

# **“ALTERNATIVE ENERGY SOURCES IN POLAND - BASIC INFORMATION”**

## **ABSTRACT**

The paper discusses the nature of renewable energy sources in Poland, with particular emphasis on classification. The article presents the reasons for the development of alternative energy in Poland, the classification of renewable energy sources, and also indicated the reasons for interest in alternative energy sources.

## **INTRODUCTION**

The development of civilization is accompanied by continuous increases in energy demand. Since the dawn of history, is known for energy based on the use of renewable energy sources. In the Middle Ages commonly used water and wind energy to power devices such as windmills and water mills that proved to work for the man.

In Polish conditions for energy is mainly used solid fuel. Use of fossil fuels (coal, petroleum, natural gas, etc.) for energy purposes has contributed to environmental pollution and to their depletion. The rapid increase in fossil fuel consumption occurred in the 70's (with the estimates show that our civilization has already consumed energy equivalent to 500 billion tons of oil equivalent, of which two thirds were used in the past 100 years) [Jastrzębska 2007]. Limited resources of fossil fuels and environmental devastation caused exploration and exploitation of unconventional sources of energy.

**To present the basic data and reasons for interest in alternative energy sources.**

## **RESEARCH METHODS**

The study used a descriptive method which involved the meticulous description of the features and phenomena by establishing the differences between them. Then the isolated set of phenomena known yet, and it describes a whole. Verbal description is performed with numerical information. Are shown reality, compares the characteristics and tasks on the subject of research.

The study also used the method of analysis of source materials and the available literature discussion. The results are shown in tabular and graphic forms complements them.

---

\* Szkoła Wyższa im. B. Jańskiego w Warszawie, Wydział Zarządzania

\*\* Małopolska School of Economics in Tarnów

# KEY ISSUES AND CLASSIFICATION OF RENEWABLE ENERGY

The dynamic development of new technologies of the 70's, the limited resources of fossil fuels, the inevitable prospect of the spectrum of the energy crisis, and the continuous destruction of the environment as a side effect of the use of conventional energy have caused humanity to draw attention to the exploration and exploitation of unconventional sources of energy. At the same time understood that it is necessary to seek new energy sources, which are:

- alternatives to fossil fuels,
- cheaper,
- more environmentally friendly.

The reason for such exploration, however, were not environmental considerations, as it is now an issue, only because of the oil crises. Wisniewski [2003] contends that this was due to the risks arising from three reasons:

- because of the uneven distribution of coal, oil and natural gas;
- due to the pollution caused by mining, transport and use of fossil fuels;
- there was more and more real vision of the risks the depletion of fossil fuels, which followed the growing energy needs and the union of the cost of production.

Renewable energy sources are considered by the World Energy Council's energy future. It is believed that due to their potential you will be able to meet the growing energy needs of humanity. It is estimated that their use is growing annually by 4% to 7%, this rate should be maintained until the 2020<sup>1</sup> [World Energy Council Statement 2000].

The term renewable energy covers a wide range self-regenerate energy sources such as solar radiation, wind, water flow, the earth's internal heat, biomass, etc. we can use them primarily for electricity production, as well as for heating and other energy storage (biomass) [Jastrzębska, 2007]. Renewable energy sources have the special property that they use on that site is not limited publicly available energy resources: solar, wind, rivers, tides and ocean currents, biomass. But we must remember that the management of renewable energy sources should be conducted in such a way that the so-called. Cheap Ekoenergia was also a threat to wildlife and human communities.

In Poland, from 1 January 2003, in accordance with paragraphs. Article 21. 3 of Law - Law Energy<sup>2</sup>, renewable energy sources are defined as:

"A source in the processing using wind, solar, geothermal, waves, currents and tides, rivers and fall in energy derived from biomass, biogas, landfill and biogas generated in the processes of discharge or wastewater treatment or decomposition of plant and animal remains".

Energy sources are divided into renewable and nonrenewable (Fig. 1).

---

<sup>1</sup> Energy for Tomorrow's World- Acting Now! World Energy Council Statement 2000 r.

<sup>2</sup> Act of 10 April 1997 Energy Law Journal. Law of 4 June 1997, No. 54, Pos. 348, subsequent amendments.

