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***The ecological policy of Ukraine
in power sector and area
of alternative power.
Assistance to practical application
of alternative energy sources***

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The main reason of air pollution (including Ukraine) is the energy sector. According to the International Energy Agency, it falls at 75% of emissions of sulfur dioxide, 50% of particulate emissions, 45% of nitrogen oxides and 69% of greenhouse gas emissions (mainly carbon dioxide and methane). It has a close connection with two major environmental problems: an increase of concentration of greenhouse gases and climate change; deteriorating of the air quality and habitat conditions of mankind.

Ukraine is a member of dozens of international and bilateral agreements related to air quality. In particular, the Convention «On the Long-Range Transboundary Air Pollution» (1979), which aims to control emissions of volatile organic compounds and their cross-border flows, the UN Framework Convention on Climate Change (1997). Being one of the participating countries, it is committed itself to develop policies aimed at reducing greenhouse gas emissions. By signing the 1999 Kyoto Protocol and ratified it in 2004, Ukraine must ensure the average annual greenhouse gas emissions during 2008 – 2012 (the first commitment period of Kyoto Protocol) at a level which does not exceed 100% of 1990 level (260 million tons of carbon equivalent per year).

The needs of mankind in the energy increase from year to year, but a lack of energy and disruptions in energy supply have a negative impact on economic development as well as on the conditions of the population.

The direction of the renewable energy usage in energy development was declared as a priority one by the international community.

So, the European Union set a goal for 2010 to increase their stake to 12% (by 2030 – up to 25%), making significant strides in its implementation: Germany is implementing a program «Million Solar Roofs», in Spain in some provinces were taken decisions about the compulsory installation of solar systems on roofs of all buildings, which consume over 30 thousand liters of hot water per year, and for new buildings solar systems are provided at the stage of projects; more than 800,000 m² of solar water-heating systems are used in Greece. In most economically developed countries the projects for assessment of the Solar power potential of buildings' roofs in settlements were implemented: in the town of Bathurst (Canada) – project «Solar mapping» (The Solar Mapping Project), in 13 U.S. cities: Boston («Solar Boston»), New York York, Pittsburgh, Portland, San Francisco etc.

At the national level in Ukraine, in the field of energy development and solution of energy problems were established two main priorities – energy efficiency and developing alternative energy sources.

Government policy in the field of energy conservation and implementation of the alternative sources of energy is reflected, above all, in the formation of an appropriate legislative framework and the designing of energy strategy development and also integrated regional energy programs, defining the medium-term policies to solve environmental and energy issues and problems.

The legislative framework of Ukraine is represented by the laws «**On Energy**» (1994), «**On alternative kinds of liquid and gaseous fuels**» (2000), «**On alternative sources of energy**» (2003), «**On amending some laws of Ukraine for establishing a «green tariff»**» (2008), «**On Amending the Law of Ukraine» On Electricity «for promoting the use of alternative energy sources»**» (2009).

First Energy Strategy of Ukraine – *the National Energy Program of Ukraine up to 2010 was approved in 1996. Among comprehensive state programs can be identified: a comprehensive state energy conservation program of Ukraine (1997), a comprehensive program of building wind farms (1997), the program of the state support for the development of alternative and renewable energy sources and small hydro-and thermal power (1997), the reconstruction of thermal power plants of Ukraine (2002).*

Preliminary results of the implementation of the National Energy Program were announced in 2004 but they were not so efficient. In this regard, the Government had decided to develop an advanced energy strategy. In 2006, the Cabinet of Ministers of Ukraine approved **the Energy Strategy of Ukraine for the period till the year 2030.**

Ecological constituent of *the Energy Strategy to 2030* is represented by several major directions related to the energy sector ecologization:

- energy conservation;
- growth of energy efficiency of power generation systems;
- improving the quality of coal used in thermal power plants;
- Development and implementation of systems of continuous monitoring of environmental performance of power generation facilities;
- development of alternative energy sources;
- introduction of green certificates and special rates (assuming that they'll be tested within the framework of special programs and activities for implementation of the Energy Strategy).

