Analysis and prospects of the development of the global photovoltaic market

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Abstract: **The article presents the development trends of the production and use of photovoltaic materials, tendencies that have been observed for more than ten years. Special attention is paid to the analysis of installed capacities, uses, and the technology of production. The economic benefits which have been recorded in the European market are also mentioned.**

Keywords: **renewable energy, photovoltaics, PV development.**

I. INTRODUCTION

The issue of obtaining energy from conversions occurring in photovoltaic modules is becoming more and more popular. With the passing of time, renewable energy is arousing greater interest, not least because of the growth of environment-friendly tendencies and the slow depletion of conventional fuel deposits, such as hard and brown coal, crude oil, natural gas, methane, and wood.

An analysis of the photovoltaic market shows a constant rise in the power of PV systems installed in many countries worldwide. Dynamically growing as it does, the production of photovoltaic modules is often compared to the burgeoning of microelectronic industry at its incipient stage of development. Next to computer science and biotechnology, photovoltaics is a branch that develops most dynamically.

II. VOLUME OF PRODUCTION AND INSTALLED CAPACITIES

The yearly average rise in the production of photovoltaic cells in the past decade is 45%, making it one of the most rapidly growing technologies of renewable energy sources. Figure 1 shows how dynamically the volume of the world's production of photovoltaic cells has grown in the past few years.

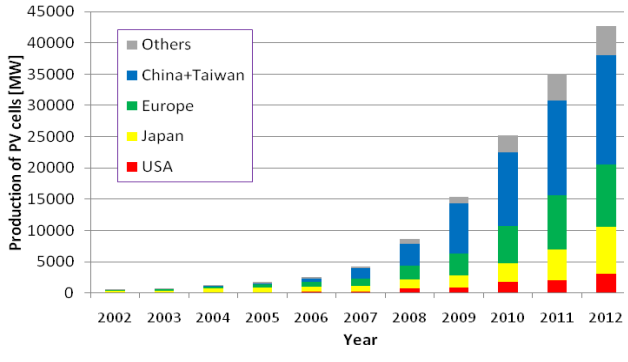

Fig. 1. World's production of photovoltaic cells in the years 2008-2009 and planned production for the years 2010-2012 [1]

The analysis of the world's photovoltaic market indicates a constant rise in the power of PV systems installed in many countries. When set beside the year 2007, the year 2008 saw a 129% rise in the newly installed capacities. If the power of all of the PV systems used worldwide had been summed up in 2008, it would have amounted to 14.7 GWp.

The legal and administrative solutions implemented by the fifteen countries that the UE used to consist of with the aim of supporting photovoltaics made the European countries dominate in the global market of photovoltaics. Germany was the indisputable leader, the accumulated power of the installed photovoltaic systems being 5.36 GW in 2008, yet the largest growth within one year occurred in Spain (fig.2).

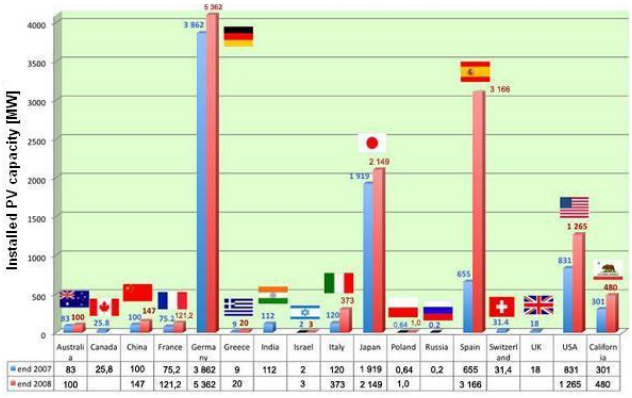

Fig. 2. Total power and a yearly increase in the installed PV systems in selected countries in 2008 [2]

The Czech Republic also merits attention, the reason being that the number of photovoltaic systems installed rose there ten times in 2008 (fig.3).

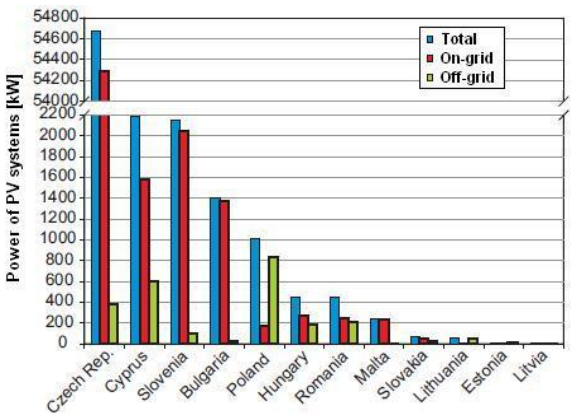

Fig. 3. Total power of the photovoltaic systems installed in the new members of UE in 2008 [3]

Among photovoltaic installations, ones that are connected to a power network constitute the highest percentage. A 50% rise was recorded in 2007 as against the previous year (2006 – 1.6 GW), amounting to an installed capacity of 2.7 GW. As a result, there existed systems of approximately 7.8 GW worldwide, which made it possible to supply energy to 1.5 million households.

