

ENERGY & CLIMATE
POLICY PAPER N°270
SEPTEMBER 2021

THE GERMAN ENERGY TRANSITION

A REVIEW OF 20 YEARS OF POLITICAL DECISIONS

#GERMANY
#CLIMATE
#ELECTIONS
#GREENDEAL



■ MARIE DELAIR

Project manager &
research assistant,
Jacques Delors
Institute

■ THOMAS PELLERIN-CARLIN

Director of the Energy
Centre, Jacques Delors
Institute

The authors warmly thank
Camille Defard, Andreas
Eisl, Murielle Gagnebin,
Sébastien Maillard,
Phuc-Vinh Nguyen, Andreas
Rüdinger, Jean-Arnold Vinois and
Yann Wernert for their invaluable
comments on this paper.

Abstract ■

Located at the heart of the European Union, Germany plays a key role in the energy transition. As early as 2000, it launched its “energy turnaround” (*Energiewende*) which primarily aimed to transform the country’s electricity generation system, then more generally its entire energy system. As the Germans prepare to vote on 26 September 2021, this policy paper reviews twenty years of German energy policy decisions.

Often caricatured in Europe and in France in particular, **the sovereign decision to phase out nuclear energy historically constitutes the first pillar of the German energy strategy**. This democratic and informed choice is now becoming a reality.

This “no” to nuclear power comes alongside a “yes” to renewable energy sources. **Wind and solar energy have developed dramatically, to a point where Germany can start along the road that will take it to phase out nuclear power by 2022, and the use of coal before 2038.**

Germany is therefore in the process of successfully conducting its “energy turnaround”, which began more than twenty years ago.

Yet to reach the new climate neutrality target that Germany has set at 2045, a simple “turnaround” will not be enough. **The next German coalition will have to scale up and make decisions that are more in line with a “major transformation”, or even an energy “revolution”.** These political decisions on the key challenges such as energy sobriety, innovation, energy citizenship and electricity generation will have to be made in Germany, in Europe and across the world.

1 ■ THE GERMAN ENERGY TURNAROUND: A LONG PROCESS ROOTED IN HISTORY

1.1 ■ The birth of the West-German anti-nuclear movement

Following the Second World War, Germany was split into two both politically and in terms of energy policy. In the West, the Federal Republic of Germany built an energy system based on fossil fuels, using coal for electricity generation and industry, and also oil in the transport sector, characterised by the generalisation of individual cars that users can drive on highways without speed limits. In the East, the German Democratic Republic also used coal intensively, and to a lesser extent oil - as having an individual car was less in line with Soviet ideology that prevailed East of the iron curtain.

West Germany was particularly hit by the first oil crisis in 1973 as it did not have any preferential oil agreements with the USSR. Against this backdrop, **the West German social-democrat government decided to step up its plan to build nuclear power plants** in order to reduce oil consumption in the power sector (see figure 1). This movement was similar to those undertaken by other countries such as France, the United Kingdom and the USA. **The government decision to expand nuclear power meets very strong opposition.** In the 1970s and 1980s, hundreds of thousands of West Germans demonstrated against atomic energy. These protests were sometimes violent, as illustrated by the occupation of the Wyhl construction site in 1975¹, or the 400 people injured at the Wackersdorf protest in 1986². It is in this context that the ecological and anti-nuclear political movement was structured with the creation of the German Green Party (*die Grünen*) in 1980, which won its first electoral victories and entered the National Assembly (Bundestag) in 1983. In academic and intellectual circles, the report on the “energy turnaround” (*Energiewende*) published in 1980³, and whose title would be used to name the current German energy policy, set out three scenarios for a transition away from oil and nuclear power⁴. This vision grew influential within West German society, both through the rise of the green party⁵ and the adoption of more critical positions on nuclear power within the two main parties (social-democrats of the *SPD* and conservatives of the *CDU*), especially following the Chernobyl nuclear disaster in 1986.

The reunification of Germany in 1990 temporarily weakened the German antinuclear movement, which was more deeply rooted in the West than in the East. **The 1998 federal election marked** a turning point with the creation of the first coalition government between social-democrats (*SPD*) and greens (*die Grünen*). This was the government that brought about the

1. Wolfgang Rudig (1990). *Anti-nuclear Movements: A World Survey of Opposition to Nuclear Energy*, Longman, pp. 130–135.

2. John Greewald, ‘Energy and Now - the political fallout’, *Time*, 2 June 1986.

3. F. Krause, H. Bossel and K. F. Müller-Reissmann, S. Fischer Verlag, (1980) *Energiewende*. Frankfurt 1980, DM 20, <https://doi.org/10.1002/piuz.19800110610> (in German)

4. For a detailed history of the *Energiewende*, read Aykut Stefan C, Evrard Aurélien, “Une transition pour que rien ne change ? Changement institutionnel et dépendance au sentier dans les « transitions énergétiques » en Allemagne et en France”, *Revue internationale de politique comparée*, 2017/1-2 (Vol. 24), p. 17-49. DOI : 10.3917/ripc.241.0017. URL : <https://www.cairn.info/revue-internationale-de-politique-comparee-2017-1-page-17.htm> (in French)

5. Sébastien Maillard, Alice Schmidhuber, *What are the ambitions of the German Green Party?*, Jacques Delors Institute, September 2021.

adoption in 2000 of the “agreement on nuclear phase-out” (*Atomkonsens*). The agreement prohibited the construction of new nuclear power plants and limited the duration of commissioning of existing plants to 32 years ie a shutdown around 2022. **This government laid the foundations for a transition based on decentralised renewables**, particularly via the then new technologies of solar panels and onshore wind turbines. It created the German Renewable Energy Sources Act (*Erneuerbare Energien Gesetz - EEG*) which aimed to double the share of renewables in Germany’s electricity consumption by 2010 (cf. figure 5), notably by setting significant feed-in tariffs for renewable energy generation. The EEG law went on to have a global reach, proving to be a source of inspiration for many national decisions in support of renewables in Europe and in the rest of the world ⁶.

1.2 ■ Citizen energy, a key lever of the German energy transition

The rise of renewables in Germany is partly due to its political system: they allow for decentralised production, which is particularly attractive in a federal system organised in sixteen States, the *Länder*. While the federal government has executive power over the energy policy, *Länders* enjoy significant leeway to implement legislation. They can also adopt their own construction and urban planning standards, particularly with regard to wind power. As a result, renewables developed considerably in Germany, from 6.3% of the energy mix in 2000, to 15% in 2010⁷, exceeding the initial target. The EEG facilitated citizen investments⁸. **Citizen energy is a key lever in the German energy transition and went a long way to ensure its public acceptability. In 2019, 40% of installed renewable capacity was owned by citizens and farmers**, both individually or grouped into cooperatives and local companies⁹ (cf. figure 2). This share has fallen slightly, however, following the professionalisation of certain citizen projects (e.g. Enertrag, Abo-wind) and the reform of the EEG in 2014 which abolished guaranteed feed-in tariffs. While the general acceptance of wind and solar power expansion remains high in Germany, energy infrastructure projects such as the installation of new wind turbines are facing **growing local resistance**¹⁰.

⁶. Ralph Dierman, *20 Jahre EEG*, PV Magazine, 25 February 2020 (in German).

