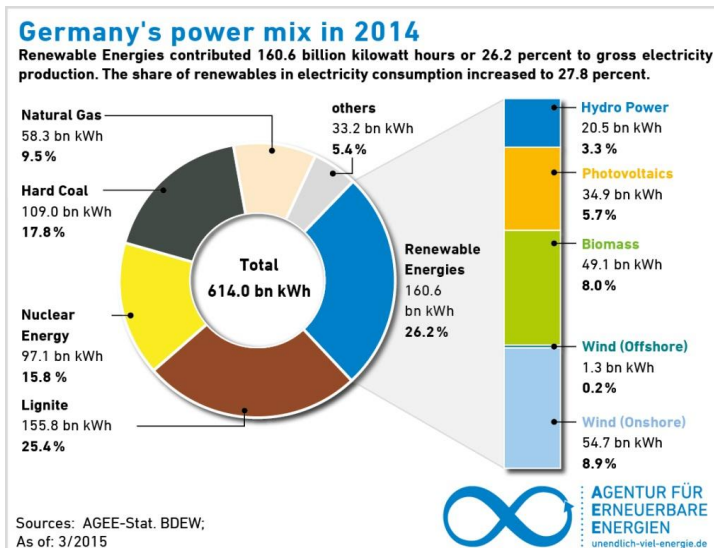


FACTSHEET

RENEWABLES FROM GERMANY

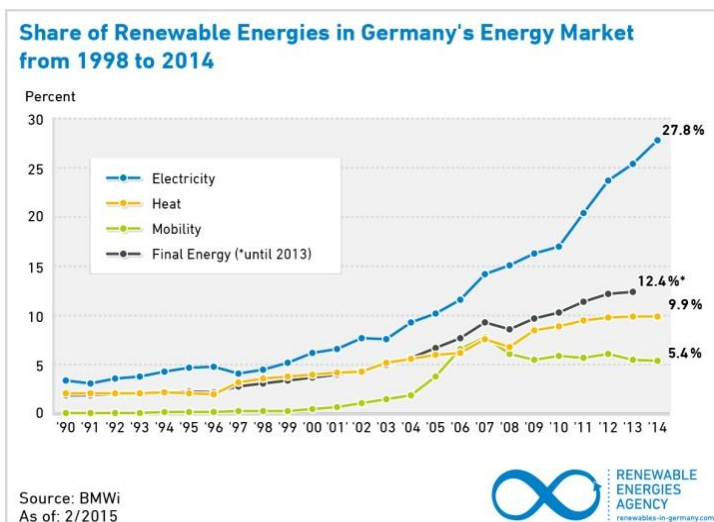
RENEWABLES - A MARKET FORCE:

Renewable energies are of **threefold importance** to Germany: They offer **climate protection**, create **economic stimuli** for growth, and provide increasing **independence from energy imports**. In Germany, the use of renewable energies **avoided the emission of 148 Million tonnes of greenhouse gas emissions** in 2014. Germany's import bill is reduced significantly due to renewables: The use of **renewables avoided fossil fuel imports of 8.2 billion Euro** in 2013.



Backed by a **propitious political environment**, growth of renewables has been **most dynamic in the power sector**. In 2014, renewables surpassed lignite as Germany's most important energy source on the power market. Wind power traditionally claims the biggest renewables share on the power market. In 2014, photovoltaics (PV) contributed the biggest relative on-year increase in terms of market share.

The successful rise of renewables has so far been largely confined to the power sector. The heat and transport sectors have lagged behind. **Technologies for expanding renewables** in the heating and transport sectors are **available**. The government offers **investment grants for renewable heating systems**. In the transport sector, a **biofuel quota** applies.



This decade, growth of renewables in Germany has so far been largely confined to the power sector. Apart from prospects for further growth in the power sector, there is huge untapped potential to expand the use of renewable energies in the heat and transport sectors too.

ECONOMIC BENEFITS:

Renewables – an investment hub:

The German economy profits from the advent and rise of renewable energies. **Investment in new installations of renewable energy plants increased to 18.8 billion Euro in 2014.** Turnover from operating renewable energy plants amounted to 14.1 billion Euro in 2014.

Investment in new renewable energy installations according to sector since the year 2000:

	2000	2005	2012	2013	2014
Wind energy	1.9 bn. Euro	2.5 bn. Euro	3.9 bn. Euro	6.6 bn. Euro	12.3 bn. Euro
Solar energy (PV and solar thermal)	0.8 bn. Euro	5.5 bn. Euro	12.2 bn. Euro	5.1 bn. Euro	3.1 bn. Euro
Biomass	1.1 bn. Euro	3.3 bn. Euro	2.9 bn. Euro	2.6 bn. Euro	2.4 bn. Euro
Hydro	0.7 bn. Euro	0.2 bn. Euro	0.3 bn. Euro	0.3 bn. Euro	0.1 bn. Euro
Geothermal and environmental heat	0.1 bn. Euro	0.3 bn. Euro	1.1 bn. Euro	1.1 bn. Euro	1.0 bn. Euro
Total	4.6 bn. Euro	11.9 bn. Euro	20.3 bn. Euro	15.7 bn. Euro	18.8 bn. Euro

Source: BMU/BMWi

Renewables – a cradle of innovation:

The rise of renewable energies fosters innovation. New patents are indicative of this development. The **number of patents** for renewables in Germany has steeply increased. In 2013, their number plateaued on a high level.

