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Реакліматизація зубра у Сколівських Бескидах (Східні Карпати)

Реакліматизацію зубра у Східних Карпатах проводять з 1965 р. На початку 90-х років ХХ ст. чисельність поголів'я досягло максимальної чисельності – близько 270 особин. Тут існувало три субпопуляції зубра (Майданська, Надвірнянська, Буковинська). З 90-х років минулого століття зареєстроване зменшення чисельності. Останніх зубрів Надвірнянської субпопуляції реєстрували в кінці 90-х років минулого століття, останні звірі Майданської субпопуляції ймовірно загинули зимою 2008-2009 рр., зменшується чисельність Буковинської субпопуляції. Сучасна чисельність поголів'я Буковинської і Майданської субпопуляцій є незначною і становить понад 40 голів, що зумовлює необхідність здійснення заходів з охорони і відтворення поголів'я зубрів. Перспективи реакліматизації зубра у Східних Карпатах полягають: у створенні розплідників на території НПП «Сколівські Бескиди», Вижницького НПП; у завезенні особин із Уладівської субпопуляції (Україна), Білорусії, Польщі, Росії та інших європейських країн для формування у новостворених розплідниках стад зубра; створенні двох нових місць оселення звірів у Східних Карпатах на території Івано-Франківської областей; завезення зубрів у біотопи поширення Буковинської субпопуляції.

Ключові слова: реакліматизація, субпопуляція, чисельність, розплідник.

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TRANSFORMATION OF ENERGY BASE IN POLAND. ENERGY CONSERVATION AND USE OF RENEWABLE ENERGY

The article is about the energy transformation of the Polish economy over the last 25 years. The basic steps of transformation, mechanisms of white certificates, energy audits, energy conservation processes in the industry. Also, the article focuses on the use of renewable energy sources in Poland, such as biomass, hydropower engineering, wind power engineering, etc., as well as mechanisms for financing projects in the field.

Keywords: energy efficiency, renewable energy sources, biomass, energy audit.

Introduction. Continuing increase in the cost of energy (economic aspect), and the need to conduct business with minimal damage to the environment (environmental aspect) requires implementation of energy-saving technologies and the use of renewable forms of energy. The energy consumption efficiency is an important economic factor. Increased energy efficiency is of benefit to the economy, namely:

- It is an important factor of the country's energy security due to the decreased energy resources import;
- It enhances the economy's competitive capacity by cheapening production cost, it improves financial condition of enterprises and households;
- It contributes to creation of additional jobs;
- It creates the basis for innovative economy;
- It reduces harmful atmospheric emissions and improves the air quality.

The history of the transformation period. The last 25 years were a turning point for Poland's economy. The nondemocratic political system and administrative-command economy, whose characteristic features were wastage of natural resources, lack of modern technologies, considerably high level of energy consumption and atmospheric emission, were replaced by market economy. Since 2004, Poland has been a member state of the European Union, which has offered strong possibilities for further development. Beginning in the latter part of the 1990s, restructuring of the energy sector of the economy has been started in Poland. On the one hand, this was compelled by requirements of market economy which the then Poland's energy industry was not tailored to meet, and, on the other hand, there were demands concerning the reduction in harmful atmospheric emission, first of all, sulphur dioxide (SO₂) and nitrogen dioxide (NO₂) [4]. Starting in 1994, the main instrument which aimed at promoting modernisation of the energy sector was long-term contracts. These were signed between energy enterprises and Polish electric power supply network. The contracts specified volumes of sales, prices, and the term of power supply (ranging from 10 to 20 years).

This enabled funds to be raised and invested for the purpose of re-equipment of energy enterprises. On 17 September 1996, Poland's Council of Ministers adopted the programme of demonopolization and privatisation of the energy sector, which also implied promotion of environmentally benign modernisation of energy enterprises. As from 1st January 1998, the prices for heat energy have been raised to the market level, which allowed for installation of environmental protection facilities at enterprises.

