

# WHERE WILL WE GET OUR BIOJET?

IRENA Parallel event at EUBCE (European Biomass Conference and Exhibition) 2019  
Lisbon, 28 May 2019

## BRIEF SUMMARY

1. Experts discussed potentials and strategies to accelerate biojet deployment. The panel included: IEA Bioenergy/U.S. Department of Energy (Jim Spaeth); SkyNRG (Darrin Morgan); RE-CORD/University of Florence (David Chiaramonti); University of Birmingham (Miloud Ouadi); Swedish Bioenergy Association – Svebio (Kjell Andersson); TOTAL (Stéphane Thion) and IRENA (Sakari Oksanen). The panel was moderated by IRENA (Dolf Gielen). About 150 participants attended the event.
2. **Dolf Gielen (IRENA)** set the scene, presenting IRENA's perspective on the role of biojet in the global energy transformation, in line with Paris climate goals. Key takeaways included the fact that biojet is significant for the biofuel industry and that biofuel production scale needs to increase five-fold by 2050, compared to current levels (half of this growth should come from biojet). Various conversion pathways have been certified but not all of them have reached commercial scale, "up-scaling" is required. The key question relates to the economics of the biojet; kerosene prices recently hit \$2 USD per gallon, roughly 60 US cents per litre. Current biojet prices are 60% higher than conventional jet fuel and their application might lead to rising flight ticket prices, therefore consumer acceptance is a concern. Further development and deployment of biojet requires supporting policies.
3. **Darrin Morgan (SkyNRG)** presented ongoing activities on biojet production. Currently, there is only one SAF (Sustainable Aviation Fuel) refinery of AltAir Fuels in the world and produces roughly 10 kt of SAF per year, since 2016. SkyNRG just announced that it will develop Europe's first dedicated sustainable aviation fuel production plant with a capacity of 100kt/year (of which KLM will purchase 75 kt per year). KLM's corporate fuel program is one good example for biojet market development. This program addresses companies that aim to reduce their corporate travel carbon footprint and those that are willing to pay a premium for using biojet. Reducing carbon footprints, however, is not the only goal; the aim is to also to drive innovation. Development of an ecosystem of major stakeholders is a key enabler for market development that can increase the production of biojet despite its lack of economic competitiveness at the moment.

4. **David Chiaramonti (RECORD)** presented the EU H2020 BIO4A project. The project aims to accelerate the deployment of aviation biofuels, enabling commercial production. Sustainable biomass feedstock supply is a key ingredient for advanced biofuel. Currently, used cooking oil is the main feedstock, which has limited availability in the EU (for instance, today in Italy 60,000 t/y of UCO are collected from commercial operators). HEFA technology has reached an industrial scale, however, the key to long-term success is to secure the supply of sustainable lipids. Camelina is a good candidate given the lipid yield in dry areas, especially if complemented by the production and use of biochar from lignocellulosic biomass (also residual) as soil amendment to recover marginal lands and poor soils of EU Mediterranean Countries.
5. **Miloud Ouadi (University of Birmingham)** presented the EU H2020 flexJET project. The project aims to build a pre-commercial demonstration plant for the production of SAF derived from digested food waste and waste vegetable oil while mapping the full economic, social and environmental impacts of the technology. It is mainly supported by the European Union (EU) (10 M Euro out of 15 M Euro of total cost) with a consortium of 13 partners from five EU countries. The project will be completed by 2022. The FlexJET demonstration plant is built with a capacity to process up to 12 t/day of food & market waste and 4000 l/day of used cooking oil (UCO). It will deliver 1200 tons of Sustainable Aviation Fuel (SAF) (ASTM D7566 Annex 2) to commercial flights. This project has high feedstock flexibility as well as end-product flexibility and is scalable to the commercial level.
6. **Kjell Andersson (Svebio)** shared insights on feedstocks. Sufficient ligno-cellulosic feedstock (forestry biomass) would be able to secure supply. According to the Swedish case, managed forests allows for the harvesting of increasing volumes while simultaneously allowing forest stocks to grow. In Sweden, forest harvests have always been less than growth. It is better to use the wood to produce renewable materials and substitute fossil fuels, instead of only storing carbon in forests. Foresters should decide when to cut woods to maximise carbon uptake. Especially, residues from harvest sites, and residues from forest industries like black liquor/tall oil/bark from pulp mills can be the main feedstock for biofuel coming from forestry.
7. **Stephane Thion (TOTAL)** shared industrial views regarding biojet fuel. The aviation sector is growing at a fast pace (about 5% passenger growth per year). This implies rising consumption of jet fuel and CO<sub>2</sub> emissions, accordingly. The industry has ambitious goals to reduce their carbon emissions. It would require 100 million tonnes of biojet to meet 2040 CO<sub>2</sub> emission reduction targets (as per ICAO scenarios). Many conversion pathways have been approved to produce biojet. Accelerating new pathway approvals is key to developing a secure and sustainable aviation industry (6 pathways approved in the last 10 years). Clear and stable policies will be critical to stimulate the incorporation of

