Part B –
The Law of Energy transition in European Countries: General Perspectives

General Perspectives on the Law of Energy Transition in Germany

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A. Introduction

Germany's *Energiewende* is being driven by a myriad of factors: some technical, some economic, some political and some legal.[1] Many of these factors are inextricably linked and most of them are *sine qua non* conditions for its current status and future development. This article aims to understand the characteristics of these factors and their interactions. To this end, it will investigate the basic structures and mechanics of German energy politics, the energy market, and the law governing energy production. In addition, it will take a close look at the conflicting interests that Germany's governments, legislators and courts have had to balance out over the years and that have shaped, and will continue to shape, the transformation of energy production.

As a first step, it provides an overview of the composition of the German energy mix since the beginning of the energy transition (B.). As a second step, it presents some basic information on the political and constitutional system that shapes German energy policy (C.). In this regard, it will outline the structure of the political system (federalism), and key constitutional obligations with respect to energy supply and climate protection, which will be followed by a profile of relevant actors and their interests. Thirdly, it will present specific legally binding targets to guide and implement the energy transition (D.). It will conclude with five sections, all of which introduce central legislation regarding the nuclear phase-out (E.), the coal phase-out (F.), the move away from oil and gas (G.), and the transition towards renewable energy (H.) and green hydrogen (I.).

1 For a general account see e.g. Katharina Hillebrandt et al., 'Pathways to deep decarbonisation in Germany' (SDSN – IDDR 2015). See also contributions in Olaf Kühne/Florian Weber (eds), *Bausteine der Energiewende* (Springer 2018); German Environment Agency (Umweltbundesamt), 'Treibhausneutrales Deutschland im Jahr 2050' (2014).

B. The Transformation of the German Energy Mix

This article aims to provide both a systematic overview and a deeper understanding of the laws governing the German Energy Transition (*Energiewende*). It outlines the evolution of Germany's energy mix, gives background information on the political and constitutional system that shapes the German energy policy, and presents key legislation and policies on phasing out energy production based on nuclear power and coal, reducing oil and gas use, and developing renewables and green hydrogen. In doing so, it hopes to contribute to the possibility of future comparative studies in this highly dynamic field.

Reducing primary energy consumption and switching energy production to renewable energy sources are the two fundamental strategies for transforming the energy sector. In total, Germany has reduced its consumption of primary energy from 1990 to 2024 by just under 30 %. In 2024, approximately 20.0 % of the country's energy was provided by renewable sources. The energy sources' individual share in energy consumption is outlined in the following table:

Table 1: Germany's energy mix: share of primary energy consumption by source in 2024[2]

Source Type	**Total Share 1990**	**Total Share 2024**	**Specific Source**	**Specific Share 1990**	**Specific Share 2024 (approx.)**
Fossil fuels	86 %	77.3 %	Oil Natural gas Hard coal Lignite	35 % 15 % 15 % 21 %	36.5 % 25.9 % 7.3 % 7.6 %
Nuclear	11 %	0 %		11 %	0 %
Renewables	1.3 %	20 %	Waste Hydro Wind Solar Biomass Geothermal	1.3 %	1.1 % 0.5 % 3.9 % 2.2 % 8.8 % 0.8 %
Others	1.7 %	2.8 %	Others	1.7 %	2.8 %

2 AG Energiebilanzen e.V., 'Verbrauchsrückgang hat sich verlangsamt' (18 March 2025) <https://ag-energiebilanzen.de/verbrauchsrueckgang-hat-sich-verlangsamt/> accessed 31 May 2025.

Shares of renewable energy sources differ quite substantially between the electricity, heating, and transportation sectors. Renewable energy is particularly important for producing electricity (54.4 %), less for heating and cooling (18.1 %), and even less for transportation (7.2 %).[3] Among the renewables, on- and offshore wind turbines currently provide half of the electricity, while solar energy makes up for 26.1 %, biomass for 18 %, and hydropower for 7.8 %.[4] These numbers show that much of the primary energy consumption is still based on fossil fuels and they also indicate the challenges ahead: In the future, renewable energies will have to compensate for the reduction of power generated through nuclear and basically all types of fossil fuels. While Germany had planned to rely strongly on natural gas as a transitory means to lower its CO_2-emissions and compensate for nuclear power, Germany's access to natural gas was interrupted and severely reduced following the Russian invasion of Ukraine. And while Germany has been quite successful in transforming electricity production, it has not produced similarly good outcomes in the transportation or heating and cooling sectors.

C. Political, Constitutional, and Socio-Economic Backgrounds

The special features of Germany's energy policies can best be understood by a look at key historical events, the constitutional framework that obligates both the federal and sub-federal governments (the *Bund* and the *Länder*) to provide energy and combat climate change, and the actors involved in energy production.

1. Historical Developments

Historically, Germany invested heavily in mining and using hard coal (especially in West Germany) and lignite (especially in East Germany) for

3 Federal Ministry for Economic Affairs and Climate Actions (BMWK), Working Group for Renewable Energy Statistics (AGEE-Stat), 'Erneuerbare Energien in Deutschland, Daten zur Entwicklung im Jahr 2024' (2025) 6. Available online at <https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/hgp_erneuerbareenergien_2024.pdf> accessed 31 May 2025.

4 ibid. 8.

energy production.[5] Huge coal deposits as well as rising global oil and gas production and trade provided for plentiful and relatively cheap energy during the 1950s and 1960s. Two major price shocks – caused by the oil crises in the early and late 1970s – forced Germany, however, to redirect its overall energy strategy: Energy saving as well as diversifying energy sources became important policy objectives.[6]

This shift also affected the political debate on the use of nuclear energy during the 1970s and 1980s. During this period a strong anti-nuclear movement developed. This movement was particularly important in the founding of the Green Party (which at least partially explains why the nuclear phase-out remains a key focus of theirs to this day[7]), gained momentum after the Chernobyl disaster in 1986, and achieved the political decision to phase out nuclear power in 1998.[8] This phase-out has been highly controversial over the years ('exiting the exit'), but the Fukushima nuclear accident in 2011 strongly influenced public opinion and led to renewed government dedication to the issue.

Politics in the 1980s were also increasingly influenced by growing concerns about the negative effects of burning coal (namely air pollution and acid rain), leading to the adoption of anti-air pollution legislation.

Energy policy in the 1990s was again strongly influenced by the European Union's efforts to liberalise energy markets, particularly by unbundling utilities and network operators. Since the early 1990s, climate change has also increasingly shaped the political debate about energy production.

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5 Historical overviews can be found in many sources. See e.g. Henning Türk, 'Kleine Geschichte der Energiepolitik' (2022) 46–47 APuZ 17; Barbara Praetorius, 'Grundlagen der Energiepolitik' in Jörg Radtke/Weert Canzler (eds), *Energiewende: Eine sozialwissenschaftliche Einführung* (Springer 2019); Jürgen Friedrich Hake et al., 'The German Energiewende – History and Status Quo' (2015) 3 Energy 532; Thomas Saretzki, 'Energiepolitik in der Bundesrepublik Deutschland 1949–1999. Ein Politikfeld zwischen Wirtschafts-, Technologie- und Umweltpolitik' in Ulrich Willems (ed), *Demokratie und Politik in der Bundesrepublik 1949–1999* (Springer 2001).

6 See German Federal Constitutional Court (*Bundesverfassungsgericht* – BVerfGE) 30, 292 – Erdölbevorratung.

7 In 1984, it introduced a 'Bill concerning the immediate decommissioning of all nuclear installations in the Federal Republic of Germany' (Atomsperrgesetz) in the German Parliament. It was, however, rejected by the parliamentary majority. See Bundestag Printed Documents (*Bundestag-Drucksachen,* BT-Drs.) 10/1013 of 29 August 1984.

8 See below in section E.

All of these various developments together have amalgamated to form a range of key political goals regarding energy production and supply. These goals have been concisely expressed in then Chancellor Merkel's speech in 2011, held immediately after the Fukushima incident: According to her, German energy policy aims to 'reduce CO_2 emissions, phase out nuclear power, increase renewable energy production, and to guarantee competitive energy prices, a functioning infrastructure, energy efficiency and energy supplies'.[9] These objectives are also enshrined in key energy-related legislation currently in force.[10]

Overall, there is a broad consensus in German politics that the *Energiewende* is particularly necessary to effectively combat climate change. The Green Party's coming to power in 2021 and their political agenda within the new government was indicative of this.[11] In addition, the consensus was strengthened by a German Federal Constitutional Court (*Bundesverfassungsgericht*) landmark decision in 2021, which spelled out the government's constitutional obligations to effectively combat climate change.[12] Finally, Russia's aggression against Ukraine ended Germany's energy cooperation with Russia and forced Germany to a) reduce its dependence on gas, b) diversify its supply chains and c) accelerate its energy transformation.[13] Recent legislative actions to promote the *Energiewende* in the heating sector, however, have met strong public and political protests and created severe conflicts within the coalition ruling Germany till May 2025.[14] It

9 Bundeskanzlerin Angela Merkel, 'Der Weg zur Energie der Zukunft' (Government policy statement 09 June 2011) BT-PlPr 17/114, 12960 (A) ff.; see also Bundeskanlzerin Angela Merkel, 'Zur aktuellen Lage in Japan', (Government policy statement 17 March 2011) BT-PlPr 17/96, 10882 (D) ff.

