Prospects for the development of Ukraine's energy sector using renewable energy sources

Table 1 - Renewable Energy Potential in Ukraine

Areas of development of renewable energy sources	Annual technically achievable energy potential		Annual volumes of replacement of natural gas
	billion kWh	*million tons of fuel*	*billion m3*
Wind power	41,7	21,0	18,26
Solar power	28,8	6,0	5,22
Geothermal energy	105,1	12,0	10,43
Hydropower	27,7	10,0	8,70
Bioenergy	162,8	20,0	17,4
Energy of the environment	154,7	18,0	15,65
Total	***520,8***	***87,0***	***75,66***

Alternative energy sources relate to electricity generating installations using renewable energy sources (RES), such as solar energy, the most powerful source of energy on Earth.

In the last decade, a number of countries have widely implemented energy facilities that use renewable energy sources.

The main factors contributing to the use of RES:

- The exhaustion of organic (natural gas, oil, coal) and nuclear fuel stocks and the constant rise in prices for these fuels;
- reduction of harmful and greenhouse gas emissions into the environment and reduction of the influence on the global climate of the Earth;
- Continuous improvement of power generation technologies with the use of RES, reducing the cost of electricity, making it competitive compared to traditional energy sources;
- increasing the reliability of electricity supply to consumers in the area of construction of new sources, reducing the technological costs of electricity for transmission in electricity networks;
- new jobs and additional revenues to the budgets of different levels;
- a number of factors of state incentives in the use of RES, which makes investment projects attractive to investors.

Energy facilities with the use of renewable energy increasolar power plants the energy independence of the state.

The main document defining the RES development strategy in Ukraine is the National Renewable Energy Action Plan for the period up to 2030. According to the Plan, the power of wind farms and solar power stations should be at 2000 MW in each direction.

The level of technically achievable annual energy potential of renewable energy sources in Ukraine (according to the data of the Institute of Renewable Energy of the National Academy of Sciences of Ukraine) is given in Table 1.1.

As of the beginning of 2018 the power of wind power stations was 1200 MW (without the AR of Crimea), and solar power stations - 760 MW (without the AR of Crimea), electricity production at power stations with RES was 2.5%.

An analysis of the work of solar power plants in Ukraine shows a rather high level of insolation, practically throughout the territory of Ukraine.

The number of hours of use of the rated power of solar power plants varies from 960 to 1300 hours per year. This makes it possible to build industrial solar power stations of various capacities. The average payback period for the construction of solar power plants is 6-7 years.

The construction of the solar power plants requires significant land plots, an average of 2.0 ha per 1 MW of power solar power plants with a plain terrain. Taking into account the value of constantly growing land, for the construction of solar power plants it is expedient to use land unsuitable for agricultural production, first of all land dumps of industrial enterprisolar power plants.

There is a problem of precisely predicting the load of the solar power plants and ensuring the claimed load by the solar power plant.

Solar power plants are among the most important objects for Ukrainian energy, which are attractive for investment in construction.

The solar power plants include:

Fields of solar modules from poly-, mono-crystalline elements, unit capacity of the module from 270 W to 340 W.

Solar modules are fixed on metal structures made of galvanized steel.

The electricity generated by the solar modules is transmitted by a direct current to the inverters, for conversion into an alternating current of 0.4 kV or 0.8 kV. An alternating current of 0.8 kV is fed to a power transformer of appropriate power. The power transformer is connected by a cable or air line to the substation of the UES of Ukraine.