земля може бути використана в якості мастила на метизних заводах. Відомо спосіб використання некондиційних рослинних олій та інших, що містять жири в миловарному виробництві.

Зазначені способи припускають хімічні методи утилізації та вторинного використання відходів олійно-жирової промисловості. При цьому самі ці методи не є безвідходними, і їх застосування не знижує техногенного навантаження на навколишнє середовище.

Експериментальні результати дослідження свідчать про перспективність ферментативного гідролізу ліпазою Rhizopus japonicus жирової фракції відходів.

Розробка технології по біодеструкції жирової фракції відходів гідрування рослинних олій дозволить отримати моно-, дигліцериди, жирні кислоти, які є затребуваною сировиною для різних галузей промисловості. Наприклад, моно-, ди- та триацилгліцериди активно застосовуються в технології виробництва еластомерів, жирні кислоти - для отримання різного роду мила, вищих жирних спиртів, у виробництві ЛФМ, гумотехнічної (пластифікатори, вторинні активатори), бавовняної, шкіряної, текстильної промисловостях та ін.

## REDUCING GREENHOUSE GAS EMISSIONS THROUGH A NEW STRATEGY FOR COMBINING THE USE OF EXISTING POWER STATIONS AND THE POSSIBLE CONSTRUCTION OF ADDITIONAL CAPACITIES

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Since the beginning of the period of world industrialization, questions have arisen with regard to environmental pollution and environmental safety issues. These issues became particularly relevant at the end of the 20th and the beginning of the 21st century.

The main dilemma concerning the use of energy resources was the question of maintaining a balance between the already existing human needs in generating a certain, demanded amount of electricity and the problem of environmental pollution, due to greenhouse gas emissions that could lead to Global warming.

In order to strategically reduce greenhouse gas emissions from countries, world congresses were convened, and the last such event took place in Paris, which resulted in the signing of the Paris Climatic Agreement, the main task of which is to maintain the global temperature on Earth at 2°C by 2100 [1].

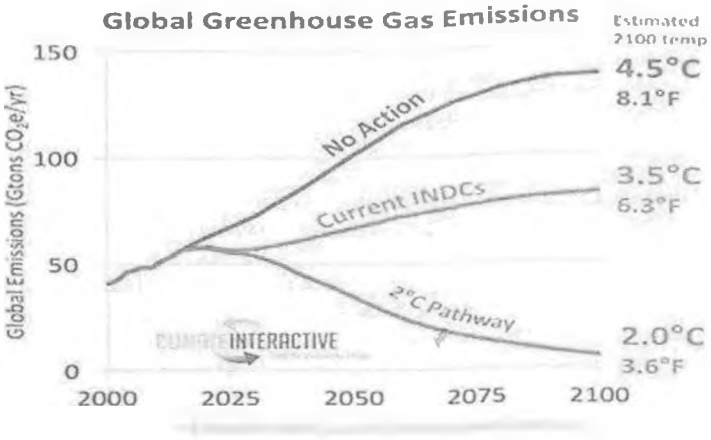


Fig 1. Projection of possible temperature change up to 2100 year.

Based on the data of the International Energy Agency (IEA), in order to achieve such results by 2050, it is necessary to increase energy efficiency by 40% and increase generation from renewable energy sources by 30%, such measures will play the most important role in preventing a rise in global temperature by more than 2°C and reduction of CO2 emissions in the period up to 2050 [2].

Based on such requirements, the question arises as to additional options for reducing the amount of greenhouse gas emissions due to the operational-production strategies for solving this problem. That is, in addition to an increase in Renewable energy sources (RES) by 40%, which can become a rather serious problem in terms of operational management, not a constant generation of energy, but also an increase in the capacity of the Nuclear power plants (NPP).

Based on the data of UkrEnergo, the schedule of daily production/consumption of electricity is it presented in the Fig. 2 [3].
Minimal winter consumption is 16.8 GWh, maximum 21.2 GWh.

The minimum consumption in the summer is 12.7 GWh, maximum - 16 GWh. Data of UkrEnergo illustrate both the tendency of electricity consumption and the amount of energy produced by different types of stations.

As we can see, the amount of energy consumption, depending on the time of day and time of the year, varies from 12.7 to 21.2 GWh.

