

The Development and Use Supporting of Renewable Energy Sources in Terms of Czech Companies

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Abstract: Renewable energy sources are used only partially in the Czech Republic; the Czech energy mix still consists mostly of primary sources of energy. Better use and expansion of renewable energy is linked to their financial demand, at the time of purchase and at the time of their use. The aim of this article is to specify the activities in the field of renewable resources which are economically interesting for entrepreneurial subjects, to describe the situation in the field of renewable energy in the Czech Republic, and analyze the possibility of financial support for their development and the reasons why these funds are utilized.

Key words: renewable energy resources, sustainable development, project financing for the support of renewable energy resources.

1 Introduction

Thanks to the petroleum prices, the renewable resources can be seen as possible, economically acceptable alternative, as by more intense utilization of renewable resources the costs of renewable energy fall.

In worldwide basis, investments in sustainable energy rise, especially on the markets with solar cells, wind power station equipment, bio-fuels and fuel cells the rise of investments is prognosticated to be 140 billion Euros by 2015. This presumption is supported by the rise of fossil fuels, especially of petroleum. The utilization of renewable energy resources can lead also to the rise of working opportunities offer on local and regional level; this field of activity is ensured by circa 350.000 of working places within the EU.

New knowledge, new technology, and new living habits and expectations must be developed to plain the quantity of energy needed to increase the standard of living and to preserve the quality of life and our environment. [4]

Unfortunately, energy system is not optimized and is partially unstructured. [3]

Renewable energy is also connected with the safety of energy delivery.

During the last years, there have been such situations when the interruption in the natural gas delivery threatened the economy of several European countries (e.g. Slovakia in 2008).

Renewable energy which is consumed within the EU is generally produced in the EU countries as well, so that the risk of the delivery interruptions decreases.

The utilization of renewable energy is closely connected partly with the limitation of greenhouse gases emissions but also with the production limitation of traditionally polluting matters, like e.g. nitrogen oxides, sulphur tetrachloride and such particles which damage not only the environment but also the human's health.

Exactly this point represents the negative impact of fossil fuel energy: from production to transportation and its final utilization.

2. Problem Formulation

2.1 Energy Resources in the Czech Republic

The geographical conditions of the Czech Republic are not ideal concerning energy resources; the utilization of renewable resources can be considered in a similar way. The hydroelectric power potential is low as there is a so called boundary of several drainage areas, the sun shine is distinctively below the southern countries' level and the wind conditions are relatively moderate so it means not very useful for processing wind energy. The final energy consumption is approximately from one half covered by national energy resources; especially net electric production covers almost completely the home consumption.

The Czech Republic is nowadays above average in the energy intensity indicators of the EU-27. This corresponds to the traditional industrial orientation of the Czech Republic. To ensure the trade with electricity and all the connected services in central Europe as well as their development, high import and export capacity is required.

The Czech transfer system is relatively strongly connected with the neighboring networks.

The portion of electricity, gas and heating industry and raw materials mining on total employment was by the end of 2008 3 %, which represents about 150.000 employees. From this amount, 57 % are employed in manufacture, electricity, heat and gas distribution, and the remaining 43 % in the raw materials mining.

The problem is the age and especially the educative structure of these employees – the assumed number of university and high school graduates in the period from 2010 to 2016 does not ensure the sufficiency of professionals as a compensation for rent-age employees (deficit of circa 35 % of retirements). [2]

There are individual supported programs in the framework of grant scheme in the field of science and research.

However, a compact long-time strategy of particular areas support and the mechanism of its completion are missing. Many tasks are

given and solved by entrepreneurial sphere, however, with limited coordination.

2.2 Evaluation of Energy Resources consumption in the Czech Republic

Renewable resources in the Czech Republic are understood in the following way: renewable non-fossil natural energy resources which are wind energy, sun shine energy, geothermal energy, water energy, soil energy, air energy, biomass energy, landfill gas energy, mud gas energy and biogas energy. (Law n. 180/2005 from the Collection of Laws About the Support of Electricity Production from Renewable Resources)

There are various and variously important links among the various sources. For example, Ali et. al (2008) summarized that there are six linkages for a successful sustainable renewable energy development.

