

ENERGY IN EUROPEAN UNION – SOURCES AND PEOPLE’S APPROACH

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***Abstract:** Since the dawn of time, the population has been looking for more and more effective ways of receiving energy. Initially using it only for own needs, but over the years and the development of technology, ways to power machines and increase production efficiency were sought. A significant element of this development was also a way to provide electricity to city dwellers. Currently, energy technologies are designed to minimize the harmful impact on the environment, together with obtaining maximum efficiency and effectiveness of machines. The aim is also to maximize the use of raw materials and gradual abandonment of non-renewable fuels, as well as the use of modern technologies in construction, to minimize heat loss, and thus reduce the need to heat apartments. The goal of this article is to show the share of individual energy sources in total energy production and the approach of individual countries of the European Union to energy production. Also, the goal is to show people’s approach to the use of various sources of energy such as wind plant or nuclear power plants. The European Union’s recommendations for energy production are presented. The main sources of energy and the residents’ approach to modern technologies are presented. It also presents the impact of power plant on the development and competitiveness of the region. The article uses the method of analysis and criticism of the literature and analyzes of existing data.*

***Key words:** modern technologies, energetic, region development*

***JEL codes:** K32, O18, R11*

1. Introduction

Practically, from the beginning of humanity, people were looking for ways to obtain energy. This involved the subjugation of fire and the supply of fuel to support it. Originally, only timber was used, mainly for the basic needs. Along with the development of industry, technology, mass production and all kinds of machines, more and more energy acquired in

a variety of ways was needed. Currently, exists the science and technology department which is energy. It is also an industry branch that deals with the processing of available forms of energy into such a form that can be easily used to supply industrial processes, machines as well as everyday devices (www1).

One of the main problems associated with obtaining energy is air pollution connected with greenhouse gas emissions. However, since 1990 you can see a gradual decrease in gas emissions (www2). It may be related to a decrease in industrial production, the use of ever-improving air filters, and a gradual increase in the share of energy obtained from renewable sources.

Nowadays, there are many ways to obtain energy, and technology is constantly evolving, finding new ways to get it. The three most-used energy sources are oil, coal and natural gas. Their share in the overall use is growing all the time. Hydroenergetic and nuclear power plants have much smaller share (www3). But still, in 2013 nuclear energy covered 11% of global electricity production [Právělie, Bandoc, 2018]. In 2010, the share of energy obtained from wind farms exceeded energy obtained from other renewable sources, such as biofuels or geothermal energy. There is considerable potential here, as energy was not sought in this way until 1990. In 2005, solar energy began to be used and it can be assumed that in the 2020s, the amount of energy obtained in this way will exceed the energy obtained from other renewable sources. In 2011, a significant decrease in energy obtained from nuclear power plants can be noticed, however, in recent years¹, this amount has increased again (www3).

In the 21st century, the European Union recorded a significant increase in the share of energy from renewable sources. While in 2004 this share amounted to approximately 8.5%, in 2016 this share amounted to 17%. Despite almost twofold increase, this share is still small and proves that mainly energy is obtained from non-renewable sources (www4). They are also often harmful to the environment because they are associated with the combustion process and greenhouse gas emissions from the atmosphere.

Renewable energy sources are considered as clean energy sources, and their proper use will minimize the negative impact on the environment. These technologies offer great opportunities to reduce greenhouse gas emissions and reduce global warming [Panwar et al., 2015].

¹ This was closely related to the earthquake and its consequences in Japan in March 2011. As a result, nuclear generators in Japan and some in Germany were shut down (Vide.: <http://www.world-nuclear-news.org/NP-Economic-cost-of-Japans-nuclear-shutdown-1404151.html>).

Apart from acquiring energy, it is also very important to store it. This is especially important for economies based on renewable energy sources such as the sun or wind. One has to take into account that the generation of electricity in such power plants is fluctuating. However, in periods of lower energy production, there is still a demand for it that needs to be met. Therefore, energy storage technologies are developing based on supercapacitors or lithium-ion batteries. These technologies aim to integrate the electricity chain to eliminate power outages [Schulze, et al., 2019].

The measure to achieve even lower demand for thermal energy is modern energy-saving construction (www5). Modern buildings are constructed in a way that they are adjusted to the climate existing in a given region. Air circulation in such constructed and designed houses allows for maximum use of heat so that additional heating is necessary only in extreme cases. Solar panels are often used for e.g. heating water [Leo Samuel, et al., 2017]

In recent years, more and more emphasis has been placed on obtaining energy from renewable sources and gradual abandonment of fossil fuels. However, technologies to reduce the negative impact of combustion on the natural environment are still being improved. The aim is to make the gas emission less and less harmful. These trends can also be seen in construction, where modern technologies and constructions are aimed at minimizing energy demand and using renewable sources where it is necessary. Next chapters of that article contains comparison between EU's countries and their sources of energy an EU's policy about different sources of energy. Also, last chapter contains results of different researches conducted in different countries examining peoples approach to wind and nuclear power plants.