The most important step in the development of practical usage of alternative energy sources in Ukraine, was the adoption of the Law «**On alternative sources of energy**» in 2003. The law defined the legal, economic, environmental and organizational principles for the use of alternative energy sources and contributed to their wide use in the fuel and energy complex. It became the basis for the further development of the regulatory framework.

Projected ways and directions of strategic development of alternative energy sources in Ukraine, according to the developers of *the Energy Strategy to 2030*, contribute to the concerted efforts of the European Community in the energy sector, and meet all the basic principles of the Green Paper «European Strategy for sustainable, competitive and secure energy» (2006).

According to *the Energy Strategy to 2030*, technically achievable annual energy potential of alternative energy sources in Ukraine is 79 million tce.

Economically achievable potential of these sources of energy (according to basic scenario) is 57.7 million tce, of which renewable energy sources (RES) has 35.5 Mtce.

As of today, the share of alternative energy sources in Ukraine's energy balance is 7.2% (0.8% of them – RES). It is assumed that the optimal scenario of development, this share could rise to 19% by 2030

It is expected that the energy use of renewable energy (basic scenario of the Energy Strategy) in the main areas for 2030 will be the following:

- **Bioenergy** – 9,2 million tce / year;
- **Solar energy** – 1.1 million tons of fuel equivalent / year;
- small hydroenergetics (less than the installed capacity of 10 MW) – 1.13 million tce / year;
- **Geothermal energy** – 0.7 million tons of fuel equivalent / year;
- **Wind energy** – 0.7 million tons of fuel equivalent / year;
- **thermal energy of the environment** – 22.7 million tons of fuel equivalent / year.

According to the optimistic scenario, the predictable electricity generation of RES (non-registering the production of electricity at small HPP and bio-fuel) by 2030 could be 2.1 billion kWh. For comparison, the projected electricity production at thermal power stations – 211.4 billion kWh, while at the nuclear power plants – 238.3 billion kWh (Fig. 2).

It should be noted that several Ukrainian non-governmental organizations treat their developed strategy of alternative energy – The concept of non-nuclear energy development path Ukraine (2006) – the possibility of increasing the share of alternative energy sources in energy balance in 2 – 3 times, compared with Energy Strategy to 2030.

