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Short-and Long-Term Impacts of the Expansion of Renewable Energy on
the German Labor Market, Second Report on Gross Employment

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**Gross Employment from Renewable Energy in
Germany in the Year 2008**

- A first estimate -

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Introduction

Over the last years Germany has achieved a leading position worldwide in the expansion of renewable energy. The share of renewable energy in final energy consumption increased from 3.8% in 2000 to 9.8% in 2007 [BMU08a]. As it is the goal of the federal government to increase this share to 18% by the year 2020 [BMU09a], a further considerable expansion of renewable energy is necessary.

Also internationally a tendency towards the use of renewable energy can be observed for some time now. A number of countries and regions have set political goals to expand renewable energy use. One of the leaders of this movement is the European Union, which aims to reach a share of 20% in final energy consumption from renewable energy by the year 2020 [COM08], starting from 9% in 2005. The main reasons for this development was the pressure from the rise in conventional energy prices until mid 2008 as well as improved knowledge and data on climate change and its follow-up costs, intensified by the Stern report [Stern06].

The renewable energy sector in Germany is characterized by steady growth rates in the past years. To a large part its success is due to the stable political framework for the expansion of energy from renewable sources in Germany. A reliable domestic market provided the base for German companies to achieve competitive positions on the international markets.

Accordingly, employment in the renewable energy sector showed a steady increase. For 2007 the so-called gross employment was estimated at approx. 249,000 jobs [BMU08b]. This covers direct employment in production, operation, maintenance and fuel provision as well as indirect – upstream –employment in other sectors induced by the demand from the renewable energy industry. In the following document these results are updated and an estimate of gross employment for the year 2008 is presented. Background of this exercise is an ongoing study of employment effects from renewable energy for the German Federal Environment Ministry.

Central to the calculations is the *turnover* of companies manufacturing renewable energy (RE) facilities in Germany. This turnover stands for domestic and international demand covered by domestic production. It is based on 2008 investments in Germany and estimates of the development of international trade. Based on this turnover, gross employment is determined using Input-Output Analysis, taking the 2005 Input-Output Table from the Department of Statistics [StaBu08]. The RE sector is represented by technology-specific vectors derived from a survey with the base year

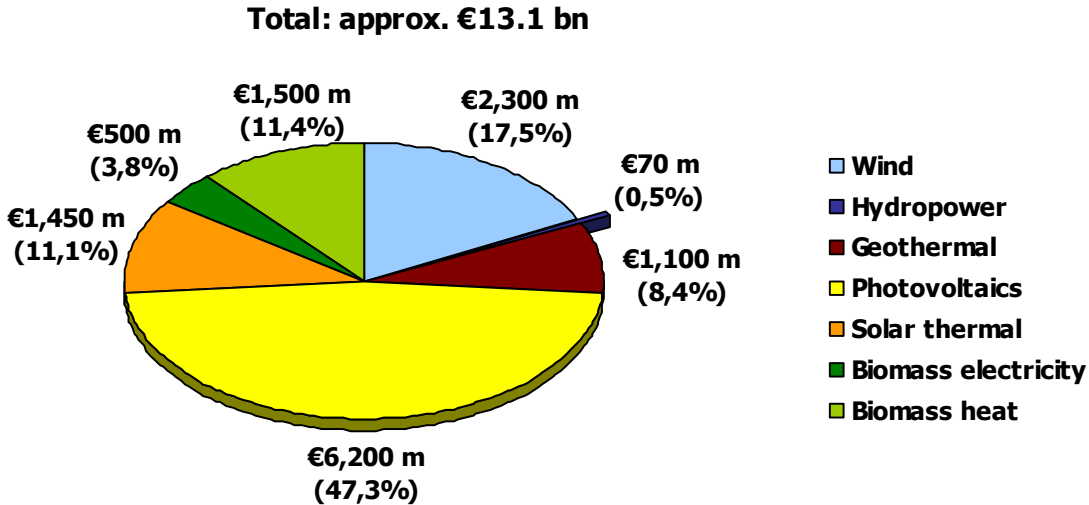
2004. Relevant benchmark data, such as the productivity of individual sectors, are adjusted as in the estimates from previous years [BMU06/BMU07/BMU08b].

Employment from operations and maintenance of German installations is calculated similarly and employment from the supply of fuels is estimated.

Employment from the expansion of renewable energy ultimately includes the fields of research, public relations and promotion as well as public service. These fields, that in 2006 totaled 4,300 jobs [BMU07], cannot be updated in the framework of this investigation. To stay on the conservative side, the 2006 value was used for 2008 as it had been for 2007.