The energy legislation that was adopted on 5 December 1997 obliged the energy enterprises to prepare development plans which were to be adjusted to environmental requirements as well as to the possibility of obtaining energy from renewable sources. The producers of energy from renewable sources were granted tax relief and preferential prices for "green energy" [4]. Along with this, a paradigm dominated in the latter part of the 1990s according to which economic growth was associated with increased energy consumption. Such an approach led to increased energy consumption, in particular gas that was supplied from Russia; this also resulted in freezing investment into energy efficiency projects and renewable energy sources development, and, consequently, to waste of time needed for radical modernization of the energy industry. It was not until 2008 that this paradigm (development = consumption) was abandoned and a demand for zero energy development for Poland was first emphasized in the document "Polish energy policy up to the year 2030". The energy efficiency is a top priority in Poland's energy policy up to 2030 according to the document adopted by the Government in 2009.

This concept has received support among the most influential political parties in the country. Poland's government has taken on obligations to improve the energy efficiency by 9 % by the year 2016 in reference to the forecast of primary energy consumption, yet the potentials for further improving energy efficiency remain still great. The energy consumption in Polish economy is twice as much as the average in the European Union countries. This factor should be taken into consideration to improve competitiveness of Polish economy and create new jobs. The financial prospects of the European Commission for the period 2014-2020 provide for as much as 20 % of funds to be allotted from the mutual fund for supporting and promotion of energy efficiency as well as the development of the renewable energy sources (RES).

In recent years, the energy efficiency in Poland has improved. During the period 1998-2009, the energy consumption in the economy decreased by roughly 30 %. The most drastic decline in energy consumption occurred in the industrial sector as a result of the privatization and modernization processes. The reduction of energy consumption in the households is largely influenced by the growth of prices for energy carriers and investments into heat engineering modernization.

White certificates. White certificates were presented in Directive 2006/32 WE by the European Parliament and Council of Europe as one of the mechanism necessary to achieve the objective: enhancing energy efficiency of end power consumption by 9 % by the year 2016, and 20 % by the year 2020.

The main addressee of the certificates is companies that supply electric power, gas and heat (energy service companies) to end-users. These companies must receive a certain number of certificates according to the amount of energy sold. If the sellers do not receive the necessary number of certificates, they will have to pay for them.

As to the instruction, the energy companies that sell electric power, heat and gas are to obtain energy efficiency certification which corresponds to, at least, a 1.5 % amount of energy saved per year. The mechanism of white certificates is an innovative market instrument which provides a system-based support for projects aimed at energy saving such as heat engineering modernization, insulation of industrial installations and others [2, 3]. Energy saving is possible to occur only when we have an accurate knowledge of "where, how much and when" this energy was consumed.

The **energy audit** makes it possible to trace at a certain enterprise all operations associated with energy consumption and then to draw up a plan of reducing energy consumption. The analysis made by the auditor allows for all-round examination of the equipment, installations, technological lines, thermal insulation condition, as well as the condition of machinery at the time under review. The energy audit specifies methods by means of which the energy consumption can be reduced, it defines necessary measures to bring about the most effect, and estimates cost budgeting for each action taken, also it determines expected time of cost recovery. The next mechanism for increasing energy efficiency is the Fund for heat engineering modernization and repairs which was established in 1998. The Fund supports projects for replacing household heating boilers, heat insulation of walls, heat pipelines and others. An important instrument for promotion of energy efficiency is targeted additional financing of measures to reduce energy consumption which comes from the State's Fund for Environmental Protection and Water Management, in particular within the framework of Green Investment Scheme (GIS). This originates from the mechanism of greenhouse gas trading. Worthy of notice is the

program for financing the development of sustainable energy, this is to support small and medium-sized enterprises by granting them soft loans for investments into new technologies and equipment that reduce energy consumption.

Energy conservation at industrial enterprises. The reduction in energy consumption at industrial enterprises implies carrying out various measures beginning with ensuring proper maintenance and operation of the equipment as well as appropriate production arrangement, including minor modification of the equipment, and ending with investments into new energy-saving equipment and technologies.

