

Renewable Energy in Sustainable Policies of the European Union

Abstract. This study discusses the problem of sustainable social and economic development in the European Union and a very important element of this growth, which is energy supply. Energy sector based on renewable energy sources is a leading and promising technology of fighting global warming, one of the most serious challenges to development of contemporary civilization. The article presents the assessment of the effects of previous activities in terms of enhanced utilization of energy from renewable sources. Renewable energy technology is deemed to be the cleanest and the most economically efficient energy technologies.

Streszczenie. W pracy omówiono problem zrównoważonego rozwoju społeczno-gospodarczego Unii Europejskiej i bardzo ważnego elementu tego rozwoju jakim jest zaopatrzenie energetyczne. Energetyka oparta o odnawialne źródła energii jest wiodącą i perspektywiczną technologią walki z globalnym ociepleniem, jednym z najważniejszych wyzwań rozwoju współczesnej cywilizacji. Artykuł przedstawia ocenę efektów dotychczasowych działań w zakresie większego wykorzystania energii ze źródeł odnawialnych. Energetyka odnawialna należy do najczystszych i ekonomicznie efektywnych technologii energetycznych. (**Energia odnawialna w zrównoważonej polityce Unii Europejskiej**).

Keywords: renewable energy, sustainable development, achievement of goals, the European Union.

Słowa kluczowe: energia odnawialna, zrównoważony rozwój, realizacja planów, Unia Europejska.

Wstęp

Sustainable development is a development where a process of integration of political, economic and social activities while preserving ecological equilibrium and continuum of fundamental natural processes in order to satisfy the needs of individual societies and citizens of both contemporary and future generations. The idea of sustainable development reflects human responsibility for common good such as Earth resources.

Particularly unfavourable effect on natural environment is from the processes of extraction and processing of fossil fuels which are energy carriers. Conventional energy technologies based on coal is one of the main consumers of environmental resources and causes degradation of lands and side effects of increased consumption i.e. pollution in soil, water and considerable emissions of combustion products to the atmosphere.

An alternative source of energy supply should be renewable energy. Renewable energy sources are typically of local character, and can be used without the need for building of a special, centralized technical infrastructure. As small, dispersed and user-friendly technologies with great energy potential, renewable energy sources stimulate policies and development plans in each country [1,3,5].

EU Energy Policies

New EU policy in the area of energy and the environment, which was agreed upon by the European Council in March 2007, envisages a far-reaching programme of political initiatives aimed at achievement of the three main objectives of community energy policy, i.e. **sustainable energy production, and supply competitiveness and safety**. In order for these objectives to be realized, the EU took commitment to meet the demands of **20-20-20** targets by 2020, i.e. reduction in emissions of greenhouse gases by **20%**, increase in share of renewable energy in total energy consumption to **20%** and increase in energy efficiency by **20%**.

Adoption of 20-20-20 package allowed the EU and its members to take measures towards implementation of more balanced and secure energy policies which would be increasingly more supported with new technologies.

Development of **renewable energy**, such as wind, solar, water, biomass and sea energy must be treated as the biggest potential source of energy in the EU. A key role for maximization of utilization of natural EU resources is

played by new technologies. Production of renewable energy is not only a priority for energy safety and sustainable energy, but it also opens up great opportunities for EU economy. This objective is currently being achieved in the context of strategic plan in the domain of energy technologies, which was adopted by the European Council in 2008 [6]. Great progress in implementation of this plan has been made through six European industrial initiatives: wind energy, solar energy, bioenergy (second-generation biofuels), CCS (carbon capture and storage), heat and power grids and sustainable nuclear fission. These initiatives emerge in close cooperation with current technological platforms and the European industry.

Role of renewable energy in energy supply in EU countries

Shares of renewable energy in energy consumption in the European Union state are presented in Fig. 1 [4]. The chart concerns all 27 states which belong to the EU. The level of achievement of the plan in 2009 by individual states is represented by dark bars. For example, in 2009 in the UK, percentage of renewable energy sources in primary energy consumption in total amounted to merely 3.2%, this value in Belgium amounted to 3.6%, whereas the opposite side of this chart is taken by Latvia (38.4%) and Sweden (37.3%). The value for the European Union in total amounted to 9.4%.

