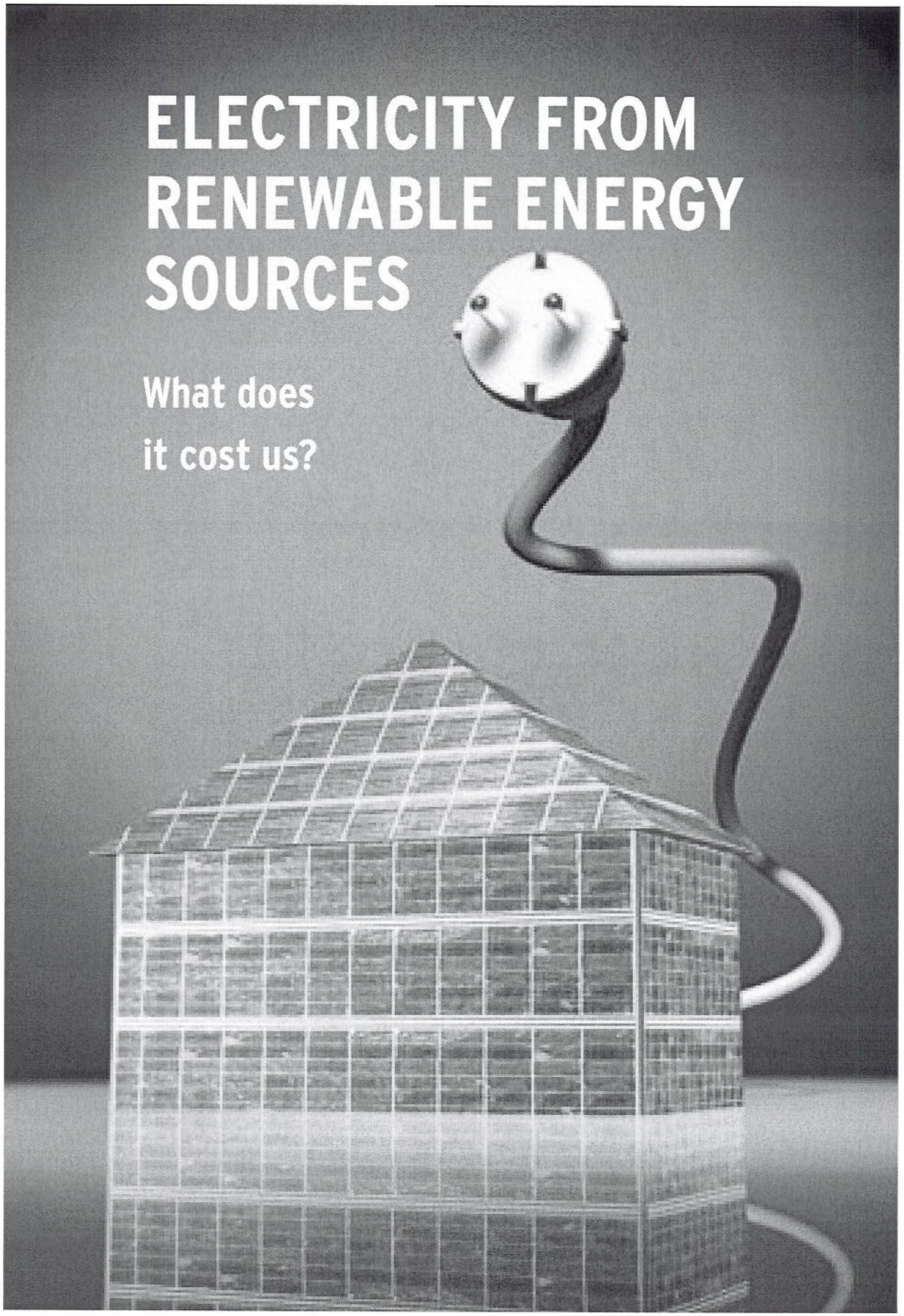
Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

ELECTRICITY FROM RENEWABLE ENERGY SOURCES

What does it cost us?



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Published by: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
Public Relations Division • 11055 Berlin • Germany
Email: service@bmu.bund.de
Website: www.bmu.de/english and www.erneuerbare-energien.de

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Design: design_idee, büro_für_gestaltung, Erfurt
Printed by: Druck Center Meckenheim

Photos: front cover: Haag & Kropp/artpartner-images.com
p. 6: Ridder/f1 online
p. 13: J. Eckel
p. 15: D. Gust/gustfoto
p. 17: Brigitte Hiss/BMU
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Date: March 2008
First Print: 10.000 copies

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DEAR READERS,

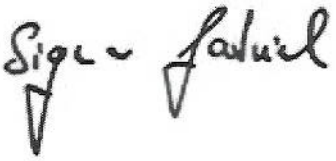
What impact do renewable energy sources have on electricity prices, which have been rising for years? This brochure provides answers to this question and explains the situation on the German electricity market.

The central factor is the success of the German Renewable Energy Sources Act (*Erneuerbare-Energien-Gesetz – EEG*). The Act has made a major contribution to the fact that around 14 percent of the electricity produced in Germany in 2007 came from renewable energy sources. This represents a sizeable increase on the year before (share 11.5%). In the electricity sector alone, the Act succeeded in reducing our CO_2 emissions by about 79 million tonnes. Together with the heat and motor fuel sectors, total savings of CO_2 due to renewables in 2007 came to around 114 million tonnes.

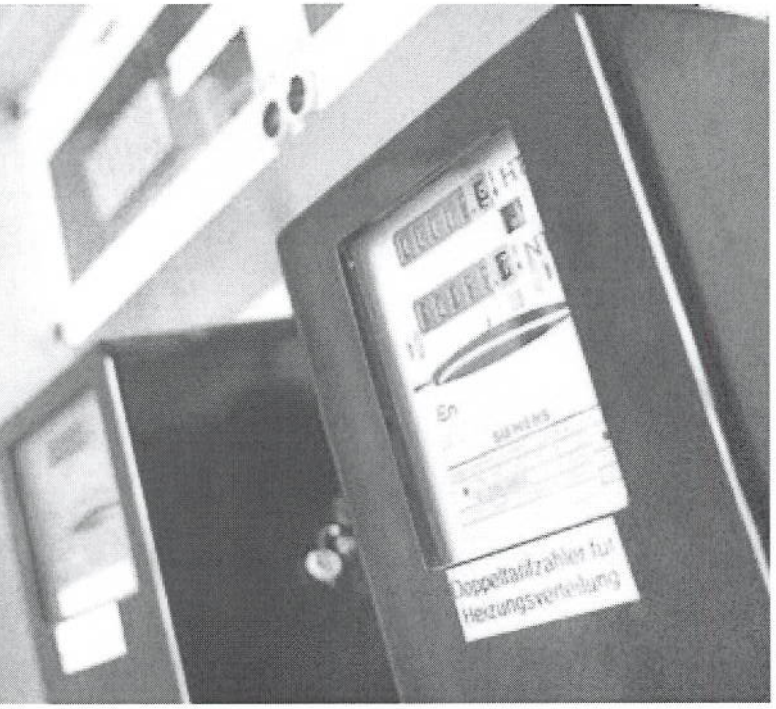
The proportion of household electricity prices due to the EEG is currently about 5%, and this is not likely to show any marked increase in the future. I regard this as a reasonable financial contribution. It is partly due to the central role that renewable energies play in efforts to mitigate climate change: the Federal Government's programme for substantial expansion of renewable energies in the electricity sector (25 – 30 percent of electricity consumption by 2020) is an important precondition for ensuring that Germany can achieve its ambitious climate change mitigation targets.

Another aspect, however, is the economic benefits of renewable energies. For example, renewable energies also increase competition on the electricity market. They reduce situations of dependency and the economic risks of rising energy prices, and they stimulate innovation, investment and employment. Today renewable energies are already providing work for nearly 250,000 people in Germany – which is over 50 percent more than three years ago!

Investment in renewable energies paves the way for Germany's energy future. It lays the foundation for sustainable, secure and affordable energy supplies.



Sigmar Gabriel
Federal Minister for the Environment, Nature Conservation
and Nuclear Safety



ELECTRICITY FROM RENEWABLE ENERGY – TOO EXPENSIVE?

"We regret to announce that owing to cost increases arising from the promotion of renewable energies and third-party electricity price rises we are forced to raise our own electricity prices with effect from the beginning of next year." This tends to be the message of the letters that electricity suppliers send their customers towards the end of the year and of official statements by the electricity industry. And it frequently creates the impression that electricity from renewable energies is a major reason for the price rises we have been seeing for years now in the electricity sector.

But is this really the case? What items go to make up the price of electricity? What share is due to the Renewable Energy Sources Act (EEG)? And above all: are renewable energies really the main reason for soaring electricity prices? This brochure sets out to explain and inform, and to throw light on the bewildering confusion of physical laws, specific energy-sector conditions and environmental aspects. And, to come straight to the point: it makes it clear that renewable energies are by no means the main factor responsible for electricity price rises.