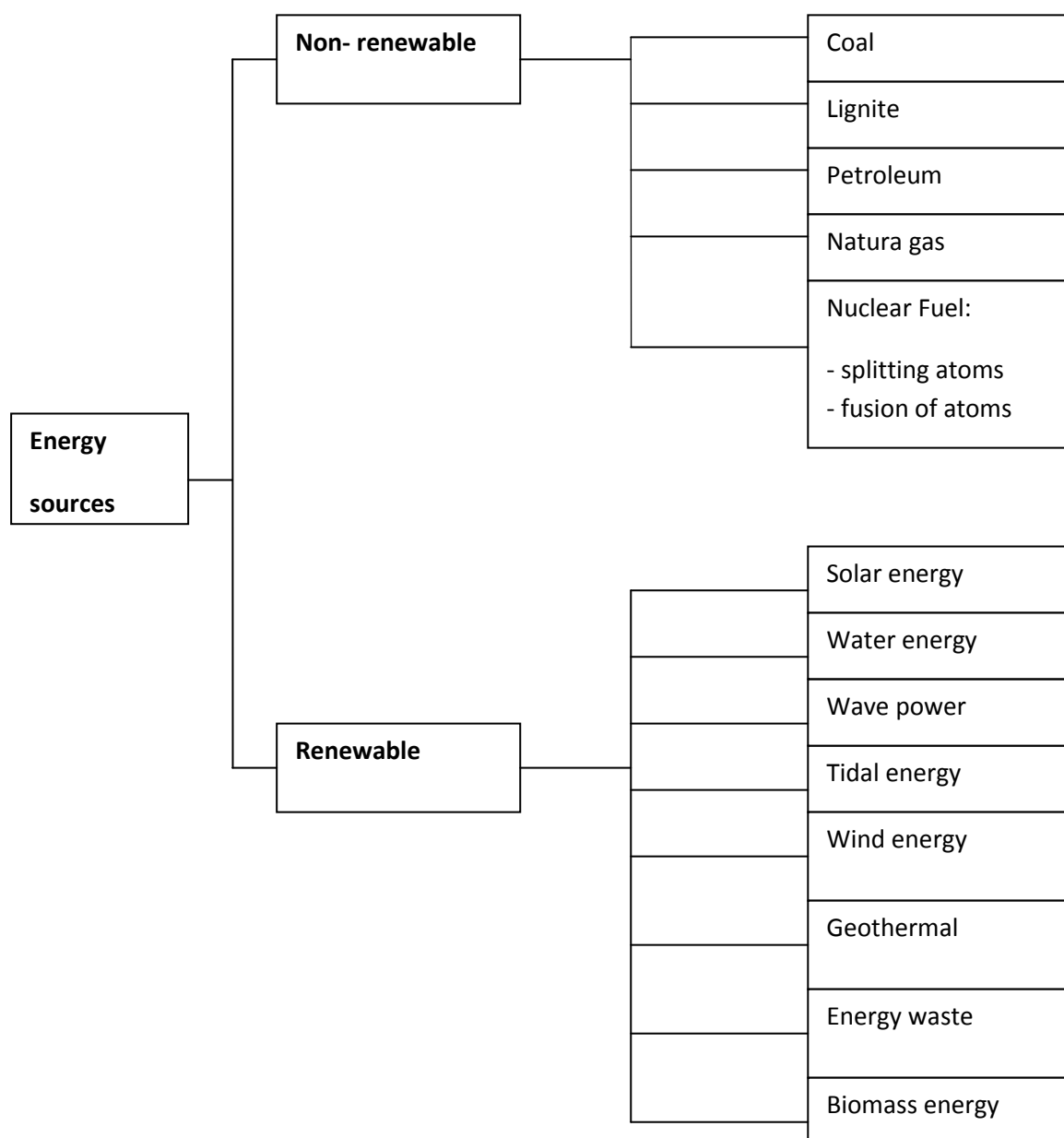


Fig.1. Classification of energy sources

Source: elaborated by authors on the ground: Ciechanowicz W. *Energia, środowisko i ekonomia*. Instytut Badań Systemowych PAN, Warszawa 1997, s. 14

Renewable energy sources are practically inexhaustible, because their resources are constantly replenished by natural processes. Their availability is not the same on a global scale, but there are almost everywhere. Resources are readily available solar energy and biomass, while the availability of geothermal energy, wind or water is limited. A characteristic feature of renewable energy sources is their minimal impact on the environment<sup>3</sup>. Renewable energy sources are also called alternative or unconventional sources<sup>4</sup>.