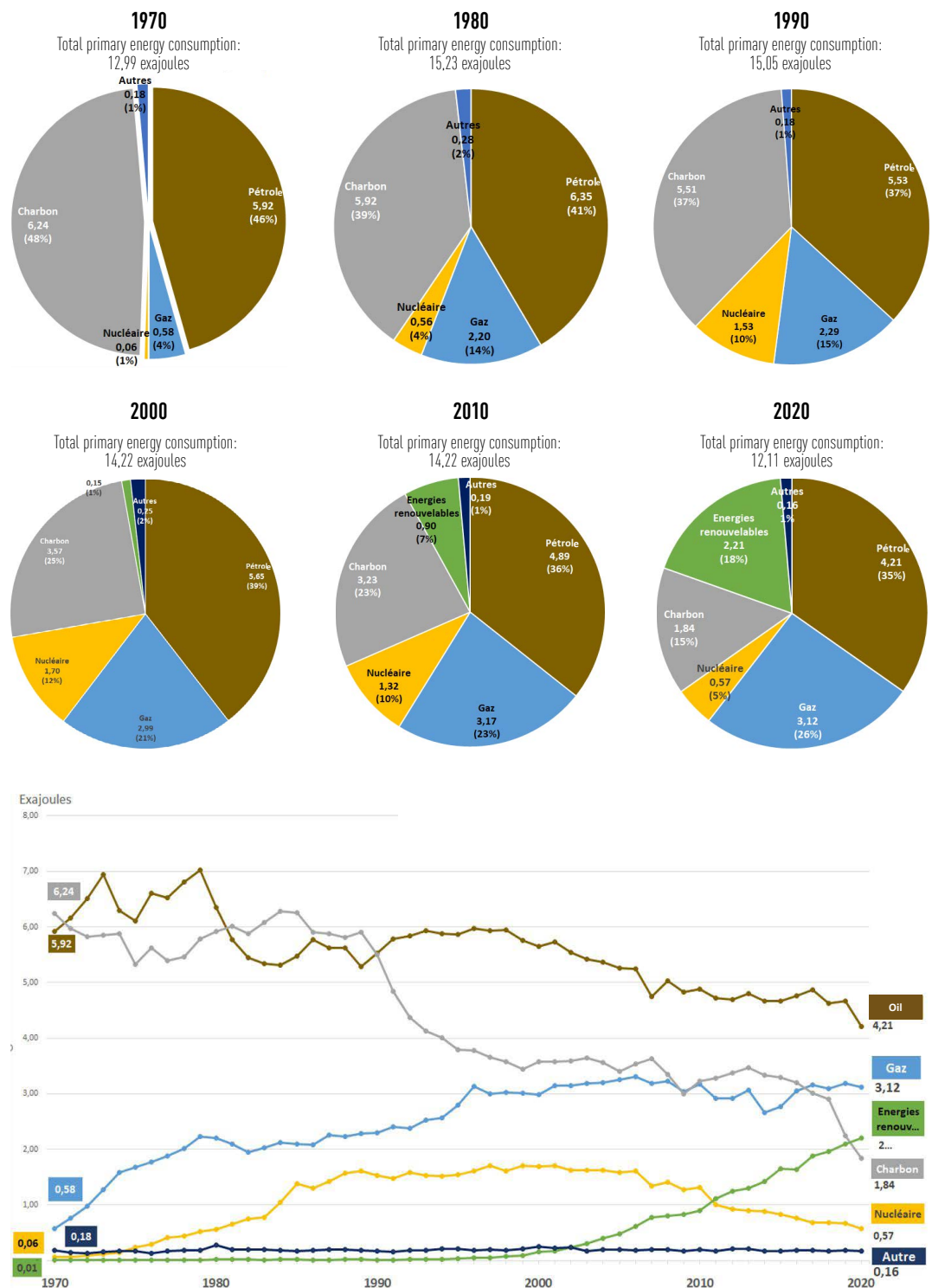
⁷. Source: AGEE-Stat, *Zeitreihen zur Entwicklung der erneuerbaren Energien in Deutschland*, February 2021 (in German)

⁸. Noémie Poize, Andreas Rüdinger, *Projets citoyens pour la production d'énergie renouvelable : une comparaison France-Allemagne*, IDDRI Working Paper, January 2014 (in French).

⁹. Andreas Rüdinger, *Energie citoyenne : où en sont la France et l'Allemagne ?*, Heinrich Böll Stiftung, 26 April 2019 (in French). Study updated with more recent data, and available on the website of the *Agentur für Erneuerbare Energien*, German Renewable Energies Agency, 2021. *Verteilung der Eigentümer an der bundesweit installierten Leistung zur Stromerzeugung aus Erneuerbaren-Energien-Anlagen 2019*.

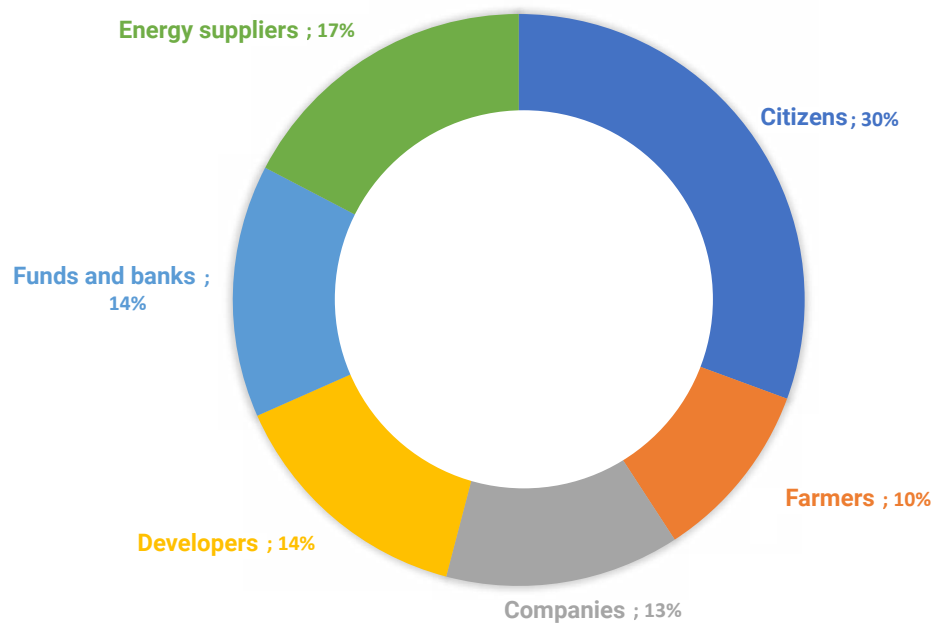
¹⁰. Conclusions from the *Zweiter Fortschrittsbericht “Energie der Zukunft”* report (in German) published by the commission of experts appointed by the government and tasked with monitoring the advances of the *Energiewende*. While Germany installed an average capacity of 3GW of onshore wind power each year between 2010 and 2018, this level slumped to 0.9GW in 2019, the lowest level since 2008.

FIGURE 1 ■ The energy mix in Germany since the 1970s



Source: Jacques Delors Institute, based on data from the British Petroleum Statistical Review of World Energy July 2021

FIGURE 2 ■ Distribution of renewable energy installations by stakeholder in Germany in 2019



Source: Jacques Delors Institute, on the basis of data from the German Renewable Energies Agency (Agentur für Erneuerbare Energien).

1.3 ■ The federal government revised its climate targets upwards under Angela Merkel's last term of office

2010 is an important milestone in the German energy transition. Led by a coalition of conservatives (CDU) and liberals (FDP), the federal government adopted its "energy concept" (*Energiekonzept*) which planned a later phasing-out of nuclear power and defined for the first time an energy strategy until 2050, together with targets for the use of renewables and the reduction of sector-specific greenhouse gas emissions. Ten years on, **Germany revised its targets upwards in response to the climate emergency** (see Table 1). It brought forward the target of reaching climate neutrality to 2045 and doubled its 2030 target for renewable energy production capacity to meet the three objectives of the *Energiewende*.