WHAT DOES ELECTRICITY COST? INFORMATION ON THE ELECTRICITY INDUSTRY

A variety of components go to make up the price of electricity. Before we explain them in more detail on the following pages, the table below offers an initial overview of the individual price components and the factors that cause them.
Among other things, the table shows that the costs of promoting renewable energies under the Renewable Energy Sources Act are not public taxes or charges. The EEG surcharge does not go to the state, but to the operators of EEG plants. The EEG merely establishes a framework for the private-sector relations between EEG plant operators and the grid operators and/or electricity suppliers.

goes to / Revenue from:	Energy suppliers	Plant operators (under EEG/KWKG)	Federal authorities	Regional authorities	Local authorities (cities/ unicipalities)	State pension scheme
Power generation	■					
Transport	■					
Marketing	■					
Metering	■					
EEG surcharge		■				
KWKG surcharge		■				
Concession charge					■	
Electricity tax			■			■
Value-added tax			■	■	■	▨

The electricity sector in Germany distinguishes two groups of customers: those who pay the general household rate, and customers with special terms. Both the absolute level of electricity prices and the relative importance of the cost components listed above show considerable variations between general household-rate (tariff) customers and special-contract (non-tariff) customers.

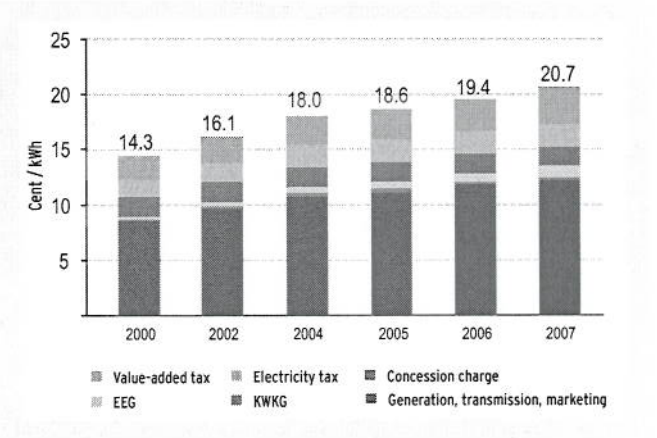
Tariff customers use electricity primarily for their own consumption in the home, or at least need less than 10,000 kilowatt-hours a year for professional, agricultural or business purposes. Their share of total German electricity consumption comes to about 25%.

Electricity suppliers are free to set their own prices for tariff customers. Since July 2007 these prices have no longer had to be approved by the competent Land authority (except in Baden-Württemberg). In all other federal Laender there is now only general price supervision under general cartel law, i.e. no check to see that the price is reasonable. Since July 2005 only the grid fees included in electricity prices have been subject to monitoring and approval by the Federal Network Agency. As a rule the household tariff is made up of a fixed basic price per month and a consumption-related price per kilowatt-hour.

Customers are not normally free to negotiate general household tariffs for electricity. They can however switch to a different supplier, subject to the relevant periods of notice, in order to secure a better price or exert influence on the source of the electricity (cf. page 31 with information on "Green power"). Price comparisons are available on the Internet from various providers (see also "Information from the Internet" at the end of this brochure). To see how prices for the average household tariff[1] have developed in Germany, see the diagram on page 9.

Non-tariff customers are usually electricity customers who consume more than 10,000 kilowatt-hours a year for professional, agricultural or commercial purposes and who have their own multi-rate meter (Energy Management Act – Energiewirtschaftsgesetz – Section 3(22)). They negotiate with the supplier an individual electricity price that takes account of special aspects such as total annual consumption or the distribution of power requirements in the course of the day. There are great variations in contract structure, duration and prices, all of which – for this reason – are usually treated as confidential.

1 The household tariff is normally based on two components: a monthly basic rate and a charge per kilowatt-hour consumed. This results in a consumption-related combined price per kilowatt-hour, which falls as consumption increases. The diagram shows the combined price for a household consuming 3,500 kWh a year.



Source: Bundesverband der Energie- und Wasserwirtschaft (BDEW), calculations by ifne

Major non-tariff customers also profit to a considerable extent from special concessions under the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz – EEG), the Heat and Power Cogeneration Act (Kraft-Wärme-Kopplungs-Gesetz – KWKG) and the Electricity Tax Act (Stromsteuergesetz – StromStG). Moreover, the Concession Charges Ordinance (Konzessionsabgabeverordnung) provides relief for major electricity consumers (see box).

The average price for all non-tariff customers in 2006, as determined by the Federal Statistical Office, was 8.02 cents per kilowatt-hour (excluding value-added tax). This figure is heavily influenced by large non-tariff customers with very favourable electricity prices. However, the price paid by the majority of non-tariff customers is considerably higher than this statistical average.[2]

This rest of this brochure does not consider individual electricity prices paid by non-tariff customers. Instead, the explanations and figures focus on general household-tariff customers, i.e. mainly private homes, but also small businesses and services.

2 For example, non-tariff customers who consume 125,000 kWh per annum and have a connected load of 100 kilowatt (kW) pay an average of 13 cents per kilowatt-hour excluding value-added tax.

Relief for non-tariff customers

Section 16 of the Renewable Energy Sources Act (EEG) contains a special compensation provision for particularly energy-intensive enterprises in the production sector and for railways. They can apply to take a much reduced quantity of EEG electricity; based on an EEG surcharge of only 0.05 cents per kilowatt-hour.

The Heat and Power Cogeneration Act (KWKG) also lays down a much reduced surcharge as compensation for energy-intensive enterprises. For final consumers with an annual electricity consumption of more than 100,000 kilowatt-hours (kWh) per delivery point it is a maximum of 0.05 cents per kilowatt-hour for the portion that exceeds the 100,000 kWh threshold. If electricity costs accounted for more than 4% of sales revenue in the preceding calendar year, the surcharge for the quantity exceeding 100,000 kWh is reduced to as little as 0.025 cents per kilowatt-hour.

Revenue from the **Electricity Tax Act** is largely paid into the state pension scheme, where it helps to stabilise the level of contributions. This reduces the burden on business that is due to the employer's contribution to the pension scheme. Without the electricity tax the present contribution rate (19.9% since 1.1.2007) would today be 1.7 points higher, at 21.6%. However, electricity-intensive operations in the production sector often derive little benefit from this reduction in the employer's contribution, since their personnel costs only account for a small proportion of total costs by comparison with other industries. In such cases the following compensation arrangement applies: if the electricity tax, after deduction of a minimum amount of €512.50, exceeds the saving on pension contributions, the company has to bear only 5% of the remaining additional cost.

In the case of the **concession charge**, non-tariff customers basically pay a reduced rate of 0.11 cents per kilowatt-hour. What is more, this charge does not apply at all if the mean annual electricity price paid by the non-tariff customer is less than the average price (see above). However, towns and municipalities may also set higher threshold prices and thereby deliberately exempt businesses from paying the concession charge.

PRICE COMPONENTS OF HOUSEHOLD ELECTRICITY

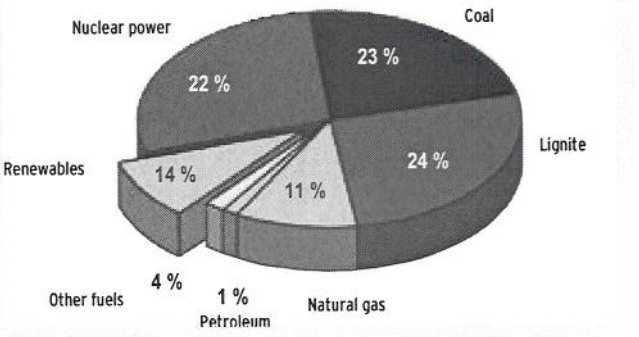
The EEG is only one of eight price components that go to make up the price of household electricity. These components can essentially be classified in two categories: electricity generation (including transmission and marketing), and taxes and charges. The KWKG and EEG surcharges which are shown separately in the following explanation belong to the electricity generation category.

Electricity generation and transmission

1. Electricity generation

In Germany electricity is mainly generated in central power plants using finite energy sources such as coal and lignite, uranium ore, and gas and heating oil. In 2007 renewable energy sources accounted for as much as 14.2%, after only 6.3% in 2000.

Generation structure of electricity consumed in 2007



Source: Arbeitsgemeinschaft Energiebilanzen as presented by AGEE Stat., ifne (figures rounded)

Specific electricity production costs for conventionally generated power are between 3 and 5 cents per kilowatt-hour in Germany, depending on the type of power plant. For comparison: payments to all EEG plants in 2007 averaged an estimated 11.4 percent per kilowatt-hour (average production costs).

A distinction must be made between electricity production costs and the market price which is determined on the Energy Exchange. This may be considerably higher or lower than production costs, because prices there are strongly influenced by the relationship between supply and demand (cf. diagram on page 23).

2. Electricity transmission

Once generated, electricity has to be transmitted from where it is produced to where it is consumed – with the aid of a multi-branched grid. This is operated by the distribution and transmission system operators (TSOs). The construction and maintenance of these grids involve corresponding costs.

According to the Federal Association of the Energy and Water Industries (BDEW), the total length of this system in Germany is currently around 1.67 million kilometres. It consists of several different sub-systems. Long-distance transport uses the extra-high voltage grid (220,000 and 380,000 volt). Conurbations and large regions are served by the high voltage grid (110,000 volt). Regional distribution takes place via medium voltage (6,000 to 60,000 volt) and low voltage grids (230 and 400 volt).

