COORDINATION OF RENEWABLE FUEL STAKEHOLDER'S STRATEGY IN THE FIELD OF AVIATION

Identifying solutions to create an initial market. Results from workshop

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1 EXECUTIVE SUMMARY

The objective of this **communication paper** is the refinement and the analysis of the existing and possible mechanisms to stimulate and support the deployment of a jet biofuel market within the EU.

The goal is to clarify the expectations from the Flightpath stakeholders and public authorities (EC) regarding the objectives in terms of targets, time horizon, industrial impacts, and technological spill over and to present a selection of the most relevant initiatives made from the analysis of the current Flightpath documentation and the European and international most recent initiatives around the topic.

The objectives of this communication paper are:

- Identifying economic levers, as well as possible other tools to be implemented that could be used to accelerate the production of alternative fuels for aviation.
- Reaching a common understanding of the meaning of the different objectives and investigate which options could be applied within the EU
- Translating high-level objectives into operational objectives that can be assessed by models to be built

2 OVERVIEW OF CURRENT SAF EXTRA-COST

This internal *short communication paper* is intended to define the actions that could be undertaken towards the definition of an updated Flightpath roadmap, beyond 2020.

Before identifying the different possible measures that can be used to promote and deploy SAF, it is necessary to analyse the limiting factors affecting their implementation.

The main driving factor for the creation of a proper SAF market is currently the price of producing biofuel, which is not competitive with fossil-derived jet A1 costs (see Fig.1). The price of jet A1, for example, was at considerably higher than their current level of about USD 80 per barrel[1]. Even then, SAF fuel was significantly more expensive: generally in a range from two to seven times more than fossil-derived jet fuel[2].

Fuel costs comprise over one-third of an average airline's operating cost[3] . Even with recent crude oil price declines in 2015, it remains a large percentage of a carrier's expenditures. Given the competitive dynamics within the industry, and pressure to compete on ticket pricing (especially in Europe with the strong competition of the low-cost carriers), fuel costs remains an important priority. Therefore a big part of the economic model of the airlines relies upon a **reduced operational cost** of their fleet.

The current price premium of SAF impacts in airline overall profits if they choose to be an early adopter of the technology. A carrier on the SAF vanguard will hurt its competitive position relative to other airlines that do not shoulder the same SAF.

Conversion Process	Feedstock	MFSP[4] Bio-jet produced in EUR pet tonne
Jet A1	-	657
HEFA	(UCO)	1.350
FT	Forest Residues / wheat straw	1.800 – 2.650
HTL	Forest Residues / wheat straw	900 – 1.300
Pyrolysis	Forest Residues / wheat straw	1.300 – 1.850
ATJ	Forest Residues / wheat straw	2.400 - 3.500
DSHC	Forest Residues / wheat straw	4.800 – 6.400

Fig.1. MFSP Biofuel price by type of pathway/feedstock.

Source: de Jong et al. (2015)

These challenges highlight the importance of policy support for SAF and its supply chains as well as other specific enabling factors that will be discussed in this **communication paper.**

Other limitations to the uptake of SAF include:

- Not a clear, stable and reliable biojet fuel policy (directly affecting investor's confidence)
- Financing cost for the projects
- Lack of long-term off-take agreements between the SAF stakeholders (producers – airlines)

[1] Jet Fuel Price Monitor, IATA. April 2018.
[2] In the **ANNEX II** the price of the jet Fuel ($/barrel) for the last five years has been accordingly represented.
[3] Fuel Impact on Operating Costs. Industry Economics Performance - Forecast Table (IATA Economics). 2016.
[4] MFSP: Manufacturer's Fuel Suggested Price.

3 ENABLING STRATEGIES TO SUPPORT AND STIMULATE THE CREATION OF AN INITIAL MARKET

This section gives a critical discussion of some of the strategies that are being implemented and worked out. It aims to get a better insight into the implications of these objectives, in order to identify potential trade-offs that would probably need to be made in the next steps.

The policy framework in favour of SAF and biofuels within the EU has been modified several times. Recent re-negotiations that are been carried out about the RED II directive are an example. Furthermore, due to the international nature of the industry, and the recent progress in the CORSIA negotiations, the industry doesn't have a clear and reliable visibility about the overall and applicable policy framework in each case. In the ESFERA deliverable D.2.1.1 *"EU and international policy frameworks"*, a detailed assessment on the topic has been performed.

A clear and stable policy framework is essential if the motivation is that the key actors and stakeholders (end users, fuel producers, and biomass groups) invest and commit efforts and resources to develop initiatives, since they will have a better visibility of the mid-term economic returns to their actions.

