

Changes in the German law system, the role of banks and the effects on the contribution of renewable energy sources after the governmental changes in 1998 and 2005

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Zmeny v Nemeckom systéme zákonov, úloha bánk a efektívita príspevku obnoviteľných zdrojov energie po vládných zmenách v rokoch 1998 a 2005

Effected by the party Bündnis 90 die Grünen, ruling together with the SPD for the first time as the Red-Green-coalition Germany from 1998 to 2005 and by the global efforts fighting climate change, renewable energy sources got more and more important during the last years. For Minister Sigmund Gabriel, sustainable usage and supply of energy belongs to the most important challenges of the 21st century.[1]

During the last eight years, government undertook many efforts to improve the use of renewable energy sources. There are many studies about amendments and the effect of state promotion. The aim of this evaluation is to show in which years remarkable changes in the allocation of renewable energy sources took place. In a further step reasons therefore will be given.

Key words: Renewable energy sources

Introduction

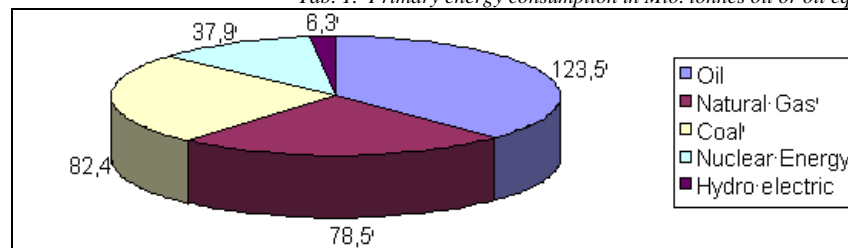
Since 1999 there is a strong increase in the contribution of renewable energy sources in Germany, caused by the governmental change in 1998. Wind energy, Biomass and Photovoltaics/Solar Radiation and Geothermal energy are growing, especially since 1999. Interesting for this analysis are the years, when the installed electricity generation grew rapidly in one source. That is the reason why Hydropower plays no important role. The GWh provided in 1990 of about 17.000 had its all time high in 2000 with 24,936 and is 21,600 in 2006. For all other kinds of renewable energy sources, an analysis is done in detail.

In this cases, both is important, the nominal and percentile growth. At the beginning of the commercial use of a source, we can find high growth rates but small nominal growth while in a later stage, the ratios change.

The sources are sorted by their relevance. Most important is actually Biomass with a contribution of 102.488 GWh followed by Wind power with 30.500 GWh, Photovoltaics/Solar radiation (5.400 GWh) and Geothermal energy (2.000 GWh). While wind energy is only used for electricity generation, heat supply is in all three other sources more relevant.

In opposite of renewable energy, oil, gas and coal are the main sources of primary energy and heat production, as shown in the following diagram. Table 2 describes the mainly substitution by renewable energy sources.

Tab. 1. Primary energy consumption in Mio. tonnes oil or oil equivalent in Germany.



* primary energy comprises commercially traded fuels only. Excluded, therefore, are fuels such as wood, peat and animal waste which, also excluded are wind, geothermal and solar power generation.

Source: www.BP.com

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Tab. 2.

Renewable energy	Hydropower	Biomass	Wind Energy	Photovoltaic	Geothermal Energy
Mainly substituted fossil source	Brown coal	Steam coal, gas, Brown coal	Steam coal, (gas, Brown coal)	Gas, steam coal	Brown coal

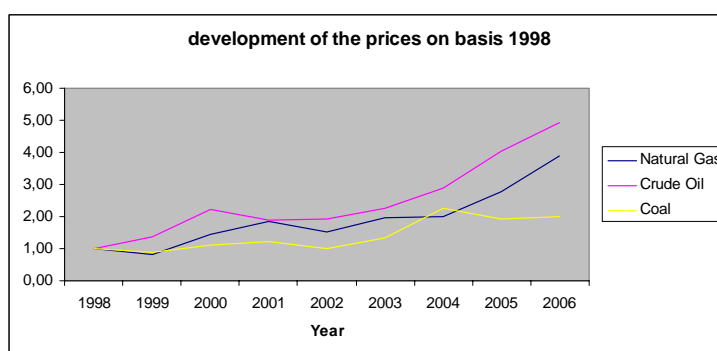
Source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