III. APPLICATIONS AND TECHNOLOGIES

In 2007 as many as 90 % of PV modules produced were fitted in installations connected to a power network in Europe, while in global terms such installations have a share of 70%. In countries where renewable sources reached a high share in the power system, the crucial problem is to specify such a maximum installed capacity of PV systems (as well of wind generators) that will not have a large adverse effect on the quality of energy in low-voltage networks. A theoretical limit is 3.5W approximately per household [4].

Building Integrated Photovoltaics (BIPV) – architectonic, structural and aesthetic photovoltaic systems integrated with buildings – is one of the most promising forms of using renewable energy, allowing as it does to combine an energy-generating system with facilities like houses, schools, and office blocks. Such installations are constructed all over the world as a part of prestigious projects, examples being gigantic office blocks of large corporations. However, smaller systems are currently more and more often designed even for private dwelling-houses. It is then that many discoveries, crucial and decisive in terms of technology, appear and make BIPV solutions more available, as is the case with new types of glass (self-cleaning glass with new anti-reflection coating transmitting up to 96% of radiation and improving the efficiency of a system by 3.5%).

Concentrator photovoltaic systems (CPV) provide another possibility of integrating installations with buildings, above all in a climate where the available radiation consists basically of direct solar radiation. Using lenses or mirrors focused on PV cells supplies more electric energy at the output of a system in relation to an area unit of an installation.

The shortage of silicone of high chemical purity enabled thin-film technologies to develop and become more important. In 2007 they constituted 11% of global sales and in 2010 25%, which attests to the fact that the share of these technologies tends to rise in the global production. [5]. The lack of sufficient supply of silicone points to the necessity of developing thin-film technologies. With the situation as it is, many activities are taken to improve the production technology in such a way as to manufacture thinner silicone plates, raise their efficiency and develop thin-film solar cells (CdTe, CIGS) for mounting on flexible and lightweight bases.

IV. ECONOMIC BENEFITS

An analysis of photovoltaics may not overlook economic benefits. In the year 2007, 60000 persons were employed in the photovoltaics industry in Europe, with 40000 people working in Germany and 12000 in Spain. In 2008 German photovoltaic branch employed as many as 48000 workers. It is estimated that this industry will have created over 2 million workplaces by the year 2020 (200000 in the European Union) for employees with various skills, ranging from system installers to highly skilled specialists to work in the field of semiconductors in the production plants of modules and in research and development centres.

The prices of photovoltaic systems and energy obtained with them are continually falling owing to the development of the technologies and increasing mass production. By contrast, the prices of fossil fuel power are incessantly rising. It follows that the prices will be becoming equal in the foreseeable future in larger and larger areas. This will be attained within a few years in many Mediterranean countries. Figure 4 shows how quickly these areas are forecast to extend.

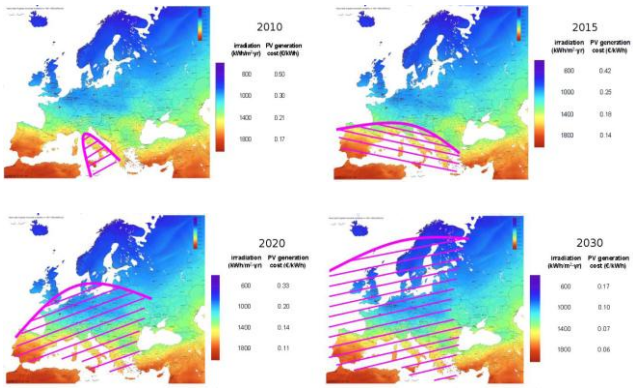

Fig. 4. Extension of the area (the lined area) where the prices of photovoltaics energy are or will be lower than conventional energy prices

V. CONCLUSION

In view of the palpable need for the development of the European photovoltaic field, special stress is put on the following: reduction of costs; technologies of new generations (increasing production and efficiency); energy storage; integration with networks (also with the intelligent ones); extending effective operating time of photovoltaic modules to more than 35 years.

VI. REFERENCES

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