



Germany

Europe and others

Ease of doing Solar classification



Achiever

Electricity Consumption in kWh/capita (2020)

6550.6

Average PVout in kWh/kWp/day (2020)

3.0

Cumulative Solar Capacity in MW (2021)

58726.0

Getting Electricity Score (2020)

98.8

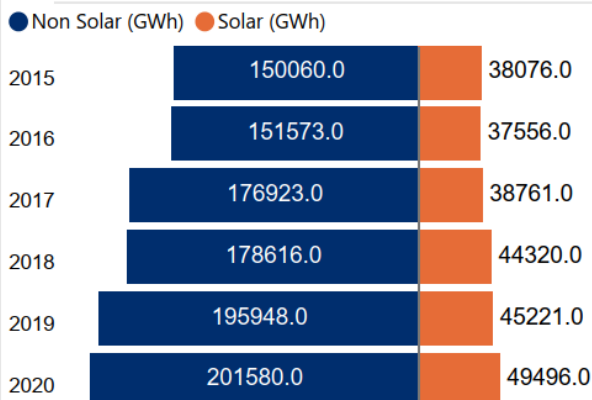
NDC Target by 2030 in % (base year 1990)

55.0

Human Development Index (2021)

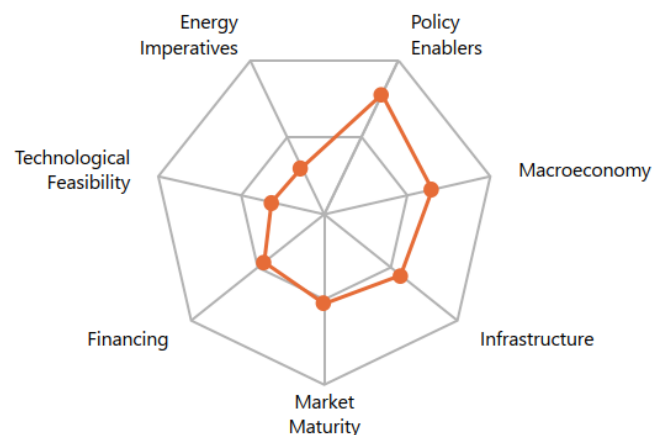
0.9

Renewable Energy Generation by Source

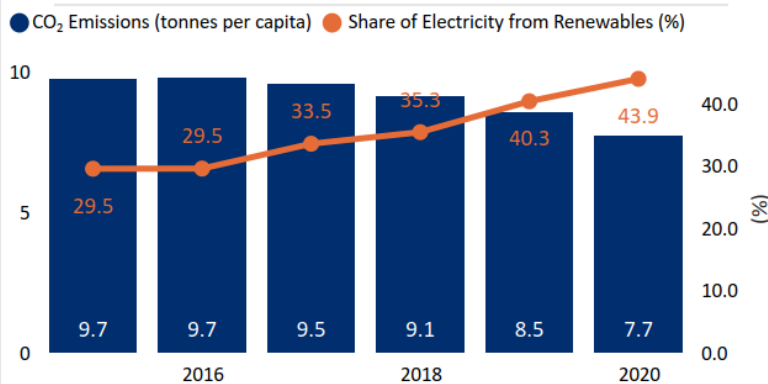


Non Solar RE includes Wind and Hydro;

Performance against 7 Drivers



CO₂ Emissions vs Electricity share from Renewables

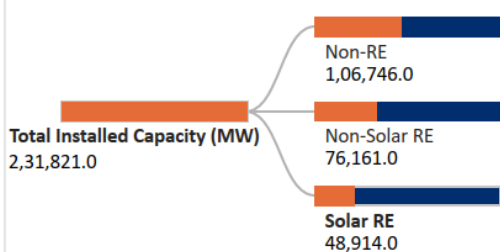


Fiscal Incentives & Public Financing for Renewables (2020)

Investment or production tax credits?
Yes

Public investment, loans, grants, capital subsidies or rebates?
Yes

Installed Capacity by Source (2019)



Non-Solar RE: Wind, Hydro, Biomass, Geothermal & Marine;

Non-RE: Coal, Natural Gas, Nuclear, Oil, etc.;

Other Solar: Utility Scale Solar, Rooftop etc.;

Data not available for other Solar RE segments;

Support for Renewables (2020)

