Bundesministerium
für Umwelt, Naturschutz
und Reaktorsicherheit

Renewable Energy Sources Act (EEG)

Development of electricity generation from renewable energies up to 2020 and financial impacts

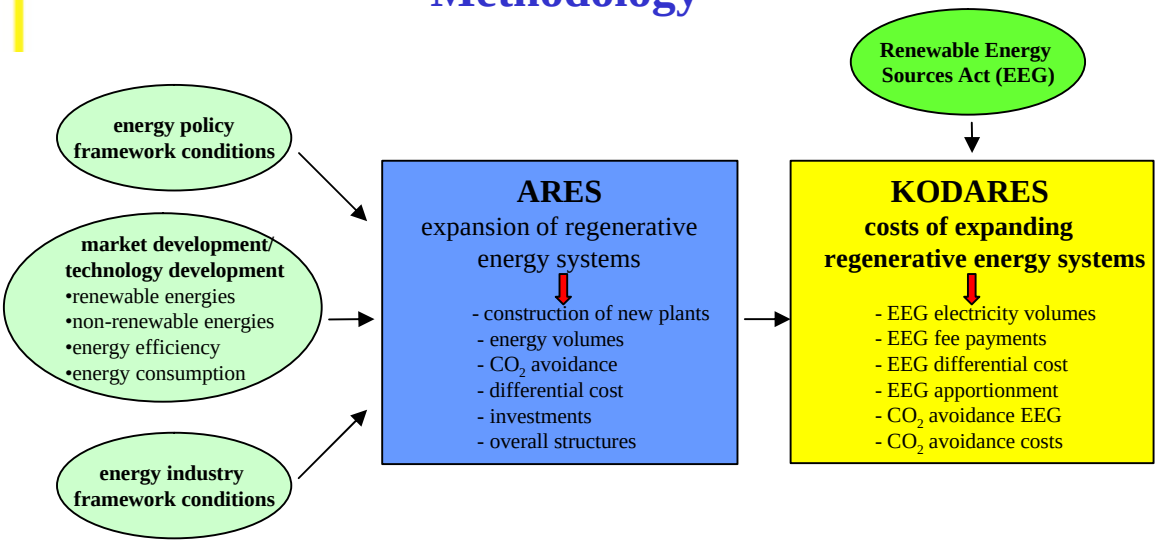
The amendment to the EEG of 21 July 2004 differentiated and further developed the framework conditions for electricity from renewable energies.

For example, the degression of fees for electricity from wind was increased and provisions for bonuses were introduced to allow greater differentiation in the fee for biomass. For the first time, the act also includes large-scale hydropower plants up to a capacity of 150 MW. New regulations on solar electricity generation already entered into force at the beginning of 2004.

The revision and expansion of the special equalisation scheme (Article 16 EEG) will relieve the burden on a significantly larger number of electricity-intensive companies in the purchase of electricity paid for according to the EEG.

Against this background and on the basis of current studies on the development of the electricity industry in Germany, the following presents an updated projection of the expansion of renewable energies in the German electricity market, including the resulting financial impacts.

