Forschungsvorhaben
des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit

Short-and Long-Term Impacts of the Expansion of Renewable Energy on the German Labour Market

(FKZ 0325042)

Gross Employment 2007

- A first estimate -

March 14, 2008

Marlene Kratzat (DLR), Dietmar Edler (DIW), Marion Ottmüller (ZSW),
Ulrike Lehr (DLR)

The renewable energy sector as well as corresponding supply and service sectors, have strongly profited in the past years from the German expansion of renewable energy. Through the stable framework that the federal government achieved with support mechanisms, the domestic market for renewable energy facilities is taking hold. The support of domestic companies in the sector has provided Germany with first-mover advantage in the international market. The positive impacts on the job market are not the least of the benefits being reaped. The jobs attributed to renewable energy between 2004 and 2006 in Germany climbed by approximately 75,000 to a total of approximately 235,600 [BMU07].

The following summarizes how the employment numbers have developed in 2007.

Central to the calculations is the turnover of companies manufacturing renewable energy (RE) installations in Germany. This is estimated from listed 2007 investments in Germany (including the volume of foreign trade), combined with a survey of the RE sector with the base year 2004. Based on this turnover, the gross employment numbers are determined using Input-Output analysis, taking the 2004 Input-Output Table from the Department of Statistics [StaBu08]. The RE sector is represented by technology-specific vectors derived from the 2004 survey data. Relevant benchmark data, such as the productivity of individual sectors, are adjusted as in the estimates from previous years [BMU06/BMU07].

Furthermore employment from operations and maintenance of German installations is to be calculated as well as the supply of fuels.

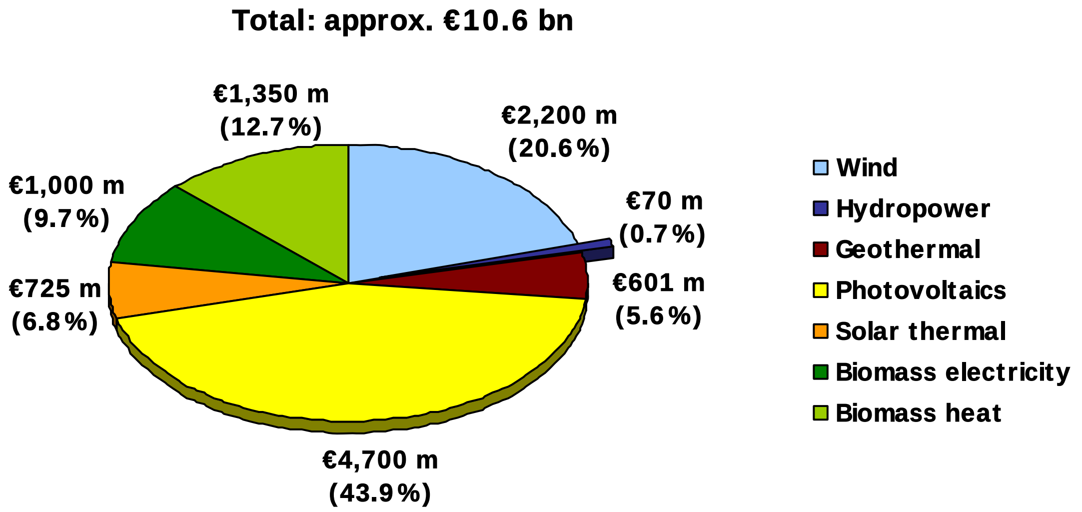
Employment effects from renewable energy ultimately include the fields of research, public relations and promotion such as public service. These fields, that in 2006 totalled 4300 jobs [BMU07], cannot in the framework of this investigation be updated. To error on the conservative side, the 2006 value was used for 2007.

Focus of the following analysis is the gross employment from renewable energy. Possible detrimental employment effects impacting net calculations cannot be delved into here. The “Net Calculation” made in 2006 had unequivocal positive results. A similar study will be made for 2007 as well.