All these aspects considered, while policy is key to any future SAF industry, it is seen as a complementary mechanism rather than a substitution to other enabling factors. Driven by the Dutch example[5], some of these key factors include:

- Enabling strategies (integrated policy making, R&D…)
- Logistics & Infrastructures (logistical advantages & flagship projects)
- Key stakeholders & industry leaders driving the market

3.1 CORPORATE CONTRIBUTION

In this approach, big companies, normally associated to an airline, pay a surcharge for flying green and decrease their environmental impact. The surcharge is applied to the price of the ticket for the participants, with the intention that their corporate and business travels will allow a reduction in the price gap between the SAF and the traditional kerosene.

The main example of this model is the KLM Corporate Biofuel Programme[6], established in 2012 and the Fly Green Fund[7], a Nordic initiative launched in 2014 around the Karlstad airport.

[5] Paul Deane; Steve Pye (2016). Stimulating the uptake of liquid biofuels in aviation through existing renewable energy support schemes. Discussion paper, Insight-E.

[6] KLM Corporate Biofuel Programme : https://klmtakescare.com/

[7] Fly Green Fund: http://www.flygreenfund.se

KLM Corporate Biofuel Programme	▪ Each contract contains specific SAF volume purchases or economic conditions (confidential) ▪ Supplies are secured through a multi-year off-take agreement ▪ The volumes are recorded under a Book & Claim mechanism CO_2 reductions are calculated with individual LCA assessment and published in KLM's Annual Sustainability Report.
Fly Green Fund	▪ 75% of funds go into SAF procurement while 25% is invested in supply chain development. ▪ Swedavia (founding partner) was the first Company to use 100% domestic flights using SAF in 2016 ▪ Biofuels are loaded at 1% blend ▪ Currently experiencing supply difficulties ▪ New approach and methodology being considered

3.2 MULTI-YEAR OFF-TAKE AGREEMENTS

An off-take agreement is a contract between a SAF producer or supplier and a purchaser, mainly airlines, which allow them to sign supply contracts in the long-run. These agreements enable airlines to sign beneficial supply contracts without incurring in strong liabilities plus getting incentive mechanisms to bridge the price gap with fossil kerosene. These have a **clear and multiplier effect over the fuels price advantage.**

The main existing long-term offtake agreements concluded with biofuel suppliers are listed below:

Airline / Airport	Supplier	Volume [t/year]	Conversion Technology	Duration	Start Delivery	Contract Date
United	Altair	17.000	HEFA	3 years	2016	2013
Cathay	Fulcrum	100.000	FT/ Municipal waste	10 years	2019	2014
FedEx / Southwest	Red Rock	10.000	FT/ Forest Residues	8 years	2017	2014
British Airways	Velocys	30.000	FT/ Municipal waste	5 years	2018	2023
United	Fulcrum	270.000 +	FT Municipal Waste	10 years	2019	2015
JetBlue	SG Preston	100 000	HEFA	10 years	2019	2016
Qantas	SG Preston	80 000	HEFA	10 years	2020	2017
Oslo Airport	Neste / Alt Air	250	HEFA	1 Year	2016	2016
Brisbane Airport	GEVO	80	ATJ	2 years	2018	2017
Toronto Airport	Alt Air	200	HEFA	1 year	2017	2016
Geneva Airport	TBC	1 %	TBD	5 years	2018	2017

Fig.2. Main off-take Agreements between airlines - suppliers

Source: IATA Fact Sheet. Alternative Fuels (Dec. 2017)

3.3 AIR NAVIGATION CHARGES

Another option to be considered is the possibility of ANSPs (Air navigation Service Providers) to cover a part of the extra-cost of flying with SAF through a specific charge. Nowadays, a charge is levied for each flight in the airspace falling within the competence of the Contracting States. This charge[8] takes into account:

- The distance (kilometers) flown
- Aircraft size and weight

The SAF price allows for the cost differential to be determined and the cost adder per service unit to be estimated. Subsequently, this extra-price is an incentive mechanism for airlines to purchase biojet fuel in the auction, since the airlines using normal kerosene would have a higher cost route.

3.4 ON-AIRPORT FINANCE AND CO-BENEFIT FOUNDING

Recently some airports took a leadership role in the development of the SAF adoption in the aviation industry. Some recent examples are:

- the Geneva Airport[9]
- Seattle-Tacoma International Airport
- Brisbane Airport

They play an active part in actively support the coordination between the diverse companies, organizations and individuals that have to be coordinated for an effective implementation of SAF supply inside their infrastructures:

- The model introduces an airport-wide SAF blend utilizing existing fuelling infrastructure, making SAF standard for all flights refuelling at the airport.
- Partners collaborate to identify and secure most appropriate mechanisms to cover the cost premium of SAF based on the financial profile of the airport.
- This can include non-aeronautical airport revenues, operational cost savings from energy efficiency projects, government subsidies, policies, grants and sponsorship by local businesses.

In addition to supporting with planning and funding, the partners work with airports on the implementation phase, including consensus building, and the identification of supply routes and sustainable feedstock.