Methodology

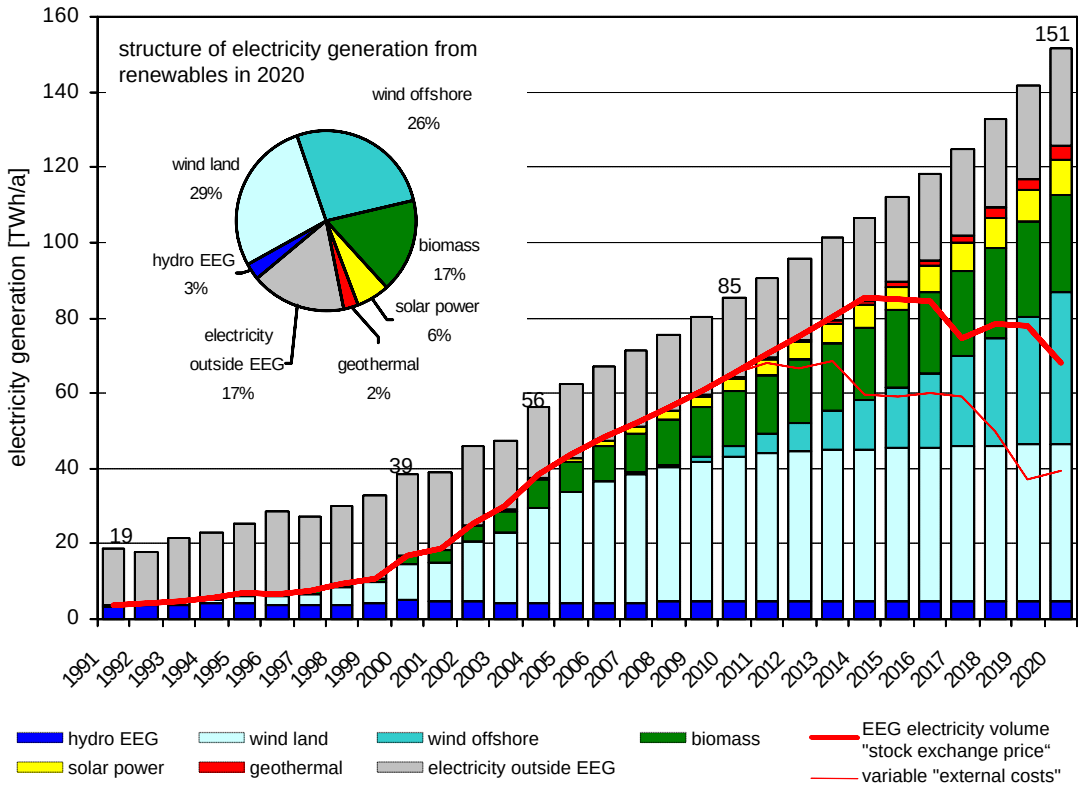


The following presentation is based on the expert report "Ausbau Erneuerbarer Energien im Stromsektor bis zum Jahr 2020 - Vergütungszahlungen und Differenzkosten durch das Erneuerbare-Energien-Gesetz" by the German Aerospace Centre (DLR), Centre for Solar Energy and Hydrogen Research (ZSW) und Wuppertal Institute (cf www.erneuerbare-energien.de). The expansion path to be expected for renewable energies is projected using the ARES model (**A**usbau **R**egenerativer **E**nergie**s**ysteme – expansion of regenerative energy systems) developed by Dr. Nitsch/DLR and thoroughly updated for this purpose. The basic assumption here is that the EEG is retained in its current form. The quantity structure for renewable energies was linked in the main variable "stock exchange price" i.a. with the following assumptions on the development of the framework conditions for the energy industry and overall economy:

- Gross electricity consumption up to 2020: slightly under 600 TWh/a (based on EWI/Prognos, Energy Report IV)
- Value of EEG electricity: based in the basic variable on EEX stock exchange prices
- Annual inflation rate 1.5%

The mathematical model developed by Dr. Staiß/ZSW, KODARES (**Ko**sten **d**es **A**usbaus **Re**generativer **E**nergie**s**ysteme – costs of expanding regenerative energy systems) was used for the accounting of the financial impacts of the future expansion of renewable energies (EEG fee payments, resulting differential cost etc.).