The consumption of energy resources is evaluated according to the PER indicator (PER – primary energy resources), which shows the total energy input needed for ensuring the functioning of the whole society. It is expressed in SI units (J – Joule, PJ – peta-joule 10¹⁵ J).

The absolute size of the indicator depends on the climate conditions, fuel mix structure, industry structure, the population size and also on the economic efficiency of the area.

The absolute indicator rise is connected with the economic development and with the consumption rise; relative rise on the output unit represents the consumption waste and higher losses in energy conversions.

The PER calculation comprises:

PER = domestic mining energy raw materials + their imports – their exports.

The PER indicator comprises also renewable resources, the energy resources division is shown in table 1.

Table 1: Energy Resources and their Division

Resource Category:	Comprises:
<i>Gas Resources</i>	Natural gas
<i>Liquid Resources</i>	Petroleum and its derivations
<i>Solid Resources</i>	Coal
<i>Primary Heat</i>	Nuclear power-station energy Thermal power-station energy Thermodynamic heating energy Solar heating energy
<i>Primary Electricity</i>	Water power-station energy
<i>Renewable Resources</i>	Wind and photovoltaic power-station energy Bio-fuels Geothermal energy

Source: processed according to [10]

You can find the structure of energy resources and their share of electricity in 2008 in table 2.

Table 2: Share of Electricity of Energy Resources in 2008

	Gross Electricity	Supply Network / netto	Share of Green Electricity	Share in Gross Domestic Energy	Share in Gross Energy
	MWh	%	%	%	%
<i>Water Power-station Energy</i>	2,024,335.0	2,015,300.0	54,26%	2.81%	2,42%
<i>Biomass</i>	1,170,527.4	581,328.8	31.37%	1.62%	1.40%
<i>Biogas</i>	266,868.3	176,714.4	7.15%	0.37%	0.32%
<i>Municipal Solid Waste</i>	11,684.3	5,347.6	0.31%	0.02%	0.01%
<i>Air Power-station</i>	244,661.0	243,800.0	6.56%	0.34%	0.29%
<i>Photovoltaic</i>	12,937.0	12,937.0	0.35%	0.02%	0.02%
<i>Liquid Bio-fuels</i>	0.0	0.0	0.00%	0.00%	0.00%
Total	3,731,013.0	3,035,427.8	100.00%	5.18%	4.47%

Source: processed according to [7]

Table 3 shows the share of energy sources of head.

Table 3 Share of Energy Sources of Head in 2008

	Gross head Production	Own Consumption, Including Losses	Delivery	Share Heat
	GJ	GJ	GJ	%
<i>Biomass</i>	43,399,942.6	41,673,578.7	1,726,363.8	89.84%
<i>Biogas</i>	1,065,390.4	922,706.0	142,684.4	2.21%
<i>Biodegradable Fraction of Municipal Waste</i>	1,848,181.8	372,006.0	1,476,175.8	3.83%
<i>Biodegradable Fraction of Industrial Waste</i>	590,560.8	590,560.8	–	1.22%
<i>Pump Head</i>	1,200,000.0	1,200,000.0	X	2.48%
<i>Solar Thermal Collectors</i>	202,491.0	202,491.0	X	0.42%
<i>Liquid Bio-fuels</i>	0.0	0.0	0.0	0.00%
Total	48,306,566.6	44,961,342.5	3,345,224.0	100.00%

Source: processed according to [7]

3. Problem Solution

3.1 Strategy of Sustainable Development and New Possibilities for Czech Enterprises in the Field of Renewable Resources

The use of renewable resource is part of the Strategy of the Sustainable Development of the Czech Republic, which was created in 2004. This strategy contains a definition of indicators that are used in the monitoring of the particular regions. Fundamental regional indicators are mentioned in one of the strategy's three pillars.

However the Strategy of the Sustainable Development is not an unchanging document. That is why the dynamics of the surroundings and its impacts were put tested using other analyses.

The implementation of Strategy of the sustainable development of EU from 2006 was an important component. The strategy of sustainable development of the European Union from 2006 consists of 6 key areas from which one is oriented on the climate change and net energy.