The introduction of new technologies, that allow energy consumption to be significantly reduced, results in decreased energy consumption for the whole branches of industry. The application of the method for “dry” manufacture of cement is an example. As a rule, these are measures which require sizable capital investments and are possible to be carried out in a selected group of enterprises. As is evident from the experience of most countries, a notable advance can also be achieved when making modifications in standard equipment that is widely used in industry and which does not necessarily require heavy capital investments.

This clearly points to the availability of essentially simple alternative means for energy conservation, this being true for the areas of energy use such as lighting, ventilation, creation of indoor climate, air compression, heat exchange, steam generation, power distribution etc.

The possible ways of energy saving at industrial enterprises are as follows:

- Gaging the energy consumed, energy consumption monitoring;
- Lighting installation (making the most use of natural lighting, replacement of lamps by energy-saving ones);
- Monitoring of the operation of compressed-air system, lowering their costs;
- The application of energy-saving pneumatic systems (e.g. pneumatic guns);
- The use of energy-saving engines, fans, pumps;
- Monitoring the operation of heating boilers: lowering steam pressure in the boilers, improving heat insulation, elimination of steam and heat loss in transferring;
- Heat insulation of piping;
- Up-to-date insulated entrance doors to workshops;
- The use of air recuperators;
- Properly adjusted system of indoor climate [9].

Renewable energy sources (RES). Renewable energy sources can make a significant share of the energy balance, assist the growth of energy security, including improving energy investment in areas with poorly developed energy infrastructure. Potentially the largest consumer of renewable energy sources may be agriculture, houses and transport. Especially for regions with high unemployment, renewable energy sources create new possibilities, including the emergence of new jobs[2, 5].

The development of RES-based energy industry can be helpful in handling many environmental problems caused by the traditional energy industry.

Supporting RES has become an important objective of the European Union’s policy. In 1997, the RES development strategy for the EU countries was presented, this forming the basis for taking actions on the EU territory. The strategy provides for a 20 % share of RES to be achieved in the fuel-and-power balance by the year 2020. The share of RES in the energy consumption for Poland in 2020 is to make 15 %.

Biomass. The most important renewable energy source in Poland is biomass. It has a 98% share in the renewable energy market and its use will continue to grow. Bio-

mass resources for energy purposes in Poland are the highest among all other renewable sources. Its use, in comparison to other renewable energy sources, is also dominant in all energy sectors.

About 20 000 people are employed in Polish enterprises engaged in biomass supply to the energy market and several thousands more is engaged in cooperating companies. The majority of plants are located in areas with above-average level of unemployment and less industrialized regions where is no alternative employment. But in Poland biomass was used mostly for “co-burning”. In 2011, Poland’s power engineering used more than 90% of “co-burning” technology.

Hydropower engineering. Hydropower engineering in Poland has a long tradition of practice. Water-power resources of Poland are rather modest, taking into consideration not-too-heavy precipitations, high water-absorbing capacity of the soils, and small differences in heights. The capacity of now operating hydroelectric stations can be raised by 20-30 % through upgrading power-generating units. Poland’s water-power industry, despite rather moderate level of exploiting the now existent potential, has considerable opportunities for further development. The number of small hydroelectric stations, which are largely built at natural elevations, is increasing at the expense of private investments.

Geothermal energy. The main resources of geothermal waters are concentrated in the lowlands, in particular in the region between Szczecin and Lodz, in the Grudzionsko-Warsaw region and also in the Precarpathian region. A characteristic feature of all geothermal investments is high start-up expenditures, which is attributed to the necessity of conducting drilling works, the cost of which amount to 50-60 % of all investment expenses. Financing drilling-based geological works from the Fund for Environmental Protection and Water Management was a contributory factor to bring into existence several geothermal heat stations in Pyzytsy and Podkhaliu.

Wind power engineering. Wind power engineering in Poland began to evolve in the early 1990s, mainly along the coast line. The most favourable conditions for wind energy use are found in the following regions: the Baltic Sea coastline, Suvalshchyzna and Mazovian plain. Towards the end of 1999, 14 network wind power farms with the total registered capacity of 3.5 MW were put into operation. In addition, there operate more than 50 small autonomous wind-driven power installations. Great interest has been shown by investors in wind-driven power installations, especially in north-western Poland where new projects are arising.

