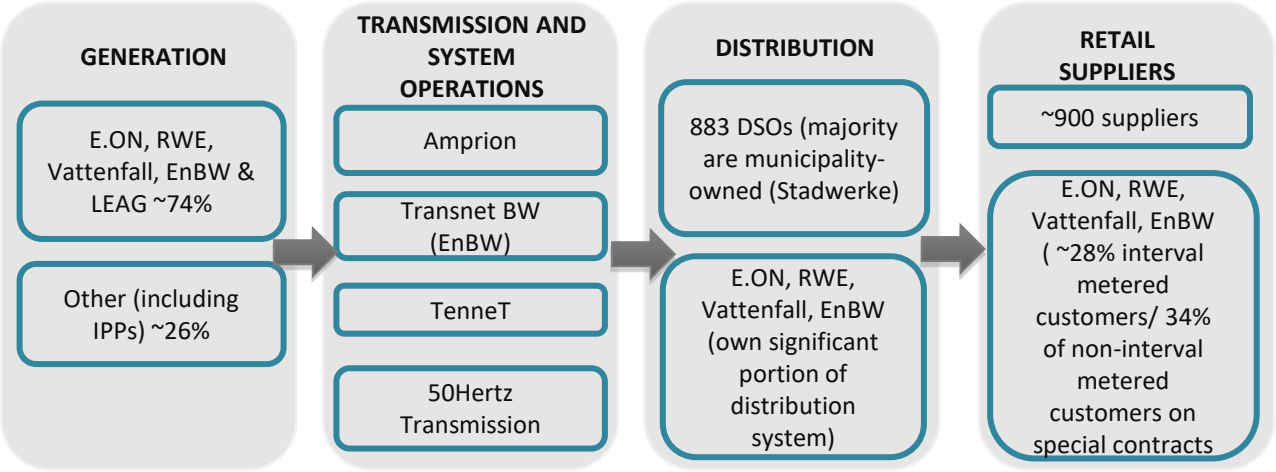
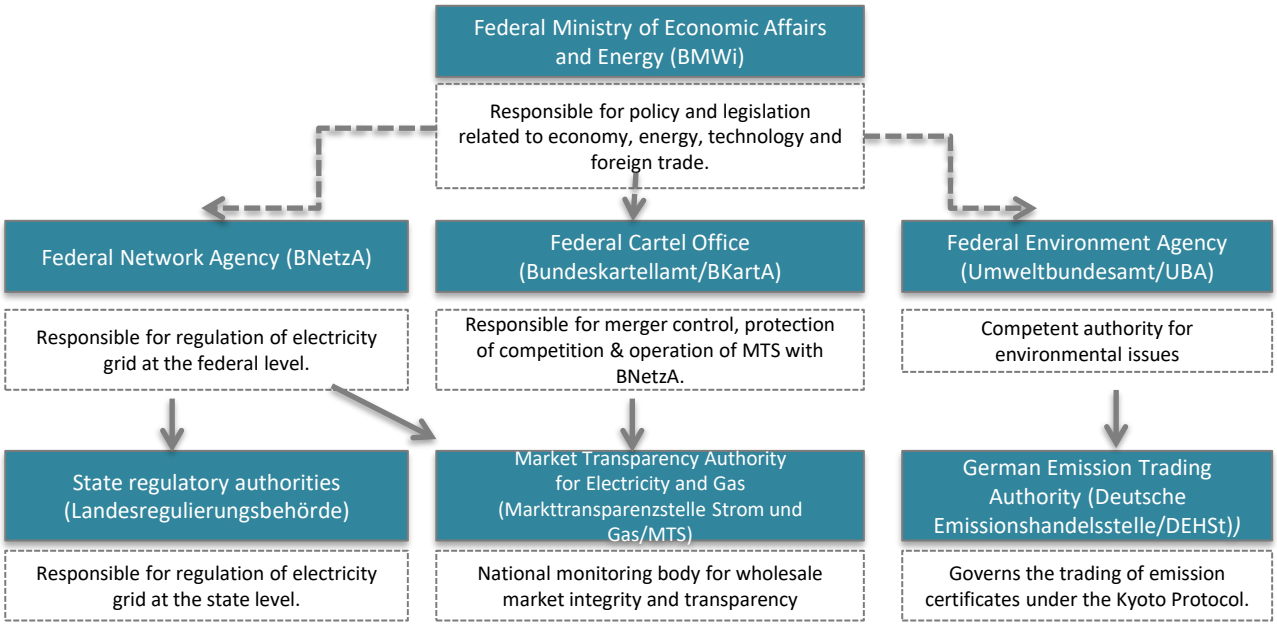
Institutional and regulatory structure, and key players

