

RENEWABLE ENERGY RESOURCES FOR ELECTRICAL ENERGY GENERATION IN THE CZECH REPUBLIC

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ABSTRACT

This article presents the general information about the opportunities for utilization of renewable energy resources for electrical energy generation in the Czech Republic and the forecast to 2010.

There are several types of power generators that can be used in a power system. In the near future approximately 8 % of electricity produced in the Czech Republic should be generated from (new unconventional and innovative energy resources) distributed generation.

1. INTRODUCTION

All the experts agree that in the future the market for renewable energy resources will grow significantly. The future for renewable energy resources in Czech Republic looks more promising than ever. The utilization of renewable resources as one of the possibilities of so-called “clean” energy is the priority of the energy industry of the EU. There is a fear of future dependence on import of raw materials. The renewable resources seem to be the best solution so far. In 2030, there is assumed that about 70 % of raw materials import used in the EU will be imported. From this reason, such a realistic forecast is a serious threat to the safety and reliability of energy supplies in Europe. In the same year, the import dependence of the Czech Republic is expected to be 60 %. At present time the Czech industry is almost absolutely dependent on import of crude oil, natural gas and nuclear fuel.

The European Union (according to Directive 2001/77/EC) requires that the share of electricity generated from renewable resources in 2010 will be about 21 %. The goal is hardly feasible. In the Czech Republic, the share of renewable resources in the gross electrical energy consumption is 3 % at present time (covered predominantly by hydro power plants). Many meetings of governmental representatives of member countries and the working meetings of the directors of energy generation companies within UCTE were held and resulted subsequently in the conclusion, that, according to the latest commitments undertaken within the EU 15, the average value of the share of energy renewable resources in the EU gross electricity consumption in 2010 should increase from the current value of 13.9 % to 21 %. The Czech Republic adopted the ambitious goal thus it has to almost triple the share of renewable sources from the 3% up to 8 % in 2010. This would allow the target to be reached. Nonetheless, experts believe that the international co-operation will take time to have an effect.

2. EXPECTANCE IN THE UTILIZATION OF RENEWABLE ENERGY RESOURCES IN THE CZECH REPUBLIC

2.1 Hydro energy

Hydro power stations are divided into two groups:

- Small hydro power stations with installed capacity less than 10 MW
- Large hydro power stations with installed capacity exceeding 10 MW

The small hydro power stations and the large ones including the pumped storage plants generate 680 GWh and 1 580 GWh per year respectively. The construction of new large hydro power stations is unrealistic from point of view of the current environmental situation in the Czech Republic.

The small hydro power plants are expected to generate 1 140 GWh in 2010.

In the European Union, there is expected the insignificant increment in energy generation by small hydro power stations, namely from 37 TWh to 55 TWh (output from 9.5 GW to 14 GW). Summed up with large power plants (whose output will increase from 82 GW to 91 GW and energy generation from 307 TWh to 355 TWh, i.e. the increase is considerably more in comparison with the small hydro power plants), the share of the hydro power stations in total electrical energy production will decrease from the existing 13% to 12.4 % in 2010.

At present the construction of new hydro power plants in Europe do not meet the energy policy of the EU concerning the utilization of renewable energy resources.

Table 1 contains the hydro power stations currently operated by the ČEZ, the biggest power company in the Czech Republic.

Locality	Type	Number of machines	Type of turbines	Total installed capacity [MW]	Year of commissioning
Dalešice	PHPS	4	Francis	450	1978
Mohelno	SHPS	2	Kaplan	1,76	1977-1999
Dlouhé Stráně 1	PHPS	2	Francis	650	1996
Dlouhé Stráně 2	SHPS	1	Francis	0,16	1996
Lipno I	HPS	2	Francis	120	1959
Lipno II	SHPS	1	Kaplan	1,5	1957
Hněvkovice	SHPS	2	Kaplan	9,6	1957
Kořensko 1	SHPS	2	Kaplan	3,8	1992
Kořensko 2	SHPS	1	Kaplan	0,94	2000
Želina	SHPS	2		0,63	1994
Orlík	HPS	4	Kaplan	364	1961-1962
Kamýk	HPS	4	Kaplan	40	1961
Slapy	HPS	3	Kaplan	144	1955
Štěchovice I	HPS	2	Kaplan	22,5	1943-1944
Štěchovice II	PHPS	1	Kaplan	45	1948-1996