Number of patent applications in the area of renewable energies registered at the German Patent and Trade Mark Office:

	2005	2010	2011	2012	2013
Solar	165	775	975	1.033	918
Wind	164	575	726	915	796
Hydro, Tidal	26	97	139	106	106
Biogas, Geothermal, others	44	116	164	152	132
Total	399	1.563	2.004	2.206	1.952

Source: DPMA

RENEWABLES - MORE AFFORDABLE THAN EVER:

Renewable energy technologies from Germany have shown that they are not just a clean, but also a **cost-efficient** solution for today's energy needs:

- **Wind power** at very good onshore locations already has lower costs than new hard coal or combined cycle gas turbines power plants.
- Feed-in tariffs for new **photovoltaic installations** have come down by more than 70 % within the last 5 years. The boom of solar power in Germany contributed to making PV attractive in other developed and in developing countries.
- Other renewable energy technologies such as biomass, hydro and geothermal energy can ideally complement supplies from fluctuating sources.
- According to several studies, amongst them from IRENA and Fraunhofer ISE, there is ample potential for further cost reductions for a whole range of renewable energy technologies.

RENEWABLES - AN EXPORT ENGINE

The renewable energy sector currently employs more than 371.000 people. The wind energy and biomass sectors contribute the largest shares with some 138.000 and 126.000 jobs respectively, followed by the solar sector with some 69.000 employees. More than 100.000 jobs in Germany's renewables sector are to be attributed to export activities.

Renewable energies have been a reliable export engine not only for the German manufacturing industry, but also for other sectors such as services. In the renewable energy sector, **export turnover** in the areas of components production and energy plant production amounted to some **10 billion Euro in 2013**, according to an estimate from Deutsches Zentrum für Luft- und Raumfahrt (DLR). For all the major branches of renewable energies, the export business has been a key pillar of success.

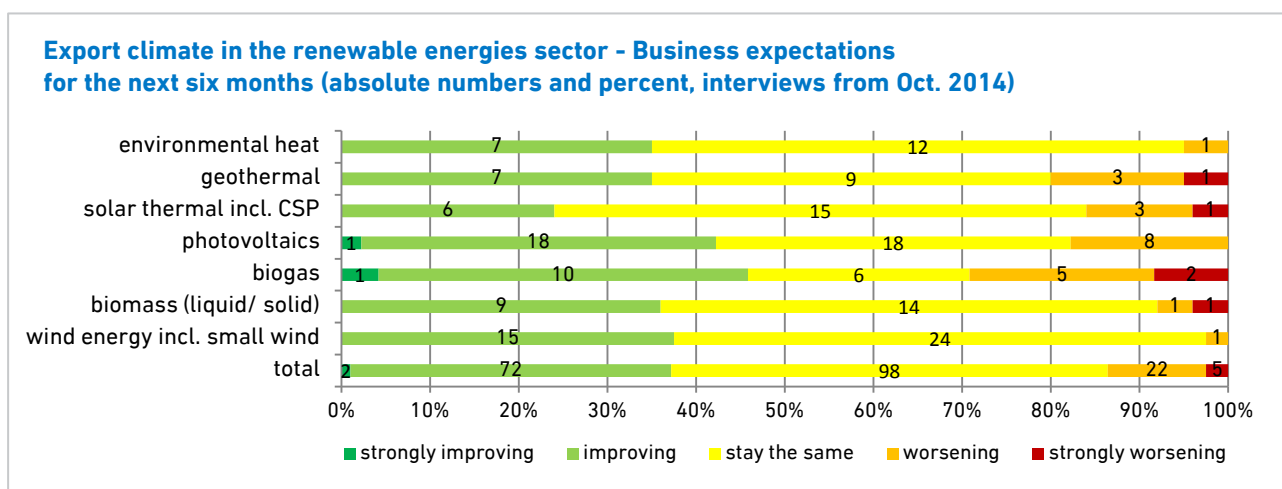
Export ratios of major renewable energy sectors according to industry estimates:

- The German wind energy industry boasts an export ratio of some 67 %, according to the German Wind Energy Association (BWE).
 - Almost 50% of all globally installed hydropower plants are based on German know-how, according to the German Engineering Association (VDMA).
 - The export ratio of the German solar industry surpassed 65 % in 2014, according to the German Solar Association (BSW).
 - In the German biogas industry, the export ratio will reach some 70 % in 2015 according to an estimate by the German Biogas Association (FvB) from November 2014. For 2014, FvB estimates that the export ratio reached 50 %.
 - Some 120,000 heat pumps were manufactured in Germany in 2014, out of which 80,000 were destined for export markets.
 - Biodiesel producers in Germany reached an export ratio of more than 50 % in 2014.
- (all figures are based on industry estimates or forecasts, as of March 2015)

Export business climate: Strong performance and a bright outlook

In 2014, the export business climate for renewable energies technology "Made in Germany" was buoyant. According to a study based on some 200 interviews carried out by EuPD Research in October 2014 on behalf of dena, some 46 % percent of respondents considered their export business situation to be good or very good. Only 22 % considered their export business to be poor or very poor.

