

The prospects of restructuring the energy sector of Ukraine within the Paris agreement

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Abstract: One of the important problems of mankind today is an increase of the global temperature of the Earth that is related with the growth of greenhouse gases emissions. In this article analysis of Ukraine's obligations to reduce greenhouse gas emissions in accordance with the terms of Paris agreement is made and considered prospects that may increase the part of alternative energy sources and energy efficiency by the example of Ukraine. A number of possible actions are proposed, which lead to reduce greenhouse gases. The analysis and forecast as to the sector receipt of emissions are made and the change of responsibility after greenhouse gas emissions reduction to 2050 years.

Keywords: energy efficiency, Paris climate agreement, greenhouse gases, alternative energy sources.

Introduction. Every country can reduce emissions of greenhouse gases in different ways: a reduction of production volumes, rational use of heat and power, improving transport sector, using alternative energy sources, and implementation of projects in other countries.

According to the calculations of expected National defined contribution, the world emissions of greenhouse gases in the air up to 2100 will increase global average planet temperature on 3,5°C [1].

In December 2015 on the 21th conference of the parties framework UN convention on climate change was adopted new international climate agreement - the Paris agreement. It provides anthropogenic load reduction on the environment, by means of greenhouse gas emissions reduction in the atmosphere. This Act changes the Kyoto protocol. The agreement enters into force on January 1, 2021 after the ratification by at least 55 States (in which the amount of greenhouse gases is at least 55% of the global). The main objective of the agreement is holding the global Earth temperature within 2°C to 2100 year [2].

Paris agreement potentially imposes on Ukraine new obligations of GHG emission reductions. This directly affects the development of the energy sectors of the country as the largest source of greenhouse gases.

Materials and Methods

The International Energy Agency predicted formulations contain three main scenarios of further world energy development [3]. The main scenario is based on the assumption that the future development of the world energy will continue the current trends, secured in political documents, programs and agreements adopted by 2008 year. It reveals the main "pain points" that determines the potential instability of global development, and puts goals that allow to remove the emerging obstacles.

Two additional scenarios of global development are the detailed development of rational directions to achieve goals and setting specific political aims set by the analysis of the main scenario.

The growth of greenhouse gases in the main scenario of International Energy Agency (IEA) will lead to further growth of greenhouse gases in the atmosphere. The global CO₂ emissions, associated with energy, will increase up to 28 GTons (GT) in 2006 year, to 41 GT in 2030 – 45% growth. [4].

On the Negotiations in Paris Ukraine voiced goal as to the reduction emission on 40% to 2030 relative to the level of greenhouse gases in 1990 (Fig. 1) [5].

But, in accordance with the New Global Purpose of Paris Agreement (2 °C), in the case of the assumption of proportionality greenhouse gas emissions to change the global temperature, the goal must be adjusted from 40% 70% in 2050 to 1990, which can meet the Scenario Maintenance of the Global temperature within 2°C. [6].

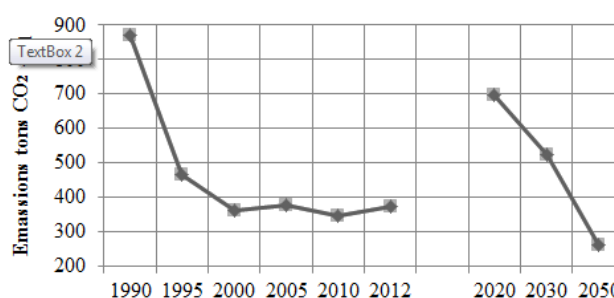


Fig. 1. Emissions of greenhouse gases in 1990-2012 (tCO₂-eq), respectively goals of Ukraine in 2020-2050 years

The project strategy low-carbon development in 2050, presented in 2014 in Ukraine, requires significant addition, because there are discrepancy of energy development plans, as the main role in reducing emissions given to increase energy efficiency in sectors production and consumption.

As to the existing situation in Ukraine a significant part of emissions comes from coal industry that is important not only in the structure of fuel and energy, but is an important economic element of energy industry country. Absolute exclusion or even minimization in the using of coal as fuel requires significantly financing. It is difficult for unstable country economic situation.

According with energy balance of Ukraine for 2013 [7], the part of renewable energy sources in gross end energy consumption is 3,62%, including biomass - 2,28% (1,61 million. t. n. e) [8].

The National action plan of renewable energy to 2020 has a goal - to achieve 11% from renewable energy sources in gross end energy consumption, that is in accordance with the Ukraine's obligation in Energy Community.

