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Bachelorarbeit

„Finance and risk management of photo-voltaic plants“

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1 Introduction

The importance of renewable energy comes up as soon as the term climate change and its threat to mankind as well as our environment pop up. As a consequence of the rise in temperature and extreme weather conditions which we have witnessed in recent years, the society seeks to raise the awareness of man-made climate change. Even if the weather conditions show a relatively wide discrepancy from region to region, it becomes a challenge for all humanity and creates a global alliance against anthropogenic global warming.¹

Ultimately, the demand for efficient environment friendly energy sources became a global process and essential measures are being adopted on political, social and economic levels.

In fact investments in renewable energies are expanding and apparently booming. Therefore it is not unjustified that conventional energy sources are successively replaced by renewable forms of energy which have reached a share of 20-percent in electricity supply during the first half of the year in 2011. In comparison: The share of renewable energies in electricity supply in the year 2000 was 6,3 percent. The Federal Ministry for the Environment (BMU) considers this as a great success and a visible proof for a sustainable way to supply energy in the future.² Not only the BMU, but also the World Climate Summit 2011 which took place in Durban (South Africa) honors Germany's "outstanding performances and its efforts as defined by measurable carbon reduction and quantifiable steps towards sustainability"³ with a Country-Leadership-Award. Germany received the Gigaton-Award for consistently improving and expanding the implementation of renewable energies as well as for its policy making this success even possible.⁴

As a result the monetary value of global investments in renewable energy increased noticeably. In 2010 it reached a total of 211 billion US dollars whereas it was 160 billion US dollars in 2009. This continuous growth within only one year is bigger than 31 percent and shows how necessary supportive policies plus climate-friendly energy

¹ cf. Ahlonsou, E., Y. Ding, and D. Schimel. (2001), p. 96 – 97.

² cf. BMU (2011), No. 108/11.

³ Gigaton Awards (2010).

⁴ cf. BMU (2011), No. 158/11.

sources are. The success of renewable energy sources would be unimaginable without photovoltaic and is directly linked with the effectiveness and constantly growing productivity of photovoltaic systems. For that reason 2010 was the year with a higher capacity growth in photovoltaic than in wind energy in Europe. Germany became a front runner and the world's leading nation in on-grid photovoltaic capacity after installing more photovoltaic systems in 2010 than the rest of the world managed to install a year before in total. Germany dominates the photovoltaic market world-wide.⁵

The production of energy using photovoltaic technology is promoted by the German Renewable Energy Sources Act (EEG)⁶. This governmental conditional framework specifies attractive and reliable fixed feed-in tariffs (FiTs) for the produced electricity for the next 20 years. The act was set up on the 1st April in 2000 and was the primary ignition for the attractiveness of renewable energy in Germany. The latest EEG amendment of June 2011 will come into force on the 1st January 2012.

Despite the boom in the last decade, the market faces many challenges of developing desirable solutions to a sustainable future. In Germany we observe the lowest prices for PV systems which lead to decreasing FiTs, because the EEG has to follow the progress of the market.⁷ Especially since PV markets are stronger than ever, adequate support policies are indispensable. This fact makes it complicated to measure and handle associated risks as well as the financing, because the profit margin seems to be decreasing. The resulting consequence is a growing discussion of finance and risk management of photovoltaic plants.⁸

2 Characteristics and development

Photovoltaic is a method of conversion of solar radiation into electrical energy using solar cells.⁹ PV applications were already used in 1958 to supply spacecrafts with

⁵ cf. REN21 - Renewables 2011 Global Status Report (2011), p. 34 – 36.

⁶ Gesetz zur Neuregelung des Rechtsrahmens für die Förderung der Stromerzeugung aus erneuerbaren Energien.

⁷ cf. SolarServer (01/2010).

⁸ cf. EPIA – Global Market Outlook for Photovoltaics until 2015 (2011), p. 4 – 5.

⁹ cf. Mark Z. Jacobson (2009), p. 4.

diverse in any case, because it is related to the service quality and the reputation of the manufacturer. The risk of a manufacturer going bankrupt has to be considered.⁸⁶

Damages to the PV plant can also be caused by rodents, especially martens, because they can easily be attracted by cables which are isolated by plastic and rubber. Even if this problem is specific to Germany, animals can be a serious threat to PV plants.⁸⁷ Once they start eating the isolation of the cables, a downtime or total breakdown of the PV plant can be the result. In such a case it is not easy to point out the error and the reason for its appearance. A routine diagnostic is a very time-consuming process for the operator.⁸⁸

5 Conclusion

5.1. Future of photovoltaic systems in Germany

Germany started early in making its experience with the PV technology. In the 90s the well known program of 1,000 rooftops was a great success and more than 2,000 PV plants were installed while the operators received financial support of up to 70% of the investment. At this moment it was quite common to pay a price of approx. 14,000 €/kWp.