2. Methodology and Data

In this article the method of a analysis and criticism of the literature was used. That method consists in demonstrating the originality of the problematic situation chosen for the study and the purposefulness of its analysis. It's about verifying what already exists in the literature, which is known and proof of the need to investigate unknown hypotheses [Mróz-Jagiello, Wolanin, 2013]. The articles about different sources of energy in European Union and EU's recommendations about energy were analysed.

Also analysed existing data connected with energy production in EU throughout the years since 1990. Furthermore, the results of research conducted by TNS Polska for Polish Wind Energy Association (Polskie Stowarzyszenie Energetyki Wiatrowej) about peoples' approach about wind energy in Poland, its benefits and disadvantages were used. As well as the

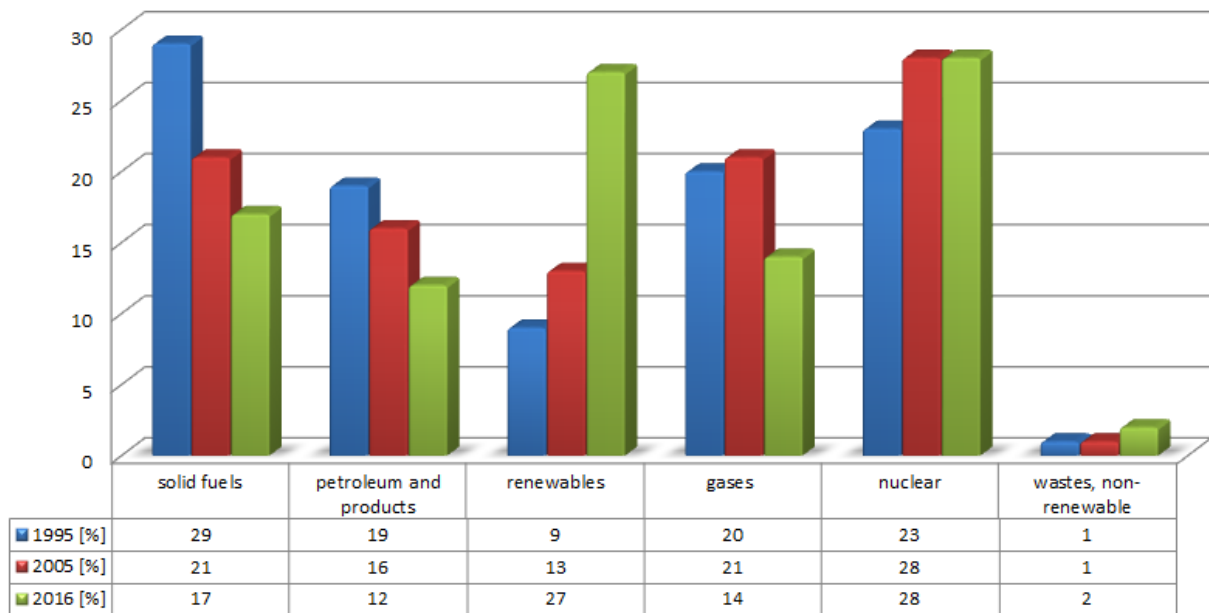
results of research conducted by Senate's Office of Analysis and Documentation about attitude of local communities in European countries to the location of nuclear power plants in their neighbourhood were used. These researches were chosen to show attitude of people of different countries to various sources of energy.

3. Energy situation in European Union

In European countries oil and gas resources are scarce. Since the 90s of the twentieth century, a significant decrease in the volume of energy produced in the European Union can be noted. At the same time, the use of fossil and non-renewable fuels such as coal, oil and gas has decreased [Momete, 2015]. The European Union also places a strong emphasis on ecology and the environment, and therefore encourages Member States to increase the share of renewable sources in total energy production and such increase is noticeable in recent years. Another reason for promoting renewable energy is the small amount of oil and gas resources in Europe. The production of energy from these sources makes these countries dependent on third countries, and energy security decreases. The production of energy from renewable resources will help to avoid the negative economic situation [Kovavic, Di Felice, 2019]. Another reason for promoting renewable energy sources is the risk of natural resources shortage or reaching the point where their extraction may cease to be profitable [Koroneos et al., 2003].