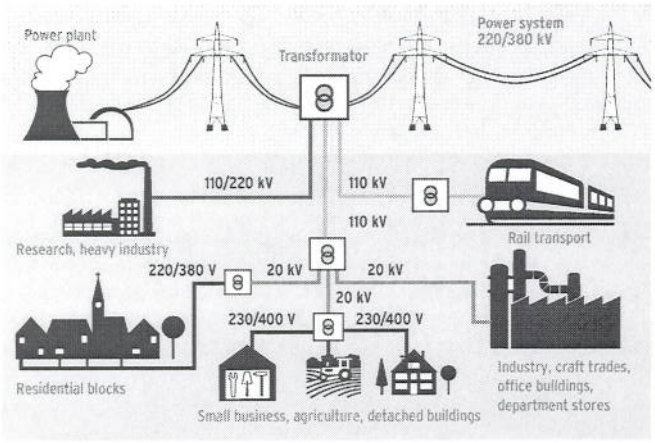


Diagram based on material published by Bundesverband der Energie- und Wasserwirtschaft (BDEW)

In Germany the supra-regional extra-high voltage grid, also known as the transmission grid, is run by only four transmission system operators: E.ON Netz, RWE Transport-Netze Strom, Vattenfall Europe Transmission, and EnBW Transportnetze. Via their group structures, these TSO companies are also linked with power plant companies and are therefore known as federated or integrated companies. They provide over 80% of domestic electricity generating capacity and also hold numerous interests in regional providers and municipal utilities.

Average grid fees for tariff customers have fallen considerably as a result of network regulation, and stood at 6.34 cents per kilowatt-hours[3] in 2007 according to the Federal Network Agency, though in individual cases they may show marked upward or downward variations depending on grid operator. They thus account for about one third of the total price of a kilowatt-hour of household electricity.

The grid fees also include the cost of constantly matching the electricity supply to actual demand, i.e. providing "regulated energy". This adjustment process ensures that at any given time the amount of electricity produced in the electricity system matches the amount consumed, and that the frequency of the alternating current remains constant at 50 hertz. The regulated energy is produced by power plants kept specially for this purpose. Over defined periods of time (seconds, minutes, hours) they smooth out the fluctuations that are constantly occurring in the electricity grids. However, no plausible evidence has yet been produced of the additional input for regulated energy that the grid operators constantly claim to be necessary as a result of large fluctuations in wind power feed, especially since it

3 Monitoring report 2007 by the Federal Network Agency (Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen) (figures: April 2007).

is not possible to identify any extra control energy input for renewable energy from publicly accessible grid operator data.[4]

However, the task of distributing EEG power to electricity suppliers as uniform band power gives rise to "costs for balancing energy" for transmission system operators, because the fluctuating input from wind and photovoltaic systems has to be smoothed out compared with fixed band power. The resulting costs are included in the grid fees, and are subject to substantial variations. A study puts the bandwidth of annual balancing energy costs over the period 2004 to 2007 at between €0 and €500 million.[5]

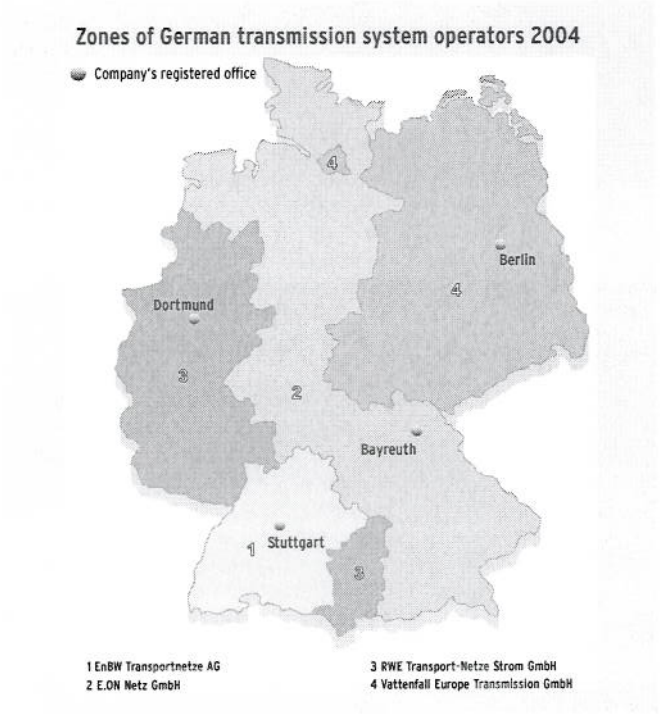
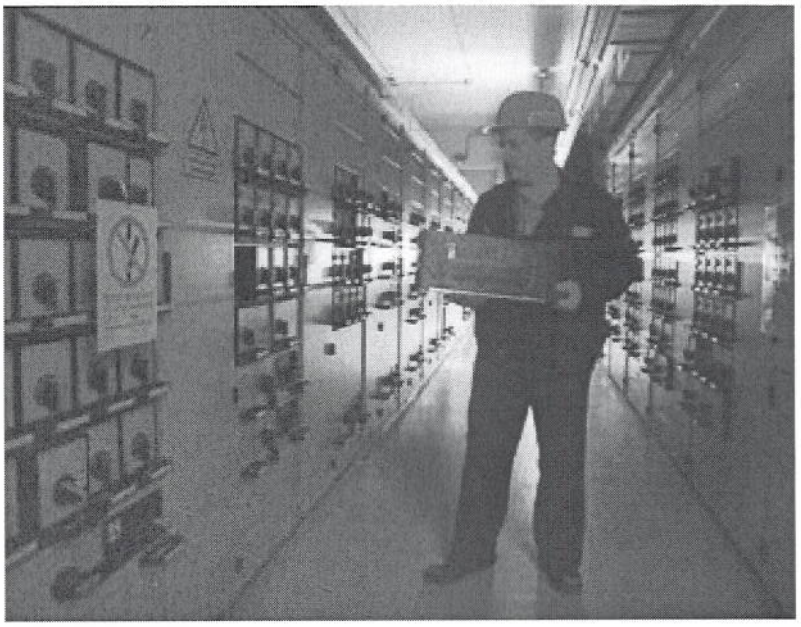


Diagram by Bundesverband der Energie- und Wasserwirtschaft (BDEW)

4 LDB-Beratungsgesellschaft: Angemessenheit der Netznutzungsentgelte der Übertragungsnetzbetreiber im Auftrag des Bundesverbandes neuer Energieanbieter und des Verbandes der industriellen Energie- und Kraftwirtschaft (2005).

5 LDB-Beratungsgesellschaft: Gutachten zur Angemessenheit der Aufwendungen für die Veredelung des EEG-Stromaufkommens durch die Übertragungsnetzbetreiber im Auftrag des Bundesverbandes neuer Energieanbieter (2007)



3. Marketing and metering

It is not only the generation and transmission of electricity that cause costs. These factors – as in other companies – are joined by additional expenditure on selling the electricity in the market (marketing costs). The final stage in the consumption cycle is the cost of metering – for ascertaining and communicating the amount of electricity consumed. The two cost components together come to around 0.5 to 1 cents per kilowatt-hour.

The 2005 revision of the Energy Management Act (Energiewirtschaftsgesetz – EnWG) initially only deregulated metering, i.e. the installation, operation and maintenance of metering facilities. Work is currently in progress on an amendment to the Electricity Management Act that will also permit meter reading by third parties. It is expected to enter into force in the second half of 2008.

4. Electricity tax

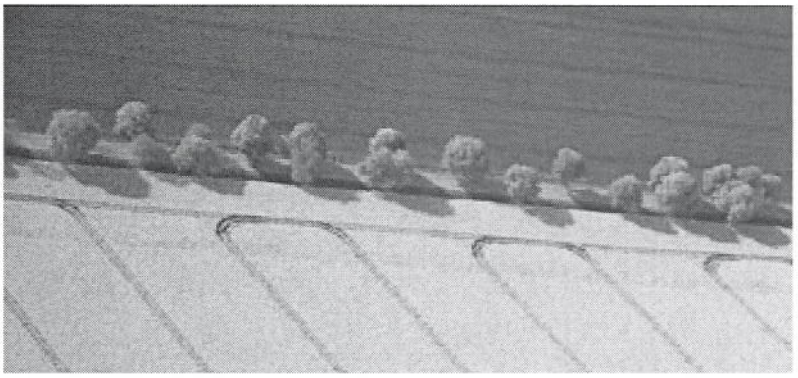
The electricity tax is part of the Ecological Tax Reform, which has been in force since 1999. It is intended to provide incentives to save energy, make efficient use of energy and use renewable energies. Tax surcharges on the use of heating oil, petrol, diesel, natural gas, liquefied gas and electricity increase the price of these fuels. This internalises external costs[6] that have not so far been taken into account in economic decisions about the use of energy. Since revenue from the Ecological Tax Reform is largely used to reduce and stabilise the rate of contributions to the state pension scheme, this reduces the burden on the production factor "labour" and raises the cost of "use of energy" instead. The benefits accrue not only to the environment, but also to employers in the form of reduced personnel costs and to employees through increased net income.

Internal consumption of electricity from plants with a nominal capacity of up to 2,000 kilowatts is exempted from electricity tax, since such plants are usually operated as efficient heat-and-power cogeneration plants and help to strengthen decentralised electricity generation.[7]

An electricity tax of 2.05 cents per kilowatt-hour for household-rate power has been in force since the fifth and latest stage of the reform in 2003. Ninety percent of the revenue goes straight to the state pension scheme, where it helps to keep down the level of contributions. Electricity tax is also levied on electricity from renewable energy sources[8]. When the Ecological Tax Reform was introduced in 1998, this was justified on fiscal grounds, but there is still a certain amount of criticism, especially since it runs counter to one of the aims of the Ecological Tax Reform, namely to promote increased use of renewable energies.