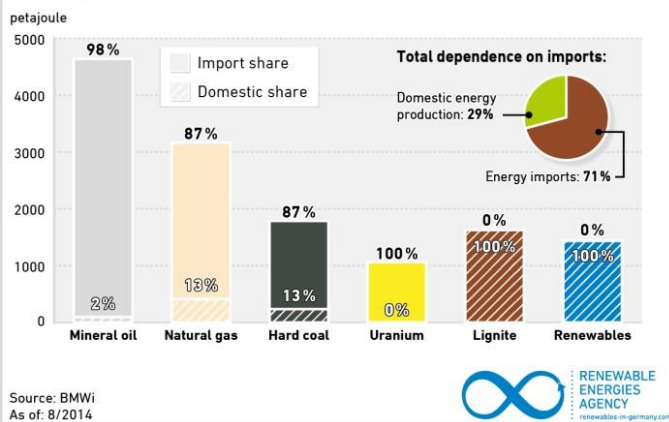
The outlook is bright too. According to the same study, only 10% of respondents talked about worsening or strongly worsening export expectations for the coming six months. By contrast, some 38 % considered their export expectations to be improving or strongly improving.



Source: German Energy Agency (dena), 2014: Erhebung zum Exportklima der Erneuerbare-Energien-Branche

Primary energy consumption and dependence on imports of Germany's energy supply in 2013

71 percent of the total primary energy consumption (13,828 petajoules) were imported.



PROVIDING MORE ENERGY SECURITY:

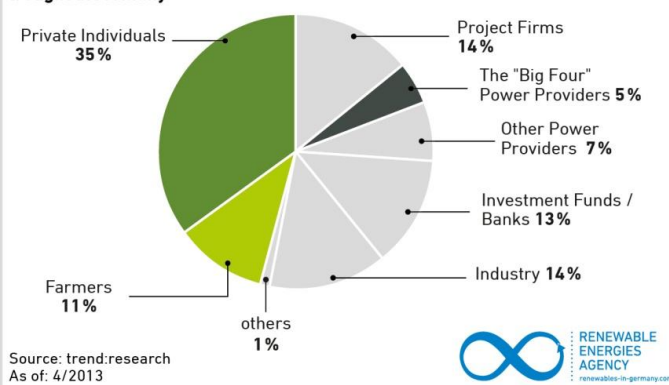
Currently, Germany covers **more than 70 percent** of its **primary energy consumption** by means of **imports**. Renewable energies are the only domestic energy source that will sustainably be available for future generations.

Security of supply can only be safeguarded with renewables. Regenerative combined power plants that use different renewable energy sources show how an intelligent management of decentralized power plants could work on a national scale.

CITIZENS' ENERGY:

Renewable energies enjoy **high acceptance levels**. According to a representative poll carried out in 2014 by TNS infratest, 92 percent of all respondents in Germany attributed high or very high importance to expanding the renewable energies sector. Climate protection, securing the well-being of future generations and more independence from imports are among the most important reasons for the overwhelming support of renewables.

Renewable energy in the hands of the people Ownership distribution of installed RE capacity for power production throughout Germany



The expansion of renewable energies is accompanied by a shift in the **ownership structure** of electricity production. Almost half of all renewable power capacity so far installed in Germany is **in the hands of private individuals**, according to a study by trend:research released in 2013. This is evidence that citizens can actively take part in the growth of renewable energies.

Those ownership structures point to the **decentralized character of the Energiewende**. Studies have shown that the increase in renewable energy production can generate **double digit billion Euro benefits** in terms of value added **on the local level**.

ENERGIEWENDE – PAST, PRESENCE AND FUTURE:

Over the first two decades, the German energy transition focused on growth and market access. Producing additional kilowatt-hours was the driver for achieving leverage. Renewable energy technologies became more efficient over time, costs and prices decreased. This led to higher affordability for investors and a lightening burden for the public. The approach has been a decentralized one, involving many social groups in the expansion of renewables. This in turn resulted in high acceptance levels and in many citizens' financial participation. The existing infrastructure was strong enough to integrate increasing capacities.

Germany is now shaping the next era of the energy transition. Lessons have been learned, while new challenges lie ahead. Apart from supplying energy, renewables will have to deliver capacity in order to support security of supply. For example, many more biogas power plants shall become more flexible. Demand side management is another factor in the context of levelling out fluctuations of solar and wind power. The grid will become more intelligent, deploying the most efficient technological solutions for connecting even higher shares of renewable energy. All stakeholders are invited to invest, to install and to connect according to their specific needs and abilities. This often goes along with a change of their business models. But most important: The energy transition has to become a holistic concept, integrating the benefits and needs of the heat and mobility sectors.