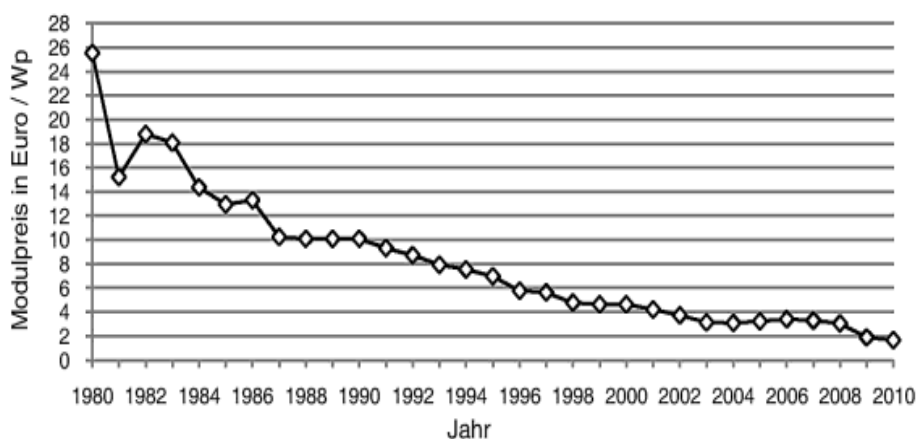


Figure 20: Price development of PV modules in € / Wp

Source: Martens (2011), p. 256.

⁸⁶ cf. Saß (2008), p. 113.

⁸⁷ cf. Goetzberger, Hoffmann (2005), p. 159.

⁸⁸ cf. Saß (2008), p. 106.

The price decrease of PV modules shows the development of the market and the progress of the technology. Consequently, the modules became much cheaper during the last 30 years and economies of scale lead to more efficient production process on behalf of the manufactures.⁸⁹

The price development does not only concern the PV modules, but also the feed-in tariffs. Studies of the “Bundesverband Solawirtschaft” (BSW) show that the feeded-in PV electricity on the private rooftop would be cheaper than the electricity sold by local energy suppliers. In 2014 the PV industry is expected to overtake the offshore wind power industry. In 2017 PV plants are supposed to exist on private rooftops without any financial support by the government, because they can be profitable without FiTs. Even the sales of PV modules would be three times higher in 2020.⁹⁰

A positive argument concerning the price can be the guaranteed FiT for the next 20 years. The payment for each generated kWh stays stable and is not related to the development of the market. As soon as a PV plant starts its operation, the FiT does not change for 20 years and the operator has no risk of earnings.

The next decades would not significantly change the consumption of electricity in Germany. Potential changes will be compensated by electric cars and electric heat pumps, so the PV industry will cover between 90 and 180 TWh of the yearly needed 600 TWh. For this aim it needs around 100 to 200 GW of installed PV performance. For covering about one-third of the energy demand in Germany, it needs less than 1% of the total area of Germany.

When establishing approx. 8 GW (last year 7.1 GW), this aim is most realistic to be achieved in the year 2035.⁹¹

5.2 Critical appreciation

It is an undeniable fact that the German government has been discussing about extending the operation of nuclear plants last year, while renewable energy sources

⁸⁹ cf. Martens (2011), p. 256 – 257.

⁹⁰ cf. SolarServer (08/2011).

⁹¹ cf. Quaschnig (2011).

became the main topic of nowadays energy mix. This shows how quick one's view can change, and the kind of influence worldwide events like the catastrophe of Fukushima can have on a country's energy policy.

The case of a 100 kWp plant shows that the operation of PV plant is profitable in Germany. The given circumstances, especially the EEG influences the German PV market in a very positive way and leads to an energy mix that is based on renewable energy more and more. The fact of including an own consumption option of the generated electricity from a PV works as an enormous benefit for the operators of PV plants.

“A complete supply from renewable energies and the end of the dependency on fossil fuels and nuclear energy could be realized”⁹² within the next 20 or 30 years. If Germany misses its chance to reach the target of complete supply from renewable energies by 2050, the climate protection goals can definitely be cancelled.⁹³

Even if the PV industry grew and became mature in the last decade, it will still be a secondary source of electricity for the next decade. Although it is a major renewable energy source among other technologies, the people need declining costs and competitive circumstances which can only be achieved through the growth of the market and continuous improvement of the legal circumstances. Large economies of scale will ensure better conditions for future generations of PV plant operators.

⁹² Heinrich Böll Foundation (2008), p. 14.

⁹³ cf. Quaschnig (2011).