	1998	1999	2000	2001	2002	since 2003
Electricity tax (cent/kWh)	–	1.02	1.28	1.54	1.8	2.05

6 For an explanation see the box on "External costs of electricity generation" on page 35.
7 Electricity from power grids or lines fed entirely with electricity from renewable energies is exempt from the tax, without quantity restrictions. The exception here is electricity from hydropower plants with a capacity of over 10,000 kilowatts.
8 The resulting tax revenue is estimated at €910 million for 2007. Part of it is used – especially via the "market incentives programme" – to promote renewable energies.



5. Value-added tax

Unlike all electricity price components listed so far, value-added tax (Umsatzsteuer – USt – also known as sales tax) – makes a major contribution to financing general government expenditure. The energy supply utilities charge it at the rate of 19% on the net electricity price and pay it to the tax authorities. As a "tax on consumer spending", value-added tax is only intended to be borne by final consumers of electricity. Since businesses are usually entitled to deduct input VAT, it is only a transitory item for them.

The revenue from value-added tax, as a "community tax", goes to the federal authorities (including the state pension scheme), the regional authorities (Laender) and – to a small extent – the local authorities. Value-added tax on electricity is levied on all other cost components mentioned here.

6. Concession charges

Concession charges are private-sector fees that electricity suppliers – like water or gas suppliers – have to pay to local authorities so that they can build or operate largely on or under public roads. The basis for this is the Concession Charges Ordinance (Konzessionsabgabenverordnung), which gives local authorities a certain freedom as to how they apply it. Depending on population, municipalities can levy between 1.32 and 2.39 cents per kilowatt-hour as "road rental". It is possible to waive the concession charge, and in some cases this is actually done. Non-tariff customers in any case pay reduced rates or no charges at all (see box on "Relief for non-tariff customers" on page 10).

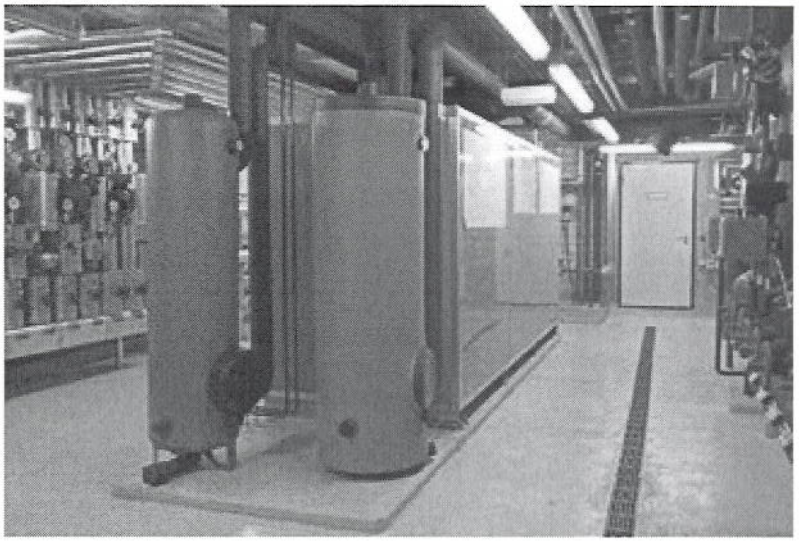
PROMOTION OF HEAT-AND-POWER COGENERATION AND RENEWABLE ENERGIES

The cost components for the Renewable Energy Sources Act (EEG) and the Heat-and-Power Cogeneration Act (KWKG) which are described from here onward increase the electricity purchase costs of the power supply utilities, and should in principle be classified in the "electricity generation" category described above. As a rule, however, the electricity industry tends to show them separately. At first sight this is logical: for one thing they have a statutory duty to take supplies of electricity from EEG or KWKG sources, while for another, suppliers of such electricity are largely in competition with the classic electricity industry. For them it therefore makes sense to show the EEG and KWKG surcharges separately as "government motivated price factors".

At the same time, however, other electricity price components that are also due to state intervention are not shown separately. One prominent example is the substantial price-boosting impact of the CO2 emissions trading system introduced throughout Europe (see box on "Emissions Trading", p. 24). In view of the largely free allocation of emission rights, this has in recent years made it possible for power suppliers to net additional "windfall" profits running into the millions.

7. Heat and Power Cogeneration Act

Between 45 and 70% of the energy used to generate electricity is currently lost in conventional power plants in the form of unused "waste" heat. This is not the case with cogeneration of heat and power: the simultaneous use of heat and power increases utilisation of the fuel in energy generation to up to 90%, the heat being used, for example, in industrial processes or in district or local heating networks. Thus cogeneration of heat and power ensures much lower energy consumption and much reduced emissions of climate-relevant carbon dioxide (CO2). Accordingly, the German government –, as an addition to the climate agreement of 2000, – reached agreement with German industry on the Heat and Power Cogeneration Act (Kraft-Wärme-Kopplungs-Gesetz – KWKG). This is intended to support the further expansion of cogeneration, because a higher payment is made when Cogeneration Act electricity is fed into the public grid.



The equalisation of burdens between transmission system operators ultimately results in higher grid fees (see box on "Equalisation of burdens for non-tariff customers" on page 10).[9]

According to the most recent annual statement (2006), the grid operators paid a total Cogeneration Act surcharge of €787 million to operators of Cogeneration Act plants, which generated a total of around 60,600 GWh[10] of electricity. For all non-privileged customers ("Final consumer group A") this increased grid fees by 0.31 cents per kilowatt-hour. Figures of 0.27 and 0.20 cents per kilowatt-hour are forecast for 2007 and 2008 respectively.

8. Renewable Energy Sources Act

The "Act on priority for renewable energy sources" (Renewable Energy Sources Act – EEG) obliges grid operators to give priority to taking electricity generated from renewable energy sources, feeding it into the electricity grid, and paying the relevant statutory minimum rates to the plant operators. These minimum rates are based on the individual generation costs and show a gradual decrease, i.e. they take account of differences in productivity advances in the various sectors and in potential cost reductions over time. Electricity from renewable

9 This is a major difference from the Renewable Energy Sources Act, which does not impose a surcharge on the grid operators' grid fees, but requires that every power supplier must buy a defined quota of EEG electricity at the average price from the transmission system operator, which increases the cost of externally purchased electricity.
10 Gigawatt-hour (GWh) = one million kilowatt-hours (kWh).

sources is passed on uniformly in accordance with a burden equalisation mechanism defined in the Act to all electricity distributors, who thus have to meet a growing proportion of their electricity purchase requirements from renewable energy sources. They thereby incur additional costs, because the average EEG remuneration that they have to pay is usually higher than the wholesale price of the electricity – most of which is not generated from renewable energies.

In 2000 the Renewable Energy Sources Act (EEG) superseded the Electricity Feed Act (Stromeinspeisungsgesetz) of 1990 and considerably expanded its scope. In 2004 it underwent its first comprehensive revision. A second revision is currently going through the parliamentary procedure. The basis for this is a progress report submitted by the German government in November 2007. The recommendations it contains have been incorporated in a government draft for a revision of the EEG, which is to enter into force not later than 1.1. 2009.[11] Among other things, it includes plans for a marked upward adjustment of the expansion targets laid down in the EEG: by 2020 the share of German electricity supplies accounted for by renewable energy sources is to rise to 25 - 30% and continue rising thereafter. At present the EEG lays down a minimum target of 20% for 2020.

The aim that the German government is pursuing in the EEG is to ensure better harnessing of the vast potential of wind, water, biomass, sun and geothermal energy for electricity generation and advance the establishment of sustainable electricity generation in Germany. According to Section 1 of the EEG currently in force, the content of which is to be adopted in the new version, the Act pursues the following additional aims:

- Sustainable development of energy supply, climate change mitigation, nature conservation and environmental protection.
- Reduced external costs of energy supply.
- Improved reliability of supply through reduced dependence on energy imports while simultaneously making a contribution to reducing conflicts about fossil energy resources.
- Technological development in the field of renewable energies.

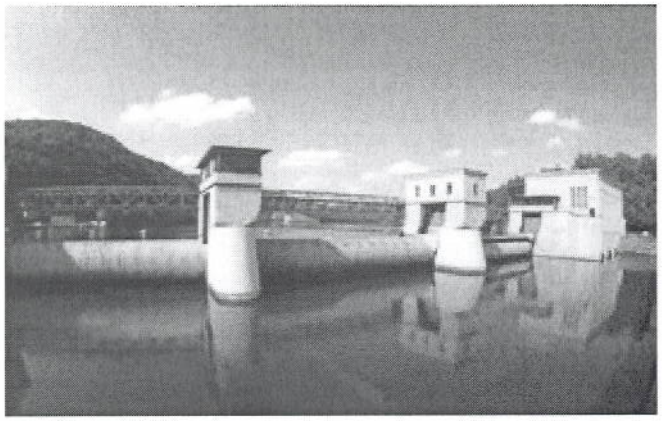
By the middle of the century as much as half of Germany's energy requirements are to be met from renewable energy sources. The marked growth in use of renewable energy sources in recent years, and also scientific studies,[12] show that this is not a mere pipedream. The clear signals of marked climate change, such as melting Alpine glaciers and polar ice caps or rising sea level, also call for a continuous shift to a future energy supply situation with a low or even non-existent carbon footprint.

Cost impacts of the EEG

CalculationsI indicate that a total of around 87,500 GWh of electricity from renewable energy sources was generated and fed into the German grid last year (2007)[13]. This is about 14% of gross power consumption. Of this figure, about 67,100 GWh was subject to remuneration in accordance with the EEG[14]. The average remuneration for the entire EEG electricity mix in this period was probably around 11.4 cents per kilowatt-hour. The sum total of EEG remuneration to plant operators was around €7.9 billion.