10 See e.g. § 1 German Energy Act (*Energiewirtschaftsgesetz*), 21 Juli 2014, BGBL I 1066.; § 1 Renewable Energy Sources Law (*Erneuerbare-Energien-Gesetz*), 21 Juli 2014, BGBL I 1066.

11 The Social Democratic Party, the Green Party and the Free Democratic Party, *Mehr Fortschritt Wagen: Koalitionsvertrag 2021–2025* (2021) 20–51.

12 BVerfG, Order of the First Senate of 24 March 2021 – 1 BvR 2656/18 -, paras 1–270.

13 Felix Ekardt/Theresa Rath, 'Energiekrise: Rechtsentwicklungen auf EU- und Bundesebene – ein Update' (2023) NVwZ 293; Thomas Mann/Lorenz Lang, 'Ein klimaneutrales Stromnetz für Deutschland' (2023) DVBl 897; Wilfried Erbguth, 'Beschleunigung in Zeiten von Klima- und Energiekrise' (2023) Natur und Recht 242; Markus Ludwigs, 'Gewährleistung der Energieversorgungssicherheit in Krisenzeiten' (2022) NVwZ 1086.

14 Gesetz zur Änderung des Gebäudeenergiegesetzes, zur Änderung des Bürgerlichen Gesetzbuches, zur Änderung der Verordnung über Heizkostenabrechnung, zur Änderung der Betriebskostenverordnung und zur Änderung der Kehr- und Überprüfungs-

remains to be seen how stable the overall consensus will remain in face of the many short and medium-term efforts to accelerate the implementation of the energy transition. The new German government, that took office in May 2025, acknowledged in its coalition agreement that it would rely on new gas power plants to address the challenges of shifting to renewable energy production and to ensure competitive energy prices.[15]

2. Constitutional Background

Germany's energy politics, policies, and legislation are strongly shaped by the legal framework laid down in its Federal Constitution (*Grundgesetz*). The Constitution requires the state to provide energy and also to combat climate change: the interplay of these often competing interests is foundational for understanding the *Energiewende*. It is also helpful to know that the Constitution divides legislative and administrative powers between the federal and the sub-federal governments.

(a) Constitutional Objectives and Obligations

Guaranteeing energy supply and combatting climate change constitute two fundamental interests addressed by Germany's Federal Constitution, both of which are particularly important in the context of the *Energiewende*. In general, the two interests are framed as constitutional objectives. In addition, the Federal Constitutional Court has made clear how important it deems these objectives for safeguarding fundamental rights. Accordingly, both interests are to be pursued by the legislature, the executive, and the courts,[16] but especially by the legislature. In this regard, the Constitution grants it a wide margin of discretion (*Einschätzungsprärogative*). In implementing these objectives and protecting fundamental rights, however, all three powers must balance different constitutional interests carefully and make sure that none of them is disproportionately neglected.

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ordnung, G. v. 16.10.2023 BGBl. 2023 I Nr. 280; Walter Frenz, 'EU-"Heizungsgesetz": eigentumsrechtliche und soziale Grenzen des Klimaschutzes' (2023) EuR 417.

15 The Christian Democrats, the Christian Social Democrats, The Social Democrats, Verantwortung für Deutschland: Koalitionsvertrag 2025–2029 (2025) 33.

16 Art. 1 (3) Grundgesetz.

In its interpretation of Germany's Federal Constitution, the Federal Constitutional Court has characterised the continuous and safe supply of energy 'as fundamental as the interest in our daily bread'.[17] It considers energy safety as a 'public task' and has declared it to be a 'supreme public good' that 'exists regardless of and unaffected by day-to-day politics'.[18] The Court has repeatedly argued that the state is required to guarantee sufficient energy supplies in order to meet its constitutional obligations a) to safeguard the fundamental right to a 'humane existence'[19] and also b) to give effect to its mandate as a 'social federal state',[20] see Art. 1 (1) and Art. 20 (1) German Constitution.[21]

The German Constitution also obliges the state to take climate action. Its Art 20a reads as follows: 'Mindful also of its responsibility towards future generations, the state shall protect the natural foundations of life and animals by legislation and, in accordance with law and justice, by executive and judicial action (…).'[22] In 2021, the Federal Constitutional Court has spelled out in great detail what this means in regard to Germany's obligations to combat climate change.[23] The Court particularly explained that Art. 20a GG 'includes the aim of achieving climate neutrality'.[24] Notably, the Court has argued that fundamental rights laid down in the Constitution constitute 'intertemporal guarantees of freedom' and afford 'protection against the greenhouse gas reduction burdens imposed by Art. 20a (…)

17 Translated by the author, see BVerfGE 91, 186 (206).

18 Translated by the author. The Court uses the term 'absolutes Gemeinschaftsgut', see BVerfGE 25, 25, 1 (16) and BVerfGE 30, 292 (323–24).

19 'Human dignity shall be inviolable.' Art. 1 (1) German Constitution (official translation).

20 'The Federal Republic of Germany is a democratic and social federal state', Art. 20 (1) German Constitution.

21 See BVerfGE 66, 248 (258); BVerfGE 30, 292 (324); See also Annette Guckelberger, 'Energie als kritische Infrastruktur' (2015) DVBl 1213 f.; see also Reinhard Ruge, *Die Gewährleistungsverantwortung des Staates und der Regulatory State: Zur veränderten Rolle des Staates nach der Deregulierung der Stromwirtschaft in Deutschland, Großbritannien und der EU* (Dunker & Humblot 2004) 218–232; Johannes Saurer, 'Verfassungsrechtliche Konfliktlagen im Klimaschutzrecht' in: *Bitburger Gespräche, Jahrbuch 2021* (C.H. Beck 2022) 97.

22 Official translation available online at <www.gesetze-im-internet.de/englisch_gg/> accessed 30 January 2024.

23 BVerfG, Order of the First Senate of 24 March 2021 – 1 BvR 2656/18 -, paras 1–270. Explaining and commenting this decision, Gerd Winter, 'The Intergenerational Effect of Fundamental Rights: A Contribution of the German Federal Constitutional Court to Climate Protection' (2023) Journal of Environmental Law 1.

24 BVerfG, Order of the First Senate of 24 March 2021 – 1 BvR 2656/18 -, para 2.

being unilaterally offloaded onto the future.'[25] The Constitution 'imposes an obligation to safeguard fundamental freedom over time and to spread the opportunities associated with freedom proportionately across generations.'[26] Based on this idea, the Court decided that the emission reduction goals in the Federal Climate Law (*Klimagesetz*) at the time were insufficient, forcing the legislature to revise the law and change its goal to achieve net-zero-emissions from 2050 to 2045, thus tightening the legal time frame for the *Energiewende*.

Notably, obligations resulting from Art. 20a GG do not take absolute precedence over other constitutional interests. In cases of conflict, they must be balanced with other constitutional interests and principles.[27] In this regard, however, the Federal Constitutional Court has pointed out that 'the obligation to take climate action is accorded increasing weight as climate change intensifies.'[28]

(b) Division of Legislative Powers

Regarding the energy sector, Germany's Federal Constitution delegates broad legislative powers to the federal legislature.[29] It is responsible for choosing between different energy sources and structuring the sector (generation and supply). Accordingly, most legislative acts on renewable energy production are adopted at the federal level. Energy related legislation in general is mainly based on three Articles. In particular, Art. 74.1.11 of the Constitution entitles the federal legislature to adopt laws on 'matters of the energy industry' (*Energiewirtschaft*). Based on this title, Germany's central energy act – the Federal Energy Industry Act (*Energiewirtschaftsgesetz* – EnWG) – was adopted and subsequently modified over the years. Most importantly, the EnWG defines energy supply as a service of public interest and includes provisions regulating energy prices as well as the planning and development of the electricity grids. In addition, Art. 73.1.14 and Art. 74.1.24 of the Constitution authorise the federal legislature to act on the civil de-

25 ibid para 4.
26 ibid para 4.
27 ibid para 2.a.
28 ibid para 2.a.
29 For a comparative perspective on both Germany's the US's Energy Federalism see Johannes Saurer/ Jonas Monast, 'Renewable Energy Federalism in Germany and the United States' (2020) 10 Transnational Environmental Law 293.

ployment of nuclear energy as well as air pollution. Federal states, however, still hold some important legislative powers and – even more so – administrative competences which are highly relevant for the implementation of the *Energiewende*.[30] It is estimated, for example, that 55 % of all energy related legislative acts at the federal level have to be supported by the federal states in second legislative chamber, i.e. the *Bundesrat* (Federal Council).[31] In addition, federal states have adopted their own climate laws and their local communities hold the competence to designate specific areas for renewable energy projects.[32]

3. Actors and their Interests

The *Energiewende* requires ambitious actions by all parties involved. This includes both vertical and horizontal coordination and cooperation of actors, i.e. at different government levels (local communities, federal states, the federation, the EU, and also between states) as well as among different ministries and important private stakeholders. It has been pointed out that Germany's federal states pursue varying interests regarding the *Energiewende*, depending on, for example, their overall emissions, the structure of their respective economies (whether focusing on industrial production or having a strong renewable sector), and their spatial policies.[33] At the federal level, the Ministry for Economic Affairs and Climate Actions is the most powerful ministry, being responsible for both energy and climate policy. It is supported by the Ministry for the Environment, Climate Action, Nature Conservation, Nuclear Safety, the Ministry for the Interior (responsible for developing the building sector), and the Foreign Ministry (responsible for Germany's international climate policy). In many cases, coordination with or consent from the other ministries is required by law,

30 In principle, the German Constitution assigns the power to implement federal legislation to the federal states, see Art. 83 German Constitution.

