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THE SOLAR INDUSTRY BOOM IN GERMANY

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ABSTRACT

In the last two years, significant photovoltaic installations have been built in some European countries, especially in Germany and Spain. The number and capacity of both private rooftop and free field solar power plants are expanding quickly. In Germany the new installed capacity has doubled from the year 2009 to 2010 and boasts a current capacity of 17.000-18.000 MW electric power (effectively this is the capacity of 3-4 new nuclear power stations). In spite of the fact that solar power is the most environmental friendly energy source; some other countries like Belgium, Holland, and the Czech Republic have revised their subsidy strategies for the industry. This study evaluates the situation in Germany, running a quantitative analysis on installed capacity over the last five years. As technological standards get more conventional, the module prices fall significantly as does the extreme oversupply. However, the guaranteed subsidy schemes are not downgrading proportionally to module prices, this has led to the overheated market situation we are facing in Germany. Furthermore, this study shows the cost for households. The key questions are rising prices for electricity that all households face and the political discussion behind the new industrial revolution. This latter concerns the fact that the biggest supplier of these technologies is no longer Germany itself, but the Far East; the subsidy is flowing out of the country. Several approaches such as PESTLE analysis are applied within the analytical framework. The recommended output will be critically appraised based also on a literature review to identify the potential limitations and obstacles to further growth in the sector.
Keywords: Sustainable economy, photovoltaic, solar economy, sustainable growth, feed-in tariffs, solar industry, Renewable Energy

INTRODUCTION

Germany currently is the most attractive place for the solar industry regarding the supportive schemes and legal background (*Mendonca*, 2007). The German Renewable Energy Sources Act (EEG) came into effect in 2000 and has been adapted by many countries around the world (*Lipp*, 2007). However, the German solar photovoltaic (PV) development continues to drive the global PV industry and shows little evidence of slowing down going forward. Largely driven by favorable feed-in tariff (FIT), more than 3.8 GW were installed in 2009 and another 4.2 GW are forecasted to be installed in 2010. Initiated by strong regulatory support, the industry is transitioning into a new phase with the scaling entrance of well-financed industrial power players, utilities, independent power producers and investors (*Deline*, 2010).

Originating in Germany, a wave of development activity is moving through southern Europe and into central and eastern Europe. Approximately 30% of

Europe's PV capacity was installed outside of Germany in 2009, signaling broader development opportunities. Key to the expansion is PV technology's unique and flexible siting applications, which allow for a range of rooftop and large-scale, ground-based PV installation opportunities (*BSW Solar*, 2011).

In last year's, cost declines improve position against other renewable sources. PV system costs are dropping dramatically and are attracting greater interest as PV approaches costs comparable to other peak-generating technologies. The cost improvement trend results largely from a recent oversupply in the global PV module market, technology and manufacturing improvements, and improved economies of scale. In the long term, these trends underlie the reduction in government incentives. These incentives have been central to getting the German PV sector off the ground, but are now evolving in their designs to shape both the size and content of the market going forward.

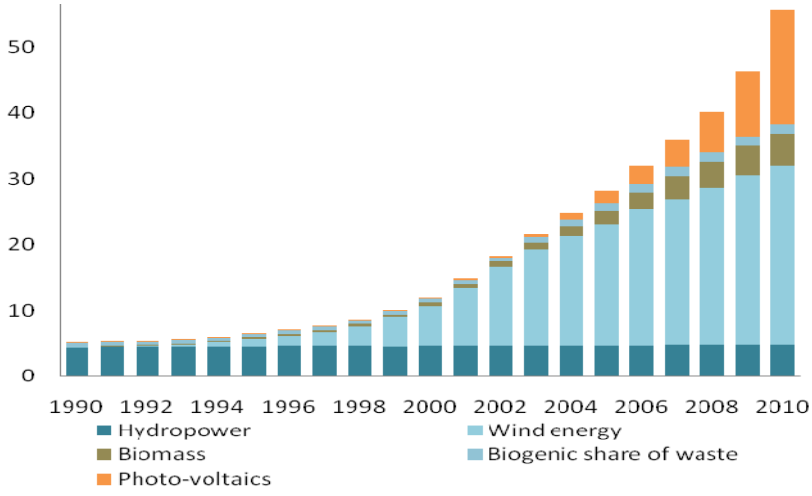
MATERIALS AND METHODS

Installed capacity

During the last 10 years the installed renewable capacity is nearly five times as much as it has been in 2000. In absolute numbers, wind has grown most dynamically with an addition of 21 GW (*Hoffmann*, 2006). In relative terms it was solar, which was expanding most, with 200 times more GW installed than 10 years ago. Looking at actual production it is wind and biomass which report the largest growth, but concentrating on large scale units. Power generation from both sources has increased by 29 and 26 GWh respectively. Production increase from solar panels stayed with 12 GWh a little bit behind, despite the enormous capacity growth by 17 GW (*Figure 1*).

