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Agenda Item 2: Supporting policies to promote the development and deployment of cleaner energy for aviation

NORWEGIAN EXPERIENCES WITH EARLY UPTAKE OF SUSTAINABLE AVIATION FUELS (SAF)

(Presented by Norway)

SUMMARY

Norway has been an early mover when it comes to use of SAF. In 2016 Oslo Airport became the first hub in the world to blend SAF into the fuel infrastructure at the airport and in 2020 Norway became the first country with an effective mandate for SAF. This information paper provides an overview of key activities and milestones by airlines, airports, the government level and other organisations that have been important for early uptake. The paper intends to provide the reader with background, details and experiences, within the context of an ICAO information paper.

1. INTRODUCTION

1.1 All sectors of society will need to contribute in order to avoid high temperature increases and irreversible anthropogenic changes to the world climate. There are a number of fossil-free technologies available for the aviation sector; electrified aircraft, hydrogen and sustainable aviation fuels (SAF) are all expected to be important parts of the solution.

1.2 In Norway, the aviation industry consisting of airlines based in the country (Norwegian Air Shuttle ASA (Norwegian), SAS and Widerøe) and State-owned Avinor (airport group operating 43 airports and Air Navigation Service Provider) together with the Federation of Norwegian Aviation Industries and the Norwegian Confederation of Trade Unions (LO) in 2020 launched a joint ambition for the industry to become fossil-free by 2050.

1.3 Norway is a country with a large and varied network of commercial routes which includes several very short and thin routes, currently operated by small aircraft on short runways, and could be one

of the countries where commercially operated electrified aircraft for passenger traffic are introduced in the near future. There is also a large potential in hydrogen as energy carrier, first in commuter size aircraft and later also in the larger regional models. The Norwegian Civil Aviation Authority and Avinor strive to develop the regulations and infrastructure necessary for zero- and low-emission technologies in contact with original equipment manufacturers and interested airlines.

1.4 However, although effort is put into the development and application of these zero- or low-emission technologies, there is little doubt that SAF will be of critical importance for the green transition of aviation also in Norway. SAF is the only fossil-free technology that is certified for use today and has the big advantage that it is a drop-in fuel; meaning it can be used in existing aircraft and infrastructure.

2. EARLY STAGE DEVELOPMENTS

2.1 In the aviation sector in Scandinavia the airline SAS was probably the first to look into SAF as a technology for reducing carbon emissions. SAF was a topic in their annual report already in the year 2000.

2.2 The airport operator Avinor is working to reduce their own emissions (from airport operations) and from surface access to the airport, but has also for more than 15 years in close cooperation with the airlines based in Norway (Norwegian, SAS and Widerøe), the Federation of Norwegian Aviation Industries and the Norwegian Confederation of Trade Unions (LO) taken a role to reduce aviation emissions. Since 2008 these organisations have published joint reports about aviation sustainability and the potential in new technologies. They have also cooperated on various industry initiatives over many years and worked to incentivize a green transition in the aviation industry.

2.3 In 2014 the first demo-flights in Norway with SAF took place, a cooperation project between Avinor, Norwegian, SAS and the non-governmental organization ZERO. A Norwegian flight from Bergen and a SAS flight from Trondheim both flew to Oslo with 49 per cent SAF blend in connection with a climate conference.

3. BLENDING SAF INTO THE FUEL INFRASTRUCTURE

3.1 A major advantage with SAF (compared to electrified aviation or hydrogen) is that it can be used in existing aircraft and mixed with fossil fuel in existing fuel infrastructure. SAF has been certified for use in existing aircraft in blends up to 50 per cent by the international standardization body ASTM since 2009.

3.2 Certification is one issue. Another thing is showing that it can actually be done. In January 2016 Avinor Oslo Airport became the first international hub in the world to drop SAF into the fuel infrastructure (main fuel farm, hydrant and dispenser system) at the airport. A mass balance principle was applied; all airlines uplifting fuel at the airport got a share of SAF in their fuel mix when tanking there, but only airlines paying the premium for SAF were allowed to claim SAF usage in their communication and accounting. The project was initiated by AirBP and Lufthansa Group and carried out as a collaborative project with Avinor, SkyNRG, Neste, SAS and KLM.

3.3 Safety is paramount in aviation, and acceptance among airlines, pilots and passengers was an important part of the project (as all airlines refuelling at the airport would get a small percentage of SAF in their fuel blend.) But the short story is that there were no serious acceptance issues and no problems in the infrastructure or fuel system were encountered.

3.4 The voluntary volume uplifted at Oslo Airport in 2016 was 1,25 million litres; a very small share of total fuel consumption at the airport, but a large SAF volume that had to be sourced from different producers at the time. The project was expanded to the second largest airport (Bergen) in Norway the following year. SAF volumes were thus uplifted at Oslo airport in 2016 and at Oslo and Bergen airports in 2017 and 2018, but gradually focus in Norway has moved from voluntary to mandatory uptake as the Norwegian government in 2018 announced a mandate for aviation to be effective from 2020.