The oil-price and its development is taken into account for the following analyse [2]. The gas and the coal-price do not offer a further benefit. For brown coal, there is no fair market value as it is used mainly for energy production next to the mine because of its low heating value [10]. Though, the price of brown coal is not possible to take into account. The gas price is linked to the oil-price and the development of the price for steam coal is linked to the oil-price till 2004 as well. After 2004 it does not reflect the same high growth rate and therefore did not offer the same relevance for the development of renewable energy sources than oil (Compare Table 3).

For Nuclear Power, uranium is the used resource. The price for a kg uranium rose from 2000 to 2005 by 400 percent to 85\$.kg⁻¹ U₃O. Because of a yearly need of about 3.800 t, compared to 113,2 Mio. t oil, this figure is of less importance. Further, the use of Nuclear power in Germany is declining as the government decided the nuclear power face-out.

In the case of state benefits, only those promoted by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety are taken into account as they represent about two third of those for renewable energy sources of all federal ministries [7].

Tab. 3.



Source: McCloskey Coal Information Service; Natural Gas Week; Bloomberg

Biomass

Biomass is mainly used for heat production (in 2006: 75 %, in 1998: 95%). The growth rates are relatively constant, only in the years 2003, 2005 and 2006 a stronger increase can be identified. The use of Bio fuel will not be taken into account as it is only relevant for Biomass and not for other renewable energy sources.

Development of Biomass in Germany and the oil price 1998 – 2006							
	Biomass			Oil-price			tendency periodic
	Absolut [GWh]	nominal growth [GWh]	growth [%]	Range [USD]	average [USD]	change [%]	
1998	55.005,00	3.980,00	7,80	9,55 - 16,80	13,34		↘
1999	54.592,00	-413,00	-0,75	9,90 - 26,15	18,03	35,16	↑
2000	58.443,00	3.438,00	6,30	21,30 - 35,30	28,53	58,24	⇔
2001	60.391,00	1.948,00	3,33	16,65 - 31,05	24,86	-12,86	↘
2002	60.588,00	197,00	0,33	18,23 - 31,02	25,03	0,68	↗
2003	79.478,00	18.890,00	31,18	23,05 - 34,55	28,48	13,78	⇔
2004	82.722,00	3.244,00	4,08	28,44 - 51,95	38,04	33,57	↗
2005	89.548,00	6.826,00	8,25	38,81 - 68,89	55,25	45,24	↗
2006	102.488,00	12.940,00	14,45	57,39 - 78,64	66,12	19,67	⇔

the figures 2003, 2004, 2005 and 2006 are provisional

Sources: [1, 2, 3]

Reasons for changing growth rates:

- 2003; the first remarkable growth follows a fast raising oil-price in 2002. The last Biomass concerning amendment took place in 2000 though three years ago. A further reason could be the first Novell of the “Act on Granting Priority to Renewable Energy Sources” (Renewable Energy Sources Act – EEG). Maybe insecurities led to investments in 2003 on a well known and safe basis. This could describe as well the small growth in 2004, on the one hand, investments planned for 2004 have already been done in 2003 and on the other hand, the effects of the amendments were awaited.

Main changes of the Renewable Energy Sources Act – EEG are:

	Since 01.08.2004	01.04.2000 till 31.07.2004
Up to 150 kWh	11,5 ct/kWh	9,9 ct/kWh
Up to 500 kWh	9,9 ct/kWh	8,9 ct/kWh
Up to 5 MW	8,9 ct/kWh	8,9 ct/kWh
Up to 20 MW	8,4 ct/kWh	8,4 ct/kWh

In the case of Landfill gas, sewage treatment plant gas and mine gas, constant fees are paid

Further changes:

