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OVERVIEW OF THE SITUATION ON PHOTOVOLTAIC MARKET IN SELECTED EASTERN EUROPEAN STATES AFTER WORLD CRISIS IN 2011

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Abstract: *This article researches the situation on the photovoltaic markets in Slovakia, Romania and Hungary. It is focused on market analysis and prediction together with specific conditions on each market. An upward trend on photovoltaic markets is expected due to the favourable conditions given by the national governments and the European Union. However, state legislation harms competitive environment. There are no big differences between customers' preferences in product features.*

INTRODUCTION

This article researches the economic view on the environmental protection. It focuses on photovoltaic (hereinafter PV) market and its focus is connected to the article Overview of the Situation on Photovoltaic Market in Selected

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Countries that deals with the development and differences of PV markets in Western Europe and the Czech Republic (Pavlíček, Kopřivová 2010). The purpose of this series of papers is to collect and analyze data for a fuzzy mathematical model.

A growing energy demand, a drop in fuel supplies and the environmental pollution are the reasons that lead to a more extensive research on new energy production systems (Ulieru, Cepisca, Ivanovici 2009). In order to avoid further environmental degradation, the environmental quality should be considered as the target of the economic policy (Ierland 1991). Almost all over the world people are taking steps to privatize the energy industry and promote environmentally friendly technologies (Patlitzianas et al 2006). The European Union has set the aim to raise the use of renewable energy sources which cut carbon dioxide emissions (Ulieru 2009).

PV systems belong to the sources of renewable energy. PV solutions transform sunlight energy into electric energy and are described by modularity, operating autonomy and long operation period (Ulieru 2009). Several years ago, the potential of PV market was not seen by investors, in other words, investors did not see its unique financial properties (Awerbuch 2000). The market with PV systems increased rapidly by 30% in 2003 and future expansion began to shape (Green 2004). The total capacity exceeded 9 GWp all around the world in 2007. 50% share of this performance belonged to the European Union (Cristian 2008).

The main goal of this article is to describe the current situation and consider possible future development in PV markets in Slovakia, Romania and Hungary. These countries were selected with respect to the new upcoming changes in the legislations, which will bring the change of the current situation on the local markets, named the PV markets. Moreover, the above mentioned countries were selected due to very a low society awareness of PV markets since they are small and not well developed in comparison to the PV market in Germany, Italy, France or Czech Republic.

The development of PV market is related to the support policies executed by the national governments and defined in national laws. The correction of such incentive schemes can significantly affect the growth PV market in any chosen country (Dusonchet and Telaretti 2010). These systems are connected with the administrative and regulatory issues, along with the potential of fraud and mafia involvement. Investors need to be aware of such risk (Wright 2010).

It is possible to divide the customers of PV market into three segments. These are the on-grid customers, the off-grid customers and the specialized producers of electricity. The on-grid customers include the residential customers (e.g. home constructions) and the industrial customers (e.g. factories) and create 78% of the global market. The off-grid customers are mid-size

industries (weather stations, semaphores, water stations, etc.). The specialized producers of electricity are “solar farms” and it is predicted that this will be the most important market segment (Cristian 2008).

RESEARCH METHODS

To attain the stated objectives, research based on the collection of the primary and secondary data was carried out. The secondary data was obtained from both the domestic and foreign literature. Additional information was used from documents from the ministries, state institutions and the local distributors of electric energy. The primary research was carried out with the employment of the qualitative and quantitative methods. From qualitative methods, a structured interview was chosen. This approach was applied among 50 representatives of producers and installation companies and more than 15 investors in order to recognize the situation on the markets. A personal questionnaire survey was selected to execute quantitative research. This method was aimed at investors and end-users to find all the factors that affect the whole permission process. The research process used all the logical methods available.

MARKETS OVERVIEW

The selected states differ in terms of conditions for the installation of PV systems. With respect to this fact, it is necessary to present the selected states individually to better understand the situation on the market.