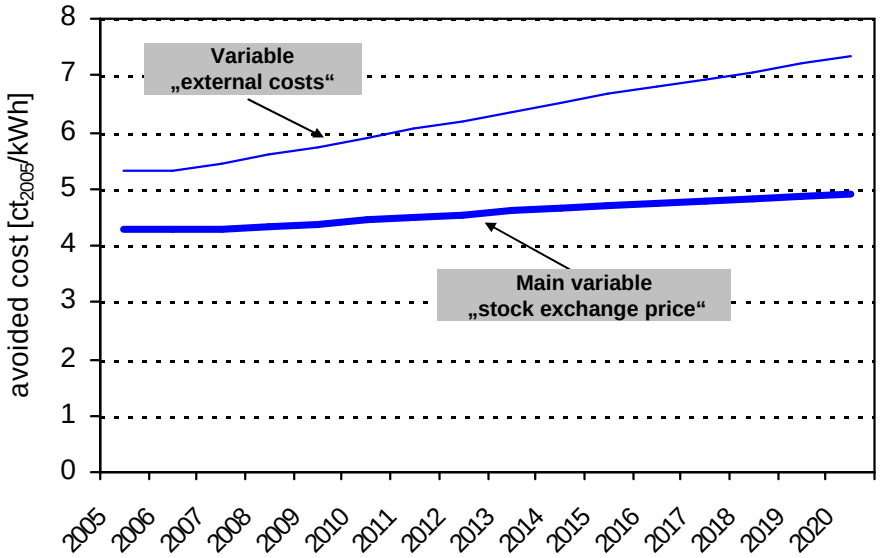
Development of electricity generation from renewables



The expected expansion leads to an increase in RE electricity from the present level of 55.8 TWh/a (2004) to 86 TWh/a in 2010 and 151 TWh/a in 2020. In relation to current (and probably also future) gross electricity consumption, this represents an RE share of a good 25 %.

Nevertheless, only part of this electricity is paid for according to the fee rates of the EEG. Firstly, the above volumes also include the "non-EEG relevant" contributions of hydropower and biomass (e.g. coincineration in coal-fired power plants) and imports from the European interconnection grid. Secondly, the red curves show that an increasing part of the electricity which is currently still being paid for according to the EEG fee rates will probably no longer depend on this support in the coming decade. The reason for this: due to the degressive system for fees and the simultaneously increasing value of the electricity produced, more and more electricity generated from renewables is becoming economically viable.

