

## COMPARISON OF GERMAN AND CZECH ENERGETIC SECTOR IN THE FIELD OF RES

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### ABSTRACT

*In recent years major changes were occurred in the power sector. These changes were caused by the liberalization of the electricity market and greater use of RES. The aim of the liberalization was, among other things, to reduce prices for final customers and it has been launched in different countries in different years. In the Czech Republic it was three years later than in Germany. Worldwide trend is to increase the share of RES on an electricity production. Comparison of energetic sectors in both countries is very broad topic, so this article focuses on the comparison of energy sector in terms of legislative changes and the use of RES.*

### 1. CZECH ENERGETIC SECTOR

First of all is necessary to introduce both countries. The Czech Republic is the middle European country. It has 78 867 km<sup>2</sup> and 10 542 080 people. It is located on the watershed of 3 rivers, which is important information for the reason of water power plants usage. The most of the generated electricity comes from brown coal-fired steam power plants and further from the nuclear power plants (Temelin, Dukovany). Most of brown coal-fired power plant is located directly at the coal mines in the northwest Bohemia. This area directly borders with the Land of Saxony.

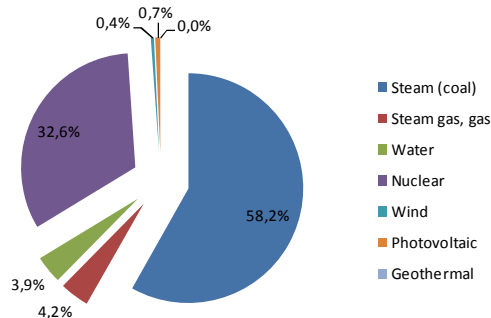


Figure 1 – Generated electricity in the Czech Republic in 2010

Total installed electricity power was 20 GW and the generated electricity was 86 TWh in 2010. Steam power plants produced roughly 58% of electricity, nuclear 33%, hydro and combined cycle 4% and the rest comes from photovoltaic and wind power plants. This situation is shown in the left figure. Czech Republic does not have ideal conditions for

massive using of renewable sources. The potential of large hydroelectric power plants construction is already exhausted. However, there is another possibility to usage of photovoltaic, biomass and wind power.

In this section it is necessary to mention the legislative changes that were occurred in the power sector. Liberalization of this sector was started in 2001 and was completed in 2006, when all customers got the opportunity to choose their supplier. As the market model was selected the Third Part Access to the network in the conditions



Figure 2 – Map of DSO in the Czech Republic

of regulated prices, which are set by the energy regulatory office. The electricity market created new entities as Energetic Regulatory Office, The Transmission System Operator, the Distribution System Operator, Operator of the Electricity Market, Trader etc. There is only one TSO and its task is, among others, to control the power system at the level of the transmission system. It works as the system operator. Furthermore, there are three DSO: The CEZ Distribution, EON Distribution, PRE Distribution as is shown in the figure above. An important subject is the Operator of the Electricity Market. Its task is the settlement of imbalances and basically combines physical flows with business flows. Finally the Energy Regulatory Office (ERU) sets the regulated prices for the network usage with the help of its pricing decisions and also the purchase price from renewable sources. The final electricity price for final customers has a regulated and an unregulated part. The regulated part includes pay for the transmission and the distribution of the electricity, pay for the Operator of the Electricity Market (OTE) services, contribution to renewable energy sources and tax on electricity. The unregulated part of price is determined by the Exchange.

### 1.1. Using of renewable source in the Czech Republic

At the beginning it is necessary to mention a little history of the use of RES in CR. There is a long tradition of using water power. After World War II were preferred large storage hydroelectric power plants. In contrast, small hydroelectric power plants were cancelled (the number of plants was decreased between 1930 and 1950 from 14,800 to 5471). The positive turnaround came in the years 1980 - 1990, when it was built more water projects, which greatly increased the production of electricity. Electricity generation from other renewable sources grew relatively slowly. After 1990, was built more demonstration plants. From a legislative perspective, it is necessary to mention the Act No. 222/1994 Coll. This law established that the supplier (the holder of the authorization for distribution) shall, where technically possible, to purchase electricity produced from renewable and secondary energy sources. Purchase prices were established by the Ministry of Finance through the price decision. In January 1999 was created the voluntary agreements with energy companies about feed-in tariff for electricity supplied to the distribution network. The price was in HV networks 1.13 CZK / kWh and LV networks 1.20 CZK / kWh.