31 Michèle Knodt/Jörg Kemmerzell, 'Alle für die Energiewende? Akteure und Institutionen in der deutschen Energiepolitik' (2022) 46–47 APuZ 25 f.

32 Matthias Knauff, 'Landesklimaschutzgesetze' in Michael Rodi (ed), *Handbuch Klimaschutzrecht* (C.H. Beck 2022); Cathrin Zengerling, 'Kommunale Klimaschutzplanung' in Michael Rodi (ed), *Handbuch Klimaschutzrecht* (C.H. Beck 2022).

33 Stefan Wurster/Christina Köhler, 'Die Energiepolitik der Bundesländer. Scheitert die Energiewende am deutschen Föderalismus?' in Achim Hildebrandt/Frieder Wolf (eds), *Die Politik der Bundesländer. Zwischen Föderalismusreform und Schuldenbremse* (2nd edn, Springer 2016) 283–314.

providing checks and balances and giving an opportunity to the various ministries involved to promote their own sectoral interests.[34]

Two more specific sets of actors are also highly influential in shaping the *Energiewende*. German energy politics strongly relies on purpose specific – often *ad hoc* – commissions, councils, and working groups to develop, negotiate, and monitor policies.[35] These bodies are either composed of experts or of actors representing different societal interests.[36] In addition, despite all efforts to liberalise the energy sector, four major energy providers still dominate the German energy market. Together they constitute a powerful voice in German energy politics. In the past, these enterprises have often lobbied to their own immediate interests, usually obstructing the *Energiewende*.[37]

D. (Moving) Targets for the Energy Transition and Key Implementation Challenges

Germany has adopted a broad set of quantifiable targets for its energy transition. Such targets have been subject to continuous revision and adapted several times over the years, mainly in service of accelerating and fine-tuning the energy transition. Acceleration, however, has created several challenges. It has become clear, for example, that in order to achieve the envisaged goals, the government has to substantially increase its financial support for both research and development, and to level out financial burdens which have been unequally distributed. Accordingly, it has begun to invest heavily in research on PtX, carbon capture and storage, carbon capture and use, electricity storage, and digitalisation[38], as well as increasing funding for building hydrogen transport infrastructures,[39] and

34 Knodt/Kemmerzell (n 31) 28.

35 ibid 28 f.

36 Two of these bodies will be introduced later in this chapter, i.e. The Ethical Commission – Safe Energy Supply and The Coal Commission. See below sections E., F.

37 Gregor Kungl, *Die großen Stromkonzerne und die Energiewende* (Campus Verlag 2018); Claudia Kemfert, *Das fossile Imperium schlägt zurück. Warum wir die Energiewende jetzt verteidigen müssen* (Murmann 2017).

38 Bundesregierung, 'Forschungs- und Innovationsförderung des Bundes im Bereich der Zukunftsvorsorge – Forschung für Grundlagen und nachhaltige Entwicklung (Antwort der Bundesregierung auf kleine Anfrage)' BT-Drucksache 20/5758, 21.2.2023.

39 Bundesregierung, 'Fortschreibung der nationalen Wasserstoffstrategie – NWS 2023'

providing support for those who cannot afford increasing energy prices.[40] In addition, non-financial measures promoting acceleration include the shortening of administrative and court procedures concerning renewable energy projects[41], developing strategies and legislation for carbon capture and use or storage and CO_2-removal[42], and boosting international cooperation with a view to building transboundary electricity grids, increasing gas, solar energy and hydrogen imports, and the export of CO_2 for storage.[43]

Another challenge for administrations and legislatures is the need to balance increasingly tense conflicts and overcome acceptance issues with concerns over nature protection (e.g. effects on birds created by wind turbines)[44], restrictions on the free use of privately or municipally owned or administered land (e.g. because of electricity grid development)[45], and structural changes in specific economic sectors and labour markets (e.g.

<www.bmbf.de/SharedDocs/Downloads/de/2023/230726-fortschreibung nws.pdf?__blob=publicationFile&v=1> accessed 30 January 2024.

40 Bundesregierung, 'Überblickpapier der Bundesregierung zur Gas- und Strompreisbremse, 15.12.2022' <www.bmwk.de/Redaktion/DE/Downloads/Energie/gas-strompreis-bremse-uebersicht.pdf?__blob=publicationFile&v=1> accessed 30 January 2024.

41 Regarding procedures see e.g.Peter Schütte/Sarah Langstädtler, 'Deutschlandtempo als "new normal"?' (2024) ZUR 3; Angela Schwerdtfeger, 'Beschleunigungsgebiete für Erneuerbaren Energien – Fragen des Rechtsschutzes' (2023) EurUP 365; Angela Schwerdtfeger, 'Beschleunigung durch Beschränkung des Rechtsschutzes?' (2023) ZUR 451; Sabine Schlacke/Helen Wentzien/Dominik Römling, 'Beschleunigung der Energiewende: Ein gesetzgeberischer Paradigmenwechsel durch das Osterpaket?' (2022) NVwZ 1577.

42 Till Markus/Danny Otto/Daniela Thrän, 'Die Carbon Management Strategie und CCS im Lichte klima- und energierechtlicher Weichenstellungen' (2024) ZUR 387; Claudio Franzius, 'CDR-Technologien auf dem Weg in die Klimaneutralität' (2024) EurUP 119.

43 Claudio Franzius 'Beschleunigung des Markthochlaufs von Wasserstoff: Fördermöglichkeiten und Beschleunigungsaspekte für Infrastrukturen und Erzeugungsanlagen' (2024) ZUR 72; Bundesregierung, *The Revised German Hydrogen Strategy* (2023); see also below in Section I.

44 Illustrative BverfG (1 BvR 2523/13) Rotmilan, BverfGE [2018] 149, 407 [23]. See Wolfgang Köck/Till Markus, 'German Courts on Scientific Uncertainties in Nature Conservation Law' in Mariolina Eliantonio/Emma Lees/Tiina Poliniitty (eds), *EU Environmental Principles and Scientific Uncertainty Before National Courts – the case of the Habitats-Directive* (Bloomsbury: Hart Books, 2023).

45 See e.g. Pascal Langenbach, 'Zur Rezeption empirischer Forschung und psychologischer Verfahrenstheorie in der verwaltungsrechtlichen Debatte zur Akzeptanz des Stromnetzausbaus' (2022) Die Verwaltung 191; Johanna Decher, *Die Rechte der Gemeinden beim Ausbau des Übertragungsnetzes* (Mohr Siebeck 2022); see also articles in Kurt Faßbender/Wolfgang Köck (eds), *Aktuelle Entwicklungen und Probleme beim*

the closure of nuclear plants[46], coal mines, and coal power plants).[47] The following table provides an overview of the most important political and legal targets that drive the energy transitions:

Table 2: Political and Legal Targets for Germany's Energy Transitions

Target Type	Content and Timeframe
Emission Reductions	• Net Zero: 2045 / Negative Emission 2050[48] • Energy Sector: 280 by 2020 / 108 by 2030 (CO_2-eq mio t)[49]
Nuclear Phase-Out	• April 2023[50]
Coal Phase-Out	• 2038 (aiming for 2035)[51]
Oil & Gas Phase-Out	• Specific measures but no deadlines and no quantitative targets
Renewable Energies[52]	• 80 % electricity from renewable sources by 2030 • 160 GW from onshore wind by 2040 • 2 % of the German territory must be made available for onshore wind farms • 70 GW from offshore wind by 2045 • 400 GW from solar power by 2040 • 8.4 GW from biomass by 2030

Netzausbau (Nomos 2021). See also Birgit Peter, *Legitimation durch Öffentlichkeitsbeteiligung* (JCB Mohr 2020).

46 See below section E.

47 See below section F.

48 § 3 (2) Bundes-Klimaschutzgesetz (Federal Climate Act) of 12 December 2019 (BGBl. I 2513), which was amended by Article 1 of the Act of 15 July 2024 (BGBl. I 235).

49 ibid, § 4, Annex 2.

50 See below section E.

51 § 2 (2), Nr. 3, § 4 (1) Kohleverstromungsbeendigungsgesetz (KVBG). Germany committed itself internationally to exit by 2035, see G7, 'Climate, Energy and Environment Ministers' Meeting Communiqué, Ministerial meeting on Climate, Energy and Environment – 28–29–30 April' (2024).

52 Goals regarding renewable energy from onshore wind farms, solar power, and biomass are laid down in § 1 (2) and § 4 of the Renewable Energy Sources Act, Erneuerbare-Energien-Gesetz of 21 July 2014 (BGBl. I 1066), which was last amended by Article 1 of the Act of 21 February 2025 (BGBl. 2025 I Nr. 52). Goals for renewable energy from offshore wind farms are laid down in § 1 (2) Windenergie-auf-See-Gesetz of 13 October 2016 (BGBl. I S. 2258, 2310), which was last amended by Article 44 of the Act of 23 October 2024 (BGBl. 2024 I Nr. 323). Regarding the 2 % goal see Gesetz zur Erhöhung und Beschleunigung des Ausbaus von Windenergieanlagen an Land, BGBl. I 2022 1353.