2004		2000
Degression: 1,5 % p.a. starting 2005		Degression: 1,0 % p.a. starting 2002
Increase by 2 ct/kWh in case of electricity within the meaning of article 3(4) of the Combined Heat and Power Generation Act		--
Increase by 2 ct/kWh in case of using innovative technologies		--
Increase for varied agricultural by-products		--
Bonus up to 500 kWh	6 ct/kWh	--
Bonus up to 5 MW	4 ct/kWh	
Bonus up to 5 MW (burning wood)	2,5 ct/kWh	

In the case of Landfill gas, sewage treatment plant gas and mine gas, constant fees are paid

	Since 01.08.2004	01.04.2000 till 31.07.2004
Up to 500 kWh	7,76 ct/kWh	7,76 ct/kWh
Up to 5 MW	6,65 ct/kWh	6,65 ct/kWh
More than 5 MW	6,65 ct/kWh	6,65 ct/kWh

Sources: [4, 5]

As far as the changes of the Renewable Energy Sources Act are only and in all cases, excluding the higher digression, positive for the use of biomass, the thesis for 2003 and 2004 must be revised. For 2003 the theory that the oil price affected the growth rate can be retained unchanged. But for 2004 another reason is under the given facts more plausible. The positive changes caused a decline of investments in 2003 – this can be reconstructed by the statistics of the Reconstruction Loan Corporation - KfW. In 2004 and 2005, the demand of state-promoted loans grew rapidly [8].

- **2005 and 2006**, those two years can be evaluated together as the basic conditions are quite similar. In both years, the oil-price rises around 30 %. This means that the heating costs using oil or gas rose strongly and the use of Biomass got more competitive. The elections in 2005 and the change of the ruling coalition did not led to a significant change of the tendency. The smaller growth in 2005 compared to 2006 is based on lower investments in 2004.

Wind energy

The use of wind energy in Germany started in the early nineties. Significant are, as shown in the following table the years 2000, 2002 and 2004 with high growth rates and 2005 and 2006 with very low growth rates:

Development of wind energy in Germany and the oil price 1998 - 2006							
	Wind energy			Oil-price			tendency periodic
	absolut [GWh]	nominal growth [GWh]	growth [%]	range [USD]	average [USD]	change [%]	
1998	4.489,00	1.489,00	49,63	9,55 - 16,80	13,34		↓
1999	5.528,00	1.039,00	23,15	9,90 - 26,15	18,03	35,16	↑
2000	7.550,00	2.022,00	36,58	21,30 - 35,30	28,53	58,24	⇒
2001	10.509,00	2.959,00	39,19	16,65 - 31,05	24,86	-12,86	↓
2002	15.859,00	5.350,00	50,91	18,23 - 31,02	25,03	0,68	↗
2003	18.859,00	3.000,00	18,92	23,05 - 34,55	28,48	13,78	⇒
2004	25.509,00	6.650,00	35,26	28,44 - 51,95	38,04	33,57	↗
2005	27.229,00	1.720,00	6,74	38,81 - 68,89	55,25	45,24	↗
2006	30.500,00	3.271,00	12,01	57,39 - 78,64	66,12	19,67	⇒

the figures 2003, 2004, 2005 and 2006 are provisional

Sources: [1, 2, 3]

Reasons for changing growth rates:

- **2000 till 2002;** 2002 is the top of a three years development promoted by the Renewable Energy Sources Act, settled in the year 2000. The oil price, constant or declining during this period was no stimulation for this development as well as state promoted research projects as the expenses therefore had been relatively constant. The elections in 2002 had no negative effects, in opposite. As far as the elections took place in September, investors used the time before to safe existing state benefits. Further a lack of wind in 2003 reduced the electricity generation and resulted in a smaller growth rate [7, 9].
- **2004** could be again mainly influenced by the first novel of the Renewable Energy Sources act. As shown in the following, the main changes were negative for wind energy. This led to investments in wind energy in 2004 especially till July 31st. Further the 250 MW-Wind-program pushed the installation of wind parks.