What additional costs – known in the EEG as differential costs – are actually incurred by electricity consumers depends above all on two factors: firstly, what additional costs are incurred by electricity suppliers as a result of their obligation to take EEG power, and secondly, whether they pass on these additional costs in full to their customers.

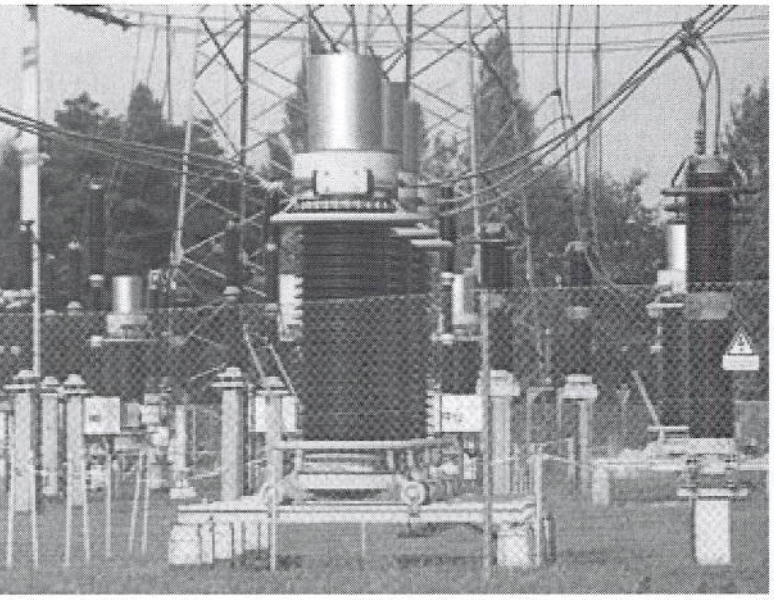
11 The EEG progress report, including information about accompanying research projects, can be downloaded from www.erneuerbare-energien.de. Up-to-date information on the progress of the legislative procedure for the EEG revision, including the government draft, can also be found here.



12 Cf. Renewable Energy Sources in Figures – National and International Development, and Leitstudie 2007: Ausbaustrategie Erneuerbare Energien.

13 These are provisional calculations by the Working Group on Renewable Energy Statistics (AGEE-Stat), see www.erneuerbare-energien.de. A final statement for the preceding year has to be presented by the transmission system operators by 30 September.

14 The difference is primarily due to electricity generated by hydro-power, which has been produced economically in large hydro-power plants for about 100 years and is therefore not the subject of remuneration under the EEG.

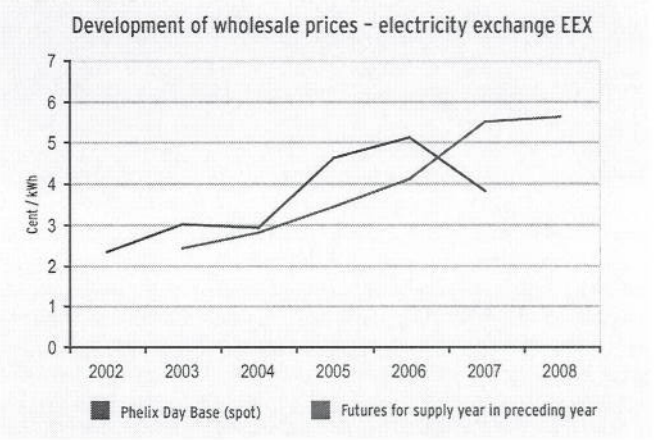


As far as procurement of electricity by electricity suppliers is concerned, compulsory purchases of electricity from renewables replace purchases of conventional electricity, which means the effective additional cost is the result of the difference between the average EEG remuneration and the purchase price of conventional electricity. Since all electricity suppliers have individual procurement terms and their purchase prices are a central business secret, the latter are not publicly available. To calculate the average EEG costs in Germany, as in this brochure, it is therefore necessary to estimate an average purchase price for all electricity suppliers as an approximation. Where electricity suppliers base their calculations of the EEG surcharge on different individual electricity procurement costs, this can in practice lead to deviations from the average EEG surcharge mentioned in this brochure. However, according to Section 15 of the EEG currently in force (2004), electricity suppliers are obliged on request to substantiate the calculation of any specific EEG surcharge imposed.

Whether the higher procurement costs ultimately have an impact on final consumer prices depends on the extent to which the electricity suppliers are willing or able to pass on their additional procurement costs to the customer in their electricity prices. Since there is still relatively little competition on the electricity market for household customers, they can be assumed to pass these costs on in full.

What is the average purchase price of conventionally generated electricity?

The market price for EEG electricity is taken to be the purchase price of the conventionally generated electricity it replaces. This purchase price is determined among other things in wholesale electricity trading on the Leipzig electricity exchange EEX. This price also has a major lead function for purchase prices outside the exchange (i.e. direct transactions between electricity producers and distributors or final customers). The following diagram shows the development of electricity prices on the EEX spot and futures markets.[15]



Source: EEX, ifne calculations

The wholesale price is no longer based entirely – as it was before the deregulation of the electricity market – on actual generation costs, but on the prices that can be obtained on the market, i.e. on the relationship between supply and demand. One clear trend is the marked rise in EEX prices since 2002. The trend of futures prices, i.e. price hedging before the actual year of delivery (front year), shows a continuous upward movement. In 2007 the prices for 2008 were about 230% above the prices for 2003 in 2002. The price trend on the spot market shows similar tendencies, though with the difference that in 2007 they were below the previous year's prices, mainly because of the barely relevant prices for CO_2 emission rights at the end of the first trading period.[16] At the beginning of 2008 emission rights prices were again much higher, in the region of €20-23 / t CO_2, and hence higher spot market prices, can be expected in 2008.

15 The spot market relates to short-term electricity supply contracts for the next day.
16 In 2007 the price of CO_2 emission rights was only marginally above €0 / t CO_2.

The average electricity purchase price of all electricity suppliers can be determined approximately by means of the EEX price. Depending on the approach adopted, i.e. use of futures and/or spot market prices, there are understandable differences in the results. A scientific study commissioned by the Federal Environment Ministry recommends combining the two prices: if the spot market and futures prices for base load electricity are weighted in accordance with their trading volume, the procurement price for 2007 works out at around 5 cents per kilowatt-hour. The price for 2008 is estimated at around 5.5 cents per kilowatt-hour.[17]

Emissions trading

As a result of emissions trading, CO_2 emission rights now have a market price that businesses have to include in their economic calculations. Operators of electricity generating plants therefore have to take this price into account – despite largely free allocation to date – in their electricity generation costs. After all, they can also sell the rights if they no longer need them as a result of CO_2 savings (reduced requirements). The extent to which this valuation raises electricity prices depends largely on the current price of emission rights and the competition situation on the electricity market.

Emissions trading was introduced in 2005 in Germany and the other countries of the European Union as a new instrument for climate change mitigation. It is intended to bring about further reductions in emissions of the climate-relevant gas CO_2 by power plants and other industrial installations. Its scope includes large energy plants with a rated thermal input exceeding 20 MW and energy-intensive industries such as cement works, refineries and iron and steel production.

If originators of CO_2 emissions do not have enough emission rights available, they can for example buy additional rights or reduce their CO_2 emissions by installing climate-friendly technologies. The number of emission rights is limited. Emission rights can only be bought if CO_2 emissions are reduced elsewhere. In this way the CO_2 savings take place where they have the most favourable impact on costs. Emission rights are traded on stock exchanges and other trading centres.

17 Wenzel, Bernd: Beschaffungsmehrkosten für Stromlieferanten durch das Erneuerbare-Energien-Gesetz im Jahr 2007 (Differenzkosten nach § 15 EEG). Study commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Teltow 2008.

Recent analyses have also shown that renewable energies have had a price-curbing impact on the EEX spot market prices, because their additional supply gives rise to a shift in the demand curve. This applies particularly to the supply of electricity from wind energy, which is sometimes very considerable. According to scientific studies for the Federal Environment Ministry, renewable energies reduced the spot market price by an average of 0.78 cent/kWh in 2006.[18]

Using the example of 2007, the following table shows what effect different assumptions about the market value of EEG electricity have on the size of the EEG differential costs for the electricity industry and final customers.

Assumption about procurement price of conventional electricity [cent/kWh]		2007	
		EEG extra costs* [billion EUR]	Statistical EEG surcharge for private households [cent/kWh]
4.9	BDEW (Basis: futures price)	4.4	1.0
5.0	BMU Report electricity purchase costs electricity suppliers	4.3	1.0
10.8	BMU plus allowance for external costs [19]	0.4	0.1

*** Data basis in each case: EEG electricity quantity 67,100 GWh, average EEG payment: 11.4 cent/kWh, Delivery to final consumers 495,000 GWh.**
Electricity purchases by companies privileged under EEG Section 16: 72,000 GWh, external costs 5.8 cent/kWh (figures rounded).

18 Cf. Sensfuß/Ragwitz/Genoese: The merit-order-effect: A detailed analysis of the price effect of renewable electricity generation on spot market prices in Germany. Fraunhofer Institute Systems and Innovation Research, Working Paper 07/2007

19 See box on "External costs of energy generation" on page 35.

WHAT DOES THE EEG COST ELECTRICITY CUSTOMERS?