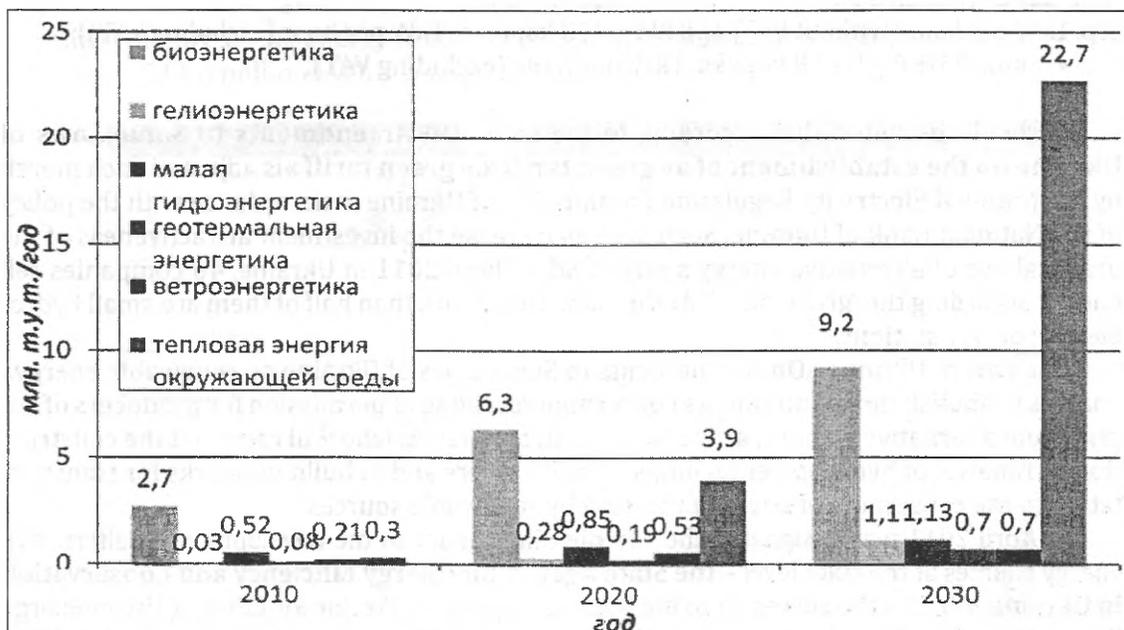


Fig. 1. Energy use of renewable energy (basic scenario)

The next important step in the practical application of alternative energy sources in Ukraine, was the adoption of the Law «On Amendments to Some Laws of Ukraine on the establishment of» green tariff «in 2008. It was determined that the electricity produced from alternative energy sources, electricity wholesale market of Ukraine is obliged to buy energy according to «green tariff» – the fixed minimum rates that are higher than tariffs for energy produced from traditional sources.

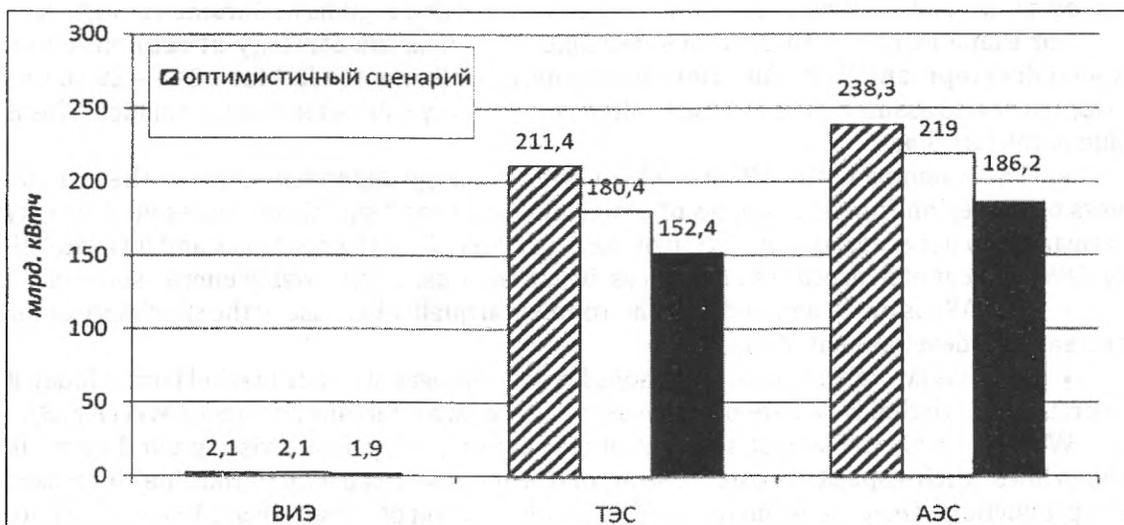


Fig. 2. Projected electricity generation by 2030

Directly **«green tariff» was introduced in Ukraine in 2009**. The minimum size for companies producing electricity by:

- **wind energy** (installed capacity less than 600 kW – 70.15 kopeks. 1kW per hour (excluding VAT), the installed capacity of 600 – 2000 kW – 81.84 kopeks. 1kW per hour (excluding VAT), the installed capacity of more than 2000 kW – 122.77 cop. 1kW per hour (excluding VAT));
- **Biomass** – 134.46 cop. 1kW per hour (excluding VAT);
- **Solar energy** (ground-based objects – 505.09 cop. 1kW per hour (excluding VAT), objects that are installed on the roofs of buildings, the installed capacity of less than 100 kW – 484.05 cop. 1kW per hour (without VAT) 100 kW – 463 kopeks. 1kW per hour (excluding VAT));
- **small HPP** – 84.18 kopeks. 1kW per hour (excluding VAT).

