

THE MAIN TENDENCIES IN ENERGY EFFICIENCY OF RENEWABLE ENERGY SOURCES IN UKRAINE

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Abstract

This article discusses the tendencies of sustainable development of renewable energy sources. The paper refers to the actual Energy strategies in Ukraine. As a conclusion, it is possible to implement the national Energy strategy by reducing the fossil fuel consumption and passing to renewable energy sources in the future. In 2035, about 50% of total energy consumption will be covered by renewable energy sources.

Key words: energy, renewable sources, strategy, trends

INTRODUCTION

Energy is the basis of economy of any country. The successful development of all sectors of the economy depends on its state.

In recent years the domestic energy sector accumulated a lot of challenges that require quick and effective solution. Among these priorities is the problem of reliable and quality energy supply, improving of energy security of Ukraine, development of energy saving technologies, efficient and sustainable functioning of the unified energy system of the country, the search for new sources of energy, renewable energy, improving energy structure, reconstruction and renewal of the material base of the industry, diversification of sources of energy, energy integration of Ukraine with the European energy system, increasing operational safety of energy facilities.

There are many forms of renewable energy. Most of these renewable energies depend in one way or another on sunlight. Both wind and solar have grown significantly in recent years and can help to provide valuable sources of renewable energy for future generations.

MATERIALS AND METHODS

The paper is based on a bibliographic study regarding the global tendencies in sustainable development of renewable energy sources. In

the given research data provided by Ministry of Energy and Coal Industry of Ukraine, Eurostat information, State Statistics of Ukraine and Energy strategy were used.

RESULTS AND DISCUSSIONS

The current state and prospects of renewable energy in the world

In recent years, the European Union has faced several important issues that have pushed energy towards the top of national and European political agendas. As to Energy statistics, Oil (crude oil and petroleum products) continues to be the most important energy source for the European economy, despite the long-term downward trend, while natural gas remains the second most important energy source [3].

With the growth of industrial production in the world the emissions of greenhouse gases in the atmosphere increased, which in turn led to global climate change. To prevent this, 192 countries, responsible for 64% of greenhouse gas emissions in the world, joined the Kyoto Protocol in 1997 (as of June 2013) [8]. Despite the efforts of many countries to implement the Kyoto Protocol, it was not enough to prevent global warming. In December 2015 at the next meeting of the Conference of Parties of the Framework Convention on Climate Change in Paris (COP21), 195 countries adopted the first-ever

universal, legally binding global climate deal. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C.

The agreement is due to enter into force in 2020 [1].

These measures will lead to the enhancement of the role of natural gas and alternative (renewable) energy sources.

As year 2014 demonstrated, the penetration and use of renewables are increasing as is the combination of renewables and energy efficiency. However the share of renewables in the overall energy mix is still under 20%. This needs to change if access to clean, modern renewable energy services for all to be assured by 2030 [10].

According to 2015 Energy outlook, by 2040, demand for electricity will shift to developing countries thanks to fast-growing economies and rising populations. In developed nations, demand will remain stable or even decrease as the link between economic growth and electricity consumption weakens.

To satisfy rising global demand, USD12,2 trillion will be invested in power plants by 2040. Renewables will make up two-thirds of that investment with a large chunk of that going to solar.

By far, the bulk of that USD12,2 trillion will be invested in Asia-Pacific which add more capacity in the next 25 years than the rest of the world combined.

And half of that will build in China which will attract USD 3.4 trillion of new investment – nearly double the total for all the Americas.

Around 70 % of capacity additions in China will be renewable – that's 989GW of solar photovoltaic and 703GW of wind power.

Despite weak growth in electricity demand, Europe will build 80 % more capacity small-scale solar over the next 25 years, almost entirely driven by renewable.

In 25 years, Europeans will see solar photovoltaics making up over a third of installed capacity while coal, gas and nuclear will decline by 30 %.

Despite significant growth in renewables, fossil fuels will maintain a 44 % share of generation in 2040 – albeit down from two-

thirds in 2014. Some 1,291GW of new coal-fired capacity will be added to 2040, predominantly in developing countries where supply is relatively cheap and climate change policies weak or yet to be implemented.

As a result of these trends, CO₂ emissions from the power sector will not peak until 2029 and by 2040 they will be 13 % above current levels.

By 2040, the world's power-generating capacity mix will have transformed: from today's system composed of two-thirds fossil fuels to one with 60% from zero-emission energy sources. Renewables will command just under 60% of the 9,786GW of new generating capacity and two-thirds of the USD12.2 trillion of investment [5].

Energy strategy of Ukraine

In recent years, growing overall energy consumption, thus surpassing the growth rate of GDP, negatively affects the pace of economic development of Ukraine. Trends of increasing consumption of non-renewable energy must change in trends in their conservation. Priority directions of the state policy in the field of energy should reduce the power consumption of individual industries and products, active use of alternative energy [4].

