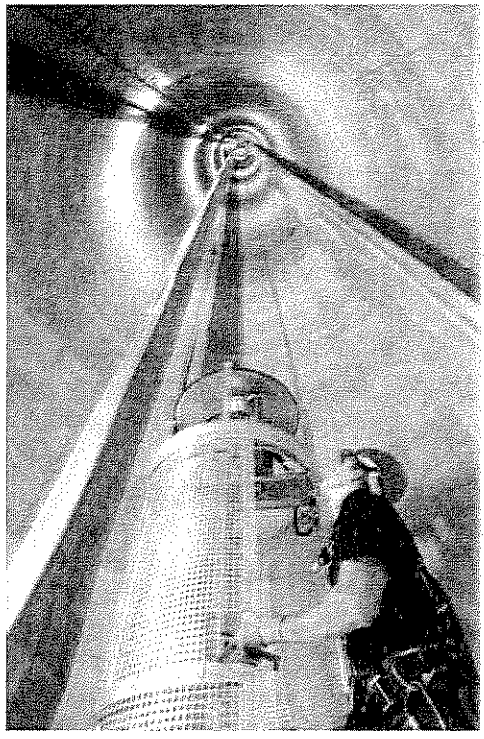
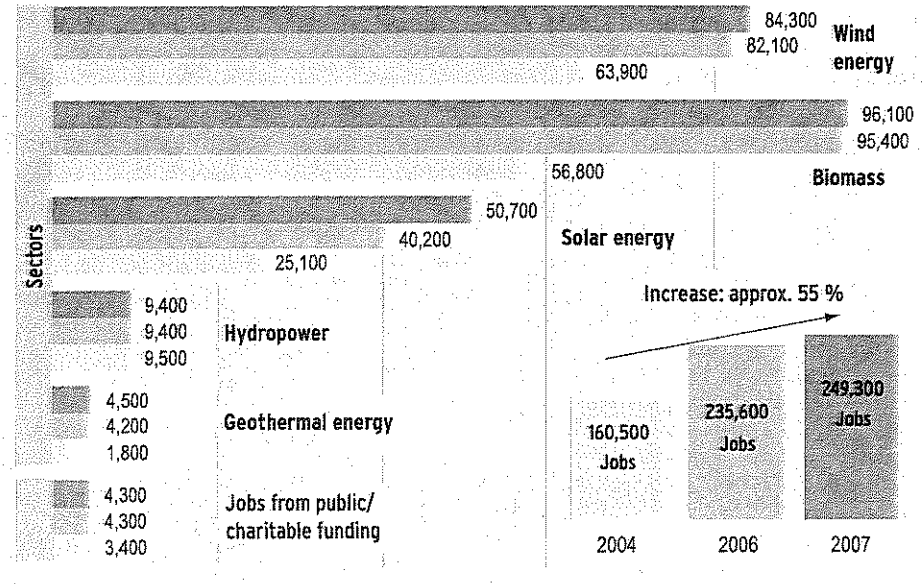
JOBS IN THE RENEWABLE ENERGIES SECTOR IN GERMANY

Renewable energies are a job creator for Germany. Their continuous expansion last year helped to create or secure numerous jobs.
According to the interim results of an on-going research project by the BMU [69], it is estimated that nearly 250,000 jobs in Germany were attributable to the renewable energies sector in 2007. This translates into an increase of around 55 % compared with 2004 (approximately 160,000 jobs). In calculating the above figures, data relating to investments in renewable energy plants, their operation, turnover and related outlay such as the required supply of biomass was taken into account. In this way, the researchers arrived at a figure of around 245,000 jobs for the year 2007, at least 60 % of which is attributable to the effects of the Renewable Energy Sources Act. This is supplemented by jobs associated with public and charitable funding to promote renewables, including public sector employees. A further BMU research project [64] updated the figures calculated for the year 2006 (4,300 jobs).

According to this study, the positive trend looks set to continue over the next few years, suggesting a potential total of around 400,000 employees in the renewables sector by 2020. Key influencing factors for future development include Germany's future attractiveness as a production location in conjunction with the positioning of German companies in the world market for renewable energies, which is expected to experience sharp growth. In this regard, a further BMU research project is currently underway, which will examine in detail the possible negative employment effects of expanding renewable energies. To date, the so-called net balance of renewables in Germany has been clearly positive [64].



