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ENERGY PRODUCTION FROM RENEWABLE SOURCES IN POLAND BEFORE EU ACCESSION

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ABSTRACT

Rationale for the paper came from Polish energetics adjustment need to the European Union requirements and necessity of energy production from renewable sources. The base of the research consists of references and interviews of energetics sector employees. The paper presents energy role in economy, energetics adjustment to Union requirements and possibilities and premises for production with renewable sources. The work is finishes with practical conclusions.

Key words: energetics, European Union, natural environment protection, renewable energy

INTRODUCTION

Poland's accession to the European Union is the strategic political and economic goal. It will enable social and economic development and at the same time diminishing the differences between Poland and developed European countries. Polish energetics system underwent many structural, organizational and legal changes. But domestic energetics market still does not fulfil the European Union requirements. Especially we have to realize privatization process and increase ecological fuels production on the base of domestic agricultural resources. It can help in natural environment protection as well.

The aim of the paper is to describe primary energy production structure and electro-energetics in Poland adjustment requirements to the European Union. Important is to present possibilities and needs of renewable sources energy production.

Data about Polish electro-energetics in the EU integration was based on references and eco-fuels organization legal act analysis. Moreover, direct interviews with electro-energetics sector employees were conducted. The range of the work covers status and importance of electroenergetics sector in national economy as well as Polish electroenergetics policy in pre-accession period to the European Union. Some aspects of natural environment protection measures were discussed in the field of replacing traditional energy sources by the renewable ones.

SOURCES AND IMPORTANCE OF ENERGY

Current energetic system is based mainly on the heat and electric energy coming from underground solid fuels. It is first of all rock oil, coal and natural gas. These sources cover 80% of total energy demand. But the period of their usage is limited to about 100 years. Therefore lately many researches consider renewable energy sources.

The energy exists in many forms and it is renewable and can be used for many human activities. Every human undertaking is connected with energy form transformations. But in practise not every energy input is transformed by the human into the same amount of output energy. This energy loss causes particular economic costs. Relation between used energy and lost energy indicates the efficiency of its application.

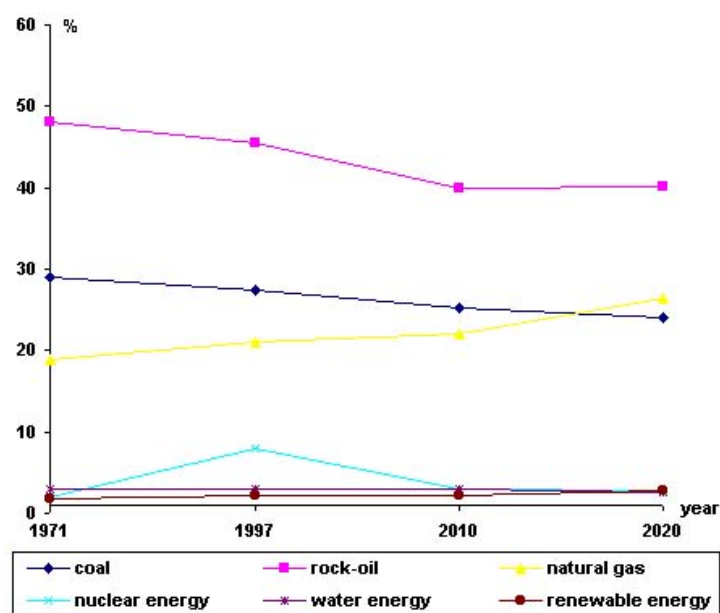
Energy inflow is the main source of keeping and development of different life forms. The primary energy sources in the earth available for human being are:

1. Heat energy existing inside the earth.
2. Relative movement energy of the earth around its own axis.
3. Solar radiation energy.
4. Other cosmic radiation energy.

As far as human civilization is concerned these energy sources can be treated as the renewables and non-exhausted. So we will not run out of the energy in the global society. But currently we cannot use or we do not benefit from that energy exploring according to the technological limitations.

Nowadays rock oil is the main source of primary energy in civilized world. The next position is occupied by coal and then go natural gas, atomic (nuclear) energy and renewable energy. Beyond 2015 the share of natural gas energy will exceed coal part. The nuclear energy share will stay the same, but the renewables use will still be not sufficient ([fig. 1](#)).

Figure 1. Primary energy structure in global usage till 2020



Energetics is for social use and for economic purposes. It draws the primary energy from the environment and transforms it into useful energy carriers as fuels, heat carriers, electric energy. Then it provides them to the final consumers. But the level and dynamic of electricity usage in particular countries or regions depend mainly on: population, economic growth, civilization and structure and efficiency of energy usage.