Target Type	Content and Timeframe
Hydrogen	• 10 GW electrolysis capacity by 2030[53]
Electricity Grid	• Approx. 14,000 km extension planned[54]

E. Nuclear Exit

Very few countries in the world have decided to leave nuclear energy production entirely behind.[55] This is particularly true in regard to countries that have many, relatively modern, and comparatively safe facilities in operation.[56] Over 27 years (i.e. 1962 to 1989), Germany built and put into operation 32 commercial nuclear power plants. Their share in electricity production peaked around the year 2000 at roughly one third.[57] Different German governments have made the Nuclear Exit a top priority of their respective energy policy, outranking even the coal phase-out. Both nuclear energy production in general and the Nuclear Exit in particular have been highly controversial and led to severe political and legal conflicts, many of which ended up in the Germany's highest courts.[58]

Strong opposition to nuclear energy production emerged in the early 1970s, leading to protests in front of power plant construction sites as well as to legal actions before courts. Most litigation revolved around the

53 Bundesregierung, Wasserstoffstrategie (n 39).

54 Federal Ministry for Economic Affairs and Energy, 'Aktueller Stand des Netzausbaus' (2025), < https://www.bmwk.de/Redaktion/DE/Downloads/M-O/netzausbau-schreitet-voran.pdf?__blob=publicationFile&v=5> accessed 10 June 2026.

55 For a current overview see World Nuclear Association, Plans for New Reactor Worldwide (2023) <https://world-nuclear.org/information-library/current-and-future-generation/plans-for-new-reactorsworldwide.aspx> accessed 30 January 2024.

56 Examples include Italy, Spain, and Taiwan, ibid.

57 See, e.g. International Energy Agency, 'Germany' <www.iea.org/countries/germany> accessed 30 January 2024.

58 Joachim Radkau, *Aufstieg und Krise der deutschen Atomwirtschaft 1945–1975: Verdrängte Alternativen in der Kerntechnik und der Ursprung der nuklearen Kontroverse* (Rowohlt 1983); Alexander Glaser, 'From Brokdorf to Fukushima: The Long Journey to Nuclear Phase-out' (2012) 6 Bulletin of the Atomic Scientists 10–21; Dolores L Augustine, *Taking on Technocracy. Nuclear Power in Germany, 1945 to the Present* (Berghahn Books 2018); Stephen Milder, *Greening Democracy. The Anti-Nuclear Movement and Political Environmentalism in West Germany and Beyond, 1968–1983* (Cambridge University Press 2017).

following three arguments[59]: First, the risk of major accidents could not be ruled out. Second, exhaust air and waste water from regular operations and minor accidents could threaten human health. Third, the safe disposal of nuclear waste was not ensured. Only very few courts, however, decided over the years to annul permissions or actually stop operations.[60]

During the 1980s and particularly in the aftermath of the Chernobyl disaster in 1986, political support for nuclear energy began to fade. Two legislative proposals for a phase out were initiated in the federal parliament.[61] It took, however, until 1998 for the then ruling coalition between the Green Party and the Social Democrats to commit itself to a 'comprehensive and irreversible' exit.[62]

As a first step towards implementing the exit, the government negotiated and agreed with the four major German energy providers operating nuclear power plants. The agreements were integrated into the Nuclear Energy Act (*Atomgesetz*) on 25 July 2002.[63] From then on, no further permission for new nuclear plants would be issued and the existing ones were only allowed to produce a limited quantity of electricity (equalling 32 years' operation in total for each plant). Early shutdowns of old plants would also be incentivised by allowing the transfer of permissions to newer facilities. The law also allowed producers to store nuclear waste temporarily on-site at the power plants.[64]

In 2009 a new government – a coalition between the Christian Democratic Union and the Free Democratic Party – decided to maintain the ban of new facilities, but to extend the plants' overall operation time and to use

59 Gerd Winter, 'The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanation, and the Role of Law' (2013) 25 Journal of Environmental Law 95.

60 ibid.

61 BT-Drs. 10/1013 of 29 August 1984; BT-Drs. 11/13 of February 1987.

62 Coalition Agreement between the Social Democrats and the Green Party, *Aufbruch und Erneuerung – Deutschlands Weg ins 21. Jahrhundert* (1998) 16 <www.spd.de/fileadmin/Dokumente/Beschluesse/Bundesparteitag/koalitionsvertrag_bundesparteitag_bonn_1998.pdf> accessed 30 January 2024.

63 Law on the Structural Phasing Out of Nuclear Energy Use for Peaceful Purposes (Gesetz zur geordneten Beendigung der Kernenergienutzung zu friedlichen Zwecken), BGBl. 2002, I 1357. Amending particularly § 7 (1a-b) with Annex 3 AtG.

64 For a comprehensive sociological study on the issue of storing radioactive waste in Germany see Jens Pape, *Politik und Recht der Endlagerung radioaktiver Abfälle* (Nomos 2016).

them as a 'bridge technology' in the energy transition.[65] A new agreement was negotiated between the federal government and the four major energy suppliers in 2010 and was again integrated into the Atomic Energy Act. Producers would receive quotas allowing them to continue production with their older plants for eight more years, and with newer ones for 14 more years. In exchange, producers were required to pay fees that would be channelled into the energy transition.[66]

In response to the Fukushima accident in March 2011, the ruling government reconsidered its position on the role of nuclear power. Recognising a fundamental shift in public opinion and strategically anticipating several imminent elections in different federal states, the Federal Government decreed a 'nuclear moratorium', requiring safety checks for all operational nuclear power plants and a three-month shutdown for the seven oldest ones (and for one that had been out of operation due to technical issues). In addition, the government appointed an independent group of experts to develop an exit strategy (The Ethical Commission – Safe Energy Supply). Based on this advice, the government once again amended the Nuclear Energy Act: The formerly introduced extensions were withdrawn and provisional shutdowns were turned into permanent ones. Already granted production quotas, however, could be transferred to those plants still in operation.[67]

The Nuclear Exit was supposed to come to an end on 31 December 2023. The shut-down of the last three nuclear power plants was postponed, however, once more to 15 April 2023, to level out rising energy prices induced by the severe reduction in gas supply due to complications caused by the Russian invasion of Ukraine.[68] Discussions about reviving some of the most modern plants have not fully died down due to the energy prices remaining at high levels.[69]

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65 The Christian Democrats, the Christian Social Democrats, and the Free Democrats, 'Coalition Agreement' (2012) 29 <www.kas.de/c/document_library/get_file?uuid=83dbb842-b2f7-bf99-6180e65b2de7b4d4&groupId=252038> accessed 30 January 2024.

66 11th Amendment of the Atomic Energy Act of 8 December 2010, BGBl. 2010 I 1814; Nuclear Fuel Tax Acts of 8 December 2010, BGBl, 2010 I 1804.

67 § 7 I lit. a-b, Annex 3 AtG (version of 22 April 2002).

68 19th Amendment of the Atomic Energy Act (19. AtGÄndG) vom 4.12.2022, BGBl. 2022 I 2153.

69 See e.g. two recent articles in important German newpapers: Christian Geinitz, 'CDU-Wirtschaftsrat: Atomkraft fortsetzen, Stromsteuer senken' *Frankfurter Allgemeine Zeitung* (Frankfurt 1 September 2023); Eric Gujer, 'Die deutsche Verblen-

F. Coal Phase-Out

As in other European countries, German industrialisation was fuelled by coal. For over a century between the 1860s and 1960s, coal was by far Germany's most important energy source. Coal's descent began slowly in the late 1950s when oil and gas became more easily available on the world market, making coal less competitive.[70] In recent decades, growing environmental concerns in general and climate targets in particular were additional drivers.[71] Decline was slow, however, and coal still accounted for nearly 30 % of the domestic electricity production in 2019.[72]

The intentional, systematic policy-driven exit arguably began in June 2018 when the German government, run by a coalition of the Christian and Social Democrats, established the Commission for Growth, Structural Change, and Employment (Coal Commission). The Coal Commission was composed of a broad spectrum of stakeholders and experts and mandated to draw up a strategy for phasing out coal-based energy production and mitigating the effects on regional economies and workers' interests.[73] Its report was submitted in January 2019[74] and formed the base for parliamentary negotiations of two laws, i.e. the Act to Reduce and End Coal-Powered Energy and Amend Other Laws (Coal Phase-Out Act) and the Structural Support for Coal Regions Act (Structural Support Act), which were adopted on 3 July 2020 and entered into force on 14 August 2020[75].

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dung – Der Atomausstieg ist nichts als Ideologie' *Neue Züricher Zeitung* (Zürich 14 April 2023).

70 Franz-Josef Brüggemeier, 'Das Zeitalter der Kohle in Europa, 1750 bis heute' in bpb (ed), *Abschied von der Kohle: Struktur- und Kulturwandel im Ruhrgebiet und in der Lausitz* (2021) 12–25.

71 Tessa Coggio/Thane Gustafson, 'When the Exit? The Difficult Politics of German Coal' (2019) 37 German Politics & Society 47, 56.