According to statistics [11], the supply of primary energy in 2014 is characterized by structural changes, the share of renewable energy amounted to 2.65%. The total supply of primary energy from biomass has increased to 1.934 million tons of oil equivalent, the equivalent of 2.25 billion m³ of gas, and more than in 2013 at 3.15%.

In the electricity share of energy from renewable sources amounted to about 6%. The significant part in the production of electricity from renewables still occupies hydropower .

Most significant in the structure of renewable energy is biomass. The production of biomass for energy purposes as compared to 2013 increased by 24.75% and amounts to 2,399 million tons of oil equivalent, the equivalent of 2.8 billion. m³ of gas.

Also the biomass exports increased 7.7 times from 0.065 million tons of oil equivalent in year 2013 to 0.502 million tons of oil

equivalent in year 2014. This is equivalent to 0.58 billion m³ of gas.

This shows that:

1. Increased production of energy from renewable sources is an important area of the natural gas replacement.

2. The energy production from biomass continued to increase by high rates: 24.75% per year.

3. The big reserve for reorientation of exports of biomass to the domestic market is saved: equivalent to 0.58 billion m³ of gas per year.

4. The total supply of primary energy from biomass directly to the domestic market in Ukraine is equivalent to 2.25 billion by 2014 m³ of gas per year.

The question of reducing energy dependence is strategically important for Ukraine and needs urgent solution.

Ukraine as a member of the Energy Community implements the EU Directive 2009/28 / EC on the promotion of renewable energy. Ukrainian government has made a commitment to introduce a mandatory share of renewable energy in the structure of total consumption in 2020 at 11%.

Achieving this goal depends on the Energy Strategy of the country, the new version of which is being developed by the National Institute for Strategic Studies [9].

However, the proposed draft of energy strategy, despite the declared support of renewable energy in practice does not account for the overall development potential of renewable energy sources (RES) in Ukraine.

Developed by the Institute of Renewable Energy reasonable forecasts indicate possible achievable level of implementation of renewables by 2035, taking into account both global and domestic trends of the industry. Available indicators confirmed the results of the studies presented in March 2015 by the International Agency for Renewable Energy (IRENA) in its "Road Map for Ukraine" (REmap Ukraine 2030) (Table 1) [6].

Instead, the government expects low growth in electricity production based on wind and solar energy, explaining the limited capacity of the electric power system to compensate for power fluctuations.

Table 1. Potential of renewable sources in Ukraine

Annual technically achievable energy potential		
	(TWh/yr)	(Mtoe/yr)
Wind	60	15
Solar	38.2	4.2
Electricity	5.7	1.4
Thermal	32.5	2.8
Hydro	28.9	7
Small	20.1	4.9
Large	8.6	2.1
Bioenergy	178	21.7
Electricity	27	7.2
Thermal	151	14.5
Geothermal	98.6	8.4
Energy of environment	146.3	12.6

Source: REmap 2035 Background paper. Renewable energy prospects for Ukraine. April 2015

It should be noted the projected increase capacity of hydroelectric power stations and biomass, which in turn can be a source of backup power. According to the Institute of Renewable Energy, total annual technically feasible potential of renewable energy of Ukraine is 68.9 million tons of oil equivalent [7].

Action Plan for the implementation of the Energy Strategy should include a clear timetable for reconstruction and upgrade units generating capacity of Ukraine to ensure the necessary level of spare capacity, development of distribution, transmission lines and thermal energy networks Ukraine, in particular given the introduction of new generating facilities from RES.

The plan must determine actual funding mechanisms, involving private investments and credit resources and the support of the state through measures it can really use.

Regarding implementation of levels of different types of renewable, can bring examples of individual EU Member States, which developed national action plans on renewable energy by 2020. For example, Poland relies only on the development of wind and bioenergy, and their share is practically identical. The plans of Germany's 2050 energy consumption through renewable energy should reach 50% by the end of the century - about 100%. The aim of Denmark on development of renewable energy by 2030 - 50% of total energy consumption and in 2050 - 100% [2].

Analyzing plans of the EU with renewable energy, we can say that the first place is the

development of energy technologies without fuel, namely wind and solar energy, especially when the investments at such stations are lower than other technologies, and investors are ready to invest heavily in the development of renewable energy.

The intelligent development and use of the existing potential of all renewable sources should be provided, as well as the cost-effective, open investment market conditions in the interests of consumers and energy security.

By signing and ratifying the Association Agreement with the EU, Ukraine has chosen the European path. As part of the implementation of the EU Directive 2009/28 / EC, our country is not only required to perform tasks for 2020, but should strive to follow this trend in the future, the more it suits its interests.

CONCLUSIONS

So, today in the world, among other energy technologies, renewable energy shows the most dynamic development. Ukraine has the potential of renewable energy sources. Effectively using this capacity to 2035 can provide about 50% of total energy consumption from renewable energy sources. Renewable energies have benefited from rapid technological progress lowering production costs and making them almost competitive with fossil energies. But they continue to suffer from their inherent handicap of intermittence which can only be neutralised by big investments in energy storage.

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