In Polish conditions, the practical application of technologies have three (groups) [Wisniewski 2003]. These are technologies designed to:

- power generation-hydro, wind, photovoltaics,

<sup>3</sup> <http://www.zielonaenergia.pl/zrodla>, dn. 15.08.2008

<sup>4</sup> R. Ulbrich, „Alternatywne źródła energii”, Politechnika Opolska, Opole 2000, str. 49

- production of electricity and heat, and both forms of energy in combination - installations for the energy use of biogas from landfills and sewage treatment plants, solid bio-fuels (wood and straw)
- heat-geothermal plants, solar collectors.

Table 1. **Repartition of renovated energy sources**

Primary energy sources		Natural processes of energy conversion	The technical processes of energy conversion	Type of energy
Sun	Water	Evaporation, melting ice and snow, rain	Hydropower	Electricity
	Wind	Movement of atmosphere	Windfarms	Heat and electricity
		Wave energy	Wave power plants	
	Solar radiation	Ocean currents	Plants using ocean currents	Electricity
		Heaters Earth's surfach and atmosphere	Plants Rusing the heat of the oceans	Electricity
			Heat pumps	Thermal energy
		Solar radiation	Collectors and thermal solar power plants	Thermal energy
			Photovoltaic cells and solar Power plants	Electricity
			Photosynthesis	Fuels
	Biomass	Biomass production	Heating and thermal power plants	Heat and electricity
			Device processing	Fuels
Earth	Decay of isotopes	Geothermal source	Geothermal heating and power plants	Heat and electricity
Moon	Grawitacion	Tidal waters	Tidal power plants	Electricity

Source: Lewandowski M., *Proekologiczne źródła energii odnawialnej*. Wydawnictwo Naukowo Techniczne, Warszawa 2001 str. 40

## REASONS FOR INTEREST IN ALTERNATIVE ENERGY SOURCES

In recent years, increasing attention is given to the what, and how much energy is produced. Reversal of Europe from fossil fuels such as petroleum, coal and lignite and natural gas is due to two disturbing information. First, the wasteful exploitation of natural resources

has caused huge damage to the ecosystem. Increasingly, we feel the effects in the form of extreme weather events. Secondly, the proven reserves of energy resources may end up still alive in this generation. Various estimates determine the energy resources for several dozen to several hundred years (Table 2). It should be noted that given the size of the table, are counted to 2005 levels. It is hard to predict what will wear for a few years. Can be reduced or increase? Estimates show one thing, the bed used to be run. With each year, deposits are deeper, and more difficult to access them.

Table 2. Documented global energy resources, According to date from 2005.					
RAW MAERIALS	SOURCES (Mt)	STRUCTURE OF RESOURCES (%)	RESOURCE CONSUMPTION (Mt)	CONSUMPTIO N STRUCTURE (%)	NEY R/P In Years
<b>COAL</b>	469 298	59,6	2957,0	31,7	158
<b>PETROLEUM</b>	159 644	20,3	3861,3	41,4	41
<b>NATURAL GAS</b>	158 815	20,1	2512,2	26,9	63
Total	<b>787 757</b>	<b>100</b>	<b>9330,5</b>	<b>100</b>	<b>84</b>
Source: www.ogrzewnictwo.home.pl					

Not without significance is the quality of life. Hundreds of millions of tons of burned mineral causes great pollution. The air in big cities is so polluted that it causes difficulty in breathing. In the largest agglomerations not surprising sight of people walking the streets in masks. Diseases of the lungs and airways are becoming the norm. The costs of treating complications arising from living in polluted environments are getting better.

The level of climate change is alarming, which cannot be concealed, and the leaders pay more attention to climate change. Violent, unpredictable, extreme weather anomalies causing huge material losses. Before the majority of these phenomena are not able to escape. Arctic winters, scorching heat, torrential rain, tornadoes and storms of unprecedented strength of the effects of the imbalance in nature excessive contamination of raw materials and an ill economy. Back to the main energy sources in the assessment of experts will limit further degradation of the environment. Felling of damaged forests and planting new, elimination of obsolete technology, construction of new energy-efficient and neutral impact of equipment and buildings for energy saving, and thus less polluting substances incidental to the process of energy production.

Pro-environment state policy influences the growth of the economy. Searching for new solutions to accelerate technological development and economic growth. Creates jobs, which affect economic growth and this translates into new investments that will boost the entire economy. Turning towards renewable energy sources (RES) becomes a stimulus to rebuild many technologically obsolete and energy-intensive sectors of the national economy.