TABLE 1 ■ The main objectives of the German energy strategy: from the 2010 "energy concept" to the 2021 Climate Act

SECTOR	2020	2030	2040	2050
Greenhouse gas emissions (compared to 1990)	-40%	-55%	-65%	-70%
Primary energy consumption (compared to 2008)	-20%	-30%		-50%
Energy supply	Nuclear phase-out in 2022	Coal phase-out in 2038		
Share of renewables in the gross final energy consumption	18%	30%	45%	60%
Share of renewables in the gross final electricity consumption	min 35%	min 50%	min 65%	min 80%
Transport		-49 to -51%	-48%	to be determined by 2024
Final energy consumption (compared to 2008)	-10%	-40%	-40%	-40%
Electric vehicles in circulation	1 million	7 -10 million	6 million	eunder revision
Charging stations		1 million		

Source : Jacques Delors Institute, with data of the Energiekonzept 2010, EEG 2014, Klimaschutzplan 2050, Energieeffizienzstrategie 2050, Masterplan Infrastruktur, Klimagesetz 2021, EEG 2021, WindSeeG 2021

2 ■ THE THREE MAIN OBJECTIVES OF THE *ENERGIEWENDE*

2.1 ■ Phasing out nuclear power by 2022

The decision to close all nuclear power plants historically constitutes the first pillar of the German energy strategy. The West German anti-nuclear movement that emerged in the 1970s successfully became prevalent in reunified Germany (cf. above). As early as 2000, the social-democrat/green coalition decided to phase out nuclear power by 2022. In 2010, the conservative-liberal coalition led by Angela Merkel confirmed the decision to phase out nuclear power but postponed the decommissioning date of some plants, while introducing a special tax on nuclear power¹¹. This decision was controversial¹² and was still a matter of debate in Germany when the Fukushima nuclear disaster (Japan) of March 2011 had a game-changing influence. Angela Merkel quickly announced a moratorium (*Atom-Moratorium*) on the life extension of nuclear reactors. Following checks of the safety conditions in German plants, eight reactors were permanently shut down. Angela Merkel also established an “ethics committee” (*Ethikkommission*) with experts and representatives of civil society, tasked with defining socially acceptable avenues for nuclear policy. On the basis of this work, and buoyed by the support of **almost all MPs from all parties¹³ and the majority of the population¹⁴**, **Germany adopted its definitive phase-out of nuclear power in 2022, thereby slightly delaying the implementation of the decision made in 2000¹⁵**. Like Italy and Austria, Germany’s phasing out of nuclear power is a sovereign decision that stems from the democratic choice of the German nation. This target will most likely be achieved with the closure of the last German reactor in December 2022.

2.2 ■ Achieving climate neutrality by 2045

Following the entry into force of the Kyoto Protocol in 2007, the European Union committed to reducing its greenhouse gas emissions by 20% by 2020, a target that all Member States, including Germany had to transpose into national law. Since then, the EU has set increasingly ambitious climate objectives to combat climate change. In 2020, the Commission presented a plan designed to reduce its emissions by at least 55% by 2030, with a view to becoming the first climate-neutral continent in the world by 2050.¹⁶

¹¹. This tax was cancelled in 2017 by the federal constitutional court, which found it to be incompatible with the German Constitution.

¹². This decision of the CDU/CSU government was fiercely criticised by opposition parties and by environmental associations. It led to many protests across the country and particularly in Berlin (source: Spiegel Politik, [July 2010](#) & [Sept. 2010](#), articles viewed on 12 August 2021).

¹³. Editorial team of Deutsche Welle, [Bundestag beschließt Atomausstieg](#), Deutsche Welle, 30 June 2011 (in German).

¹⁴. Source: *Spiegel Umfragen*, [Deutsche wenden sich radikal von der Atomkraft ab](#), 15.03.2011, viewed on 12 August 2021 (in German).

¹⁵. Compared to the 2002 agreement on nuclear phase-out (*Atomkonsens*), the amended atomic energy law (AtG) extended the operation of eight reactors.

¹⁶. See Marie Delair, Emilie Magdalinski and Thomas Pellerin Carlin, [EUROPE CONTINUES ITS CLIMATE MARATHON infographics](#), Jacques Delors Institute, 25/09/20

Germany has set itself an even more ambitious target: **achieving climate neutrality by 2045**. Before 2019, GHG emission reduction targets were defined by two non-binding national strategies: the energy concept (*Energiekonzept*) adopted in 2010, which sets targets for 2030 and 2040, and the 2050 Climate Protection Plan (*Klimaschutzplan 2050*) which sets sector-specific targets to achieve climate neutrality by this timeframe. In 2018, a report¹⁷ published by the Environment Ministry sounded the alarm: Germany was on its way to significantly missing its target to cut its GHG emissions by 40% by 2020¹⁸. Youth mobilisation calling for greater ambition and climate action, of which the Swedish activist Greta Thunberg is the figurehead, is particularly strong in Germany, where the organisers of the *Fridays for Future* demonstration estimated that the protest on 20 September 2019 brought together 1,400,000 people, compared to 40,000 in France¹⁹. This popular mobilisation urged the government to adopt a package of additional measures to cut its GHG emissions by 55% by 2030 (*Klimaschutzgesetz*). This law is nonetheless deemed insufficient by the German constitutional court (*Bundesverfassungsgericht*), which, following on from similar rulings in the Netherlands²⁰ and in France²¹, decided that the roadmap to achieve climate neutrality breached the fundamental freedoms of young generations. The lack of ambition of climate targets for 2030 were ruled to be insufficient, “irreversibly offloading major emission reduction burdens onto periods after 2030”²². Following this ruling, the federal government approved new, more ambitious climate targets: cutting its GHG emissions by 65% by 2030 and achieving climate neutrality by 2045, by further reducing GHG emissions in all sectors.

2.3 ■ Phasing out coal by 2038

Although German coal consumption has been reduced threefold since 1990, 23% of electricity generated in the country still comes from coal-fired plants²³, compared to 13% on average in the European Union²⁴. Nevertheless, coal combustion causes a very high amount of pollution and many alternatives exist. In 2018, Germany established the commission on “Growth, Structural Change and Employment”, nicknamed the **Coal Commission (Kohlekommission)**, tasked with developing instruments to support a socially just and gradual phasing out of coal power. It recommends closing the last German coal-fired plants in 2038 and proposes a set of intermediary measures to achieve this, including support for mining regions in Germany²⁵. Its recommendations were adopted in 2020 through a legislative package that set out a roadmap for the phasing out of coal-fired plants by 2038. This deadline

17. Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU) (2018) *Klimaschutzbericht 2017 Zum Aktionsprogramm Klimaschutz 2020 der Bundesregierung* (in German).

18. This 2020 target was ultimately achieved, mainly due to the effects of the COVID-19 pandemic.

19. Eliza Barclay and Brian Resnick, *How big was the global climate strike?*, Vox, 22 September 2019.

20. *Urgenda Foundation versus State of the Netherlands*, 2015. U.S. Climate Change Litigation database.

21. Arnaud Gossement, *Climat : le Conseil d'État enjoint l'État de prendre toute « mesure utile » d'ici au 31 mars 2022*, Gossement Avocats, 1 July 2021 (in French).

22. “The challenged provisions do violate the freedoms of the complainants, some of whom are still very young. The provisions irreversibly offload major emission reduction burdens onto periods after 2030. The fact that greenhouse gas emissions must be reduced follows from the Basic Law. These future obligations to reduce emissions have an impact on practically every type of freedom because virtually all aspects of human life still involve the emission of greenhouse gases and are thus potentially threatened by drastic restrictions after 2030.” *Press release No.31/2021* of the Bundesverfassungsgericht, 29 April 2021

23. Source: AG Energiebilanzen 2020, Gross power generation by source 2019

24. Data from Agora Energiewende and Ember, *The European Power Sector in 2020*, Analysis, January 2021

25. Source: Kommission “Wachstum, Strukturwandel und Beschäftigung” *Abschlussbericht*, January 2019 (in German)

may be brought forward now that Germany is striving to achieve climate neutrality by 2045²⁶ and that the European carbon trading system (EU ETS) has made electricity generation using coal a particularly costly business that can even be financially unprofitable²⁷.