Employment from Installation Manufacturing

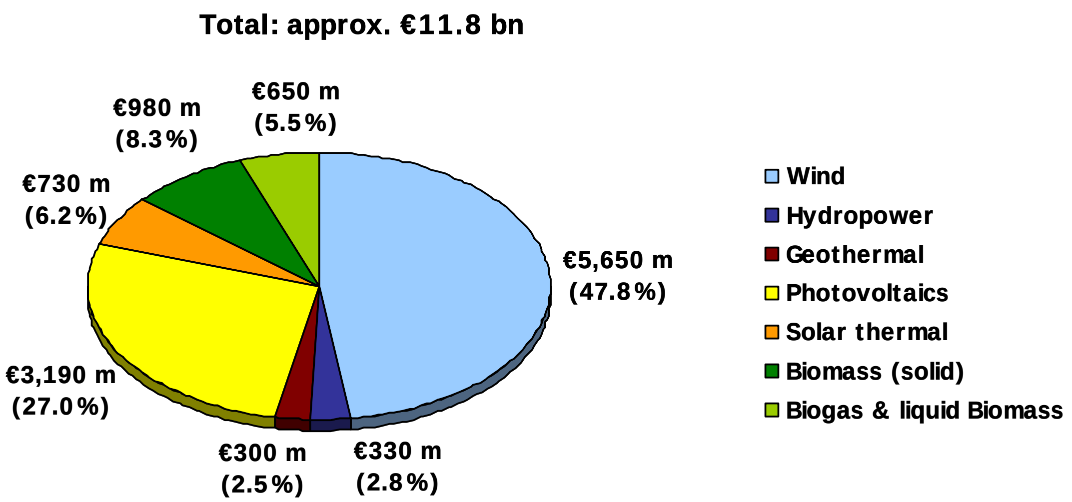
The investment in German installations that use renewable energy has in the past years shown consistent growth—reaching the highest point, so-far, in 2006 with nearly €11.6 billion in new installations in Germany [preliminary numbers, BMU07]. In the past year, after first estimates based on numbers from the Renewable Energy

Statistics Working Group (AGEE-Stat), the total of new investments in Germany for new installations was €10.6 billion (see Graph 1). This is the first recorded decrease in domestic investment when compared with the previous year.



Graph 1: Investment in Installations Using Renewable Energy in Germany in 2007 [ZSW08].

In contrast to the aforementioned domestic investment in renewable energy the turnover of the German domestic manufacturers of RE installations increased in total, according to conservative estimates. The ground for this is the strong increase in sales volume of Photovoltaic systems as well as the undiminished strong competitive position of German wind turbine manufacturers in the consistently growing world market. For the year 2007, the total turnover of the manufacturers was in the €11.8 billion range (see Graph 2) and this was an 11% increase over 2006 (€10.6 billion).



Graph 2: Turnover for German Manufacturers of Renewable Energy Installations in 2007.

The gross employment figures that result from this turnover account for around 146,300 people in 2007 (see Table 1).

Employment from Operations and Maintenance as well as the Supply of Fuels

With the growing numbers of installation assets, the employment effects in operations and maintenance become increasingly relevant. Changes in employment cannot be directly derived from the energy yield. In the case of wind power, for example, a "good" wind year does not result in more employment than a "bad" year. The relevant drivers are the operations costs that are calculated as a percentage of the investment costs. In 2007 employment due to operations and maintenance of installations using renewable energy increased by 13% to 47,400 people (see Table 1).

For biomass the supply of fuels, for transport, power and heat, has to be considered —with 51,300 the employment numbers in this area are nearly the same as in 2006.

In total the gross employment figure is around 245,000 for the year 2007 (see Table 1).

Table 1: Employment from Renewable Energy in Germany 2007.

	Employment from investment (incl. export)	Employment from operation & maintenance	Employment from supply of biomass	Total employment 2007	Total employment 2006
Wind	67,500	16,800		84,300	82,100
Photovoltaics	36,700	1,900		38,600	26,900
Solar thermal	10,200	1,900		12,100	13,300
Hydropower	5,000	4,400		9,400	9,400
Geothermal	4,200	300		4,500	4,200
Biomass	13,900	17,400		31,300	33,800
Biogas & liquid Biomass	8,800	4,700		13,500	11,400
Biomass for power			22,800	22,800	18,200
Biomass for transport			28,500	28,500	32,000
Total	**146,300**	**47,400**	**51,300**	**245,000**	**231,300**
Employment from the use of public and common-use funds				4,300	4,300
Total				**249,300**	**235,600**

Background Information

The largest category of turnover in renewable energy continues to be **Wind energy**. In the past years, the newly installed capacity in Germany – with the exception of 2006 – decreased, but the turnover of companies continues to increase every year. This is because the wind installations are manufactured for the global market where the Global Wind Energy Council calculates a 30% increase to 20GW in 2007 [GWEC08]. Thus, when the investment in new wind energy installations in Germany decreased by 24% from €2.9 billion in 2006 to €2.2 billion in 2007 the turnover of German companies with international activities was not negatively impacted.

On average and estimating conservatively the export quota of the RE installation manufacturers increased from 55% to 70% in 2007. The resulting turnover is right at €5.7 billion and is around 7% over the 2006 value. Based on increased productivity, but assuming lower rates than in previous years, the total employment figure was estimated at **84,300** in the wind energy category – with 2,300 jobs more a slight increase over the 2006 number.