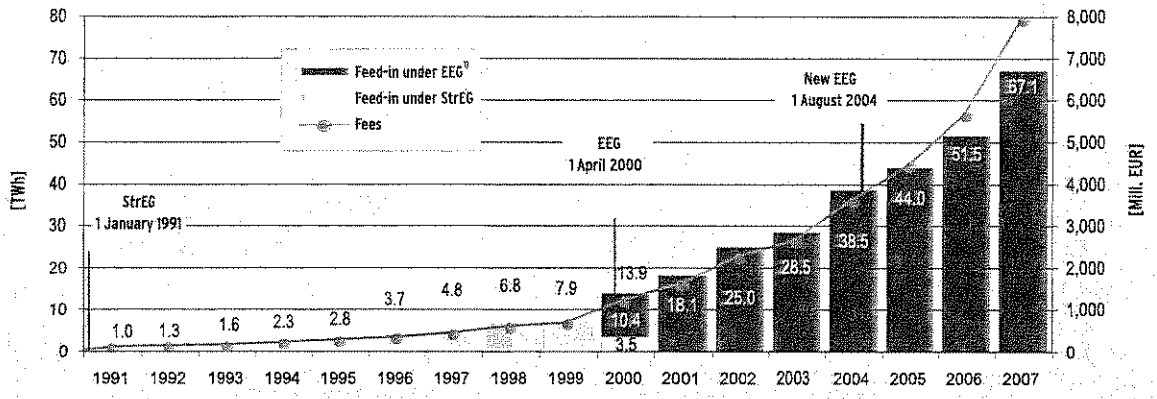
Jobs in the renewable energies sector in Germany



Figures for 2006 and 2007 are provisional estimates

Sources: BMU [64], [69]

FEED-IN AND FEES UNDER THE ACT ON THE SALE OF ELECTRICITY TO THE GRID (STREG) AND THE RENEWABLE ENERGY SOURCES ACT (EEG)



Figures for 2007 are provisional

1) Private and public feed-in

Sources: VDEW [55]; VDN [9]; ZSW [3]

On 1 April 2000, the Act on the Sale of Electricity to the Grid was replaced by the Renewable Energy Sources Act, with improved terms. Over 45 % of all fees currently apply to electricity from wind energy, and only around 23 % to photovoltaic electricity. Since 2004, following the commissioning of Germany's first electricity-generating geothermal plant, fees have also been payable for geothermal electricity. Around 80 % of electricity from hydropower originates from older plants with a capacity of more than 5 MW; this electricity is not eligible for remuneration under the EEG. Private producers make a very high contribution to the supply of electricity from renewable energy sources. In 2007, they provided some 58 TWh of electricity [BDEW 21].

Structure of electricity volumes remunerated under the EEG

		2000[1]	2001	2002	2003	2004	2005	2006	2007[2]
Total end consumption	[GWh]	344,663	464,286	465,346	478,101	487,627	491,177	495,203	495,000
Privileged end consumption[3]	[GWh]	-	-	-	5,847	36,865	63,474	70,161	72,040
EEG electricity volume TOTAL[4]	[GWh]	10,391.0	18,145.4	24,969.9	28,417.1	38,511.2	43,966.6	51,545.2	67,120.4
Hydropower, gases[5]	[GWh]	4,114.0	6,088.3	6,579.3	5,907.7	4,616.1	4,952.6	4,923.9	5,100.0
Gases[5]	[GWh]					2,588.6	3,135.6	2,789.2	2,700.0
Biomass	[GWh]	586.0	1,471.7	2,442.0	3,483.6	5,241.0	7,366.5	10,901.6	16,320.0
Geothermal energy	[GWh]	-	-	-	-	0.2	0.2	0.4	0.4
Wind energy	[GWh]	5,662.0	10,509.2	15,786.2	18,712.5	25,508.8	27,229.4	30,709.9	39,500.0
Solar irradiation energy	[GWh]	29.0	76.2	162.4	313.3	556.5	1,282.3	2,220.3	3,500.0
EEG quota[6]	[%]	3.01	3.91	5.37	6.02	8.48	10.0	12.01	15.80
Average fee	[ct/kWh]	8.50	8.69	8.91	9.161	9.29	9.995	10.875	11.4
Total fee[7]	[bn EUR]	0.88	1.58	2.23	2.61	3.61	4.50	5.81	7.90