72 See above section B.

73 Kommission "Wachstum, Strukturwandel und Beschäftigung", 'Abschlussbericht' (26 January 2019) 6 f. <www.bmwk.de/Redaktion/DE/Publikationen/Wirtschaft/abschlussbericht-kommission-wachstum-strukturwandelund-beschaeftigung.html> accessed 30 January 2024. See also Olaf Däuper, 'Die Empfehlungen der Kohlekommission: Inhalte und juristische Fragestellungen' (2019) EnWZ 153.

74 Kommission "Wachstum, Strukturwandel und Beschäftigung" (n 73); see also Katharina Baudisch/Dörte Fouquet, 'Germany's Coal Exit Plan: A Legal and Political Outline on How Germany Plans to Phase out Coal Fired Power Stations by 2038' (2019) 9 Renewable Energy Law and Policy Review 45 f.

75 The Coal Phase Out Act is structured in several sections. Each section includes either a stand-alone act or amendments to other laws. Each section is headed by an Article.

In principle, the Coal Phase-Out Act gradually demands reducing the use of coal-powered energy in Germany, aiming to ultimately stop in 2038. In particular, it lays down a timeline for ending electricity generation from hard coal and lignite. By 2022, power generated from both coal types had to be reduced to around 15 gigawatts (GW) each.[76] By 2030, reduction to 8 GW for hard coal and 9 GW for lignite must be achieved.[77] Even by 2038 at the latest, the use of coal-fired plants must come to an end.[78] This schedule may be subject to revision to decide whether the exit can be achieved by 2035.[79]

Targets are to be reached by different means for hard coal and lignite. For hard coal, a two-step approach has been adopted. First, until 2027 hard coal plant operators are called upon to voluntarily shut-down their power plants.[80] To incentivise operators, the act sets up an (reverse) auction system in which operators are granted the opportunity to competitively offer production reduction and receive financial compensation in return.[81] The German Federal Network Agency has organised the auctions and determined a maximum tender volume for each auction.[82] To motivate operators to shut down earlier, compensation sums have decreased each year. Second, after 2027, no more compensations will be paid and operators will simply be required to end their operation according to a specific plan.[83] With regard to lignite power plants, the Coal Phase-Out Act determines specific dates and rules for determining compensation sums for individual

Section 1 (headed by Article 1) includes the Act on the Reduction and Termination of Coal-fired Power Generation (Coal-fired Power Generation Termination Act), i.e. the Gesetz zur Reduzierung und zur Beendigung der Kohleverstromung (Kohleverstromungsbeendigungsgesetz – KVBG), see Gesetz zur Reduzierung und zur Beendigung der Kohleverstromung und zur Änderung weiterer Gesetze (Kohleausstiegsgesetz) vom 8. August 2020 (BGBl I S. 1818); Strukturstärkungsgesetz Kohleregionen vom 8. August 2020 (BGBl. I S. 1795).

76 § 2 (2) Nr. 1 Coal-fired Power Generation Termination Act.

77 ibid § 2 (2) Nr. 2.

78 ibid § 2 (2) Nr. 3, § 4.

79 ibid §§ 47, 56.

80 ibid §§ 10 ff.

81 In a 'reverse auction' the seller bids for the price at which he/she is willing to offer his or her good or service. For an illustrative explanation of how the auction system works under the Coal Phase Out Act, see Agora Energiewende, *Coal Phase-Out in Germany: The Role of Coal Exit Auctions* (2022) 13–20.

82 § 18, § 19 Coal-fired Power Generation Termination Act (n 75).

83 ibid §§ 27–39.

facilities (beginning in 2020 and ending in 2038).[84] This system is supplemented by a general ban of new coal-fired plants after 14 August 2020 (i.e. the day the Act entered into force)[85] as well as a general ban on burning coal for energy production (entering into force in different cases under specific conditions at different points in time).[86]

In addition to phasing out the use of coal, the Structural Support Act offers financial support to affected plant operators, workers, and regions. The Structural Support Act allocates 14 billion Euros to lignite coal regions until 2038 and 1.09 billion Euros to hard coal regions. It also channels a further 26 billion Euros to infrastructure projects and new jobs in federal agencies within the affected areas till 2038.[87] In addition, coal-plant workers 58 years of age and older who lose their jobs due to the decommissioning of plants will be compensated for a maximum of five years until they are eligible to retire (and receive a pension).[88]

The phase-out has been criticised on various grounds. Energy providers have argued that phasing out coal and nuclear would threaten energy safety and investment security, and increase costs for industrial production, thus creating a competitive disadvantage for Germany industries and enterprises.[89] Overall, compensation sums were regarded as too low.[90] Economic experts have opined that the government's exit strategy was much too

84 Lignite coal mines and lignite coal power plants operators will receive compensation for ending operations. Compensations sums are individually negotiated with the government, approved by the parliament, and laid down in contracts (öffentlich-rechtliche Verträge). §§ 40–50, 44 (1–3), Annex 2, 49 Coal-fired Power Generation Termination Act (n 75).

85 ibid § 53. This general ban was subject to one exception: plants which had received a permit before January 29, 2020. The exception was inserted to allow the modern hard coal-fired Datteln IV plant to operate.

86 § 51 Coal Phase Out Act (n 75).

87 See § 1 and § 11, § 27 (2) Structural Support Act (n 75).

88 § 57 Coal-fired Power Generation Termination Act (n 75).

89 See, e.g. Deutscher Industrie- und Handelskammertag, 'Stellungnahme zum Kohleausstiegsgesetz – Kabinettsfassung' (19 May 2020) <www.dihk.de/resource/blob/24158/baf1397129bd90dc52ba5b94dd6b1dc4/dihk-stellungnahme-kohleausstiegsgesetz-kabinettsfassung-data.pdf> accessed 30 January 2024.

90 Some plant operators had argued and sued for higher compensations. See e.g. BVerfG, Beschluss der 1. Kammer des Ersten Senats vom 18. August 2020- 1 BvQ 82/20 -, Rn. 1–32. The file was rendered inadmissible. The plant operator was denied legal standing because the plant was 85.9 % owned by municipalities and could therefore not invoke fundamental rights.

costly: Increasing carbon prices in the EU's emission trading system as well as the growing competition from other energy sources would have rendered coal use unprofitable anyway and most likely caused a market induced phase-out (possibly even earlier).[91] Furthermore, it was argued that alternative governance approaches might have achieved the phase-out earlier and less costly.[92] The Green Party (which was not in government at the time) and green non-governmental organisations basically argued that the phase-out was too slow and that it would make achieving Germany's obligations under the Paris Agreement difficult.[93]

G. Oil & Gas

Like coal, oil and gas are emission-intensive fossil fuels. Not all fossil fuels, however, are equally harmful, and natural gas in particular performs better in regard to greenhouse gas emission intensity. Many countries have encouraged switching from coal or oil to gas and using it as a 'bridge fuel' to a low(er) greenhouse gas emission economy.[94] To this day, Germany has not adopted any specific targets for a gradual or final phase-out for oil and gas. It has, however, adopted several measures which aim to reduce the use of oil and gas, particularly targeting the transport and heating sector. The two most recent and pertinent measures will be highlighted here.

First, to put a price on emissions not covered by the European Emission Trading System (ETS), Germany has adopted the Fuels Emission Trading Act (*Brennstoffemissionshandelsgesetz* – BEHG) in 2021.[95] The basic rationale behind the act is to establish a national emission trading scheme that complements the ETS by requiring those who place CO_2-intensive fuels

91 See e.g. German Council of Economic Experts, 'Setting Out for A New climate Policy' (2019) 37–44 <www.sachverstaendigenratwirtschaft.de/fileadmin/dateiablage/gutachten/sg2019/sg_2019_en.pdf> accessed 30 January 2024.

92 Johann-Christian Pielow, 'Rechtsfragen des Kohleausstiegs' in Michael Rodi (ed), *Handbuch Klimaschutzrecht* (C.H. Beck 2022) 600 f.

93 For an overview of the green criticism see e.g. Louisa Reitbaur, 'The New German Coal Laws: A Difficult Balancing Act' (2021) 11 Climate Law 176, 185–187.

94 See e.g. Justin Gundlach/Michael B Gerrard, 'Climate Change and energy Transition Policies' in Jorge E Viñuales/Emma Lees (eds), *The Oxford Handbook of Comparative Environmental Law* (Oxford University Press 2019) 531, 565–567.

95 Brennstoffemissionshandelsgesetz of 12 December 2019 (BGBl. I 2728), which was last amended by Article 7 of the Act of 22 December 2023 (BGBl. 2023 I Nr. 412).

on the market to obtain and submit (tradeable) emission certificates and to gradually limit the total number of certificates ('upstream emissions trading').[96] This system in effect makes using oil and gas increasingly expensive and using renewable energy more attractive. Fuels covered by the new scheme include, for example, petrol, diesel, heating oil, natural gas, coal and materials for waste incineration.[97] Rising costs ought to be passed on to fuel end-users, who are thus incentivised to reduce their consumption.[98] From 2027 on the amount of certificates in national emission trading scheme will be linked (and thus limited) to Germany's overall emission budget granted under EU law.[99] In addition, the BEHG ensures that those participating in the ETS are not charged twice under the two trading regimes.[100] In such cases participants will be compensated.[101]

Second, to lower fossil fuel dependency in the heating sector, Germany recently adopted legislation to substantially amend its Building Energy Act (*Gebäudeenergiegesetz* – GEG).[102] This amending act has often been termed the 'Heating Systems Act' (*Heizungsgesetz*)[103], because it primarily establish-

96 § 1 BEHG.