Plan for the year 2020 is represented by white bars. It can be observed that these levels differ considerably. Commitments adopted by the EU member states are a result of evaluation of previous share of renewable energy in energy consumption. Furthermore, during determination of commitments, the emphasis was on the resources and availability of individual renewable sources, potential and status of social and economic development in individual European Union countries. As can be observed in the figure, the levels adopted for the commitments for 2020 range from 10% for Malta to 49% in Sweden. Poland, with 15% commitment, takes the middle position of EU countries.

According to the data by Eurostat [7], share of renewable energy sources in energy supply in EU countries in 1999-2009 was almost doubled (Fig. 2). Share of energy from renewable energy sources in EU consumption in 1999 amounted to 5%, whereas in 2009 it amounted to over 9%. The biggest progress in utilization of green energy was

observed in Denmark (increase from 8.1% to 16.7%), Sweden (from 26.6% to 34.4%), Germany (from 2.4% to 8.5%). Poland is not a record-breaking country, with the increase in share of energy from renewable energy sources from 4% in 1999 to 6.6% in 2009 [7].

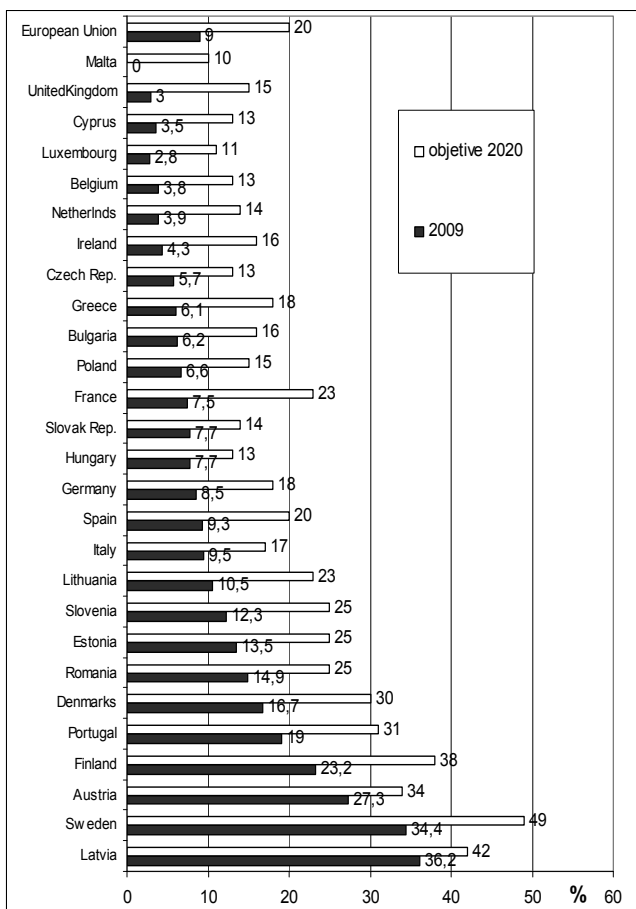


Fig.1 Share of renewable energy in gross energy consumption in EU countries in 2009 and commitments adopted for 2020 [%], [4,5]

Crude oil in 2009 was still the main source of energy in the EU, with 37% share in overall consumption.

In the decade from 1999 to 2009, share of gas in energy consumption in the EU also rose, from 22% to 24%. Nuclear energy remained at similar level (ca. 14%). Use of solid fuels (coal) in the EU in total declined, from 18% to 16%. Poland is still a leader in use of coal, which was a source of energy consumption at 54% in 2009, although this means a decline compared to 1999 (65.1%).

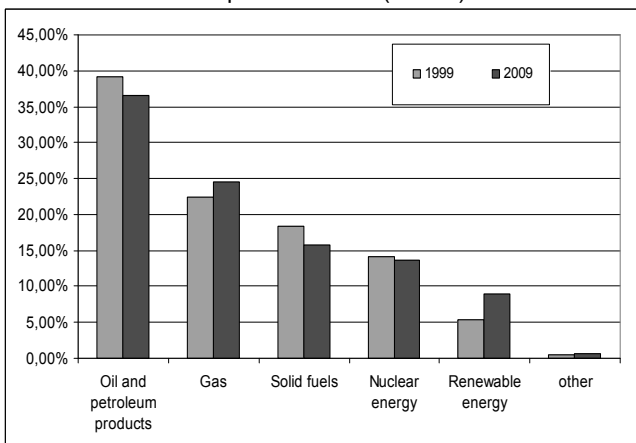


Fig. 2. Percentage changes in the structure of gross final energy consumption in the EU countries [%], [7]

Another interesting tendency is share of individual types of renewable energy in renewable energy consumption. A percentage structure for the European Union in 2009 is presented in Figure 3 [4].

