Energy Strategy Reviews 20 (2018) 1–5

Contents lists available at ScienceDirect

Energy Strategy Reviews

journal homepage: www.ees.elsevier.com/esr

Europe's ambition for biofuels in aviation - A strategic review of challenges and opportunities[☆]

J.P. Deane [a, *], Steve Pye [a, b]

[a] MaREI Centre, Environmental Research Institute, University College Cork, Ireland
[b] Energy Institute, University College London, UK

ARTICLE INFO

Article history:
Received 14 July 2017
Received in revised form
10 November 2017
Accepted 18 December 2017
Available online 6 January 2018

Keywords:
Biojet fuel
European policy
Aviation
Climate policy

ABSTRACT

Europe's Biofuel FlightPath Initiative was introduced in 2011 with the aim of producing two million tons of biojet fuel derived from renewable sources for the aviation industry by 2020. This volume, equating to approximately 4% of current EU jet fuel consumption has not yet materialized and Europe's biojet fuel industry is in a nascent state. To date surface transport in the EU has benefited from the push effect of renewable transport targets and this has led to the development of a biodiesel and bioethanol industry in the EU to meet the demand created. Biojet fuel has not benefited from this uplift with only one Member State (Netherlands) acknowledging the option of biojet fuel as a means of contribution to the renewable transport target. Higher costs, investor uncertainty and poor policy awareness at Member State level have contributed to the nascent state of biojet fuel in Europe. A clear and stable policy landscape for biojet fuel can help mitigate some of these issues. However, other non-policy measures are also required to overcome these challenges. This review surveys the challenges and opportunities for a nascent biojet fuel sector in Europe and presents options to stimulate the sector.

1. Introduction

All sectors of the global economy must play a role in reducing greenhouse gas emissions to meet the objectives of the Paris Agreement on climate change [1]. Emissions from both domestic and international global aviation accounts for approximately 2% of global CO_2 emissions produced by human activity. World air transportation demand is projected to grow at a rate of around 5% per year over the next several decades [2] thus amplifying the challenge of emission reduction for the sector. At a European level, CO_2 emissions have increased by almost 80% between 1990 and 2014, and are forecast to grow by a further 45% between 2014 and 2035 [3]. On an average day in Europe, over 26,800 flights pass over European airspace and with just 7% of the world's population, these flights accounts for around 25% of global air traffic. Europe is home to approximately 3800 passenger aircraft and over 700 large commercial airports, which supported the movement of 918 million passengers in 2015.[1] Fig. 1 shows passenger movements between EU Member States for 2014.

Following the economic crisis, a significant recovery in the aviation industry was seen in 2014, with a 4% increase in passenger numbers from the previous year. Final energy consumption in the sector in 2014 was 49 Mtoe, 14% of total transport energy usage or 4% of final energy consumption across all EU 28 sectors. CO_2 emissions from aviation in the same year were 137 Mt, representing 15% of total transport emissions or 3.1% of EU 28 emissions [4].

Biofuels can be used in all modes of transport as blend in fuels. In the aviation sector, biofuels known as biojet is particularly critical, with few other obvious alternatives if indeed the sector is going to help contribute meaningfully to carbon reduction targets without severely curtailing growth. There are a wide variety of studies existing in the literature that address the role biofuels in international aviation from different perspectives including technological, environmental and economic perspectives [5–7]. In this paper, we focus on the specific policy challenges and opportunities for the European biojet fuel sector.

2. Global aviation policy context

Emissions from domestic aviation, accounting for approximately

☆ Research provided by European Commission funded project (INSIGHT_E).
* Corresponding author.
E-mail address: jp.deane@ucc.ie (J.P. Deane).
[1] Air transport statistics, Eurostat (Accessed October 2017). http://ec.europa.eu/eurostat/statistics-explained/index.php/Air_transport_statistics.