Development of the "anlegbare Wert" for electricity from renewables

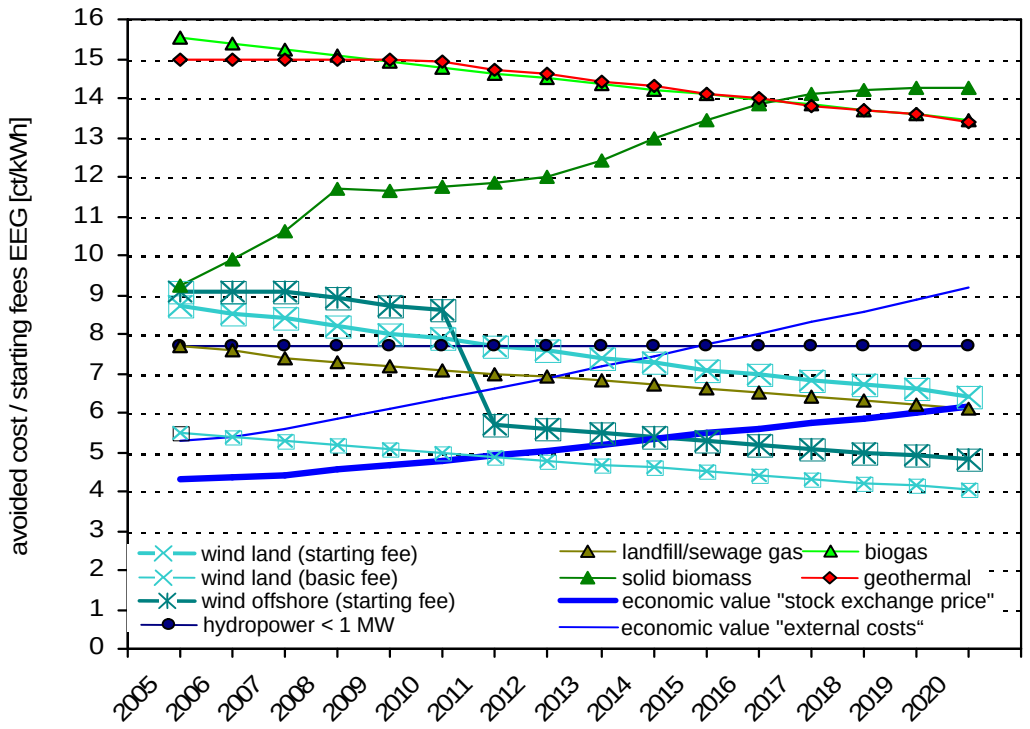


The graph shows - in prices for the year 2005 – the assumptions regarding the costs of electricity generation from non-renewable energies. These correspond to the so-called avoided cost of electricity purchase for electricity generation from renewables and form the basis for calculating the so-called EEG differential cost.

With a view to a market-oriented evaluation, the main variable "stock exchange price" is based on the stock exchange price for base load electricity. Largely on the basis of Energy Report IV, it is assumed that due to the need to replace the power plant park, by 2010 prices will gradually approximate the long-term marginal costs of new power plants (real: 4.43 Cent/kWh). In line with certificate prices, CO_2 credits for electricity from renewable energies will amount to €10/t CO_2 in 2010 and €12.5/t CO_2 or 0.5 Cent/kWh in 2020. In view of the significant increases in electricity prices in 2005, when the annual mean for base load electricity was already 4.6 Cent/kWh, this electricity price variable is conservative.

In contrast, the variable "external costs" assumes a more ambitious climate protection policy and here takes into account a credit rising to €30/t CO_2 or 1.4 Cent/kWh. In addition, the external costs of conventional electricity generation, which are even then significantly higher than those of renewable energies, were also estimated with a flat rate supplement of 1 Cent/kWh. The upper electricity price variable is thus based more on economic considerations.