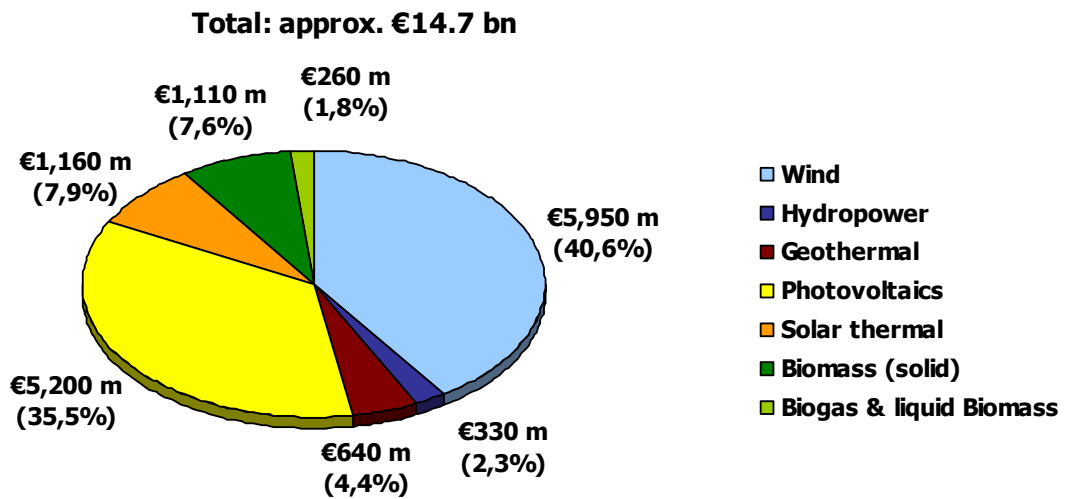
Employment from Equipment Manufacturing

First estimates based on numbers from the Renewable Energy Statistics Working Group (AGEE-Stat) yield investment in German facilities that use renewable energy in 2008 of approx. €13.12 billion (see Graph 1). This represents a 19% increase to the previous year (€ 11 bn) and tops the 2006 all-time-high of €11.6 bn.



Graph 1: Investment in Renewable Energy Facilities in Germany in 2008 [ZSW09].

For the year 2008 the turnover of German based manufacturers of RE facilities also increased and was in the €14.65 billion range (see Graph 2). The large expansion of Photovoltaic systems, which comes with an expansion of production facilities in Germany, contributed considerably to this development. Furthermore, the heat market recovered its losses from the previous year, particularly affecting solar thermal and geothermal systems. In contrast, the turnover of the biogas industry and the producers of facilities for stationary use of liquid biomass declined.



Graph 2: Turnover of German Manufacturers of Renewable Energy Facilities in 2008.

From this turnover the estimate of gross employment totals 170,400 people in 2008, which represents a 16% increase compared to 2007 (see Table 1).

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

The relevant drivers of employment from operations and maintenance (O & M) of existing installations are the costs of operation (without fuel costs), which are calculated as a percentage of the investment costs. With growing installation numbers, employment in O & M becomes increasingly relevant. In 2008 it increased to 49,600 people (see Table 1).

In the biomass sector employment from the supply of fuels has to be considered in addition to operations and maintenance for both transport and power. With 53,700 jobs in this area it slightly increased last year. Table 1 shows that decreasing employment in supply of biofuels was compensated by an increase in combustible biomass.

In total, gross employment from private activity is around 273,700 for the year 2008. Including employment from the use of public and common-use funds this number rises to 278,000 representing an increase of 12% compared to 2007.

Table 1: Employment from Renewable Energy in Germany 2008.

	Employment from investment (incl. export)	Employment from operation & maintenance	Employment from supply of biomass	Total employment 2008	Total employment 2007
Wind	68,100	17,000		85,100	84,300
Photovoltaics	54,700	2,300		57,000	38,600
Solar thermal	15,500	1,900		17,400	12,100
Hydropower	4,900	4,400		9,300	9,400
Geothermal	8,600	500		9,100	4,500
Biomass	15,200	19,500		34,700	31,300
Biogas & liquid Biomass	3,400	4,000		7,400	13,500
Biomass for power			28,500	28,500	22,800
Biomass for transport			25,200	25,200	28,500
Total	170,400	49,600	53,700	273,700	245,000
Employment from the use of public and common-use funds				4,300	4,300
Total				278,000	249,300

Background Information

Newly installed capacity of **Wind energy** in Germany remained at the same level as in 2007 with 1,665 MW [DEWI09]. Worldwide, new installations increased by 38% to 27,261 MW. Especially the markets in the US and China have contributed to this significantly with almost 31% (8,351 MW) and 23% (6,298 MW) respectively of the newly installed capacity worldwide. With a total installed capacity of 25,170 MW the US overtook Germany (23,903) for the first time as worldwide number one [WWEA09]. However, this does not directly translate into increased exports of German manufacturers, because extensions of production facilities - also by German manufacturers – have mainly been built abroad. From 2007 until the end of August 2008, 41 production plants for wind energy facilities have been built or extended in the US [GADORE08].