There are interesting advantages for the SAF industry with this new approach:

- **Equality** within the airlines with operational costs since the blend ratio distributes the extra SAF cost burden between all the airlines of the complex.
- **Economies of scale since** the demand to take into account are the one from the whole airport users instead of the one from a specific airline.

[8] The total charge per flight collected by EUROCONTROL (R) equals the sum of the charges r_i generated in the charging zones defined by States: $(R = \sum_n r_i)$

[9] Funding scheme: 80% FOG (Federal Government of Switzerland) + 20% Geneva Int. Airport

- **National/regional economic development,** because such an approach requires clearly of a well-organised task force within the region.

ANNEX I

As a first step in the analysis a review was made of various policy frameworks that are defined in the EU and outside the EU that are relevant in the context of alternative fuels for aviation. These policy frameworks consist of:

- Current EU policy:

  Renewable Energy Directive (RED), European Emission Trading System (ETS phase III (2013-2020) and proposal for phase IV (2021-2030)), Fuel Quality Directive (FQD), Common Agricultural Policy (CAP), Land use, land use-change and forestry (LULUCF) regulation
- "Clean Energy for All Europeans" proposals, with particular attention for the Proposal for a revised Renewable Energy Directive

- National policies in a selection of EU Member States: Belgium, Germany (Federal Emission Protection Act (BImSchG)), Spain, France (Law for the energy transition and Multi-year Energy Planning), the Netherlands (Energy agreement), the UK

- International policies:

  - ICAO: Carbon offsetting and Reduction Scheme for International Aviation (CORSIA)

  - US: Renewable Fuel Standard (Federal level), Low Carbon Fuel Standard (State of California)

  - Australia: Biofuels Act 2007 (New South Wales)

ANNEX II

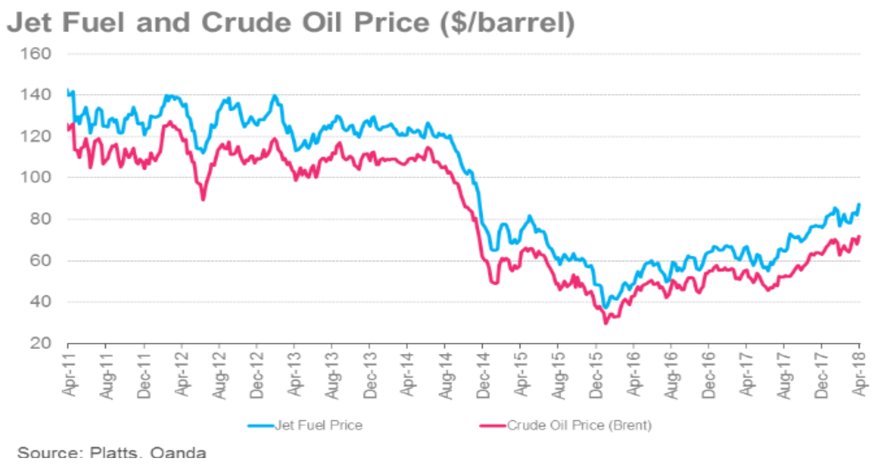

Fig.3. Jet Fuel Price ($ / barrel) fluctuation for the last 7 years

Summary of the economic effects of different policy instruments for a given level of GHG emission reduction (closed economy, one sector, and one period)

	Mechanisms				Welfare components			
POLICY	Impact on aviation activity?	Impact on fuel efficiency of aviation ?	Impact on use of sustainable aviation fuels	Abatement other sectors	Welfare cost	Change in government revenues	Level of consumer surplus	Change in profits of fuel providers
Tax on fossil fuel	Yes	Yes	Low		Low	Positive	Lowest (higher price, lower consumption)	Neutral[d]
Grandfathered tradable permits (aviation)	Yes	Yes	Low		Low	Neutral	Lowest (higher price, lower consumption)[e]	Highest (with grandfathered permits given to fuel suppliers)
Grandfathered tradable permits (whole economy)	Yes	Yes	Very low	Yes	Lowest (uses low cost abatement methods in other sectors)	Neutral	High (lower price increase than in two previous cases)[e]	High (with grandfathered permits given to fuel suppliers)
Sustainable fuel subsidy	Yes - may increase	Yes - may increase	Highest		Highest	Negative	Highest (constant or reduced price of aviation fuel)	Neutral[d]
Sustainable fuel mandate	Yes	Yes	High[c]		Low	Neutral	High	Neutral[d]
Sustainable fuel subsidy financed by ATC route charging	Yes		High		High	Neutral	Low (lower price increase than in first two cases)	Neutral[d]
Voluntary contributions		Very small[a] – cannot reach target	Very small[b] – cannot reach target		Low - but cannot reach target	Neutral	High (as the target is not reached)	Neutral
Fuel efficiency standard airplanes	Yes - may increase	Yes	Zero		Low	Neutral	High	Neutral