Slovakia

The country is fully self-sufficient and export-oriented; no matter that Slovakia had approx. 5.4 million of inhabitants in 2009 (Source: The World Bank). Despite the fact that it covers a small area, the market with renewable energy sources is rising thanks to the system of feed-in tariffs that were introduced in the years 2007. The purpose of the feed-in tariffs is to enable Slovakia to meet the goal of creating 20% of renewable sources in electricity generation by the year 2020.

It was recognized that there are more than 40 companies operating on the market with PV systems in Slovakia. None of these companies has a privileged position on the market and each offers a slightly different product. The structure of the market refers to monopolistic competition. However, investors in Slovakia mostly they work with Slovakian partners they know. Firms

present mainly Chinese products but recently these are replaced also by the German companies that offer higher quality products and are able to provide the whole technology.

Slovakia has developed its feed-in tariff based on the feed-in tariff from the Czech Republic. The level of the tariffs may remind of the rate in the European Union.

The Slovak government has approved new legislation about the support of photovoltaic market. The main change will be the reduction of the feed-in tariff for installation up to 100kW from 0.387 €/kW in 2010 probably to 0.259 €/kW from July 1st 2011. The feed-in tariff in Slovakia started in 2009 at the level of 0.431 €/kW with a guaranteed period of 15 years, this tariff is continuously being decreased each year by the government. The legislation was suggested by ÚRSO¹.

Simultaneously with the newly suggested legislation by ÚRSO, permissions to connect to the distribution network in western Slovakia were denied. This will probably change after July 1st 2011 when the new legislation, with lower feed-in tariff, comes into force.

Eastern and Central Slovakia continue to grant permissions in accordance with the current Slovak legislation of 2010.

The Slovak economy, after the world crisis in 2008, has been growing in comparison with Romania and Hungary. A stable increase in PV market does not depend on the speed of the whole economy growth thanks to the fact that it is based on a feed-in tariff guaranteed by the state for 15 years.

Romania

This country is a member of the EU, but still there are many barriers because a lot of permissions to connect and install are required from the local authorities. Nowhere is to be found an official methodology how to get all permissions.

Romania, after the world crisis in 2008, was forced to increase the VAT from 19% to 24% in the year 2010 due to the decreasing economy. That was a shock for most of its inhabitants. However, this shock has an impact only on small private installations because other projects are financed by the EU subsidies.

The location of Romania is ideal for the installation of the PV systems. Energy that comes from the sun ranges on average from 900 W/m² to 1300 W/m² in the eastern part of the country. There are high mountains where the

¹ Úrad pre reguláciu sieťových odvetví SR (English: Regulatory Office for Network Industries SK).

² ANRE - Romanian Energy Regulatory Authority.

electric power is needed, but the distribution network does not have enough funds to cover all these places.

Despite such favorable conditions for installation of the PV systems, the Romanian market, in fact, is not open for everyone. In the legislation no feed-in tariff is described. But there are also installations with a total capacity of approximately 40kWp in the off-grid connection.

The future of the PV business will be established on the European Union subventions. The EU subvention should cover the up to 98% of the cost of technology if the system is installed on the public building. Due to this fact all projects are at the start and the investors are just finishing the documentation and all necessary permissions.

There is also a system for household installations, but the subventions do not cover more than half of the costs. With regard to the fact that an average salary is approximately EUR 300 and the price of electric power is on average EUR 0.1 per kWh, the potential small private investors are not motivated to invest their money into the PV systems.

Energy law no. 220/2008 rectified by Law no. 139/2010 implemented a green certificate system. These green certificates are given in different share to the green energy producers (wind, photovoltaic, hydro < 10MW, biogas and geothermal). For example the PV energy producers should receive 6 green certificates for each produced 1 MWh. Each provider of electricity has to buy a certain percentage of energy from renewable sources. So each provider has to buy green certificates. By regulations imposed by ANRE² these green certificates are sold on a transparent market at prices ranging from EUR 27 to EUR 55 per certificate. Because the demand is higher than the supply, the price has always been at its maximum. But these laws have never had an application norm so the share is always 1 green certificate per 1MWh. Thus, in the PV instead of receiving 6 green certificates you get only 1.