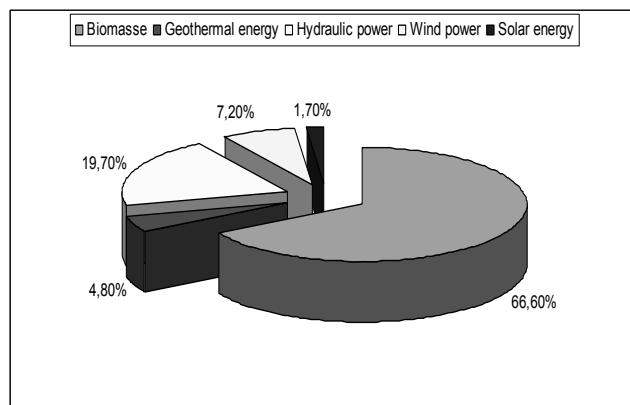


Fig. 3. Structure of types of renewable energy in renewable energy consumption in EU countries in 2009 [4]

As can be observed, 66.6% of renewable energy consumption was from biomass. Considerable share (19.7%) was shown by water energy, whereas geothermal energy contributes to this balance with 4.8%. Wind energy, which, similarly to water energy, is processed mainly into electricity, ensures 7.2% of share. Solar energy constitutes 1.7%. Share of individual types of sources were averaged for the whole EU. They exhibit huge differentiation, which results from availability, policies of support for individual states and economic development.

Analysis of implementation of 3x20 targets

Renewable energy sources have been developed for many years through extended systems of support for all European Union countries. The European Commission presented the assessment of the effects of previous activities in terms of enhanced utilization of energy from renewable sources [8]. The communication describes the accomplishments of EU countries in this area and key challenges for achievement of targets adopted for the year 2020. Evolution of percentage share of different types of renewable energy in the energy in total for the whole EU in the past decade is presented in Figure 4. Data for the years 2009 and 2010 were given based on an approximation of trends from recent years for individual types of energy. Thus, some discrepancies occur between the levels of energy from renewable energy sources in 2009 presented in Fig. 1 and 4. The directives for electricity targets from renewable resources [9] and the directive on biofuels [10] defined estimated targets which assume achievement of 21-percent share of renewable energy in electricity production by the EU until 2010 and 5.75% share of renewable energy as replacement of petrol and diesel fuel in transport. Analysis of the levels obtained through approximation shows that the targets included in the directive have not been met. Definite confirmation of this estimation can be obtained after official report on the actual data, which will presumably make corrections in the forecast data for 2010 contained in Fig. 4.

Slow progress in terms of achievement of the set goals and the need for strengthening of development of renewable energy sector in all the member states rather than merely a few countries are the reasons for changes in political approach, which was reflected by adoption, in 2009, of the directive on renewable energy sources [5]. The scope of the new directive encompasses energy consumption in total, including the consumption for heating

and cooling purposes. It also defined legally binding (rather than merely estimated) national targets which assume achievement of 20% share of renewable energy in the EU by 2020.

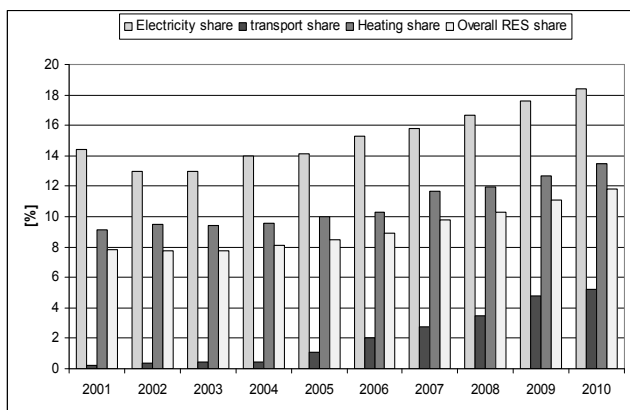


Fig. 4. Percentage share of renewable energy in total and its types in energy consumption in the EU [8]