3.5 Airports and other stakeholders still reach out from many parts of the world in order to learn from experiences with early uptake at Oslo Airport in 2016.

4. INTRODUCTION OF A NATIONAL MANDATE FOR SAF

4.1 In 2018 the Norwegian government announced the introduction of a national mandate from January 2020. Fuel suppliers for aviation must ensure that at least 0.5 per cent by volume of the total amount of fuel sold per year consists of advanced biofuel. Advanced biofuel is defined as biofuel made from feedstock listed in Part A and Part B of Annex IX to the EU Renewable Energy Directive, Directive (EU) 2018/2001. For sustainability reasons, first generation biofuels such as feed-, food- and crop-based biofuels, which have limited scalability potential and raise sustainability concerns, is not included in the mandate. Synthetic fuels/e-fuels is also not included. In 2022 the mandate was fulfilled with 3,2 million liters of HEFA SAF made from animal fats not suitable as food and feed, originating from Europe.

4.2 All aviation fuel is covered by the mandate, except for fuel that is sold for flights carried out by military aircraft. The regulation allows for cooperation with other fuel suppliers, where fuel suppliers who trade more biofuel than they are obliged to can transfer excess volumes to other suppliers.

4.3 The government has stated that the blending mandate is the main measure to increase the use of advanced jet biofuels and intends to increase the current mandate in line with ReFuelEU Aviation, meaning an increase of the mandate to 2 per cent from 2025.

5. CREATING THE KNOWLEDGE BASIS FOR ACTION

5.1 In 2012 Avinor commissioned a comprehensive study on the topic of SAF. In 2021, the Norwegian aviation industry published a program for increased production and uptake of SAF, proposing both industry and government activities to reach the goal. In 2023 a study looking into the opportunities for SAF production from non-biological feedstocks (hydrogen, CO2, waste, plastics etc) has been published. Many of the mentioned reports are available in English at Avinor's website[1].

5.2 The prerequisites for production of SAF differ widely between different parts of the world. In order to establish and increase production in Norway it has been important to understand how SAF can be produced based on waste and residue feedstocks available locally. It has also been important to understand how SAF production can fit into national industry structure.

5.3 Norway has been active also in international cooperation on the topic of SAF, including sharing national experiences. One example is the Aviation Common Interest Group of the International Transport Forum (ITF) and the development of a SAF Policy vision which outlines policy principles and recommendations.

[1] https://avinor.no/konsern/klima/rapporter/rapporter

6. VOLUNTARY UPTAKE IN THE SHAPING

6.1 Airlines like SAS and Widerøe have for some time already offered their passengers to pay the premium for SAF. The cost of this is quite substantial, compared to the total ticket price, and the experience so far has been that only a very small percentage has used the opportunity.

6.2 The airline Norwegian offers corporate customers to reduce their emissions from business travel through uplift of SAF. In August 2023 the airline Norwegian won a contract with the Norwegian Defence Logistics Organisation for procurement of staff air travel services for the armed forces on scheduled civil commercial air services. Sustainability was emphasized when the Norwegian Defence invited airlines to bid, and the result was a contract with substantial voluntary uptake of SAF (more than 10% of the fuel consumption).

6.3 The voluntary uptake of SAF described in this section is volumes of SAF that are additional to the mandated volumes.

7. PROSPECTS FOR SAF PRODUCTION IN NORWAY

7.1 There are several industry initiatives in Norway for production of SAF from feedstocks other than used cooking oil and animal fats, applying new pathways and production processes. One project in northern Norway and one in southern Norway develop plans for production of e-fuels targeting the aviation sector, and there are also some initiatives on biobased SAF, although probably primarily planning to produce a biocrude (not ready SAF).

7.2 Funding is a challenge for the projects. None of the industry initiatives in Norway have yet taken a final investment decision. One of the reasons seems to be that costs of construction and other costs have increased since the pandemic. Some projects have received public funding, in particular from the European Innovation Fund and the national funding agency Enova[2].

7.3 In 2023 we have seen the airline Norwegian partnering up with one of the efuel-projects; Norsk e-Fuel; the airline has closed an offtake-agreement and also agreed to invest in the company. In an industry context, SAF production could be an opportunity for value creation from a number of sidestreams and waste resources and an early market for hydrogen.

7.4 In January 2023 the Norwegian Government launched a National aviation strategy proposing continued use of SAF mandate as the public policy to promote uptake of SAF. In the same strategy it was announced that the government will consider implementing the EUs upcoming ReFuelEU Aviation regulation. The strategy was passed by Parliament during spring 2023.

— END —

[2] Enova is owned by the Ministry of Climate and Environment. It is the main Norwegian funding agency contributing to a faster transition to a low-emission society. https://www.enova.no/about-enova/