3 ■ THE *ENERGIEWENDE*: A GERMAN ENERGY STRATEGY STRUCTURED AROUND LEGISLATIVE AND FINANCIAL INSTRUMENTS AND SUPPORT MEASURES

To roll out this energy turnaround, the 2030 Climate Action Programme (*Klimaschutzprogramm 2030*) and the 2050 Climate Protection Plan (*Klimaschutzplan 2050*) comprise a set of legislative and financial instruments and support measures (cf. Figure 3), on local, regional and federal levels. Here, we will focus on the federal level. **The Climate Protection Act adopted in 2019 and updated in 2021 (*Klimaschutzgesetz*) provides that the federal government must implement the necessary measures** to reduce GHG emissions by 65% by 2030 and achieve climate neutrality in 2045 by making these targets legally binding.

3.1 ■ Germany relies on a legislative framework that promotes renewables and energy efficiency

1. Germany **aims to halve its primary energy consumption by 2050, by making its building stock more energy efficient**²⁸. In keeping with the European energy efficiency directive, the German federal government regulates the labelling of energy consumption (*EnVKG*), subjects companies (excluding very small, small and medium businesses) to a mandatory energy audit (Energy Services Act, *EDL-G*) and sets requirements on the energy quality of buildings (Energy Act for Buildings, *GEG*). The *GEG* sets some renovation obligations for existing building stock and specifies the share of renewable energy consumption for the heating and cooling of new buildings²⁹. It will be revised in 2022 in order to raise these standards, with the federal government also considering to make the installation of solar modules compulsory³⁰, in line with the revised 2050 energy efficiency roadmap (*Roadmap Energieeffizienz 2050*). The stakeholder forum tasked with drafting energy efficiency measures will publish its conclusions in October 2022. These findings will be used to draw up a white paper.
2. To decarbonise its energy supply without nuclear or coal power, **Germany is rolling out renewable energy sources on a massive scale**. Amended in 2021, the Offshore Wind Energy Act (*WindSeeG*) and the Renewable Energy Sources Act (*EEG*) both aim to achieve

26. ZEIT ONLINE, *Unionspolitiker für schnelle Änderung des Klimaschutzgesetzes*, 3. May 2021, viewed on 12 August 2021 (in German)

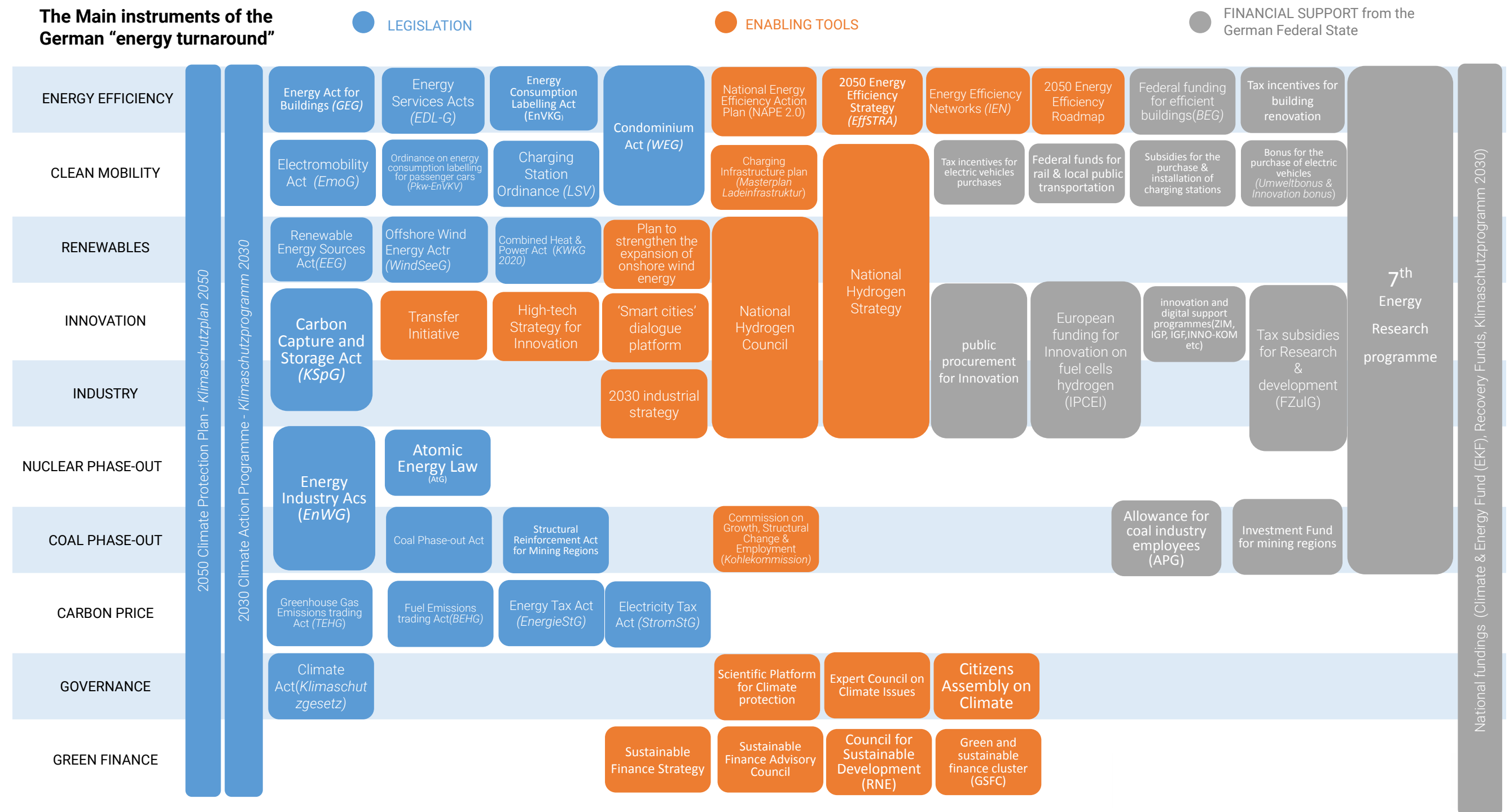
27. The EU ETS: From Cornerstone to Catalyst - Jacques Delors Institute (institutdelors.eu)

28. Source: BMWi (2019) *Energy Efficiency Strategy 2050* (EffSTRA)

29. See the analysis of the Federation of German Consumer Organisations (VZBV), *GEG: Was steht im neuen GebäudeEnergiegesetz?*, 11 December 2020 (in German)

30. BERND FREYTAG AND JULIA LÖHR, *40.000 Euro mehr für ein Einfamilienhaus*, FAZ, updated on 04.06.2021 (in German).

FIGURE 3 ■ The main instruments to achieve the German “energy turnaround” in 2021*



Source : Jacques Delors Institute.

*This overview is not exhaustive.

up to 65% for renewables in German electricity consumption by 2030 by dramatically increasing the capacity of solar and wind generation (cf. table 1). The latter Act introduces a cooperation mechanism between Länder, which must report the progression of renewable energy sources to the federal government³¹.