In January 2007, the European Commission submitted an integrated proposal about climate change which solved the questions about energy deliveries, climate changes and industrial development. Energy policy was projected in the following goals:

- 20% rise of energetic efficiency,
- 20% fall of greenhouse gas emissions,
- 20% portion of renewable resources on the total EU energy consumption by the year 2020,
- 10% portion of bio-fuels in propellant matters by the year 2020.

The defined aims are very ambitious: renewable energy represents nowadays about 9%. To achieve them, all the branches of economy and all of the member states will have to make a great effort.

The support of renewable resources on the EU level comes from the above mentioned goals for the year 2020 which are stated by the European Parliament and the European Council Directives About the Support of Renewable Energy Exploitation and About the Change and Following Canceling of Directives

2001/77/ES and 2003/30/ES. In this part, a big role innovation processes play [5].

The Czech Republic as a member state of the European Union bounded itself to ensure the rise of processing electric energy from renewable energy resources (RER).

By the law number 180/2005 from the Collection of Laws About the Support of Processing Electric Energy from Renewable Resources, stable conditions for entrepreneur decisions were guaranteed. It is thanks to this fact that this law defines the system of support which is in the form of fixed purchase prices or eventually in the form of extras paid to the market electricity prices. Simultaneously, it guarantees a certain amount of revenue for one unit of electricity for the period of 15 years.

The RER support system which has been supplemented by the possibility of structural EU funds support since 2004 helps to achieve the goal defined as reaching 8% portion of renewable resources on the gross domestic consumption of electricity.

Generally, the goals specified in the Czech Republic concerning this area can be characterized as follows:

- achieving the most effective and most economical exploitation of primary energy resources
- necessity of raising the climate protection and reducing the exploitation of the environment caused by energetic processes and creating such conditions which are suitable for fulfillment of international obligations
- reduction of dependency on import of energy raw materials (in the case of termination of coal mining, the Czech Republic will be almost from 100% dependent on the import of energy raw materials).
- ensuring progressive transformation to sustainable energetics and consumption (i.e. while production stagnates or grows, the measuring flux of inputs decreases as well as the outputs exploiting the environment).

From the point of view of entrepreneurial possibilities, there are other particular goals and their criteria which are of interest:

- development of especially small and medium enterprises producing equipment for renewable resources,

- increase of working opportunities not only in primary manufacturing but also in operational and maintenance services, in connection with renewable energy resources,
- improvement of care about countryside when growing biomass.

3.2 Entrepreneurial Strategies and Goals in the Field of Environmental Protection

Czech enterprises declare very often their systematical attitude to environmental protection in all the activities as well as the consideration of environmental standpoints in defined goals as it is a part of their company strategy. Usually, the system of running these companies is connected with Quality Management System (QMS) and Environmental Management System (EMS); naturally, the main criteria are due to the today's financial situation mainly the economic standpoints.

Development and higher usage of renewable energy resources is so that connected with the following possibilities for the company management:

- by their utilization create such savings which can be clearly expressed in numbers by
- produce such sources of revenue which are higher than the costs connected with this production, i.e. to realize a profit
- get a grant (i.e. financial resources) which covers at least a part of the investment in the renewable energy resources.

3.3 Support of Renewable Resources Development in the Czech Republic

The principal purpose of environmental policy in the Czech Republic is to provide a framework and guidelines for decision-making and activities at the international, national, regional, and local levels aimed at further improvements in the environmental quality as a whole and in the quality of environmental components.

Environmental policy focuses on the enforcement of sustainable development principles, continuing integration of the environmental perspective into sectoral policies, and increasing the economic efficiency and social acceptability of

environmental protection programmes, projects, and activities. [9]

Funds for projects aimed at improving environmental quality are an important factor of environmental protection. Good environmental quality supports a healthy population and increases the attractiveness of places for living, work, and investment. Funds represent new resources for the development of companies or cities and provide options of improving the state of the environmental components, thus contributing to sustainable development.

3.3.1 The utilization of funds EKO-ENERGIE and EFEKT Program

One of the possibilities how to get a grant for renewable energy resources is to use the structural fund of the European Union by the form of Operational program Industry and Innovation.