1) Short year: 01/04-31/12/2000
2) Provisional; quantities of electricity generated, fees and quotas have been adjusted since the VDN medium-term forecast.
3) Privileged end user (since July 2003) under the special compensation provision (§ 11 and 16 of the EEG).
4) Does not include post-corrections by the VDN (2002 to 2006) because the additional feed-ins for previous years according to auditors' certificates cannot be allocated to energy sources
5) Landfill, sewage and pit gas listed separately for the first time in 2004
6) Quota of non-privileged end use
7) Overall fees excluding avoided grid utilisation fees. The fees differ significantly from the differential costs (see following pages).

Sources: according to VDN [9]; ZSW [3]

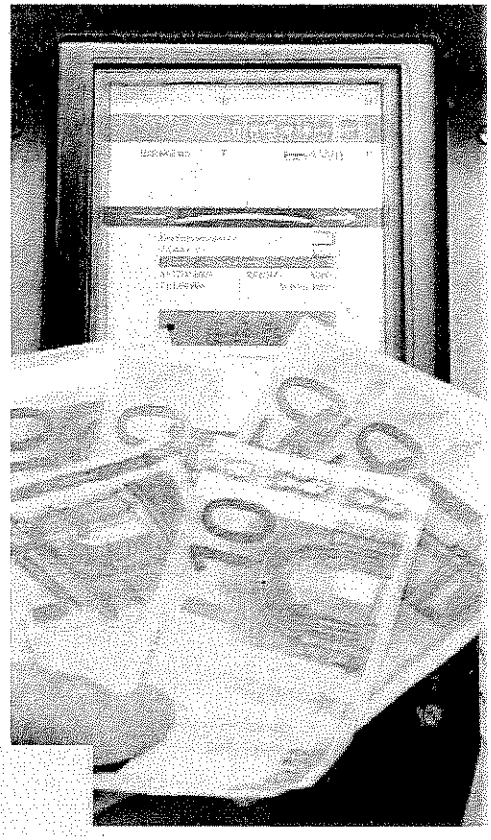
COST TO ELECTRICITY CONSUMERS

From a business viewpoint[1], electricity from renewable energy sources which is eligible for remuneration under the EEG is still more expensive than that from conventional energy sources. To date, the resulting total costs have generally been calculated according to the following basic formula:

EEG apportionment = EEG quota x (EEG average fee – avoided electricity purchase price)

The EEG fees paid to plant operators are published on 30 September of the following year by the Verband der Netzbetreiber (Association of German Network Operators, VDN e.V.: now a member of the Bundesverband der Energie- und Wasserwirtschaft (German Energy and Water Association, BDEW e.V.) together with other associations), in the form of an audited annual account.
Until that date, only forecasts are available. The electricity purchase costs avoided as a result of EEG feed-in can only be approximated, since these are trade secrets and there is no general database available. As the assumptions made may vary, published figures on EEG cost levels can vary significantly.
Based on BMU research projects [73, 94], it would seem plausible to estimate the (commercial) value of conventionally generated electricity that is substituted by the EEG feed-in at 5.0 cents per kWh in 2007. With a provisional EEG electricity volume of around 67 TWh in 2007 and an average estimated fee of 11.4 cents per kWh, this leads to additional costs (differential costs) of around 4.3 billion Euros. The additional costs are therefore significantly lower than the fees paid to the operators of electricity EEG generation plants of 7.9 billion Euros.