It should be noted that according to the **Law «On Amendments to Some Laws of Ukraine on the establishment of a» green tariff «,» green tariff »** is adjusted each month by the National Electricity Regulation Commission of Ukraine in accordance with the policy of the National Bank of Ukraine. Such actions increase the investment attractiveness of the practical use of alternative energy sources. So, in June 2011 in Ukraine, 46 companies sell energy according to the 'green tariff'. At the same time more than half of them are small hydro-electric power stations.

The Law of Ukraine «On Amendments to Some Laws of Ukraine on renewable energy» enables to abolish the requirements concerning receiving of permission for producers of energy from alternative sources, as well as for entrepreneurs, who will carry out the construction or renewal of hydropower facilities on small rivers and to build networks for transportation to the consumers of energy produced by renewable sources.

In April 2011 was designated the coordinating agency in the development of alternative energy sources at the state level – **the State Agency for Energy Efficiency and Conservation in Ukraine**, which is the successor to the National Agency of Ukraine for Efficient Use of Energy Resources and the State Inspectorate for Energy Conservation (*government body of state administration who acted in the National Agency of Ukraine for Efficient Use of Energy Resources*).

In the further implementation of **the Energy Strategy of Ukraine for 2030** it is planned to develop a detailed concept of development for each type of alternative energy sources, to improve the existing legal framework in the field of application of alternative energy sources, as well as to develop effective economic measures that improve the investment attractiveness of this Energy sector (for example, preferential loans, tax exemptions, etc.).

Within Energy Strategy of Ukraine, taking into consideration the regional natural and socio-economic specificities, separate strategies of areas and regions of Ukraine are formed.

For example, in the Autonomous Republic of Crimea, **the Strategy of economic and social development of the Autonomous Republic of Crimea (ARC) for 2011 – 2020** was adopted, it also assumes an increase of alternative energy sources in energy balance. This is due to the fact that:

- The economy of the ARC has a high level of energy dependence, due to the remoteness of the region from the centers of power in Ukraine and significant losses in electricity transmission networks, the depletion of existing fields of energy resources and low-intensity development of hydrocarbon resources, insufficient use of renewable energy sources.
- The ARC is made demands for environmental quality because of the specificity of the recreational development of the region.
- ARC has favorable natural conditions for development of power in wind farms. Today, it operated 543 windmills (4 state-owned enterprises) with a total capacity of 63.1 MW (**Fig. 3**).

Wind power is the largest segment of alternative energy. Four existing wind farms in the Crimea (their capacity is over 70% of total wind power capacity of Ukraine) increased the production of electricity almost for 6 times for a period of 5 years (Fig. 3). Now the share of electricity produced by wind farms, represents 10% of the total energy generated by its

own generating capacity of the republic. In the next 1-2 years the increasing of the capacity of existing wind farms more than twice is expected.

- ARC also has sufficient capacity for the development of solar energy (the average annual solar radiation in the region up to 1400 kWh / m²) (Fig. 4). Solar power station with capacity of 2.5 MW (draft Austrian company ActivSolar) was launched in 2010. In the nearest future the company plans to complete construction of an additional 5 MW. The power plant is connected to public electrical supply network and has a guaranteed sale, in accordance with the law of Ukraine about «green tariff».