3. In order to allocate pollution its fair costs and deprive fossil fuels of their competitive edge, **the federal government has increased the national carbon price**. In addition to the emissions trading scheme for GHG emissions which sets a European carbon price for the power and industry sectors, Germany introduced in January 2021 **a emissions trading scheme for fuels used for transport and buildings (BEHG)**³². This system sets a maximum price level for the first years (€25/TCO₂), lower than the current carbon contribution in force in France. This maximum level is set to be increased and then removed in order to make room for a price system set solely by this new German carbon market.
4. Finally, Germany wants to **promote electromobility to decarbonise the transport sector**. By 2030, 7 to 10 million electric vehicles will have to be in circulation and one million charging stations have to be deployed across Germany according to the Federal Charging Infrastructure Plan (*Masterplan Infrastruktur*). The national electromobility platform (*Nationale Plattform Zukunft der Mobilität*) created in 2018 by the coalition government of conservatives (CDU-CSU) and social-democrats (SPD) is tasked with recommending a set of measures that could led to a federal government work programme for to decarbonise the transport sector, a blind spot in the German energy policy in recent decades (see section 4.a.).

³¹. See Kerstine Appunn, *What's new in Germany's Renewable Energy Act 2021*, Clean Energy Wire, 23 April 2021

³². The renewable energy surcharge (EEG surcharge) that consumers pay to help to finance green electricity was lowered to offset the price increases due to this introduction and fell from 7 ct€/kWh in early 2021 to 6.5 ct€/kWh (see figure 6).

3.2 ■ These sector-specific targets are supported by various federal funding and tax incentives.

1. The federal budget boasts several instruments to finance the energy transition. The **Energy and Climate Fund** (*Energie- und Klimafonds*) allocates €4 billion per year to fund its 2030 Climate Action Programme, a contribution that will amount to €6 billion per year by 2025³³. It also supports **research in the energy sector** to the tune of €6.4 billion for the 2018-2022 period. Germany also invests part of the funds which aim to mitigate the economic and social impact of the coronavirus pandemic in climate protection. In addition to the emergency measures adopted in 2020 including some to support clean mobility and hydrogen³⁴, 38% of investments from the German recovery plan should contribute to the climate and digital transitions, in accordance with the European targets set for the funding of national recovery plans. They will support in particular the decrease in the *EEG* surcharge³⁵, hydrogen, and a bonus for purchases of electric vehicles reaching up to €9000³⁶. The increases to the national GHG reduction targets adopted in May 2021 come with **additional funding of €8 billion** aimed at implementing the necessary measures³⁷.
2. On top of the federal funds, Germany contributes to financing renewables and energy efficiency through **public loans** managed by the public investment bank KfW³⁸. For example, federal funding for efficient buildings (*BEG*) provides assistance of up to €6 billion for measures ranging from the in-depth renovation of housing units to simply replacing windows, with interest rates lower than 1% and repayments of 15 to 50% of the total investment amount³⁹. The lifting of **green bonds** will also enable the federal government to finance projects to the tune of €11.5 billion⁴⁰.
3. **Tax incentives** are also an important lever for the energy transition in Germany. Tax depreciation and exemptions make electric vehicles and company bicycles more attractive⁴¹ and enable housing block owners to claim 20% of renovation costs against their taxes⁴².

33. Source: Germanwatch, G7-Gipfel: Deutschland macht wichtigen Schritt zu verbesserter internationaler Klimafinanzierung, press release, 13.06.2021 (in German)

34. See Koalitionsausschuss, Corona-Folgen bekämpfen, Wohlstand sichern, Zukunftsfähigkeit stärken, 3 June 2020 (in German).

35. See footnote 26.

36. For a detailed analysis of the German recovery plan, read Green Recovery tracker report: Germany, on the basis of data from the Green Recovery Tracker developed by E3G & Wuppertal Institute, updated on 06/05/2021 and viewed on 12 August 2021.

37. *Klimaschutz-Sofortprogramm 2022*, adopté le 23. Juni 2021 par le cabinet du gouvernement fédéral

38. In 2019, the KfW allocated 38% of its funds to measures aimed at protecting the climate and the environment on behalf of the German government, i.e. €29,374 billion. For further details, see *KfW at a Glance, Fact and Figures 2019*, updated in April 2020.

39. For further information, see Kfz, *BUNDESFÖRDERUNG FÜR EFFIZIENTE GEBÄUDE*, conditions viewed on 20 August 2021 (in German).

40. In 2019 according to the Federal Finance Ministry *Green bond allocation report 2020* published in June 2021.

41. See Bundesregierung, *Steuerliche Anreize für Elektroautos* (in German). All the regulations presented have been in application since 1 January 2020

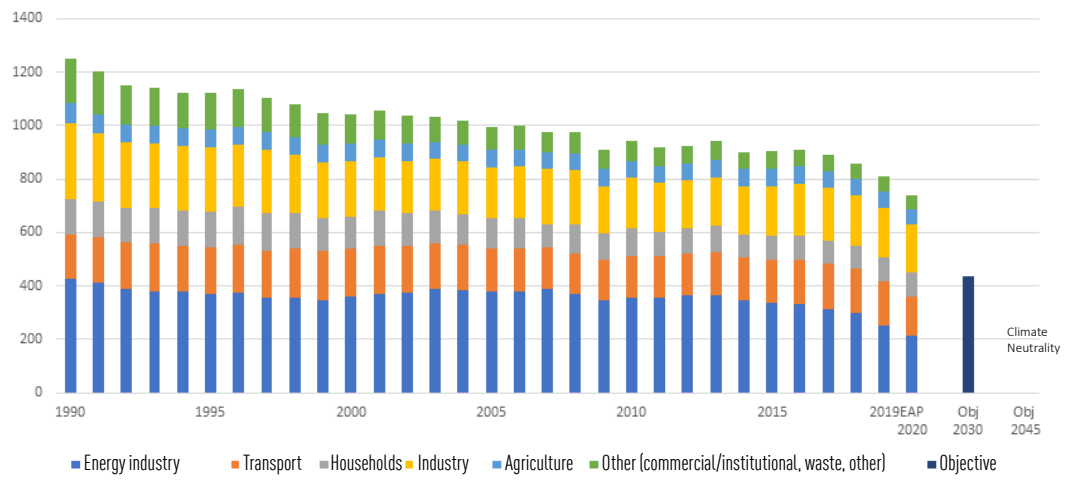
42. Up to €40,000. See Bundesministerium der Finanzen, *Kurz erklärt: Steuerliche Förderung energetischer Gebäudesanierungen*, 07.02.2020, viewed on 20 August 2021 (in German).

4 ■ THE SUCCESSES AND CHALLENGES OF THE *ENERGIEWENDE* IN 2021

4.1 ■ Climate: Germany reaches its 2020 target thanks to the pandemic, and must step up its efforts to become climate neutral by 2045

As in other States in North-West Europe, German GHG emissions have fallen significantly since 1990, particularly in the power (cf. section 4.b.), industry and residential buildings, despite stagnating emissions from the transport sector (cf. figure 4).

FIGURE 4 ■ Germany's greenhouse gas emissions since 1990



Source : German Environment Agency, International reports for the German greenhouse gas inventory from 1990 to 2019 (as at 12/2020) and the previous year estimate (EAP) for 2020.

Emissions per category determined by the UN, without land use, land use change and forestry

* Industry: Emissions related to energy and industrial processes (1.A.2 & 2);

Other emissions: other combustions (remaining CRF 1.A.4 1.A.5 military) and fugitive fuel emissions (1.B)

** EAP Previous year estimate for 2020

*** Objectives for 2030 and 2045: according to the revision of the Federal Climate Act (KSG) on 12.05.2021

The transport sector remains the main blind spot in German energy policy over the last decades, as in most European Union Member States. While Germany has successfully met its target to cut its GHG emissions by 40% by 2020, this is the result of a particularly mild winter⁴³ and the impact of the COVID-19 pandemic and health measures which considerably and temporarily reduced economic activity - and related energy consumption. Whereas the federal government has adopted more ambitious climate objectives (65% reduction of GHG emissions by 2030, climate neutrality by 2045), this must be bolstered by a legislative and

⁴³. Source: AGE, Energieverbrauch sinkt in Deutschland im Jahr 2020 in Folge der Covid-19-Pandemie auf historisches Tief, 1.2.2021 (in German)

budgetary arsenal to be adopted by the political decision-makers that the German people will elect during the upcoming federal elections on 26 September 2021.