For the year 2011, new legislation that should give chance for more big installations is not planned. The experts of local conditions speculate on the market with the capacity bigger than 50 MWp in 2011. The adoption of the legislation and energy feed-in tariffs will be affected mainly by the current economic situation in the country. Romania is still in the phase of economic crisis.

Hungary

Since the world crisis in 2008, when Hungary was announced to be the first EU bankrupt state, its economy has been stagnating. Although the European Union sent massive funds support to the energy sector, the market is not growing correspondingly.

Hungary invests into renewable energy sources mainly through the EU funds that have promised almost EUR 4.5 milliard by 2013. These subventions are drawn and then redistributed by the Ministry of Environment.

Hungary has built approximately 80 MWp wind power plants around the bordering area with Slovakia and Austria. Money from the EU funds is also heavily directed to biomass and geothermal energy for which Hungary offers suitable conditions thanks to many hot springs. Considering these facts, it is logical that the PV became a secondary issue although some degree of support was visible.

The whole system was based on the state support that pays off from 30% to 60% of the price of technology to investors till the end of 2010. The size of the subsidy was determined by whether the consumer moves from the lower to the higher energy level thanks to the technology installed.

The state support is not guaranteed by law and therefore there is no certainty that if an investor builds a PV system, he/she will receive the subsidy. Due to this fact the market was divided into two groups of investors:

Group 1– investors who spend money on the PV because of their attitude to ecology and thus, the financial support does not present a motivation for them.

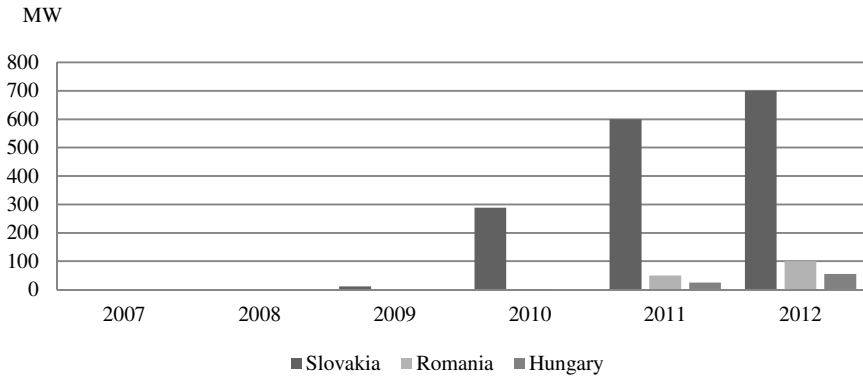
Group 2– investors who speculate if it is somehow possible to guarantee that the subsidy will be obtained.

Very interesting and getting popular was the household system. This system can have max. 50kVA and can only be connected to the low-voltage grid (10kW). In this case there is no permission needed. However, the systems up to 50kW are also allowed without bigger administrative procedure from the beginning of 2011. The new law will change the size to max. 3x16A (11kW) for the household systems (The Ministry of Rural Development, 2007). This law is being prepared at this moment, it will most probably be ready by mid 2011.

MARKET DEVELOPMENT

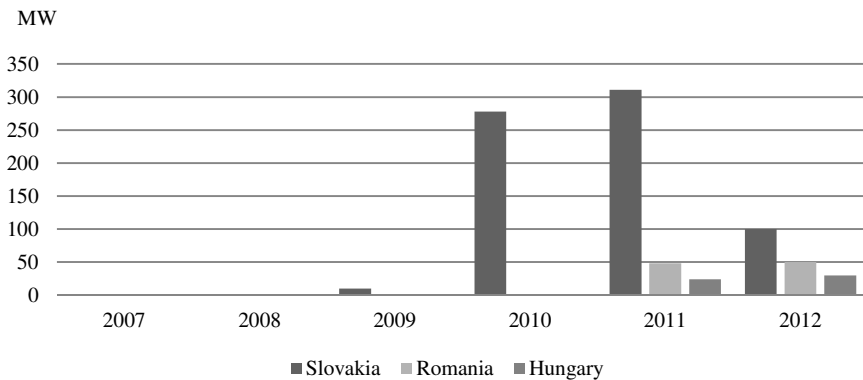
Market development is monitored in the selected countries. The current and probable future market development of the selected countries is shown in the graph (see: Figure 1 and Figure 2). This development takes into account the current and future feed-in tariffs, demand of inhabitants and possibilities of connections and installations. The first chart of the graph (Figure 1) shows total installed power and the second one (Figure 2) demonstrates the installed power in individual years.