Making allowance for a special provision in the EEG for particularly electricity-intensive companies[2], this produces an average nationwide EEG apportionment of 1.0 cents per kWh (provisional) for all electricity consumers without privileges, which includes private households. This equates to just under 5 % of the costs for one kilowatt hour of household electricity in 2007 (an average of 20.7 cents/kWh). Depending on the market situation and the market behaviour of electricity suppliers, however, the actual EEG apportionment invoiced may vary. In 2007, the cost of the EEG to an average household with an electricity consumption of 3,500 kWh per annum was around 3 Euros per month.
Despite the further increase in the feed-in of electricity from renewable sources, the EEG cost share will only increase at a below-average rate over the next few years.
In conjunction with the significant rise in EEG electricity, recent estimates for the current year 2008 suggest an increase in EEG differential costs of around 0.5 billion Euros, which in turn would lead to an increase in the EEG apportionment to approximately 1.2 cents/kWh. More reliable figures in this connection will not become available until early 2009.



Development of EEG costs and specific EEG apportionment

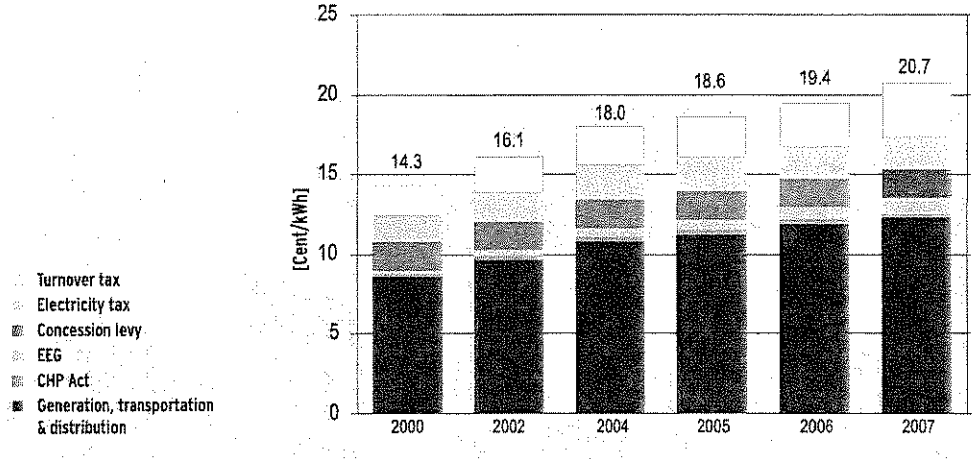
Year	EEG costs [bn. EUR]	EEG apportionment [Cent/kWh]
2000	1.0	0.2
2001	1.2	0.3
2002	1.8	0.4
2003	1.9	0.4
2004	2.5	0.6
2005	2.8	0.6
2006	3.3	0.8
2007[1]	4.3	1.0

1) Provisional figures

In 2007 prices

1) A macro-economic analysis gives a different picture; cf. in this respect page 36.
2) In 2007, § 16 of the EEG allowed 380 particularly electricity-intensive companies in the manufacturing industry and railways to purchase EEG electricity at significantly reduced prices, based on an EEG apportionment (differential costs) of just 0.05 ct/kWh. As a result, the EEG costs of all other electricity customers are increased. The retrospective implementation of an amendment to § 16 for the year 2006 based on the First Act Amending the Act on the Sale of Electricity to the Grid, which entered into force on 1 December 2006, has been disregarded in the above figures. It will additionally increase the EEG apportionment in 2008 with a time lag.