Main changes of the Renewable Energy Sources Act – EEG are:

	Since 01.08.2004	01.04.2000 till 31.07.2004
Minimum feed-in tariff	5,5 ct/kWh	5,9 ct/kWh
Higher tariff	8,7 ct/kWh	8,8 ct/kWh

Further changes:

2004	2000
Degression: 2 % p.a. starting 2005	Degression: 1,5% p.a. starting 2002
No allowance for installations that can not surely produce at least 60 % of the reference	--
Promotion of the replacement or modernisation of plants older than 31.12.2005 and tripling the installed capacity	--

Sources: [4, 5]

Changes for offshore plants are not taken into account as they play an unimportant role right now. Over all the promotion for these plants was forced.

- **2005 and 2006;** the rising oil-price should be a reason for a stronger use of alternative energy sources. For wind energy this is not of the same relevance as it mainly substitutes steam coal and this price was

nearly constant since 2004 as shown in Table 3. The decline of the growth rate can be traced back on insecurities of the elections 2005 and changes in tax policies. Especially the abolition of models for tax deduction or the cancellation of tax relieves through depreciation allowance, stopped the development of wind parks. In such investments specialized funds stopped their investments as the demand broke down because of a declining after tax profitability. Another difficulty takes place in the case of wind energy as well. Profitable places for new plants are more and more rare [2].

Photovoltaics

Photovoltaics and Solar radiation show a relatively constant development since the beginning of this evaluation. Excluding 2004, the growth rates range between 21 % and 36 %. The highest growth took place in the years 2003 and 2005 while the smallest growth was in 2004. Especially in the case of photovoltaics the problem is that this technology is relatively new and not yet well engineered. Before 2003, they played only a marginal role with 188 GWh in 2002. This changed in 2004, when 224 GWh of an all over growth of 332 GWh and in the years 2005 and 2006 when the main growth of about 720 GWh was based on Photovoltaics.

Development of Photovoltaics/Solar radiation in Germany and the oil price 1998 – 2006							
	Photovoltaics/Solar radiation			Oil-price			tendency periodic
	absolut [GWh]	nominal growth [GWh]	growth [%]	range [USD]	Average [USD]	change [%]	
1998	889,00	168,00	23,30	9,55 - 16,80	13,34		↘
1999	1.079,00	190,00	21,37	9,90 - 26,15	18,03	35,16	↑
2000	1.343,00	264,00	24,47	21,30 - 35,30	28,53	58,24	⇔
2001	1.742,00	399,00	29,71	16,65 - 31,05	24,86	-12,86	↘
2002	2.143,00	401,00	23,02	18,23 - 31,02	25,03	0,68	↗
2003	2.798,00	655,00	30,56	23,05 - 34,55	28,48	13,78	⇔
2004	3.130,00	332,00	11,87	28,44 - 51,95	38,04	33,57	↗
2005	4.242,00	1.112,00	35,53	38,81 - 68,89	55,25	45,24	↗
2006	5.400,00	1.158,00	27,30	57,39 - 78,64	66,12	19,67	⇔

the figures 2003, 2004, 2005 and 2006 are provisional

Sources: [1, 2, 3]

Reasons for changing growth rates:

- **2004;** The small growth in 2004 has two reasons: on the one hand, as shown above, a change took place in a stronger growth of Photovoltaics than Solar radiation. On the other hand the novel of the EEG and the end of the 100.000 roofs solar energy program in summer 2003 that promoted about 346 MWp electricity production [11]. In the second case, it takes time, till new plants can feed in electricity power as they had to be developed and installed first. Maybe the fall of the growth of solar radiation is caused by the novel of the EEG. That is why it is necessary to step more into detail.