4.2 ■ Electricity: The massive roll-out of wind and solar power allow Germany to exit nuclear power while reducing its coal consumption

Since Germany began its phase out from nuclear power, it has managed to develop renewable energy faster than it has shut down its nuclear power plants. Renewables therefore constitute the main source of electricity in Germany, accounting for 46% of its gross final electricity consumption in 2020, considerably exceeding its initial objective⁴⁴. This growth is significant and has little equivalent in the history of energy.⁴⁵ **While German coal consumption increased over the period from 2009 to 2013,** it subsequently fell dramatically, being almost cut by half between 2013 and 2020⁴⁶ (cf. figure 5)

This double exit from nuclear power and coal raises three main challenges:

1. Firstly, it can only work if Germany successfully rolls out a massive number of new renewable energy installations each year. While this challenge was met in the 2010s, a sharp slowdown has been recorded in recent years, partly due to local resistance and to *Länder* regulations which complicate the installation of new onshore wind turbines⁴⁷. The same situation can be observed in many other European countries.
2. A second challenge is specific to Germany and is related to its geography. The closure of nuclear power plants, and to a lesser extent of coal-fired plants, implies a drop in electricity generation in areas in southern and western Germany, which are highly industrialised. The largest installations of renewables, especially wind turbines, are currently implemented in the north and east of the country. To meet its target, Germany therefore has to rescale its electricity network so that it can transmit more electricity from the North/East to the South/West by high-voltage power lines, poorly accepted by local population. The too slow action of the German authorities on this subject has become a problem with a European dimension, in a now unified electricity market⁴⁸. The modernisation of the German electricity grid requires significant investment that German politicians have decided to finance by increasing households' electricity prices (cf. figure 6).
3. A third challenge is German's continued dependence on natural gas imported from Russia. German gas consumption is stagnating at a high level - higher than the quantity of gas consumed in all eleven EU Member States in Central and Eastern Europe. Germany will have to wean itself off this dependence if it is to reach its climate objectives. Moreover, in order to avoid conflict between Ukraine and Russia that endangers

⁴⁴. As a reminder, this was 35%. See table 1 which sets out the objectives of the 2011 Energiekonzept

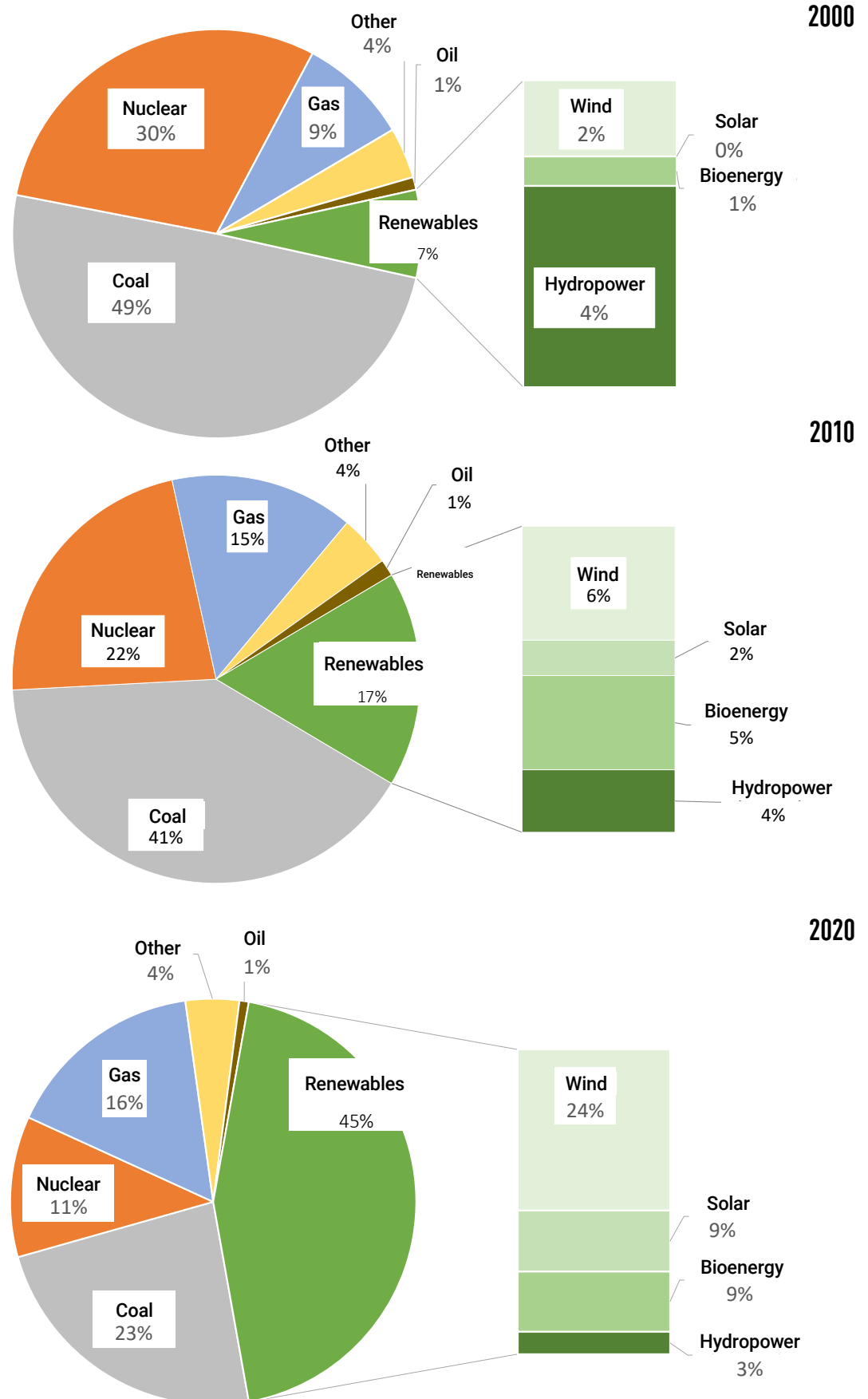
⁴⁵. A trend of comparable proportions occurred in France in the 1980s, when the French civil nuclear programme was launched, which saw French nuclear production grow from 60 TWh in 1980 to 300 TWh in 1990.

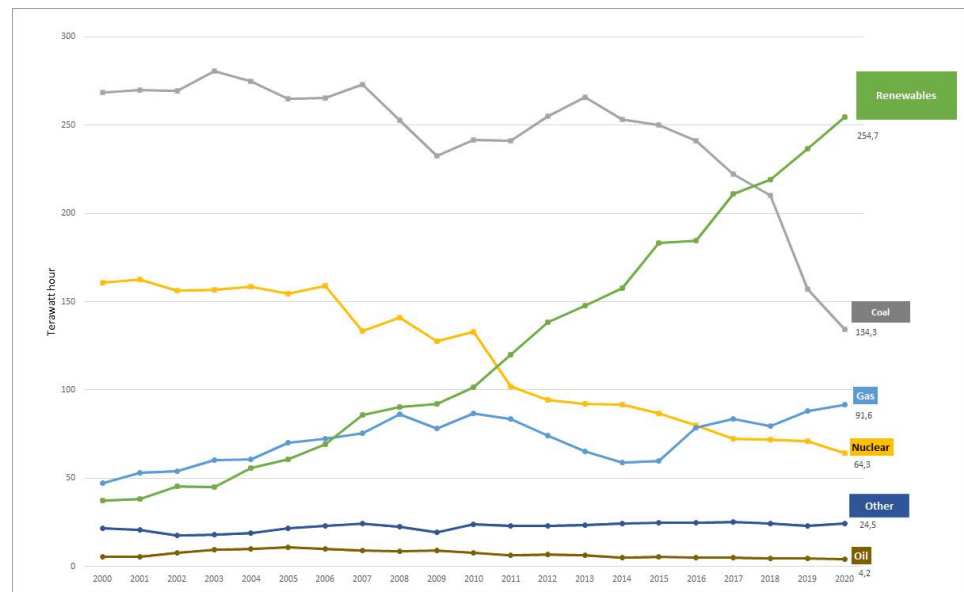
⁴⁶. German coal consumption fell from 3.5 Exajoules in 2013 to 1.8 Exajoules in 2020. Source: [British Petroleum Statistical Review 2021](#).