- 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 883 distribution system operators (DSOs) as of 2019.
- 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 GW at the end of 2020. Of this majority (58%) was based on renewable energy.
- Though during 2014–19, installed capacity increased at a CAGR of only XX%, renewable energy-based generation capacity witnessed a CAGR of almost XX%. Other sources of generation – hydro, nuclear and thermal – all witnessed a decline in the capacity base.
- During 2014–19, both electricity production and consumption declined. During 2018-19, electricity generation and consumption declined by XX% and XX% and stood at XXXXX GWh and XXXXX GWh in 2019 respectively.

Growth in installed generation capacity (MW)

	2014	2018	2019P	CAGR (%)
Hydro	10,320	XXXX	XXXX	XX
Nuclear	12,696	XXXX	XXXX	XX
Thermal	87,466	XXXX	XXXX	XX
Renewables	91,511	XXXX	XXXX	XX
Total	**XXXXXX**	**XXXXXX**	**XXXXXX**	**XX**

Growth in generation and consumption (GWh)

	2014	2018	2019P	CAGR (%)
Generation	626,700	643,500	611,500	XX
Consumption	XXXXXX	XXXXXX	XXXXXX	XX

Expected growth in generation capacity and consumption

- Under the draft scenarios developed in the latest development round (Scenario Framework for the Network Development Plan for Electricity 2035, version 2021), an addition of XX GW to XX GW is envisaged by 2035 and XXGW by 2040. The scenarios are differentiated according to the parameters of pace of transformation (speed of implementation of energy transition) and degree of innovation (technological form). In all these scenarios, the basic assumptions for the long term include over 95% reduction in power plant carbon emissions by 2050 compared to 1990 level; share of renewable energies in gross electricity consumption to increase well over 80% by 2050; and comprehensive flexibility of conventional power plant fleet.
- Under the new scenarios, it is noted that there will be an increase in electricity consumption (as against a decline forecasted previously) across all scenarios driven by further electrification of other sectors and a progressive sector coupling required for economic decarbonisation. In the first three scenarios up to 2035, consumption is expected to grow at XX%; XX% and XX% respectively while under the fourth scenario up to 2040, consumption will grow at XX%.

Expected addition to generation capacity (GW)

Source	Scenario A 2019–35	Scenario B 2019–35	Scenario C 2019–35	Scenario B 2019–40
Nuclear	(9.5)	(9.5)	(9.5)	(9.5)
Lignite	(16.0)	(18.9)	(18.9)	(18.9)
Coal	(18.6)	(21.8)	(21.8)	(21.8)
Gas	XXX	XXX	XXX	XXX
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
Net capacity addition	**XXX**	**XXX**	**XXX**	**XXX**

Expected growth in electricity demand (GWh)

	2020	2025	2030	2035	2040
Scenario A 2035	599,849	XXXXXX	XXXXXX	XXXXXX	-
Scenario B 2035	603,411	XXXXXX	XXXXXX	XXXXXX	-
Scenario C 2035	609,379	XXXXXX	XXXXXX	XXXXXX	-
Scenario B 2040	603,660	XXXXXX	XXXXXX	XXXXXX	XXXXXX

Note: 2019 data is based on preliminary actual figures for installed capacity, generation and consumption.
Source: BMWi; BNetzA; AG Energiebilanzen e.V; Global Transmission Research