In the framework of this program the Ministry of Industry and Trade of the Czech Republic has already published two program appeals called EKO-ENERGIE. In the first appeal, 1.700 million Czech Crowns was allocated, planned allocation for the second appeal is 4.500 million Czech Crowns.

Supported activities are the following:

- a) Usage of renewable and subsidiary energy resources comprises:
 - the build-up of new and reconstruction of existing manufacturing equipment for the production and distribution of electric energy and heat which were made with the utilization of water, biomass and subsidiary energy resources,
- b) Raising of efficiency in producing, distribution and consumption of energy – comprises:
 - modernization of existing equipment for energy production for individual need which leads to the rise of their efficiency,
 - implementing and modernization of measuring and regulating systems,
 - modernization, reconstruction and reduction of losses in electricity and heat distribution,
 - improvement of thermal-technical features of buildings, except family and flat houses,
 - utilization of waste energy in industrial processes,

- raising of energetic efficiency by implementing a combined production of electricity and heat,
- reduction of energy intensity / raising energetic efficiency of production and technological processes.

The grant can be demanded by small and medium companies for the activities stated below letters a) and b), big companies can demand a grant for activity b).

The grant is applied on caused project expenses and according to the project type can be in the first appeal from 15-40%, in the second appeal in the interval from 30-60%, which is, however, paid retroactively.

The minimal size of the grant is 0.5 million Czech Crowns, the maximal is stated on 250 million Czech Crowns. In the framework of the EKO-ENERGIE program, the following expenses are supported:

- purchase of lands
- landscaping
- engineering networks and communications
- project documentations of buildings
- engineering activity in building-up

- technical betterment of buildings
- new buildings
- hardware and networks
- machines and equipment including the controlling software which were not subjects of amortization.

Further support is granted in the form of State program for the support of energy saving and utilization of renewable energy resources, from the program EFEKT.

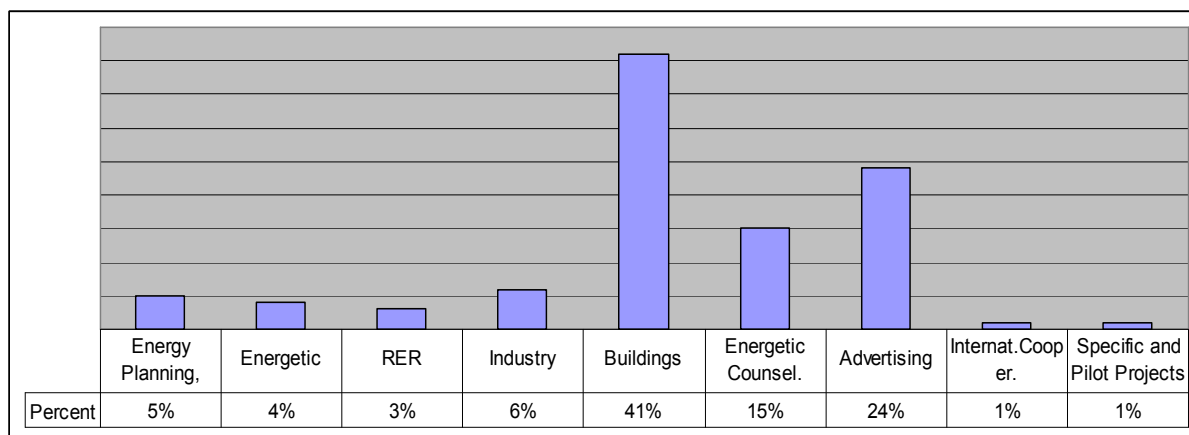
For the year 2008, the Ministry of Industry and Trade of the Czech Republic stated the following areas of support: energy planning and management, energetics, renewable and subsidiary energy resources, industry (including industrial energy), buildings (low-energy buildings), energetic counseling, advertising (in the saving energy area), international cooperation, specific and pilot projects.

Circa 59 million Czech Crowns was paid out on grants, supporting 250 projects. More detailed structure of the supported projects is shown in table 4 and in graph 1.