A "reference household" with an annual electricity consumption of 3,500 kilowatt-hours is often used to make it possible to compare the electricity costs of tariff customers over a period of several years. In fact, individual electricity consumption depends on a large number of factors such as number of persons, usage habits, or age and number of electrical appliances. For example, household electricity consumption can range from nearly 1,800 kWh for a 1-person household to 5,300 kWh for households with 5 or more persons.[20] Households that are well equipped with efficient appliances and make sparing use of energy may nevertheless keep their annual consumption down to as little as 2,000 kWh for four persons. In terms of the total population of Germany, average annual electricity consumption per household customer is currently around 1,700 kWh.

By the way: Do you know how much electricity you use every year?

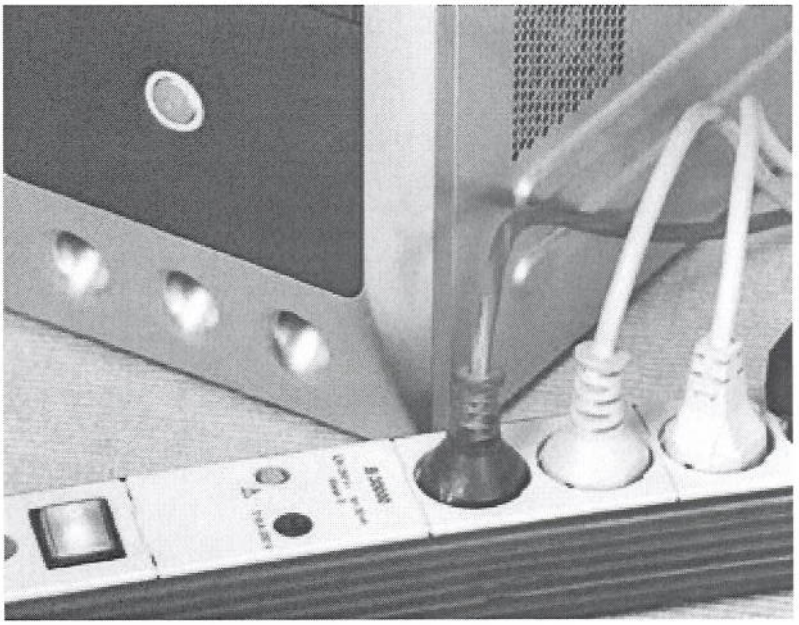
Cost trends

The table below shows how average monthly electricity costs for the reference household mentioned above have developed over the last seven years. The figures are based on information from the Federal Association of the Energy and Water Industries (BDEW). Only the EEG surcharge since 2005 is calculated rather differently than by the BDEW, in line with the above assumptions regarding the procurement price of conventionally generated electricity.

	2000	2002	2004	2005	2006	2007
Electricity bill €/month (3,500 kWk/a)	**40.67**	**46.99**	**52.48**	**54.23**	**56.63**	**60.31**
Generation, transmission, marketing	25.15	28.32	31.56	32.73	34.53	35.70
EEG	0.58	1.02	1.58	1.84	2.20	2.94
KWKG	0.38	0.73	0.91	0.99	0.90	0.85
Concession charge	5.22	5.22	5.22	5.22	5.22	5.22
Electricity tax	3.73	5.22	5.97	5.97	5.97	5.97
Value-added tax	5.61	6.48	7.24	7.48	7.81	9.63
Electricity bill at 2000 prices	40.67	45.45	49.41	50.07	51.44	54.23

Sources: Bundesverband der Energie- und Wasserwirtschaft (BDEW); calculations by ifne.

20 Forsa/EWI: Erhebung des Energieverbrauchs der privaten Haushalte für das Jahr 2005. Forschungsprojekt Nr. 15/06 im Auftrag des Bundesministeriums für Wirtschaft und Technologie 2008.



In 2007 the EEG surcharge, at 1 cent per kilowatt-hour, only accounted for a bare 5% of the total household electricity price.

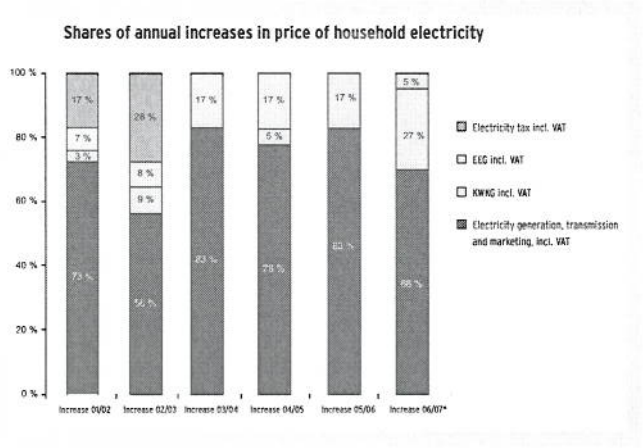
In individual cases there are naturally considerable variations in the size of the EEG surcharge, depending on electricity consumption. On the basis of the above mentioned spectrum for individual household sizes, the average EEG surcharge for 2007 gives rise to household costs of between about €1.40 and €4.50 per month.

WHY ARE ELECTRICITY PRICES RISING DESPITE COMPETITION?

The table above also shows that there has been a steady increase in the price of electricity for households in recent years. This is primarily due to the price components for generation, transmission and marketing which are attributable to the electricity industry. Including the relevant value-added tax, their share of the annual electricity price rises came to between 56 and 83%. A large part of the sizeable overall increase in monthly electricity bills from 2006 to 2007 was due to the increase in value-added tax from 16 to 19%.

The influence of the other components, such as electricity tax, Co-generation Act and EEG, was considerably smaller. On the other hand, since 2001 the proportion of the annual electricity price increase accounted for by the EEG – including the relevant value-added tax – has only been between 7 and 27%. It is thus not the principal price factor that the electricity industry likes to present it as (cf. next diagram).[21]

But why have costs in the field of electricity generation and transport been rising continuously for several years?



Source: Bundesverband der Energie- und Wasserwirtschaft, AG Erneuerbare Energien Statistik, ifne calculations

Little competition on the electricity market

In Germany, electricity and its price have a special history compared with other goods and services. Until 1998 the supply of electrical energy was governed by an Energy Management Act dating from 1937, the basic features of which were thus over 60 years old at that time. Germany was divided into supply districts where the individual supplier had a duty to supply (demarcation agreements), but also enjoyed a monopoly. To prevent the supplier from demanding exorbitant monopoly prices from the customer, electricity prices were subject to approval. This situation, which had been established for decades, changed when an EU directive of 19 July 1997 obliged the Member States to gradually open the electricity markets. This directive was transposed into German law in the new Energy Management Act (Energiewirtschaftsgesetz – EnWG) of 1998. The new Energy Management Act abolished the district monopolies and basically permitted free competition.

The revision of the Energy Management Act in 2005 created a new regulatory framework for the energy industry. The natural monopoly in the electricity grid sector is now subject to regulation. Since the revised version entered into force, grid fees have been approved by the Federal Network Agency and the regulatory authorities of the federal Laender. From 2009 onward the system of grid fee approval will be replaced by incentive-based regulation, which is intended to bring about a steady increase in the efficiency of grid operation and a reduction in grid fees. Grid operators are obliged to provide grid connections and system access to anyone, and to expand grids to cater for needs. Separation of the generation, transmission and marketing sectors within an integrated energy supply enterprise is subject to rules for unbundling of grid operation

Since 1998, however, there has been increasing concentration in the electricity supply sector, with the four major integrated companies acquiring interests in municipal utilities and regional suppliers. Grid fees are therefore a central competition factor in electricity trading today. In its 2007 monitoring report, the Federal Network Agency therefore stated:

"The competition situation on the electricity markets upstream and downstream of the grid sector did not improve significantly in 2006 either. The trend towards greater market concentration ... is therefore continuing."
"The players active on the demand side are a small number of major customers, sourcing-optimised redistributors and the major electricity supply companies themselves. The four biggest electricity supply companies together account for an overwhelming share of the trading offers."[22]

In the annual report 2005 it had already been noted that:

"It can be said of the electricity market as a whole that the market is highly concentrated. ... In addition to the large market shares of the two leading enterprises RWE and E.ON, their importance is further enhanced by the large number of interests they hold in other electricity supply companies (especially municipal utilities). These often enable them to exert a controlling influence on the competitive behaviour of the businesses in which they have a stake."

21 The proportionate increase in electricity tax in 2007 in the diagram is solely due to the increase in value-added tax.

22 Monitoring report 2007 by the Federal Network Agency (Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen), p. 11.

The monopoly commission set up by the German government has also been examining competition on the electricity market for several years now, and in 2007 it presented a special report. Although this notes progress on some fronts, it reaches the following overall conclusion:

"The analysis of the German electricity and gas market shows that on the markets for grid-based energy supplies in the Federal Republic of Germany one still cannot speak of a functioning market." [23]

The reasons given are:

- Concentration of electricity generation on a small number of companies.
- Numerous horizontal and vertical linkages between the market-controlling transmission system operators themselves and between the TSOs and downstream municipal utilities.
- High barriers to market access for new companies.
- Small number of final consumers changing suppliers.
- Participation by the four integrated companies in municipal utilities and other redistributors.

Similar statements for Germany and the EU were also made in the report by the EU Competition Commission in February 2006.[24] In September 2007 the EU Commission made suggestions for a third single market package with a view to advancing deregulation of the markets.