Development of EEG fee rates for newly commissioned plants

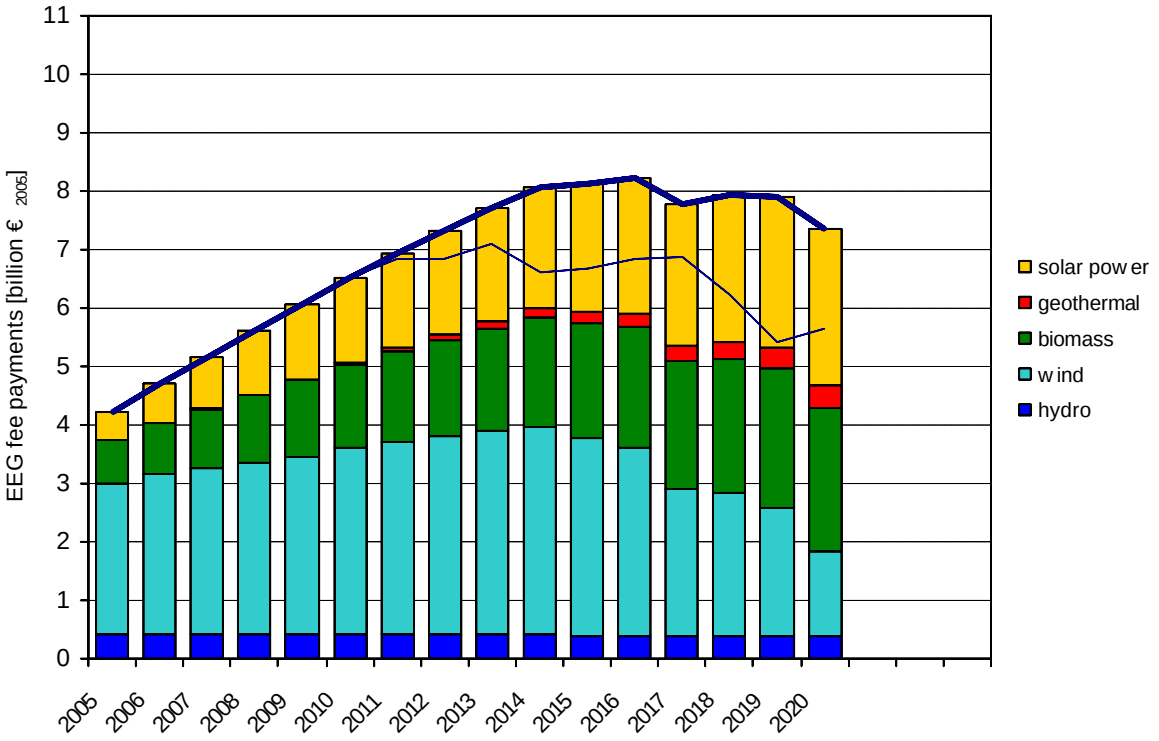


The graph shows, in the respective prices (ie nominal), the progression of EEG fees for selected systems for the year the plant went into operation. The degression laid down in the EEG means that as a rule the fee rates steadily decline so that in the second decade some plants will no longer fall under the EEG fee system. The extent to which this occurs is essentially influenced by the assumptions regarding the development of the avoided cost of electricity purchase for electricity from renewable energies, also indicated here in nominal terms to allow direct comparison.

It should be noted that the higher starting fees for offshore wind power plants are only granted to installations commissioned up to 31 December 2010. After this date the significantly lower basic fee applies to newly commissioned plants for the whole of the period for which the EEG fees apply.

The rising trend of the average EEG fee for new plants for the utilisation of solid biomass is a result of the expansion scenario (see p. 3) and of the – politically desired – increase over time in the use of regenerative raw materials and innovative procedures for which bonuses are paid.

Development of EEG fee payments

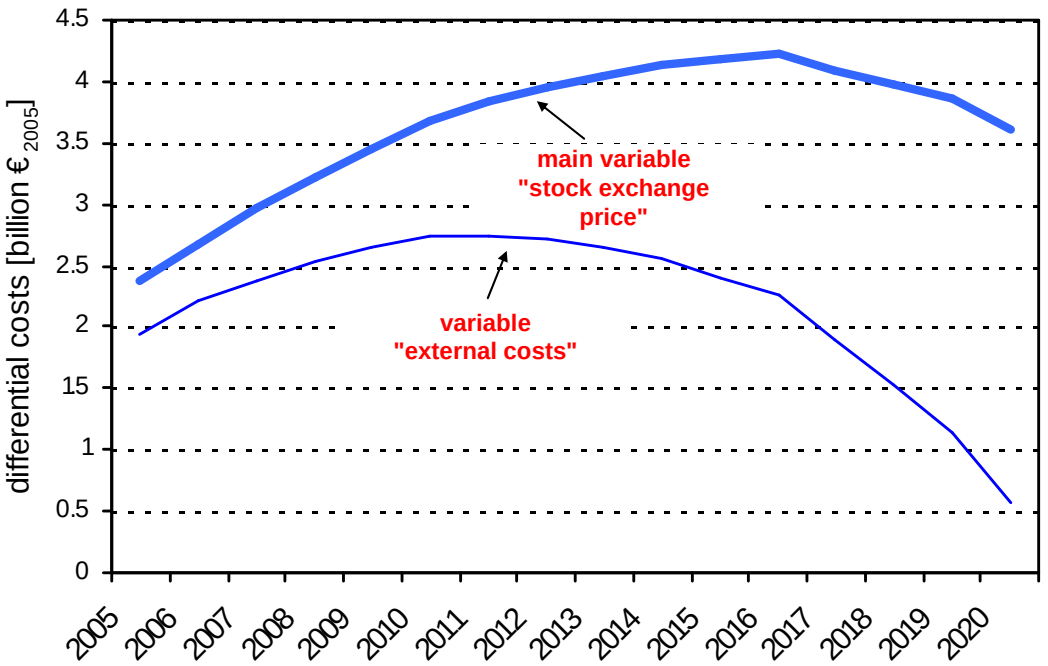


The graph shows the expected fee payments under the EEG for the main variable in 2005 prices (i.e. real).