sustainable aviation fuels. Growing societal concerns is putting pressure on the entire supply chain and biojet producers must ensure a high level of sustainability (feedstock access and certification).

8. **Jim Spaeth (IEA Bioenergy/US DOE)** presented new pathways for drop-in biofuel, co-processing in existing oil refineries. Co-processing of bio-based intermediates in existing refineries produces fossil fuels with renewable content (lower carbon intensity). It is relatively less costly than repurposing existing infrastructure, co-location with other hydrogen sources, or new stand-alone infrastructure. It does, however, present increased risks to expansion, with the acceptance of the oil refinery industry as a potential obstacle.
9. **Sakari Oksanen (consultant to IRENA)** presented results of IRENA's upcoming report on *"Advanced Biofuels - What holds them back?"*. The study shows survey results of 14 major advanced biofuel companies for identifying main barriers to further deployment of biojet fuel. The feedstock issue is important but not considered as a serious concern. For ligno-cellulosic pathways, few concerns were raised on the feedstock side but more on the technology side. In contrast, for the HEFA pathway, it was the other way around with more concerns on feedstock issues. Generally, stability of regulation is ranked as the most important barrier. Stéphane Thion (TOTAL) confirmed during the session that stability of regulation is also the most important barrier to investment for industry.
10. Following the brief presentations from panellists, key messages were delivered from the panel members. **Darrin Morgan** noted that the key to success is not to worry about the future, we need to focus on the real market and go forward. **David Chiramonti** stated that he was impressed by how major industries responded to the issues surrounding biojet. No concern on feedstock risk for ligno-cellulosic technology is quite surprising, as in any case process performances are not independent from the type of feedstock. **Miloud Ouadi** noted that we have to start somewhere. A fast track on the market is what we need. We need to maximise use of by-products to maximise the cost advantage. We need to speed up for climate change. **Kjell Andersen** conveyed that the real issue is to create demand. It will not be driven by research, but by industry. If there is sufficient product demand, industry will move forward. **Stéphane Thion** noted that the aviation sector has very ambitious climate targets. The roadmap is not clear, but it will become clearer as we work collectively. **Jim Spaeth** noted that a key challenge is the sourcing and cost of feedstocks. Two pioneer stand-alone advanced biojet plant in the US are planning for capacities of approximately 10 million gallons per year. To address sustainability issues, the industry needs very strong collaboration among a wide range of stakeholders. **Sakari Oksanen** pointed out that the challenge is still on the demand side. A market has to be created by international agreement. If incentives for airlines are mandated and applied, the market will follow.

11. Questions from the floor:

- a. Where will the jump of biojet production come from?
  - It will come from reduction in costs and development of technology. Effective policy will create the market. Currently, we only have ETS, but the pressure is too low to create the market. CORSIA could play an important role.
  
- b. Who is politically responsible for bringing biojet to market?
  - It is up to the national governance. In Europe, this has to be done by the member states. ICAO made a good international agreement but its scope is still limited at the global scale. So far the agreement is carried by rich and environmentally friendly countries.
  - Support mechanisms from CORSIA do not have to be the only ones. It's temporary measure. France is a good example where the State talks to private companies and different stakeholders and is considering a national binding target for biojet.