At present the Energy Regulatory Office sets purchase prices of renewable energy sources (RES). In the Czech Republic there are two different ways of their support.

- Purchase prices (Feed-in tariffs)
- Green premiums

The size of the purchase prices and green premium allow the 15-30 (by the type of resource) years guarantee to the return of investments. Purchase prices are set with the help of the price decision of ERU and guarantee the minimum purchase price for a certain type of RES. The green premium is the bonus which is paid to the market price of the electricity and also to the ‘other house load’. If a producer chose the green premium mode, he must sell its generated electricity on the electricity market. Then they paid for him a premium for the amount of sold electricity. If a producer chose the purchase prices mode, he gets money from DSO or TSO on the basis of purchase prices and delivered quantity of electricity.

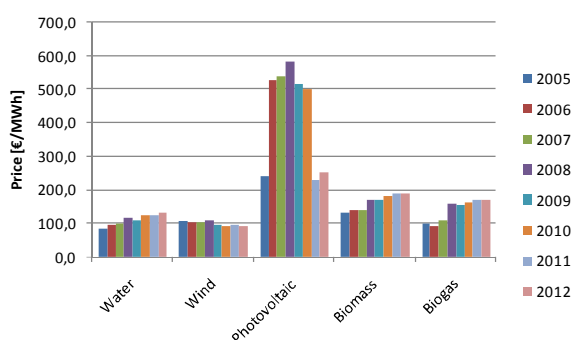


Figure 3 – Development of purchase prices in the Czech Republic - In the figure are shown the maximum Purchase prices and for photovoltaic above 100 kW

In the left figure you can see the progress of purchase prices. The highest modification occurred at the purchase price of photovoltaic. From any other source except the wind, the price increases every year. The massive increase in purchase prices for photovoltaic caused substantial growth in the installation of these types of power stations. This situation is illustrated in the figure bellow. The installed capacity in 2010 is approximately 50 times greater than in 2008 and it is approximately equivalent to an installed capacity of hydroelectric power plants. This sharp increase of installed capacity was

stopped to help the TSO, which did not allow network connection and also with the help of a significant reduction of purchase prices. This rapid development also caused a significant increase of electricity prices regulated part. Currently (2011) it can be connected to the grid photovoltaic roof installations up to 30 kWp. The sharp increase of solar installations also caused an increase in electricity production from RES. In 2008 the share of electricity produced from renewable energy sources was more than 5%. In 2010 it was more than 8%. These shares are not included in the usage of biodegradable municipal waste and sludge.

According to the National Action Plan, which respects the Directive 2009/28/EC the target share of energy from renewable sources in gross final energy consumption in 2020 should be 13.5%.

