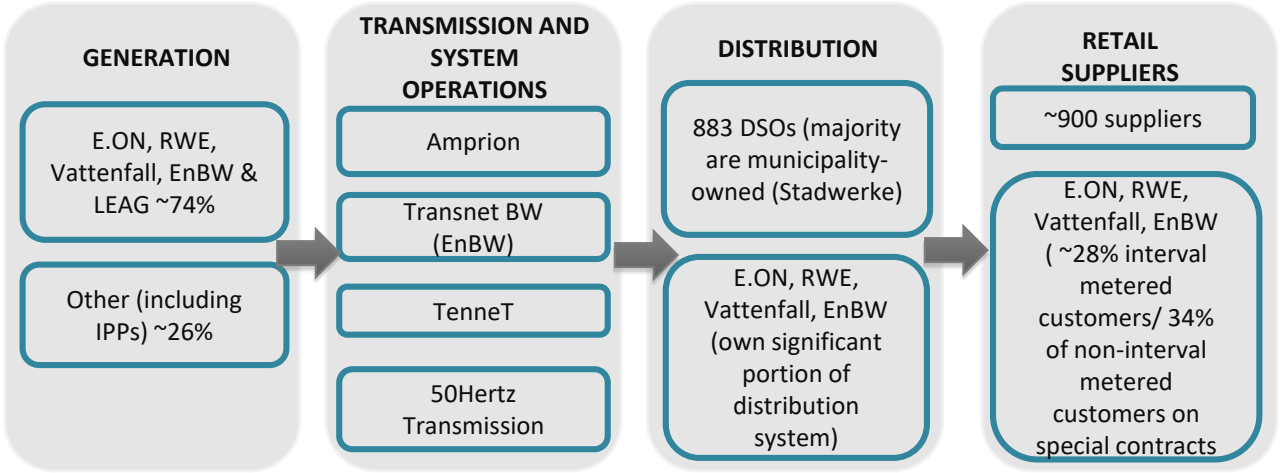
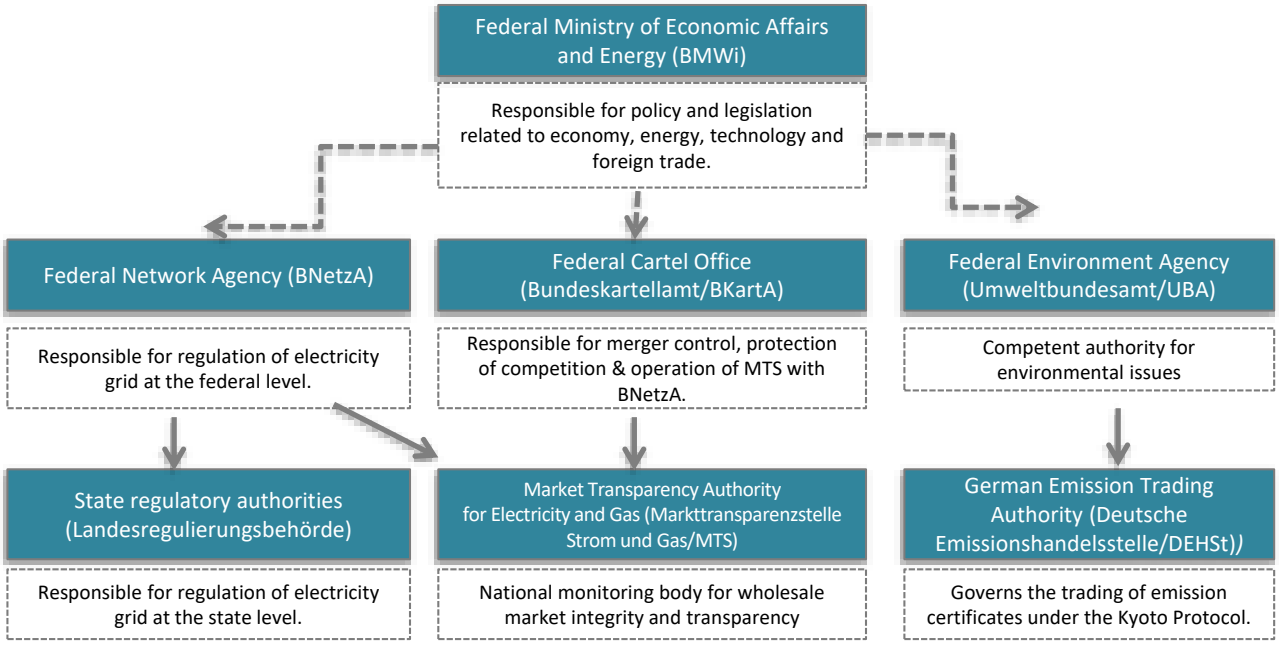
Institutional and regulatory structure, and key players