The employment figure for the **Photovoltaic** category, on the other hand, has increased by almost 44% to some **38,600**. Not only has investment in new, domestic installations continued to increase, but also the turnover of the installation manufacturers has reached a new high at more than €3 billion. In particular, the development of domestic solar module production is worth highlighting, which, after an industry poll conducted by PHOTON magazine, was doubled in comparison with the year before [PHOTON08].

A contrasting development to take notice of is in the category of **Solar thermal**. The number of new installations in Germany was around 33% lower than in 2006. The resulting negative impacts on company turnover are compensated for, to some degree, by an increase in exports. This was deduced from statements of individual collector manufacturers who faced a 23% decrease in production compared to the year before [NeueEnergie08]. The European Solar Thermal Industry Association (ESTIF) attributes a 10% decrease in the European solar thermal market to the importance of the German sales market; France, Italy and Spain, on the other hand, saw double-digit growth rates [ESTIF08]. With the turnover of the German manufacturers at approximately €730 million, an employment figure, including operations and maintenance, of **12,100** can be derived.

2007 also saw no significant change in the **Hydropower** category. The employment figures, in accordance with the productivity gains, remain unchanged at approximately **9,400** jobs.

New investments, like manufacturing turnover, for both shallow and deep geothermal energy are similar to the previous year, showing slight increases. Shallow and deep geothermal are the only categories in the German heating market showing an increase in the number of new installations. With **4,500** employees, **Geothermal** in 2007 shows a slight increase in employment.

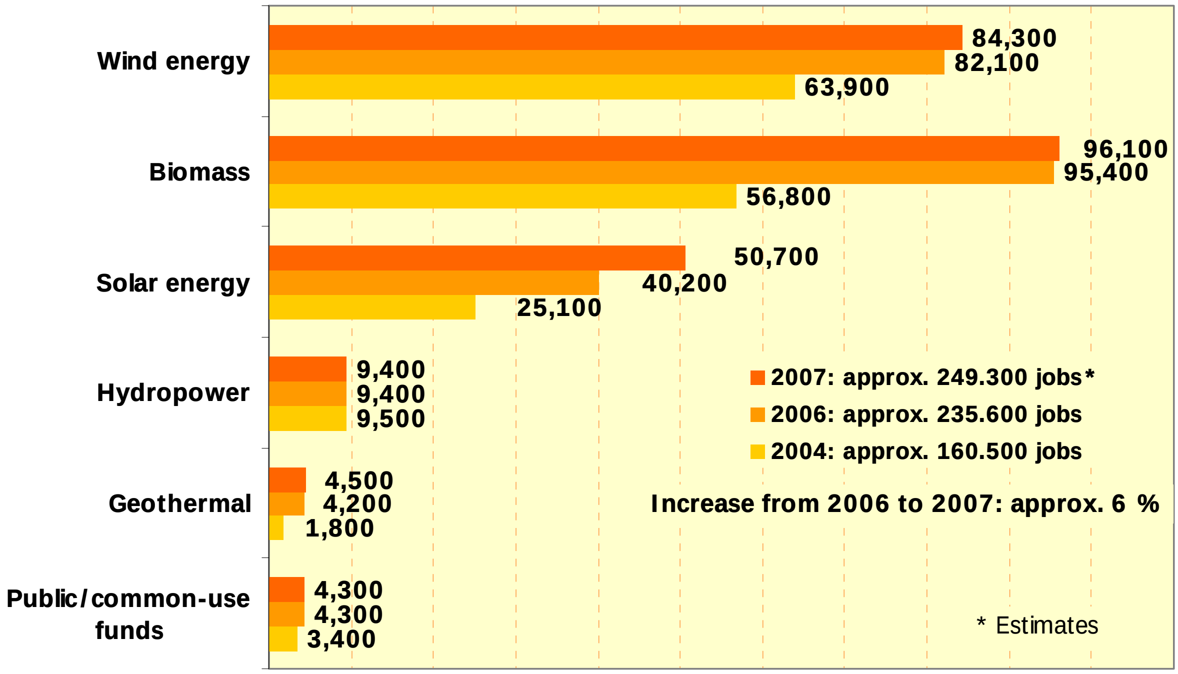
Investments in new **biomass** installations in 2007 showed a decline for all categories. This was clearly the case for biogas installations and large-firing solid biomass plants and, to a lesser extent; this was the case for small solid biomass installations and electric/heat liquid biomass installations. Here, the estimates taken from the 2004 Market Survey were used [BMU07/BMU06]. Only in the biogas manufacturer category an adjustment in favour of domestic content was made. This was mainly attributed to one large manufacturer that managed to make gains of 47% — for a turnover totalling €132 million—compared to the year before, despite a decline in the market [IWR08]. Thus the estimated overall turnover of domestic manufacturers did not decline to the same extent as the investments. In total, a negative balance compared to the previous year did have effects on the employment figures. Under the growing category of employment in the framework of operations and maintenance, gas and liquid biomass showed small gains. From the **13,500** jobs attributed, a new 2100 jobs contributed to increases in the overall employment figure for 2007. Solid biomass employment figures decreased by 2500 to 31,300 (see Table 1).