Figure 1

Installed renewable energy capacities in Germany in GW between 1990 and 2010



In December 2009 and June 2010 alone PV reported an increase by 1.5 and 2 GW, jumps which were triggered by sharp reductions in solar feed in tariffs in the German renewable energy support scheme. Currently the tariff system grants per kilowatt-hour produced between 25 and 33 Euro-cents. For this year a further reduction will become effective on 1st of July.

High technology production and innovation

Within an extremely short period of time, largely automated factories have sprung up which manufacture thin-film modules in an industrial process. This has allowed the costs per Watt of solar energy capacity to be significantly reduced, which in turn has noticeably expanded the fields of application and the markets for solar technology. As is the case with silicon technology, the German PV manufacturing industry is excellently positioned in the thin-film field and plays an active role in shaping the world market. The photovoltaic industry resembles the chip manufacturing industry in that prices are heavily dependent on production capacities. If quantities are doubled, module prices sink by a good 20%. Across Germany, the cost of solar modules has dropped on average by over 40% since 2006. Fierce competition to increase production capacities and lower prices is fuelled even further by Asian competitors. Cheap loans from the state-owned bank, lower social standards and wages and an artificially undervalued currency allow Chinese manufacturers to offer their goods at markedly lower prices. However, manufacturers producing in Germany are countering this by further streamlining production, driving forward technological development and developing brand identities (*Renewableinsight*, 2010).

Increasing solar power production

The volatile cost of fossil fuel and peak power generation over the last decade has brightened the prospects for renewable, with zero fuel costs. Additionally, the predictability of future power prices for solar PV gives PV an advantage over natural gas, with its highly volatile prices. EU carbon policies, looming on the horizon in 2013, threaten to increase fossil fuel energy costs further and pressure utilities to expand their renewable generation capacities. In Germany, a 1% share of overall power generation is expected to be exceeded in 2009 (*Wenham,* 2010). The growth potential of photovoltaic has often been strongly underestimated up to now, as this supposedly expensive technology has seen cost reductions in recent years at a rate that nobody expected Solar power can thus be generated for around 10 ct/kWh at locations with lots of sunshine, and this figure is falling all the time (*Archer,* 2001). This means that photovoltaics are at the threshold of major market penetration, and the sector has shown in the last ten years that it can deliver high growth rates (*Figure 2*). For example, the European Photovoltaic Industry Association's scenarios assume that it will be possible to install photovoltaic capacity of more than one hundred GW in Europe alone by as early as 2020 (*Figure 3*).

The IEA's expectations are admittedly significantly lower, with a worldwide installed capacity of around 130 GW, but it should be noted that this is based on very conservative development as regards power generation costs; these costs are an important factor in determining the rate of market penetration and, based on current trends, these assumptions can already be regarded as outdated (*Goetzberger*, 2005).

Nonetheless, the IEA scenario also implies that photovoltaics will be able to meet around 10% of the world increase in power consumption before 2030 (*Archer*, 2001).