So for a better understanding, we divide the demand of consumers into 2 parts:

1. Non-variable demand (up to 12.7 GWh).
2. Variable demand (from 12.7 to 21.2 GWh).

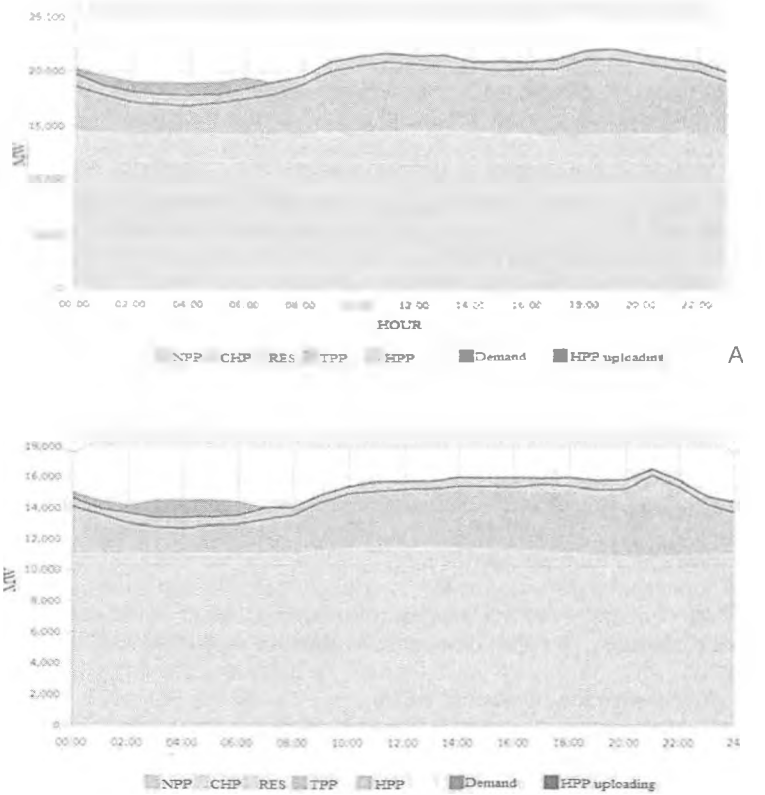


Fig. 2. The daily schedule of production/consumption electricity. A - Winter months data; B - Summer months data

Subsequent consideration of these two parts will be based on the idea of maximizing the number of Thermal power plants (TPP) and Combated heat and Power (CHP) plants and other stations, and the level of carbon dioxide emissions is relatively high.

To satisfy the demand for electricity of the first part of the schedule, it will be most expedient to use the NPP. This conclusion is based on the principle of the NPP. They are the cheapest sources of electricity, but their biggest drawback is the inability to operate promptly. But with constant demand, we will get the most favorable conditions for the work of NPP.

Based on the above, it can be assumed that under such conditions, it is advisable to increase the level of power generation of AEC from 11.5 to 12 GWh (it should not be raised to 12 GWh, since in this case a critical reduction in demand may lead to possible accidents on NPP) in the winter period (in the summer, to display certain blocks of work for repair). Such problems are caused

by a critical reduction in demand for electricity at night. To solve this problem, incentives for the purchase of electricity at night, using the night rate, have already been introduced. In the future, to improve the situation, the possibility of creating special garages for electric cars, which will be charged at night, is considered, thus balancing the value of demand, and thus reducing the possibility of accidents at the NPP.

At the second stage, we will consider the possibility of operational management of consumer demand. Relying on the energy development strategy of Ukraine by 2035 [4], which plans to increase generation from RES from 7 to 20.4% of the total generation (without taking into account the HPP), we will try to calculate based on current demand for electricity.

As of 2018/2019 year, at peak hours, electricity generation at the expense of RES is: summer period - 0.5 GWh, winter period - 0.4 GWh. Consequently, according to the strategy, the amount of production at the RES should be increased to: summer period - 1.46 GWh, winter period - 1.17 GWh.

Calculate the percentage of satisfaction of consumer demand during peak hours, with combined power generation at NPPs, Hydro power plants (HPPs) and RES:

Summer time: $\frac{\text{NPP}+\text{HPP}+\text{RES}}{\text{Demand}} = \frac{1,46+2+12}{16} \cdot 100\% = 96\%.$

Winter time: $\frac{\text{NPP}+\text{HPP}+\text{RES}}{\text{Demand}} = \frac{1,17+2+12}{21,2} \cdot 100\% = 72\%.$

As you can see, following the strategy of 2035, we have a share of dissatisfied demand, so that this option should be considered 3 variants of investment:

1. Increase the number of RESs.
2. Investing in upgrading and supporting the generation of TPP and CHP.
3. Investing in the development and procurement of batteries with a fairly high capacity to accumulate electricity (not the best option).

Summarizing, it can be said that in this work, I analyzed the possible changes in the components of electricity generation and selected priority projects for future financing with a view to future compliance with Ukraine's International Agreements and a significant reduction of greenhouse gas emissions.

REFERENCES

1. Paris Agreement (2015). Retrieved from https://unfccc.int.

2. Dombrovsky, A., & Geletuh, G. (2016, April 26). Paris climate agreement: Ukraine needs to cut emissions by 70%. Economic Truth, Retrieved from https://www.epravda.com.ua.

3. UkrEnergo (n.d.). Genaration/demand of electric energy. Retrieved from https://ua.energy/diyalnist/dyspetcherska-informatsiya/dobovyi-grafik-vyrobnytstva-spozhyvannya-e-e/

4. Energy Strategy of Ukraine till 2035. (2014). Retrieved from http://mpe.kmu.gov.ua.