LEGAL FOUNDATIONS OF POLISH ENERGETICS ADJUSTMENT TO THE EUROPEAN UNION REQUIREMENTS

There is a big interest of renewable sources of primary energy development in the European Union countries. In 2001 European Commission stated that alternative fuels, it means: natural gas, hydrogen and biofuels up till 2020 will be equal 20 % of the global use of petrol and diesel. Biofuels share in total fuel usage should increase in 2010 to 2 % and to 5.75 % in 2020.

The European Union established many official acts regarding energetics activity. They consist of main international obligations. One can indicate following documents:

5. European Energetics Card from December 17, (1991).
6. Treaty of European Energetics Card from December 11, (1994).
7. Many bilateral agreements signed with different countries about trade in the field of energy carriers and agreements connected with joint energetic investments operating.

European Treaty on Energetics card can be signed by different countries, that do not discriminate foreign energetics companies. In that context Treaty plays a role of creating free – competitive energetics market.

Moreover, legal foundations of electroenergetics sector operation are based on various European Parliament Regulations. The main one is the Regulation IEM No 96/92/EEC from December, 19,1996. It determines the rules of functioning of Single European Electricity Market.

European Union requires from Polish legal system appropriate adjustment in the common legal rules of the Communities. It is stated in the Chapter “of Legal documents adjustment” of European Treaty from December, 12 1991. In that way following acts have been established:

1. European Treaty of Poland association with the European Communities and their member – countries.
2. “Energetic law” from April, 10 1997.
3. Polish electricity market. Rules of this market operating in Poland in 2000 and next years – government document from 1999.
4. Foundations of Polish energetic policy to 2002.

In April 10,1997 Polish parliament voted for the act called “Energetic law” implemented in December 5,1997. This act introduces mechanisms similar to the European Union member countries market requirements. In February 2000 Government accepted “The assumptions of Polish energetics policy to 2020”. They determined strategy of this energetic sector development.

Lately Polish Parliament and Government approved the documents connected with increasing of the energy usage from renewable sources. There are following ones:

1. Polish Parliament resolution from June 8,1999 about renewable energy usage increase.
2. “Second Ecological Policy” prepared by Ministry of Natural Environment, 2000.
3. “Longterm strategy of permanent and sustainable development of Poland to 2025”.
4. “Renewable energetics development strategy” approved on September 5,2000 by Ministers Council.

The legal acts considered energetics technologies environmentally friendly, especially renewable sources used. The strategic aims were elaborated regarding amount of renewable energetics share, the European Union requirements and analysis of renewable resources potential estimation.

ENVIRONMENT POLLUTION IN THE ENERGY PRODUCTION WITH THE USE OF TRADITIONAL SOURCES

Traditional sources of energy are the non – renewable sources. There are mainly: coal, rock – oil and natural gas. Their exploitation causes many externalities for natural environment.

Hard and soft coal resources amount for about 7 % of total world resources 45 % of collected hard coal is used for electricity production and almost 100 % of soft coal go to electricity production. Electric current in Poland is manufactured in 14 power – stations and 19 stations based on the hard coal, but 3 on the soft coal. They provide together 91 % of electricity in the country. The rest energy is produced by 177 industrial heat and power generating plant and water power plant (28 %) and independent dispersed ones (ab. 1 %).

Poland in the European Union requirements adoption process has to improve ecological factors of energy production. In order to do this we should limit the coal sources as the energy carriers. Anyway total Polish emission of basic atmosphere pollutions is not far bigger than the European Union average level. The only exception is sulphur dioxide.

The biggest emission of basic pollutions to Polish atmosphere exists in the form of CO₂, then NO_x and SO₂. The lowest amount of pollutions is observed in the dust shape. In the last few years we observed in Poland significant headway in the natural environment pollution reduction regarding energy production from non-renewable sources. For example in 1992 comparing to 1980 CO₂ emission has been reduced on 40 % per capita ([tab. 1](#)).

Table 1. Annual emission of basic pollutions in Polish atmosphere

Specification	Years	SO ₂	NO _x	Dusts	CO ₂
Poland	1996	60.6	77.9	52.1	77.9
Professional energetics	1996	59.7	78.1	21.5	98.8
	1998	51.8	57.7	12.7	90.2

Source: URE Bulletin 5/2001

In June 1994 Poland signed sulphur protocol in Geneva Convention regarding trans border air pollutions carrying for the long distances. This protocol states that up till 2010 (compared 1980) SO₂ emission will be diminished of 80 %. But the same index in the European Union decreases of 66 %.

Practical example of electroenergetics adjustment to the ecological requirements is the Power Station Group Dolna Odra S.A. in Nowe Czarnowo. Since 1992 this plant has been realizing dear investments, that limit bad impact of energy production on natural environment. Currently, the new project is conducted in hard coal desulphurization. During this investment combustion gases rising in energetic blocks are neutralized. This installation removes from the gases environmentally hazardous sulphur compounds. These equipments can purify in one hour 1800 cubic meters of combustions.