Table 4 Supported Projects in the 2008 EFEKT Program

Supported Area	Supported Projects	Total Costs (thousands Crowns)	Grants (thousands Crowns)
<i>Energy Planning, Management</i>	12 (5 %)	4.113	1.886
<i>Energetic</i>	9 (4 %)	26.499	6.228
<i>Renewable and Subsidiary Energy Resources</i>	8 (3 %)	29.510	8.916
<i>Industry</i>	14 (6 %)	38.241	15.956
<i>Buildings</i>	105 (41 %)	26.643	9.313
<i>Energetic Counseling</i>	38 (15 %)	4.971	4.971
<i>Advertising</i>	59 (24 %)	19.087	8.701
<i>International Cooperation</i>	3 (1 %)	2.192	1.090
<i>Specific and Pilot Projects</i>	2 (1 %)	2.294	2.294
<i>In Total</i>	250	153.549	59.355

Source: [6]



Graph 1 Supported Projects in the 2008 EFEKT Program

Source: [own]

Direct energy savings were granted with 38.924 thousands Czech Crowns, however, the total investment costs reached the triple of this amount.

costs of the supported projects reached, however, 35.234 thousands Czech Crowns.

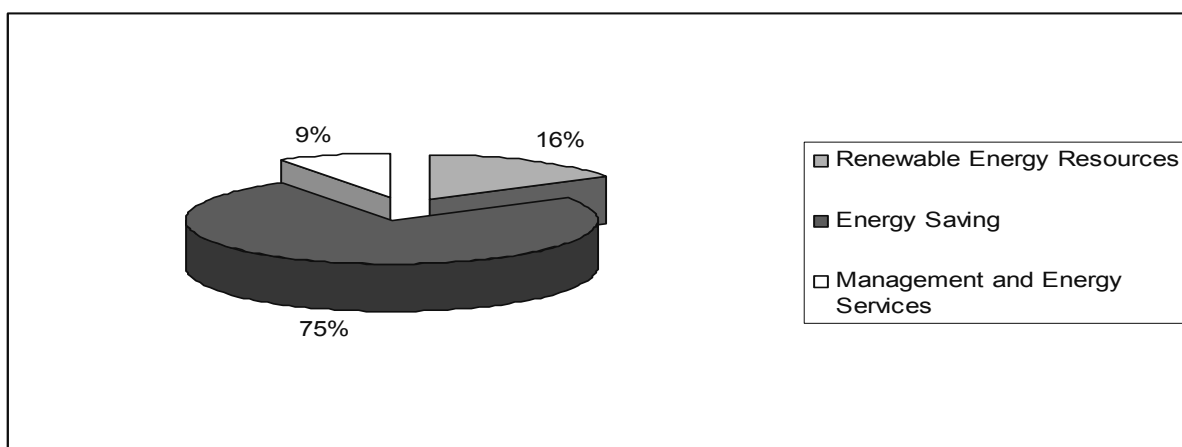
Indirect energy savings were granted with 20.431 thousands Czech Crowns, the total

30 million Czech Crowns was allocated in the framework of the EFEKT program in 2009 [8].

Table 5 Supported Projects with Direct Energy Savings – Year 2008

Activity	Number of Projects	Total Costs (thousands Crowns)	Grant (thousands Crowns)	Energy Saving (GJ)
<i>Renewable Energy Resources</i>	5	22.844	6.384	3.642
<i>Energy Saving</i>	28	87.943	29.048	78.225
<i>Management and Energy Services</i>	12	7.528	3.492	12.731
In Total	45	118.346	38.924	94.603

Source: [6]



Graph 2 Supported Projects with Direct Energy Savings in Percent – Year 2008

Source: [own]

3.3.2 More Options in the European Unions

The Czech Republic gained access to funds from the Norwegian Financial Mechanism in 2004.

The Ministry of the Environment created Revolving Fund for provisional financial assistance in the form of loans or grants (i.e. non-refundable support).

The community programme LIFE+ is a financial instrument narrowly focused on areas of the environment: Nature and Biodiversity,

Environmental Policy and Governance, and Information and Communication.

The operational programme Environment (programming period 2007-2013) supports landscape management, the use of renewable energy sources, and the building of infrastructure for environmental education. Projects can be co-financed by the EU Regional Development Fund (17,562 mil. Czech Crowns allocated) and Cohesion Fund (105,385 mil. Czech Crowns allocated).