The forecasts of the member states demonstrate that the sector of renewable energy will be growing by 2020 faster than in the past. Almost half of the member states (Austria, Bulgaria, Denmark, France, Greece, Spain, Lithuania, Malta, the Netherlands, Germany, Czech Republic, Slovenia and Sweden) plan to exceed their own targets and make the surplus targets available to other member states. Luxembourg and Italy plan that insignificant part of renewable energy necessary to meet the targets will be 'imported' in the form of transfer from member states which will demonstrate surplus or from third party countries. If all these forecasts for production will be met, general share of renewable energy in the EU will exceed 20% in 2020 [8]. It is estimated that total consumption of renewable energy in the member states will be doubled, from 103 Mtoe in 2005 to 217 Mtoe in 2020 (gross final energy consumption). The electricity sector will be responsible for 45% of this rise, heat energy sector will involve 37% and transport industry will be responsible for 18%. The forecast development of the three sectors in terms of consumption of renewable energy in the EU is presented respectively in Figures 5, 6 and 7 [8].

Electricity from Renewable Energy Sources

Plan of use of individual renewable energy sources by 2020 for electricity production is presented in Fig. 5. Significant contribution in achievement of this plan is from the energy obtained from technologies which utilize wind as a source. Wind energy will in 2020 account for 27% of the planned consumption of electricity from renewable energy sources. Two third of this energy will be obtained inland, whereas one third will be produced offshore. Solar energy industry will also see increase, particularly in terms of

Based on plans from the member states by 2020, according to the analyses by the Commission [8], share of renewable energy in energy portfolio should amount to 37%. The expected increase in electricity share from renewable energy sources involves several effects. Firstly, the necessity of acceleration of the process of modernization of combined heat and electricity networks is emphasized. Electricity systems must become more and more integrated and flexible. It will be necessary to develop and strengthen the new infrastructure, which should also focus on development of intelligent network technologies [8]. One of the biggest challenges connected with network infrastructure is connecting sea potential, particularly in terms of wind energy in northern seas of Europe, including

development of networks in the sea and land. Modern wind power plants, connected with intelligent networks of consumers will be competitive, both economically and ecologically, to other energy sources. photovoltaics.

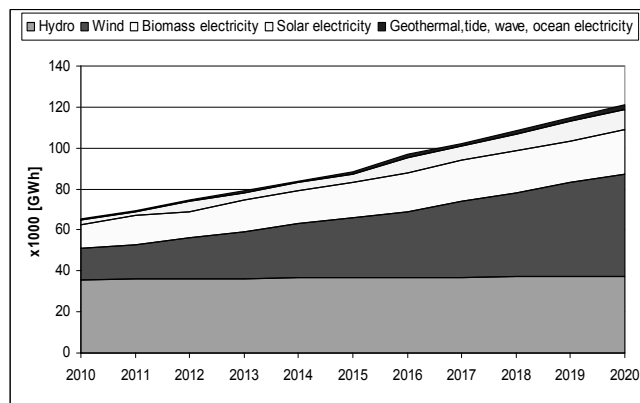


Fig. 5. Use of renewable energy sources for electricity production [8]

Wind power plants in 2020 will be the cheapest renewable electricity source, with its costs being comparable with the costs of electricity production in operating nuclear power plants [2,8].

Wind energy sector will be a fundamental element of the market of green electricity in Europe and, driven by climate policies and quick economic development, it is an essential segment of the whole energy market.

Heat and Cooling from Renewable Energy Sources

The chart in Fig. 6 presents the forecast development of technologies of heat and cooling in the nearest decade. A dominant technology is use of biomass, whose share is dominant and is likely to maintain this tendency in the nearest decade. The second, in terms of share, source of production of heat and cooling will be utilization of heat pumps. Solar radiation energy and geothermal energy supplement the group of renewable sources used for heat production.

