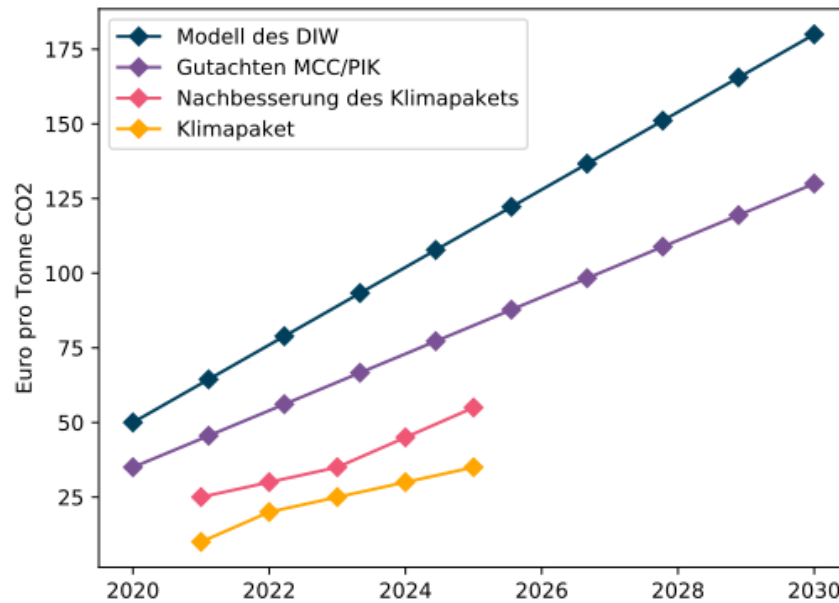
MEDIUM-term action
(5-10 yrs)

- The Netherlands (Gasunie) have multiple projects for the retrofitting of natural gas pipelines to transport hydrogen (some already finished)
- According to Gasunie, pipelines can be converted gradually at a cost of 10% of a new pipeline
- Plans are also considered for a European-wide H₂ infrastructure
- However, LNG terminals are more difficult to convert to liquified H₂ terminals



Starting with a modest CO2 price in 2020, increasing over time

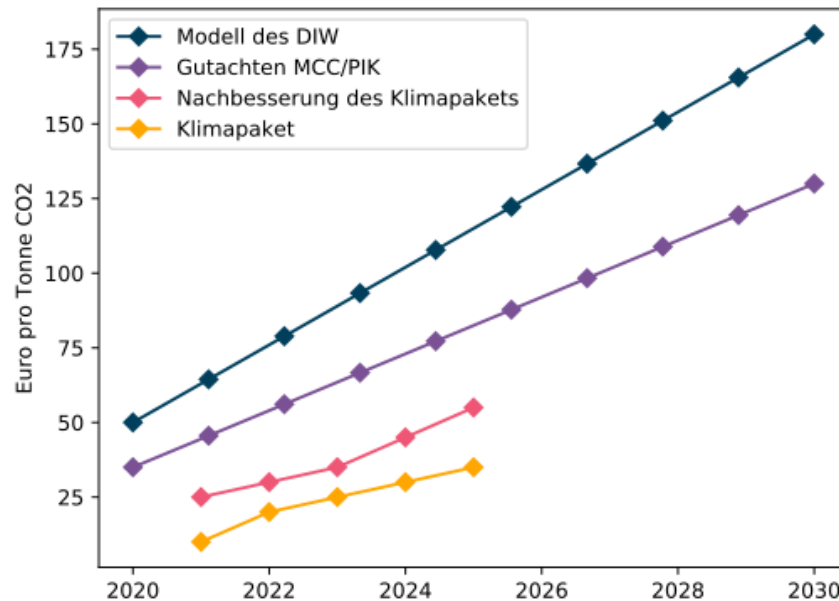
- 2019 proposal: 15 Euro per tonne
- 2020: 25 Euro per tonne
- 2025: 55 Euro per tonne
- = significantly lower than the CO2 prices modelled to be in line with the Paris Agreement



Source: IET based on Bene20080, CC BY 4.0 <<https://creativecommons.org/licenses/by/4.0>>

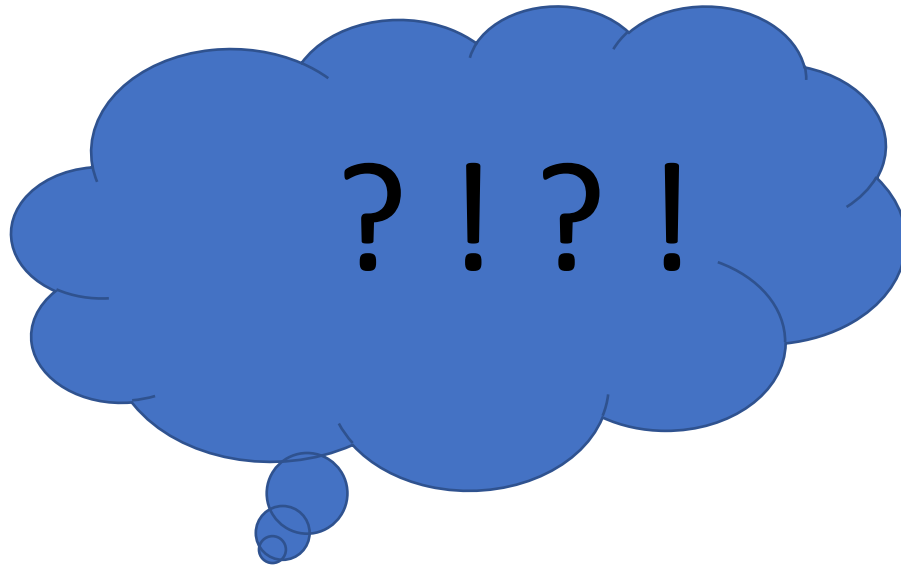
Increase and stabilization of CO2 price

- New Coalition Agreement 2021: Increase the CO2 price and assuring that it will not drop below 60€ per tonne



Source: IET based on Bene20080, CC BY 4.0 <<https://creativecommons.org/licenses/by/4.0>>

Questions, comments?



List of References and Further Reading

- Prognos, Öko-Institut, Wuppertal-Institut (2021): Towards a Climate-Neutral Germany by 2045. How Germany can reach its climate targets before 2050 Executive Summary conducted for Stiftung Klimaneutralität, Agora Energiewende and Agora Verkehrswende.
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Discussion

Thank you very much for your attention!