97 § 2 Annex I BEHG.

98 The law intends to pass costs on to end users. It is the users (not the providers) of fuels who ultimately decide the quantities used, see Miriam Vollmer, 'BEHG/Nationales Brennstoffemissionshandelssystem (nEHS)' in Michael Rodi (ed), *Handbuch Klimaschutzrecht* (C.H. Beck 2022) 325 f.

99 See § 4 (1), S. 2 BEHG. The law refers to the overall emissions laid down in § 4 (1) and Annex I of the Regulation
(EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by member states from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 [2018] OJ L 156/26. Before 2027, there was not an overall cap, turning the price mechanism into a fee or tax. It was heavily discussed whether the fee or tax approach was in compliance with the German constitution, see Vollmer (n 97) 315.

100 In principle, this should not happen, see § 7 (5) BEHG.

101 § 11 (2) BEHG.

102 Gebäudeenergiegesetz of 08 August 2020 (BGBl. I S. 1728), which was last amended by Article 1 of the Act of 16 October 2023 (BGBl. 2023 I Nr. 280). The Building Energy Act has existed since 2020. It aims to reduce greenhouse gas emissions from buildings by increasing the use of renewable energy and unavoidable waste heat for energy supply. The Act requires that these measures be economically viable, socially acceptable, and efficiency-enhancing. See § 1 GEG.

103 Gesetz zur Änderung des Gebäudeenergiegesetzes, zur Änderung des Bürgerlichen Gesetzbuches, zur Änderung der Verordnung über Heizkostenabrechnung, zur Änderung der Betriebskostenverordnung und zur Änderung der Kehr- und Überprüfungsordnung, G. v. 16.10.2023 BGBl. 2023 I Nr. 280. See Thomas Hei-

es a set of requirements regarding the phasing out of oil- and gas-based heating systems for most types of buildings.[104] The GEG entered into force on 1 January 2024. In principle, from now on any new heating system that is installed has to run on 65 per cent renewable energy (but existing heaters may continue to be operated and broken heaters may be repaired).[105] The law distinguishes between new and existing buildings: While newly built houses generally fall within the remit of the general requirement from 1 January 2024 onwards, different deadlines apply for existing buildings as well as new buildings which are being constructed in urbanised areas (i.e. placed into 'gaps between existing bulidings' or *Baulücken*). This last exception allows for a better integration of newly built buildings into existing long-distance heating systems. Depending on the size of the city, deadlines are 30 June 2026 (for cities with less than 100,000 inhabitants) or 1 June 2028 (for cities with more than 100,000 inhabitants).[106] The law also provides that the 65 per cent obligation is automatically met where specific types of more sustainable heating systems are installed (e.g. systems connected to the local or regional public heating systems, electrical heat pumps, solar-thermal systems, biomass- or hydrogen-based heating systems, etc.)[107] The newly introduced regime also provides the government the opportunity to grant massive financial support for installing new heating systems, in some cases covering up to 70 % of the arising costs.[108] Despite the significant public funding, the Heating Systems Act has remained unpopular. The new government, which took office in May 2025, has indicated that it will abolish many of the requirements introduced by the Act.[109]

In parallel to revising the GEG, another central measure has been developed and adopted. The Heat Planning and Decarbonisation of Heating Networks Act (*Gesetz für die Wärmeplanung und zur Dekarbonisierung der Wärmenetze – Wärmeplanungsgesetz*) was passed by the German legislature

nicke, 'Das "Heizungsgesetz" – Die Voelle des Gebäudeenergiegesetzes und dem Blickwinkel von Art. 14 GG' (2024) KlimRZ 3.

104 § 2 GEG determines the types of buildings that fall within the act's remit.

105 § 71 (1) GEG.

106 § 71 (8) GEG.

107 § 71 (3), § 71 lit. b-h GEG.

108 Federal Ministry for Economic Affairs and Climate Actions, 'Richtlinie für die Bundesförderung für effiziente Gebäude – Einzelmaßnahmen (BEG EM) vom 21. Dezember 2023' (BAnz AT 29.12.2023 B1) 1–32.

109 The Christian Democrats, the Christian Social Democrats, The Social Democrats, Verantwortung für Deutschland: Koalititionsvertrag 2025–2029 (2025) 24.

on 17 November 2023 and entered into force on 1 January 2024.[110] The Act's main goal is also to transition away from fossil fuels in heat supply.[111] To this end, it requires federal states to systematically establish 'heat plans' for their respective territories.[112] In addition to this obligation, the law aims to significantly expand and promote heat supply by long-distance heating systems which will deliver energy from renewable sources or waste heat.[113] To this end, it sets ambitious targets for grid operators. For example, grids must derive at least 30 % of their heat from renewable energy sources or waste energy by 2030, and at least 80 % by 2040.[114] Both enhancing planning in general and decarbonising energy supply through long distance grid systems may strengthen the overall role of centralised heating systems in the future. This development will probably also be stimulated by § 109 GEG which entitles local municipalities (or associated municipalities) to require their respective citizens to connect their buildings to long-distance heating or cooling systems.[115]

H. Promoting Renewable Energy

It has been aptly pointed out that integrating renewable energy into existing energy systems meets three basic challenges: 'price competitiveness of renewable with traditional generation, difficulties in siting renewable facilities and transmission lines (…), and integrating renewables' variable outputs and financial profiles (…) into existing grid operations and accounting'.[116] Germany has responded to these challenges by adopting different sets of legislation.[117] Since the early 1990s the German government's efforts to

110 BGBl. 2023 Teil I Nr. 394, 1–30.
111 § 1 Wärmeplanungsgesetz.
112 § 4 – § 25 Wärmeplanungsgesetz.
113 § 2 Wärmeplanungsgesetz.
114 § 29 (1) Wärmeplanungsgesetz.
115 Municipalities are entitled to require connection 'for the purpose of climate and resource protection.' The provision had been introduced earlier in § 16 of the Renewable Energy Heating System Act (Gesetz zur Förderung Erneuerbarer Energien im Wärmebereich), Gesetz vom 07.08.2008 (BGBl. I S. 1658). On the legal nature and constitutional legality of this requirement see, in particular, Federal Administrative Court, Judgment 08.09.2016 (BVerwG 10 CN 1.15).
116 See e.g. Gundlach/Gerard (n 94) 531, 561.
117 For a more comprehensive overview see Michael Fehling's chapter in this book. See also for a more general account of the financial instruments supporting the energy

advance renewable energy production, however, had a strong focus on promoting the transformation of the electricity sector, particularly by creating financial incentives for investing in renewable energy production.[118] Efforts to expand and improve management of transmission lines began significantly later but have been increased and accelerated in recent years.[119] The following subsection will provide an overview of the measures which have aimed to promote the price competitiveness of renewables.[120]

The Electricity Feed-in Act of 1990 (*Stromeinspeisungsgesetz* – StrEG) constituted an important early step in this regard, establishing a kind of prototype approach for subsequent legislation: It required energy providers (which at that time also owned the energy transmission lines) to purchase renewable energy from producers in accordance with technology-specific feed-in tariffs.[121] This basic obligation established a reliable support scheme for producers by substantially lowering their investment risks. While this scheme had no significant impact on expanding solar energy production, wind power generation increased from 70 MW in 1990 to 4,445 MW by 1999.[122]

In 2000 the German legislature developed this approach into a more comprehensive system and adopted the Renewable Energy Sources Act (*Erneuerbare Energien Gesetz* – EEG). To this day, the EEG has remained Germany's central regulatory instrument to promote investments in renewable energy production. In 2000 its overall goal was to promote climate protection by doubling renewable energy production by 2010. Producers of renewable energy received the right to require transmission line operators to provide certain information, expand their grids, connect production units, accept their renewable energy (even prioritise it over energy derived from fossil fuels), and reimburse them in accordance with technology-spe-

transition Michael Rodi, 'Das Instrumentarium zur staatlichen Finanzierung der Energietransformation' (2023) 11 KlimR 322.

118 For a more comprehensive account of German law on the expansion of renewables see Fehling, in this volume, 301 ff.

119 Phillip Fest, 'Der Netzausbau im Recht der Energiewende' (2013) NvWZ 824; Mann/Lang, 'Ein klimaneutrales Stromnetz für Deutschland' (n 13).

120 For a more comprehensive analysis see Fehling, in this volume, 301 ff.

121 The Act was based on Art. 74.1.11 and Art. 74.1.24 of the German Constitution, Gesetz über die Einspeisung von Strom aus erneuerbaren Energien in das öffentliche Netz (Stromeinspeisungsgesetz – StrEG), 7.12.1990, BGBl. I 2633.

122 Jan Resthöft, 'Klimaschutz durch das Erneuerbare-Energien-Gesetz' in Michael Rodi (ed), *Handbuch Klimaschutzrecht* (C.H. Beck 2022) 401 f.

cific feedin tariffs.[123] In effect, the EEG provided for long-term price guarantees that would compensate producers of renewable energy for their relatively high production costs. The EEG also provided for a surcharge mechanism to refinance payments guaranteed to investors in renewable energy production. This surcharge was passed on to energy consumers.[124] Over the years, the EEG has been subjected to many minor and major revisions and has become increasingly complex. The basic mechanisms, however, have remained in place.