Assuming a turnover of €6 billion from producing wind energy facilities in 2008 and considering operations and maintenance as well as productivity gains, the total employment figure can be estimated at 85,100. This would mean a slight increase in employment for 2008.

For the **Photovoltaic (PV)** sector the past year was a great success. New all-time-highs have been reached in Germany and worldwide the market development accelerated. According to first estimates the Spanish PV market was larger than the German market in 2008 for the first time with 2,279 MW newly installed capacity [IDAE08]. The latest industry survey conducted by PHOTON magazine reported an increase of solar module production in 2008 of 76% compared to 2007 [PHOTON09]. In total the turnover from the German PV industry is estimated at €5.2 billion. Taking into account operations and maintenance this adds up to 57,000 jobs.

From 2007 to 2008 the German **Solar thermal** market almost doubled and thus recovered from its slump. A first estimate of the total turnover in this sector amounts to approx. €1.2 billion. Including operations and maintenance this adds up to 15,500 jobs.

As in the previous years, 2008 saw no significant change in the **Hydropower** sector. Due to productivity gains the employment figures slightly decreased to approximately 9,300 jobs.

In 2008 new investments in **Geothermal** facilities increased significantly. This was mainly due to a sharp rise in the heat pump market. Investment in deep geothermal facilities remained similar to the previous year. Total employment amounted to 9,100 jobs.

Investments in new **biomass** facilities in 2008 showed a fall of approx. 22% with large differences in market development between the various sectors. Investment in liquid biomass facilities and biogas plants decreased considerably, resulting in a drop in employment by 45% to 7,400 jobs. In the case of liquid biomass the main reason for this was uncertainty about the future of palm oil use, which will be the subject of a national sustainability directive in 2009. Biogas investment was reduced due to rising substrate prices as well as delayed investments due to better feed-in tariffs starting from 2009. This resulted in the postponement of several projects from the second half of 2008 to the year 2009. The declining domestic demand was partly compensated by increased activity abroad. In total however, the turnover in the sector decreased considerably in 2008. According to the German Biogas Association many producers did not lay off employees as a rise in demand in 2009 was expected also taking into account the problem of finding skilled workers. This suggests that employment was almost kept constant through part-time work. However, no details are known for the upstream supply industries. Therefore, these effects cannot be taken into account. We note that employment in the upstream industries not necessarily decreased but has to be accounted for in other sectors but the biogas sector.

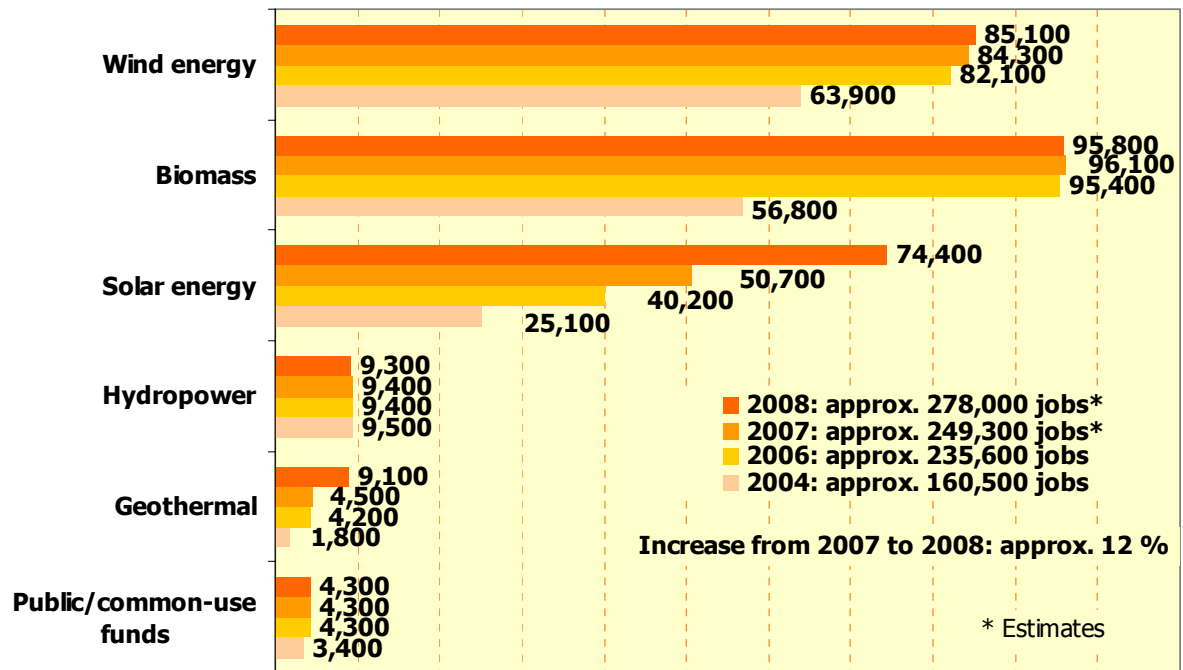
In 2008, solid biomass showed an increased turnover of €1.11 billion, resulting in approx. 34,700 jobs.