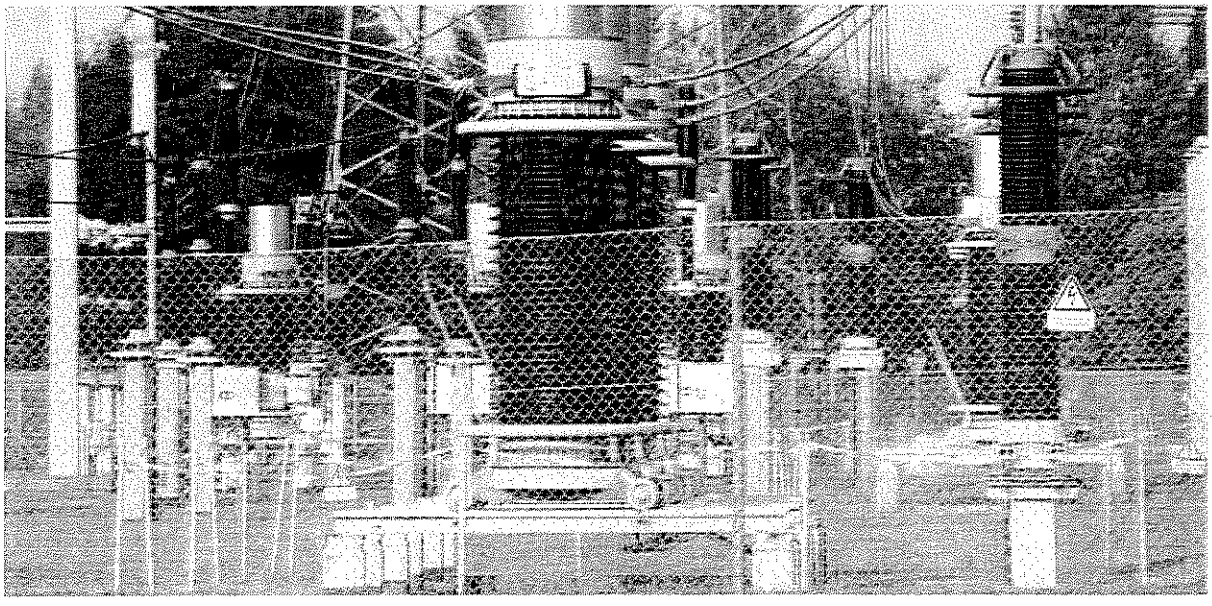
Cost shares for one kilowatt hour (kWh) of electricity for household customers in Germany



	2000	2002	2004	2005	2006	2007
Turnover tax	2.0	2.2	2.5	2.6	2.7	3.3
Electricity tax	1.5	1.8	2.0	2.0	2.0	2.0
Concession levy	1.8	1.8	1.8	1.8	1.8	1.8
EEG	0.2	0.3	0.5	0.6	0.8	1.0
CHP Act	0.2	0.3	0.3	0.3	0.3	0.3
Generation, transportation & distribution	8.6	9.7	10.8	11.2	11.8	12.2
Total	**14.3**	**16.1**	**18.0**	**18.6**	**19.4**	**20.7**

EEG: Renewable Energy Sources Act
CHP Act: Combined Heat and Power (Cogeneration) Act

Source: BMU [43]

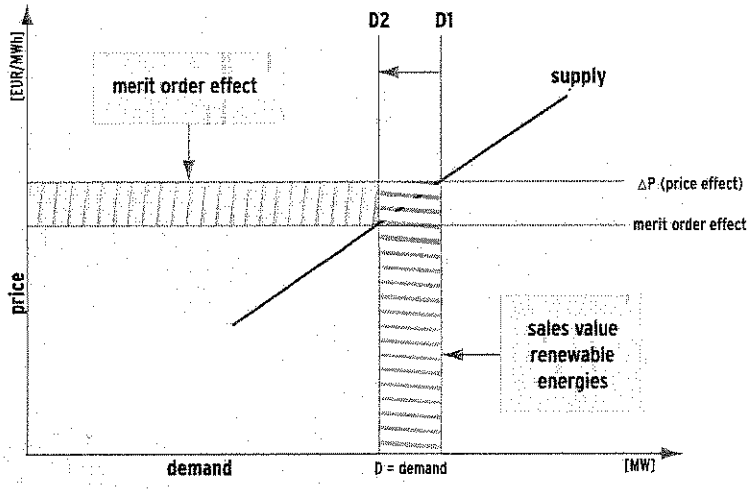


EFFECTS OF RENEWABLE ENERGIES ON ELECTRICITY PRICES

When assessing the economic effects of the promotion of renewable energy sources by the EEG, as well as considering the market value of the EEG electricity, it is also necessary to take into account the impacts of electricity generation from renewable energies on wholesale electricity market prices. The fact that priority is given to the feed-in of renewables will, in the short term, lead to a lowering of electricity prices on the wholesale market. An on-going scientific study commissioned by the BMU [86] analyses the impacts of EEG electricity generation on wholesale prices.

The market price of electricity is determined by the most expensive power station still needed to satisfy the demand for electricity (merit order). Because priority is given to EEG feed-in, demand for conventional electricity is reduced. In accordance with the merit order, therefore, the most expensive power plants are no longer needed to meet demand, and the market price falls accordingly. This effect is known as the merit order effect. The illustration below provides a diagrammatic overview.