⁴⁷. Antje Nieber and Paul Lehmann, [Where to build new Wind Turbines in Germany? Lowest cost vs residents and nature](#), Energy Post, June 11 2021, viewed on 17 August 2021

⁴⁸. Sami Andoura and Jean-Arnold Vinois, *From the European Energy Community to the Energy Union*, Report, Jacques Delors Institute, January 2015, p.57.

FIGURES 5 ■ The German electricity mix since 2000





Source : Jacques Delors Institute, with data from AGEB 2021

the security of Germany's supply of Russian gas, the federal government firmly supports the construction of the Nord Stream 2 pipeline, a plan that is clearly incompatible with its climate objectives, its European policy and its foreign policy with regard to Russia and Ukraine⁴⁹. Such support goes beyond energy concerns and can be explained for the most part by geopolitical considerations (relations between Germany and Russia) and also by the key role that German figures play in the biggest Russian energy companies⁵⁰. In addition to the serious ethical questions this poses, the major role of German industries, particularly chemical companies, must not be underestimated. They are major consumers of natural gas and their competitiveness depends on a secure supply of low-priced gas. In this respect, gas transported directly by pipeline from Russia to Germany via the Baltic Sea, without transiting through third countries, costs less than liquefied natural gas (LNG) regardless of its origin, even from North America. Lastly, transport infrastructure investments planned for natural gas can only be justified if the economic lifetime goes well beyond 2045, the new climate neutrality deadline set by Germany. This is another example of how difficult it is to revise a plan designed in the 2000s, in terms of Germany's new strategic choices.

4.3 ■ Germany's political choice: high electricity prices for households

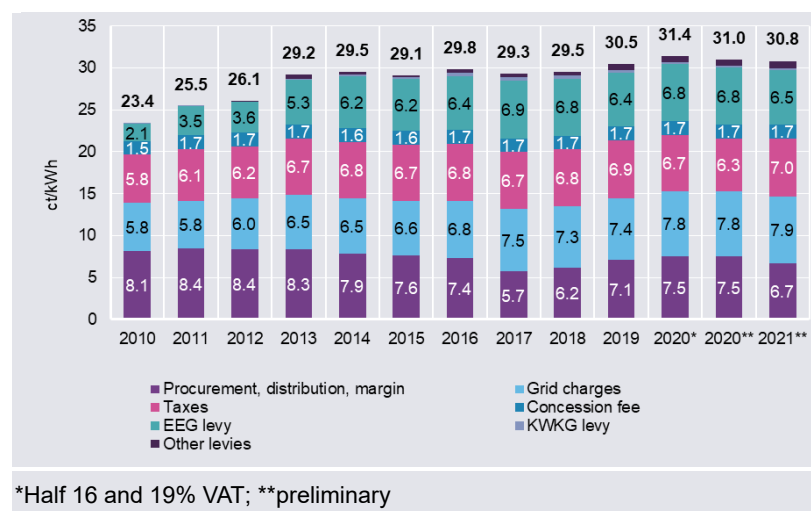
Electricity prices have risen considerably in Germany since the country began its energy transition and these prices are currently among the highest in Europe. It is not, however, the phasing out of nuclear power that has led to this rise in electricity costs. Wholesale electricity prices in Germany are among the lowest in Europe, due to the low marginal cost

⁴⁹. Jean-Arnold Vinois and Thomas Pellerin-Carlin, [Nord Stream 2: a decisive test for EU energy diplomacy](#), Natural Gas World, December 2015.

⁵⁰. For example, the former Chancellor Gerhard Schröder [chairs the Shareholders' Committee of the company Nord Stream](#). The CEO of this company is Matthias Warnig, a German citizen and [former Stasi agent](#), the East-German state security service, modelled on the Soviet KGB.

of generating electricity from wind and solar power⁵¹. The increase in the electricity bill for German households and small businesses is due to an increase in the EEG surcharge, and taxes and grid fees which make up more than half of the electricity price (see figure 6). Meanwhile, large companies enjoy exemption from these taxes despite being the main consumers of electricity in Germany⁵². **German policymakers have therefore made the political choice to place the financial burden of the German energy transition on citizens and small businesses, to the benefit of large German companies and in particular the ones consuming the most energy, for the sake of their competitiveness on the global markets.** This assistance from the German government to its companies was authorised by the European Commission and other Member States have also drawn inspiration from this model.

FIGURE 6 ■ Breakdown of the average electricity price for German households



Source: Agora Energiewende 2021, from the analysis by Dr. Patrick Graichen & Fabian Hein, 10 years after Fukushima: consequences of the nuclear phase-out for the energy transition? March 2021

4.4 ■ Energy poverty is a limited phenomenon in Germany

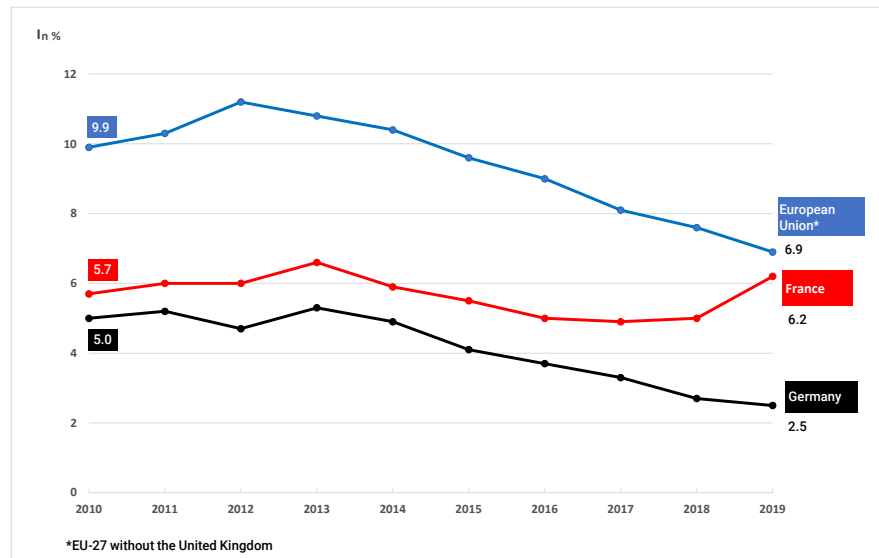
The share of the German population that suffers from the cold at home in winter is relatively small, with only 2.5% of the population claiming that they are unable to sufficiently heat their homes in 2019, compared to 6.2% in France and 6.9% on average in the European Union (see figure 7). Furthermore, this share has been falling steadily since 2010. **This is partly due to actions on regional and local levels in Germany to combat energy poverty.** Nevertheless, the federal government does not acknowledge energy poverty as an issue in its own right and supports low-income households through welfare benefits. With the establishment of the national CO2 price in early 2021 which led to an increase in heating costs, the government introduced a climate component in housing benefits for low-income households with

⁵¹. See the map of electricity prices in Europe in 2020 drawn up by Agora Energiewende 2021, in the publication [10 years after Fukushima: consequences of the nuclear phase-out for the energy transition? Answers to 10 common questions](#)

⁵². Source: AGEF 2020, final electricity consumption per consumer group

a view to offsetting the increase in fuel prices. More than 600,000 households receive on average an additional monthly amount of €15⁵³.