The only by-product in the “wet” purification technology is the high class plaster which will be totally used in the construction materials manufacturing. Nowadays there are 50 thousand tons of plaster produced annually in Dolna Odra and it will be increased in future.

Hitherto prevailing modernization of Polish energetics and its adjustment to the European Union have brought positive results. For example comparing to 1989 dusts emission was reduced of 85%, sulphure dioxide of 45%, nitrogen oxide of 33% and carbon dioxide of 10%.

NATURAL ENVIRONMENT PROTECTION BY RENEWABLE ENERGY PRODUCTION

Civilization development and will of Poland's access to European Union cause the ecological requirements increase. At the same time we observe higher interest of renewable sources energy production.

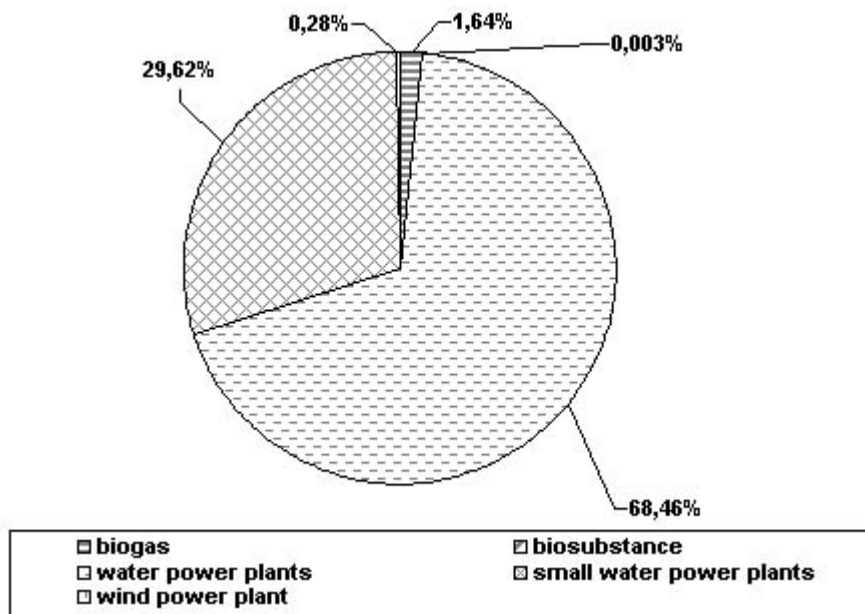
Currently renewable sources energy production is still not competitive as far as economics is concerned comparing to solid fuel energy. But gradually the usage of these fuels will be decreased. And renewable energy becomes cheaper. This process will cause dynamic growth of renewable energetics and natural environment quality improve.

There are some features of renewable energy sources:

1. The resources are practically not exhaustible.
2. They can provide different kinds of energy (electricity heat, engine fuels).
3. Fuel cost is none (wind, water, earth heat).
4. They do not pollute the natural environment.
5. They exist nearly everywhere but in different amounts.

There is a possibility in Poland to use many different types of renewable energy sources but specially ([fig 2](#)): water, wind, biosubstances, geothermic sources, sun radiation and low-temperature sources (eg. soil water). Generally we can divide them into “the old ones” – “wood, peat, biosubstances wastes, water energy, and “the new ones” (wind energy, biogas, some kinds of biosubstance, geothermic energy, sun radiation and artificial materials – plastics).

Figure 2. Share of energy sources in total production in 2000 in (MWh)



Sun radiation is one of the most important renewable energy source. However a thousand times more sun energy is provided to the earth surface than it is used for energy purposes, This energy can exists in different shapes and mainly as: sun radiation – direct, wind energy, biosubstance, kinetic energy, running water, inside heat of the earth.

At the same time people do not use these sources for social purposes in Poland. Moreover, we have various sun radiation levels in year cycle, because 80 % of total sun activity goes in Spring and Summer. Currently we use 50-60 commutators of air and flues which have about 6000 square meters of surface. They work in a year-time 300-600 hours in order to grain drying and water heating. Technical potential of that energy is very high and equals 1340 PJ and currently is used in 0,0008 %.

Similar situation is observed in water energetic potential usage. It is used in 11 % which places Poland on the last position in Europe. This potential is created as the gravitation power of water streams.

Water energy usage is connected with the big financial support. Currently in Poland we do not conduct any projects with large-scale water power stations. But there are many small point plants manufacturing low energy supply. They are created mainly on deteriorated water accumulations. Polish most common water power stations investments consider power of under 5 MW and sometimes under 0.5 MW.