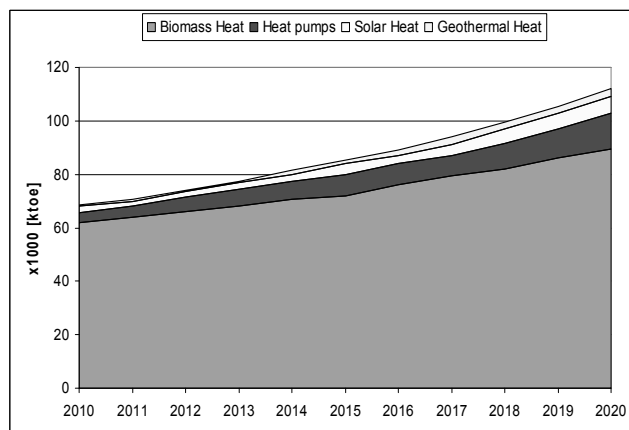


Fig. 6. Utilization of renewable sources of energy production for heat and cooling [8]

Current progress in utilization of renewable energy sources in heat sector was limited due to lack of sufficient support in the most of member states. However, this situation will change in the nearest years as a result of inclusion of heat and cooling sector in the new EU framework in terms of renewable energy [8]. The member states plan the reforms in the system of subsidies, feed-

in tariffs or other instruments in heat energy sector. Therefore, positive changes and investments in the European industry of pellets from biomass, modern designs of biomass boilers, co-firing technologies and biofuel refining can be expected.

Fuels for Transport from Renewable Energy Sources

The plans of the European Union also define the method of achievement of 10% renewable energy share in transport by the member states. A dominant share will be played, similarly to the present situation, by first generation fuels, which is presented in Fig. 7. In 2020, share of biofuels of second generation and electricity in car transport will be insignificant, but its tendency also shows rising character.

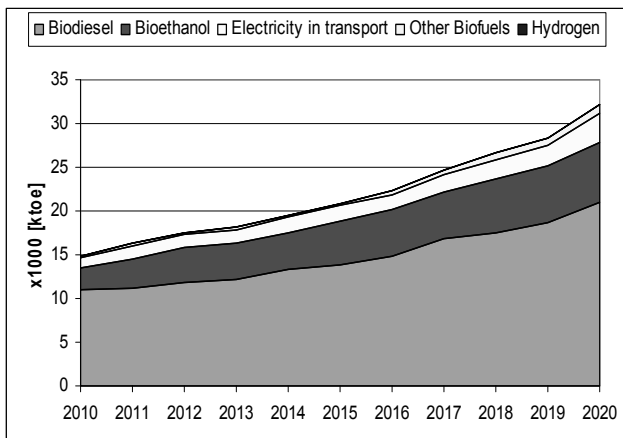


Fig. 7. Use of renewable energy sources in transport fuels [8]

Objectives for EU member states

Achievement of the targets by 2020 necessitates further investments and research on advanced technologies of renewable energy production. An important challenge will be improvement in efficiency of energy acquisition from offshore wind energy, photovoltaic energy and use of electrical vehicles and second generation fuels.

At the first place, the European Commission urges the member states to implement their own national action plans for renewable energy, presented in the beginning of the year 2010 and to facilitate the requirements for infrastructure development and acceleration of network development in order to integrate higher share of electricity from renewable energy sources. The most recent data demonstrated that the most of the member states have not met the indicative targets for the year 2010 and, in consequence, the targets have not been met by the whole European Union. The European Commission also calls on European countries to double annual capital investments in renewable energy sources from 35 billion euro a year to the level of 70 billion euro [8]. The European Commission emphasized that support for renewable energy sources at the EU level is relatively low and it plans the review of financial instruments used directly by the EU, managed together by the member states and those managed by other institutions in the context of working over EU financial plans for the next period, i.e. after 2014.

Summary

The limited and scattered development of European renewable energy industry in the decade before the year 2008 resulted partially from limited legal frameworks of the EU. However, the EU recognizes that renewable energy will be a key element in future low-emission energy sector, thus it implements comprehensive and solid legal frameworks. Implementation of the directive and presentation of plans is

a manifestation of the progress and should be provided concrete support [8].

The European Commission, when analysing current implementation of the plan by 2020, deemed achievement of this plan as possible through:

- realization of national action plans in terms of renewable energy sources,
- planning infrastructure with respect to the principles and legislature in the EU in terms of environmental protection,
- development of heat and electricity grid which matches rising requirements of energy transmission from renewable energy sources,
- development of mechanisms of cooperation and initiation of integration of renewable energy in the European market,
- reforms in current national systems of support that ensure stability for investors.

In order to support these initiatives, the European Commission ensures in its documents the cooperation with the EU member states on implementation of the directive. The European Union ensures improvement in effectiveness of financing in terms of projects in the domain of renewable energy. All the states should analyse domestic support systems in terms of ensuring the best possible conditions for development of renewable energy in Europe.

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