FIGURE 7 ■ Share of the population in Germany, France and the European Union claiming to be unable to heat their home sufficiently.



Source: Jacques Delors Institute with data from EUROSTAT (2021), the EU-SILC survey [ilc_mdcs01], updated on 01/07/2021 and extracted on 20/08/2021.

5 ■ THE *ENERGIEWENDE* IS A FOCUS OF DEBATE IN THE UPCOMING GERMAN FEDERAL ELECTION.

On 26 September 2021, German citizens will vote to renew the members of the lower house of Parliament (*Bundestag*) and of the government in the federal election. **The coalition that will succeed the one led by Angela Merkel will have to meet the crucial mission of quickly transforming the country's energy and climate policy, at least to reach the new target of cutting Germany's emissions by 65% by 2030.** Youth movements, the momentous ruling of the German Constitutional Court (see section 2.b) and the fatal flooding of July 2021 have urged most candidates to take up clear positions with regard to climate change. This issue is also the leading concern of German citizens, ahead of the COVID-19 pandemic. 67% also believe that the current government's action in this area is insufficient⁵⁴.

The introduction of a carbon price on fuels for heating and transport has led to many debates regarding the level required to bring about a real reduction of emissions in these sectors, with the Greens calling for a higher CO₂ price that would account for €0.16 more per litre

⁵³. See box 3 on Germany in Emilie Magdalinski, Marie Delair Thomas Pellerin-Carlin, *Europe needs a political strategy to end energy poverty*, Policy Paper, Jacques Delors Institute, February 2021.

⁵⁴. Eurobarometer, Special Eurobarometer 513, Climate Change, Fieldwork March-April 2021. See in particular Question QB1a on the single most serious problem facing the world as a whole.

of petrol by 2023⁵⁵. **This considerable increase in fuel and heating prices for households raises the question of who can and must pay for the country's climate action.** At this point, tenants, who are the majority across Germany, bear this cost alone, although they cannot decide on the renovation of homes they do not own. A federal government proposal to share equally rising heating costs between tenants and owners has been blocked for now in Parliament by conservative MPs.⁵⁶

The German Green and Social-Democrat parties have also announced that they are in favour of a 130 km/h speed limit on German motorways, a controversial measure for this country in which 70% of motorways still have no speed limit.⁵⁷

Lastly, the court decision dated 26 August 2021 regarding the Datteln 4 coal-fired power plant has provided greater visibility for the coal issue. Whereas the Greens wish to phase out coal by 2030, the Social-Democrats and Conservatives have retained the current target of 2038 at the latest.⁵⁸

6 ■ CONCLUSION AND RECOMMENDATIONS ■ SUCCEEDING THE GERMAN ENERGY TURNAROUND TO MAKE THE EUROPEAN ENERGY TRANSITION A SUCCESS

The German energy turnaround has been launched. Based on a democratic consensus deeply rooted in German society, Germany is succeeding in reaching its first energy policy objective: the phase-out of nuclear power by 2022, thereby fulfilling a commitment made twenty years ago by the German federal State upon the adoption of the "agreement on nuclear phase-out" (*Atomkonsens*).

The next milestones will play a much more structuring role and will be difficult as they entail Germany **successfully dispensing with almost all fossil fuels in the space of a generation**, in order to achieve climate neutrality by 2045. More than a turnaround, this is a major transition, and even a genuine revolution.

To make this energy transition a financial, social and environmental success, Germany can count on its economic, human and political strengths. However, the battle is far from won and success for Germany will only be possible by consistently articulating local, national, federal, European and international decisions. As regards Franco-German cooperation and Germany's European action, this paper recommends that the parliamentary and government majority resulting from the federal election on 26 September 2021 must:

⁵⁵. Declaration by Annalena Baerbock interviewed for the daily newspaper Bild, [Baerbock würde auch mit der Linkspartei sprechen](#), 31.05.2021 (in German)

⁵⁶. Handelsblatt, [Einigung gekippt: Mieter müssen CO₂-Preis-Kosten doch alleine tragen](#), 22.06.2021 (in German)

⁵⁷. Matthias Janson, [70 Prozent der deutschen Autobahnen ohne Tempolimit](#), Statista, 22 January 2019 (in German).

⁵⁸. Nikolaus Kurmayer, [Coal exit debate haunts German parties ahead of election](#), Euractiv, 30 August 2021.

- **Make Germany a leading player in the European energy transition**, not only with regard to renewable energy generation, but also **for all the other key challenges of the energy transition** such as energy **sobriety**, building **renovation, investment** in infrastructure that would curtail the use of individual cars and the **reduction and eventual elimination of carbon emissions in industrial production processes**. A strong German drive in these areas could promote the emergence of Franco-German leadership, or with Spain and Italy, where governments are currently stepping up their energy transitions.
- Support the shift from oil/diesel fuelled cars to **100% electric cars**⁵⁹. This is a major issue for the German automotive industry, which is the largest on the continent, and is essential for Germany. This involves industrial choices that must be made on European, Franco-German and national levels, in addition to European, national and local investments in charging station infrastructure. It also requires support for the proposal made by the European Commission on 14 July 2021 to prohibit the sale of new petrol/diesel cars, including hybrid internal combustion vehicles, by 2035. In the past, German - and French - governments have more often blocked such developments, preferring the short-term interests of the major national car manufacturers.
- Initially with France, and subsequently with other European partners, **revise the European rules to enable States and local authorities to make the necessary public investments** to ensure a successful energy transition.
- In view of the high stakes, **Germany must step up its public investment in energy research and innovation**.⁶⁰ Investment amounts are two times lower than levels in the early 1980s⁶¹. This commitment from Germany would encourage other States, including France, to follow suit, and must be coordinated with existing European instruments such as Horizon Europe and the European Innovation Council.
- Lastly, Germany's experiments with **energy citizenship**⁶² should serve as the basis to draft a strategy enabling German citizens to enjoy more direct control over energy decisions. Regarding this point, a Franco-German cooperation could prove to be useful given the growing similarity between the trends observed in both countries in recent years (e.g. Citizens' Convention on Climate, citizen opposition to wind farm projects).

59. Emilie Magdalinski, *Clean Mobility - the European Way*, Jacques Delors Institute, Policy-paper, January 2019

60. Thomas Pellerin-Carlin, *Europe needs to innovate to become a front-runner in the global green economy race*, Jacques Delors Institute, Policy Brief, February 2021.

61. According to the International Energy Agency, German public investment in research, development and demonstration (RD&D) in the energy sector currently accounts for \$1.6 billion (expressed in purchasing power parity for 2020). This budget has increased compared to its level in the 2000s (roughly 0.5 billion) but remains much lower than the level in the early 1980s (approximately 2.8 billion).

62. For a better understanding of energy citizenship issues, find out more about the European Energy Prospects project, in which the Jacques Delors Institute participates.



Managing Editor: Sébastien Maillard ■ The document may be reproduced in part or in full on the dual condition that its meaning is not distorted and that the source is mentioned ■ The views expressed are those of the author(s) and do not necessarily reflect those of the publisher ■ The Jacques Delors Institute cannot be held responsible for the use which any third party may make of the document ■ Original version ■ © Jacques Delors Institute