The most important legislative revision should briefly be outlined here. Major amendments took place in 2004, 2009, 2012, 2014, 2017, 2021, and 2023[125]; the 2014 and 2017 reforms in particular brought about fundamental changes to the existing system. In general, the EEG's early version could be described as a simple legal framework that aimed to massively ramp-up renewable energy production. Later versions added a lot more fine-tuning, necessary for overcoming specific conflicts and challenges emerging as the sector grew. Reforms mainly responded to changes in the market or to political and legal actions taken at European Union level: While production and installation costs for renewable energy decreased over the years, the overall public costs for the energy transition rose. In addition, the EU Commission grew increasingly critical of the distorting effects of Member States' support schemes on the Common European Market and sought a more competition-oriented development of the sector.[126] Against this background, the system of long-term feed-in tariffs was slowly phased out. The 2009, 2012, and 2014 reforms introduced and developed the possibility for renewable energy producers to sell their electricity directly on the electricity market.[127] The 2017 reform substantially modified the support scheme by deciding the level of public payments through auctions: First, the competent authority would announce a premium for the production of a certain quantity of renewable energy. Second, producers would submit

123 § 3 (1) EEG. For a comprehensive overview of the development of the EEG see Reshöft (n 120); Thorsten Müller, 'Vom Kartell- zum Umwelt(energie)recht' in Thorsten Müller (ed), *20 Jahre Recht der Erneuerbaren Energien* (Nomos 2012). See also Saurer/Monast (n 29) 299–302.

124 Energy intensive industries were exempted from the surcharge to maintain their global competitiveness.

125 For more details see Resthöft (n 120) 487–504.

126 See e.g. Commission Guidelines on State Aid for Environmental Protection and Energy 2014–2020.

127 § 17 EEG (2009). See also Resthöft (n 122) 493–496.

their bids by declaring how much energy they would offer to deliver for the respective premium. Third, the bidder offering the lowest price would win the auction. Fixed feed-in tariffs would become the exception and only be granted for small-scale installation (e.g. roof-top solar panels). With a view to geographically matching production with grid capacities, the EEG 2017 also lowered funding for onshore wind farms in areas that had insufficient grid capacities.[128] Finally, the 2017, 2021, and 2023 reforms introduced and developed specific pathways for the key renewable energy production methods (on- and offshore wind, solar energy, and biomass).[129] The 2023 reform aimed at substantially accelerating the expansion of renewable energy production, qualifying renewable projects as an 'overriding public interest', thus prioritising them over other public interests in administrative and judicial decision making. In addition, local communities are entitled to greater financial benefit from providing space for onshore wind farms. Finally, financial support for innovative projects involving hydrogen production and storage has been substantially increased.[130]

Ramping up renewable energy production has met many different challenges. Over the years, spatial, environmental, and acceptance issues have become increasingly visible. For example, optimal spaces for siting wind farms are grown scarce.[131] Only 4 % of potential sites on German territory are deemed 'optimal' in regard to farms' operational effectiveness, their impacts on adjacent neighbours, their optic effects on landscapes, and their potential for damaging fauna (particularly birds).[132] Specific conflicts have arisen, for example, in the context of building and expanding transmission lines.[133]

Notably, building transmission lines from north to south has been slowed down due to political opposition by some federal states and citizens.[134] In addition, local communities have become increasingly reluctant

128 See § 1 (2), S. 2 and § 36 c EEG 2017.

129 See table 1 above.

130 See § 2, § 6, §§ 28 lit. f and § 28 lit. g EEG (2023).

131 For an animated overview of spatial distribution of all renewable energy production units in Germany over time see the UFZ, 'EE-Monitor' (Renewable Energy Monitor) <https://web.aufz.de/ee-monitor/> accessed 30 January 2024.

132 Philip Tafarte/Paul Lehmann, 'Quantifying trade-offs for the spatial allocation of onshore wind generation capacity – a case study for Germany' (2021) 2 UFZ Discussion Paper.

133 See e.g. Urteil vom 06.04.2017 – BVerwG 4 A 2.16.

134 See e.g. Federal Administrative Court, SüdLink, Beschluss vom 09.05.2019, Az.: 4 VR 1.19, BVerwG, SüdOstLink, Beschluss vom 24.03.2021, 4 VR 2.20.

to plan and permit wind farms on their territories, arguing that burdens and benefits are not equally shared between them and the energy producers.[135] Many citizens living in close proximity to wind farms also began to challenge the permission and operation of wind farms before courts, claiming that they are negatively affected by farms' visual impact and noise, as well as experiencing safety issues.[136] Finally, some federal states have been reluctant to support wind farm development by adopting prohibitive spatial requirements regarding farms' distance from houses or urban areas. In response, to provide the necessary space for onshore wind farming, the federal legislature adopted a law that requires federal states to allocate at least 2 % of their territories to wind-farming, forcing them to grant more importance to wind energy in their spatial planning.[137]

I. Sector-coupling: the example of hydrogen

In June 2020 the German federal government adopted and published the 'National Hydrogen Strategy'. According to the Strategy, hydrogen 'will play a key role in enhancing and completing the energy transition'.[138] In this regard, the government deems five functions of hydrogen most important: hydrogen as an energy source, as a storage medium, for sector coupling, as a base substance for various chemical products, and to eliminate process-related emissions in different industrial processes.[139] The Strategy focuses on 'green hydrogen' (produced by using renewable energy[140]) and aims to promote its 'rapid market rollout'.[141] To this end, the government

135 Sachverständigenrat für Umweltfragen, *Klimaschutz braucht Rückenwind: Für einen konsequenten Ausbau der Windenergie an Land* (2022) 55–62.

136 ibid.

137 Gesetz zur Erhöhung und Beschleunigung des Ausbaus von Windenergieanlagen an Land, BGBl. I 2022 1353. For an overview of the far-reaching implications of this law, see: Claudio Franzius, 'Das Recht der Energiewende – Bestandsaufnahme und Entwicklungsperspektive' (Teil 1) (2025) JURA, forthcoming.

138 Bundesregierung, *The German Hydrogen Strategy* (2020) 2. English version available online at <www.bmbf.de/bmbf/shareddocs/downloads/files/bmwi_nationalewasserstoffstrategie_eng_s01.pdf?__blob=publicationFile&v=2> accessed 30 January 2024.

139 ibid 2.

140 Green hydrogen is defined by the Strategy as follows: 'green hydrogen is produced via the electrolysis of water; the electricity used for the electrolysis must derive from renewable sources. (…).' ibid 28.

141 ibid 3.

announced its intention to provide substantial investments in research and development, achieve specific targets for creating generation capacity (5 GW till 2030 and additional 5 GW till 2035), build up international hydrogen partnerships, and substantially expand transport infrastructures. Two institutions were also installed to support the hydrogen ramp-up, i.e. the 'National Hydrogen Council' (made up of 26 high-level experts from science, business and civil society) and a 'State Secretaries Committee on Hydrogen' (composed of high-ranking officials from the relevant ministries). Both units aim to provide continuous knowledge and organisational support.[142] Finally, the Strategy lays down an action plan including 38 specific measures to support hydrogen's market ramp-up. Measures include specific actions in different fields of application (industry, heat, infrastructure, transport, research and education), as well as political actions at the EU and international level.

In 2023, the National Hydrogen Strategy was substantially revised. These revisions were necessary due to changes in energy markets and to quickly become independent from Russian energy supply. The Revised Strategy's overall objective is to substantially accelerate hydrogen's build-up. To this end, targets for creating generation capacity till 2030 were doubled from 5 GW to 10 GW. In addition, the Government committed itself to establish a working 1,800 km long hydrogen grid by 2027/2028. Legally, the Government announced that it will adopt legislation to accelerate planning and permission procedures for hydrogen related facilities and to establish sustainable production, transport, and use standards both at the national and the international level.[143] The Government also made more explicit estimations regarding hydrogen demands and hydrogen supply. In 2023 it assumed that by 2030 demand for hydrogen in Germany will lie at 95 to 130 TWh, 50 to 70 percent of which will have to be satisfied by imports.[144] Sufficient imports, however, will have to be systematically organised and guided through a 'Hydrogen Import Strategy'. The Strategy was published in July 2024 and addresses topics such as ensuring sustainable extraterritorial production, transboundary transport infrastructures, and reliable financing of imported hydrogen.[145]

142 ibid 14–15.

143 Bundesregierung, *The Revised German Hydrogen Strategy* (2023) 5, 14, 26–29.

144 ibid 9.