- Germany's energy sector policy and regulatory regime have been driven by Energiewende—the country's policy to fast-track the phase-out of its nuclear power plants by 2022 and to integrate massive amounts of renewable energy into the grid. Germany aims to meet 80-100% of its electricity needs through renewable resources by 2050.
- In the generation segment, RWE, E.ON Vattenfall, EnBW and LEAG (which acquired Vattenfall's lignite business in Germany in 2016) are among the key players.
- In the transmission segment, Germany has four grid owners and operators— Amprion GmbH, TenneT TSO GmbH, 50Hertz Transmission, and TransnetBW GmbH. Germany's distribution and retail segments are characterised by the presence of several players, including the four energy giants. Most of the distribution grids (generally at 110 kV and below) are owned by the municipalities (called Stadtwerke). These grids feed electricity into local grids at lower voltages. There were 875 distribution system operators (DSOs) as of 2020.
- The electricity market in Germany is regulated by Federal Network Agency (Bundesnetzagentur/BNetzA). The Bundesministerium für Wirtschaft und Technologie (BMWi) or the Ministry of Economic Affairs and Energy, is responsible for energy planning in Germany.

Germany's electricity industry structure and key players



Germany's electricity institutional structure



Growth in installed capacity, generation and consumption

- Germany installed generation capacity stood at XXX MW at the end of 2020. Of this majority (58%) was based on renewable energy.
- As of December 2021, Germany had an installed generation capacity of XXX MW. Of this, 56% was based on renewable energy, 34% on thermal, 6% was based on hydropower and 4% on nuclear.
- During 2006–21, electricity production and consumption each declined at a CAGR of 0.6%, reaching XXX GWh and XXX GWh in 2021 respectively.

Growth in installed generation capacity (MW)

	2017	2020	2021	CAGR (%)
Hydro	XXX	XXX	XXX	0.7
Nuclear	XXX	XXX	XXX	-
Thermal	XXX	XXX	XXX	-
Renewables	XXX	XXX	XXX	4.2
Total	XXX	XXX	XXX	**1.9**

Growth in generation and consumption (GWh)

	2017	2020	2021	CAGR (%)
Generation	XXX	XXX	XXX	-
Consumption	XXX	XXX	XXX	-

Expected growth in generation capacity and consumption

- Under the scenarios developed in the latest development round (Scenario Framework for the Network Development Plan for Electricity 2035, version 2021), an addition of 70 GW to 98 GW is envisaged by 2035 and 103 GW by 2040. In line with Energiewende, the underlying scenarios reflect an energy system without nuclear energy, largely without coal electricity with an advanced state of development of renewable energies on land and at sea as well as an increasingly flexible asset base responding electricity demand. The forecast for installed offshore wind capacity ranges from 28 GW-32 GW by 2035 and 40 GW by 2040.
- The scenarios also take into account the national ambitions related to sector coupling (including heat, transport, gas and industrial sectors), development of electromobility and hydrogen strategy. Sector coupling technologies in the future system will not only be a relevant factor as additional consumers but also offer additional flexibility that supports the integration of renewable energies.
- Under all the scenarios, there will be an increase in electricity consumption driven by further electrification of other sectors and a progressive sector coupling. Over 70% of the electricity consumption would be covered by renewable energy by 2035 and over 75% by 2040. In the first three scenarios up to 2035, consumption is expected to grow at 0.7%; 0.8% and 1.1% respectively while under the fourth scenario up to 2040, consumption will grow at 0.9%.

Expected addition to generation capacity (GW)

Source	Scenario A 2020–35	Scenario B 2020–35	Scenario C 2020–35	Scenario B 2020–40
Nuclear	(8.1)	(8.1)	(8.1)	(8.1)
Lignite	(13.1)	(20.9)	(20.9)	(20.9)
Coal	(22.6)	(22.6)	(22.6)	(22.6)
Gas	8.1	12.4	16.7	12.4
Oil	XXX	XXX	XXX	XXX
Pumped storage	XXX	XXX	XXX	XXX
Other conversion based sources	XXX	XXX	XXX	XXX
Wind onshore	XXX	XXX	XXX	XXX
Wind offshore	XXX	XXX	XXX	XXX
Photovoltaic	XXX	XXX	XXX	XXX
Biomass	XXX	XXX	XXX	XXX
Hydropower	XXX	XXX	XXX	XXX
Net capacity addition	XXX	XXX	XXX	XXX

Expected growth in electricity demand (GWh)

	2022	2025	2030	2035	2040
Scenario A 2035	586,413	598,323	618,714	639,800	XXX
Scenario B 2035	590,063	604,857	630,342	656,900	XXX
Scenario C 2035	XXX	XXX	XXX	XXX	XXX
Scenario B 2040	XXX	XXX	XXX	XXX	XXX

Note: 2021 data is based on preliminary actual figures for installed capacity, generation and consumption.
Source: BMWi; BNetzA; AG Energiebilanzen e.V; Global Transmission Research