Figure 1. Market development – total installed power



Source: own work.

Figure 2. Market development –installed power in individual years



Source: own work.

Slovakia occupies the first place in terms of using the PV among the selected countries. Total power of all the installed PV sources reached the value of ca. 289 MWp at the end of 2010. There was a 2627% rise in comparison to 2009. This big growth results come from the big field systems installed with motivated feed-in tariff that were implemented at that time. The expected increase goes hand in hand with the state policy that plans to create 20% of renewable sources in electricity generation by 2020.

The Romanian market has experienced an increase since 2010. The installed power in 2010 was 2 MWp. This is a result of the slow market development without education in the PV technology and slow bureaucracy in the subvention system from the EU. Moreover, the bank loan system is not yet prepared for such a big investment. Future development is very optimistic according to the local specialists. It is expected to market capacity of up to 50 MWp/year with the EU subvention. Everything depends on the EU subsidies and the state attitude.

The PV systems are not in the lead position in Hungary due to the natural conditions that are more favorable for wind and geothermal energy. Thanks to the EU funds, that support the PV in Hungary, it seems that investors find new business opportunity no matter if their purposes are only speculative or ecological. So it is obvious that the number of PV installations has been significantly growing since the beginning of 2010.

To conclude, the market in Slovakia has been consistently growing exponentially, while in Romania it is more in form of a gradual increase. The prediction of a gradual increase is clearly illustrated on the second chart of the graph (Figure 2). The prediction assumes the approval of the amendment. Hungary seems to be the slowest-growing market due to its focus on other sources of energy.

DISCUSSION

The world crisis in 2008 has very low impact on continuously growing photovoltaic market in all three researched countries. This is due to the feed-in tariffs and the subventions guaranteed by the state legislations and the European Union aiming to produce some percent of the whole amount of energy from green sources in order to reduce production of CO₂.

This attitude will probably prevail after the nuclear disaster that happened in Japan in March 2011. It was the first time when the Germans started to stop their nuclear reactors. These reactors produced 7% of their total capacity and these 7% is the amount of energy that Germany is selling to the neighboring states. This quantity is missing now on the market with the electric power and causes higher prices of the electric power. France, as well, launched one of the first campaigns against the nuclear power plants in their history.

The market in Slovakia seems fully developed but the market structure corresponds to a monopolistic competition. This business field was at the stage of its biggest development during 2010 and all aspects indicate even bigger expansion in 2011. Although, the feed-in tariffs will probably decrease by 33% in July 2011, a growing demand is expected. Small investors

agree that the year 2011 will probably be the best year for the PV energy sources. However, the systems up to 100kWp are allowed and they can also be used by the commercial customers. Considering a reasonable system that permits maximum installed power of 150MWp, it is highly unlikely that an abrupt change in the perception of this energy source would occur as it happened in the Czech Republic. Granting permissions to connect to the distribution network in western Slovakia was stopped. This will probably change after July 1st, 2011 when the new legislation with the lower feed-in tariff comes into force. This situation arose from apprehension following the growth of the PV market in Slovakia like on the market in the Czech Republic in 2010. Slovakia has changed the legislation several times and and it looks that changes are going to support optimal projects.