Feed-in-Tariffs for renewable energy supply to the grid?
Yes

Net metering/Gross metering policies and regulations?
No

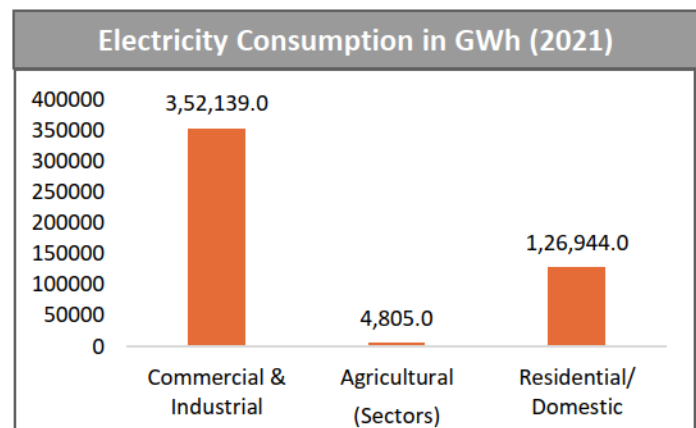
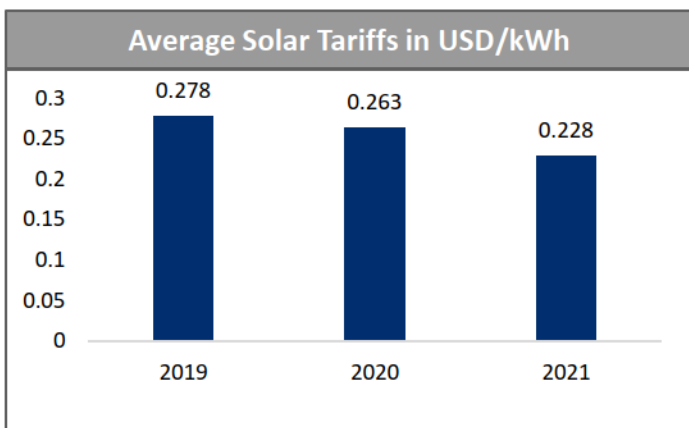
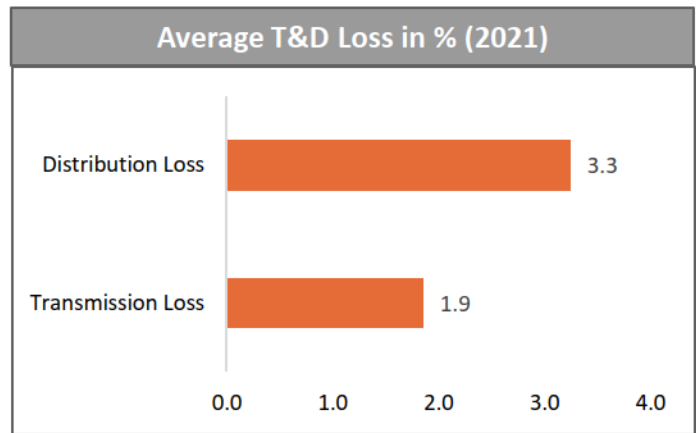
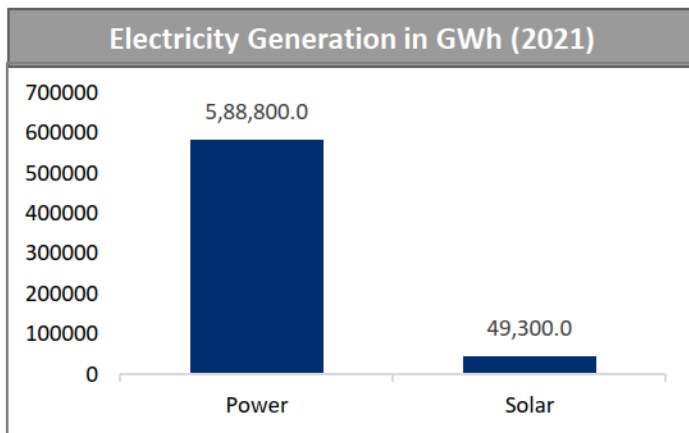
Renewable Energy Certificates?
Yes

Renewable Purchase Obligation?
No

Solar Investment in Million US Dollars (2021)
4,570.0

Peak Demand/Load in MW (2021)
81,079.0

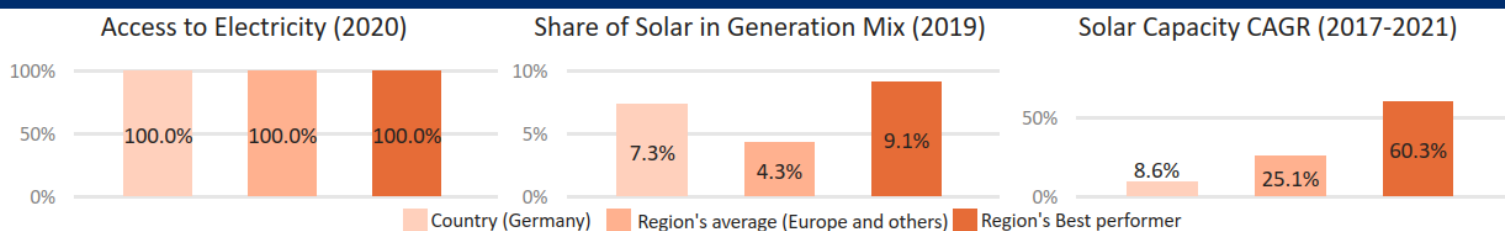
Solar Tariff (Feed in Tariff mechanism) in USD/kWh
0.228