Thus more competition on the electricity generation market calls for more suppliers and above all for sufficient generating capacity, since capacity shortages would inevitably result in higher prices. Renewable energy sources make a great contribution to the provision of new and environmentally sound generating capacity.

23 Sondergutachten der Monopolkommission gemäß § 62 Abs. 1 des Energiewirtschaftsgesetzes. Strom und Gas 2007: Wettbewerbsdefizite und zögerliche Regulierung, p. 14. Bundesdrucksache 16/7087.
24 DG Competition report on energy sector inquiry (SEC(2006)1724)

What is green power?

Electricity from renewable energy sources is also known as green power. However, this does not mean that the green power sold under various product names by electricity suppliers is the same as EEG electricity.

Electricity remunerated under the EEG is expressly not allowed to be marketed as green power. This is prohibited by the "double marketing ban" in Section 18 of the Renewable Energy Sources Act. In other words, green power must have been produced in generating plants not subject to remuneration under the EEG, which may also mean abroad.

Since the term green power is not clearly defined or even protected, there are many products of widely varying quality on sale on the electricity market. For this reason a number of organisations offer certifications that claim to say something about the quality of the green power (e.g. "Grüner Strom Label gold/silber" or "OK-Power").

The green power products frequently include a very large proportion of (relatively inexpensive) hydro-power, which has been produced and exported by Scandinavia, Austria or Switzerland, in some cases for many years. Under present-day market conditions, German demand for green power is unlikely to create any additional demand for electricity from renewable energy sources.

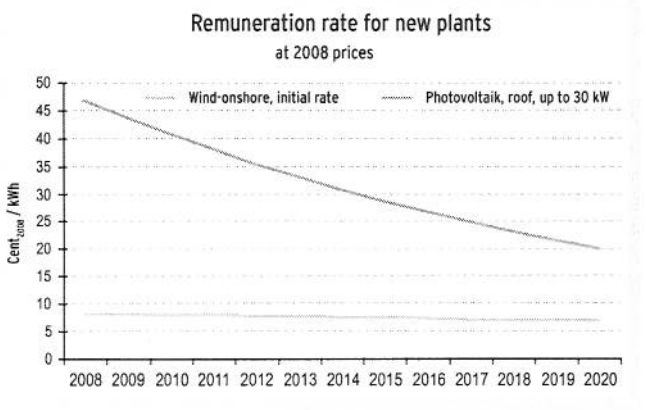
Anyone who wants to pursue environmental and especially climate protection objectives with their choice of electricity should therefore make sure that their decision does indeed contribute to the building of new plants for generation of electricity from renewable energy sources, thereby creating incentives to shift the present electricity mix in the direction of more renewables.

Against this background, consumers are well advised to obtain information about the kind of certification and the underlying requirements before they consider changing to a green power tariff. This is easily done by Internet.

Further development

The ongoing dynamic expansion of electricity generation from renewable energy sources, especially in the young and innovative fields of offshore wind energy, solar energy or biomass, will initially result in a further rise in the costs of the Renewable Energy Sources Act in the years ahead – though the pace will gradually ease off: for example, the decreasing rates for payments under the EEG will make their effects felt (see diagram below). Moreover, the fact that the price of conventionally produced electricity will in all probability continue to rise (e.g. as a result of targeted reductions in CO2 emission rights, price increases for natural gas and coal, decline in power plant generating capacity) will ensure a gradual reduction in the cost differential for power from renewable energy sources.

The revised EEG currently going through the parliamentary procedure will in all probability result in a faster rate of decrease for photovoltaic energy, causing the curve shown in the graph to dip faster.



Source: EEG 2004, ifne calculations; estimated price increase 2% per annum

According to estimates[25] made for the BMU, the monthly EEG surcharge for the "reference household" mentioned above (3,500 kWh/a) could show a further increase to over €4 by 2015. This would mean monthly EEG costs of over €2 for a single-person household.

25 Base prices 2007. Cf. BMU background information on EEG Progress Report 2007 (Cost and benefit aspects with an eye to 2020/30); can be downloaded from www.erneuerbare-energien.de

After that, the decreasing cost of renewables due to the declining rates of remuneration, coupled with continuing price rises for conventional power, will result in a continuing marked reduction in the size of the EEG surcharge. On this basis it will be only around 60 cents per month in 2030 (reference household with 3,500 kWh/a), or around 30 cents per month for a single-person household.

In 2008 the total cost differential for EEG power could rise to around €5 billion, or 1.2 cents per kilowatt-hour. This would be about €3.30 per month for the reference household described above.

Even at its peak, the share of household electricity bills accounted for by the EEG will in all probability not be more than 6%. In view of the numerous benefits of electricity from renewables (see below), this is a reasonable contribution.

WHY EEG COSTS ARE ONLY HALF THE TRUTH

The public debate about the cost of renewable energy generally focuses on the extra procurement costs of the electricity suppliers and the – resulting – EEG surcharge for final consumers. This issue has been discussed in detail in this brochure. For a sound economic assessment of renewable energy sources and the EEG, however, it is not enough to confine one's view to these operating cost factors.

For one thing, it fails to take account of other costs attributable to renewable energy sources. These include, for example, the additional cost for basic and reserve energy that is needed because of the fluctuating input of electricity from photovoltaic and especially wind energy systems. Other factors are grid expansion due to the integration of power from renewables, and administrative costs incurred by grid operators for implementation of the EEG. These additional cost factors are difficult to quantify, but they are estimated to total some €300 – 600 million per annum.[26]

On the other hand, the expansion of renewables also involves a number of beneficial effects that are not reflected in the operating cost factors so far considered. On an overall view they considerably improve the economic bottom line for renewables.

Apart from the price-curbing effect of the EEG on wholesale electricity prices, the external costs of electricity generation from fossil fuels that are avoided by using renewable energy are particularly important from a macro-economic point of view (see box below on "External costs of electricity generation"): If these costs were allocated in strict accordance with the "polluter pays" principle, the price of electricity from fossil fuels would be much higher. There would be a corresponding reduction in the EEG surcharge and the additional cost of EEG power procurement. In this connection a scientific study for the BMU came to the conclusion that external costs saved by the EEG, at €4.3 billion in 2007, were more or less equal to the additional procurement costs for the EEG.

Electricity generation from renewable energy sources also results in a significant reduction in imports of coal and natural gas into Germany. In 2007 this reduced Germany's bill for fuel imports by about €1.0 billion after allowing for biomass imports.

26 Fachgespräch zum "Merit-Order-Effekt" im Auftrag des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit Berlin, 07.09.2007. Abgestimmtes Thesenpapier. Available from www.erneuerbare-energien.de

External costs of electricity generation

The concept of external costs is a firmly established part of economic theory. External costs arise, for example, where electricity generation causes damage that electricity producers do not have to include as costs in their electricity prices. Examples include damage arising from global climate change, harmful effects on health, or damage to materials due to acid and soot. On a broader view, external costs also arise if access to energy resources is secured by political and military means.

External costs may be included in electricity prices if relevant provisions require the originators to take technical or organisational measures that cause additional costs ("internalisation"). Examples include stricter limit values for sulphur dioxide, nitrogen oxides and particulates in the case of power plants in the 1980s and 1990s, and also electricity tax or emission rights for carbon dioxide (see box about "Emissions trading" on page 24). Calculating external costs is a complex task, and the results vary widely depending on the choice of parameters. There are therefore considerable fluctuations in the figures quoted in studies.

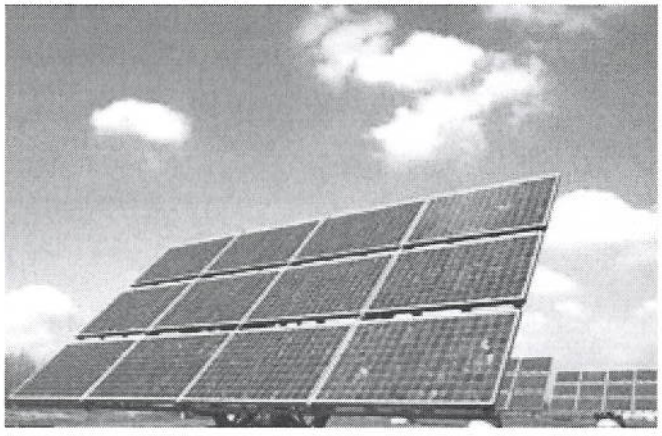
The expected costs of damage due to climate change account for the largest share of the external costs of electricity generation. A study conducted for the Federal Environment Ministry (DLR/FhG-ISI 2006) comes to the following conclusion: These costs are very likely to be over €15 per tonne of carbon dioxide (CO_2), and could, on plausible assumptions, work out at up to €300 per tonne CO_2. According to this investigation on the basis of studies analysed, one can work on a best estimate of €70 per tonne CO_2. The external costs of electricity generation in modern lignite and coal power plants thus come to between six and eight cents per kilowatt-hour, and are therefore well in excess of the electricity production costs of two to five cents per kilowatt-hour. As a rule, the external costs of electricity from renewable energy sources are less than one cent per kilowatt-hour.

Estimates in various studies regarding the external costs of nuclear power range from less than one cent per kilowatt-hour to more than €2 per kilowatt-hour. The immense damage caused by a maximum credible nuclear accident is not covered by insurance and must, in the worst case, be borne by society.

One must also remember the positive effects of renewable energy on growth and employment: In 2007 they provided work for a total of around 250,000 people in Germany in the electricity, heat and motor fuels market – a plus of more than 50% in only three years. More than half these jobs are attributable to the EEG.

