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Status and prospects of using aviation biofuels

Increase of human population had significantly impacted the transport sphere, causing fossil fuels depletion, higher greenhouse gas emissions and emergence of risks, associated with environmental, social and economic pillars of sustainability. According to statistics, aviation is in charge of about 2 % of induced-human CO_2 emissions and 12 % of CO_2 emissions from all transport sources. At the same time there is commitment that the global civil aviation operations will achieve net-zero carbon emissions by 2050, supported by accelerated efficiency measures, energy transition and innovations. Different strategies and policies, aimed to lower the environmental impact by the aviation sector were developed and implemented recently, the essence of which mainly consists in transition to the wider use of sustainable aviation fuels, which includes biofuels. This indicates the significance of analyzing this topic [1–2].

The production of aviation biofuels is estimated to be about 0.05 % of current aviation fuel consumption. Among the first producers of aviation biofuels worldwide, representing this percentage, are World Energy (Paramount, USA), Neste (Porvoo, Finland), Gevo (Silsbee, USA), Total (La Mede, France) and Fulcrum (Sierra, USA). The commissioning of new factories promises to increase production capacity tenfold.

In 2021, Air Transport Action Group issued "Waypoint 2050" report proposing three scenarios of greenhouse gas emissions reduction in the aviation sector. Under the first scenario, technology improvements are prioritized. Emissions reduction contributions in 2050 due to the technology improvements, efficiency improvements in operations, infrastructure development, wider use of sustainable aviation fuel as well as introduction of market-based measures are represented in Fig. 1.

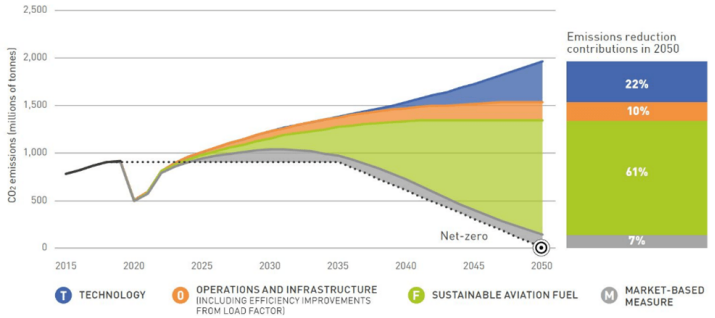

Fig. 1. Greenhouse gas emissions reduction according to the first "Waypoint 2050" strategy

Based on this scenario, it will be required to use the offsets (mostly in a form of carbon removals) to compensate any remaining emissions shortfall in emissions above the target indicator. Two other two scenarios consist

of “aggressive sustainable fuel deployment” and “aspirational and aggressive technology perspective”, according to which technology improvements are ambitious with new aircraft configurations.

The issue of decarbonization of the air transport sector is receiving attention all over the world. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is important in this regard. CORSIA was developed by International Civil Aviation Organization (ICAO) and adopted in 2016. There was formulated the ambitious aim to reduce greenhouse gas emission to 50 % until 2050 (compared to 2005). CORSIA introduces the rule, according to which each airline must compensate its emissions, above a baseline. The first pilot phase lasted during 2021–2023, then voluntary phase started in 2024 and will continue until 2026 and, finally obligatory phase will be from 2027–2035. This scheme aims for offsetting 80 % of the air traffic growth after 2020.

As for the EU, much attention is paid to the regulation of the aviation biofuel market there. One of the most important acts in this area is the Refuel EU Aviation initiative. This initiative is a regulation that is part of the EU’s Fit for 55 Package. Under the Refuel EU Aviation Regulation, aviation fuel suppliers are mandated to progressively blend increasing amounts of sustainable aviation fuels (SAF) with kerosene. This begins with a minimum blend of 2 % in 2025 and escalates to 70 % by 2050.

European experience and effective plans aimed towards the development of environmentally friendly aviation fuels can also be applicable in Ukrainian realities. This is facilitated by the fact that Ukraine has the largest areas of agricultural land in Europe and, therefore, one of the best potentials in the world to use agricultural raw materials for the production of biofuels [4]. For the possibility of successful implementation of projects in this sector, it is necessary to improve the legislative framework, as well as more widely apply economic stimulation of biofuel production, for example, by introducing a state subsidy for the production of sustainable liquid aviation biofuels and performing scientific and practical work aimed at reducing the cost of relevant technologies and equipment.

Conclusion. The main scenarios of decarbonization of the aviation transport sector are considered. It is shown that the CORSIA scheme is one of the mechanisms of the “green” transition in the aviation industry. The provisions of the Refuel EU Aviation initiative related to the wider use of sustainable aviation fuels with the aim of achieving climate neutrality in the EU by 2050 are analyzed. It is noted that Ukraine has significant potential for the production of aviation biofuels. At the same time, the application of the best world practices and experience of the EU in this context will contribute to the processes of decarbonization of the Ukrainian aviation transport sector in the post-war reconstruction.

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