Figure 1 shows the share of individual energy sources in 1995, 2005 and 2016 in the total energy production in the European Union countries. It can be seen that since the mid-1990s, the share of renewable sources has increased three-fold with a simultaneous decrease in energy production from solid fuels, oil and gas. The share of energy from nuclear power plants has remained stable since 2005 and amounts to almost 30%.

Fig. 1. Share of individual energy sources in EU



Source: own elaboration based on [Publications Office of the European Union, 2018]

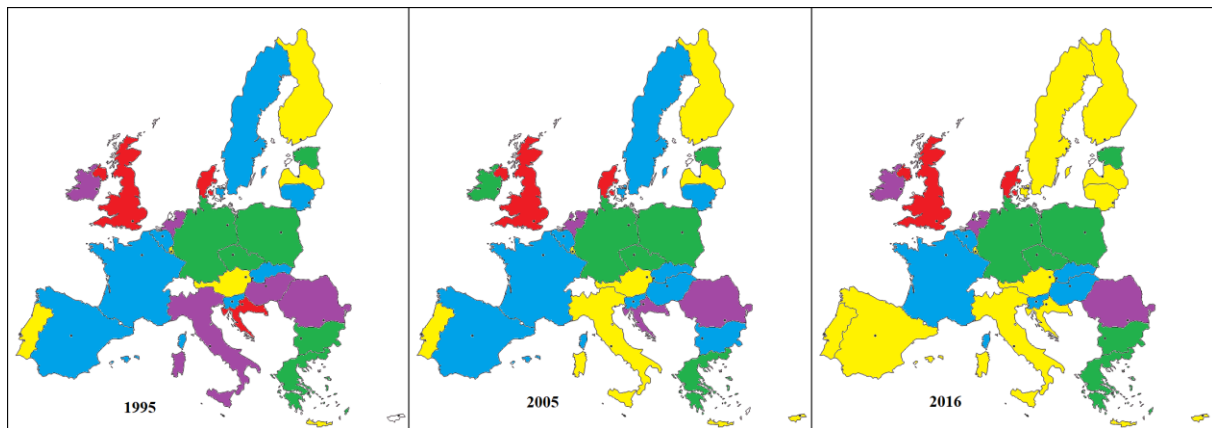
In 2016, a total of 770.4 Mtoe² was produced in the European Union. More than half of the energy came from two sources: renewables and nuclear. One third of energy came from solid fuels and gases. The remaining sources accounted for approximately 13% of the total energy generated. It can be deduced from this, that the EU's attempts to use energy sources more environmentally friendly are reflected in reality, and the member states are slowly changing their power plants [Publications Office of the European Union, 2018].

Figure 2 presents the countries of the European Union. They were coloured depending on the main energy production product in 1995, 2005 and 2016. These products were divided in accordance with the statistical yearbook into:

- solid fuels (green colour),
- petroleum and products (red),
- gasses (violet),
- nuclear (blue),
- renewables (yellow),
- wastes, non-renewable (it does not dominate anywhere).

² Toe, tonne of oil is “equivalent is a unit of energy defined as the amount of energy released by burning one tonne of crude oil” (www9).