The basis for this positive trend is the rise in domestic sales of renewable energy (2007: €24.6 million) that has been in progress for years and – to an increasing extent – the export success of the German renewables sector. The latter is profiting considerably from the fact that the EEG and research promotion measures in particular have set in motion a technological development process that has given Germany a leading position on the world market in various fields in the renewables sector. Today wind turbines or biomass power plants "Made in Germany" are already very successful internationally and still have considerable growth potential, because renewable energy markets worldwide are booming. The fact that the EEG itself is increasingly proving to be an export hit both reflects this trend and is one of its main driving forces.

The Renewable Energy Sources Act (EEG) as an instrument with fixed feed payments that can be predicted for long periods is a method of promoting and organising renewable energy which is considerably more efficient and cost-effective than other approaches such as quotas and bonus models. This has several times been confirmed by the European Commission. Moreover, the EEG stimulates competition on the electricity market: it creates distributed generating structures with considerably more actors, thereby reducing imbalances of market power.



RENEWABLE ENERGY – GREAT BENEFITS, DEPENDABLE PRICES

Renewables have long since emerged from their much ridiculed niche existence and established a firm place in the energy mix. Their further expansion is certain now that the European Union has set ambitious and binding targets. These state that by 2020 renewables are to account for as much as 20 percent of Europe's final energy consumption. In this context there is talk of 18% for Germany.

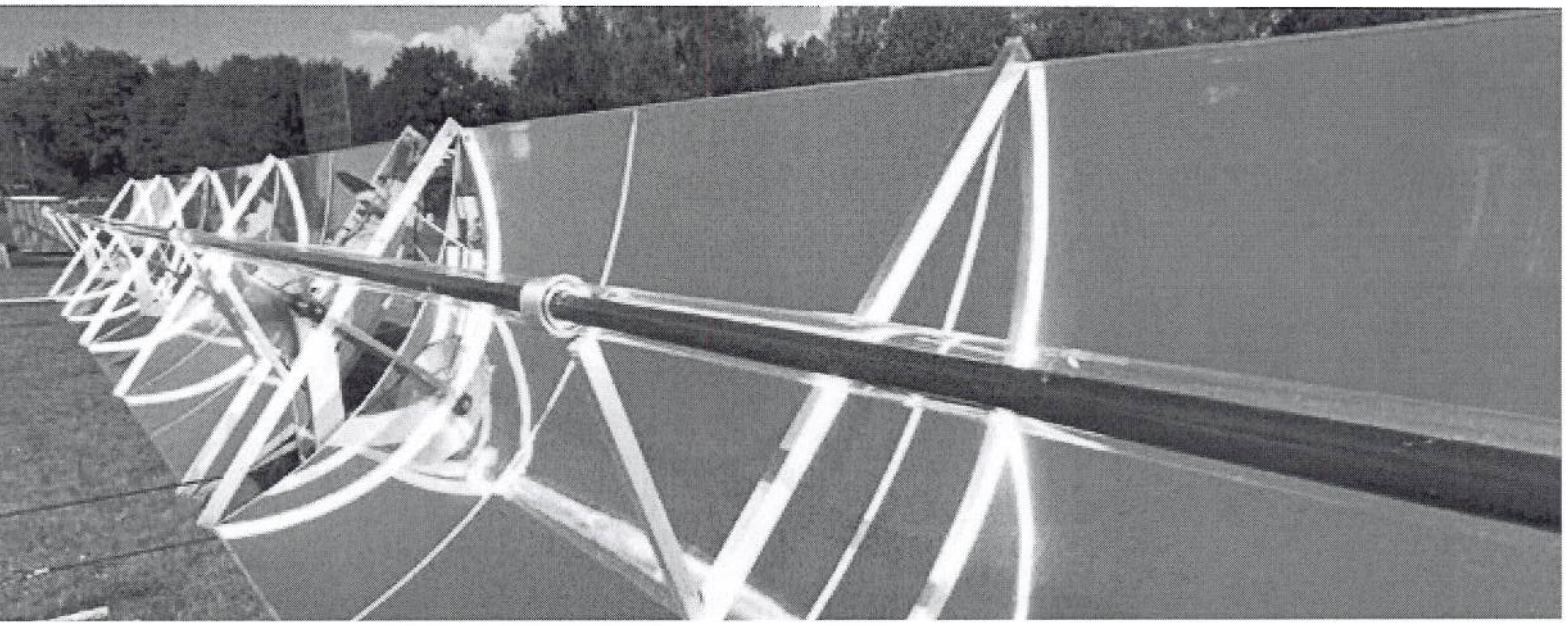
These targets focus attention not only on the electricity sector, but also on the use of renewable energy sources in cooling and heating and in the transport sector. With its energy and climate programme adopted in Meseberg in 2007, the German government has already responded and has set in motion numerous measures that are to be implemented in the years ahead. These include the revision of the Renewable Energy Sources Act and the introduction of a Renewable Energy Heat Act, and also numerous measures to improve energy efficiency and reduce electricity consumption.

In the electricity sector, Germany is already in a particularly good position to expand renewable energies. This is largely thanks to the EEG, which next to the Ecological Tax is by far the most successful instrument for reducing climate-relevant carbon dioxide emissions. In 2007 renewable energy sources saved some 79 million tonnes CO_2 in the electricity supply sector in Germany alone, of which 57 million tonnes are attributable to the EEG. For all three sectors together (electricity, heat, transport), the contribution of all renewables to CO_2 emission reduction in 2007 totalled as much as 114 million tonnes. In 2020 renewable energy sources will probably make it possible to save more than 120 million tonnes CO_2 in the electricity sector alone. The saving of around 100 million tonnes due to the EEG accounts for more than 80% of this figure.

The EEG will continue to play a key role in the expansion of renewable energy sources in the future as well: whereas the cost of conventional electricity generation will go on increasing as a result of rising fuel prices and the need to construct new power plants, most of the feed-in remuneration payments laid down in the EEG will go down every year. Thus renewable energy sources will steadily become more economic. Under the revision of the EEG that is currently in progress, the Act will also embody incentives for better integration of renewables in the electricity system and for separate marketing of electricity generated from renewables. This too will further improve the profitability of electricity generation from renewables.

The expansion of renewable energy sources creates the basic requirements for energy supply at reasonable prices that is sustainable and technologically viable in the long term. It will conserve the basis for the life of future generations and put new and especially environment-friendly technologies in place on the world market.

Good prospects for the future!



SUGGESTIONS FOR FURTHER READING

- **Publications by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety:**
  - Renewable Energy Sources in Figures – National and International Development.
  - Wirtschaftsförderung durch erneuerbare Energien – Was bringt uns das?
  - EEG: The Renewable Energy Sources Act
  - Renewable Energy Sources Act Progress Report 2007

- **DLR/FhG-ISI (2006):** Externe Kosten der Stromerzeugung aus erneuerbaren Energien im Vergleich zur Stromerzeugung aus fossilen Energieträgern. Report commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

- **Nitsch, Joachim:** Leitstudie 2007 "Ausbaustrategie Erneuerbare Energien – Aktualisierung und Neubewertung bis zu den Jahren 2020 und 2030 mit Ausblick bis 2050". Study commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

- **EWI/Prognos AG (2005):** Energiereport IV – Die Entwicklung der Energiemärkte bis zum Jahr 2030. Study commissioned by the Federal Ministry for Economics and Labour.

- **Wenzel, Bernd;** Diekmann, Jochen (2006): Ermittlung bundesweiter, durchschnittlicher Strombezugskosten von Elektrizitätsversorgungsunternehmen. Report commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

- **Prognos AG; IER (2004):** Analyse der Wirksamkeit von CO_2-Minderungsmaßnahmen im Energiebereich und ihre Weiterentwicklung. Report commissioned by the Federal Ministry for Economics and Labour.

- **WI/DLR/ZSW/PIK (2006):** RECCS Strukturell-ökonomisch-ökologischer Vergleich regenerativer Energietechnologien (RE) mit Carbon Capture and Storage (CCS). Research project commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

INFORMATION ABOUT RENEWABLE ENERGY ON THE INTERNET

This list is only a small selection of the information available on the Internet that is closely related to the topics in this publication.

- bundesrecht.juris.de/eeg_2004/: bundesrecht.juris.de/eeg_2004/: German version of the Renewable Energy Sources Act currently in force. A non-binding english translation can be found at www.erneuerbare-energien.de/inhalt/6465/5982/
- www.bdew.de: Bundesverband der Energie- und Wasserwirtschaft (Federal Association of the Energy and Water Industries), EEG data
- www.bine.info: Informationsdienst Energieeinsparung, Nutzung erneuerbarer Energien.
- www.bmu.de: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.
- www.co2online.de: Project sponsor of the climate protection campaign, comprehensive information portal on efficient exploitation of energy and utilisation of renewable energy sources.
- www.dena.de/themen/thema-reg: Deutsche Energieagentur (German Energy Agency)
- www.eex.de: European Energy Exchange.
- www.energiefoerderung.info: Development programme database.
- www.erneuerbare-energien.de: Federal Environment Ministry's information portal on renewable energy sources.
- www.externe.info: EU research findings on external costs from the ExternE project.
- www.klima-sucht-schutz.de/oekostromrechner03.0.html: Comparative calculator for green power tariffs.
- www.unendlich-viel-energie.de: Information campaign on renewable energy sources

PUBLICATION ORDER:

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This publication is part of the public relations work of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. It is distributed free of charge and is not intended for sale. Printed on 100% recycled paper.