In the main variable "stock exchange price" fee payments continue to rise until 2016 to €8.2 billion/a and then drop to €7.3 billion/a. In the course of the next two decades, larger hydropower plants (> 5 MW), some biomass plants, landfill and sewage gas plants as well as some wind power plants will no longer fall under the EEG fee system (see p.5). **After this, primarily only especially innovative and young renewable energy technologies will remain dependent on EEG support**.

In the case of the – economy-oriented - variable "external costs" (lower line) the above-mentioned decline in fee payments will take effect much sooner. In this case they will already peak in 2013 at around €7.1 billion/a. By 2020 the difference between the two variables will have increased to a good €1.7 billion/a.

Development of the differential cost

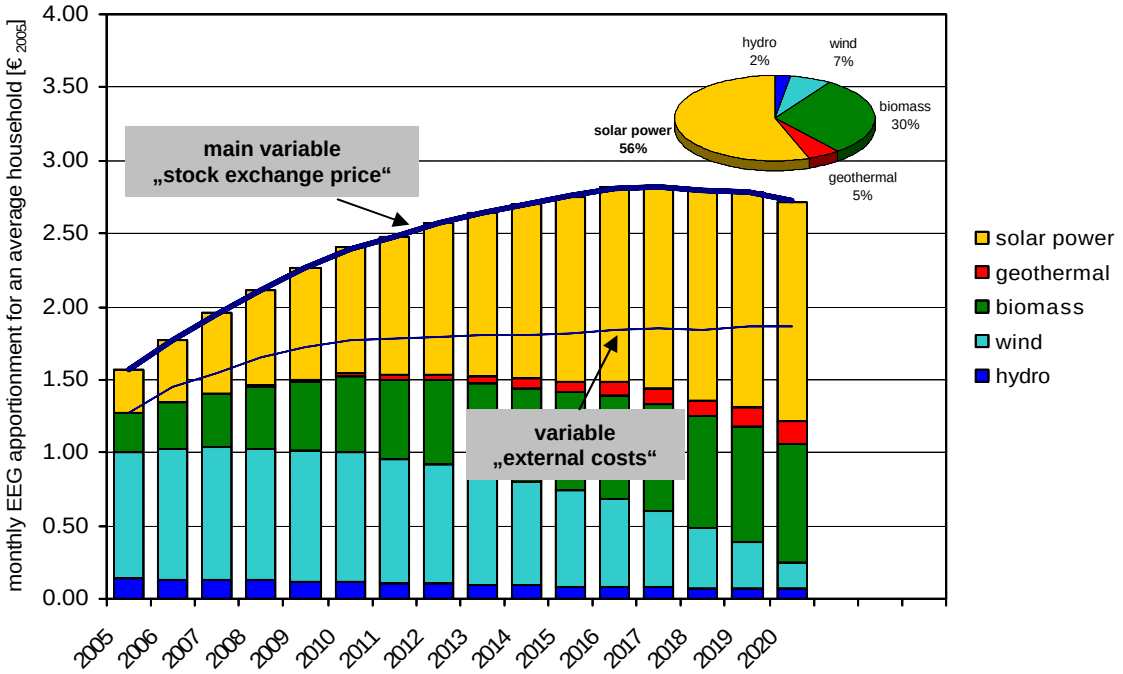


The graph shows the difference between the actual cost of electricity from plants subject to the EEG and the investment value of this electricity. This so-called differential cost is worked out here for the – conservatively calculated – variable "stock exchange price" in 2005 prices (i.e. real).