https://doi.org/10.1016/j.esr.2017.12.008
2211-467X/

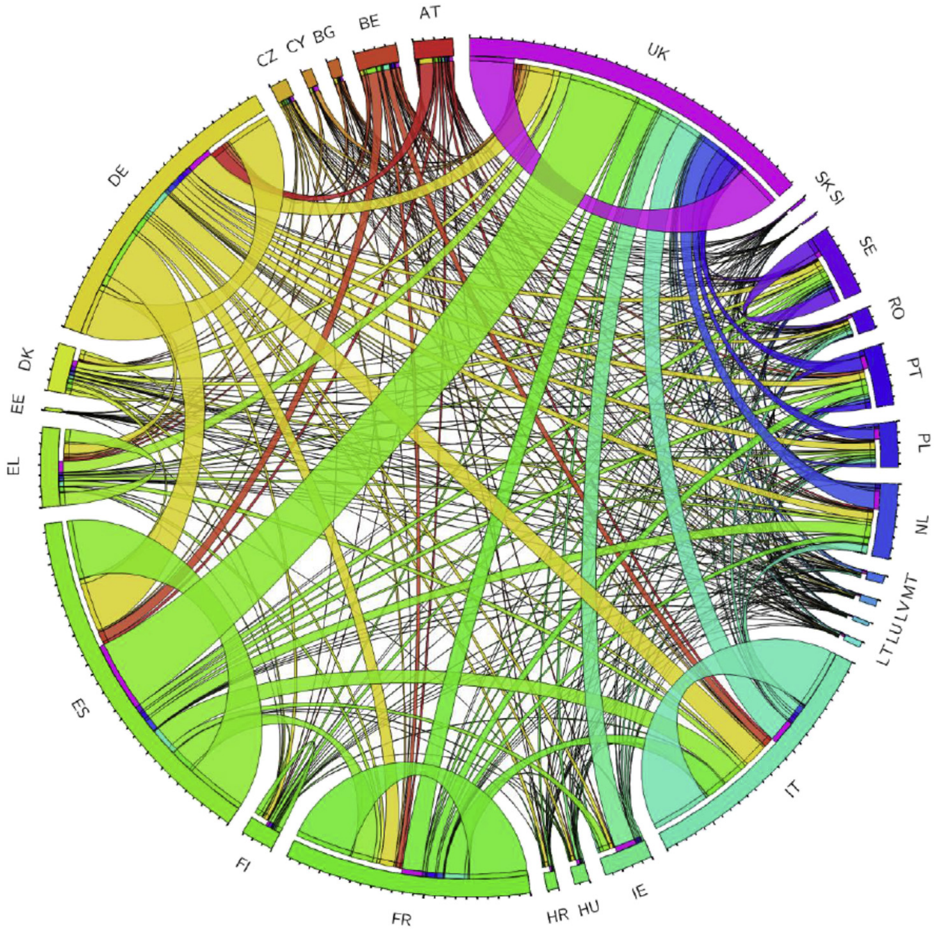

Fig. 1. Circle Diagram showing 2014 passenger movements between EU Member States (domestic flights are shows as links within each Member State Segment. Data sourced from EuroStat).

0.7% of global CO_2 emissions are reported under the United Nations Framework Convention on Climate Change (UNFCCC) and thus the responsibility for emission reduction rests with countries. International aviation emissions, on the other hand, accounting for approximately 1.3% of global CO_2 emissions are the responsibility of the International Civil Agency Organization (ICAO) and therefore these emissions are typically not included in countries' Nationally Determined Contributions (NDCs) under the Paris Agreement. In 2016, ICAO adopted a global carbon-offsetting scheme for international aviation [8]. The Carbon Offset and Reduction Scheme for *I*nternational Aviation (CORSIA) encourages aircraft operators within countries that agree to the scheme to address and offset emissions over and above their average emissions from 2019 to 2020. Offsets may be obtained through existing schemes such as the UNFCCC's Clean Development Mechanism or buying allowances from emissions trading schemes. As of August 2017, 72 States, representing more than 87% of international aviation activity, intend to voluntarily participate in the scheme from its outset. In terms of biojet fuel, ICAO resolution A38-18 [9] on climate change recognizes the role and importance of 'Alternative Fuels' and the needs for coordinated policies and sustainability criteria but does not set targets for fuel uptake. It is unlikely that a focus on offsets as the primary means of mitigation will incentivize the uptake of biojet fuel, due to the much lower comparative cost of offsets. ICAO estimate a range of offsetting costs from 6 to 20 $/ton CO_2e for the year 2020. A high carbon price in excess of 200€/t would be required to make biojet fuel commercially favorable with jet kerosene [10].

3. European policy context

The emergence of the recent ICAO agreement highlights an important tension arising from differing regulatory jurisdictions, demonstrated in recent European policy moves on aviation emissions. In 2012 the EU led the way in implementing market-based measures (MBMs) for aviation by including aviation in its Emission Trading System (EU ETS). The scheme places the responsibility for emissions reduction on the aircraft operators. Initially the EU ETS was set to cover 100% of EU aviation emissions, which equated to approximately a third of global aviation emissions. However, this was fiercely resisted by the industry and in April 2013, the EU decided to temporarily suspend enforcement (a move called 'Stop the Clock') of the EU ETS requirements for flights operated in or to non-EU countries, while continuing to apply the legislation to flights within and between countries in Europe. While the scheme is focused on a 'cap and trade' emission principle, aviation companies can gain credits for use of biojet fuels. However their present use by aircraft operators remains extremely small to date mainly due to very high cost differentials [11]. The European Commissions has to give careful consideration on how the EU-ETS for aviation and the recently proposed CORSIA global scheme for emissions reduction from international aviation will work, as both systems together may overlap. Fig. 2 presents an overview of global and EU climate initiatives that impact aviation. In 2017 the European