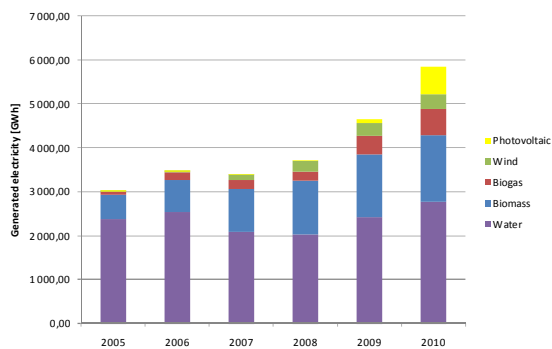


Figure 4 – Development of generated electricity from RES

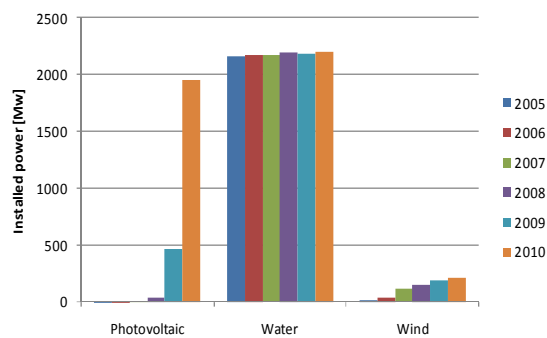


Figure 5 – Development of installed power from RES

## 2. GERMAN ENERGY SECTOR

Germany has 357,021 km<sup>2</sup> and 81 799 600 people. In the terms of the possibilities of using renewable energy sources, Germany has a convenient position in the electricity production from wind, especially in the northern part of the country. Total installed electricity power was 170 GW and the generated electricity 625 TWh in 2010. Most of generated electricity comes from coal, natural gas and mineral oil (57%). Furthermore, 28% from nuclear power plants. An important part is the electricity generated from renewable sources, namely 6% from wind power plant, 4% from hydro power plant and 5% from biomass power plant.

In the next part of this article will be mentioned legislative changes in the German energy sector. Liberalization of this sector was started in 1998 when the EU directive was transposed into national legislation with the amended EnergyAct 1998. Under this Act, regional monopolies that existed before 1998 were abolished. The aim of the Act has been to open the market. Changes were initially slow, due in part to the industry being allowed to self-regulate. Another important step in the liberalization process was the creation of the regulator, the Bundesnetzagentur (BNA), which set about introducing measures to promote competition.

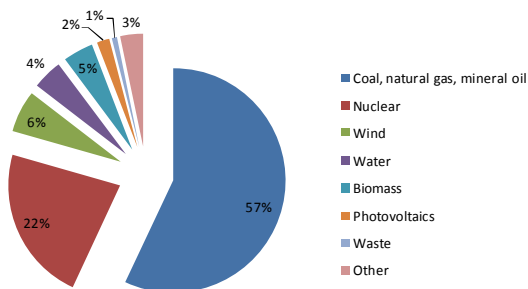


Figure 6 – Generated electricity in Germany in 2010



Figure 7 – Map of German TSO

The German power market is one of the largest in Europe and is dominated by four vertically integrated companies: E.ON, RWE, Vattenfall and EnBW, who supply approximately 50% of the market. In addition to this, there are approximately 60 regional suppliers and 725 municipal suppliers, who have both distribution and retail assets. There are also around 150 pure retail companies.

### 2.1. Using of renewable source in Germany

Renewable energy policy in Germany began in 1974, after the first oil crisis. For about a decade and a half, this policy consisted almost exclusively in the promotion of research.[9] In the late 1980s were created programs to support the market with the RES technology. There were a 100/250 MW Wind Program and a 1000 Solar Roof Program. The expansion of use renewable sources in Germany was based on the law on compulsory purchase of electrical energy (Stromeinspeisungsgesetz), which came into force on 1 January 1991. Under this Act, all distributors of electrical energy are required to buy electricity produced from renewable energy sources in their territory at the statutory minimum purchase price. (65 to 90 percent of the average tariff for final customers). In the field of wind power plants is important to mention the modification of the Building Act (Baugesetz), which entered into force on January 1, 1997, under which the wind turbines become the privileged status of buildings. This means that is it allowed to build them in areas where under the Building Code (Baugesetzbuch) may not actually realize the building, in areas outside of human settlements.

Another important law was the law of prioritization renewable energies (Gesetz für den Vorrang Erneuerbarer Energien shortly EEG), which entered into force on 1 April 2000. This Act introduced a model of reference yield and purchasing price. The electricity from RES was no longer dependent on generally applicable prices for electricity. These changes provide significant long-term investment security. Under the prioritization renewable energy continues the obligation of current priority of the RES for local network operator. EEG was then amended in 2004, 2009 and 2011. The adjustments are primarily related about solar power plants and Feed-in tariffs.

EEG law was and is successful. The share of electricity produced from RES in Germany has increased since 2000 from 5% to 16% of the total electricity production.