Policies/Schemes for Solar Segments (2021)						
Rooftop Solar	Solar Mini Grids	Standalone solar systems	Utility scale solar	Solar Parks	Floating Solar	Solar heating and cooling system
Yes	No	No	Yes	Yes	Yes	Yes

Emerging Technologies/Innovative Models (2021)	
Hybrid technologies - combination of two or more technologies to achieve efficient systems (Example: wind + solar PV hybrid systems, solar + storage systems)	Yes
E-mobility/Electric vehicles	Yes
Green Hydrogen	Yes

Country's regional performance and characteristics



Areas of Strength

Macroeconomy

Policy Enablers

Areas of Improvement

Energy Imperatives

Technological Feasibility

Key Insights

Drivers

Insights



Macroeconomy

- Germany is a high-income country with a GDP per capita (PPP) of USD 58,276 in 2021.^{1, 2}
- Due to COVID-19 Pandemic, the GDP (Real) had declined by 3.7% in 2020. However, in 2021, the GDP has bounced back recording an annual growth rate of 2.6%.³
- The inflation rate (CPI) of Germany has increased to 3.2% in 2021 from 0.4% levels in 2020.⁴
- The general government gross debt to GDP has marginally grew to 69.6% in 2021 from 68% levels in 2020.⁵



Policy enablers

- Germany has aimed to become GHG neutral by 2045. It has set the preliminary targets of cutting emissions by at least 65% by 2030 compared to 1990 levels, and 88% by 2040.⁸
- Germany's Federal Council has passed a law in 2022 which enshrines the commitment of sourcing 80% of electricity through renewables by 2030.⁶
- Germany has targeted to achieve onshore wind power of 115 GW, solar power of 215 GW by 2030. Further, the offshore wind is set to reach 40 GW by 2035, and 70 GW by 2045 respectively.⁶
- EU NDC target applies to reach climate neutrality by 2050.²⁵



Technological Feasibility

- Germany receives low solar irradiation (GHI) of 2.9 kWh/m²/day and specific yield 3.0 kWh/kWp/day indicating a low technical feasibility for solar in the country.⁹
- Germany has installed 300,000 battery energy storage systems by 2020 with an average capacity of 8.5 kWh which is about 2.3 GWh capacity.¹⁰
- Germany's utility Westnetz ranks 25th in Smart Grid Index 2021.¹¹



Market Maturity

- Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway (Bundesnetzagentur (BNetzA)) serves as the regulatory authority for regulating transmission and distribution networks in Germany.¹³
- RWE, LEAG, Uniper, Va enfall and EnBW are the main power generating companies in Germany.¹³
- Germany has four transmission system operators (50 Hertz Ltd, Amprion, TenneT, and TransnetBW).¹³
- Germany has 900 distribution system operators (DSOs) registered with BNetzA.¹³
- Germany has 890 energy supply companies which are active in the German Electricity Market.¹³



Infrastructure

- Germany's transmission system comprises of 35,000 kms of lines with a maximum voltage of 380 kV.¹⁴
- The total length of Germany's distribution grid is 1,679,000 kms operating at 60 kV, 6 kV, 440 V, 230 V and 94,800 ckms operating at 110 kV.¹⁴
- Germany has cross border transmission network with Norway, Denmark, Sweden, Poland and Czech Republic, Austria, Switzerland, Belgium, Luxembourg, France and Netherlands.¹⁵
- Germany has planned to install new transmission lines between northern and southern territory using HVDC technology by 2025.¹⁶



Financing

- Germany has planned to invest an amount of USD 216 Bn to foster renewable energy to ease their reliability on gas.¹⁷
- KfW has financed renewable energy projects of the German Federal Ministry for Economic Cooperation and Development (BMZ). The project included large-scale German Indian solar partnerships.¹⁸
- European Investment Bank (EIB) has provided USD 391.6 Mn to support energy link connecting Germany and UK.¹⁹



Energy Imperatives

- In 2020, Germany's per capita electricity consumption stood at 6.5 MWh which is significantly higher than the global average of 3.31 MWh.²⁰
- In 2021, the total installed capacity in the country had reached 228.35 GW with a significant share coming from coal (29.04%) followed by gas (15.73%), nuclear (11.84%), wind (23.4%), solar (8.62%), bioenergy (9.01%), other fossil (3.48%), hydro (2.91%).^{22, 23}