Today in Ukraine acts the Energy Strategy of Ukraine until 2030, which was adopted by the Cabinet of Ministry

of Ukraine in July 24, 2013 and immediately was subjected to reasonable criticism.

The main indicators of this document have not consistent with National Action Plan for Renewable Energy. The strategy (main scenario) provides the growth of power consumption by 25% in 2030 (238,1 million tons standard fuel), compared to the basic 2010. As well it is planned to significantly increase the electricity consumption - 55% in 2030, compared to 2010. Such forecasts seem to be issued false, because they are not intended to savings fuel and energy resources and energy efficiency. Also the Operating Energy Strategy does not put specific objectives on the development of renewable energy sources - not indicated share of renewable energy sources in gross end energy consumption, which must be achieved in 2020. Those numbers of renewable energy sources that are still there seem to be unreasonably understated [6].

World countries experience. Today in the world there are approximately 148 planned and already sold projects for replacing the usage of fossil fuel and complete transition to renewable energy. All these projects aim at 100% renewable energy, but have different end date of realization. Among these projects in some countries, cities and companies there are such as [9].

In the European Union state of renewable energy as a whole is close to the Global Indicators. Part of RES in end consumption is 15% (2013), in particular biomass - about 9%. The share of RES in the production of electricity is 25,4%, in particular about 5% - from biomass. More than 19% of total heat in the EU is made from renewable sources, mainly from biomass. In 2011 in order to comply with the script climate change 2DS the European Union again confirmed its official aim to reduce emissions of greenhouse gases (decarbonization) in 2050 by 80-95% compared to the indicators in 1990 [10].

Sweden energy policy is governed by two government laws that have been approved by Sweden Parliament in 2009. Act "Integration climate and energy policy" («En integrerad energi-och klimatpolitik») sets ambitious goal for the implementation of the general purpose 20/20/20 EU and, in addition, introduces National standards and laws that are stricter than offers European government. Transition policy sustainable development and environment, competitiveness and long-term stability present the country on the new level in the EU, where Sweden plans to take the leading place.

Also in 2015 by the Swedish government has been accepted the purpose to be the first country that refuses from fossil fuel [11].

German energy strategy to 2050 (adopted in 2010.) provides complete refuse from the use of atomic energy to 2022. Implementation of this plan began to stop 8 oldest nuclear power plants. Renewable energy sources were identified strategy as the main part of the structure of

energy country in the future term. It was also developed legislative mechanisms stimulation of RES and energy efficiency [12, 13]. Housing defined in Germany as the main sector for the implementation of energy efficiency measures. Concept of energy efficient houses, set forth in energy strategy to 2050, includes three main points [14]:

- reduce heat consumption by 20% to 2020;
- reduction demand for primary energy in housing sector approximately 80% to 2050, which requires doubling current rates renovation - 1% general fund houses per year to 2%; - from 2020;
- all new homes should be "Energy-efficient" according to the specific parameters power consumption.

In 2014 US President Barack Obama offered so-called "Comprehensive Energy Strategy" (the all-of-the-above energy strategy) [15]. Should be noted that the individual States, for example, California, confidently moves towards achieving 100% energy renewable.

One of the authoritative american scientists in energy efficiency (Mark Z. Jacobson - Stanford University professor) conducted research and analysis further development of energy state. Main ideas were forgoing fossil fuel and nuclear energy for the benefit of renewable energy sources. By building new facilities renewable energy, including energy efficiency and transition technology power generation, using processes burning on BBC10 energy state may go 100% renewable energy and fully give from fossil fuel already in 2050. Interesting fact is that the study also indicates that the area of land used for WWS energy (wind, hydro and solar energy (wind, water, Sun)). In order to ensure the needs of all state it will take only 4,77% of the total area of California [15].

China will remain the world leader of the building capacities atomic power over the forecast period "Scenario New Strategies," an average of almost 5 GVt for year. Electricity production of coal grow in China more than any other part of the world, but the part of coal in general structure power generation significantly reduced, with 76% in 2012 to 52% in 2040 year [16].

Before 2020 consumption of biomass, wind, biogas and biofuel increase due to the existing and new technologies. At a significant increase in the use of solid biomass, biogas and biofuels, bioenergy will continue to take a large part of the total consumption of renewable energy sources in 2020. It is expected that share of RES continue their growth and after 2020 - to depending on the dynamics prices, new initiatives and so on, considering the new initiative. To expand the use of wind energy and biomass, Denmark is located on the way for successful implementation of the purposes of energy strategy to 2050.