In contrast, the Romanian market with the PV energy sources is experiencing a chaotic situation this year due to the economic crisis. Although there are over 20 companies involved in selling and installing the PV modules on the market, most of them are not able to remain successfully in this business. There are only several companies on the market that trade in the PV. These companies work usually co-operate with the companies located in Western and Central Europe. It is because Romanians are not so educated in projects documentation, calculation and optimization. The weakness of the Romanian market is that a PV installation may stay off-grid and therefore it is unable to supply electricity to its customers. It is expected that the capacity for these energy sources will be increased, which would lead to an open door for all investors and suppliers of green technologies. Moreover, there are also projects involving wind energy, biomass and water turbines that take a piece from the requested production of electrical energy from green energy sources.

Hungary is in a phase of slight economic growth after total bankruptcy in 2008. There are not so many investors like in other states; nevertheless, the PV is of apparent interest in Hungary. It is granted mainly due to the location of the country – there are not mountains for the hydro power plants, there are not many windy areas except for the border with Slovakia and Austria. On the other hand, there is plenty of solar irradiance. The average solar irradiance ranges from 1250 kWh/m² to 1500 kWh/m². This important fact makes Hungary one of the best locations with regard to the average yearly temperature and the average solar irradiance. During spring and summer in 2010, the government subventions into the PV systems were stopped. Now investments into PV installations are on the increase again. Companies and investors who are concerned with the PV installations expect growth of investments in the next year. The Ministry of Environment has approximately EUR 4.5 billion for investments into green energy. It was planned to invest approximately EUR 250 million into PV power plants. It seems that this

trend will continue and investments into PV will increase due to transfer of investments from wind power plants. Since Hungary must increase production of green energy, it was decided that projects with total power of 50MW will also start. It is expected that one of these power plants will be covered by photovoltaic technology and will be divided into several big installations with power between (1–5) MWp. Other 50MWp power plants projects will probably be reserved for other green sources, such as Biomass and Geothermal.

All estimated data for the year 2012 could change with the market development of technology prices. Also disasters like in Fukushima nuclear power plant in Japan in 2011 may change strategies of investments in green energy of all the EU states. Germany already stopped 8 of their oldest nuclear reactors. According to the statement on April 15th, 2011, they would like to close all nuclear power plants till the year 2022 and substitute this nuclear power plants with green energy sources (in total it is more than 23GW of energy).

CONCLUSIONS

It could be said that Slovakia was the best market for investments into PV systems from all the above described Eastern European states. Slovakia has almost no entry barriers. Market structure is appropriate to monopolistic competition where Chinese manufacturers started to be dominant. Investments into this business field have been growing and this trend is expected to continue in the same way for the year 2011 despite a decrease in feed-in tariffs by 33%. The market is characterized by high bureaucracy. Projects usually take more than 8 months to complete.

The Romanian market is at the start of its photovoltaic future. Only big projects with subvention from the European Union are in progress now, unlike small installations of private investors that want to have photovoltaic system for their consumption of electric power. Moreover, the whole process is accompanied by many applications for permits and bureaucracy. Currently, the subvention system covered 98% of technology cost of photovoltaic installations on state buildings. On the other hand, PV systems are spread over Romanian mountains where there is no electricity. Only big production plants are feasible in Romania now and roof top installations are for those who wish to have a PV source. Change of the subvention system to feed-in tariff could prove unfavorable for this market. The biggest boom will probably happen in 2012.

Hungarian system, which supports investors with 30%–60% subsidies for technology, started up this market. It is expected that these investments will

grow mainly thanks to qualified organizations. Market development predicts a significant growth in 2012. However, this market will probably not reach the same size as the market in Slovakia.

Although the world crisis in 2008 did not have any impact on photovoltaic market development, in spite of economic problems in all researched countries, the photovoltaic market is affected by feed-in tariffs, subvention systems, the price of technology and difficulties connected with getting a permission.

Thanks to the conducted analysis of the data obtained, it is possible to compile a fuzzy mathematical model that will be used as managerial a tool for investment decision in PV projects. On the basis of gained information, the model will enable to calculate the investment costs, the costs of technical documentation, preparation of the project itself and the rate of return. At the same time, the information provided with regard to the selected country and its political, economic and legislative conditions, is taken into account.

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