Fig. 2. Main source of energy in UE in 1995, 2005 and 2016

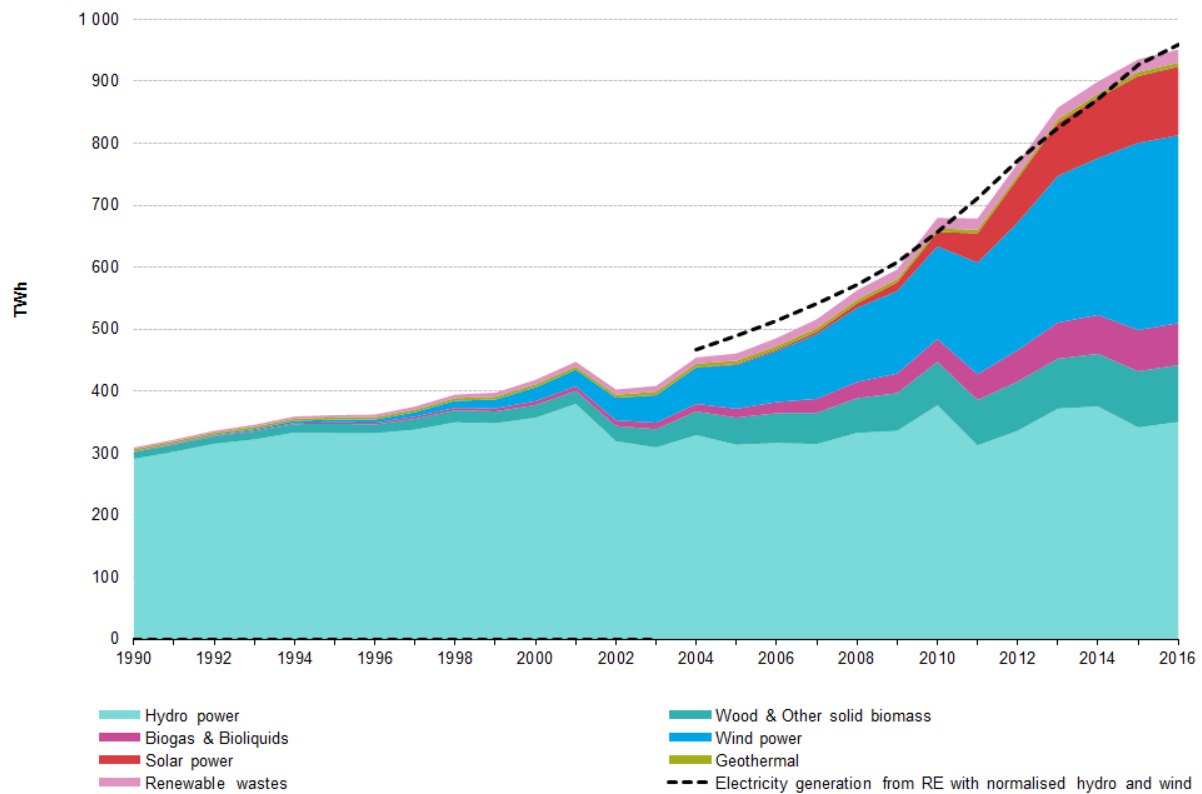


Source: own elaboration based on [Publications Office of the European Union, 2018]

Figure 2 shows how the approach to energy production has changed in individual countries. While in 1995 energy in nuclear power plants dominated in seven countries, in six from renewable sources, energy generated from solid fuels, oil and gas predominated in other countries. In 2005, the countries in which nuclear power plants were mainly used were nine. The number of countries with renewable energy also increased to eight. Other countries relied on non-renewable resources. In 2016, a significant decrease in the number of countries where nuclear power plants are the main source of energy - up to five. In 12 out of 28 EU countries, energy from renewable sources predominates and in 11 non-renewable sources. Countries that have left the use of nuclear power plants are now investing in renewable sources [Publications Office of the European Union, 2018].

Figure 3 shows an increase in the share of individual renewable sources in energy production from such sources. It can be noticed that the share of hydropower plants is the highest among all sources, however, over the years shown in the chart, this share is constant without significant increases or decreases. The lowest shares have renewable wastes and geothermal. A slight increase can be seen in wood and other solid biomass as well as biogas and bioliquids. However, the greatest increase was recorded in the energy obtained from the sun and wind.

Fig. 3. Production of energy from renewable sources in the years 1990 - 2016



Source: (www4)

However, in the European Union countries, are not only investments in improving technologies related to renewable energy sources or increasing the share of energy produced in this way. The technologies for gasification of wood fuels are also being developed. This process involves gasification of various types of biomass, and the gas thus obtained can be used in furnaces, power machines and electrochemical fuel cells. In contrast to the normal combustion of fuels, gasification allows to reduce the costs of gas cleaning, but on the other hand, it is associated with a large loss of substance, increased transport costs and conditioning [Kozlov et al., 2019].

A very important aspect of investment in various energy technologies is also taking into account public opinion on a given topic. The topic of building a nuclear power plant in Poland is the most controversial. These power plants have the least harmful impact on the environment than other energy sources, and technologies associated with obtaining uranium, storage of waste and the very production of energy are constantly developing (www6). However, in society there is still a belief that such plants are dangerous and down breaking. Although three accidents have been reported since the beginning of their operations, people do not want to agree to construct them. Even the supporters believe that every place is good for construction, but as far as possible

from their place of residence. This problem exists all over Europe, and there is a risk that places with new power plants will not arrive, only those already existing will be extended and modernized. Residents of the area are already accustomed to their presence and there is already the necessary infrastructure connected with power supply or cooling of blocks (www7). Also the European Parliament voted that the transition to atomic energy may be difficult for entrepreneurs, in return promoting wind and solar energy (www8).