The employment figures related to the **supply of biomass** increased over last year's figure to reach **22,800** employees. Largely, this can be attributed to the sharp expansion of renewable raw materials for use in biogas facilities—data from the Agency for Renewable Resources (FNR) estimated 400,000 hectares compared to 158,000 in 2006 developed for these purposes [FNR08].

However, the employment figures from the supply of **biofuels** decreased in 2007. Behind these numbers is a sharp increase in imports, especially biodiesel from the USA. In total the employment figure was estimated at **28,500** employees.

Employment from the use of public and common-use funds for renewable energy was, as the year before, estimated at 4300 people. In light of increasing research activity this is seen as a conservative estimate.

The total estimated employment figure for the renewable energy sector was around 249,000 employees for 2007—a 6% increase over the previous year (see Graph 3). Biomass continued to contribute the largest share to the total with 39%, followed by wind energy with around 34%. Solar energy demonstrated the largest growth and added approximately 20% to the total employment figure, followed by hydropower (4%) and then geothermal (2%).



Graph 3: Development of Gross Employment from Renewable Energy in Germany.

Finally, it is important to emphasize that these numbers are estimates based on detailed analysis of the base year 2004 and close attention to market development in subsequent years. The further away in time this base year becomes, the less reliable the foundation of the numbers. A more extensive market survey of the renewable energy sector and its inputs from other sectors will be carried out and the gross employment numbers for 2007 will be updated. This study will also look again into the net employment effects. Moreover, it will look on larger scale interdependencies on a European level and on regional employment effects as well. This work is expected to be completed in 2009[1].

References

[BMU06] Staiß, F.; Kratzat, M. (ZSW); Nitsch, J.; Lehr, U. (DLR); Edler, D. (DIW); Lutz, C. (GWS): Erneuerbare Energien: Arbeitsplatzeffekte – Wirkungen des Ausbaus erneuerbarer Energien auf den deutschen Arbeitsmarkt, Forschungsvorhaben im Auftrag des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit (BMU), June 2006.

[BMU07] Kratzat, M. (ZSW); Lehr, U.; Nitsch, J. (DLR); Edler, D. (DIW); Lutz, C.

[1] For more information contact Ulrike Lehr, GWS mbH, lehr@gws-os.de

(GWS): Erneuerbare Energien: Arbeitsplatzeffekte 2006 – Wirkungen des Ausbaus erneuerbarer Energien auf den deutschen Arbeitsmarkt – Follow up, Forschungsvorhaben im Auftrag des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit (BMU), September 2007.

[ZSW08] Zentrum für Sonnenenergie und Wasserstoff-Forschung Baden-Württemberg (ZSW), Stuttgart, Data as of March 2008.

[ESTIF07] European Solar Thermal Industry Federation (ESTIF): Provisional ESTIF figures on the EU Solar Thermal market 2007, 21.12.2007.

[FNR08] Fachagentur Nachwachsende Rohstoffe (FNR): Anbau nachwachsender Rohstoff in Deutschland, http://www.fnr.de/, Download:1.2.2008

[GWEC08] Global Wind Energy Council (GWEC): Continuing boom in wind energy – 20 GW of new capacity in 2007, http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=121&tx_ttnews[backPid]=4&cHash=f9b4af1cd0, 18.01.2008

[IWR08] Internationales Wirtschaftsforum Regenerative Energien (IWR): Schmack Biogas: Schwache Nachfrage lässt EBIT sinken, http://www.iwr.de/bioenergie/bio-news.php?id=11919, 26.02.2008.

[NeueEnergie08] Rentzing, S.: Warm laufen, Neue Energie, 01/2008, S. 38-43.

[PHOTON08] Kreutzmann, A. Siemer, J.: Sind wir Solarpapst, PHOTON, Januar 2008, S. 28-41.

[StaBu07] Statistisches Bundesamt: Input-Output-Rechnung 2004, Volkswirtschaftliche Gesamtrechnungen, Fachserie 18, Reihe 2, Artikel-nummer: 2180200049005, Wiesbaden 2007 (published on 18 September 2007).