Table 6 shows the Consumption of Priority Axis Sustainable use of Resources.

Table 6 The Consumption of Priority Axis Sustainable use of Resources (12-31-2009)

Number of Projects	1,192
Grant EU (thousands Crowns)	9,234,048
Grant CZ (thousands Crowns)	512,206
Total Costs (thousands Crowns)	17,768,588
Reimbursed	2,680,092

Source: [9]

The Cohesion Fund provided finance for investment projects in the environment in EU Member States whose GDP per capita is below 90% of the EU average, and which are implementing the measures towards an economic aims of convergence programme. The proportion of EU assistance provided by the Fund makes up to 85% of the public or equivalent expenditures.

3.4 Questioning: Development and Utilization of Renewable Resources from the Point of View of Small and Medium Companies

The following results – except for others – were discovered in the framework of questioning small and medium entrepreneurs supporting the quality of the environment in the proximity of Pardubice and Hradec Králové.

A – What do you consider the most important factor supporting the rise of the renewable resources number?

The price decision of the Energetic Regulation Office which stated – already for the year 2002 – the purchase prices for the basic categories of renewable resources, small water power-stations, biomass burning, biogas burning, wind power-stations, utilization of sunshine and the utilization of geothermal energy, but

especially the law number 180/2005 from the Collection of Laws, about the Support of Renewable Resources.

It defines two support systems – purchasing prices and green bonuses.

Purchasing prices are set in such a way that during the period of existence of individual types of renewable resources electricity production, a fifteen years long return rate of paid-in investments would be ensured to producers, as well as the adequate profit.

The support in the form of green bonuses is more complicated, but on the other hand, it makes it possible for the producer to realize a profit. The producer can sell his electricity production to any customer for the power electricity market price which is usually higher than the difference between the purchasing price and the green bonus for the stated category of the renewable resource.

B – Have you applied the project in the framework of OPPI or of a different program supporting the utilization of renewable resources? Please give reasons for your answer.

Yes (15% of questioned) – we have experience with thermal solar panels and as the installation of photovoltaic system was affected by the legislative conditions which

made it possible to reach a 8 or 9 years long system return, we asked for a grant.

No (85%) from which:

50%: currently, we are not thinking about any investments in this area but we are monitoring the situation;

35%: the grant from the operation program is paid out ex-post, our economic situation does not allows us to realize this investment from our own sources, assumed legislative changes in the field of purchasing prices guarantee (after the year 2011) will be less advantageous than the current conditions.

C – What do you consider the basic problem limiting the utilization of renewable resources?

High initial investments, difficult administration connected with grant programs, uncertainty in the price height fixing after the year 2011. Concerning the biomass energy, there is problem in the traffic burden when moving of biomass to incineration houses as well as little interest of grant policy (circa 11% of all grants). People often protest against the solar panel areas or wind power-stations columns from the point of view of landscaping, its damage etc., which makes the building control more difficult.

4. Conclusion

Electricity and heat coming from renewable resources contribute to the protection of the environment as they substitute the production in current fossil fuel equipments, and what is more, further savings are achieved in production and distribution. Biomass, for instance, is a fuel on plant basis which is neutral concerning emissions and used for the electric energy production as well as the production of heat. Also the bio-gas production represents an effective method how to transform plant material and organic leftovers into methane which can be used for energy and heat production.

From the entrepreneurial point of view the problems lie in the fact that the availability of grants is aggravated not only by difficult administration but especially by the necessity of full for-financing. There is also a distinct anxiety because of the possibility of rules changes in the purchase of renewable energy resources.

Thanks to the electricity purchase for attractive prices and initiatory build-up grants about 20 agricultural biogas stations have been built and run every year since 2007. The positive trend can also be seen in the usage of wind power-stations which, despite unfavorable climatic conditions, produce about 270 GWh each year in the Czech Republic (the energy output is 150 MW in 2009). This situation can negatively change in the case of purchasing prices decrease.

Possibility for the increase of energy production in small water power-stations lies firstly in the built-up of new resources with the preference of current hydro-electric plant usage, and secondly in the increase of production brought by the help of technological improvements.

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