According to this the differential cost is likely to rise from around €2.4 billion in 2005 to a maximum of around €4.2 billion/a up to 2016. It will then fall steadily to €3.6 billion in 2020.

In contrast, the progression of the variable "external costs" shows the importance of evaluating renewable energies in economic terms. Here, towards the end of the second decade the costs for electricity generation in the sectors wind energy, hydropower and biomass fall in some cases substantially below the avoided costs of electricity purchase. Thus here the total mix of all plants subject to the EEG have already reached the threshold of economic viability.

Development of the EEG apportionment for a typical household

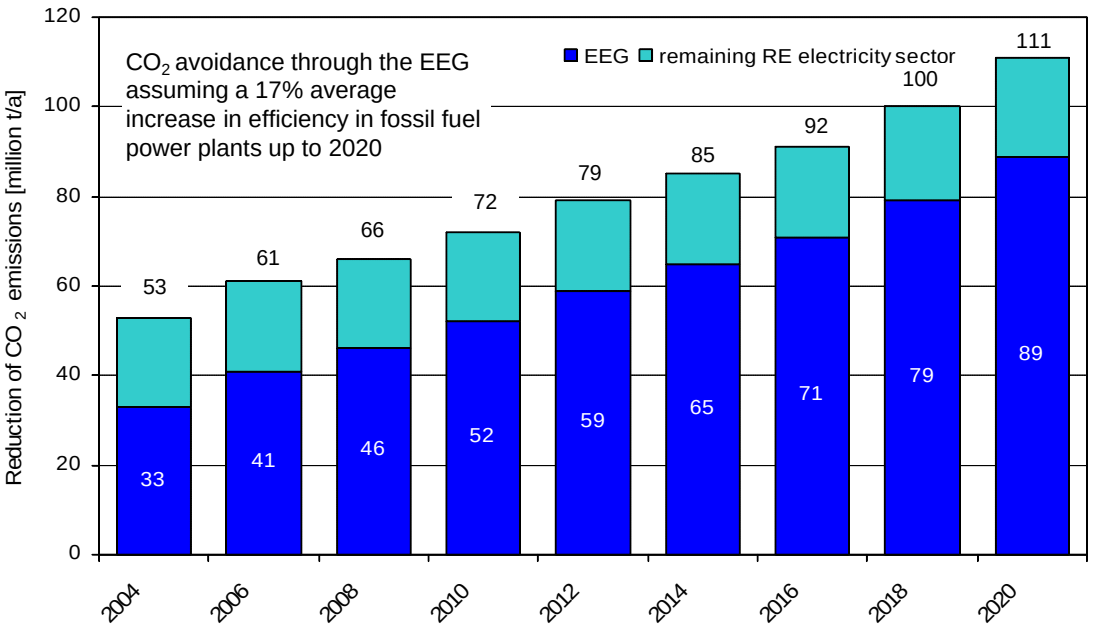


The graph shows the costs of the EEG – the so-called EEG apportionment – for an average German household with an annual electricity consumption of 3,500 kWh. This assumes that final electricity consumption will rise from the current approx. 475 billion kWh/a to 485 billion kWh/a around the year 2010, and then fall again by the end of the period under considered to approximately its starting level. Due to the special equalisation scheme (Article 16 EEG) some final consumption is largely exempt from the obligation to purchase EEG electricity. This is taken into consideration through a flat rate supplement of 10% on the EEG apportionment of non-privileged households.

On the basis of these assumptions it can be expected that the monthly EEG apportionment for an average household will increase from its current (2005) level of a good €1.50 to a maximum of around €2.80 by the year 2017 (equivalent to 0.97 Cent/kWh) and then fall again (2020: around €2.70 per month). Electricity generation from solar radiation and the innovative utilisation of biomass will then account for the main share of the apportionment.