From the Strategic point of view, the Economy Makes Them independent from external suppliers, Especially Valuable When It Is a supplier, as is the case of Polish. The use of green energy, which is available in various forms, is conducive not only to improve the environment, but also reduces dependence on the existing suppliers, often monopolies.

All this makes good environmental policies, the search for alternative energy sources is a requirement of the times and attempt to find a different reality than the one we know.

EU law will force the member countries to increase the share of renewable energy sources in energy balance (Table 3). In Poland the government policy on renewable sources of energy corresponds to the Ministry of Economy (MG). MG task is to prepare and implement a strategy for the sector. The strategy prepared by the Ministry to assist in increasing the share of green energy in the energy balance. The purpose for which we strive is to achieve over the next ten years, a 15% share of renewables in electricity production and a share of 10% market share of bio-fuels for transport fuels.

**Table 3. Estimated share of energy from renewable sources (RES) in final energy consumption from 2010 to 2020 and a surplus of energy from RES**

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Final energy consumption (ktoe)	61 300	61 800	62 400	62 900	63 400	64 000	65 000	66 100	67 100	68 200	69 200
2	Final consumption of RES (ktoe)	5 595	5 933	6 332	6 706	7 080	7 501	8 123	8 723	9 362	10 024	10 713
3	<b>The final share of RES (%) 2/1</b>	<b>9,13</b>	<b>9,60</b>	<b>10,15</b>	<b>10,66</b>	<b>11,17</b>	<b>11,72</b>	<b>12,50</b>	<b>13,20</b>	<b>13,95</b>	<b>14,70</b>	<b>15,48</b>
4	The minimum value resulting from the directive (%)		8,76	8,76	9,54	9,54	10,71	10,71	12,27	12,27		15
5	The minimum value resulting from the Directive (ktoe) 4 * 1		5 413	5 466	6 000	6 048	6 854	6 961	8 110	8 233		10 380
6	Surplus (ktoe) 2-5		519	866	705	1 032	647	1 162	613	1 129		333
7	Surplus (%) 6/1 * 100		0,84	1,39	1,12	1,63	1,01	1,79	0,93	1,68		0,48

Source: Ministerstwo Gospodarki

Several documents were prepared in the form of: policies, strategies and plans to be implemented and lead to the achievement of the objectives. The most important document for the energy, talking about its future shape of the "Polish Energy Policy for 2030". It is a document that contains the most current operational strategy in the energy and especially renewable energy. Particularly important is the "Annex 3 - The enforcement activities for the years 2009 - 2012" setting out in detail the proceedings in the coming months and years.

Principal documents relating to the development of RES in Poland are: "National Action Plan for RES" called. "Action Plan", which sets national targets for the share of renewable energy in transport, electricity, heating and cooling in 2020, takes into account the impact of other energy efficiency policies on final energy consumption as well appropriate measures to be taken to achieve the national overall targets for the share of renewables in final energy use.

The document also points out: co-operation between local authorities, regional and national level, the estimated surplus of energy from renewable sources, which could be transferred to other Member States; strategy to develop existing biomass resources and mobilize new resources for different uses of biomass, as well as measures that be taken to fulfill the relevant obligations under Directive 2009/28/WE<sup>5</sup>.

According to the draft Polish Energy Policy until 2030 (PEP) is expected to increase the gross electricity production from RES in 2020 to around 31TWh, or 19.6% of total production, in 2030 to 38TWh, which means about 20.3% of the total gross production. Electricity generation in highly efficient cogeneration is expected to rise to 52.7TWh in 2030 (for comparison, in 2006 reached the level of 24.4TWh). The projected final energy demand for the gross of the various types of RES, according to the PEP project in 2030 that will increase demand for electricity from biogas final two orders of magnitude and by more than an order of magnitude increase in the demand for heat produced from biogas in relation to 2006<sup>6</sup>.

Institution that is responsible for the realization of the most important sector of RES 9.4 and 10.3 and is responsible for the flow of EU funds to the sector entities is the Ministry of Economy.