Changes of the Renewable Energy Sources Act belonging to solar radiation:

	Since 01.08.2004			01.04.2000 till 31.07.2004
	≤30 kW	≤100 kW	> 100 kW	
capacity				
Generally	45,7 ct/kWh			45,7 ct/kWh
Attached to or integrated on top of a building/noise protection walls	57,4 ct	54,6 ct	54,0 ct	45,7 ct/kWh

Further changes:

2004	2000
Degression: 6,5 % p.a. starting 2005 respectively 5 % p.a. for plants Attached to or integrated on top of a building/noise protection wall	Degression: 5 % p.a. starting 2002
5 ct/kWh bonus if the plant is a substantial part of the building but not designed to be the roof or integrated into the roof	--

Sources: [4, 5]

- **2005;** A rising oil and gas price is one reason for the growth. The other, maybe more important points are the changes of the EEG and other state benefits especially in form of subsidized loans as successful implemented by the 100.000 roofs solar energy program. [7, 8]

Geothermal energy

Geothermal energy is the smallest part of renewable energy sources. The growth rates are very small for years; only in 2006 a strong increase took place. This technology is still in an early stage of development.

Development of Geothermal energy in Germany and the oil price 1998 - 2006							
	Geothermal Energy			Oil-price			tendency periodic
	Absolut [GWh]	nominal growth [GWh]	growth [%]	Range [USD]	average [USD]	change [%]	
1998	1.384,00	49,00	3,67	9,55 - 16,80	13,34		↓
1999	1.429,00	45,00	3,25	9,90 - 26,15	18,03	35,16	↑
2000	1.433,00	49,00	3,43	21,30 - 35,30	28,53	58,24	↔
2001	1.447,00	14,00	0,98	16,65 - 31,05	24,86	-12,86	↓
2002	1.483,00	36,00	2,49	18,23 - 31,02	25,03	0,68	↗
2003	1.532,00	49,00	3,30	23,05 - 34,55	28,48	13,78	↔
2004	1.558,20	26,20	1,71	28,44 - 51,95	38,04	33,57	↗
2005	1.586,20	28,00	1,80	38,81 - 68,89	55,25	45,24	↗
2006	2.000,40	414,20	26,11	57,39 - 78,64	66,12	19,67	↔

the figures 2003, 2004, 2005 and 2006 are provisional

Sources: [1, 2, 3]

Reasons for changing growth rates:

- **2006** is the only year with a significant anomalous growth rate. Different reasons are imaginable. As the growth was only 414,20 GWh, a few state promoted projects could be the reason. The benefits spent for Geothermal Energy are constantly increasing from EUR 3 Mio. in 2001 to EUR 11 Mio. in 2005 and EUR 14 Mio. in 2006(excluding 2004 with EUR 5,9 Mio.)[6] [7]. The oil price could be as well jointly responsible as it increased over 5 Years. But this cannot explain why the growth of geothermal energy took place that abrupt.

Changes of the Renewable Energy Sources Act belonging to geothermal energy:

	Since 01.08.2004	01.04.2000 till 31.07.2004
Up to 5 MW	15 ct/kWh	8,95 ct/kWh
Up to 10 MW	14 ct/kWh	8,95 ct/kWh
Up to 20 MW	8,95 ct/kWh	8,95 ct/kWh
Up to 20 MW	7,16 ct/kWh	7,16 ct/kWh

Degression: 1% starting 01.01.2005

Sources: [4, 5]

This table shows that geothermal energy is strongly promoted by the first novel of the Renewable Energy Sources Act. Further, state promoted loans exploded in 2005 to EUR 10,5 Mio., invested in three projects, while in the years before maximum one project was promoted with not more than EUR 2,6 Mio. [8].

Conclusion

Remarkable in this analyse is, that no year can be identified, where the growth of renewable energy sources was in all four cases similar. As carbon trading started at 1 January 2005, a general positive impulse to all renewable energy sources should be recognizable. As shown above, this positive impulse cannot be verified.

Further can be pointed out that the Renewable Energy Sources Act is a basis and one reason for the positive development of renewable energy sources but surely not the only. Many other factors must be taken into account; in particular state benefits and subsidized loans but as well the oil, gas and coal price.

Higher costs for other sources of energy makes renewable energy sources more profitable with smaller subventions. In future, a basis like the Renewable Energy Sources Act is absolutely necessary to promote alternative or renewable sources of energy. State benefits for the development will become more and more unimportant as the technical development goes forward. Then the price mechanism in case of rising cost for raw materials like oil, gas or coal will support the further development of Biomass, Wind energy, Solar radiation and Geothermal energy.

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