Figure 3

The renewable power production by technologies between 1990 and 2010

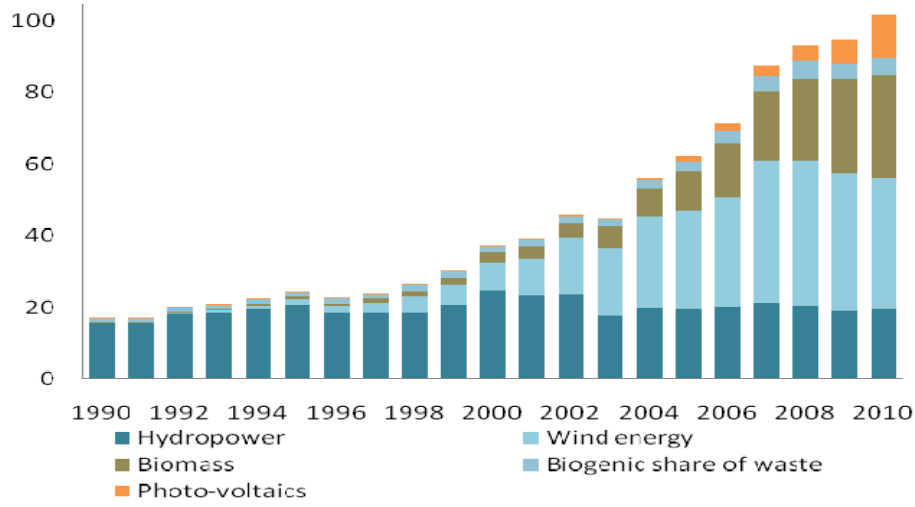
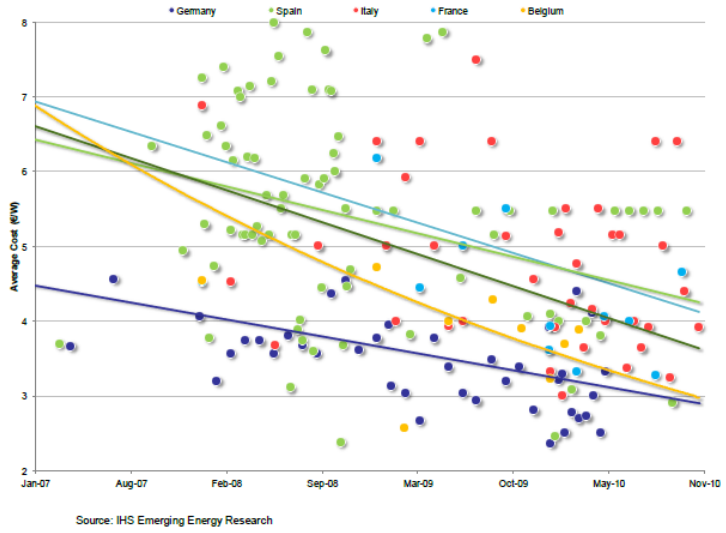


Figure 3

Average cost development of PV installations in some of the major European countries between 2007 and 2010



Source: IHS Emerging Energy Research

Working labor

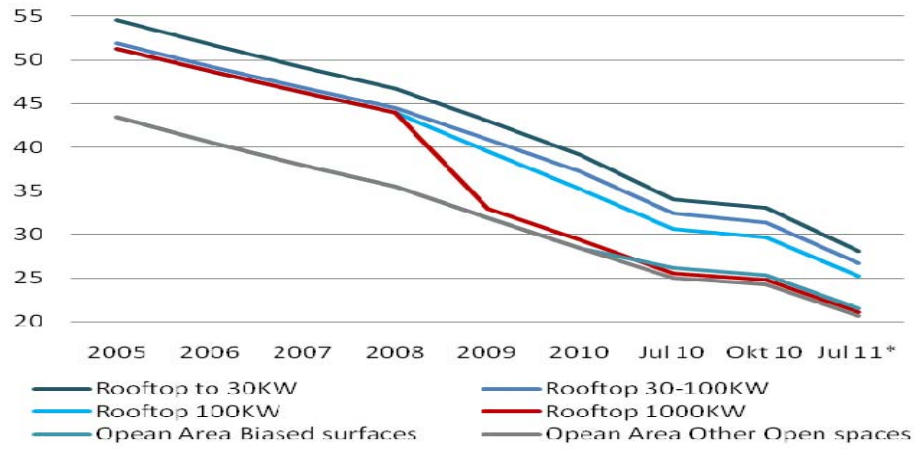
More than 83.000 employees are working in the solar economy, prognosis 2020: 100.000, mostly skilled labor. The industry has made 10 Billion EUR turnover in 2010, 75% export (*Lehra et al.*, 2008). The potential has often been strongly underestimated up to now, high investments taken place in the industry and generates new jobs in the recent years at a rate that nobody expected (*Mendonca*, 2007). In detail numerous new factories for cells and modules; the solar manufacturing industry represents an important sector of the economy, particularly in the economically underdeveloped regions of East Germany. German suppliers, who are especially densely located in the classic economic regions of Western and Southern Germany, primarily operate in materials management, factory equipment, mechanical engineering and the services sector.

Feed-in-Tariffs

As of January 2010, FITs were reduced by 9% to 11%, depending on system size, to the current rates of €0.28/kWh for ground-based systems, €0.29/kWh for large rooftop, €0.35/kWh for medium rooftop, and €0.37/kWh for small rooftop. Taking into account these annually prescribed tariff cuts, 2010 tariff rates will be 26% lower than 2009 rates. Moving forward, tariff rates will be subject to a 10% annual digression schedule. Germany targets 18% of gross electricity production to come from renewable energy systems (RES) by 2020, without setting targets for specific technologies (*Figure 4*). The resulting flexibility for policymakers to adjust incentives clouds the visibility of policy developments. However, the government has set a target of 3 GW of annual additions, ideally not exceeding 3.5 GW (*Papineau*, 2006).