Vrané	HPS	2	Kaplan	13,88	1936
Total:		35		1867,77	

HPS - Hydro power station, PHPS – Pump hydro power station, SHPS – Small hydro power station

Tab. 1 – Hydro power stations in the Czech Republic (2004)

2.2 Wind energy

The Czech power companies are focusing mostly on utilization of wind energy. However, the utilization of wind energy is at the very beginning. Although in early 90th the Czech companies had a chance to belong among the prospective manufacturers, they have lost the foothold gradually. At present there are installed 22 large wind power plants in the Czech Republic. The total installed capacity is 8.7 MW; the wind power plants generate about 10 GWh. In consequence of the planned installation of new wind power plants, the production of 900 GWh can be expected in 2010.

The energy policy of the EU concerning the utilization of renewable energy resources allowed for an increase from 4 TWh to 80 TWh, which corresponds with a share increase from 0.2 % to 2.8 % of expected total electrical energy generated in 2010 (output increase from 2.5 to 40 GW).

The wind power plant construction projects exceed above-mentioned assumptions markedly.



Fig. 1 – The wind power plant in the Czech Republic (photo from 2005)

2.3 Biomass energy

At present there is produced 200 GWh of electrical energy from biomass in the Czech Republic. In near future the big increase in production of electricity is expected. It is assumed that 2 200 GWh of electrical energy from biomass will be generated in 2010.

In the European Union, an increase in electrical energy from the existing 22 TWh to 230 TWh is assumed, which corresponds with the share increase from about 1% to 8 % of expected total electrical energy generated in 2010.

The capacity of 2.2 TWh expected to be generated in the Czech Republic in 2010 by combustion of biomass is no utopia. The comparable power system, such as that of Finland with its current generation of 70 TWh, generates today 8.6 TWh from biomass, or that of the Netherlands with its generation of 89 TWh where energy generation from biomass makes today also 3.2 TWh.

2.4 Photovoltaic energy and geothermal energy

The solar power photovoltaic energy conversion shows strong development at present time. There is expected 15 GWh of electricity from photovoltaic systems to be produced in 2010.

In the European Union, an increase in output from 30 GW to 3000 GW and in generation from 0.03 TWh to 3 TWh (a 0.1 % share in the total electrical energy generation expected in 2010) was assumed. The actual rate of development is slower but accelerating.

In geothermal applications, it is expected that 15 GWh will be achieved in 2010.

3. A COMPREHENSIVE VIEW OF THE ISSUE

In conclusion let us take a comprehensive view of the issue of possible utilization of renewable resources in the Czech power system.

Taking all renewable resources as a whole, we would like to move from the current 2 % share in the gross domestic consumption of primary energy resources (about 1700 PJ) to the proposed 8%. The experts have calculated the current economic possibilities and consider a 6.8 % share in the approximately same volume in 2010 to be realistic (expert assessment).

Electrical energy generation from renewable resources is related to the gross domestic consumption of electricity. There is the assumption that it will increase from the current 3.6 % of 64 961 GWh up to 8 % of 68 000 GWh in 2010. This assumption seems to be somewhat ambitious idea from view of present situation. For comparison, the annual generation of the Orlick hydro power plant is about 350 GWh or we can assume that 1 % of the gross domestic electricity consumption is fed by the large hydro power plants: Orlick, Slapy and Lipno.

These and many other problems with connection, expansion, financing, economic benefits and environmental aspects in using the potential of energy renewable resources have been and still are the topics of the discussions in the national and international conferences focusing on the issues of power engineering. Finally, they are the topics for follow-up discussions and expert meetings of individual energy companies not only in the EU countries but also over the world.

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