Representation of the merit order effect



Note: The model is calculated against the market prices for the respective years, which means that comparability between the results for different years is limited. With the time series given below, it is important to bear in mind that in 2006, the feed-in prices of CO_2 for lignite power plants were reduced slightly, while fuel prices followed with a time lag.

Source: BMU [86]

Scientific studies commissioned by the BMU, prepared on the basis of a detailed electricity market model (PowerACE) and confirmed by an expert discussion, suggest that over the past three years, the merit order effect has reduced the cost of electricity purchased via the spot market by between 2.5 and 7.8 Euros/MWh (see table below) [42], [80], [86].

Hence, the merit order effect reduces the purchasing costs to electricity suppliers, which in turn tends to lower electricity prices.

Year	Simulated EEG electricity generation [TWh]	Average price reduction [EUR/MWh]	Volume merit order effect [bn. EUR]	Specific effect [EUR/MWh$_{EEG}$]	Average EEG feed-in fee [EUR/MWh$_{EEG}$]
2004	41.5	2.50	1.65	40	92.9
2005	45.5	4.25	2.78	61	99.5
2006	52.2	7.83	4.98	95	109.0

Source: Sensfuß [89]

MACROECONOMIC EXTERNAL COSTS

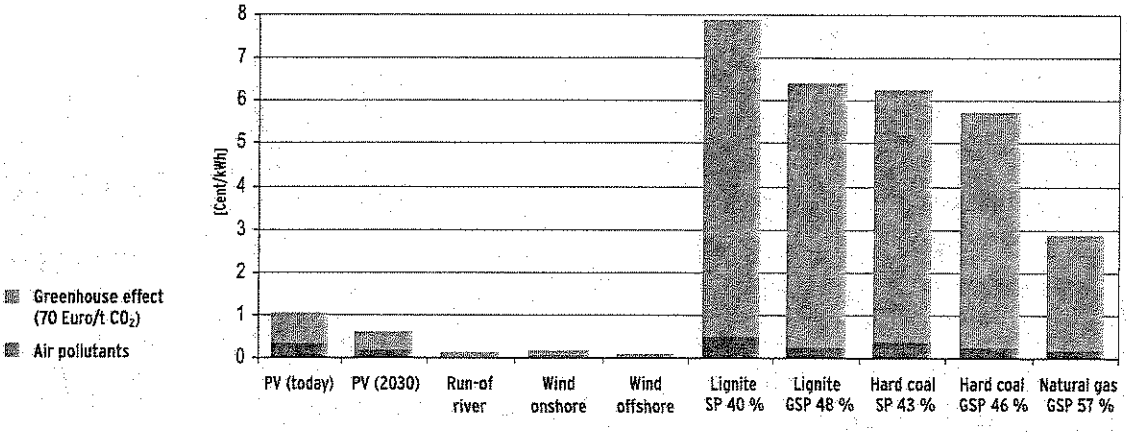
The costs of the EEG derived from the figures on the previous pages are not in themselves sufficient for a comprehensive economic evaluation of renewable energy sources, because as microeconomic dimensions, they do not reflect the fact that conventional electricity generation still causes significantly more environmental damage than electricity from renewable energy sources, despite the major environmental progress made in recent decades. These so-called external costs are not yet incorporated into the electricity prices as required by the polluter pays principle.

According to a scientific study carried out on behalf of the BMU [39], greenhouse gas emissions play a key role: the current best estimate of the cost of climate damage arising from this emission is around 70 Euros/t CO_2. In addition, health and material damage caused by air pollutants are important, together with, to a lesser extent, agricultural revenue losses. External costs for electricity generated from hard coal and lignite – even allowing for modern technology – amount to 6 to 8 cents/kWh. For modern, gas and steam plants, the external costs are still approximately 3 cents/kWh[1].

By contrast, electricity generation from renewable energies causes comparatively minor external costs (generally less than 0.5 cents/kWh; only photovoltaics at present still cost around 1 cent/kWh). The construction and disposal of the plants are included in these calculations[1].