Greater internalisation of the "external cost" would lead to a clear reduction in the EEG apportionment. Here the maximum is a good €1.80 per month, or 0.64 per kilowatt hour of electricity from renewable energies.

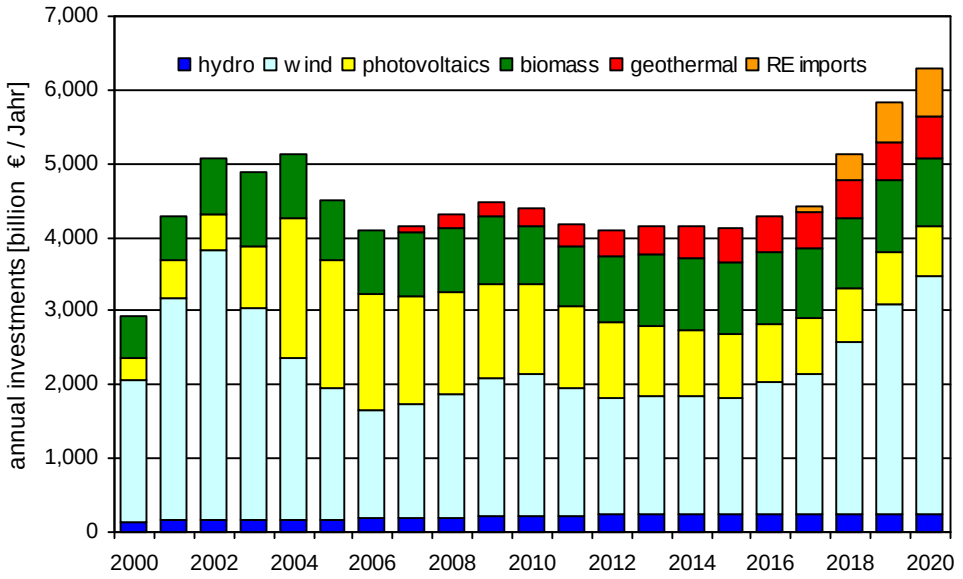
Contribution of the EEG to climate protection



Renewable energies make a very substantial contribution to climate protection. Assuming a 17% efficiency increase in the fossil fuel power plant park and taking into account the continued phase-out of nuclear energy up to 2020, under the expansion scenario (see p.3) electricity from renewables will lead to annual reductions in CO_2 rising from 53 million tonnes (2004) to 111 million tonnes per year. Furthermore RE electricity plays an essential role in avoiding emissions of other climate gases and air pollutants such as nitrogen oxide and sulphur oxides.

The main share of 80% of CO_2 reductions can thus be attributed to the EEG. For example, in the year 2020, a CO_2 avoidance of 89 million tonnes can be ascribed to electricity generation from plants covered by the EEG. If the increase in efficiency in the conventional generation system is less than expected, these contributions will be even higher.

Development of investments in renewable energies for electricity generation



The predicted expansion of renewable energies in the electricity sector is linked to considerable investment. In the expansion scenario (see p.3) they are €4 to €5 billion per year, and thus very much at a high level, increasing to nearly €7 billion/a at the end of the period under consideration.

The temporary decline in investments in the wind sector is largely compensated by the current strong growth in solar electricity generation and rising investments in biomass and geothermal energy.

Between 2001 and 2005 investments in plants for electricity generation from renewable energies totalled around €24.5 billion, and investment volumes in the following five-year period 2006 - 2010 are likely to be a similar sum. In total, therefore, around €50 billion can be expected in the second decade. This amounts to around €100 billion of investment, of which by far the largest share will be activated by the EEG.

While part of the above-named investment volume is imported to Germany, the total turnover relevant for employment is nevertheless higher than the levels named above. For firstly, the German renewable energy exports currently exceed imports, and secondly the operation of renewable energy installations must also be taken into consideration (total turnover in 2005 provisional estimates: approx. €3.9 billion). The BMU has commissioned a research project to gather more detailed data on this.