Gross employment from the **supply of biomass** has increased to 28,500 jobs last year. This can be largely attributed to the expansion of wood pellet production in Germany, which according to the German Energy Pellet Federation means an increase of 30% in comparison to the previous year [DEPV09]. Furthermore, renewable raw materials for the use in biogas facilities can now be grown on 500,000 hectares of land which means an increase of 25 % compared to 2007 [FNR09].

The supply of **biofuels** from German production continued to decrease in 2008. The main reason was the reduction of land that was used for rape seed for the production of biodiesel and plant oil [FNR09]. In the face of a rather uncertain data basis especially concerning seasonal patterns, the number of jobs was estimated cautiously at 25,200. It is based on conservative estimates, particularly concerning the share of imports on different production levels, which have a strong influence on the final result. A more detailed analysis of the biofuels and biomass supply sectors will be part of the final report of the more comprehensive study mentioned earlier.

Employment from the use of public and common-use funds for renewable energy was, as in previous years, estimated at 4,300 people. In the light of increasing research activity this is a conservative estimate as e.g. the German Federal Environment Ministry has increased its research funding considerably [BMU09b]. Since no reliable information is available on the development of funding in total, we assume that higher output stems from productivity gains.

The estimate for total employment in the renewable energy sector is approx. 278,000 employees for the year 2008—an around 12% increase in comparison to the previous year (see Graph 3). Biomass continued to contribute the largest share to the total with 34%, followed by wind energy with around 31%. Solar energy demonstrated the largest growth and added approximately 27% to total employment, followed by hydropower (3%) and then geothermal (3%).



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

Finally, it is important to emphasize that these numbers are estimates largely based on detailed analysis using the statistical base year 2004 with additional close observation to the market development in subsequent years. A new market survey of the renewable energy sector with the base year 2007 was finished last year. The data basis for future employment estimates will be updated with the results from this survey. The Input-Output Vector which represents the structure of the renewable energy sector and its connections to other sectors will be updated later this year. The up-to-date data set will form the basis for estimating employment for the year 2009, and for reappraising and revising the estimates for the years 2007 and 2008. This study will also include close analysis of the impact of the current economic situation on the renewable energy sector and on employment, which is only outlined in the following chapter.

Impact of the Financial and Economic Crisis on the Renewable Energy Sector

Sparked by the financial crisis and the credit crunch in 2007 and 2008, the last quarter of 2008 has seen a worldwide economic crisis which has continued thus far into 2009. In addition several sectors, for instance the automotive industry, are undergoing a severe structural crisis. Currently, any evaluation of the further development

is difficult. The declining demand for capital goods leads to not only decreasing turnover and overcapacities in many industries but also to price decreases on resource markets and therefore to a lesser burden for households and productive sectors.

During the last quarter of 2008 the main impact in the renewable energy sector seemed to be a delay in release and call-off of orders. The German domestic market environment for the RE sector is characterized by stable conditions and regulatory reliability. Projects are still being financed based on profitability. Where feed-in tariffs determine profitability the influence of falling prices for fossil fuels is curbed. Project funding has become more difficult for geothermal, small biogas plants and offshore wind.

On international RE markets project funding is affected by deteriorating country ratings and a partly dramatic worsening of the situation of local banks. With decreasing profitability due to fallen energy prices and RE support mechanisms relying on (vanishing) public budgets, the financial and economic crisis yields new risks for international RE trade.

The PV sector is hit by the financial crisis in a phase of a necessary consolidation. It has still to be seen whether production capacity expansion, which appeared necessary last year, will now turn out to be excess capacity. Downstream renegotiations of delivery agreements resulting in price reductions of more than 10% are very likely.

Even though currently the effects of the economic situation cannot be predicted precisely it can be expected that employment in the RE sector will continue to grow. We still assume that by the year 2020 at least 400,000 jobs in the German renewable energy industry is realistic [BMU06]. A detailed analysis of the long-term development of gross employment, taking into account possible global development scenarios including foreign trade is part of the current study. Furthermore the future development of the net employment will play a prominent role in the results of the study.

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