In the last 20 years, a significant increase in the number of countries where renewable energy is the main source of energy can be seen in the European Union. This is a favourable situation for the environment but also for society. The gradual departure from fossil fuels in favour of environmentally friendly power plants reduces greenhouse gas emissions and limits global warming. Despite the many advantages of nuclear power plants, one can notice the public's resistance to this kind of energy source. Several countries also limit this way of producing energy for renewable resources. In Poland, for many years there has been a discussion whether such a power plant should be created, but the public's resistance and low awareness of this technology makes it difficult to approve any plan associated with such an investment.

4. Using of modern energy technologies and its impact of region development

This chapter shows results of two studies considered with wind and nuclear power plants. These two kinds of energy sources are arguable in Poland. Lots of people consider nuclear power plant as dangerous due to failure in Chernobyl in 1986 or Fukushima in 2011 [Kaur et al., 2019]. Also, wind power plants are seen as a threat to natural environment such as birds or loss in ground value. These studies shows opinion of people of different countries and how these power plants influenced the region.

The construction of any power plant in a given region, whether using renewable resources or not, affects the competitiveness of a given region and its development, both positively and negatively. The region's competitiveness can be considered in several aspects: spatial (providing the area with resources), economic and social (behavior of users of resources and the effects of their activities) and organizational (impact of local authorities on the quality of social life) [Góralski, Lazarek, 2009]. Positive aspects include increasing work places, the attractiveness of a given place for other investors, as well as developing the region through the construction of new roads or other infrastructure. On the other hand, such construction may

contribute to reducing the tourist attractiveness of the region and, consequently, reducing income and lessen the quality of life in a given place.

In 2013, research on wind energy in Poland was carried out. Computer-assisted telephone interviews were conducted with the residents of the Warmian-Masurian Voivodeship. They wanted to find out what the attitude of residents to wind energy is. Most of the respondents supported the idea of building a wind farm, pointing out that it would bring technological development of the region, decrease unemployment and gain a modern and innovative image of the commune [TNS, 2013]. Also, municipalities that decided to build farms recorded tourism development (windmills are considered a tourist attraction), and ecological education centres are being built in the vicinity. Municipalities with farms promote themselves as environmentally friendly and they charge large fees for renting land. Inhabitants that were speaking negatively about farms were complaining about noise and destruction of the region's natural landscape [Batyk, 2012].

In 2009, international research on nuclear power plants was also carried out. Respondents from different countries were asked whether it is possible and acceptable to locate a nuclear power plant in an attractive tourist destination, and what are the consequences of such a location for the local residents. Answers were obtained from Belgium, the Czech Republic, France, Sweden and Germany. It was found that in the case of the construction of the power plant in the post-war period, less attention was paid to social opinion and a specific location, but they were sought to be built in places with adequate water and remote from large agglomerations. Many power plants were built near large rivers or the sea. These places usually have an increased tourist, historical and agricultural value. However, the construction of a nuclear power plant did not make the region uncompetitive. On the contrary, it was found that tourist traffic increased for a trip to the power plant, thanks to which trade and services in the vicinity also developed. The construction of the power plant allowed the municipality to develop technologically, new infrastructure was built (both road and auxiliary, for example sewage treatment plants) and the number of work places increased. In Sweden, many power plants were built near big cities and this did not meet the residents' opposition [Marczak et al., 2009]. Also, Sweden in almost 20 years of development of this source of energy attained such level that in 1990s. it was main source of energy in that country [Jewell et at, 2019]. In other countries,

residents of towns where there is already a nuclear power plant are, for the most part, positively oriented towards them and trust the security systems installed there [Marczak et al., 2009].

The most common adversities in the construction of a wind or nuclear power plant are the opinion of the residents. Very often, they do not want such a building to arise in their neighbourhood, citing the reduction of the tourist attractiveness of the area and the risks resulting from the operation of a power plant based on renewable or nuclear resources. However, the research cited above indicates that the construction of wind farms or nuclear power plant did not adversely affect tourism in the region, on the contrary, it attracted new people willing to visit such a power plant. Developing safety and energy technologies make these plants environment-friendly and the risk of failure is negligible.

5. Conclusions

All around the world one can see the trends associated with the increasing use of renewable resources for energy production. The European Union regularly issues recommendations that give Member States the goals they must achieve when producing energy. The emphasis is put on the development of technologies for acquiring and storing produced energy, so that the whole process is as environmentally friendly as possible. It can also be noted that nuclear power plants are popular all around the world. But in Poland, more than 70% of energy is still produced from fossil fuels. This is a negative phenomenon, and the transition to energy production from renewable resources is a tedious and long-lasting process. Also the transition to nuclear energy may prove impossible in the coming years due to the high resistance of the society. However, the research carried out shows that electric and wind farms positively influence the development of the region as an investment-attractive area, and the windmills and batteries put up are treated as tourist attractions.

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