Solar power engineering. Solar energy is the least used form of energy in Poland. The meteorological conditions in Poland are characterized by rather uneven distribution of solar radiation throughout the year, about 80 % of the year’s amount of solar radiation falls within six months of the spring-summer period. The character and structure of the solar radiation suggest low potentials for its usage, especially during the winter time. An increase in solar energy use in Poland would be possible due to more extensive application of solar heat collectors of flat liquid type for heating water and houses. Photocells which convert solar energy into electricity are few in Poland.

Financing of projects in the RES field. The following financial institutions that support the use of RES are operative in Poland: State Fund for Environmental Protection and Water Management, Ecofund, Thermal Engineering Modernization Fund, Regional funds for nature protection and water management. There also exist financial in-

stitutions which can provide financial support for RES projects in rural areas (for agricultural development): Agricultural Programmes Foundation, Agency for Agricultural Property of the Treasury, Agricultural Foundation. These institutions give soft loans and subsidies that usually make no more than 50 % of the credit costs. There also exist great opportunities for the use of foreign support in this sphere. In addition to the World Bank and well-known European financial institutions, of increasing importance in the sphere of financing of projects are target programmes of the European Commission such as Al-tener II, Synergy, Life, and Framework programme on technological cooperation and preferences.

In most cases, these funds and programmes allow for funding subsidies to prepare investment projects and construct model installations. In the context of further integration into the EU, the following funds may be of importance: PHARE, ISPA, SARARD. In addition to the international funds for financing of RES, there are funds that can be used within the framework of bilateral cooperation with western states such as Denmark, Sweden, and Germany.

Conclusions. Meeting demands of the EU as to the 50 % share of RES in Poland's power balance up to 2020 would be impossible without the government assistance. The current practice in Poland is granting certificates of origin which are issued by President of the administration of energy industry management in accordance with the energy industry law.

The main proof of origin is "green certificate" which came to be granted in the late 2004 – the early 2005 to the producers of energy from renewable sources. Their introduction into National Legislation emerged from Directive 2001/77/EC on green energy promotion. The producers of energy, in addition to the money from selling the energy, receive certificates which they sell at the Polish energy exchange. The energy companies which sell energy to end-users have to purchase the certificates or just pay money instead.

In the nearest future, the energy from renewable sources will make up a significant share in the world and European power balance. The integration into the EU, on the one hand, compels Poland to take actions which promote the development of RES and, on the other hand, makes it possible to make use of the EU's assistance in this field.

Until the present time, the reduction in energy consumption of Poland's economy has resulted from the transformation of the economic system as well as due to the availability of simple reserves for increasing energy efficiency. Although the situation in the sphere of energy efficiency has significantly improved, there is still much to be done and the potential for further improvement is promisingly high. The increase in the share of RES in Poland's power balance has been made possible due to the obligations resulting from the EU Directive 2009/28/EC that provides for an increase in the share of RES by 15 % in the year 2020.

However much has been done as for now (about 11 % RES in the power balance), Poland, as many other countries, is facing a challenge of further transformation of the energy sector and, consequently, its economy. Energy efficiency and the use of RES should become priority tasks for the society, business and the state.

This is the only way to ensure the country's energy security and competitiveness of its economy. To do this would require creation of long-range government's strategy for energy efficiency, conducting an active information campaign for promotion of en-

ergy saving among citizens, businessman and jobholders; it is necessary to set ambitious objectives as to reduction in energy consumption followed by continuous monitoring of attaining these objectives.

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Трансформація енергетичної бази Польщі.

Енергозбереження та використання відновлюваних джерел енергії

Проаналізовано енергетичну трансформацію польської економіки за останніх 25 років. Описано основні кроки трансформації, механізми білих сертифікатів, енергетичного аудиту, процеси енергозбереження на промислових підприємствах. Розглянуто використання відновлюваних джерел енергії в Польщі, таких як біомаса, гідроенергетика, вітрова енергетика та інші, а також механізми фінансування проектів в галузі.

Ключові слова: енергозбереження, відновлювальні джерела енергії, трансформація, біомаса, енергетичний аудит.