In the beginning of eighties there were 100 water power plants included in energetics administration in Poland. Currently, according to Energetic Market Agency data, 359 small water power plants operate in Poland. They are owned by various economic units. They manufacture together 3.6 MW but sell to the electric network 136.7 GWh power. There are about 104 MEW included in professional energetics sector. Their power equals 124 MW but the power sold to the network amounts about 410 GWh electricity.

Another high clean energy source is a wind that does not emit any pollutions. This source can provide energy cheaper than traditional heat power stations. Lately one can observe intensive development of this part of energetics sector.

Beginning of wind energetics in Poland came from the nineties. It was established mainly in Baltic sea shore regions. Nowadays there are 14 network wind power plants operated in Poland with total power of 3.5 MW. Moreover 50 small independent wind power stations are in operating.

Wind energetics is not accepted by the ecologists Windmills do not make the landscape good-looking and moreover they threaten birds in the flight routes. Last but not least they make specific kind of noise, which can impact on ecosystem and human environment.

Possible power supply coming from windmills in Poland is estimated as 36 PJ yearly. Today there is only 0.01 PJ provided by wind energy.

Another common energy source is the biosubstance as the organic stuff from animal origin or plant origin. Currently in Poland 98 % energy of renewable sources comes just from biosubstances. There are 700 registered wastes sites in Poland where this energy is produced. Current power of installations providing energy from wasted biogases equals 5.44 MW of electric energy and 3.5 MW heat energy.

Lots of interest is connected with biogas usage in the sewage purification systems. In the first half of nineties 30 biogas plants were constructed in these places. Their total power equaled 14.5 MW of electricity and 24.4 MW of heat energy. Total possibilities of biosubstances energetics in Poland are evaluated yearly for 900 PJ, and usage lately equals 100 PJ.

Energy production from renewable sources – biosubstances in Poland is conducted mostly by burning fuel and gas biostuff. The other sources are solid biofuels like: straw from grains, plants of quick growing and big growth of biosubstance (eg Pennsylvanian mallow, Chinese reed, willow and wood wastes).

Biosubstance is the organic stuff coming from animals or plants. The importance of them is indicate by fact, that 98 % of Polish renewable energy comes from this source ([table 2](#) and [3.](#))

Table 2. Combustible values of solid and traditional fuels of various physical features

Biofuel	Combustible value (GJ/t)
Wood waste	16
Pensylvanian mallow	18
Chinese reed	17
Yellow straw	14.3
Grey straw	15.2
Soft coal	25
Hard coal	8
Koke	27
Natural gas	48
Propan-butan	45
Combustible oil	42

Source: Konieczny S.: Economic and technical analysis of usage possibilities solid biofuels in Poland, University of Agriculture. Faculty of Economics and Organization of Food Economy Szczecin (manuscript)

Table 3. Renewables energetic potential on the example of straw, hay and wood in Poland

Fuel	Total amount (mln ton)	Usage index (%)	Possible USE amounts (mln ton)
Grain straw	21.5	50	8.9
Rape straw	2.4	70	1.4
Hay	18.1	10	1.5
Wood	6.2	60	3.8
Total energetic potential in agriculture and forestry			15.6

Source: EL BREC Warsaw.

Solid biofuels contain different characteristics of physic (for example: humidity, disperse extent, density). The most important feature is energetic value (combustible value, burning heat). Depending on adopted technology and equipment power, biofuels are used in various types.

CONCLUSIONS

1. Polish energetics law is not adjusted to the European Union requirements and energetic companies privatization process is not satisfied for the Government, part of the society mainly because of economic reasons.
2. Ecological quality of traditional energy carriers has a special importance because of environmental requirements and big investments needed in order to improve these standards in Polish plants. Sometimes it is cheaper to construct renewables installations.
3. Renewable sources usage enables the heat gases emission reduction mainly carbon dioxide (55 %). Biosubstances burning does not issue the CO₂ into the atmosphere.
4. In order to unemployment reduction and rural areas activity improvement one can increase the share of renewables sources energy in total energy balance of the country.
5. Biosubstances usage in energy production reduces its production costs and increases agricultural production efficiency and living standards of rural society.

REFERENCES

1. Duda M., 2000. Perspektywy rozwoju elektroenergetyki w świecie i w Polsce [Electroenergetics development perspectives in the world and in Poland]. URE, Warszawa [in Polish].
2. Giermek K., Godzisz K., 2002. Restrukturyzacja elektroenergetyki a rozwój rynku konkurencyjnego [Restructuring of electroenergetics and complete market development]. Biuletyn nr 1 URE [in Polish].
3. Stachowiak I., 2002. Polska elektroenergetyka w procesie integracji z Unią Europejską [Polish electroenergetics in the European Union integration, University of Agriculture]. Akademia Rolnicza, Wydział Ekonomiki i Organizacji Gospodarki Żywnościowej, Szczecin [in Polish].

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