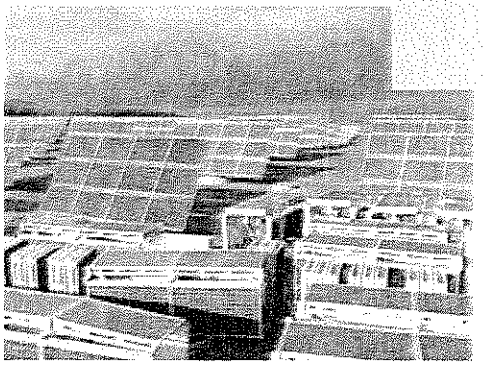
1) Further external effects of electricity generation from fossil fuels (impairment of biodiversity, ecosystems and supply reliability, as well as geopolitical risks) cannot be quantified, due to the lack of reliable data. As such, the aforementioned variables are only a fraction of the actual external costs currently anticipated.

External costs of electricity generation for various options in Germany



PV Photovoltaics
SP Steam power plant
GSP Gas and steam power plant

Source: BMU [39]



Given the – scientifically proven – assumption that the electricity generated from renewable energies at present fully displaces electricity generated from fossil fuels, in 2007 the external costs avoided in the electricity sector, thanks to renewables, can be estimated at at least 5.8 billion Euros (electricity remunerated under the EEG and not remunerated under the EEG) [48]. For this reason these are higher than EEG differential costs over the same period (4.3 billion Euros – cf. page 33 "Costs to electricity consumers"), indicating that the promotion of renewable energy sources via the EEG is worthwhile purely by virtue of the avoided external costs alone. Renewable energies also boast a host of other strategic and economic advantages.

On the preceding pages, we have explained in detail that while the Renewable Energy Sources Act (EEG) incurs costs, it also brings with it substantial macroeconomic benefits. The following overview summarises the key variables:

Costs of the EEG

From a microeconomic viewpoint, electricity from renewable energy sources is still more expensive than that produced by conventional means. Because the utility companies are obliged under the EEG to purchase electricity from renewable sources, this incurs higher procurement costs. In 2007, these costs totalled around 4.3 billion Euros (cf. page 33).

A (conservatively estimated) upper limit of a further 0.3 – 0.6 billion Euros was calculated for 2006[1] to allow for the additional balancing and compensatory energy requirements necessitated by renewable energies, the transaction costs to the transmission grid operators, and any potential EEG-related additional costs associated with part-load operation of power plants.

Benefits

The beneficial effects of the EEG include, firstly, a very positive influence on innovation, turnover and value-added in Germany, coupled with the creation of new jobs. Around 60 % of the almost 250,000 jobs in the renewable energy sector were attributed to the EEG in 2007 (cf. page 29 et seqq.).

EEG-related savings on imports of hard coal and natural gas should also be viewed in the same light. In 2007, including biomass imports, these totalled some 1 billion Euros (page 28).

By avoiding externalities, a relevant macroeconomic benefit of 5.8 billion Euros (for electricity remunerated under the EEG and not remunerated under the EEG) is also attributable to the EEG in 2007 (page 36).

Finally, on page 35, we explained in greater detail that the cost of electricity purchased via the spot market was around 7.8 Euros/MWh lower in 2006, thanks to the additional electricity supply available from renewable energy sources. In relation to total trade on the spot market, this amounts to around 700 million Euros. If this effect is extrapolated to the electricity demand as a whole, it equates to around 5 billion Euros. Hence, the merit order effect of renewable energy sources exerts downward pressure on electricity prices, which may in turn impact end-user prices. For 2007 no calculations are available yet.

Summary

The above overview of the possible cost and benefit effects of the EEG does not claim to be exhaustive. Given the varying effect levels and the interactions between them, these figures cannot be balanced out.
Nevertheless, the significant beneficial effects associated with the EEG clearly show that an economic assessment of the EEG based purely on microeconomic cost variables (as is often implemented) falls well short of the mark.

1) Generally speaking, possible EEG-related grid expansion costs will not come into play until the future, and have therefore been disregarded here. Current estimates [85] suggest that the expansion of offshore and onshore networks could cost around 4 billion Euros in total; the long depreciation periods mean that the additional costs incurred would total just under 400 million Euros per annum.