Table 4. Required share of RES in the gross final energy consumption in 2020 in the EU (in%)		
Kraj	Udział OŹE w bilansie energii	
	w 2005	cel na 2020
Austria	23,3	34
Belgium	2,2	13
Bulgaria	9,4	16
Cyprus	2,9	13
Czech Republic	6,1	13
Denmark	17,0	30
Estonia	18,0	25
Finland	28,5	38
France	10,3	23
Greece	6,9	18
Spain	8,7	20
Netherlands	2,4	14
Ireland	3,1	16
Lithuania	15,0	23
Luxembourg	0,9	11
Latvia	32,6	40
Malta	0	10
Germany	5,8	18
<b>Poland</b>	<b>7,2</b>	<b>15</b>
Portugal	20,5	31
Romania	17,8	24
Slovakia	6,7	14
Slovenia	16,0	25
Sweden	39,8	49
Hungary	4,3	13
United Kingdom	1,3	15
Italy	5,2	17
<b>UE-27</b>	<b>8,5</b>	<b>20</b>
Source: Directive 2009/28/EC of 23 April 2009 on the promotion of renewable energy, Coll. Gazette. EU L 140 of 5 June 2009, p. 16;		

## CONCLUSIONS

Recently in Poland and the world observed the gradual elimination of natural fuels and use of new, unconventional and renewable sources of energy. Investing in renewable energy and increased use of renewable energy can and should contribute to the social effects: the increase of the renewable energy sector employment (e.g. operating and production

<sup>5</sup> Source: Ministry of Economy.

<sup>6</sup> Cyt.

[http://www.ekoenergia.pl/index.php?id\\_akt=610&plik=Biogazownie,\\_biznes\\_i\\_wsparcie\\_dla\\_inwestorow\\_cz.\\_2.html](http://www.ekoenergia.pl/index.php?id_akt=610&plik=Biogazownie,_biznes_i_wsparcie_dla_inwestorow_cz._2.html) 17.11.2010

equipment and technological lines, service companies investing in renewable energy sources), and as a growth annual turnover and regional development, and ecological effects, it is to reduce emissions of greenhouse gases (CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>). Furthermore, there are economic effects, which could include: increased energy security and conservation of raw materials and energy.

## LITERATURE

1. Bogdanienko J., *Odnawialne źródła energii*. Biblioteka problemów t. 254. Wydawnictwo PWN, Warszawa. 1989.
2. Ciechanowicz W. *Energia, środowisko i ekonomia*. Instytut Badań Systemowych PAN, Warszawa 1997
3. Energy for Tomorrow's World- Acting Now! World Energy Council Statement 2000 r.
4. Jastrzębska G., *Odnawialne źródła energii i pojazdy proekologiczne*. Wydawnictwo Naukowo-Techniczne, Warszawa 2007
5. Klugmann - Radziemska E., *Odnawialne źródła energii-przykłady obliczeniowe*. Wydawnictwo Politechnika Gdańska, Gdańsk 2006.
6. Lewandowski M., *Proekologiczne źródła energii odnawialnej*. Wydawnictwo Naukowo Techniczne, Warszawa a 2001, b 2006.
7. Renewable energy In the 21st century: building a more sustainable future, Approved by European Commision, Brussels, 10.1.2007, COM (2006) 848
8. Rozporządzenia Ministra Gospodarki z dnia 19 grudnia 2005 r. (Dz. U. Nr 261, poz. 2187
9. Szlachta J. (red.), *Niekonwencjonalne źródła energii*. Wydawnictwo AR we Wrocławiu, Wrocław 1999.
10. Ulbrich R., *Alternatywne źródła energii*. Politechnika Opolska, Opole 2000.
11. Tymiński J., *Wykorzystanie odnawialnych źródeł energii w Polsce do 2030 roku. Aspekt energetyczny i ekologiczny*. Wydawnictwo Zakład Promocji IBMER, Warszawa. 1997.
12. Ustawa z dnia 10 kwietnie 1997 r. Prawo Energetyczne , Dz. U. z dnia 4 czerwca 1997 r. Nr 54, Poz. 348, późn. zm.
13. Wiśniewski G. (red.), *Odnawialne źródła energii jako element rozwoju lokalnego. Przewodnik dla samorządów terytorialnych i inwestorów*. Wydawnictwo EC BREC/IBMER, Warszawa 2003.
14. *Polityka Energetyczna Polski do roku 2030*, wersja listopad 2010.
15. *Krajowy Plan Działania na rzecz OZE*, wersja listopad 2010.
16. [www.zielonaenergia.pl/zrodla](http://www.zielonaenergia.pl/zrodla), dn. 15.08.2008.
17. [www.ekoenergia.pl](http://www.ekoenergia.pl), dn. 17.11.2010.
18. [www.ogrzewnictwo.home.pl](http://www.ogrzewnictwo.home.pl), dn. 20.11.2010.
19. Strona internetowa Ministerstwa Gospodarki.