145 See Bundesregierung, Import Strategy for hydrogen and hydrogen derivatives (2024). English version available at <https://www.bmwk.de/Redaktion/EN/Publ

The federal government has taken several legislative steps after publishing its first version of the Hydrogen Strategy.[146] Such laws address different factors that will enable hydrogen's build up, particularly regarding its production, (including permission procedures), its transportation through grids, its use as a fuel in the transportation sector.[147] The above mentioned EEG was amended and further implemented in 2021 to provide for a clear cut legal definition of hydrogen and to financially incentivise production (by exemptions from certain tax and fee schemes, and the EEG surcharge mechanism).[148] In addition, legal framework provisions were laid down for testing and deploying offshore hydrogen production facilities.[149] Most importantly, however, the Federal Energy Industry Act (EnWG) was substantially developed to provide legal certainty with a view to investing into the development of hydrogen grids, inter alia by laying down definitions (from now on, hydrogen is deemed as a form of energy under the law), giving provisions regarding the unbundling of grids, and also by regulating access to and fees for their use.[150]

Developing the legal frame for the German hydrogen ramp-up at the federal level is shaped by some specific challenges.[151] First, climate targets and energy scarcity have put severe pressure on the German government to accelerate the energy transition. Hydrogen is a key element in this regard and needs to be ready for large-scale deployment in just a few years. Second, the whole process is somewhat complicated by the fact that the

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ikationen/Energie/importstrategy-hydrogen.pdf?__blob=publicationFile&v=7> accessed 28 July 2025.

146 Overview in Bundesregierung, *Fortschrittsbericht zur Umsetzung der Nationalen Wasserstoffstrategie* (2022) 27–31.

147 See Gesetzentwurf der Bundesregierung zur Beschleunigung der Verfügbarkeit von Wasserstoff und zur Änderung weiterer rechtlicher Rahmenbedingungen für den Wasserstoffhochlauf sowie zur Änderung weiterer energierechtlicher Vorschriften v. 29.5.2024, BT-Drs 20/11899 v. 21.6.2024.

148 See § 12 lit. i of the Verordnung zur Umsetzung des EEG 2021 und zur Änderung weiterer energierechtlicher Vorschriften, BT-Drucks. 19/29793 vom 19.05.2021.

149 Verordnung zur Vergabe von sonstigen Energiegewinnungsbereichen in der ausschließlichen Wirtschaftszone (SoEnergieV).

150 See the current versions of § 1, § 3 Nr. 14, § 28 lit j. to § 28 lit. s., § 112 lit b. and § 113 lit. a to § 113 lit. c ENWG.
See also Verordnung über die Kosten und Entgelte für den Zugang zu Wasserstoffnetzen (Wasserstoffnetzentgeltverordnung). See Ulrich Büdenbender, 'Die Regulierung von Wasserstoffnetzen nach der EnWG-Novelle 2021' (2022) 3 RdE 101.

151 Claudio Franzius, 'Das Recht der Energiewende – Bestandsaufnahme und Entwicklungsperspektiven' (Teil 2), (2025), JURA, forthcoming.

federation is 'locked-in' between its federal states and the European Union. On both levels, political and legal actions have been adopted and require substantial coordination efforts in order to avoid inhibiting progress and creating contradictions. It has been observed, for example, that the EU is waiting to see what its member states do, while member states like Germany wait for what happens at the EU level.[152] In addition, most German federal states have also developed their own hydrogen strategies which require coordination with each other and with the federal government.[153] Third, green hydrogen production, transport, and use all depend on large quantities of renewable energy. Renewable energy, however, is already a scarce resource in Germany and demand is likely to increase in the coming years.[154] In particular, land for producing renewable energy is becoming increasingly hard to find, thus making (complex) international partnerships for a fast hydrogen ramp-up inevitable. Accordingly, there is a strong need to develop hydrogen policies at the EU and international levels.

J. Conclusions

The German Energy Transition bears some specific and some generic characteristics. While its comprehensiveness and its current speed seem to be somewhat special, its challenges and conflicts are likely to be more generic. Both dimensions are particularly interesting for developing comparative perspectives.[155]

152 Claudio Franzius, 'Beschleunigung des Markthochlaufs von Wasserstoff – Fördermöglichkeiten und Beschleunigungsaspekte für Infrastrukturen und Erzeugungsanlagen' (2024) 2 ZUR 72–81; Christian Schneller, 'Der neue Rechtsrahmen für Wasserstoff – Provisorium oder Perspektive' (2021) 4 ER 135–146.

153 See Michèle Knodt et al., 'Mehr Kooperation wagen: Wasserstoffgovernance im deutschen Föderalismus. Interterritoriale Koordination, Planung und Regulierung' (2022) Kopernikus-Projekt Ariadne 5–32.

154 For example, other means to combat climate change will require both large amounts of renewable energy or space, i.e. technology or nature based carbon dioxide removal operations. See Till Markus, 'Land-use Implications of Carbon Dioxide Removal: An Emerging Legal Issue?' (2022) International Yearbook of Soil Law and Policy 107; See also Freia Harzendorf et al., 'Multi-Factor Site Assessment for Effective Direct Air Capture and Storage Roll-out' (2024) Environmental Research Letters (forthcoming).

155 See e.g. Gundlach/Gerard, (n 94); Michael Mehling, 'The comparative law of climate change: a research agenda' (2015) 24 RECIEL 341; Till Markus, 'Zur Rechtsvergleichung im nationalen und internationalen Umweltrecht' (2022) ZaöRV 649.

To this day, Germany is the only industrialised country to have plans for exiting both coal and nuclear energy. In addition, ambitious steps have also been taken with a view to reducing the use of oil and gas to transform the transportation and heating sectors. Altogether, this makes Germany a pioneer in energy transition, both in the European Union and globally.[156]

In addition, few industrialised countries currently seem to be transforming their energy sectors at a similarly fast pace. The Green Party rising to power in 2021, the Federal Constitutional Court's decision on Germany's obligations to increase its effort to combat climate change, and the Russian-Ukrainian conflict created powerful impulses. The latter has particularly pressured Germany to reduce its gas consumption earlier than planned, as well as to (at least) try to rely less on gas as a 'bridge fuel' to a low-carbon economy. All three causes together compel Germany to aggressively roll out renewable energy production, including the fast ramp-up of alternative energy carriers (such as green hydrogen), support infrastructures, and new technologies.[157]

Acceleration, however, catalyses challenges and fuels conflicts that currently put severe pressure on the overall political consensus regarding further steps to implement the energy transition.

Rising energy prices, particularly after the cut-back of Russian gas in 2022, have reignited political claims to extend deadlines for both the Nuclear Exit and the Coal Phase-Out. Major concerns were voiced with a view to the effects of rising prices on the industry's competitiveness ('unequal global playing field') and their disproportionate effect on lower-income populations. Populist movements have made use of people's fears regarding rising energy prices in particular and structural change in general, putting additional political pressure on the government to slow down the transition's pace.

Furthermore, promoting and scaling up renewables has created structural, environmental, and acceptance issues, bringing to light the energy

156 The complementary emission trading system and the Heating legislation can be characterised as proactive national climate actions within the European Union legal framework. See Claudio Franzius, 'Rechtliche Möglichkeiten einzelner Staaten zum unilateralen Schutz globaler Umweltgüter' in Till Markus/Markus Reese/Wolfgang Köck (eds), *Zukunftsfähiges Umweltrecht III: Unilaterale Beiträge zur globalen Nachhaltigkeitsordnung – Pflichten, Möglichkeiten, Grenzen* (Nomos 2023).

157 Schneller has rightly pointed out that the German hydrogen sector has to be developed basically from scratch. Schneller, 'Der neue Rechtsrahmen für Wasserstoff' (n 152) 135.

transition's spatial, ecological, and justice dimensions. Conflicting use interests, opposing environmental objectives, and distributional matters have kept the legislature, administrations, and courts increasingly busy over the years, requiring them to both substantially expand and fine-tune the body of law governing the energy transition. The necessity to accelerate the transition has put pressure on the government to meet these issues more quickly.

Acceleration is being supported mainly by two strategies, i.e. increasing public expenditure and improving governance. First, huge amounts of public support have been granted and promised for phasing out old technologies (coal, nuclear, and also for reducing the use of oil in the heating sector) and for rolling out new technology (research, development, imports of and infrastructures for green hydrogen). Second, in regard to improving governance, powers have been centralised (e.g. transferring climate action to the Ministry of Economics in 2021, [the decision was, however reversed by the new government in 2025]; assigning powers regarding the allocation of spaces for renewables partly to the federal level[158]), coordination among actors has been institutionalised (by creating new coordinating units e.g. the *Klimakabinett* in 2019, the *Bund-Länder-Kooperationsausschuss* regarding renewables in 2021, and the 'Hydrogen Council'), and administrative and court procedures have been streamlined in order to accelerate permission and implementation of renewable energy production and related infrastructure projects.

This chapter has aimed to sketch out a rough map of the central regulations and policy measures that pursue and put into effect the German *Energiewende*. To this end, it provided a brief introduction to its historical and constitutional background and a first glimpse at the roles played by different actors at different levels. It has also included a discussion of general legal targets when it comes to energy transition, followed by laws pertaining to phasing out or reducing the use of specific energy sources (nuclear, coal, oil and gas). Finally, an overview was given of legislation promoting the transition to renewables and green hydrogen. Such a map necessarily offers only an entry point for further comparative research on specific political

158 To provide the necessary space for onshore wind farming, the federal legislature adopted a law that requires federal states to allocate at least 2 % of their territories to wind-farming, forcing them to grant more importance to wind energy in their spatial planning. See Gesetz zur Erhöhung und Beschleunigung des Ausbaus von Windenergieanlagen an Land, BGBl. I 2022 1353.

strategies and legal measures, all of which tend to be complex in their formulation but even more so in their implementation.

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