Figure 4

The feed in tariff development of PV installations in Germany between 2005 and 2011 divided by type of installation



RESULT AND DISCUSSION

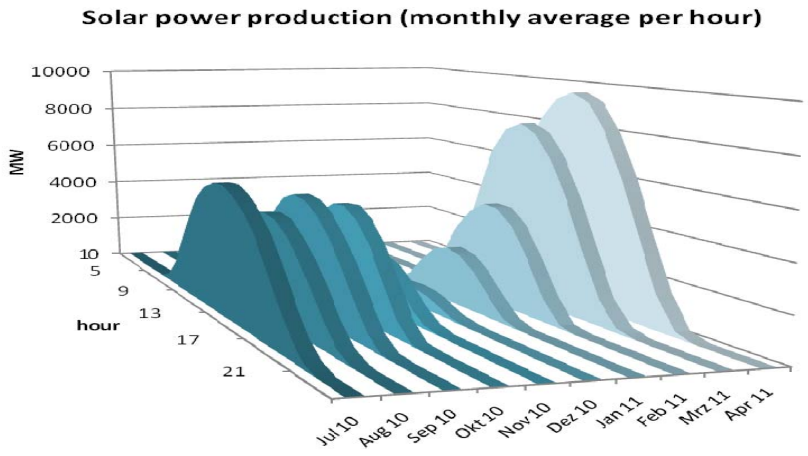
From the society aspect – based on surveys conducted by Emnid, Forsa and Allensbach - 98% of Germans are in favor of solar energy being more widely used. Around 75% of German citizens would themselves like to live in a solar house – over a million of them have already fulfilled this dream. An opinion poll carried out by Emnid suggests that 71% of all Germans would invest in renewable energy. PV is the preferred choice to ease the burden on the environment, and no other energy source enjoys such immense popularity amongst the population. This fact drives to the finding that rise of the solar industry is well grounded and fully supported by the society.

The second result is that the power market is highly influence by the photovoltaic power production. There is summer days where 25-30% of the overall electricity usage in Germany coming from photovoltaics. Furthermore, photovoltaic supporting the peak hours, and has no effect on nuclear power as this are supplementary strategies (as nuclear delivers base-load power, the PV is supporting at daytime) (*Goetzberger*, 1997) Therefore it is common for solar and the power market, that the demand curve hits the supply curve more and more in the flat part of the supply curve.

The power generation from solar panels has been highly influenced also by the capacity growths in the recent years. Currently, the power generation ranges between 1500 MW and 12000 MW in hour 12. In light of further additional capacity, the volatility in PV power generation will raise further and straight the previously described effect on the mid-term (*Figure 5*).

Figure 5

The power produced by the current PV installations between mid of 2010 and mid of 2011



CONCLUSIONS

Unlike other renewable technologies, photovoltaic has the advantage of scalability, a broad range of potential project sizes and sittings possible. Solar energy generation, which can be down from utility-scale, ground-based, multi-megawatt projects to small, residential rooftop projects, attracts market participants ranging from multinational utilities to commercial and industrial players to individuals. So this socio effect is from my point of view the most important finding to give the answer for the success of photovoltaic. Not only does it result in a larger net pool of potential investors, small rooftop systems also benefit from shorter permitting and construction times. It is important to state, that Germany was the first country in Europe realized the importance and potentials of photovoltaics. The systematic governmental subsidy scheme was also supporting the PV development. But, with the technological improvements, regulators are cutting feed-in-tariffs - not only in Germany –, but across Europe, putting a greater emphasis on cost-competitiveness and stress to more technological and manufacturing improvements.

The future growth of the PV industry in Germany is depended on political actions. In order to stimulate the markets either in grid-connected systems by feed-in tariff programs as well as for off-grid rural developing country applications by long-term financing schemes.

A technology roadmap is already defined by different customer needs with best-adopted technologies and competitiveness with foreign competitor, mainly from China. As the recent market development shows that the German PV industry can deliver PV systems with network parity efficiency, but without opening new product ideas and additional market segments, cannot obtain against other producers. For further development of the photovoltaic market is the followings are needed: decreasing costs by increasing productivity for all technologies as well.

The role of photovoltaics in the future energy supply chain is given. Due to a fast growing market driven by increasing acceptance of solar power generation, a substantial PV business and creation of employment is expected for the future. Germany with its photovoltaic development can provide a possible solution for nowadays global issues, such as a global energy justice by providing environmentally friendly power to billions of people, who otherwise will lack energy solutions severely (*Hoffmann*, 2006).

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