Results and Discussion. Based on this analysis is proposed a number of mitigating measures to reduce greenhouse gases (table. 1) [17,18, 19].

Table 1. Purpose of Ukraine

	Sectors name	Event title	Short description
1	Industry	Steel production	Replacement of technology steelmaking: partial transition from open pods furnaces and oxygen converters to modern electric furnace with less terms of specific emissions reductions in a tons of products
2		Production of cement	Transition from "Wet" method of producing cement to "Dry".
3	Transport	Alternative transport	Using of electric cars, improving the engine internal minimize. Using of hybrid and "Plug-hybrid" systems for diesel and gasoline engines.
4	Housing sector	Housing sector (power generation)	Using waste heat from power station for the needs of heat supply and substitution thermal energy that produced in the boiler.
5		Housing sector (production)	Using of bio fuel for the needs of heat supply and substitution thermal energy that produced in the boiler.
6		Central heating in commercial and industrial sectors	Using of bio fuel for the needs of heat supply and substitution thermal energy that produced in the boiler.
7		Central heating in commercial and industrial sectors	Using of bio fuel for the needs of heat supply and substitution thermal energy that produced in the boiler.
8	Power generation	Electricity production	Replacement (partial) of fossil fuels hard biomass, using of wind energy, water, sun to produce electricity and improve the overall efficiency cycle power station.
9	Farm land	Reforestation unused agricultural land	Reforestation of unused agriculture lands
10		Protective reforestation	Reforestation of unused agriculture lands
11	Mining industry	Mining – methane in the mine flare	Catching and burning on flare
12		Mining – cogeneration in the newspaper methane	Catching and utilization methane in the mine for getting heat and electricity (in the cogeneration engine).
13	Waste management	Waste management	Catching and burning on flare biogas in the landfills solid waste from cities, that have population of over 200 000
14		Waste management	Collection of biogas of landfill cities, that have population of over 200 000 and production electricity on cogeneration installations and sale to network
15	Wastewater	Waste management – wastewater	Production of biogas from wastewater's and future utilization in cogeneration installations and sale to network.
16	Agriculture	Agriculture – Waste management – utilization of biogas for cogeneration in agriculture.	Production of biogas from waste of the cattle and future utilization in cogeneration installations and going to network

Conclusions. Based on conducted analysis the following prospects for restructuring the energy sector as part of Paris climate agreement are offered:

1. Edit planning horizon on reduce of greenhouse gas emissions to 2050.
2. Explore the possibility of making more rational purpose of emission reduction energy sector in the next 30 years - by the level of -70% compared to 1990, responsible framework in signed agreement.
3. Explore the possibility of adoption of new purposes of energy efficiency - reduction of the total delivery primary energy at the expense of energy efficiency and energy saving by 20% to 2050 compared to 2014 year.
4. Explore the possibility to boost of an increase in the share of renewable energy - by 1% per year of the achievement of 40% of renewable energy sources in the structure of total delivery primary energy to 2050.

To speed up the development of "Green" energy in Ukraine and improve energy efficiency recommended:

1. Finalize and take energy strategy of Ukraine for the period of at least to 2035 year with more ambitious objectives of RES, energy efficiency and greenhouse gas emissions reduction.
2. Take adequate goals from the greenhouse gas emissions reduction and consistently reach them.
3. In the long term (up to 2050.) try to follow example of the world and Europe that put a high aims (50% or more) on the transition to RES, emission reductions and increase the level of energy efficiency.
4. At the National level contribute to the fact that climate planet developed by the scenario 2DS (increase in the average annual temperature for 2 degrees to 2050).
5. Do steps to the introduction of "Environmental" directive 2009/125 / EC and 2010/30 / EU to raising competitiveness in the world environmental arena.

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Анализ перспективы реструктуризации энергетического сектора Украины в рамках Парижского климатического соглашения

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Одной из важных проблем человечества на сегодняшний день является увеличение глобальной температуры Земли, что связано с ростом выбросов парниковых газов. В данной статье проведен анализ обязательств Украины относительно уменьшения выбросов парниковых газов согласно условиям Парижского соглашения и рассмотрены перспективы относительно увеличения части альтернативных источников энергии и повышения энергоэффективности на примере Украины. Предложен ряд возможных действий, внедрение которых приведет к уменьшению выбросов парниковых газов. В соответствии с сектором поступление выбросов проведено анализ и сделан прогноз относительно изменения ответственности после сокращения выбросов парниковых газов до 2050 года.

Ключевые слова: энергоэффективность, Парижское климатическое соглашение, парниковые газы, альтернативные источники энергии.