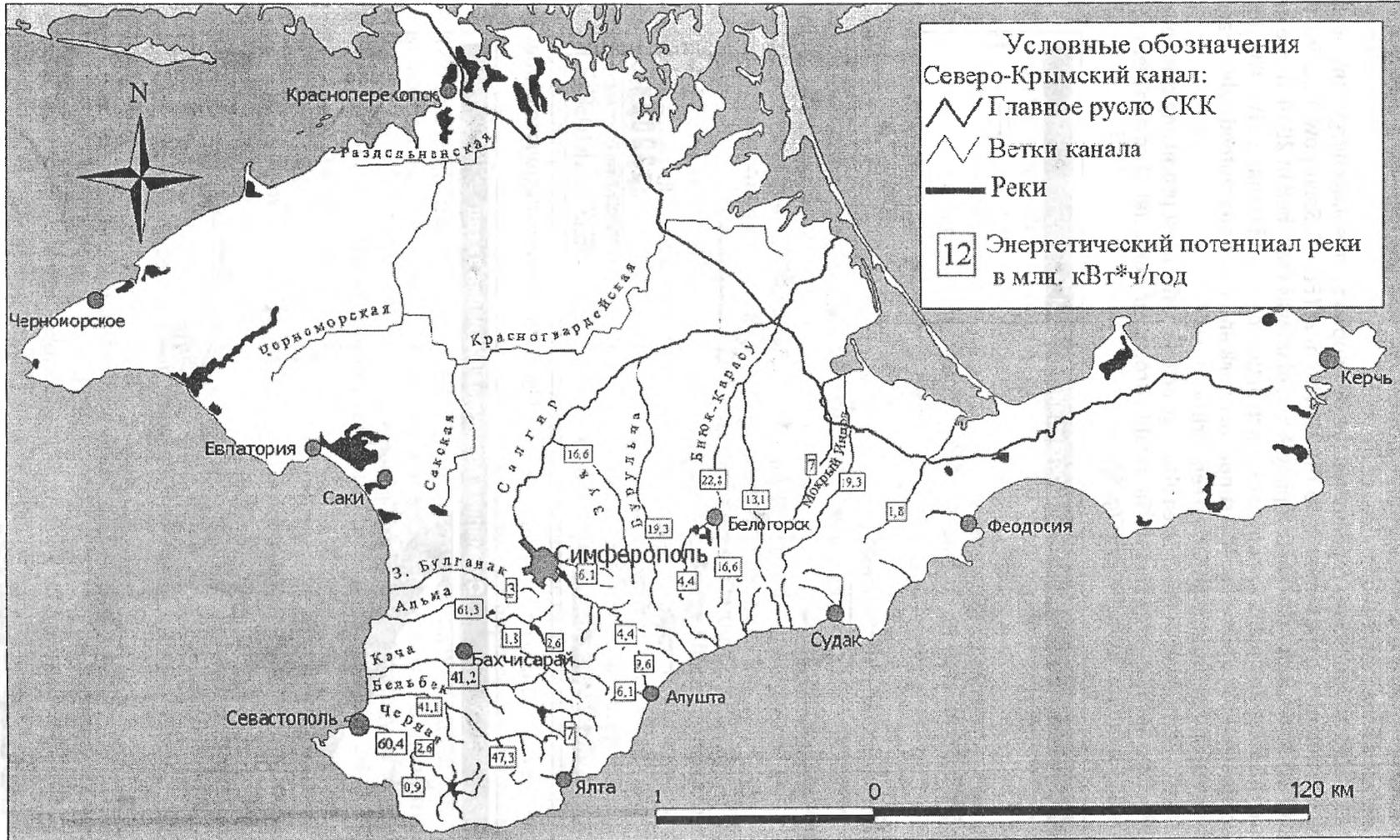
- Small hydropower in the Crimea also may be one of the most promising components in the structure of the energy sector. The total hydropower potential of small rivers of the Crimea is 211.0 million kWh / year (Fig. 5).



Fig. 3. Wind power stations in Crimea



Fig. 4. The total solar radiation per year in the ARC



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Fig. 5. The energy potential of the rivers of the Crimea