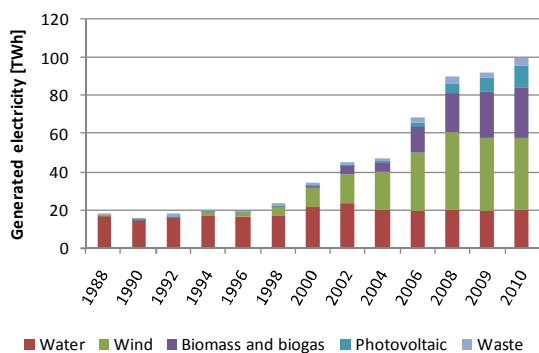


Figure 8 – Development of generated electricity from RES

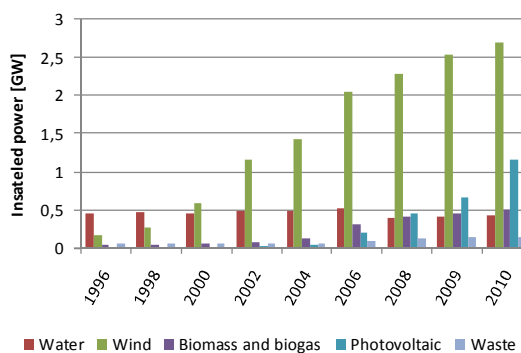


Figure 9 – Development of installed power from RES

As you can see on the charts above stable position holds generated electricity from hydroelectric power, which has a long tradition. However, greater expansion due to natural conditions no longer occurs. Furthermore, there is obvious significant development of wind energy, which was basically started after 1990. In recent years, it should also mention the gradual development of electricity from photovoltaic power plants.

### 3. COMPARISON BETWEEN BOTH COUNTRIES

The Czech Republic has a common border with Germany. The energy sectors are linked together by cross-border transmission lines. Both countries also belong to the European Network of Transmission System Operators for Electricity (ENTSO-E).

Growing use of RES in the Czech Republic occurred later than in Germany. In Germany there was a significant expansion of wind energy for the reasons of favourable geographical conditions of the country and also due to set purchase prices well. In the Czech Republic, the majority of electricity generated from RES comes from hydropower. In recent years there has been substantial growth in electricity production from biomass and biogas, which has potential in the Czech Republic. From other renewable energy sources is necessary to mention the rapid development of photovoltaic due to high purchase prices.

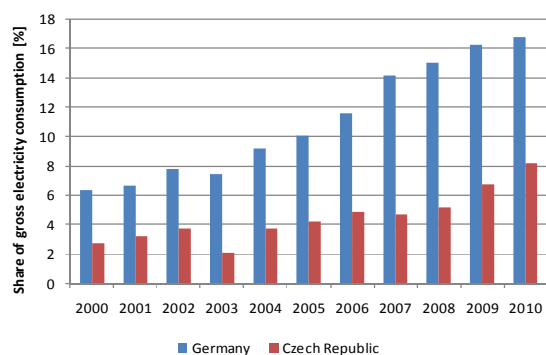


Figure 10 – Comparison of share of RES on the final electricity consumption

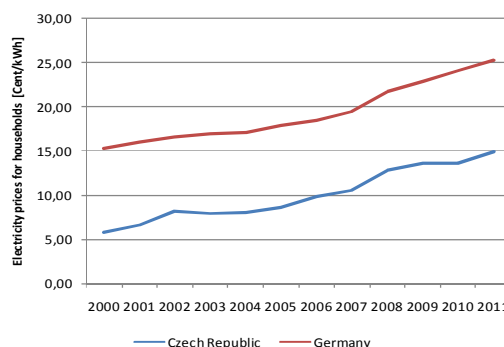


Figure 11 – Comparison of the electricity prices

The chart above shows a comparison between the percentages of electricity production from RES to the total electricity consumption. In Germany thanks to a well-adjusted legislation and favourable conditions of use wind energy has a gradual increase this share up to 16.8% in 2010. In the CR is this share 6.8%. In the figure 11 you can see the progress of electricity prices for household. In both countries there is a gradual increase of prices.

#### 4. CONCLUSIONS

The aim of this article was to describe the Czech and Germany energetic sector and also the development and usage of RES. It also briefly describes the state of liberalization in both countries.

In both countries there are the efforts to increase of using renewable sources. Germany started with the support before, which is shown in RES share of total consumption. It is also necessary to mention that Germany has favourable conditions for wind energy. In the Czech Republic is the most potential wind sites located in protected areas. In both countries is visible increase in photovoltaic installations, which is caused by the feed-in tariffs. The advantage of this increase is the reduction of investment costs for their construction.

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